

Material & Equipment Literature

for the

SAN PEDRO MARTIR TELESCOPE

Baja California, Mexico

November 14, 2014

30% DESIGN SUBMITTAL

ARCHITECTURE
ENGINEERING
CONSTRUCTION MANAGEMENT

M3-PN147005

M3 Engineering & Technology Corporation ❖ 2051 W. Sunset Road, Ste. 101 ❖ Tucson, Arizona 85704 ❖ 520-293-1488

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5. MECHANICAL (CONTINUED)

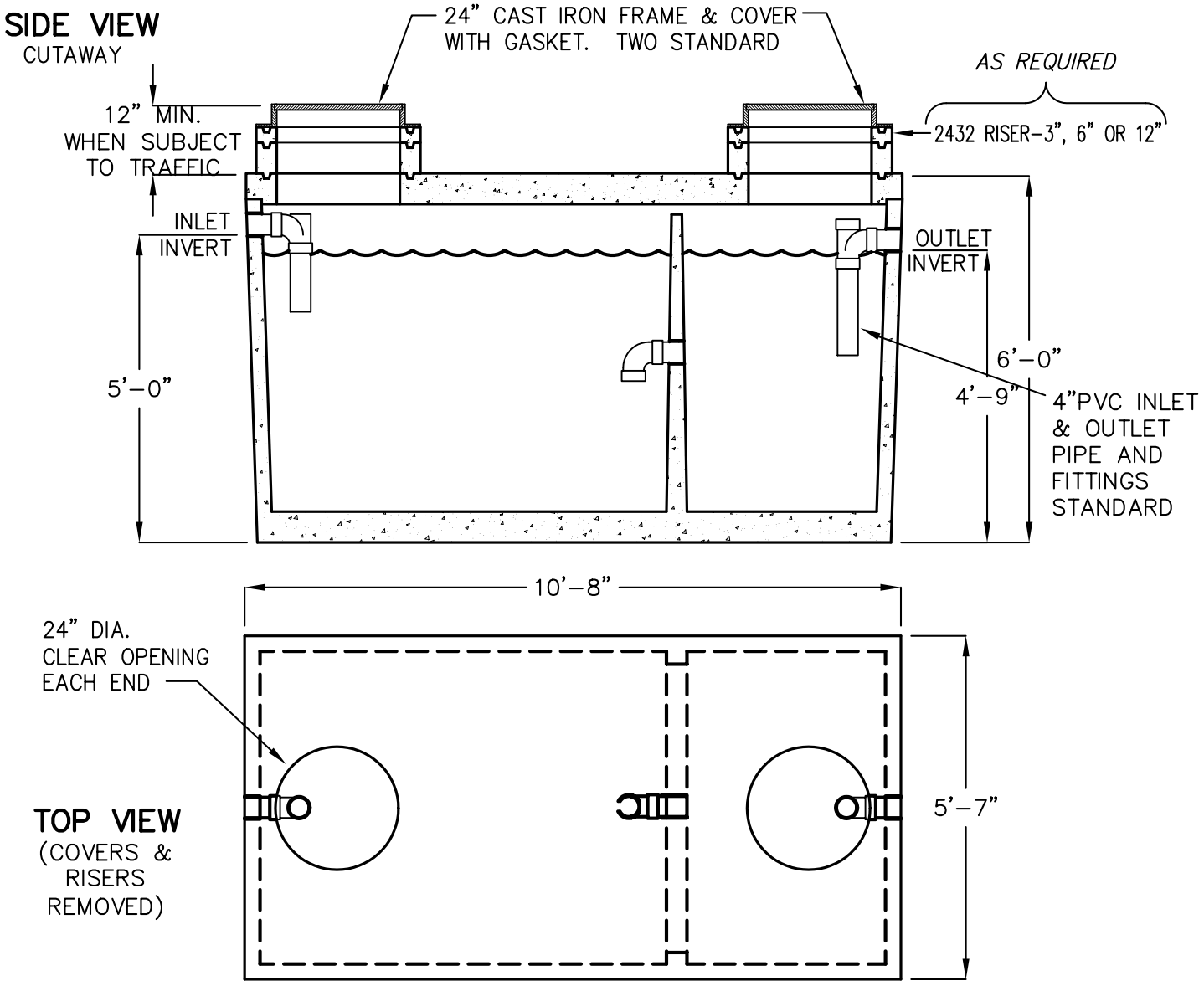
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1500 GALLON COMMERCIAL SEPTIC TANK

MODEL JP1500
TRAFFIC RATED
ACCEPTED BY **UPC**



- LIQUID CAPACITY: 1500 GALLONS
- TANK DESIGNED FOR H-20 TRAFFIC WHEEL LOAD WITH DRY SOIL CONDITIONS (WATER TABLE BELOW TANK) EARTH COVER OVER TANK NOT TO EXCEED 6 FT.

MINIMUM EXCAVATION SIZE:
6'-7" X 11'-8" X DEPTH REQ'D.

- SUITABLE NATIVE OR SUB-BASE SHALL BE PREPARED TO HANDLE ANTICIPATED LOADS. THE EXCAVATION SHALL BE BEDDED WITH SUITABLE GRANULAR MATERIAL AND SHALL BE COMPACTED TO 90% MAXIMUM DRY DENSITY, OR TO REQUIREMENTS OF THE PROJECT GEOTECHNICAL ENGINEER.
- FOR COMPLETE DESIGN AND PRODUCT INFORMATION CONTACT JENSEN PRECAST.

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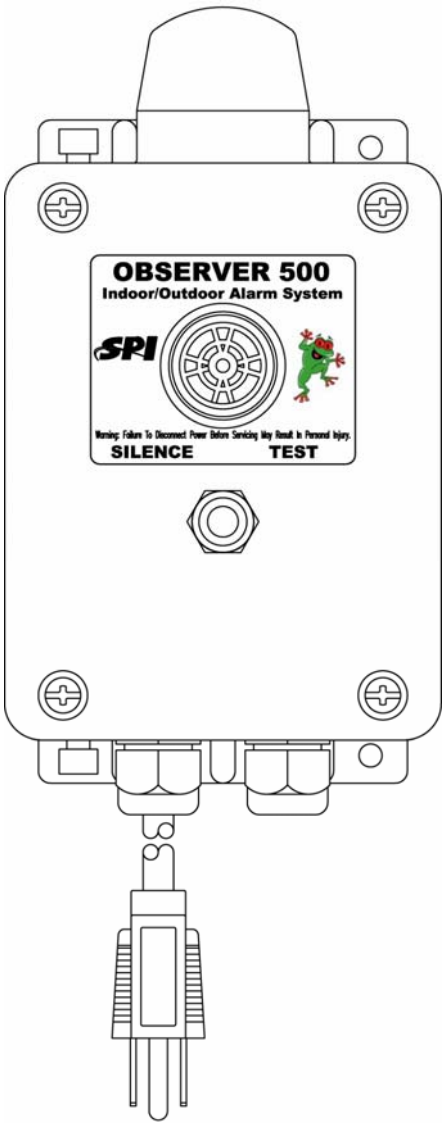
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JENSEN PRECAST®

ALARM SYSTEMS

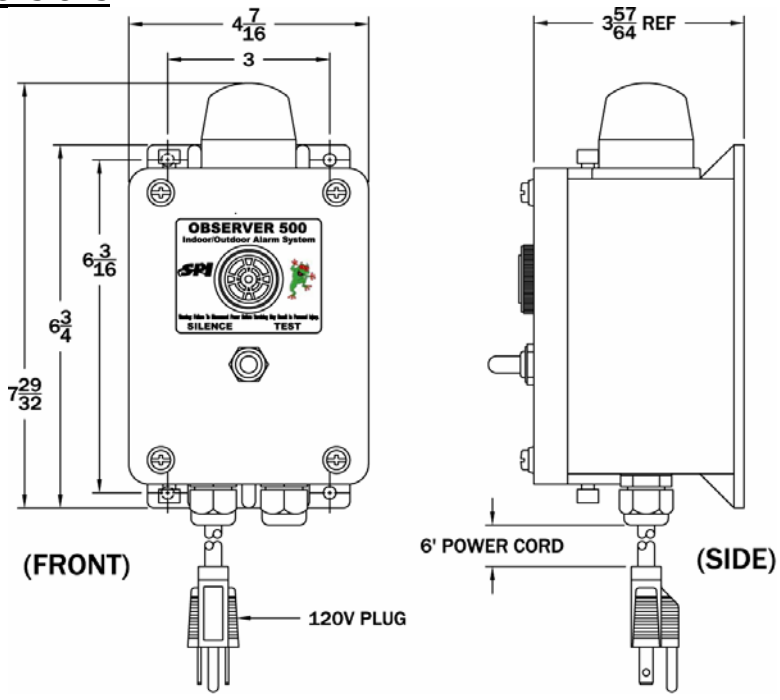
"Observer 500" Series Indoor/Outdoor Alarm

Features & Benefits



- **NEMA 4x Thermoplastic Enclosure**
- **Large Alarm Condition Indicating Light**
- **Audible Horn rated 85db @ 10'**
- **Alarm Test-Normal-Silence switch**
- **Automatic Alarm Reset**
- **Supplied w/Cord Grip for Float Switch Installation**
- **Includes 15' Mechanical Alarm Float & mounting tie strap**
- **6' Power Cord with 115 volt plug**
- **Suitable for Indoor or Outdoor Use**
- **Two Year Limited Warranty**
- **Available in both High Water & Low Level Alarm versions**

Dimensions



***Note: Consult the factory for other available options.**

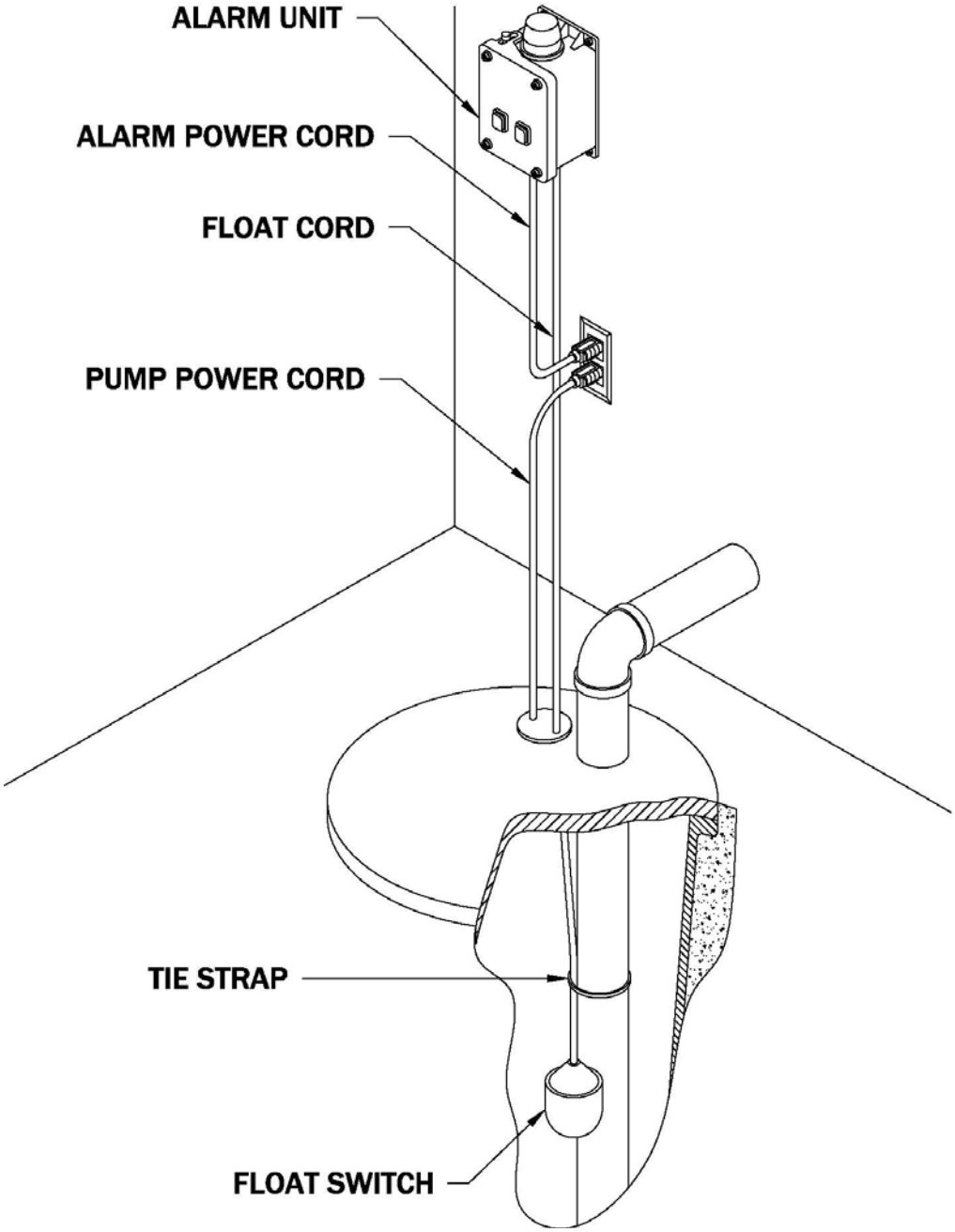
Septic Products, Inc. 1378 Twp Rd Ashland, Ohio 44805 Ph: (419)282-5933 Fax: (419)282-5943

Septic Products Inc.

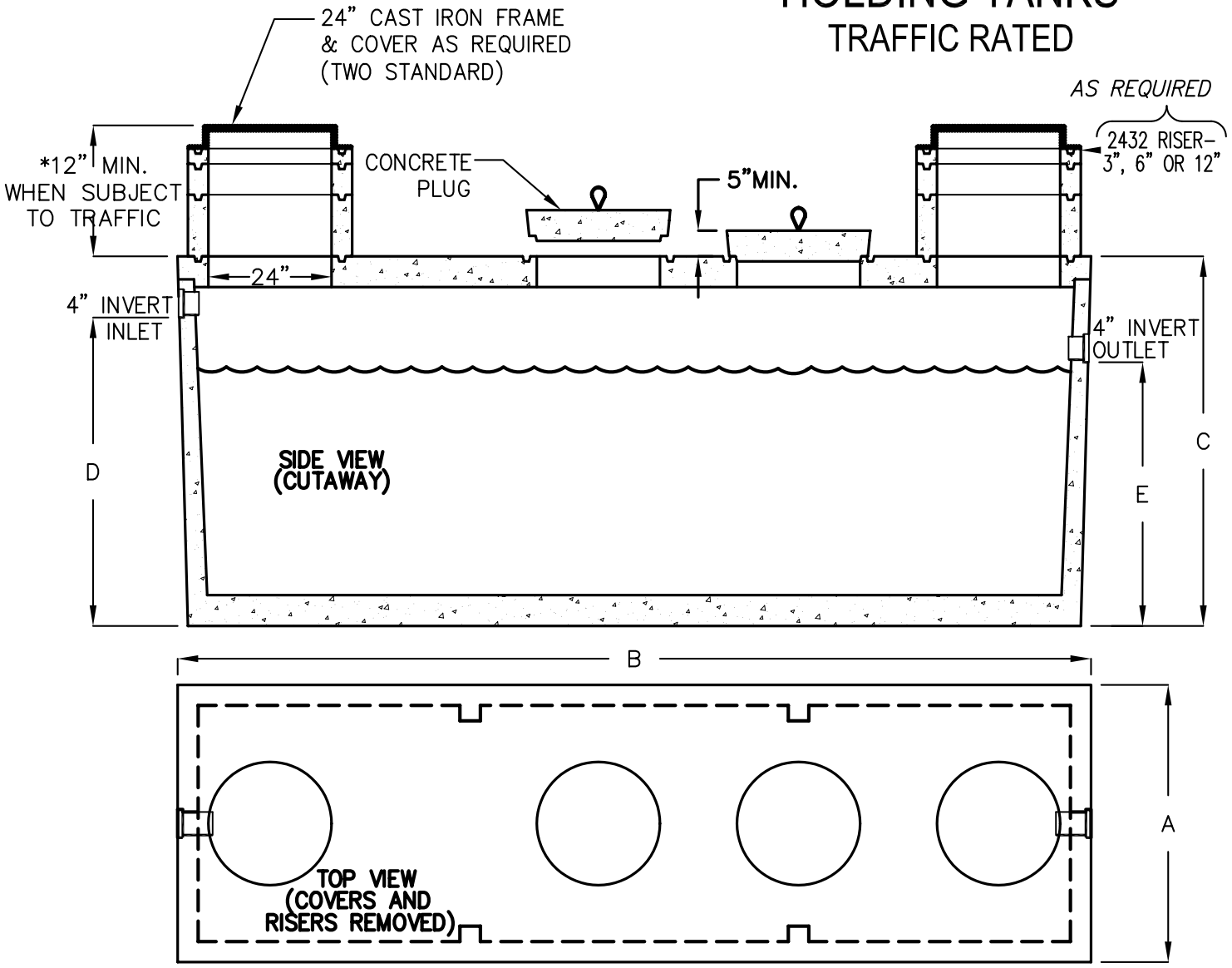
ALARM SYSTEMS

"Observer 500" Series Indoor/Outdoor Alarm

Typical Installation



2,000 - 5,000 GALLON HOLDING TANKS
TRAFFIC RATED



NOTE: NOT RECOMMENDED FOR POTABLE WATER OR ABOVE GROUND USE. NO WARRANTIES EXPRESSED OR IMPLIED FOR MERCHANTIBILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

MODEL NUMBER	LIQUID CAPACITY GALLONS	TOTAL TANK VOLUME	WIDTH "A"	OVERALL LENGTH "B"	TANK HEIGHT "C"	INLET "D"	OUTLET "E"	MINIMUM EXCAVATION WIDTH	MINIMUM EXCAVATION LENGTH	* DEPTH OF BURY	MAX. LIFT WEIGHT
HP–2000	2000	2424	4'–11"	15'–11"	6'–0"	5'–0"	4'–9"	5'–11"	16'–11"	6' MAX.	19,100
HZ–2500	2500	3066	5'–9"	16'–10"	6'–0"	5'–0"	4'–9"	6'–9"	17'–10"	5' MAX.	22,700
HZ–3000	3000	3526	5'–9"	16'–10"	6'–9"	5'–9"	5'–6"	6'–9"	17'–10"	5' MAX.	24,000
HZ–4000	4000	4851	7'–8"	16'–7"	6'–9"	5'–6"	5'–3"	8'–8"	17'–7"	5' MAX.	22,100
HZ–5000	5000	5750	7'–8"	16'–7"	7'–11"	6'–9"	6'–6"	8'–8"	17'–7"	4' MAX.	24,100
LARGER SIZES AVAILABLE UPON REQUEST, CONTACT JENSEN PRECAST FOR DETAILS.											

- TANK DESIGNED FOR H–20 TRAFFIC WHEEL LOAD WITH DRY SOIL CONDITIONS (WATER TABLE BELOW TANK).
- SUITABLE NATIVE OR SUB–BASE SHALL BE PREPARED TO HANDLE ANTICIPATED LOADS. THE EXCAVATION SHALL BE BEDDED WITH SUITABLE GRANULAR MATERIAL AND SHALL BE COMPACTED TO 90% MAXIMUM DRY DENSITY, OR TO REQUIREMENTS OF THE PROJECT GEOTECHNICAL ENGINEER.
- FOR COMPLETE DESIGN AND PRODUCT INFORMATION CONTACT JENSEN PRECAST.

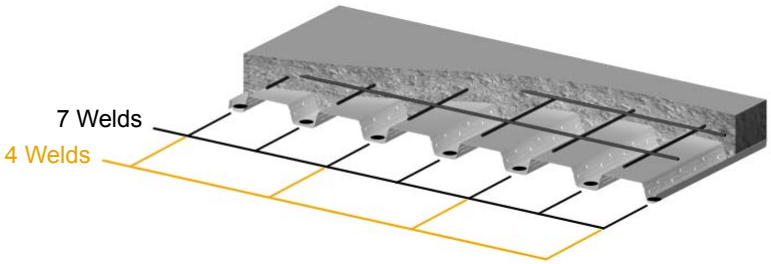
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2000thru5000_holding_tanks–W.dwg
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JENSEN PRECAST®

PLB™ or B FORMLOK™

- 4 in. TOTAL SLAB DEPTH
- Normal Weight Concrete (145 pcf)
  36.6 psf
- Galvanized or Phosphatized/Painted



Deck Weight and Section Properties

Gage	Weight (psf)		I_d for Deflection		Moment		Allowable Reactions per ft of Width (lb)				
							End Bearing			Interior Bearing	
	Galv G60	Phos/ Painted	Single Span ($in.^4/ft$)	Multiple Spans ($in.^4/ft$)	$+S_{eff}$ ($in.^3/ft$)	$-S_{eff}$ ($in.^3/ft$)	2"	3"	4"	3"	4"
22	1.9	1.8	0.177	0.192	0.176	0.188	935	1076	1163	1559	1671
20	2.3	2.2	0.219	0.231	0.230	0.237	1301	1492	1609	2190	2340
18	2.9	2.8	0.302	0.306	0.314	0.331	2181	2484	2667	3714	3950
16	3.5	3.4	0.381	0.381	0.399	0.410	3265	3699	3955	5607	5938

Allowable Superimposed Loads (psf)

Gage	Spans	Max. UCS[1]	Span (ft-in.)										
			6'-0"	6'-6"	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-6"	10'-0"	10'-6"	11'-0"
22	1	6'-2"	303	229	198	173	151	133	118	104	93	83	74
	2	7'-3"	303	265	234	173	151	133	118	104	93	83	74
	3	7'-4"	303	265	234	173	151	133	118	104	93	83	74
20	1	7'-5"	318	279	246	183	160	141	125	111	99	89	79
	2	8'-8"	318	279	246	220	197	178	125	111	99	89	79
	3	8'-9"	318	279	246	220	197	178	125	111	99	89	79
18	1	8'-5"	344	301	266	237	213	155	138	123	109	98	88
	2	10'-2"	344	301	266	237	213	192	175	160	147	98	88
	3	10'-5"	344	301	266	237	213	192	175	160	147	98	88
16	1	9'-1"	342	300	265	236	212	192	174	121	108	97	87
	2	11'-3"	342	300	265	236	212	192	174	159	146	135	125
	3	11'-2"	342	300	265	236	212	192	174	159	146	135	125

[1] Max. UCS = Maximum Unshored Clear Span (ft-in.)

Shoring required in shaded areas to right of heavy line.

Allowable Diaphragm Shear Values, q (plf) and Flexibility Factors, F (in./lb x 10^6)

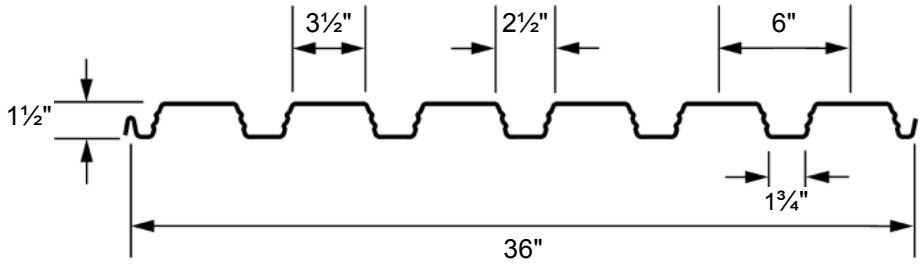
Gage	Welds	Span (ft-in.)										
		6'-0"	6'-6"	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-6"	10'-0"	10'-6"	11'-0"
22	q4	2065	2026	1993	1965	1940	1918	1898	1881	1865	1851	1838
	F4	0.40	0.41	0.41	0.42	0.42	0.43	0.43	0.44	0.44	0.45	0.45
	q7	2274	2220	2173	2133	2097	2066	2038	2013	1991	1971	1952
	F7	0.36	0.37	0.38	0.39	0.39	0.40	0.40	0.41	0.41	0.42	0.42
20	q4	2132	2086	2047	2012	1983	1956	1933	1912	1893	1876	1860
	F4	0.35	0.36	0.37	0.37	0.38	0.38	0.39	0.39	0.40	0.40	0.40
	q7	2384	2318	2262	2214	2171	2134	2100	2071	2044	2020	1997
	F7	0.32	0.32	0.33	0.34	0.35	0.35	0.36	0.36	0.37	0.37	0.38
18	q4	2285	2224	2171	2126	2086	2051	2020	1992	1967	1944	1923
	F4	0.29	0.29	0.30	0.31	0.31	0.32	0.32	0.33	0.33	0.34	0.34
	q7	2620	2533	2459	2394	2337	2287	2243	2203	2168	2135	2106
	F7	0.25	0.26	0.27	0.27	0.28	0.29	0.29	0.30	0.30	0.31	0.31
16	q4	2454	2377	2312	2255	2205	2161	2122	2087	2055	2027	2001
	F4	0.24	0.25	0.25	0.26	0.26	0.27	0.27	0.28	0.28	0.29	0.29
	q7	2873	2764	2671	2590	2519	2457	2401	2352	2307	2267	2230
	F7	0.20	0.21	0.22	0.23	0.23	0.24	0.24	0.25	0.25	0.26	0.26

PLB™ or B FORMLOK™

- 1½" Deep Deck
- Galvanized or Phosphatized/Painted



Dimensions

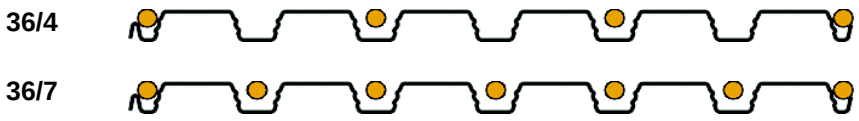


Deck Weight and Section Properties

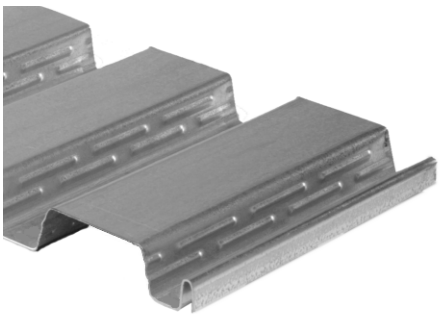
Gage	Weight (psf)		I_d for Deflection		Moment		Allowable Reactions per ft of Width (lb)				
	Galv G60	Phos/ Painted	Single Span (in.⁴/ft)	Multiple Spans (in.⁴/ft)	$+S_{eff}$ (in.³/ft)	$-S_{eff}$ (in.³/ft)	End Bearing			Interior Bearing	
							2"	3"	4"	3"	4"
22	1.9	1.8	0.177	0.192	0.176	0.188	935	1076	1163	1559	1671
20	2.3	2.2	0.219	0.231	0.230	0.237	1301	1492	1609	2190	2340
18	2.9	2.8	0.302	0.306	0.314	0.331	2181	2484	2667	3714	3950
16	3.5	3.4	0.381	0.381	0.399	0.410	3265	3699	3955	5607	5938

Note: Section properties are based on F_y = 50,000 psi.

Attachment Patterns to Supports

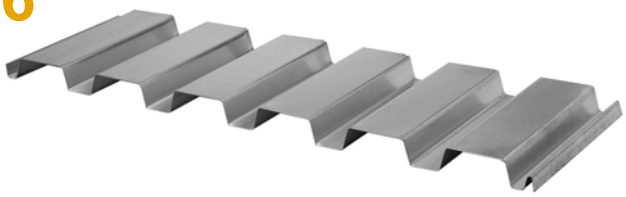


Embossment Pattern

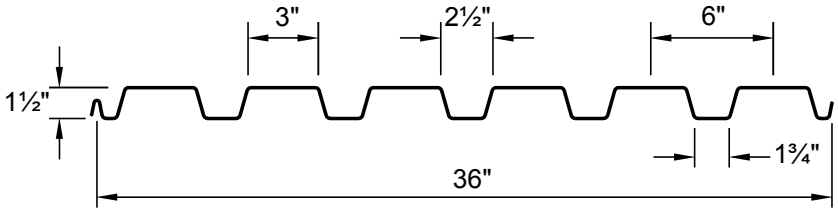


Type PLB™-36 or HSB®-36

- 1½" Deep Roof Deck
- Primer Painted or Galvanized



Dimensions



PLB-36 or HSB-36



Standard Interlocking Sidelap

HSB-SS-36



Screw Fastened Sidelap

HSB-30 NESTABLE



Overlapping Sidelap Available 30" Wide – Special Order

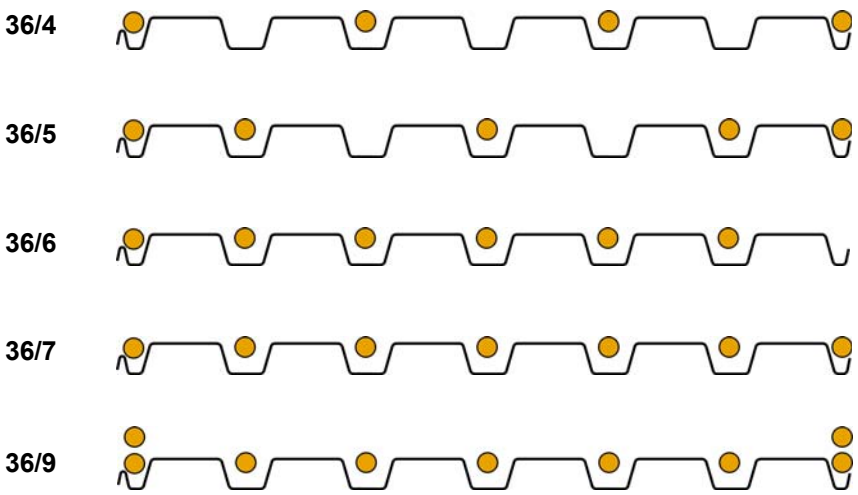
Deck Weight and Section Properties

Gage	Weight		I_d for Deflection		Moment		Allowable Reactions per ft of Width (lb)				
	Galv	Painted	Single Span	Multi Span	$+S_{eff}$	$-S_{eff}$	End Bearing			Interior Bearing	
	(psf)	(psf)	($in.^4$/ft)	($in.^4$/ft)	($in.^3$/ft)	($in.^3$/ft)	2"	3"	4"	3"	4"
22	1.9	1.8	0.180	0.192	0.185	0.194	748	861	931	1248	1337
20	2.3	2.2	0.223	0.231	0.233	0.244	1041	1193	1287	1752	1872
18	2.9	2.8	0.305	0.306	0.318	0.331	1745	1988	2133	2972	3160
16	3.5	3.4	0.381	0.381	0.404	0.410	2612	2959	3164	4485	4751

Notes:

1. Section properties are based on F_y = 40,000 psi.
2. See Verco's evaluation report for section property and allowable reaction adjustment factors for acoustical decks.

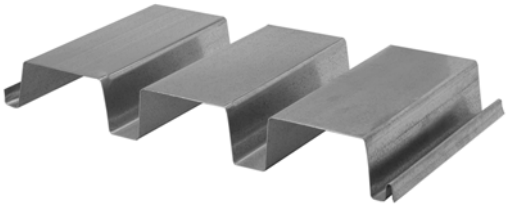
Attachment Patterns to Supports



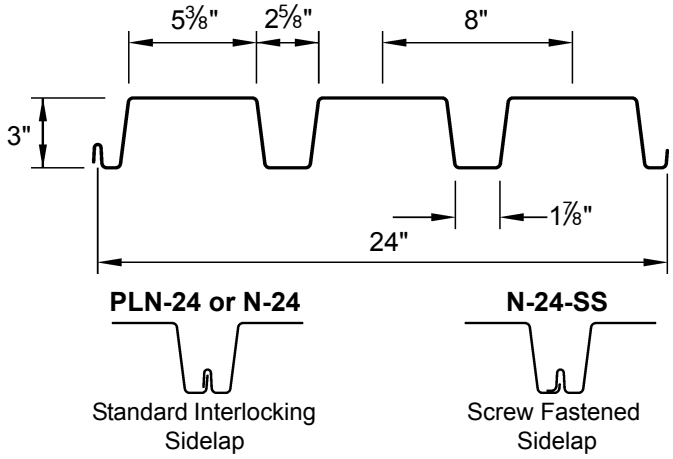
Note: ● indicates location of weld, power actuated fastener, or screw as indicated in the load tables.

Type PLN™-24 or N-24

- 3" Deep Roof Deck
- Primer Painted or Galvanized



Dimensions



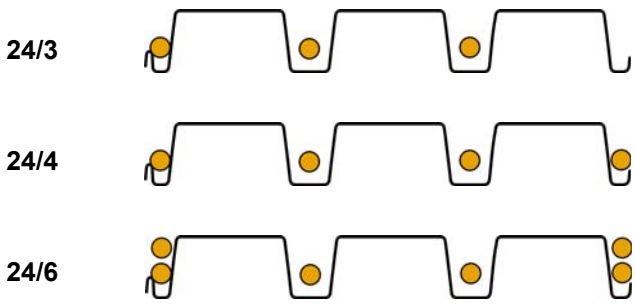
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Gage	Weight		I_d for Deflection		Moment		Allowable Reactions per ft of Width (lb)				
	Galv	Painted	Single Span	Multi Span	$+S_{eff}$	$-S_{eff}$	End Bearing			Interior Bearing	
	(psf)	(psf)	($in.^4$/ft)	($in.^4$/ft)	($in.^3$/ft)	($in.^3$/ft)	2"	3"	4"	4"	5"
22	2.2	2.1	0.748	0.860	0.359	0.438	523	602	669	1040	1121
20	2.6	2.5	0.926	1.032	0.464	0.542	737	844	935	1458	1569
18	3.5	3.4	1.293	1.369	0.663	0.736	1253	1427	1573	2468	2645
16	4.2	4.1	1.667	1.706	0.850	0.914	1893	2145	2357	3719	3974

Notes:

1. Section properties are based on F_y = 40,000 psi.
2. See Verco's evaluation report for section property and allowable reaction adjustment factors for acoustical decks.

Attachment Patterns to Supports

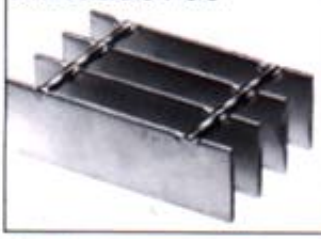


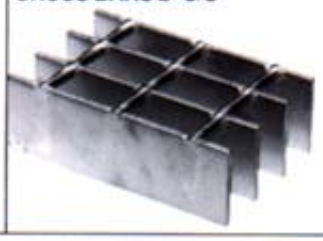
Note: ● indicates location of weld, power actuated fastener, or screw as indicated in the load tables.

STEEL WELDED GRATING

1-3/16" CENTER TO CENTER OF BEARING BARS

19-4	19-2
CROSS BARS 4" C/C	CROSS BARS 2" C/C





STEEL PRESSURE-LOCKED GRATING

1-3/16" CENTER TO CENTER OF BEARING BARS

19-4	19-2
CROSS BARS 4" C/C	CROSS BARS 2" C/C





STATIC LOAD TABLE – Loads & deflections are theoretical, based on a maximum allowable fiber stress of 18,000 PSI, E = 30,000,000 PSI.

Bar Size	Symbol	Approx. Weight*** Lbs./Sq. Ft.	Sec. Mod. Per Ft. Of Width		SPAN (LGTH. OF BRG. BAR) 2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	8'-0"	9'-0"
3/4" x 1/8"	19-4-32	*4.0 **4.3	.122	U	366	234	163	120	92	72							
				D	.096	.150	.216	.295	.386	.484							
	19-2-32	*4.6 **4.9		C	366	293	244	209	183	163							
				D	.077	.120	.173	.235	.307	.389							
3/4" x 3/16"	19-4-33	*5.6 **6.4	.183	U	549	351	244	179	137	108							
				D	.096	.150	.216	.294	.383	.482							
	19-2-33	*6.3 **7.1		C	549	439	366	314	275	244							
				D	.077	.120	.173	.236	.308	.389							
1" x 1/8"	19-4-42	*5.1 **5.4	.216	U	648	415	288	212	162	128	104	86	72				
				D	.072	.112	.162	.221	.288	.364	.451	.546	.647				
	19-2-42	*5.7 **6.0		C	648	518	432	370	324	288	259	236	216				
				D	.057	.090	.129	.176	.230	.291	.359	.435	.517				
1" x 3/16"	19-4-43	*7.3 **8.0	.325	U	975	624	433	318	244	193	156	129	108				
				D	.072	.113	.162	.221	.289	.366	.451	.546	.648				
	19-2-43	*8.0 **8.7		C	975	780	650	557	488	435	390	355	325				
				D	.058	.090	.130	.177	.231	.292	.361	.437	.520				
1-1/4" x 1/8"	19-4-52	*6.1 **6.5	.339	U	1017	651	452	332	254	201	163	134	113	96	83		
				D	.058	.090	.130	.177	.231	.293	.362	.435	.520	.609	.708		
	19-2-52	*6.8 **7.2		C	1017	814	678	581	509	452	407	370	339	313	291		
				D	.046	.072	.104	.142	.185	.234	.289	.350	.416	.488	.560		
1-1/4" x 3/16"	19-4-53	*8.9 **9.7	.507	U	1521	973	676	497	380	300	243	201	169	144	124		
				D	.058	.090	.130	.177	.230	.291	.359	.435	.518	.608	.705		
	19-2-53	*9.6 **10.4		C	1521	1217	1014	869	761	676	608	553	507	468	435	380	338
				D	.046	.072	.104	.141	.184	.233	.288	.348	.415	.487	.565	.614	.770
1-1/2" x 1/8"	19-4-62	*7.3 **7.9	.488	U	1464	937	651	478	366	289	234	194	163	139	120	92	72
				D	.048	.075	.108	.147	.192	.233	.299	.363	.433	.508	.590	.772	.967
	19-2-62	*7.9 **8.5		C	1464	1171	976	837	732	651	586	532	488	450	418	366	325
				D	.038	.060	.086	.118	.153	.194	.240	.290	.345	.405	.470	.614	.770
1-1/2" x 3/16"	19-4-63	*10.6 **11.8	.730	U	2190	1402	973	715	548	433	350	290	243	207	179	137	108
				D	.048	.075	.108	.147	.192	.243	.300	.364	.431	.506	.589	.769	.971
	19-2-63	*11.2 **12.4		C	2190	1752	1460	1251	1095	973	876	796	730	674	626	548	487
				D	.038	.060	.086	.118	.154	.196	.240	.290	.346	.406	.471	.615	.778
1-3/4" x 3/16"	19-4-73	*12.2 **13.5	.994	U	2982	1908	1325	974	746	589	477	394	331	282	243	186	147
				D	.041	.064	.093	.126	.165	.208	.257	.311	.370	.434	.503	.657	.832
	19-2-73	*12.9 **14.2		C	2982	2386	1988	1704	1491	1325	1193	1084	994	918	852	746	663
				D	.033	.051	.074	.101	.132	.167	.206	.249	.296	.348	.403	.527	.667
2" x 3/16"	19-4-83	*13.9 **15.1	1.299	U	3897	2494	1732	1272	974	770	624	515	433	369	318	244	192
				D	.036	.056	.081	.110	.144	.182	.225	.272	.324	.380	.441	.577	.728
	19-2-83	*14.5 **15.7		C	3897	3118	2598	2227	1949	1732	1559	1417	1299	1199	1113	974	866
				D	.029	.045	.065	.088	.115	.146	.180	.218	.259	.304	.353	.461	.583
2-1/4" x 3/16"	19-4-93	*15.4 **16.7	1.644	U	4932	3156	2192	1610	1233	974	789	652	548	467	403	308	244
				D	.032	.050	.072	.098	.128	.162	.200	.242	.288	.338	.392	.512	.649
	19-2-93	*16.1 **17.4		C	4932	3946	3288	2818	2466	2192	1973	1793	1644	1518	1409	1233	1096
				D	.026	.040	.058	.078	.102	.130	.160	.194	.230	.271	.314	.410	.518
2-1/2" x 3/16"	19-4-103	*17.1 **18.3	2.029	U	6087	3896	2705	1988	1522	1202	974	805	676	570	497	380	301
				D	.029	.045	.065	.088	.115	.146	.180	.218	.259	.304	.353	.460	.584
	19-2-103	*17.7 **18.9		C	6087	4870	4058	3478	3044	2705	2435	2213	2029	1873	1739	1522	1353
				D	.023	.036	.052	.071	.092	.117	.144	.174	.207	.243	.282	.369	.467

NOTE: When grating with serrated bearing bars is specified, the depth of grating required for a specified load should be 1/4" greater than that shown in the load table.

NOTE: Spans and loads to the right of the heavy line exceed a deflection of 1/4" for uniform loads of 100#/sq. ft. which provide safe pedestrian comfort, but can be exceeded for other types of loads at the discretion of the engineer.

Material: ASTM A-569 standard; ASTM A-570 available on specification.

U – Safe Uniform Load in lbs. per sq. ft.

C – Safe Concentrated Load in lbs. per foot of Grating Width.

D – Deflection in inches.

***Weight depends on panel width, cross bar selection, mill tolerance and manufacturing tolerance.

PANEL WIDTH CHART IN INCHES **DIMENSIONS SHOWN ARE OUT TO OUT OF BEARING BARS**

No. of Bars		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
19-4 or 19-2	1/8 Bar	1 5/16	2 1/2	3 11/16	4 7/8	6 1/16	7 1/4	8 7/16	9 5/8	10 13/16	12	13 3/16	14 3/8	15 9/16	16 3/4	17 15/16
	3/16 Bar	1 3/8	2 9/16	3 3/4	4 15/16	6 1/8	7 5/16	8 1/2	9 11/16	10 7/8	12 1/16	13 1/4	14 7/16	15 5/8	16 13/16	18

No. of Bars		17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
19-4 or 19-2	1/8 Bar	19 1/8	20 5/16	21 1/2	22 11/16	23 7/8	25 1/16	26 1/4	27 7/16	28 5/8	29 13/16	31	32 3/16	33 3/8	34 9/16	35 3/4
	3/16 Bar	19 3/16	20 3/8	21 9/16	22 3/4	23 15/16	25 1/8	26 5/16	27 1/2	28 11/16	29 7/8	31 1/16	32 1/4	33 7/16	34 5/8	35 13/16

FLEX-C HEADER™



The flexible radius header can be shaped by hand to form a curve or S-shape. Once the header is in the desired curvature, it is locked in place by screws or nails and is ready for installation. Its unique construction makes it much lighter and easier to install than conventionally made curved headers. The header is available in 2"x 4", 2"x 6" sizes for wood framing, and in 3 5/8" and 6" widths for steel framing.

INSTALLATION INSTRUCTIONS

1- Draw the desired curve on the floor or work surface.

2- Position the Flex-C Header on the line to match the radius.

3- Secure header in this curve by screwing into the top of the header through the pre-punched holes.

4- Slide side sheet metal so that at least six inches of it extends past the end of the curve. This will be used to secure the header to the framing later.

5- Now, fasten the side sheet metal to the wood blocks by installing screws or nails along the sides of the header, three per stud side, one fastener each through the sides of the top and bottom tracks, into the header blocks, and one fastener in the middle of the sheet metal and into the block. (See Diagram A)

6- Before lifting header into place install trimmer studs at each end and prepare temporary middle support stud.

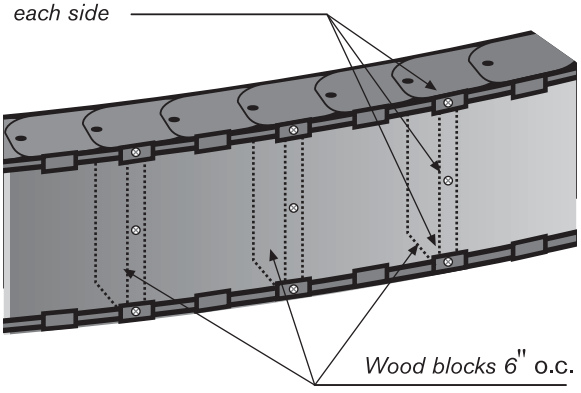
7- Set header on trimmer and temporary middle support stud. Attach header to king studs through the overlapping side sheet metal. Also fasten band to top plate of wall. Install permanent middle support(s) as needed for door and/or window placement. (Refer to Diagram D)

8- All loads (i.e. joists and rafters) must make contact across the top entire width of the header.

9- If practical, point loads should be located directly over the stud blocks inside the header. If this is not practical, a wood "2by" or steel plate must be used under the point load, sufficiently long to distribute the load to two or more stud blocks.

Diagram A

3 Fasteners (Screws or Nails) per block, each side



TECHNICAL DATA

Lengths: 8'

Widths:
For Wood Studs: 2"x 4", 2"x 6"
For Steel Studs: 3 5/8" and 6"

Minimum Radius: 18"

	Thickness	Grade	Coating / Treatment
Side Steel Sheet	16 ga.	50	G60 or better
Flex-C Channel	20 ga.	33	G60 or better
Flex-C Strap	0.023"	80	G60 or better
Commercial wood blocks*	1 1/2"	#2	Fire Treated
Residential wood blocks*	1 1/2"	#2	———

Fasteners

Single Openings:
Screws: #10 x 1 1/4" self drilling ASTM C954-93–Not Provided
Nails: 0.131" x 1 1/2" Positive Placement Heat Treated–Not Provided

Multiple Openings:
Screws: #8 x 1 1/4" self drilling ASTM C954-93– Provided
Nails: 0.131" x 1 1/2" Positive Placement Heat Treated–Not Provided

**Factory installed inside Flex-C-Header*

FLEX-ABILITY CONCEPTS

TOLL FREE 866.443.FLEX (866.443.3539)
(405) 996.5343 (FAX) 996.5353
5500 SW 36th St. Oklahoma City, OK 73179
www.flexabilityconcepts.com

PART 1 – GENERAL

1.1 DESCRIPTION
- A. Scope of Work
  All interior and exterior load-bearing and non load-bearing light gage steel and wood studs, track, joists, trusses, bridging, headers and related accessories are as indicated on the Contract Drawings and specified herein.
- B. Related work specified elsewhere.

1.2 SUMMARY
- A. This Section includes the following:
  1. Exterior and Interior load-bearing headers.

1.3 PERFORMANCE REQUIREMENTS
- A. Engineering Responsibility: Engage a fabricator who assumes undivided responsibility for engineering FLEX-C HEADER metal framing by employing a qualified professional engineer to prepare design calculations, shop drawings, and other structural data.
- B. All Exterior and Interior load-bearing applications are to be engineered by a qualified professional Engineer.

1.4 QUALITY ASSURANCE
- A. Installer Qualifications: Engage an experienced Installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this project and with a record of successful in-service performance.
- B. Standard
  1. Work shall meet the requirements of the following standards:
     a. American Iron and Steel Institute (A.I.S.I.) "Design of Cold Formed Steel Structural Members," January 2002 edition.
     b. American Society for Testing Materials (A.S.T.M.)
     c. American Institute of Steel Construction (A.I.S.C.) "Manual of Steel Construction," 9th edition.
     d. All pertinent Federal, State, and Local codes.
  2. The most stringent requirements shall govern in conflicts between specified codes and standards.
- C. Inspection
  1. As directed by Architect, Owner's testing agency may inspect the maintenance of a quality control program.
  2. Full responsibility for quality control shall remain with the Contractor.

1.5 DELIVERY, STORAGE, AND HANDLING
- A. Protect FLEX-C HEADER metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. To store FLEX-C HEADER metal framing, protect with waterproof covering, and ventilate to avoid condensation.

1.6 SUBMITTALS
- A Structural Calculations
  1. Submit structural calculations prepared by the Professional Engineer of record. Calculations shall include, but are not limited to:
     a. Description of design criteria.
     b. Engineering analysis depicting stress and deflection (stiffness) requirements for each framing application.
     c. Selection of framing components and accessories.
     d. Verification of attachments to structure and/or adjacent framing components.
- B. Drawings
  1. Submit drawings prepared by the manufacturer for approval by the Project Architect and Engineer. These drawings should include:
     a. Component cross-sections, plans and/or elevations depicting component assembly.
     b. Component assembly details showing screw types and locations and other related fastener requirements of component.

PART 2- PRODUCTS

2.1 AVAILABLE MANUFACTURERS:
- A. Manufacturers offering FLEX-C HEADER metal framing that may be incorporated in the work include, and are limited to, the following:
  1. FLEX-ABILITY CONCEPTS - 5500 SW 36th St. Oklahoma City, OK 73179
     (405) 996.5343 (FAX) 996.5353
     www.flexabilityconcepts.com

2.2 MATERIALS
- A. Galvanized – 20 Ga. Steel Sheet Track for (3 1/2" & 3 5/8"):
  ASTM A 653, and as follows:
  1. Coating Designation: Hot Dipped Galvanized Steel equal or superior to ASTM A653 G60 or A60.
  2. Grade: Structural Grade 33
- B. Galvanized – 20 Ga. Steel Sheet Track (for 5 1/2" & 6" track): ASTM A653, and as follows:
  1. Coating Designation: Hot Dipped Galvanized Steel equal or superior to ASTM A653 G60 or A60.
  2. Grade: Structural Grade 33
- C. Galvanized – Sliding Steel Strap(for all headers): ASTM A653
  1. Coating Designation: Hot Dipped Galvanized Steel Strapping equal or superior to ASTM A653 G60 or A60.
  2. Grade: Structural Grade 80
- D. Galvanized – 16 Ga. side sheet metal (for all FLEX-C HEADERS): ASTM 653
  1. Coating Designation: Equal or superior to ASTM A653 G60 or A60.
  2. Grade: Structural Grade 50.
- E. Wood Internal Components:
  1. Fire Treated (Commercial); Non Fire Treated (Residential)
  2. Grade: #2 or better.
- F. Nails (pre-installed):
  1. 0.104" dia. Shank knurled nail or equal.

2.3 HEADER FRAMING
- A. FLEX-C HEADER: manufacturer's standard rectangular flexible steel header with 3 1/2", 3 5/8", 5 1/2" or 6" FLEX-C TRAC flanges and nail attachments at every flange, fasteners penetrating top and bottom flanges at every wood support.

2.4 FRAMING ACCESSORIES
- A. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 33,000 psi.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated.

2.5 FASTENERS (for installation)
- A. Mechanical Fasteners:
  1. Single Openings: Screws: #10 x11/4 Corrosion-resistant coated, self-drilling screws. Pan-head or low-profile head beneath sheathing, manufacture's standard elsewhere.
  2. Multiple Openings: Screws: #8 x11/4 Corrosion-resistant coated, self-drilling screws. Pan-head or low-profile head beneath sheathing, manufacture's standard elsewhere.
  3. Nails: Positive Placement™ type. 11/2" x 0.131" heat treated.

2.6 MISCELLANEOUS MATERIALS
- A. Galvanizing Repair Paint: SSPC-Paint 20 of DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

2.7 FABRICATION
- A. Fabricate FLEX-C HEADER metal framing and accessories plumb, square, true to line, true to radius, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.
  1. Fabricate assemblies in jig templates or free form scribed radiuses.
  2. Cut FLEX-C HEADER metal framing by sawing or shearing; do not torch cut.
     a. Extreme care should be taken when handling or cutting any metal products. Observe all safety precautions when handling, cutting or fastening FLEX-C HEADER.
  3. Fasten FLEX-C HEADER metal framing by screw fastening as standard with fabricator. Wire tying of FLEX-C HEADER framing members is not permitted.
     a. Locate and install mechanical fasteners according to FLEX-C HEADER manufacturer's instructions with screws or nails penetrating banding at every wood support; 2 (two) penetrating top and bottom bands at every wood header block and 1 (one) penetrating each sheet metal side midpoint at every wood header block.
  4. Splice per manufacturer's specifications.
  5. Fasten other materials to FLEX-C HEADER metal framing by bolting, or screw fastening, according to manufacturer's recommendations.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or distortion.
- C. Fabrication Tolerances: Fabricate assemblies as required.

PART 3- EXECUTION

3.1 INSTALLATION, GENERAL
- A. FLEX-C HEADER metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install FLEX-C HEADER metal framing and accessories plumb, square, true to line, true to radius, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.
  1. Cut FLEX-C HEADER members by sawing or shearing; do not torch cut.
     a. Extreme care should be taken when handling or cutting any metal products. Observe all safety precautions when handling, cutting or fastening FLEX-C HEADER.
  2. Fasten FLEX-C HEADER members by screw fastening as standard with fabricator. Wire tying of FLEX-C HEADER members is not permitted.
     a. Locate and install mechanical fasteners according to FLEX-C HEADER manufacturer's instructions with screws or nails penetrating banding at every wood header block; 2 (two) penetrating top and bottom bands at every wood header block and 1 (one) penetrating each sheet metal side midpoint at every wood header block.
  3. Splice per manufacturer's specifications.
- C. Install FLEX-C HEADER members in one or multi-piece lengths as specified.
- D. Verify splicing of FLEX-C HEADER with Engineer of record. See Manufacturer's standard splicing instructions to verify overlap requirements.
- E. Provide temporary bracing and leave in place until framing is permanently stabilized.
- F. Do not bridge building expansion and control joints with FLEX-C HEADER metal framing. Independently frame both sides of joints.
- G. Fasten reinforcement plate over web penetrations that exceed size of manufacturer's standard punched openings.

3.2 REPAIRS AND PROTECTION
- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed FLEX-C HEADER metal framing with galvanizing repair paint according to ASTM A 780 and the manufacturer's instructions.
- B. Touchup painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on fabricated and installed prime-painted FLEX-C HEADER metal framing.
  1. Touchup painted surfaces with same type of shop paint used on adjacent surfaces.
- C. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer to ensure that FLEX-C HEADER metal framing is without damage or deterioration at the time of Substantial Completion.

FLEX-C HEADER

Technical Sheet

Proper Layout for Flex-C Header Supports

1 – All header assemblies which do not meet the single opening conditions (See page 4) must be supported by a MINIMUM of three supports. Please refer to diagrams B and C.

2 – Maximum clear span in a **single** opening assembly is 42". See Chart 3. Maximum clear span in a **multiple** opening assembly is 12'. See Charts 1 and 2.

3 – Splices must be within two (2) feet of a support.
– All splices must be performed according to the manufacturer's detailed instructions. See below.

4 – To locate supports calculate the ratio of every adjacent span. This ratio must be greater than 1/2 and less than 2. Use this formula:

$$\text{Ratio} = \frac{\text{Clear Span Length A}}{\text{Clear Span Length B}}$$

Assuming equal loading, this formula will result in the middle support being located within the middle third portion of the two adjacent spans. Please refer to diagram D. This ratio formula must also be applied to each pair of adjacent spans of a multiple span assembly, i.e. A-B, B-C, C-D, D-E. See Diagram E. Point loads or Uniform loads must be symmetrically and evenly spaced in relation to adjacent spans.

5 – Inflection points (points where curve reverses direction) MUST be supported.

Loads must not exceed the values listed in the Load Capacities Multiple Opening Tables published by Flex-Ability Concepts. See page 4.

To Cut Flex-C Header

Use a reciprocating saw, abrasive blade or tin snips. Always use proper safety precautions when handling or cutting Flex-C Header.

To Splice Flex-C Header

Overlap top and bottom tracks and screw in line with desired curve. Overlap the ends of all the side sheet metal pieces at least 18" by sliding them along the inside flanges of the top and bottom tracks, and fasten each side with three columns of three screws or nail into wood blocks (9 on each side). If these sets of three fasteners are not within 1 1/2" of each end of each splice, add another column of three screws within 1 1/2" of the ends of the splice overlap.

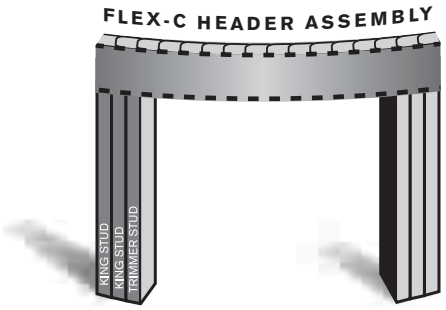


Diagram B
Flex-C Header can be used over single openings only under very specific conditions. (See page 4)

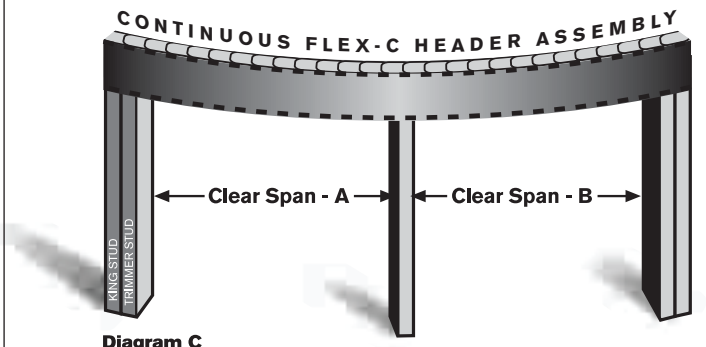


Diagram C
All Flex-C Header assemblies which do not meet the single opening conditions (See page 4) must extend over two or more spans (must have a minimum of three supports).

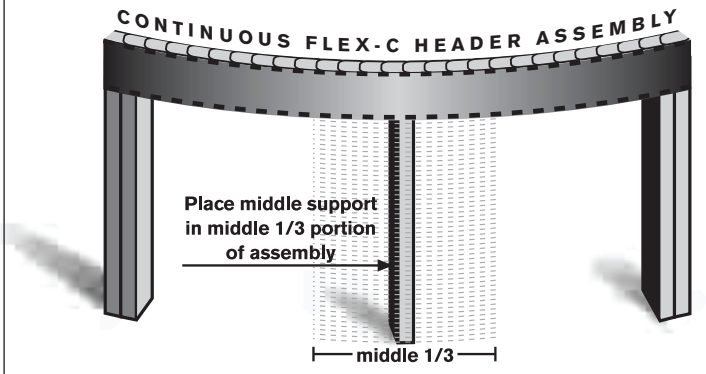


Diagram D
Support must be located anywhere in the middle third portion of the two adjacent spans.

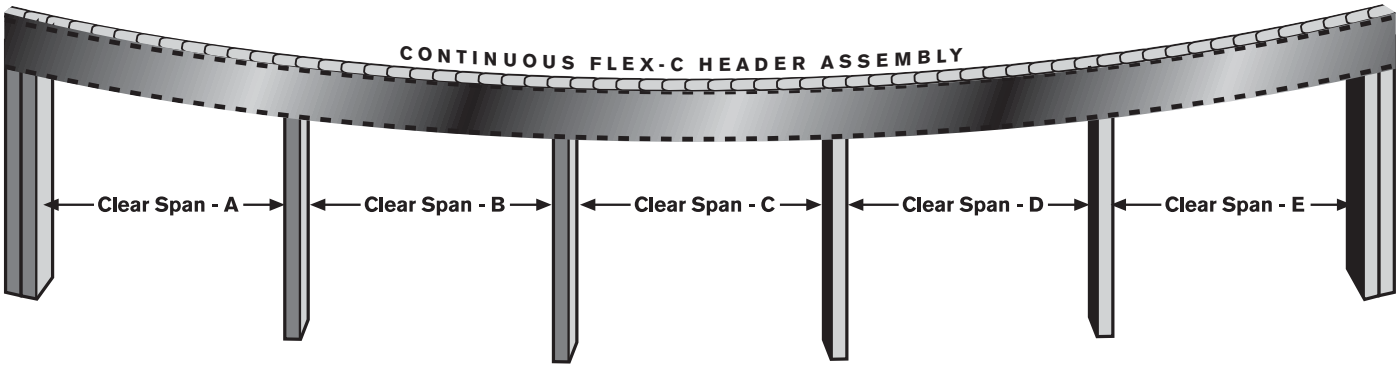


Diagram E
Supports must be located anywhere in the middle third portion of each pair of adjacent spans.

Load capacity- Always refer to the Flex-C Header Design Load Tables, Charts1&2 to verify that the loads determined by the engineer of record for each specific job are in line with the recommended capacities.

Design Load Tables Located on Page 4

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FLEX-ABILITY CONCEPTS

FLEX-C HEADER DESIGN LOAD TABLES

CHART 1 LOAD CAPACITIES MULTIPLE OPENING

(Test data is available upon request.)

3 1/2"x 11 1/2" 3 5/8"x 11 1/2"		
Clear Span (ft)	Point Load (lbs)	Uniform Load (plf)
2.5	2920	2336
3.0	2433	1622
3.5	2086	1192
4.0	1825	913
4.5	1622	721
5.0	1460	584
5.5	1327	483
6.0	1217	406
6.5	1123	346
7.0	1043	298
7.5	973	260
8.0	913	228
8.5	859	202
9.0	811	180
9.5	768	162
10.0	730	146
10.5	695	132
11.0	664	121
11.5	635	110
12.0	608	101

CHART 2 LOAD CAPACITIES MULTIPLE OPENING

(Test data is available upon request.)

5 1/2"x 11 1/2" 6"x 11 1/2"		
Clear Span (ft)	Point Load (lbs)	Uniform Load (plf)
2.5	3125	2500
3.0	2604	1736
3.5	2232	1275
4.0	1953	977
4.5	1736	772
5.0	1562	625
5.5	1420	516
6.0	1302	434
6.5	1202	370
7.0	1116	319
7.5	1042	278
8.0	977	244
8.5	919	216
9.0	868	193
9.5	822	173
10.0	781	156
10.5	744	142
11.0	710	129
11.5	679	118
12.0	651	109

Single Opening Conditions

1. Single, unsupported, span not to exceed 42".
2. Single span and radius dimensions must not be less than the corresponding value on chart 3 below.
3. Framing must include triple 2x's (2 bys) at both end supports 3 king studs or 2 king studs and 1 trimmer stud.
4. Four #10x1 1/4" screws in each king stud side, 36 or 48 total.

CHART 3

Minimum Allowable Outside Radius Per Span and Header Width

Span in inches	Header Width		
	3 5/8"	5 1/2"	6"
12	18.00	18.00	18.00
13	18.00	18.00	18.00
14	18.00	18.00	18.00
15	18.00	18.00	18.00
16	18.00	18.00	18.00
17	18.00	18.00	18.00
18	18.00	18.00	18.00
19	18.50	18.00	18.00
20	20.36	18.00	18.00
21	22.31	18.00	18.00
22	24.36	18.00	18.00
23	26.50	18.00	18.00
24	28.74	18.25	18.00
25	31.07	19.61	18.13
26	33.50	21.03	19.40
27	36.06	22.50	20.73
28	38.65	24.03	22.10
29	41.36	25.61	23.53
30	44.17	27.25	25.00
31	47.07	28.94	26.53
32	50.07	30.69	28.10
33	53.17	32.50	29.73
34	56.36	34.36	31.40
35	59.65	36.28	33.13
36	63.03	38.25	34.90
37	66.50	40.28	36.73
38	70.07	42.36	38.60
39	73.74	44.50	40.53
40	-	46.69	42.50
41	-	48.94	44.53
42	-	-	46.60

Minimum Allowable Radius in Inches

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Product Identification

All SSMA products have a four part identification code which identifies the size (both depth and flange width), style, and material thickness of each member.

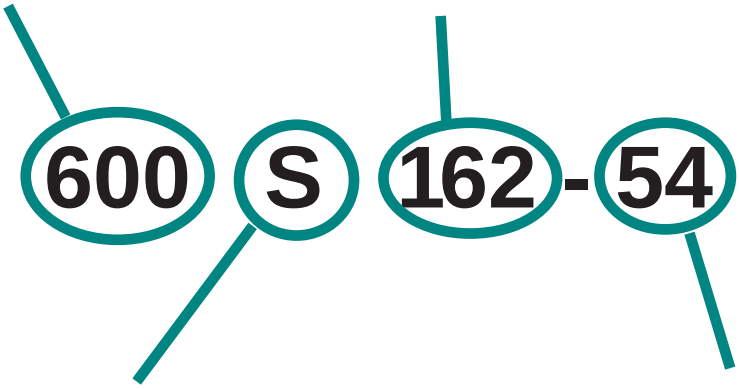
Example:

Member Depth:

(Example: 6" = **600** × 1⁄100 inches)
All member depths are taken in 1⁄100 inches.
For all "T" sections member depth is the inside to inside dimension.

Flange Width:

(Example: 1 5⁄8" = 1.625" ≈ **162** × 1⁄100 inches)
All flange widths are taken in 1⁄100 inches.



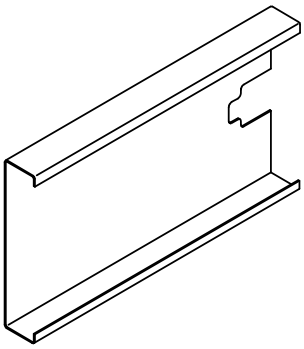
Style:

(Example: Stud or Joist section = **S**)
The four alpha characters utilized by the designator system are:
S = Stud or Joist Sections*
T = Track Sections
U = Channel Sections
F = Furring Channel Sections

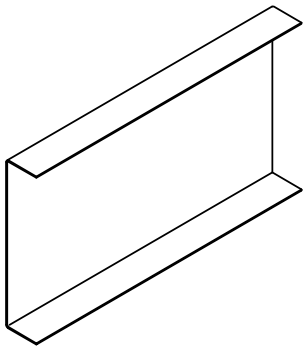
Material Thickness:

(Example: 0.054 in. = 54 mils;
1 mil = 1⁄1000 in.)
Material thickness is the minimum base metal thickness
in mils. Minimum base metal thickness represents 95% of the design thickness.

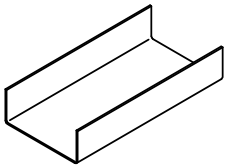
Note: For those sections where two different yield strengths (33 ksi and 50 ksi) are shown, the yield strength used in the design, if greater than 33 ksi, needs to be identified on the design and ordering of steel. (i.e., 600S162-54 (50 ksi))
* For "S" members, see table on page 5 for stiffening lip length.



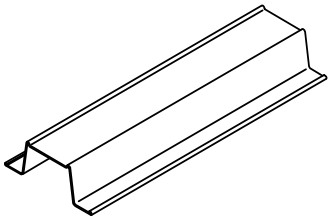
C-STUD / JOIST
S-SECTIONS



TRACK
T-SECTIONS



CHANNEL
U-SECTIONS



FURRING CHANNEL
F-SECTIONS

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SSMA

General Product Information

Thickness Table

Designation Thickness (mils)	Minimum Thickness[1](in)	Design Thickness[1] (in)	Design Inside Corner Radii [2] (in)	Reference Only Gauge No.
18	0.0179	0.0188	0.0843	25
27	0.0269	0.0283	0.0796	22
30	0.0296	0.0312	0.0781	20 – Drywall
33	0.0329	0.0346	0.0764	20 – Structural
43	0.0428	0.0451	0.0712	18
54	0.0538	0.0566	0.0849	16
68	0.0677	0.0713	0.1069	14
97	0.0966	0.1017	0.1525	12
118	0.1180	0.1242	0.1863	10

Design Stiffening Lip Length

Section	Flange Width	Design Stiffening Lip Length (in)
S125	1 ¼"	0.188
S137	1 ⅜"	0.375
S162	1 ⅝"	0.500
S200	2"	0.625
S250	2 ½"	0.625
S300	3"	0.625
S350	3 ½"	1.000

[1] Minimum Thickness represents 95% of the design thickness and is the minimum acceptable thickness delivered to the job site based on Section A2.4 of the 2004 AISI Specification.
[2] The tables in this catalog are calculated based on inside corner radii listed in this table.

General Notes for all tables

1. Where 'AISI 2004 Specification' is referenced, it is the "North American Specification for the Design of Cold-Formed Steel Structural Members", 2001 edition, including the 2004 Supplement, with US provisions.
2. The strength increase from cold work of forming has been incorporated for flexural strength per AISI 2004 Specification A7.2
3. The effective moment of inertia for deflection is calculated at a stress which results in a section modulus such that the stress times the section modulus at that stress is equal to the allowable moment. AISI 2004 Specification Procedure I for serviceability determination has been used.
4. Various sections may be manufactured with yield points of 33 or 50 kips per square inch (KSI). The yield point used for calculations is indicated in the tables.
5. For sections available in both 33 and 50 KSI, the specifier must clearly indicate which yield point is required. For example: 362S162-54 (50 KSI).
6. When provided, factory punchouts will be located along the centerline of the webs of the members and will have a minimum center-to-center spacing of 24 inches. Punchouts for members > 2.5 inches deep are a maximum of 1.5 inches wide x 4 inches long. Members with depths 2.5" and smaller are maximum 3/4" wide x 4 inches long.

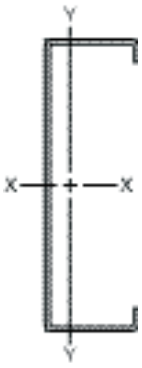
Definitions of Structural Property Symbols

Gross Properties

Ix: Moment of inertia of the gross section about the X-X axis (strong axis).
Sx: Section modulus about the X-X axis (strong axis).
Rx: Radius of gyration of the gross section about the X-X axis.
Iy: Moment of inertia of the gross section about the Y-Y axis (weak axis).
Ry: Radius of gyration of the gross section about the Y-Y axis.

Effective Properties

Ixe: Moment of inertia for deflection calculations based on "Procedure 1 for Deflection Determination" of the 2004 AISI Specification.
Sxe: Effective section modulus about the X-X axis (strong axis) Stress = F_y.
Ma: Allowable Bending Moment – Based on the effective section modulus and the allowable stress including the strength increase from cold-work of forming (AISI 7.2) where applicable.
Vag: Allowable strong axis shear away from punchout, calculated in accordance with AISI section C3.2.1.
Vanet: Allowable strong axis shear at the punchout, calculated in accordance with AISI section C3.2.2.



Torsional and Other Properties

J: St. Venant Torsional Constant.
Cw: Torsional warping constant.
M: Distance from shear center to mid-plane of web.
Xo: Distance from the shear center to the centroid along the principal X-axis.
Ro: Polar radius of gyration about the centroidal principal axis.
β: $1- (Xo/Ro)^2$
Lu: The longest weak axis (Ly) and torsional (Lt) unbraced length at which lateral torsional buckling is restrained in accordance with AISI C3.1.2.1.

Section Properties

Non-Structural (S) Stud Section Properties (continued)

Member	Design Thickness (in)	Fy (ksi)	Gross Properties: Area (in^2)	Weight (lb/ft)	Ix (in^4)	Sx (in^3)	Rx (in)	Iy (in^4)	Ry (in)	Effective Properties: Ixe (in^4)	Sxe (in^3)	Ma (in-k)	Vag (lb)	Vanet (lb)	Torsional: J x 1000 (in^4)	Cw (in^6)	Xo (in)	m (in)	Ro (in)	β	Lu (in)
600S125-18[1,2]	0.0188	33	0.162	0.55	0.778	0.259	2.189	0.024	0.382						0.019	0.172	-0.623	0.408	2.308	0.927	
600S125-27[1]	0.0283	33	0.243	0.83	1.160	0.387	2.183	0.035	0.377	1.10	0.27	5.35	349	349	0.065	0.251	-0.614	0.402	2.299	0.929	27.7
600S125-30	0.0312	33	0.268	0.91	1.275	0.425	2.181	0.038	0.376	1.22	0.32	6.22	468	468	0.087	0.274	-0.611	0.401	2.296	0.929	27.7
600S125-33	0.0346	33	0.297	1.01	1.409	0.470	2.179	0.042	0.374	1.36	0.37	7.30	638	638	0.118	0.300	-0.608	0.399	2.293	0.930	27.5
600S125-43	0.0451	33	0.385	1.31	1.817	0.606	2.173	0.053	0.369	1.81	0.56	10.96	1416	1240	0.261	0.378	-0.598	0.393	2.284	0.931	27.3
600S125-54	0.0566	33	0.479	1.63	2.236	0.745	2.161	0.063	0.362	2.24	0.73	14.37	2739	1890	0.511	0.457	-0.586	0.386	2.269	0.933	27.1
600S125-54	0.0566	50	0.479	1.63	2.236	0.745	2.161	0.063	0.362	2.74	0.91	21.53*	4347	2339	0.511	0.457	-0.586	0.386	2.269	0.933	24.4
600S125-68	0.0713	33	0.595	2.02	2.740	0.913	2.146	0.073	0.351	2.22	0.67	20.15	2823	1947	1.008	0.548	-0.570	0.378	2.248	0.936	21.9
600S125-68	0.0713	50	0.595	2.02	2.740	0.913	2.146	0.073	0.351	2.74	0.90	26.88	5350	2879	1.008	0.548	-0.570	0.378	2.248	0.936	21.6
800S125-33[1]	0.0346	33	0.366	1.25	2.881	0.720	2.806	0.044	0.347	2.66	0.51	10.02	474	474	0.146	0.582	-0.519	0.349	2.875	0.967	26.6
800S125-43	0.0451	33	0.475	1.62	3.721	0.930	2.799	0.056	0.342	3.58	0.77	15.27	1051	1051	0.322	0.735	-0.510	0.344	2.865	0.968	26.3
800S125-54	0.0566	33	0.592	2.01	4.593	1.148	2.786	0.066	0.335	4.57	1.04	20.46	2091	2091	0.632	0.889	-0.499	0.338	2.850	0.969	26.0
800S125-54	0.0566	50	0.592	2.01	4.593	1.148	2.786	0.066	0.335	5.64	1.38	27.18	4221	3367	0.632	0.889	-0.499	0.338	2.850	0.969	25.6
800S125-68	0.0713	33	0.738	2.51	5.653	1.413	2.768	0.078	0.324	4.43	0.94	28.21	2091	2091	1.250	1.068	-0.485	0.330	2.829	0.971	21.1
800S125-68	0.0713	50	0.738	2.51	5.653	1.413	2.768	0.078	0.324	5.63	1.29	38.54	4221	3367	1.250	1.068	-0.485	0.330	2.829	0.971	20.8

Structural (S) Stud Section Properties

Member	Design Thickness (in)	Fy (ksi)	Gross Properties: Area (in^2)	Weight (lb/ft)	Ix (in^4)	Sx (in^3)	Rx (in)	Iy (in^4)	Ry (in)	Effective Properties: Ixe (in^4)	Sxe (in^3)	Ma (in-k)	Vag (lb)	Vanet (lb)	Torsional: J x 1000 (in^4)	Cw (in^6)	Xo (in)	m (in)	Ro (in)	β	Lu (in)
250S137-33	0.0346	33	0.197	0.67	0.203	0.163	1.015	0.052	0.515	0.20	0.16	3.11	975	399	0.079	0.076	-1.141	0.677	1.612	0.499	35.5
250S137-43	0.0451	33	0.255	0.87	0.261	0.208	1.010	0.067	0.511	0.26	0.21	4.53*	1265	394	0.173	0.096	-1.129	0.670	1.599	0.501	33.7
250S137-54	0.0566	33	0.316	1.07	0.318	0.255	1.004	0.080	0.504	0.32	0.26	5.76*	1553	373	0.337	0.115	-1.115	0.663	1.583	0.504	33.3
250S137-54	0.0566	50	0.316	1.07	0.318	0.255	1.004	0.080	0.504	0.32	0.24	8.22*	2353	565	0.337	0.115	-1.115	0.663	1.583	0.504	27.0
250S137-68	0.0713	33	0.390	1.33	0.386	0.309	0.994	0.095	0.495	0.39	0.31	7.19*	1891	342	0.661	0.138	-1.096	0.653	1.561	0.507	33.2
250S137-68	0.0713	50	0.390	1.33	0.386	0.309	0.994	0.095	0.495	0.39	0.31	10.65*	2866	519	0.661	0.138	-1.096	0.653	1.561	0.507	26.8
250S162-33	0.0346	33	0.223	0.76	0.235	0.188	1.027	0.087	0.624	0.24	0.18	3.55	975	399	0.089	0.146	-1.470	0.859	1.898	0.401	44.1
250S162-43	0.0451	33	0.289	0.98	0.302	0.242	1.022	0.111	0.620	0.30	0.24	5.22*	1265	394	0.196	0.184	-1.457	0.852	1.885	0.402	42.0
250S162-54	0.0566	33	0.358	1.22	0.370	0.296	1.016	0.135	0.613	0.37	0.30	6.57*	1553	373	0.383	0.223	-1.443	0.845	1.868	0.403	41.8
250S162-54	0.0566	50	0.358	1.22	0.370	0.296	1.016	0.135	0.613	0.37	0.28	9.42*	2353	565	0.383	0.223	-1.443	0.845	1.868	0.403	33.9
250S162-68	0.0713	33	0.443	1.51	0.450	0.360	1.007	0.162	0.605	0.45	0.36	8.21*	1891	342	0.752	0.268	-1.424	0.835	1.846	0.405	41.7
250S162-68	0.0713	50	0.443	1.51	0.450	0.360	1.007	0.162	0.605	0.45	0.36	12.11*	2866	519	0.752	0.268	-1.424	0.835	1.846	0.405	33.7
350S162-33	0.0346	33	0.258	0.88	0.508	0.290	1.404	0.098	0.617	0.51	0.26	5.08	1024	487	0.103	0.277	-1.324	0.796	2.026	0.573	42.8
350S162-43	0.0451	33	0.334	1.14	0.654	0.374	1.400	0.125	0.612	0.65	0.36	7.05	1739	631	0.227	0.350	-1.312	0.789	2.014	0.575	42.6
350S162-54	0.0566	33	0.415	1.41	0.804	0.460	1.392	0.152	0.606	0.80	0.45	8.83	2253	633	0.443	0.426	-1.298	0.782	1.998	0.578	42.7
350S162-54	0.0566	50	0.415	1.41	0.804	0.460	1.392	0.152	0.606	0.80	0.43	12.74	3372	947	0.443	0.426	-1.298	0.782	1.998	0.578	34.5
350S162-68	0.0713	33	0.515	1.75	0.985	0.563	1.383	0.184	0.597	0.99	0.55	10.89	2774	592	0.872	0.514	-1.280	0.772	1.977	0.581	34.6
350S162-68	0.0713	50	0.515	1.75	0.985	0.563	1.383	0.184	0.597	0.99	0.55	16.44	4202	897	0.872	0.514	-1.280	0.772	1.977	0.581	34.5
350S300-43[2]	0.0451	33	0.469	1.60	1.040	0.595	1.489	0.589	1.120						0.318	1.767	-2.697	1.539	3.278	0.323	
350S300-54	0.0566	33	0.585	1.99	1.286	0.735	1.483	0.724	1.113	1.28	0.58	11.51	2253	633	0.624	2.166	-2.682	1.531	3.261	0.323	74.7
350S300-54	0.0566	50	0.585	1.99	1.286	0.735	1.483	0.724	1.113	1.21	0.51	15.20	3372	947	0.624	2.166	-2.682	1.531	3.261	0.323	60.4
350S300-68	0.0713	33	0.729	2.48	1.586	0.906	1.475	0.888	1.104	1.59	0.78	15.31	2774	592	1.235	2.649	-2.663	1.521	3.238	0.324	75.1
350S300-68	0.0713	50	0.729	2.48	1.586	0.906	1.475	0.888	1.104	1.56	0.69	20.56	4202	897	1.235	2.649	-2.663	1.521	3.238	0.324	60.5
362S137-33	0.0346	33	0.236	0.80	0.479	0.264	1.424	0.059	0.501	0.48	0.23	4.59	1024	521	0.094	0.165	-1.003	0.615	1.813	0.694	34.7
362S137-43	0.0451	33	0.306	1.04	0.616	0.340	1.419	0.075	0.497	0.62	0.32	6.32	1739	676	0.207	0.208	-0.991	0.608	1.801	0.697	34.6
362S137-54	0.0566	33	0.379	1.29	0.756	0.417	1.411	0.091	0.490	0.76	0.40	7.94	2341	705	0.405	0.251	-0.978	0.601	1.785	0.700	34.5
362S137-54	0.0566	50	0.379	1.29	0.756	0.417	1.411	0.091	0.490	0.76	0.38	11.42	3372	1016	0.405	0.251	-0.978	0.601	1.785	0.700	27.9
362S137-68	0.0713	33	0.470	1.60	0.922	0.509	1.401	0.109	0.480	0.92	0.50	9.84	2884	662	0.797	0.302	-0.959	0.592	1.764	0.704	34.6
362S137-68	0.0713	50	0.470	1.60	0.922	0.509	1.401	0.109	0.480	0.92	0.49	14.77	4370	1004	0.797	0.302	-0.959	0.592	1.764	0.704	27.8
362S162-33	0.0346	33	0.262	0.89	0.551	0.304	1.450	0.099	0.616	0.55	0.27	5.29	1024	521	0.105	0.297	-1.308	0.789	2.048	0.592	42.6
362S162-43	0.0451	33	0.340	1.16	0.710	0.392	1.445	0.127	0.611	0.71	0.37	7.34	1739	676	0.230	0.376	-1.297	0.782	2.036	0.594	42.5
362S162-54	0.0566	33	0.422	1.44	0.873	0.481	1.438	0.154	0.604	0.87	0.47	9.22	2341	705	0.451	0.457	-1.283	0.774	2.020	0.597	42.5
362S162-54	0.0566	50	0.422	1.44	0.873	0.481	1.438	0.154	0.604	0.87	0.44	13.28	3372	1016	0.451	0.457	-1.283	0.774	2.020	0.597	34.4
362S162-68	0.0713	33	0.524	1.78	1.069	0.590	1.429	0.186	0.596	1.07	0.58	11.43	2884	662	0.887	0.552	-1.264	0.765	1.998	0.600	42.7
362S162-68	0.0713	50	0.524	1.78	1.069	0.590	1.429	0.186	0.596	1.07	0.57	17.18	4370	1004	0.887	0.552	-1.264	0.765	1.998	0.600	34.3
362S200-33	0.0346	33	0.297	1.01	0.648	0.358	1.478	0.177	0.772	0.65	0.29	5.81	1024	521	0.118	0.577	-1.741	1.030	2.411	0.478	53.5
362S200-43	0.0451	33	0.385	1.31	0.836	0.461	1.474	0.227	0.767	0.84	0.43	8.43	1739	676	0.261	0.734	-1.729	1.024	2.398	0.480	53.5
362S200-54	0.0566	33	0.479	1.63	1.030	0.568	1.467	0.277	0.761	1.03	0.55	10.93	2341	705	0.511	0.896	-1.715	1.016	2.382	0.482	53.6
362S200-54	0.0566	50	0.479	1.63	1.030	0.568	1.467	0.277	0.761	1.03	0.49	14.66	3372	1016	0.511	0.896	-1.715	1.016	2.382	0.482	43.3
362S200-68	0.0713	33	0.595	2.02	1.265	0.698	1.458	0.337	0.753	1.27	0.69	13.58	2884	662	1.008	1.089	-1.696	1.006	2.360	0.484	53.8
362S200-68	0.0713	50	0.595	2.02	1.265	0.698	1.458	0.337	0.753	1.27	0.67	19.95	4370	1004	1.008	1.089	-1.696	1.006	2.360	0.484	43.4
362S300-33[2]	0.0346	33	0.366	1.25	0.871	0.481	1.543	0.463	1.125						0.146	1.478	-2.666	1.537	3.296	0.336	
362S300-43[2]	0.0451	33	0.475	1.62	1.125	0.621	1.539	0.596	1.120						0.322	1.888	-2.674	1.530	3.282	0.336	
362S300-54	0.0566	33	0.592	2.01	1.390	0.767	1.533	0.734	1.114	1.38	0.61	11.99	2341	705	0.632	2.316	-2.659	1.522	3.265	0.337	74.5
362S300-54	0.0566	50	0.592	2.01	1.390	0.767	1.533	0.734	1.114	1.31	0.53	15.83	3372	1016	0.632	2.316	-2.659	1.522	3.265	0.337	60.3
362S300-68	0.0713	33	0.738	2.51	1.716	0.947	1.525	0.900	1.105	1.72	0.81	16.02	2884	662	1.250	2.833	-2.640	1.512	3.243	0.337	74.9
362S300-68	0.0713	50	0.738	2.51	1.716	0.947	1.525	0.900	1.105	1.68	0.72	21.44	4370	1004	1.250	2.833	-2.640	1.512	3.243	0.337	60.4

1. Web-height to thickness ratio exceeds 200. Web Stiffeners are required at all support points and concentrated loads. Suitability of web holes must be evaluated independently.
2. Where web height-to-thickness ratio exceeds 260, or flange width-to-thickness ratio exceeds 60, effective properties are not calculated (limitations in AISI section B1)

* Allowable moment includes cold-work of forming.

See Section Properties Table Notes on page 6.

Complies with the 2006 International Building Code (IBC)

Section Properties

Structural (S) Stud Section Properties

Member	Design Thickness (in)	Fy (ksi)	Gross Properties							Effective Properties					Torsional						Lu (in)
			Area (in^2)	Weight (lb/ft)	Ix (in^4)	Sx (in^3)	Rx (in)	Iy (in^4)	Ry (in)	Ixe (in^4)	Sxe (in^3)	Ma (in-k)	Vag (lb)	Vanet (lb)	J x 1000 (in^4)	Cw (in^6)	Xo (in)	m (in)	Ro (in)	β	
400S137-33	0.0346	33	0.249	0.85	0.603	0.301	1.556	0.061	0.496	0.60	0.26	5.12	976	595	0.099	0.204	-0.965	0.597	1.897	0.741	34.5
400S137-43	0.0451	33	0.323	1.10	0.776	0.388	1.551	0.078	0.491	0.78	0.36	7.09	1739	810	0.219	0.257	-0.954	0.591	1.885	0.744	34.4
400S137-54	0.0566	33	0.401	1.36	0.953	0.477	1.542	0.094	0.484	0.95	0.45	8.96	2603	944	0.428	0.311	-0.940	0.583	1.870	0.747	34.2
400S137-54	0.0566	50	0.401	1.36	0.953	0.477	1.542	0.094	0.484	0.95	0.43	12.82	3372	1223	0.428	0.311	-0.940	0.583	1.870	0.747	27.7
400S137-68	0.0713	33	0.497	1.69	1.165	0.582	1.531	0.112	0.475	1.17	0.57	11.21	3215	895	0.842	0.375	-0.922	0.574	1.849	0.751	34.3
400S137-68	0.0713	50	0.497	1.69	1.165	0.582	1.531	0.112	0.475	1.17	0.56	16.70	4871	1356	0.842	0.375	-0.922	0.574	1.849	0.751	27.6
400S162-33	0.0346	33	0.275	0.94	0.692	0.346	1.586	0.103	0.611	0.69	0.30	5.91	976	595	0.110	0.363	-1.263	0.768	2.118	0.644	42.3
400S162-43	0.0451	33	0.357	1.21	0.892	0.446	1.581	0.131	0.606	0.89	0.42	8.23	1739	810	0.242	0.460	-1.252	0.761	2.106	0.647	42.2
400S162-54	0.0566	33	0.443	1.51	1.098	0.549	1.574	0.159	0.600	1.10	0.53	10.39	2603	944	0.473	0.560	-1.238	0.754	2.090	0.649	42.2
400S162-54	0.0566	50	0.443	1.51	1.098	0.549	1.574	0.159	0.600	1.10	0.50	14.90	3372	1223	0.473	0.560	-1.238	0.754	2.090	0.649	34.1
400S162-68	0.0713	33	0.550	1.87	1.346	0.673	1.564	0.192	0.591	1.35	0.66	13.00	3215	895	0.933	0.677	-1.220	0.745	2.069	0.653	42.2
400S162-68	0.0713	50	0.550	1.87	1.346	0.673	1.564	0.192	0.591	1.35	0.65	19.41	4871	1356	0.933	0.677	-1.220	0.745	2.069	0.653	34.0
400S200-33	0.0346	33	0.310	1.05	0.812	0.406	1.619	0.183	0.769	0.81	0.33	6.49	976	595	0.124	0.697	-1.688	1.007	2.462	0.530	53.1
400S200-43	0.0451	33	0.402	1.37	1.047	0.524	1.615	0.235	0.764	1.05	0.48	9.45	1739	810	0.272	0.886	-1.676	1.000	2.449	0.532	53.0
400S200-54	0.0566	33	0.500	1.70	1.292	0.646	1.608	0.287	0.758	1.29	0.62	12.30	2603	944	0.534	1.083	-1.662	0.993	2.433	0.534	53.1
400S200-54	0.0566	50	0.500	1.70	1.292	0.646	1.608	0.287	0.758	1.29	0.55	16.43	3372	1223	0.534	1.083	-1.662	0.993	2.433	0.534	42.9
400S200-68	0.0713	33	0.622	2.12	1.589	0.795	1.599	0.349	0.750	1.59	0.78	15.40	3215	895	1.054	1.318	-1.643	0.983	2.412	0.536	53.2
400S200-68	0.0713	50	0.622	2.12	1.589	0.795	1.599	0.349	0.750	1.59	0.75	22.48	4871	1356	1.054	1.318	-1.643	0.983	2.412	0.536	42.9
400S300-33 [2]	0.0346	33	0.379	1.29	1.084	0.542	1.691	0.479	1.125						0.151	1.786	-2.621	1.510	3.316	0.375	
400S300-43 [2]	0.0451	33	0.492	1.67	1.400	0.700	1.687	0.617	1.120						0.334	2.282	-2.608	1.503	3.302	0.376	
400S300-54	0.0566	33	0.613	2.09	1.732	0.866	1.681	0.760	1.114	1.72	0.68	13.44	2603	944	0.655	2.802	-2.594	1.496	3.285	0.377	74.1
400S300-54	0.0566	50	0.613	2.09	1.732	0.866	1.681	0.760	1.114	1.64	0.59	17.72	3372	1223	0.655	2.802	-2.594	1.496	3.285	0.377	59.9
400S300-68	0.0713	33	0.764	2.60	2.139	1.070	1.673	0.933	1.105	2.14	0.91	18.06	3215	895	1.295	3.432	-2.574	1.486	3.263	0.378	74.3
400S300-68	0.0713	50	0.764	2.60	2.139	1.070	1.673	0.933	1.105	2.10	0.81	24.09	4871	1356	1.295	3.432	-2.574	1.486	3.263	0.378	60.0
550S162-33	0.0346	33	0.327	1.11	1.458	0.530	2.112	0.113	0.589	1.46	0.51	10.11	699	699	0.130	0.713	-1.114	0.697	2.459	0.795	41.4
550S162-43	0.0451	33	0.424	1.44	1.883	0.685	2.107	0.145	0.584	1.88	0.68	14.79*	1550	1199	0.288	0.905	-1.103	0.691	2.448	0.797	39.2
550S162-54	0.0566	33	0.528	1.80	2.324	0.845	2.098	0.176	0.577	2.32	0.85	18.76*	2739	1666	0.564	1.105	-1.090	0.684	2.434	0.800	38.7
550S162-54	0.0566	50	0.528	1.80	2.324	0.845	2.098	0.176	0.577	2.32	0.81	26.86*	3093	1881	0.564	1.105	-1.090	0.684	2.434	0.800	31.6
550S162-68	0.0713	33	0.657	2.24	2.861	1.040	2.086	0.212	0.568	2.86	1.04	23.72*	4347	2057	1.114	1.342	-1.072	0.675	2.414	0.803	38.0
550S162-68	0.0713	50	0.657	2.24	2.861	1.040	2.086	0.212	0.568	2.86	1.03	34.94*	5350	2532	1.114	1.342	-1.072	0.675	2.414	0.803	31.1
550S300-33 [2]	0.0346	33	0.431	1.47	2.210	0.804	2.265	0.536	1.115						0.172	3.401	-2.392	1.415	3.478	0.527	
550S300-43 [2]	0.0451	33	0.560	1.90	2.860	1.040	2.261	0.690	1.110						0.379	4.357	-2.380	1.408	3.465	0.528	
550S300-54	0.0566	33	0.698	2.37	3.545	1.289	2.254	0.850	1.104	3.51	1.08	21.34	2739	1666	0.745	5.364	-2.365	1.401	3.449	0.530	73.1
550S300-54	0.0566	50	0.698	2.37	3.545	1.289	2.254	0.850	1.104	3.30	0.98	29.44	3093	1881	0.745	5.364	-2.365	1.401	3.449	0.530	59.2
550S300-68	0.0713	33	0.871	2.96	4.391	1.597	2.245	1.044	1.095	4.38	1.41	27.88	4347	2057	1.476	6.594	-2.346	1.391	3.427	0.531	73.1
550S300-68	0.0713	50	0.871	2.96	4.391	1.597	2.245	1.044	1.095	4.29	1.29	38.53	5350	2532	1.476	6.594	-2.346	1.391	3.427	0.531	59.1
600S137-33	0.0346	33	0.318	1.08	1.582	0.527	2.229	0.069	0.464	1.55	0.46	8.98	638	638	0.127	0.500	-0.807	0.519	2.416	0.889	33.5
600S137-43	0.0451	33	0.413	1.41	2.042	0.681	2.223	0.087	0.459	2.04	0.65	12.74	1416	1240	0.280	0.633	-0.796	0.513	2.406	0.890	33.2
600S137-54	0.0566	33	0.514	1.75	2.518	0.839	2.213	0.105	0.452	2.52	0.83	16.44	2739	1890	0.549	0.769	-0.784	0.506	2.391	0.893	33.0
600S137-54	0.0566	50	0.514	1.75	2.518	0.839	2.213	0.105	0.452	2.52	0.78	23.26	2823	1947	0.549	0.769	-0.784	0.506	2.391	0.893	26.8
600S137-68	0.0713	33	0.640	2.18	3.094	1.031	2.200	0.125	0.443	3.09	1.03	24.05*	4347	2339	1.084	0.930	-0.768	0.497	2.371	0.895	30.2
600S137-68	0.0713	50	0.640	2.18	3.094	1.031	2.200	0.125	0.443	3.09	1.03	30.84	5350	2879	1.084	0.930	-0.768	0.497	2.371	0.895	26.6
600S137-97	0.1017	33	0.889	3.03	4.188	1.396	2.170	0.159	0.422	4.19	1.40	34.48*	6911	2512	3.066	1.216	-0.734	0.480	2.330	0.901	28.8
600S137-97	0.1017	50	0.889	3.03	4.188	1.396	2.170	0.159	0.422	4.19	1.40	50.80*	10472	3805	3.066	1.216	-0.734	0.480	2.330	0.901	23.6
600S162-33	0.0346	33	0.344	1.17	1.793	0.598	2.282	0.116	0.581	1.79	0.58	11.41	638	638	0.137	0.861	-1.072	0.677	2.587	0.828	41.1
600S162-43	0.0451	33	0.447	1.52	2.316	0.772	2.276	0.148	0.576	2.32	0.77	16.68*	1416	1240	0.303	1.095	-1.062	0.670	2.577	0.830	39.0
600S162-54	0.0566	33	0.556	1.89	2.860	0.953	2.267	0.180	0.570	2.86	0.95	21.17*	2739	1890	0.594	1.337	-1.049	0.663	2.562	0.832	38.4
600S162-54	0.0566	50	0.556	1.89	2.860	0.953	2.267	0.180	0.570	2.86	0.92	30.33*	2823	1947	0.594	1.337	-1.049	0.663	2.562	0.832	31.4
600S162-68	0.0713	33	0.693	2.36	3.525	1.175	2.255	0.218	0.560	3.53	1.18	26.79*	4347	2339	1.174	1.626	-1.032	0.655	2.543	0.835	37.7
600S162-68	0.0713	50	0.693	2.36	3.525	1.175	2.255	0.218	0.560	3.53	1.16	39.47*	5350	2879	1.174	1.626	-1.032	0.655	2.543	0.835	30.8
600S162-97	0.1017	33	0.966	3.29	4.797	1.599	2.229	0.283	0.541	4.80	1.60	38.37*	6911	2512	3.329	2.153	-0.997	0.636	2.501	0.841	36.4
600S162-97	0.1017	50	0.966	3.29	4.797	1.599	2.229	0.283	0.541	4.80	1.60	56.73*	10472	3805	3.329	2.153	-0.997	0.636	2.501	0.841	29.8
600S162-118	0.1242	33	1.158	3.94	5.652	1.884	2.209	0.321	0.526	5.65	1.88	46.82*	8267	2391	5.956	2.487	-0.971	0.623	2.470	0.845	35.6
600S162-118	0.1242	50	1.158	3.94	5.652	1.884	2.209	0.321	0.526	5.65	1.88	68.94*	12526	3622	5.956	2.487	-0.971	0.623	2.470	0.845	29.0
600S200-33	0.0346	33	0.379	1.29	2.075	0.692	2.340	0.209	0.743	2.06	0.62	12.28	638	638	0.151	1.593	-1.457	0.901	2.855	0.740	51.6
600S200-43	0.0451	33	0.492	1.67	2.683	0.894	2.335	0.268	0.739	2.68	0.87	17.24	1416	1240	0.334	2.033	-1.446	0.894	2.844	0.742	51.5
600S200-54	0.0566	33	0.613	2.09	3.319	1.106	2.327	0.328	0.732	3.32	1.11	24.07*	2739	1890	0.655	2.493	-1.432	0.887	2.829	0.744	48.9
600S200-54	0.0566	50	0.613	2.09	3.319	1.106	2.327	0.328	0.732	3.32	1.02	30.40	2823	1947	0.655	2.493	-1.432	0.887	2.829	0.744	41.6
600S200-68	0.0713	33	0.764	2.60	4.101	1.367	2.316	0.400	0.723	4.10	1.37	30.42*	4347	2339	1.295	3.047	-1.415	0.878	2.809	0.746	48.2
600S200-68	0.0713	50	0.764	2.60	4.101	1.367	2.316	0.400	0.723	4.10	1.32	43.71*	5350	2879	1.295	3.047	-1.415	0.878	2.809	0.746	39.3
600S200-97	0.1017	33	1.067	3.63	5.612	1.871	2.293	0.530	0.705	5.61	1.87	43.49*	6911	2512	3.679	4.080	-1.378	0.859	2.767	0.752	46.9
600S200-97	0.1017	50	1.067	3.63	5.612	1.871	2.293	0.530	0.705	5.61	1.87	64.53*	10472	3805	3.679	4.080	-1.378	0.859	2.767	0.752	38.3
600S200-118	0.1242	33	1.283	4.36	6.641	2.214	2.275	0.611	0.690	6.64	2.21	53.05*	8267	2391	6.595	4.753	-1.351	0.845	2.735	0.756	46.1
600S200-118	0.1242	50	1.283	4.36	6.641	2.214	2.275	0.611	0.690	6.64	2.21	78.44*	12526	3622	6.595	4.753	-1.351	0.845	2.735	0.756	37.6
600S250-43	0.0451	33	0.537	1.83	3.082	1.027	2.396	0.458	0.923	3.08	0.92	18.14	1416	1240	0.364	3.411	-1.874	1.136	3.179	0.652	62.4
600S250-54	0.0566	33	0.670	2.28	3.819	1.273	2.388	0.562	0.917	3.82	1.16	22.90	2739	1890	0.715	4.194	-1.860	1.129	3.163	0.654	62.3
600S250-54	0.0566	50	0.670	2.28	3.819	1.273	2.388	0.562	0.917	3.77	1.07	32.00	2823	1947	0.715	4.194	-1.860	1.129	3.163	0.654	50.5
600S250-68	0.0713	33	0.836	2.84	4.727	1.576	2.378	0.688	0.908	4.73	1.51	32.82*	4347	2339	1.416	5.145	-1.842	1.119	3.142	0.656	59.2
600S250-68	0.0713	50	0.836	2.84	4.727	1.576	2.378	0.688	0.908	4.72	1.39	41.49	5350	2879	1.416	5.145	-1.842	1.119	3.142	0.656	50.4
600S250-97	0.1017	33	1.169	3.98	6.496	2.165	2.357	0.923	0.889	6.50	2.16	48.81*	6911	2512	4.030	6.947	-1.803	1.100	3.098	0.661	58.1
600S250-97	0.1017	50	1.169	3.98	6.496	2.165	2.357	0.923	0.889	6.50	2.06	69.38*	10472	3805	4.030	6.947	-1.803	1.100	3.098	0.661	47.3
600S250-118	0.1242	33	1.407	4.79	7.713	2.571	2.342	1.075	0.874	7.71	2.57	59.58*	8267	2391	7.234	8.142	-1.775	1.085	3.066	0.665	57.3
600S250-118	0.1242	50	1.407	4.79	7.713	2.571	2.342	1.075	0.874	7.71	2.50	85.92*	12526	3622	7.234	8.142	-1.775	1.085	3.066	0.665	46.7

1. Web-height to thickness ratio exceeds 200. Web Stiffeners are required at all support points and concentrated loads. Suitability of web holes must be evaluated independently.
2. Where web height-to-thickness ratio exceeds 260, or flange width-to-thickness ratio exceeds 60, effective properties are not calculated (limitations in AISI section B1)

* Allowable moment includes cold-work of forming.

See Section Properties Table Notes on page 6.

SSMA

Section Properties

Structural (S) Stud Section Properties

Member	Design Thickness (in)	Fy (ksi)	Gross Properties: Area (in^2)	Weight (lb/ft)	Ix (in^4)	Sx (in^3)	Rx (in)	Iy (in^4)	Ry (in)	Effective Properties: Ixe (in^4)	Sxe (in^3)	Ma (in-k)	Vag (lb)	Vanet (lb)	Torsional: J x 1000 (in^4)	Cw (in^6)	Xo (in)	m (in)	Ro (in)	β	Lu (in)
600S300-68	0.0713	33	0.907	3.09	5.354	1.785	2.430	1.075	1.089	5.34	1.58	31.23	4347	2339	1.537	7.937	-2.280	1.363	3.505	0.577	72.8
600S300-68	0.0713	50	0.907	3.09	5.354	1.785	2.430	1.075	1.089	5.22	1.45	43.30	5350	2879	1.537	7.937	-2.280	1.363	3.505	0.577	59.9
600S300-97	0.1017	33	1.271	4.32	7.381	2.460	2.410	1.454	1.070	7.38	2.35	52.07*	6911	2512	4.381	10.776	-2.241	1.343	3.461	0.581	68.8
600S300-97	0.1017	50	1.271	4.32	7.381	2.460	2.410	1.454	1.070	7.28	2.25	67.28	10472	3805	4.381	10.776	-2.241	1.343	3.461	0.581	58.9
600S300-118	0.1242	33	1.531	5.21	8.785	2.928	2.395	1.704	1.055	8.79	2.84	64.29*	8267	2391	7.872	12.683	-2.212	1.328	3.427	0.583	68.1
600S300-118	0.1242	50	1.531	5.21	8.785	2.928	2.395	1.704	1.055	8.71	2.80	94.24*	12526	3622	7.872	12.683	-2.212	1.328	3.427	0.583	55.4
600S350-54	0.0566	33	0.825	2.81	5.022	1.674	2.467	1.491	1.344	4.91	1.45	28.70	2739	1890	0.881	12.942	-3.037	1.787	4.137	0.461	91.8
600S350-54	0.0566	50	0.825	2.81	5.022	1.674	2.467	1.491	1.344	4.72	1.34	39.97	2823	1947	0.881	12.942	-3.037	1.787	4.137	0.461	74.4
600S350-68	0.0713	33	1.032	3.51	6.237	2.079	2.459	1.841	1.336	6.24	1.95	38.50	4347	2339	1.748	15.968	-3.018	1.777	4.115	0.462	91.8
600S350-68	0.0713	50	1.032	3.51	6.237	2.079	2.459	1.841	1.336	6.17	1.77	53.01	5350	2879	1.748	15.968	-3.018	1.777	4.115	0.462	74.4
600S350-97	0.1017	33	1.449	4.93	8.631	2.877	2.441	2.518	1.318	8.63	2.82	61.55*	6911	2512	4.994	21.811	-2.979	1.757	4.071	0.464	87.5
600S350-97	0.1017	50	1.449	4.93	8.631	2.877	2.441	2.518	1.318	8.63	2.59	77.64	10472	3805	4.994	21.811	-2.979	1.757	4.071	0.464	74.4
600S350-118	0.1242	33	1.748	5.95	10.304	3.435	2.428	2.978	1.305	10.30	3.44	76.39*	8267	2391	8.990	25.791	-2.951	1.742	4.038	0.466	86.9
600S350-118	0.1242	50	1.748	5.95	10.304	3.435	2.428	2.978	1.305	10.30	3.27	108.43*	12526	3622	8.990	25.791	-2.951	1.742	4.038	0.466	70.6
800S137-33	0.0346	33	0.388	1.32	3.198	0.799	2.873	0.073	0.435	3.00	0.62	12.30	474	474	0.155	0.957	-0.696	0.460	2.987	0.946	32.5
800S137-43	0.0451	33	0.503	1.71	4.134	1.033	2.866	0.093	0.430	4.00	0.90	17.70	1051	1051	0.341	1.214	-0.687	0.454	2.978	0.947	32.2
800S137-54	0.0566	33	0.627	2.13	5.110	1.277	2.855	0.112	0.423	5.08	1.18	23.29	2091	2091	0.670	1.478	-0.676	0.448	2.964	0.948	32.0
800S137-54	0.0566	50	0.627	2.13	5.110	1.277	2.855	0.112	0.423	4.97	1.08	32.42	2091	2091	0.670	1.478	-0.676	0.448	2.964	0.948	25.9
800S137-68	0.0713	33	0.782	2.66	6.303	1.576	2.839	0.134	0.414	6.30	1.54	30.45	4221	3367	1.325	1.789	-0.661	0.440	2.944	0.950	31.6
800S137-68	0.0713	50	0.782	2.66	6.303	1.576	2.839	0.134	0.414	6.29	1.47	43.96	4221	3367	1.325	1.789	-0.661	0.440	2.944	0.950	25.6
800S137-97	0.1017	33	1.093	3.72	8.597	2.149	2.805	0.169	0.394	8.60	2.15	53.09*	8843	4824	3.767	2.349	-0.630	0.423	2.902	0.953	27.6
800S137-97	0.1017	50	1.093	3.72	8.597	2.149	2.805	0.169	0.394	8.60	2.15	64.35	10885	5938	3.767	2.349	-0.630	0.423	2.902	0.953	25.0
800S162-33[1]	0.0346	33	0.413	1.41	3.582	0.896	2.943	0.125	0.550	3.38	0.71	14.03	474	474	0.165	1.630	-0.936	0.607	3.137	0.911	40.1
800S162-43	0.0451	33	0.537	1.83	4.633	1.158	2.937	0.160	0.546	4.50	1.02	20.14	1051	1051	0.364	2.076	-0.926	0.601	3.128	0.912	39.9
800S162-54	0.0566	33	0.670	2.28	5.736	1.434	2.927	0.194	0.539	5.70	1.33	26.36	2091	2091	0.715	2.539	-0.914	0.594	3.113	0.914	39.6
800S162-54	0.0566	50	0.670	2.28	5.736	1.434	2.927	0.194	0.539	5.60	1.23	36.79	2091	2091	0.715	2.539	-0.914	0.594	3.113	0.914	32.1
800S162-68	0.0713	33	0.836	2.84	7.089	1.772	2.913	0.235	0.530	7.09	1.74	34.32	4221	3367	1.416	3.093	-0.899	0.586	3.094	0.916	39.3
800S162-68	0.0713	50	0.836	2.84	7.089	1.772	2.913	0.235	0.530	7.07	1.66	49.80	4221	3367	1.416	3.093	-0.899	0.586	3.094	0.916	31.9
800S162-97	0.1017	33	1.169	3.98	9.713	2.428	2.883	0.305	0.510	9.71	2.43	58.27*	8843	4824	4.030	4.114	-0.866	0.568	3.053	0.919	35.1
800S162-97	0.1017	50	1.169	3.98	9.713	2.428	2.883	0.305	0.510	9.71	2.43	72.70	10885	5938	4.030	4.114	-0.866	0.568	3.053	0.919	31.4
800S162-118	0.1242	33	1.407	4.79	11.504	2.876	2.860	0.345	0.496	11.50	2.88	71.47*	11341	4971	7.234	4.766	-0.842	0.556	3.022	0.922	34.1
800S162-118	0.1242	50	1.407	4.79	11.504	2.876	2.860	0.345	0.496	11.50	2.88	105.23*	16235	7115	7.234	4.766	-0.842	0.556	3.022	0.922	28.0
800S200-33[1]	0.0346	33	0.448	1.52	4.096	1.024	3.023	0.227	0.712	4.10	0.82	16.12	474	474	0.179	2.971	-1.288	0.817	3.363	0.853	50.5
800S200-43	0.0451	33	0.582	1.98	5.302	1.325	3.018	0.292	0.708	5.30	1.29	25.54	1051	1051	0.395	3.797	-1.277	0.811	3.353	0.855	50.4
800S200-54	0.0566	33	0.726	2.47	6.573	1.643	3.009	0.357	0.701	6.57	1.64	35.75*	2091	2091	0.775	4.663	-1.265	0.804	3.338	0.856	47.8
800S200-54	0.0566	50	0.726	2.47	6.573	1.643	3.009	0.357	0.701	6.57	1.50	44.87	2091	2091	0.775	4.663	-1.265	0.804	3.338	0.856	40.7
800S200-68	0.0713	33	0.907	3.09	8.140	2.035	2.996	0.435	0.692	8.14	2.04	45.29*	4221	3367	1.537	5.712	-1.248	0.796	3.319	0.859	47.0
800S200-68	0.0713	50	0.907	3.09	8.140	2.035	2.996	0.435	0.692	8.14	1.96	65.21*	4221	3367	1.537	5.712	-1.248	0.796	3.319	0.859	38.4
800S200-97	0.1017	33	1.271	4.32	11.203	2.801	2.969	0.576	0.673	11.20	2.80	65.12*	8843	4824	4.381	7.684	-1.214	0.777	3.278	0.863	45.5
800S200-97	0.1017	50	1.271	4.32	11.203	2.801	2.969	0.576	0.673	11.20	2.80	96.63*	10885	5938	4.381	7.684	-1.214	0.777	3.278	0.863	37.2
800S200-118	0.1242	33	1.531	5.21	13.316	3.329	2.949	0.665	0.659	13.32	3.33	79.78*	11341	4971	7.872	8.981	-1.188	0.764	3.247	0.866	44.6
800S200-118	0.1242	50	1.531	5.21	13.316	3.329	2.949	0.665	0.659	13.32	3.33	117.95*	16235	7115	7.872	8.981	-1.188	0.764	3.247	0.866	36.5
800S250-43	0.0451	33	0.627	2.13	6.015	1.504	3.097	0.500	0.893	6.02	1.31	25.95	1051	1051	0.425	6.374	-1.675	1.043	3.632	0.787	61.5
800S250-54	0.0566	33	0.783	2.66	7.465	1.866	3.088	0.614	0.886	7.47	1.71	33.82	2091	2091	0.836	7.850	-1.661	1.036	3.617	0.789	61.4
800S250-54	0.0566	50	0.783	2.66	7.465	1.866	3.088	0.614	0.886	7.38	1.53	45.66	2091	2091	0.836	7.850	-1.661	1.036	3.617	0.789	49.8
800S250-68	0.0713	33	0.978	3.33	9.261	2.315	3.077	0.752	0.877	9.26	2.22	48.33*	4221	3367	1.658	9.652	-1.644	1.027	3.597	0.791	58.2
800S250-68	0.0713	50	0.978	3.33	9.261	2.315	3.077	0.752	0.877	9.24	2.06	61.65	4221	3367	1.658	9.652	-1.644	1.027	3.597	0.791	49.6
800S250-97	0.1017	33	1.372	4.67	12.789	3.197	3.053	1.009	0.857	12.79	3.19	72.07*	8843	4824	4.731	13.091	-1.607	1.008	3.555	0.796	56.8
800S250-97	0.1017	50	1.372	4.67	12.789	3.197	3.053	1.009	0.857	12.79	3.05	102.70*	10885	5938	4.731	13.091	-1.607	1.008	3.555	0.796	46.4
800S250-118	0.1242	33	1.655	5.63	15.242	3.810	3.035	1.175	0.843	15.24	3.81	88.31*	11341	4971	8.511	15.395	-1.580	0.994	3.524	0.799	55.9
800S250-118	0.1242	50	1.655	5.63	15.242	3.810	3.035	1.175	0.843	15.24	3.71	127.51*	16235	7115	8.511	15.395	-1.580	0.994	3.524	0.799	45.6
800S300-68	0.0713	33	1.050	3.57	10.382	2.595	3.145	1.179	1.060	10.35	2.32	45.86	4221	3367	1.779	14.888	-2.055	1.262	3.903	0.723	72.0
800S300-68	0.0713	50	1.050	3.57	10.382	2.595	3.145	1.179	1.060	10.08	2.15	64.21	4221	3367	1.779	14.888	-2.055	1.262	3.903	0.723	58.4
800S300-97	0.1017	33	1.474	5.02	14.375	3.594	3.123	1.595	1.040	14.38	3.44	76.21*	8843	4824	5.082	20.304	-2.017	1.243	3.860	0.727	67.7
800S300-97	0.1017	50	1.474	5.02	14.375	3.594	3.123	1.595	1.040	14.17	3.30	98.92	10885	5938	5.082	20.304	-2.017	1.243	3.860	0.727	58.1
800S300-118	0.1242	33	1.779	6.05	17.167	4.292	3.106	1.871	1.025	17.17	4.17	94.33*	11341	4971	9.149	23.979	-1.989	1.229	3.828	0.730	66.8
800S300-118	0.1242	50	1.779	6.05	17.167	4.292	3.106	1.871	1.025	17.02	4.11	138.41*	16235	7115	9.149	23.979	-1.989	1.229	3.828	0.730	54.5
800S350-54	0.0566	33	0.938	3.19	9.683	2.421	3.212	1.646	1.325	9.48	2.13	41.98	2091	2091	1.002	22.897	-2.766	1.668	4.441	0.612	90.1
800S350-54	0.0566	50	0.938	3.19	9.683	2.421	3.212	1.646	1.325	9.19	1.87	55.96	2091	2091	1.002	22.897	-2.766	1.668	4.441	0.612	73.1
800S350-68	0.0713	33	1.174	4.00	12.046	3.012	3.203	2.034	1.316	12.05	2.84	56.07	4221	3367	1.990	28.308	-2.748	1.658	4.421	0.614	89.9
800S350-68	0.0713	50	1.174	4.00	12.046	3.012	3.203	2.034	1.316	11.91	2.60	77.73	4221	3367	1.990	28.308	-2.748	1.658	4.421	0.614	72.9
800S350-97	0.1017	33	1.652	5.62	16.737	4.184	3.183	2.784	1.298	16.74	4.10	89.43*	8843	4824	5.696	38.834	-2.710	1.639	4.377	0.617	85.4
800S350-97	0.1017	50	1.652	5.62	16.737	4.184	3.183	2.784	1.298	16.74	3.79	113.34	10885	5938	5.696	38.834	-2.710	1.639	4.377	0.617	72.7
800S350-118	0.1242	33	1.997	6.79	20.041	5.010	3.168	3.295	1.285	20.04	5.01	111.44*	11341	4971	10.267	46.068	-2.682	1.624	4.345	0.619	84.6
800S350-118	0.1242	50	1.997	6.79	20.041	5.010	3.168	3.295	1.285	20.04	4.76	158.02*	16235	7115	10.267	46.068	-2.682	1.624	4.345	0.619	68.9
1000S162-43[1]	0.0451	33	0.627	2.13	8.025	1.605	3.577	0.168	0.518	7.52	1.30	25.74	836	836	0.425	3.430	-0.823	0.545	3.707	0.951	38.8
1000S162-54	0.0566	33	0.783	2.66	9.950	1.990	3.565	0.204	0.511	9.63	1.72	34.02	1661	1661	0.836	4.198	-0.812	0.538	3.692	0.952	38.6
1000S162-54	0.0566	50	0.783	2.66	9.950	1.990	3.565	0.204	0.511	9.39	1.57	47.07	1661	1661	0.836	4.198	-0.812	0.538	3.692	0.952	31.3
1000S162-68	0.0713	33	0.978	3.33	12.325	2.465	3.550	0.246	0.502	12.26	2.28	44.98	3345	3345	1.658	5.121	-0.798	0.531	3.673	0.953	38.2
1000S162-68	0.0713	50	0.978	3.33	12.325	2.465	3.550	0.246	0.502	11.98	2.15	64.51	3345	3345	1.658	5.121	-0.798	0.531	3.673	0.953	31.0
1000S162-97	0.1017	33	1.372	4.67	16.967	3.393	3.516	0.320	0.483	16.97	3.39	67.06	8843	6434	4.731	6.827	-0.768	0.514	3.631	0.955	37.5
1000S162-97	0.1017	50	1.372	4.67	16.967	3.393	3.516	0.320	0.483	16.97	3.27	97.89	9864	7177	4.731	6.827	-0.768	0.514	3.631	0.955	30.4
1000S162-118	0.1242	33	1.655	5.63	20.169	4.034	3.491	0.363	0.468	20.17	4.03	100.24*	13189	7747	8.511	7.924	-0.746	0.502	3.600	0.957	32.9
600S300-54	0.0566	33	0.726	2.47	4.319	1.440	2.439	0.875	1.098	4.269	1.211	23.93	2739	1890	0.775	6.452	-2.299	1.372	3.527	0.575	72.8
600S300-54	0.0566	50	0.726	2.47	4.319	1.440	2.439	0.875	1.098	4.014	1.106	33.13	2823	1947	0.775	6.452	-2.299	1.372	3.527	0.575	59.0
800S300-54	0.0566	33	0.839	2.86	8.358	2.090	3.156	0.960	1.069	8.249	1.785	35.28	2091	2091	0.896	12.076	-2.073	1.271	3.924	0.721	72.2
800S300-54	0.0566	50	0.839	2.86	8.358	2.090	3.156	0.960	1.069	7.862	1.535	45.96	2091	2091	0.896	12.076	-2.073	1.271	3.924	0.721	58.6

See Section Properties Table Notes on page 6.

1. Web-height to thickness ratio exceeds 200. Web Stiffeners are required at all support points and concentrated loads. Suitability of web holes must be evaluated independently.
* Allowable moment includes cold-work of forming.

Complies with the 2006 International Building Code (IBC)

Section Properties

Structural (S) Stud Section Properties

Member	Design Thickness (in)	Fy (ksi)	Gross Properties							Effective Properties					Torsional						Lu (in)
			Area (in^2)	Weight (lb/ft)	Ix (in^4)	Sx (in^3)	Rx (in)	Iy (in^4)	Ry (in)	Ixe (in^4)	Sxe (in^3)	Ma (in-k)	Vag (lb)	Vanet (lb)	J x 1000 (in^4)	Cw (in^6)	Xo (in)	m (in)	Ro (in)	β	
1000S162-118	0.1242	50	1.655	5.63	20.169	4.034	3.491	0.363	0.468	20.17	4.03	120.77	16235	9536	8.511	7.924	-0.746	0.502	3.600	0.957	29.9
1000S200-43[1]	0.0451	33	0.672	2.29	9.085	1.817	3.676	0.309	0.677	8.60	1.47	29.05	836	836	0.456	6.236	-1.147	0.743	3.910	0.914	49.3
1000S200-54	0.0566	33	0.839	2.86	11.278	2.256	3.666	0.378	0.671	10.95	1.98	39.20	1661	1661	0.896	7.665	-1.135	0.737	3.896	0.915	49.1
1000S200-54	0.0566	50	0.839	2.86	11.278	2.256	3.666	0.378	0.671	10.77	1.71	51.05	1661	1661	0.896	7.665	-1.135	0.737	3.896	0.915	39.8
1000S200-68	0.0713	33	1.050	3.57	13.994	2.799	3.652	0.460	0.662	13.92	2.61	51.51	3345	3345	1.779	9.401	-1.120	0.729	3.876	0.917	48.8
1000S200-68	0.0713	50	1.050	3.57	13.994	2.799	3.652	0.460	0.662	13.67	2.42	72.46	3345	3345	1.779	9.401	-1.120	0.729	3.876	0.917	39.6
1000S200-97	0.1017	33	1.474	5.02	19.336	3.867	3.622	0.609	0.643	19.34	3.87	76.42	8843	6434	5.082	12.679	-1.088	0.711	3.836	0.920	48.2
1000S200-97	0.1017	50	1.474	5.02	19.336	3.867	3.622	0.609	0.643	19.34	3.74	112.00	9864	7177	5.082	12.679	-1.088	0.711	3.836	0.920	39.0
1000S200-118	0.1242	33	1.779	6.05	23.052	4.610	3.599	0.703	0.629	23.05	4.61	110.50*	13189	7747	9.149	14.848	-1.064	0.699	3.805	0.922	43.3
1000S200-118	0.1242	50	1.779	6.05	23.052	4.610	3.599	0.703	0.629	23.05	4.61	138.04	16235	9536	9.149	14.848	-1.064	0.699	3.805	0.922	38.7
1000S250-43[1]	0.0451	33	0.717	2.44	10.203	2.041	3.771	0.531	0.860	10.20	1.62	31.95	836	836	0.486	10.481	-1.518	0.965	4.155	0.867	60.7
1000S250-54	0.0566	33	0.896	3.05	12.677	2.535	3.762	0.653	0.854	12.68	2.28	44.99	1661	1661	0.957	12.922	-1.505	0.958	4.140	0.868	60.5
1000S250-54	0.0566	50	0.896	3.05	12.677	2.535	3.762	0.653	0.854	12.66	1.88	56.26	1661	1661	0.957	12.922	-1.505	0.958	4.140	0.868	49.1
1000S250-68	0.0713	33	1.121	3.81	15.751	3.150	3.749	0.799	0.844	15.75	3.03	65.93*	3345	3345	1.899	15.909	-1.488	0.950	4.121	0.870	57.3
1000S250-68	0.0713	50	1.121	3.81	15.751	3.150	3.749	0.799	0.844	15.74	2.77	82.89	3345	3345	1.899	15.909	-1.488	0.950	4.121	0.870	48.8
1000S250-97	0.1017	33	1.576	5.36	21.827	4.365	3.722	1.072	0.825	21.83	4.36	98.41*	8843	6434	5.433	21.632	-1.454	0.932	4.080	0.873	55.8
1000S250-97	0.1017	50	1.576	5.36	21.827	4.365	3.722	1.072	0.825	21.83	4.18	140.63*	9864	7177	5.433	21.632	-1.454	0.932	4.080	0.873	45.6
1000S250-118	0.1242	33	1.904	6.48	26.080	5.216	3.701	1.249	0.810	26.08	5.22	120.89*	13189	7747	9.788	25.490	-1.428	0.918	4.049	0.876	54.7
1000S250-118	0.1242	50	1.904	6.48	26.080	5.216	3.701	1.249	0.810	26.08	5.08	174.84*	16235	9536	9.788	25.490	-1.428	0.918	4.049	0.876	44.7
1000S300-54	0.0566	33	0.953	3.24	14.076	2.815	3.844	1.024	1.037	13.94	2.31	45.69	1661	1661	1.017	19.888	-1.892	1.185	4.408	0.816	71.5
1000S300-54	0.0566	50	0.953	3.24	14.076	2.815	3.844	1.024	1.037	13.44	1.90	56.96	1661	1661	1.017	19.888	-1.892	1.185	4.408	0.816	58.1
1000S300-68	0.0713	33	1.192	4.06	17.509	3.502	3.832	1.258	1.027	17.44	3.16	62.41	3345	3345	2.020	24.551	-1.874	1.176	4.388	0.818	71.3
1000S300-68	0.0713	50	1.192	4.06	17.509	3.502	3.832	1.258	1.027	17.10	2.80	83.89	3345	3345	2.020	24.551	-1.874	1.176	4.388	0.818	57.8
1000S300-97	0.1017	33	1.677	5.71	24.318	4.864	3.808	1.702	1.007	24.32	4.67	103.39*	8843	6434	5.783	33.570	-1.838	1.158	4.346	0.821	66.8
1000S300-97	0.1017	50	1.677	5.71	24.318	4.864	3.808	1.702	1.007	23.97	4.50	134.69	9864	7177	5.783	33.570	-1.838	1.158	4.346	0.821	57.4
1000S300-118	0.1242	33	2.028	6.90	29.109	5.822	3.789	1.997	0.992	29.11	5.66	128.16*	13189	7747	10.427	39.725	-1.811	1.144	4.315	0.824	65.8
1000S300-118	0.1242	50	2.028	6.90	29.109	5.822	3.789	1.997	0.992	28.86	5.59	188.23*	16235	9536	10.427	39.725	-1.811	1.144	4.315	0.824	53.8
1000S350-54	0.0566	33	1.052	3.58	16.220	3.244	3.927	1.768	1.297	15.94	2.77	54.77	1661	1661	1.123	36.575	-2.546	1.566	4.857	0.725	89.0
1000S350-54	0.0566	50	1.052	3.58	16.220	3.244	3.927	1.768	1.297	15.58	2.33	69.69	1661	1661	1.123	36.575	-2.546	1.566	4.857	0.725	72.2
1000S350-68	0.0713	33	1.317	4.48	20.204	4.041	3.917	2.185	1.288	20.20	3.82	75.57	3345	3345	2.232	45.277	-2.529	1.557	4.837	0.727	88.7
1000S350-68	0.0713	50	1.317	4.48	20.204	4.041	3.917	2.185	1.288	20.03	3.42	102.32	3345	3345	2.232	45.277	-2.529	1.557	4.837	0.727	72.0
1000S350-97	0.1017	33	1.855	6.31	28.148	5.630	3.895	2.992	1.270	28.15	5.52	120.33*	8843	6434	6.397	62.280	-2.492	1.538	4.795	0.730	84.1
1000S350-97	0.1017	50	1.855	6.31	28.148	5.630	3.895	2.992	1.270	28.15	5.12	153.25	9864	7177	6.397	62.280	-2.492	1.538	4.795	0.730	71.6
1000S350-118	0.1242	33	2.245	7.64	33.772	6.754	3.878	3.543	1.256	33.77	6.75	150.23*	13189	7747	11.544	74.030	-2.465	1.524	4.764	0.732	83.1
1000S350-118	0.1242	50	2.245	7.64	33.772	6.754	3.878	3.543	1.256	33.77	6.43	213.25*	16235	9536	11.544	74.030	-2.465	1.524	4.764	0.732	67.8
1200S162-54[1]	0.0566	33	0.896	3.05	15.730	2.622	4.190	0.212	0.486	14.74	2.11	41.68	1377	1377	0.957	6.340	-0.732	0.493	4.281	0.971	37.5
1200S162-54[1]	0.0566	50	0.896	3.05	15.730	2.622	4.190	0.212	0.486	14.30	1.91	57.31	1377	1377	0.957	6.340	-0.732	0.493	4.281	0.971	30.5
1200S162-68	0.0713	33	1.121	3.81	19.518	3.253	4.173	0.255	0.477	18.96	2.82	55.66	2771	2771	1.899	7.739	-0.719	0.485	4.261	0.972	37.2
1200S162-68	0.0713	50	1.121	3.81	19.518	3.253	4.173	0.255	0.477	18.39	2.65	79.19	2771	2771	1.899	7.739	-0.719	0.485	4.261	0.972	30.2
1200S162-97	0.1017	33	1.576	5.36	26.966	4.494	4.137	0.331	0.459	26.97	4.33	85.51	8147	7411	5.433	10.331	-0.691	0.470	4.219	0.973	36.4
1200S162-97	0.1017	50	1.576	5.36	26.966	4.494	4.137	0.331	0.459	26.74	4.09	122.49	8147	7411	5.433	10.331	-0.691	0.470	4.219	0.973	29.5
1200S162-118	0.1242	33	1.904	6.48	32.145	5.357	4.109	0.376	0.444	32.15	5.36	105.87	13189	9714	9.788	12.002	-0.670	0.459	4.187	0.974	35.8
1200S162-118	0.1242	50	1.904	6.48	32.145	5.357	4.109	0.376	0.444	32.15	5.17	154.74	14986	11037	9.788	12.002	-0.670	0.459	4.187	0.974	29.0
1200S200-54[1]	0.0566	33	0.953	3.24	17.662	2.944	4.306	0.393	0.643	16.68	2.43	47.93	1377	1377	1.017	11.550	-1.032	0.681	4.474	0.947	36.4
1200S200-54[1]	0.0566	50	0.953	3.24	17.662	2.944	4.306	0.393	0.643	16.33	2.07	62.07	1377	1377	1.017	11.550	-1.032	0.681	4.474	0.947	29.5
1200S200-68	0.0713	33	1.192	4.06	21.947	3.658	4.291	0.479	0.634	21.38	3.22	63.54	2771	2771	2.020	14.176	-1.017	0.673	4.455	0.948	47.7
1200S200-68	0.0713	50	1.192	4.06	21.947	3.658	4.291	0.479	0.634	20.86	2.96	88.71	2771	2771	2.020	14.176	-1.017	0.673	4.455	0.948	38.7
1200S200-97	0.1017	33	1.677	5.71	30.417	5.069	4.258	0.635	0.615	30.42	4.90	96.81	8147	7411	5.783	19.150	-0.987	0.656	4.414	0.950	47.0
1200S200-97	0.1017	50	1.677	5.71	30.417	5.069	4.258	0.635	0.615	30.18	4.66	139.51	8147	7411	5.783	19.150	-0.987	0.656	4.414	0.950	38.1
1200S200-118	0.1242	33	2.028	6.90	36.347	6.058	4.234	0.732	0.601	36.35	6.06	119.71	13189	9714	10.427	22.451	-0.964	0.644	4.384	0.952	46.5
1200S200-118	0.1242	50	2.028	6.90	36.347	6.058	4.234	0.732	0.601	36.35	5.87	175.59	14986	11037	10.427	22.451	-0.964	0.644	4.384	0.952	37.7
1200S250-54[1]	0.0566	33	1.009	3.43	19.681	3.280	4.416	0.683	0.823	18.83	2.48	49.05	1377	1377	1.078	19.505	-1.378	0.892	4.699	0.914	59.6
1200S250-54[1]	0.0566	50	1.009	3.43	19.681	3.280	4.416	0.683	0.823	18.43	2.15	64.34	1377	1377	1.078	19.505	-1.378	0.892	4.699	0.914	48.4
1200S250-68	0.0713	33	1.263	4.30	24.484	4.081	4.402	0.836	0.813	23.96	3.50	69.08	2771	2771	2.141	24.034	-1.362	0.884	4.679	0.915	59.2
1200S250-68	0.0713	50	1.263	4.30	24.484	4.081	4.402	0.836	0.813	23.58	3.01	90.04	2771	2771	2.141	24.034	-1.362	0.884	4.679	0.915	48.1
1200S250-97	0.1017	33	1.779	6.05	34.016	5.669	4.373	1.121	0.794	34.02	5.50	108.60	8147	7411	6.134	32.734	-1.329	0.867	4.639	0.918	58.6
1200S250-97	0.1017	50	1.779	6.05	34.016	5.669	4.373	1.121	0.794	33.84	5.04	150.82	8147	7411	6.134	32.734	-1.329	0.867	4.639	0.918	47.5
1200S250-118	0.1242	33	2.152	7.32	40.726	6.788	4.350	1.307	0.779	40.73	6.79	134.13	13189	9714	11.065	38.619	-1.305	0.854	4.608	0.920	58.2
1200S250-118	0.1242	50	2.152	7.32	40.726	6.788	4.350	1.307	0.779	40.73	6.54	195.84	14986	11037	11.065	38.619	-1.305	0.854	4.608	0.920	47.1
1200S300-118	0.1242	33	2.276	7.75	45.106	7.518	4.452	2.095	0.959	45.11	7.32	165.76*	13189	9714	11.704	60.251	-1.666	1.071	4.849	0.882	64.9
1200S300-118	0.1242	50	2.276	7.75	45.106	7.518	4.452	2.095	0.959	44.73	7.23	243.67*	14986	11037	11.704	60.251	-1.666	1.071	4.849	0.882	53.0
1200S350-118	0.1242	33	2.494	8.48	51.992	8.665	4.566	3.741	1.225	51.99	8.67	192.74*	13189	9714	12.821	110.302	-2.284	1.436	5.250	0.811	81.9
1200S350-118	0.1242	50	2.494	8.48	51.992	8.665	4.566	3.741	1.225	51.99	8.26	274.07*	14986	11037	12.821	110.302	-2.284	1.436	5.250	0.811	66.9
1200S300-54[1]	0.0566	33	1.066	3.63	21.699	3.617	4.512	1.074	1.004	21.65	2.74	54.06	1377	1377	1.138	30.051	-1.743	1.111	4.940	0.876	70.8
1200S300-54[1]	0.0566	50	1.066	3.63	21.699	3.617	4.512	1.074	1.004	21.04	2.27	68.04	1377	1377	1.138	30.051	-1.743	1.111	4.940	0.876	57.4
1200S300-68	0.0713	33	1.335	4.54	27.020	4.503	4.499	1.320	0.994	26.92	4.06	80.30	2771	2771	2.262	37.126	-1.726	1.103	4.921	0.877	70.5
1200S300-68	0.0713	50	1.335	4.54	27.020	4.503	4.499	1.320	0.994	26.51	3.32	99.32	2771	2771	2.262	37.126	-1.726	1.103	4.921	0.877	57.2
1200S300-97	0.1017	33	1.881	6.40	37.616	6.269	4.472	1.786	0.974	37.62	6.04	133.59*	8147	7411	6.484	50.853	-1.691	1.085	4.880	0.880	66.0
1200S300-97	0.1017	50	1.881	6.40	37.616	6.269	4.472	1.786	0.974	37.09	5.83	174.57	8147	7411	6.484	50.853	-1.691	1.085	4.880	0.880	56.7
1200S350-54[1]	0.0566	33	1.165	3.96	24.860	4.143	4.620	1.866	1.266	24.61	3.30	65.12	1377	1377	1.244	54.279	-2.363	1.478	5.341	0.804	88.0
1200S350-54[1]	0.0566	50	1.165	3.96	24.860	4.143	4.620	1.866	1.266	24.09	2.79	83.46	1377	1377	1.244	54.279	-2.363	1.478	5.341	0.804	71.4
1200S350-68	0.0713	33	1.460	4.97	30.996	5.166	4.608	2.306	1.257	31.00	4.91	96.98	2771	2771	2.473	67.251	-2.346	1.469	5.322	0.806	87.7
1200S350-68	0.0713	50	1.460	4.97	30.996	5.166	4.608	2.306	1.257	30.92	4.06	121.59	2771	2771	2.473	67.251	-2.346	1.469	5.322	0.806	71.2

1. Web-height to thickness ratio exceeds 200. Web Stiffeners are required at all support points and concentrated loads. Suitability of web holes must be evaluated independently.
2. Where web height-to-thickness ratio exceeds 260, or flange width-to-thickness ratio exceeds 60, effective properties are not calculated (limitations in AISI section B1)

* Allowable moment includes cold-work of forming.

See Section Properties Table Notes on page 6.

SSMA

Section Properties

Structural (S) Stud Section Properties

Member	Design Thickness (in)	Fy (ksi)	Gross Properties							Effective Properties					Torsional						
			Area (in^2)	Weight (lb/ft)	Ix (in^4)	Sx (in^3)	Rx (in)	Iy (in^4)	Ry (in)	Ixe (in^4)	Sxe (in^3)	Ma (in-k)	Vag (lb)	Vanet (lb)	J x 1000 (in^4)	Cw (in^6)	Xo (in)	m (in)	Ro (in)	β	Lu (in)
1200S350-97	0.1017	33	2.059	7.01	43.269	7.211	4.584	3.159	1.239	43.27	7.07	154.22*	8147	7411	7.098	92.672	-2.310	1.450	5.281	0.809	83.1
1200S350-97	0.1017	50	2.059	7.01	43.269	7.211	4.584	3.159	1.239	43.27	6.59	197.31	8147	7411	7.098	92.672	-2.310	1.450	5.281	0.809	70.8
1400S162-54[1]	0.0566	33	1.009	3.43	23.302	3.329	4.805	0.218	0.464	21.10	2.50	49.32	1177	1177	1.078	8.980	-0.667	0.454	4.873	0.981	36.6
1400S162-54[1]	0.0566	50	1.009	3.43	23.302	3.329	4.805	0.218	0.464	20.37	2.26	67.54	1177	1177	1.078	8.980	-0.667	0.454	4.873	0.981	29.7
1400S162-68	0.0713	33	1.263	4.30	28.952	4.136	4.787	0.262	0.456	27.36	3.36	66.33	2365	2365	2.141	10.966	-0.654	0.447	4.853	0.982	36.2
1400S162-68	0.0713	50	1.263	4.30	28.952	4.136	4.787	0.262	0.456	26.38	3.14	93.85	2365	2365	2.141	10.966	-0.654	0.447	4.853	0.982	29.4
1400S162-97	0.1017	33	1.779	6.05	40.115	5.731	4.748	0.340	0.437	39.97	5.25	103.71	6939	6939	6.134	14.651	-0.628	0.433	4.810	0.983	35.3
1400S162-97	0.1017	50	1.779	6.05	40.115	5.731	4.748	0.340	0.437	38.90	4.92	147.14	6939	6939	6.134	14.651	-0.628	0.433	4.810	0.983	28.7
1400S162-118	0.1242	33	2.152	7.32	47.928	6.847	4.719	0.385	0.423	47.93	6.66	131.59	12745	11287	11.065	17.032	-0.609	0.422	4.777	0.984	34.7
1400S162-118	0.1242	50	2.152	7.32	47.928	6.847	4.719	0.385	0.423	47.77	6.28	188.07	12745	11287	11.065	17.032	-0.609	0.422	4.777	0.984	28.1
1400S200-54[1]	0.0566	33	1.066	3.63	25.951	3.707	4.935	0.406	0.617	23.77	2.87	56.63	1177	1177	1.138	16.355	-0.946	0.633	5.062	0.965	47.0
1400S200-54[1]	0.0566	50	1.066	3.63	25.951	3.707	4.935	0.406	0.617	23.20	2.44	73.05	1177	1177	1.138	16.355	-0.946	0.633	5.062	0.965	38.2
1400S200-68	0.0713	33	1.335	4.54	32.284	4.612	4.918	0.494	0.608	30.68	3.82	75.56	2365	2365	2.262	20.083	-0.932	0.625	5.043	0.966	46.7
1400S200-68	0.0713	50	1.335	4.54	32.284	4.612	4.918	0.494	0.608	29.80	3.51	104.93	2365	2365	2.262	20.083	-0.932	0.625	5.043	0.966	37.9
1400S200-97	0.1017	33	1.881	6.40	44.853	6.408	4.883	0.655	0.590	44.68	5.92	116.93	6939	6939	6.484	27.156	-0.904	0.609	5.001	0.967	45.9
1400S200-97	0.1017	50	1.881	6.40	44.853	6.408	4.883	0.655	0.590	43.62	5.58	167.07	6939	6939	6.484	27.156	-0.904	0.609	5.001	0.967	37.3
1400S200-118	0.1242	33	2.276	7.75	53.698	7.671	4.857	0.755	0.576	53.70	7.48	147.81	12745	11287	11.704	31.861	-0.883	0.598	4.970	0.968	45.4
1400S200-118	0.1242	50	2.276	7.75	53.698	7.671	4.857	0.755	0.576	53.52	7.10	212.47	12745	11287	11.704	31.861	-0.883	0.598	4.970	0.968	36.8
1400S250-54[1]	0.0566	33	1.122	3.82	28.702	4.100	5.057	0.707	0.794	26.76	2.93	57.83	1177	1177	1.198	27.675	-1.272	0.835	5.275	0.942	58.6
1400S250-54[1]	0.0566	50	1.122	3.82	28.702	4.100	5.057	0.707	0.794	26.14	2.53	75.65	1177	1177	1.198	27.675	-1.272	0.835	5.275	0.942	47.6
1400S250-68	0.0713	33	1.406	4.78	35.743	5.106	5.042	0.865	0.784	34.24	4.15	81.90	2365	2365	2.383	34.118	-1.257	0.827	5.255	0.943	58.2
1400S250-68	0.0713	50	1.406	4.78	35.743	5.106	5.042	0.865	0.784	33.57	3.55	106.29	2365	2365	2.383	34.118	-1.257	0.827	5.255	0.943	47.3
1400S250-97	0.1017	33	1.983	6.75	49.764	7.109	5.010	1.160	0.765	49.58	6.61	130.64	6939	6939	6.835	46.520	-1.225	0.811	5.214	0.945	57.6
1400S250-97	0.1017	50	1.983	6.75	49.764	7.109	5.010	1.160	0.765	48.65	6.01	179.95	6939	6939	6.835	46.520	-1.225	0.811	5.214	0.945	46.7
1400S250-118	0.1242	33	2.400	8.17	59.676	8.525	4.986	1.352	0.750	59.68	8.33	164.61	12745	11287	12.342	54.927	-1.203	0.798	5.184	0.946	57.0
1400S250-118	0.1242	50	2.400	8.17	59.676	8.525	4.986	1.352	0.750	59.50	7.88	235.94	12745	11287	12.342	54.927	-1.203	0.798	5.184	0.946	46.2
1400S300-54[1]	0.0566	33	1.179	4.01	31.453	4.493	5.165	1.115	0.972	29.58	3.02	59.66	1177	1177	1.259	42.690	-1.617	1.046	5.499	0.914	69.9
1400S300-54[1]	0.0566	50	1.179	4.01	31.453	4.493	5.165	1.115	0.972	27.23	2.58	77.25	1177	1177	1.259	42.690	-1.617	1.046	5.499	0.914	56.8
1400S300-68	0.0713	33	1.477	5.03	39.201	5.600	5.151	1.370	0.963	37.90	4.24	83.71	2365	2365	2.503	52.772	-1.601	1.038	5.480	0.915	69.6
1400S300-68	0.0713	50	1.477	5.03	39.201	5.600	5.151	1.370	0.963	36.29	3.66	109.42	2365	2365	2.503	52.772	-1.601	1.038	5.480	0.915	56.5
1400S300-97	0.1017	33	2.084	7.09	54.675	7.811	5.122	1.854	0.943	54.57	7.04	139.02	6939	6939	7.186	72.365	-1.568	1.020	5.439	0.917	68.9
1400S300-97	0.1017	50	2.084	7.09	54.675	7.811	5.122	1.854	0.943	53.23	6.37	190.78	6939	6939	7.186	72.365	-1.568	1.020	5.439	0.917	55.9
1400S300-118	0.1242	33	2.525	8.59	65.655	9.379	5.100	2.174	0.928	65.66	9.05	178.75	12745	11287	12.981	85.812	-1.544	1.008	5.408	0.919	68.5
1400S300-118	0.1242	50	2.525	8.59	65.655	9.379	5.100	2.174	0.928	65.57	8.43	252.29	12745	11287	12.981	85.812	-1.544	1.008	5.408	0.919	55.5
1400S350-54[1]	0.0566	33	1.278	4.35	35.830	5.119	5.295	1.947	1.234	35.66	3.82	75.54	1177	1177	1.365	76.252	-2.207	1.400	5.868	0.859	87.0
1400S350-54[1]	0.0566	50	1.278	4.35	35.830	5.119	5.295	1.947	1.234	33.31	3.25	97.27	1177	1177	1.365	76.252	-2.207	1.400	5.868	0.859	70.7
1400S350-68	0.0713	33	1.602	5.45	44.707	6.387	5.283	2.406	1.226	44.71	5.70	112.64	2365	2365	2.715	94.534	-2.190	1.391	5.848	0.860	86.8
1400S350-68	0.0713	50	1.602	5.45	44.707	6.387	5.283	2.406	1.226	44.71	4.71	141.00	2365	2365	2.715	94.534	-2.190	1.391	5.848	0.860	70.5
1400S350-97	0.1017	33	2.262	7.70	62.507	8.930	5.257	3.296	1.207	62.51	8.76	191.08*	6939	6939	7.799	130.430	-2.156	1.373	5.808	0.862	82.0
1400S350-97	0.1017	50	2.262	7.70	62.507	8.930	5.257	3.296	1.207	62.51	8.19	245.18	6939	6939	7.799	130.430	-2.156	1.373	5.808	0.862	70.0
1400S350-118	0.1242	33	2.742	9.33	75.200	10.743	5.237	3.903	1.193	75.20	10.74	238.95*	12745	11287	14.099	155.387	-2.130	1.360	5.778	0.864	80.9
1400S350-118	0.1242	50	2.742	9.33	75.200	10.743	5.237	3.903	1.193	75.20	10.26	340.44*	12745	11287	14.099	155.387	-2.130	1.360	5.778	0.864	66.1
1600S162-68[1]	0.0713	33	1.406	4.78	40.913	5.114	5.394	0.268	0.436	37.53	3.90	76.99	2062	2062	2.383	14.816	-0.601	0.415	5.445	0.988	35.2
1600S162-68[1]	0.0713	50	1.406	4.78	40.913	5.114	5.394	0.268	0.436	35.99	3.62	108.49	2062	2062	2.383	14.816	-0.601	0.415	5.445	0.988	28.6
1600S162-97	0.1017	33	1.983	6.75	56.824	7.103	5.354	0.347	0.418	55.56	6.17	121.97	6043	6043	6.835	19.807	-0.577	0.401	5.401	0.989	34.4
1600S162-97	0.1017	50	1.983	6.75	56.824	7.103	5.354	0.347	0.418	53.73	5.74	171.79	6043	6043	6.835	19.807	-0.577	0.401	5.401	0.989	27.9
1600S162-118	0.1242	33	2.400	8.17	68.014	8.502	5.323	0.393	0.405	68.01	7.92	156.50	11088	11088	12.342	23.035	-0.559	0.391	5.368	0.989	33.7
1600S162-118	0.1242	50	2.400	8.17	68.014	8.502	5.323	0.393	0.405	66.54	7.40	221.51	11088	11088	12.342	23.035	-0.559	0.391	5.368	0.989	27.4
1600S200-68	0.0713	33	1.477	5.03	45.291	5.661	5.537	0.506	0.585	41.92	4.43	87.56	2062	2062	2.503	27.155	-0.862	0.584	5.634	0.977	45.7
1600S200-68	0.0713	50	1.477	5.03	45.291	5.661	5.537	0.506	0.585	40.52	4.05	121.11	2062	2062	2.503	27.155	-0.862	0.584	5.634	0.977	37.1
1600S200-97	0.1017	33	2.084	7.09	63.050	7.881	5.500	0.670	0.567	61.76	6.94	137.10	6043	6043	7.186	36.744	-0.835	0.569	5.592	0.978	44.9
1600S200-97	0.1017	50	2.084	7.09	63.050	7.881	5.500	0.670	0.567	59.93	6.50	194.61	6043	6043	7.186	36.744	-0.835	0.569	5.592	0.978	36.4
1600S200-118	0.1242	33	2.525	8.59	75.601	9.450	5.472	0.773	0.553	75.60	8.86	175.05	11088	11088	12.981	43.132	-0.815	0.558	5.560	0.979	44.3
1600S200-118	0.1242	50	2.525	8.59	75.601	9.450	5.472	0.773	0.553	74.08	8.33	249.44	11088	11088	12.981	43.132	-0.815	0.558	5.560	0.979	35.9
1600S250-68[1]	0.0713	33	1.549	5.27	49.814	6.227	5.672	0.889	0.758	46.61	4.79	94.70	2062	2062	2.624	46.230	-1.167	0.778	5.840	0.960	57.3
1600S250-68[1]	0.0713	50	1.549	5.27	49.814	6.227	5.672	0.889	0.758	45.55	4.09	122.51	2062	2062	2.624	46.230	-1.167	0.778	5.840	0.960	46.5
1600S250-97	0.1017	33	2.186	7.44	69.476	8.685	5.638	1.192	0.738	68.16	7.73	152.72	6043	6043	7.536	63.082	-1.138	0.762	5.799	0.962	56.5
1600S250-97	0.1017	50	2.186	7.44	69.476	8.685	5.638	1.192	0.738	66.58	6.98	209.06	6043	6043	7.536	63.082	-1.138	0.762	5.799	0.962	45.8
1600S250-118	0.1242	33	2.649	9.01	83.427	10.428	5.612	1.389	0.724	83.43	9.83	194.19	11088	11088	13.620	74.524	-1.116	0.750	5.768	0.963	56.0
1600S250-118	0.1242	50	2.649	9.01	83.427	10.428	5.612	1.389	0.724	81.92	9.22	276.12	11088	11088	13.620	74.524	-1.116	0.750	5.768	0.963	45.4
1600S300-68[1]	0.0713	33	1.620	5.51	54.336	6.792	5.792	1.411	0.933	51.47	4.89	96.68	2062	2062	2.745	71.608	-1.494	0.981	6.054	0.939	68.7
1600S300-68[1]	0.0713	50	1.620	5.51	54.336	6.792	5.792	1.411	0.933	49.11	4.21	126.04	2062	2062	2.745	71.608	-1.494	0.981	6.054	0.939	55.7
1600S300-97	0.1017	33	2.288	7.78	75.903	9.488	5.760	1.909	0.914	74.74	8.20	162.09	6043	6043	7.887	98.275	-1.463	0.964	6.013	0.941	68.0
1600S300-97	0.1017	50	2.288	7.78	75.903	9.488	5.760	1.909	0.914	72.67	7.39	221.28	6043	6043	7.887	98.275	-1.463	0.964	6.013	0.941	55.2
1600S300-118	0.1242	33	2.773	9.44	91.253	11.407	5.737	2.239	0.899	91.25	10.64	210.19	11088	11088	14.258	116.606	-1.439	0.951	5.982	0.942	67.4
1600S300-118	0.1242	50	2.773	9.44	91.253	11.407	5.737	2.239	0.899	89.91	9.84	294.48	11088	11088	14.258	116.606	-1.439	0.951	5.982	0.942	54.7
1600S350-68[1]	0.0713	33	1.745	5.94	61.622	7.703	5.943	2.490	1.195	58.54	6.04	119.38	2062	2062	2.957	127.370	-2.055	1.322	6.401	0.897	85.8
1600S350-68[1]	0.0713	50	1.745	5.94	61.622	7.703	5.943	2.490	1.195	57.44	5.18	155.08	2062	2062	2.957	127.370	-2.055	1.322	6.401	0.897	69.7
1600S350-97	0.1017	33	2.466	8.39	86.270	10.784	5.915	3.410	1.176	84.93	9.77	193.09	6043	6043	8.501	175.896	-2.022	1.304	6.361	0.899	85.2
1600S350-97	0.1017	50	2.466	8.39	86.270	10.784	5.915	3.410	1.176	83.69	8.38	250.96	6043	6043	8.501	175.896	-2.022	1.304	6.361	0.899	69.1
1600S350-118	0.1242	33	2.990	10.18	103.892	12.987	5.894	4.038	1.162	103.89	12.37	244.38	11088	11088	15.376	209.692	-1.998	1.291	6.331	0.900	84.8
1600S350-118	0.1242	50	2.990	10.18	103.892	12.987	5.894	4.038	1.162	102.53	11.31	338.47	11088	11088	15.376	209.692	-1.998	1.291	6.331	0.900	68.8

1. Web-height to thickness ratio exceeds 200. Web Stiffeners are required at all support points and concentrated loads.
* Allowable moment includes cold-work of forming. Suitability of web holes must be evaluated independently.

See Section Properties Table Notes on page 6.

Complies with the 2006 International Building Code (IBC)

Section Properties

(T) Track Section Properties

Member	Design Thickness (in)	Gross							Effective 33ksi				Effective 50ksi				Torsional					
		Area (in^2)	Weight (lb/ft)	Ix (in^4)	Sx (in^3)	Rx (in)	Iy (in^4)	Ry (in)	Ix (in^4)	Sx (in^3)	Ma (in-k)	Vag (lb)	Ix (in^4)	Sx (in^3)	Ma (in-k)	Vag (lb)	J^{x1000} (in^4)	Cw (in^6)	Xo (in)	m (in)	Ro (in)	β
162T125-18	0.0188	0.077	0.26	0.041	0.047	0.733	0.013	0.411	0.030	0.025	0.500	302					0.009	0.007	-0.878	0.503	1.215	0.478
162T125-27	0.0283	0.117	0.40	0.063	0.072	0.735	0.020	0.410	0.050	0.044	0.870	541					0.031	0.010	-0.872	0.501	1.211	0.482
162T125-30	0.0312	0.129	0.44	0.070	0.079	0.735	0.022	0.409	0.057	0.050	1.000	597					0.042	0.012	-0.870	0.500	1.210	0.483
162T125-33	0.0346	0.143	0.49	0.077	0.087	0.736	0.024	0.408	0.066	0.058	1.150	663					0.057	0.013	-0.868	0.499	1.209	0.484
250T125-18	0.0188	0.094	0.32	0.103	0.079	1.051	0.015	0.400	0.078	0.045	0.900	249					0.011	0.018	-0.769	0.460	1.362	0.681
250T125-27	0.0283	0.141	0.48	0.157	0.119	1.053	0.022	0.398	0.129	0.079	1.560	685					0.038	0.027	-0.763	0.457	1.360	0.685
250T125-30	0.0312	0.156	0.53	0.173	0.131	1.053	0.025	0.397	0.145	0.090	1.770	832					0.051	0.030	-0.762	0.456	1.359	0.686
250T125-33	0.0346	0.173	0.59	0.192	0.145	1.054	0.027	0.397	0.166	0.103	2.030	1024					0.069	0.033	-0.760	0.456	1.358	0.687
250T125-43	0.0451	0.225	0.77	0.250	0.188	1.055	0.035	0.395	0.231	0.147	2.910	1356					0.153	0.042	-0.755	0.453	1.356	0.690
250T125-54	0.0566	0.282	0.96	0.318	0.236	1.062	0.043	0.392	0.310	0.203	4.010	1692	0.297	0.188	5.640	2563	0.301	0.054	-0.749	0.449	1.357	0.696
250T125-68	0.0713	0.355	1.21	0.408	0.297	1.072	0.054	0.389	0.408	0.281	5.560	2111	0.402	0.262	7.850	3199	0.602	0.069	-0.740	0.444	1.360	0.704
250T150-27	0.0283	0.156	0.53	0.181	0.137	1.078	0.037	0.486	0.139	0.082	1.610	685					0.042	0.044	-0.976	0.575	1.534	0.595
250T150-30	0.0312	0.172	0.58	0.199	0.151	1.078	0.040	0.486	0.157	0.093	1.830	832					0.056	0.049	-0.975	0.574	1.533	0.595
250T150-33	0.0346	0.190	0.65	0.221	0.167	1.079	0.045	0.485	0.179	0.107	2.110	1024					0.076	0.054	-0.973	0.573	1.532	0.596
250T150-43	0.0451	0.248	0.84	0.289	0.217	1.080	0.058	0.483	0.252	0.154	3.030	1356					0.168	0.070	-0.968	0.570	1.529	0.599
250T150-54	0.0566	0.311	1.06	0.368	0.273	1.088	0.072	0.481	0.342	0.213	4.220	1692	0.325	0.197	5.890	2563	0.332	0.089	-0.961	0.566	1.529	0.605
250T150-68	0.0713	0.391	1.33	0.472	0.344	1.099	0.089	0.478	0.465	0.299	5.920	2111	0.445	0.276	8.270	3199	0.663	0.114	-0.953	0.561	1.531	0.613
250T200-33	0.0346	0.225	0.76	0.280	0.212	1.117	0.097	0.658	0.203	0.112	2.220	1024					0.090	0.118	-1.418	0.813	1.921	0.455
250T200-43	0.0451	0.293	1.00	0.366	0.275	1.118	0.126	0.657	0.288	0.163	3.210	1356					0.198	0.153	-1.413	0.810	1.918	0.457
250T200-54	0.0566	0.367	1.25	0.466	0.346	1.127	0.157	0.654	0.396	0.228	4.510	1692	0.371	0.209	6.250	2563	0.392	0.195	-1.405	0.806	1.917	0.462
250T200-68	0.0713	0.462	1.57	0.600	0.437	1.139	0.196	0.652	0.548	0.324	6.410	2111	0.517	0.296	8.860	3199	0.783	0.251	-1.396	0.800	1.916	0.469
350T125-18	0.0188	0.113	0.38	0.219	0.121	1.394	0.016	0.383	0.174	0.063	1.250	175					0.013	0.038	-0.675	0.418	1.595	0.821
350T125-27	0.0283	0.170	0.58	0.331	0.182	1.396	0.025	0.381	0.277	0.128	2.530	590					0.045	0.057	-0.670	0.416	1.595	0.823
350T125-30	0.0312	0.187	0.64	0.365	0.200	1.396	0.027	0.380	0.312	0.145	2.860	790					0.061	0.063	-0.669	0.415	1.594	0.824
350T125-33	0.0346	0.207	0.71	0.405	0.222	1.397	0.030	0.379	0.354	0.165	3.270	1024					0.083	0.070	-0.668	0.414	1.594	0.824
350T125-43	0.0451	0.270	0.92	0.528	0.288	1.397	0.038	0.377	0.490	0.233	4.610	1739					0.183	0.090	-0.663	0.412	1.592	0.826
350T125-54	0.0566	0.339	1.15	0.668	0.361	1.404	0.048	0.375	0.651	0.317	6.260	2392	0.626	0.297	8.890	3372	0.362	0.114	-0.658	0.408	1.595	0.830
350T125-68	0.0713	0.427	1.45	0.851	0.454	1.412	0.059	0.372	0.851	0.433	8.550	2994	0.839	0.407	12.180	4536	0.723	0.144	-0.650	0.403	1.599	0.835
350T150-27	0.0283	0.184	0.63	0.377	0.207	1.431	0.041	0.470	0.298	0.132	2.620	590					0.049	0.094	-0.869	0.529	1.739	0.750
350T150-30	0.0312	0.203	0.69	0.416	0.228	1.432	0.045	0.469	0.336	0.150	2.960	790					0.066	0.103	-0.867	0.528	1.739	0.751
350T150-33	0.0346	0.225	0.76	0.461	0.253	1.432	0.049	0.469	0.382	0.171	3.390	1024					0.090	0.114	-0.866	0.527	1.738	0.752
350T150-43	0.0451	0.293	1.00	0.601	0.328	1.433	0.064	0.467	0.531	0.243	4.800	1739					0.198	0.148	-0.861	0.525	1.736	0.754
350T150-54	0.0566	0.367	1.25	0.761	0.412	1.440	0.079	0.465	0.712	0.332	6.570	2392	0.679	0.310	9.280	3372	0.392	0.187	-0.855	0.521	1.738	0.758
350T150-68	0.0713	0.462	1.57	0.972	0.518	1.450	0.099	0.462	0.957	0.459	9.070	2994	0.919	0.428	12.810	4536	0.783	0.238	-0.847	0.516	1.741	0.763
350T200-33	0.0346	0.259	0.88	0.574	0.315	1.487	0.108	0.647	0.428	0.181	3.570	1024					0.103	0.249	-1.285	0.761	2.069	0.614
350T200-43	0.0451	0.338	1.15	0.749	0.409	1.489	0.140	0.645	0.600	0.257	5.090	1739					0.229	0.323	-1.280	0.758	2.066	0.616
350T200-54	0.0566	0.424	1.44	0.949	0.513	1.496	0.175	0.642	0.814	0.355	7.010	2392	0.770	0.329	9.850	3372	0.453	0.409	-1.273	0.754	2.067	0.621
350T200-68	0.0713	0.534	1.82	1.213	0.647	1.508	0.218	0.639	1.112	0.496	9.800	2994	1.054	0.458	13.710	4536	0.904	0.522	-1.264	0.749	2.069	0.626
362T125-18	0.0188	0.115	0.39	0.237	0.126	1.435	0.017	0.380	0.189	0.065	1.290	169					0.014	0.042	-0.665	0.413	1.627	0.833
362T125-27	0.0283	0.173	0.59	0.358	0.191	1.438	0.025	0.378	0.301	0.135	2.660	569					0.046	0.062	-0.661	0.411	1.627	0.835
362T125-30	0.0312	0.191	0.65	0.395	0.210	1.438	0.027	0.378	0.339	0.152	3.010	762					0.062	0.068	-0.659	0.410	1.626	0.836
362T125-33	0.0346	0.212	0.72	0.438	0.232	1.438	0.030	0.377	0.384	0.174	3.440	1024					0.085	0.076	-0.658	0.409	1.626	0.836
362T125-43	0.0451	0.276	0.94	0.571	0.302	1.439	0.039	0.375	0.531	0.245	4.840	1739					0.187	0.098	-0.654	0.407	1.625	0.838
362T125-54	0.0566	0.346	1.18	0.723	0.378	1.445	0.048	0.373	0.705	0.332	6.570	2480	0.678	0.312	9.340	3372	0.369	0.123	-0.648	0.404	1.627	0.841
362T125-68	0.0713	0.436	1.48	0.921	0.475	1.454	0.060	0.370	0.921	0.453	8.950	3104	0.907	0.427	12.780	4703	0.738	0.156	-0.641	0.399	1.631	0.846
362T150-27	0.0283	0.187	0.64	0.408	0.217	1.475	0.041	0.468	0.323	0.140	2.760	569					0.050	0.102	-0.857	0.524	1.769	0.765
362T150-30	0.0312	0.207	0.70	0.449	0.239	1.475	0.045	0.467	0.364	0.158	3.120	762					0.067	0.112	-0.856	0.523	1.768	0.766
362T150-33	0.0346	0.229	0.78	0.499	0.264	1.475	0.050	0.467	0.414	0.180	3.560	1024					0.091	0.124	-0.854	0.522	1.767	0.766
362T150-43	0.0451	0.298	1.02	0.650	0.343	1.476	0.064	0.465	0.574	0.255	5.040	1739					0.202	0.160	-0.850	0.519	1.766	0.768
362T150-54	0.0566	0.374	1.27	0.823	0.431	1.483	0.080	0.462	0.769	0.349	6.890	2480	0.735	0.325	9.740	3372	0.400	0.202	-0.844	0.516	1.768	0.772
362T150-68	0.0713	0.471	1.60	1.050	0.542	1.492	0.099	0.459	1.034	0.480	9.490	3104	0.993	0.449	13.430	4703	0.799	0.257	-0.836	0.511	1.771	0.777
362T200-33	0.0346	0.264	0.90	0.619	0.328	1.532	0.110	0.645	0.464	0.190	3.760	1024					0.105	0.269	-1.270	0.754	2.092	0.631
362T200-43	0.0451	0.343	1.17	0.808	0.427	1.534	0.142	0.643	0.649	0.270	5.340	1739					0.233	0.350	-1.265	0.752	2.090	0.633
362T200-54	0.0566	0.431	1.47	1.024	0.536	1.541	0.177	0.640	0.879	0.372	7.350	2480	0.832	0.345	10.340	3372	0.460	0.442	-1.259	0.748	2.091	0.637
362T200-68	0.0713	0.543	1.85	1.307	0.675	1.552	0.221	0.638	1.199	0.519	10.260	3104	1.138	0.480	14.370	4703	0.919	0.564	-1.250	0.743	2.093	0.643
400T125-18[1]	0.0188	0.122	0.41	0.297	0.144	1.560	0.017	0.374	0.241	0.072	1.420	153					0.014	0.052	-0.637	0.400	1.726	0.864
400T125-27	0.0283	0.184	0.63	0.449	0.217	1.562	0.025	0.372	0.380	0.156	3.080	515					0.049	0.078	-0.633	0.398	1.726	0.866
400T125-30	0.0312	0.203	0.69	0.495	0.239	1.562	0.028	0.371	0.427	0.176	3.490	689					0.066	0.085	-0.632	0.397	1.726	0.866
400T125-33	0.0346	0.225	0.76	0.549	0.265	1.563	0.031	0.371	0.484	0.201	3.970	940					0.090	0.095	-0.630	0.396	1.725	0.867
400T125-43	0.0451	0.293	1.00	0.716	0.344	1.563	0.040	0.369	0.666	0.282	5.570	1739					0.198	0.122	-0.626	0.394	1.724	0.868
400T125-54	0.0566	0.367	1.25	0.904	0.431	1.569	0.049	0.366	0.882	0.381	7.530	2739	0.849	0.359	10.740	3372	0.392	0.154	-0.621	0.390	1.727	0.871
400T125-68	0.0713	0.462	1.57	1.150	0.541	1.577	0.061	0.363	1.150	0.517	10.220	3435	1.134	0.488	14.620	5205	0.783	0.194	-0.614	0.386	1.731	0.874
400T150-27	0.0283	0.198	0.67	0.509	0.246	1.602	0.042	0.461	0.409	0.154	3.040	515					0.053	0.127	-0.824	0.509	1.860	0.804
400T150-30	0.0312	0.218	0.74	0.561	0.271	1.603	0.046	0.461	0.458	0.183	3.610	689					0.071	0.140	-0.823	0.508	1.859	0.804
400T150-33	0.0346	0.242	0.82	0.622	0.300	1.603	0.051	0.460	0.519	0.208	4.120	940					0.097	0.155	-0.821	0.507	1.859	0.805
400T150-43	0.0451	0.315	1.07	0.811	0.390	1.604	0.066	0.458	0.719	0.293	5.800	1739					0.214	0.200	-0.817	0.504	1.857	0.807
400T150-54	0.0566	0.396	1.35	1.025	0.489	1.610	0.082	0.456	0.960	0.399	7.890	2739	0.918	0.374	11.190	3372	0.422	0.252	-0.811	0.501	1.860	0.810

1 Web-height to thickness ratio exceeds 200. Web stiffeners are required at all support points and concentrated loads. Suitability of web holes must be evaluated independently.

See Section Properties Table Notes on page 6.

SSMA

Section Properties

(T) Track Section Properties

Member	Design Thickness (in)	Gross							Effective 33ksi				Effective 50ksi				Torsional					
		Area (in^2)	Weight (lb/ft)	Ix (in^4)	Sx (in^3)	Rx (in)	Iy (in^4)	Ry (in)	Ix (in^4)	Sx (in^3)	Ma (in-k)	Vag (lb)	Ix (in^4)	Sx (in^3)	Ma (in-k)	Vag (lb)	J^{x1000} (in^4)	Cw (in^6)	Xo (in)	m (in)	Ro (in)	β
400T150-68	0.0713	0.498	1.69	1.306	0.615	1.619	0.102	0.453	1.286	0.548	10.820	3435	1.237	0.513	15.350	5205	0.844	0.320	-0.804	0.496	1.864	0.814
400T200-33	0.0346	0.277	0.94	0.768	0.371	1.666	0.113	0.639	0.581	0.220	4.340	940					0.110	0.336	-1.229	0.737	2.166	0.678
400T200-43	0.0451	0.360	1.23	1.002	0.482	1.668	0.146	0.637	0.811	0.311	6.140	1739					0.244	0.436	-1.224	0.734	2.164	0.680
400T200-54	0.0566	0.452	1.54	1.268	0.604	1.675	0.182	0.635	1.093	0.426	8.420	2739	1.037	0.397	11.880	3372	0.483	0.551	-1.217	0.730	2.165	0.684
400T200-68	0.0713	0.569	1.94	1.617	0.761	1.685	0.227	0.632	1.485	0.591	11.680	3435	1.412	0.549	16.420	5205	0.965	0.702	-1.209	0.725	2.168	0.689
550T125-27	0.0283	0.226	0.77	0.948	0.336	2.046	0.027	0.348	0.786	0.192	3.790	372					0.060	0.160	-0.543	0.352	2.145	0.936
550T125-30	0.0312	0.250	0.85	1.045	0.370	2.046	0.030	0.347	0.897	0.226	4.470	499					0.081	0.176	-0.542	0.351	2.145	0.936
550T125-33	0.0346	0.277	0.94	1.159	0.410	2.046	0.033	0.346	1.029	0.270	5.330	680					0.110	0.195	-0.541	0.350	2.145	0.936
550T125-43	0.0451	0.360	1.23	1.510	0.533	2.047	0.043	0.344	1.428	0.416	8.230	1504					0.244	0.252	-0.537	0.348	2.144	0.937
550T125-54	0.0566	0.452	1.54	1.903	0.668	2.052	0.053	0.342	1.862	0.597	11.800	2739	1.811	0.535	16.010	2980	0.483	0.315	-0.532	0.345	2.147	0.939
550T125-68	0.0713	0.569	1.94	2.412	0.839	2.058	0.066	0.339	2.412	0.807	15.950	4347	2.379	0.769	23.020	5350	0.965	0.397	-0.526	0.341	2.152	0.940
550T150-27	0.0283	0.241	0.82	1.059	0.376	2.098	0.046	0.436	0.893	0.207	4.100	372					0.064	0.263	-0.716	0.456	2.259	0.900
550T150-30	0.0312	0.265	0.90	1.168	0.414	2.098	0.050	0.435	0.995	0.251	4.960	499					0.086	0.289	-0.715	0.455	2.259	0.900
550T150-33	0.0346	0.294	1.00	1.295	0.459	2.099	0.055	0.434	1.115	0.310	6.120	680					0.117	0.320	-0.714	0.455	2.259	0.900
550T150-43	0.0451	0.383	1.30	1.688	0.596	2.099	0.072	0.432	1.516	0.468	9.250	1504					0.260	0.414	-0.709	0.452	2.258	0.901
550T150-54	0.0566	0.480	1.63	2.128	0.747	2.105	0.089	0.430	2.005	0.628	12.410	2739	1.928	0.595	17.810	2980	0.513	0.519	-0.704	0.449	2.261	0.903
550T150-68	0.0713	0.605	2.06	2.699	0.939	2.112	0.110	0.427	2.660	0.850	16.800	4347	2.569	0.804	24.070	5350	1.025	0.655	-0.698	0.445	2.265	0.905
550T200-33	0.0346	0.329	1.12	1.567	0.555	2.184	0.123	0.613	1.246	0.307	6.060	680					0.131	0.694	-1.088	0.674	2.516	0.813
550T200-43	0.0451	0.428	1.46	2.043	0.722	2.185	0.160	0.611	1.690	0.495	9.790	1504					0.290	0.900	-1.083	0.671	2.514	0.814
550T200-54	0.0566	0.537	1.83	2.578	0.905	2.191	0.199	0.609	2.253	0.669	13.210	2739	2.153	0.630	18.860	2980	0.573	1.133	-1.077	0.668	2.517	0.817
550T200-68	0.0713	0.676	2.30	3.274	1.139	2.200	0.248	0.606	3.027	0.914	18.060	4347	2.894	0.857	25.670	5350	1.146	1.434	-1.070	0.663	2.521	0.820
600T125-27[1]	0.0283	0.241	0.82	1.168	0.381	2.204	0.028	0.340	0.958	0.210	4.160	341					0.064	0.196	-0.519	0.339	2.290	0.949
600T125-30	0.0312	0.265	0.90	1.288	0.419	2.204	0.031	0.340	1.095	0.249	4.920	456					0.086	0.215	-0.518	0.338	2.289	0.949
600T125-33	0.0346	0.294	1.00	1.428	0.465	2.204	0.034	0.339	1.258	0.297	5.870	622					0.117	0.238	-0.516	0.337	2.289	0.949
600T125-43	0.0451	0.383	1.30	1.861	0.604	2.205	0.044	0.337	1.768	0.461	9.110	1377					0.260	0.307	-0.513	0.335	2.288	0.950
600T125-54	0.0566	0.480	1.63	2.344	0.756	2.209	0.054	0.335	2.299	0.666	13.150	2728	2.241	0.592	17.730	2728	0.513	0.384	-0.508	0.332	2.291	0.951
600T125-68	0.0713	0.605	2.06	2.969	0.950	2.215	0.067	0.332	2.969	0.916	18.090	4347	2.934	0.858	25.690	5350	1.025	0.483	-0.503	0.329	2.296	0.952
600T125-97	0.1017	0.862	2.93	4.281	1.347	2.228	0.092	0.326	4.281	1.347	30.43*	7359	4.281	1.347	40.330	10885	2.973	0.685	-0.491	0.321	2.305	0.955
600T150-27[1]	0.0283	0.255	0.87	1.300	0.424	2.260	0.047	0.427	1.011	0.214	4.230	341					0.068	0.320	-0.686	0.441	2.400	0.918
600T150-30	0.0312	0.281	0.96	1.434	0.467	2.260	0.051	0.427	1.159	0.253	5.010	456					0.091	0.352	-0.685	0.440	2.400	0.918
600T150-33	0.0346	0.311	1.06	1.590	0.517	2.260	0.057	0.426	1.334	0.303	5.990	622					0.124	0.390	-0.684	0.439	2.399	0.919
600T150-43	0.0451	0.405	1.38	2.072	0.673	2.261	0.073	0.424	1.890	0.474	9.360	1377					0.275	0.504	-0.680	0.437	2.398	0.920
600T150-54	0.0566	0.509	1.73	2.611	0.843	2.266	0.091	0.422	2.473	0.689	13.620	2728	2.400	0.609	18.240	2728	0.543	0.632	-0.675	0.434	2.401	0.921
600T150-68	0.0713	0.641	2.18	3.309	1.059	2.273	0.113	0.419	3.262	0.963	19.030	4347	3.162	0.891	26.680	5350	1.086	0.797	-0.669	0.430	2.406	0.923
600T150-97	0.1017	0.913	3.11	4.778	1.504	2.288	0.156	0.413	4.778	1.504	29.710	7359	4.778	1.444	43.230	10885	3.148	1.138	-0.656	0.421	2.415	0.926
600T200-33	0.0346	0.346	1.18	1.913	0.622	2.352	0.126	0.604	1.542	0.333	6.590	622					0.138	0.847	-1.048	0.655	2.645	0.843
600T200-43	0.0451	0.451	1.53	2.494	0.809	2.353	0.163	0.602	2.076	0.565	11.160	1377					0.305	1.098	-1.044	0.652	2.643	0.844
600T200-54	0.0566	0.565	1.92	3.145	1.015	2.359	0.203	0.600	2.759	0.759	15.000	2728	2.641	0.717	21.480	2728	0.604	1.381	-1.038	0.649	2.646	0.846
600T200-68	0.0713	0.712	2.42	3.990	1.277	2.367	0.254	0.597	3.696	1.034	20.420	4347	3.540	0.973	29.120	5350	1.206	1.746	-1.031	0.644	2.650	0.849
600T200-97	0.1017	1.015	3.45	5.773	1.816	2.385	0.354	0.591	5.758	1.667	32.950	7359	5.558	1.568	46.940	10885	3.499	2.510	-1.016	0.635	2.659	0.854
800T125-33[1]	0.0346	0.363	1.24	2.895	0.711	2.824	0.036	0.313	2.441	0.407	8.030	465					0.145	0.456	-0.439	0.294	2.875	0.977
800T125-43	0.0451	0.473	1.61	3.773	0.924	2.824	0.046	0.311	3.484	0.640	12.650	1030					0.321	0.589	-0.436	0.292	2.874	0.977
800T125-54	0.0566	0.594	2.02	4.745	1.158	2.827	0.057	0.309	4.668	0.940	18.580	2039	4.426	0.824	24.660	2039	0.634	0.735	-0.432	0.289	2.877	0.977
800T125-68	0.0713	0.748	2.54	5.998	1.454	2.833	0.070	0.306	5.998	1.356	26.800	4087	5.956	1.216	36.390	4087	1.267	0.920	-0.427	0.286	2.881	0.978
800T125-97	0.1017	1.066	3.63	8.613	2.062	2.843	0.096	0.301	8.613	2.062	40.740	8843	8.613	2.062	61.720	10885	3.674	1.296	-0.417	0.279	2.889	0.979
800T150-33[1]	0.0346	0.380	1.29	3.180	0.781	2.891	0.060	0.397	2.569	0.414	8.180	465					0.152	0.751	-0.588	0.388	2.977	0.961
800T150-43	0.0451	0.496	1.69	4.144	1.015	2.891	0.077	0.395	3.689	0.655	12.950	1030					0.336	0.972	-0.584	0.386	2.976	0.961
800T150-54	0.0566	0.622	2.12	5.214	1.272	2.896	0.096	0.393	4.976	0.969	19.150	2039	4.692	0.844	25.270	2039	0.664	1.215	-0.580	0.383	2.979	0.962
800T150-68	0.0713	0.783	2.67	6.594	1.599	2.902	0.119	0.390	6.527	1.412	27.910	4087	6.361	1.255	37.580	4087	1.327	1.526	-0.575	0.379	2.984	0.963
800T150-97	0.1017	1.116	3.80	9.479	2.269	2.914	0.165	0.384	9.479	2.269	44.830	8843	9.479	2.192	65.620	10885	3.849	2.162	-0.564	0.372	2.993	0.965
800T200-33[1]	0.0346	0.415	1.41	3.749	0.921	3.005	0.135	0.571	2.788	0.424	8.370	465					0.166	1.638	-0.917	0.589	3.194	0.918
800T200-43	0.0451	0.541	1.84	4.887	1.197	3.006	0.175	0.569	4.043	0.676	13.350	1030					0.367	2.124	-0.913	0.587	3.193	0.918
800T200-54	0.0566	0.679	2.31	6.152	1.501	3.011	0.218	0.567	5.505	1.009	19.930	2039	5.149	0.871	26.090	2039	0.725	2.664	-0.908	0.584	3.196	0.919
800T200-68	0.0713	0.854	2.91	7.786	1.888	3.019	0.272	0.564	7.306	1.490	29.450	4087	7.051	1.310	39.220	4087	1.448	3.357	-0.902	0.580	3.201	0.921
800T200-97	0.1017	1.218	4.15	11.212	2.683	3.034	0.379	0.558	11.176	2.491	49.220	8843	10.833	2.347	70.270	10885	4.200	4.792	-0.889	0.571	3.210	0.923
1000T125-43[1]	0.0451	0.563	1.92	6.630	1.305	3.431	0.047	0.290	5.886	0.819	16.190	822					0.382	0.973	-0.379	0.259	3.464	0.988
1000T125-54	0.0566	0.707	2.41	8.333	1.634	3.434	0.059	0.288	7.960	1.216	24.030	1628	7.479	1.055	31.590	1628	0.755	1.212	-0.376	0.256	3.466	0.988
1000T125-68	0.0713	0.890	3.03	10.522	2.053	3.438	0.073	0.286	10.452	1.781	35.190	3261	10.155	1.575	47.150	3261	1.508	1.515	-0.372	0.253	3.470	0.989
1000T125-97	0.1017	1.269	4.32	15.077	2.912	3.447	0.100	0.280	15.077	2.907	57.440	8843	15.077	2.753	82.420	9507	4.375	2.123	-0.363	0.247	3.477	0.989
1000T150-43[1]	0.0451	0.586	1.99	7.207	1.419	3.507	0.080	0.370	6.195	0.837	16.540	822					0.397	1.612	-0.513	0.345	3.564	0.979
1000T150-54	0.0566	0.735	2.50	9.061	1.777	3.511	0.100	0.368	8.430	1.249	24.690	1628	7.880	1.079	32.290	1628	0.785	2.013	-0.509	0.342	3.567	0.980
1000T150-68	0.0713	0.926	3.15	11.445	2.233	3.516	0.124	0.366	11.342	1.846	36.480	3261	10.774	1.621	48.530	3261	1.569	2.522	-0.505	0.339	3.571	0.980
1000T150-97	0.1017	1.320	4.49	16.413	3.170	3.526	0.171	0.360	16.413	3.165	62.540	8843	16.413	2.902	86.900	9507	4.550	3.557	-0.495	0.332	3.579	0.981
1000T200-43[1]	0.0451	0.631	2.15	8.361	1.646	3.640	0.183	0.539	6.722	0.861	17.010	822					0.428	3.540	-0.813	0.534	3.769	0.953
1000T200-54	0.0566	0.792	2.69	10.516	2.062	3.645	0.228	0.537	9.231	1.295	25.600	1628	8.560	1.111	33.260	1628	0.845	4.434	-0.809	0.531	3.772	0.954
1000T200-68	0.0713	0.997	3.39	13.292	2.594	3.651	0.284	0.534	12.551	1.936	38.260	3261	11.820	1.684	50.420	3261	1.690	5.576	-0.803	0.527	3.776	0.955
1000T200-97	0.1017	1.422	4.84	19.087	3.686	3.664	0.397	0.528	19.031	3.427	67.720	8843	18.583	3.081	92.250	9507	4.901	7.924	-0.791	0.519	3.786	0.956

[1] Web-height to thickness ratio exceeds 200. Web stiffeners are required at all support points and concentrated loads. Suitability of web holes must be evaluated independently.

See Section Properties Table Notes on page 6.

Complies with the 2006 International Building Code (IBC)

(T) Track Section Properties

Member	Design Thickness (in)	Gross Area (in^2)	Gross Weight (lb/ft)	Gross Ix (in^4)	Gross Sx (in^3)	Gross Rx (in)	Gross Iy (in^4)	Gross Ry (in)	Effective 33ksi Ix (in^4)	Effective 33ksi Sx (in^3)	Effective 33ksi Ma (in-k)	Effective 33ksi Vag (lb)	Effective 50ksi Ix (in^4)	Effective 50ksi Sx (in^3)	Effective 50ksi Ma (in-k)	Effective 50ksi Vag (lb)	Torsional J^{x1000} (in^4)	Torsional Cw (in^6)	Torsional Xo (in)	Torsional m (in)	Torsional Ro (in)	Torsional β
1200T125-54[1]	0.0566	0.820	2.79	13.335	2.186	4.033	0.060	0.271	12.296	1.491	29.470	1354	11.460	1.286	38.510	1354	0.876	1.820	-0.333	0.230	4.055	0.993
1200T125-68	0.0713	1.033	3.51	16.826	2.747	4.036	0.074	0.268	16.246	2.206	43.600	2713	15.686	1.934	57.900	2713	1.750	2.270	-0.329	0.227	4.059	0.993
1200T125-97	0.1017	1.472	5.01	24.078	3.897	4.044	0.102	0.263	24.078	3.690	72.920	7902	23.751	3.442	103.060	7902	5.076	3.171	-0.322	0.222	4.065	0.994
1200T150-54[1]	0.0566	0.848	2.89	14.378	2.357	4.117	0.103	0.348	12.962	1.530	30.230	1354	12.020	1.313	39.310	1354	0.906	3.033	-0.454	0.310	4.156	0.988
1200T150-68	0.0713	1.068	3.64	18.148	2.963	4.121	0.127	0.345	17.568	2.281	45.080	2713	16.566	1.987	59.480	2713	1.810	3.795	-0.450	0.307	4.160	0.988
1200T150-97	0.1017	1.523	5.18	25.987	4.206	4.130	0.176	0.340	25.987	3.996	78.970	7902	25.719	3.616	108.270	7902	5.252	5.335	-0.441	0.301	4.168	0.989
1200T200-54[1]	0.0566	0.905	3.08	16.464	2.699	4.265	0.236	0.510	14.078	1.582	31.260	1354	12.962	1.350	40.410	1354	0.966	6.714	-0.730	0.487	4.357	0.972
1200T200-68	0.0713	1.140	3.88	20.791	3.395	4.271	0.294	0.508	19.277	2.383	47.090	2713	18.026	2.058	61.620	2713	1.931	8.431	-0.725	0.483	4.362	0.972
1200T200-97	0.1017	1.625	5.53	29.805	4.824	4.283	0.410	0.502	29.805	4.298	84.930	7902	28.959	3.819	114.350	7902	5.602	11.945	-0.714	0.476	4.371	0.973

[1] Web-height to thickness ratio exceeds 200. Web stiffeners are required at all support points and concentrated loads. Suitability of web holes must be evaluated independently.

See Section Properties Table Notes on page 6.

Web Depth-to-Thickness Ratios for Stud and Joist Members[2] [3]										
Style	Web Depth (inches)	18mil 0.0188	27mil 0.03	30mil 0.03	33mil 0.03	43mil 0.05	54mil 0.06	68mil 0.07	97mil 0.1	118mil 0.12
162S	1.63	75	50	45	41	31	24	18	11	8
250S	2.5	122	81	73	66	50	39	30	20	15
350S	3.5	175	116	105	95	72	57	44	29	23
362S	3.63	182	120	109	98	75	59	46	31	24
400S	4	202 [1]	134	121	109	84	66	51	34	27
550S	5.5	-	187	169	153	117	92	72	49	39
600S	6	-	204 [1]	185	167	128	101	79	54	43
800S	8	-	-	249 [1]	225 [1]	172	136	107	74	59
1000S	10	-	-	-	-	217 [1]	172	135	93	76
1200S	12	-	-	-	-	-	207 [1]	164	113	92
1400S	14	-	-	-	-	-	242 [1]	192	133	108
1600S	16	-	-	-	-	-	-	220 [1]	152	124

[1] h/t exceeds 200

[2] h value used for h/t calculation is the flat width of the web. For S members, this is the out-to-out member size, minus twice the thickness, minus twice the inside bend radius.

[3] h/t values exceeding 260 are marked with a dash (-)

Members with h/t between 200 and 260				
member	**h/t**		**member**	**h/t**
400S__18	**202**		**1000S__43**	**217**
600S__27	**204**		**1200S__54**	**207**
800S__30	**249**		**1400S__54**	**242**
800S__33	**225**		**1600S__68**	**220**

SSMA

3M

Aluminum Foil Tape

425 • 427

Technical Data **April, 2008**

Product Description

3M™ Aluminum Foil Tapes 425 and 427 are 5 mil nominal dead soft aluminum foil backing combined with a transparent acrylic adhesive. 3M aluminum foil tape 427 offers an easy-release liner.

Product Construction

Backing	Adhesive	Color	Liner	Standard Roll Length
Dead soft aluminum	Acrylic	Shiny silver	Easy-release paper (3M aluminum foil tape 427)	60 yds. (55 m)

Typical Physical Properties

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

		ASTM Test Method
Adhesion to Steel: 3M aluminum foil tape 425 3M aluminum foil tape 427	 47 oz./in. width (51 N/100 mm) 50 oz./in. width (55 N/100 mm)	D-3330
Tensile Strength:	30 lbs./in. width (525 N/100 mm)	D-3759
Backing Thickness:	2.8 mils (0.07 mm)	D-3652
Total Tape Thickness:	4.6 mils (0.12 mm)	D-3652
Liner Thickness: 3M aluminum foil tape 427	 3.1 mils (0.08 mm)	D-3652
Elongation at Break:	8%	D-3759
Temperature Use Range:	-65° to 300°F (-54° to 149°C)	
Water Vapor Transmission Rate:	0.1g H_2O/100 sq. in./24 hrs. (1.55 g/m^2/24 hrs.)	D-3833
Approximate Weight:	0.013 lbs./yd./in. width (4.77 gms/m/24 mm)	

Features

- Flame resistant. Meets U.L. 746C (File E 122798) and 723, Class “L” low flammability rating (File R 7311).
- 3M aluminum foil tape 425 can be certified to meet SAE-AMS-T-23397 and L-T-80B.
- Meets requirements of F.A.R. 25.853(a).
- The very low moisture vapor transmission rate makes these tapes a good sealant.
- The acrylic adhesive, combined with the durable aluminum backing, offers ideal properties for long serviceable life in and outdoors.
- Good candidate as a maskant in electroplating of aluminum because it will not contaminate the bath.
- Aluminum backing provides excellent reflection of both heat and light.
- Best results obtained when applied to a clean, dry surface above 32°F (0°C).

IMPORTANT: These tapes are not intended for medical usage. Neither 3M nor the Food and Drug Administration have evaluated or reviewed this tape for medical application. 3M does not recommend or endorse the usage of the aluminum tape for medical application. User assumes all risk and liability whatsoever in connection with usage of product in a medical application.

3M™ Aluminum Foil Tape

425 • 427

Application Ideas

- Aircraft paint stripping maskant.
- Moisture barrier in "white goods" appliances.
- General purpose heat reflector and heat dissipator.
- Mechanically hold wires and cooling coils in "white goods" appliances.
- Repair tears on truck trailers and aircraft.
- Splicing of thin gauge foils.
- General purpose holding, patching, sealing applications – indoors and out.

Storage

Store under normal conditions of 60° to 80°F (16° to 27°C) and 40 to 60% R.H. in the original carton.

Shelf Life

To obtain best performance, use this product within 24 months from date of manufacture.

Technical Information

The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

Warranty, Limited Remedy, and Disclaimer

Many factors beyond 3M's control and uniquely with user's knowledge and control can affect the use and performance of a 3M product in a particular application. User is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application. Unless an additional warranty is specifically stated on the applicable 3M product packaging or product literature, 3M warrants that each 3M product meets the applicable 3M product specification at the time 3M ships the product. 3M MAKES NO OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY IMPLIED WARRANTY OR CONDITION ARISING OUT OF A COURSE OF DEALING, CUSTOM OR USAGE OF TRADE. If the 3M product does not conform to this warranty, then the sole and exclusive remedy is, at 3M's option, replacement of the 3M product or refund of the purchase price.

Limitation of Liability

Except where prohibited by law, 3M will not be liable for any loss or damage arising from the 3M product, whether direct, indirect, special, incidental or consequential, regardless of the legal theory asserted, including warranty, contract, negligence or strict liability.

ISO 9001:2000

This Industrial Adhesives and Tapes Division product was manufactured under a 3M quality system registered to ISO 9001:2000 standards.

3M

Industrial Adhesives and Tapes Division
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PRODUCTOS

El sistema de perfiles para ventanas y puertas más exitoso

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¡Establezca un diseño moderno, porque - a fin de cuentas - las ventanas y la puerta de calle son la tarjeta de visita de su vivienda! Los productos de Abatik se distinguen por un **grado máximo de seguridad y durabilidad** y ofrece una **protección óptima frente al ruido y la intemperie**.

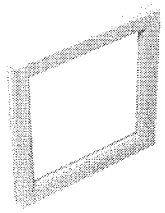
Ofrece la **mejor relación calidad-precio** y una rentabilidad óptima. Sus múltiples variaciones permiten aplicarlo tanto en grandes proyectos de obra como en el ámbito residencial.

Perfil Características Configuraciones Colores

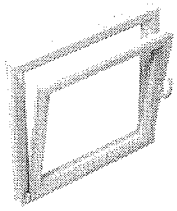
- Propiedades de aislamiento térmico de la combinación estándar Uf = 1.6 W/m²K
- Espesor de acristalado hasta 35 mm
- Aislamiento acústico hasta 43 dB (hasta clase IV de protección contra ruido)
- 3 tipos de diseño para el batiente (no alineada | semi-alineada)
- Disponible en diferentes contornos de perfil
- Camuflada cualidad de drenaje
- Sistema de Doble Junta y 3 cámaras con dos niveles de obturación
- El uso de la correspondiente bisagra de seguridad le garantiza una sosegada protección antirrobo
- También a disposición en varios colores de laminado

Diversas aperturas

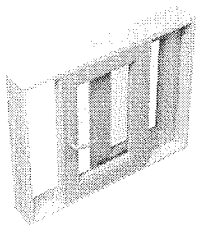
Dispone de perfiles de marco, hoja, poste, inversora y junquillos y una gran gama de productos auxiliares que permiten diseñar cualquier construcción tanto en ventanas como en puertas



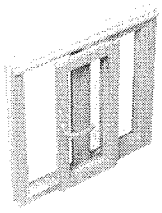
ACRISTALAMIENTO FIJO



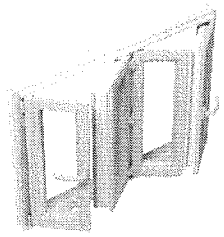
ELEMENTO ABATIBLE



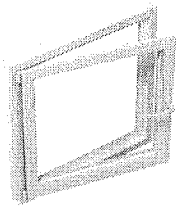
ELEMENTO CORREDERA



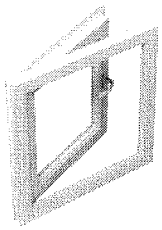
ELEMENTO CORREDERA ELEVADORA



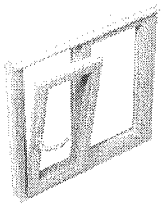
ELEMENTO PLEGABLE



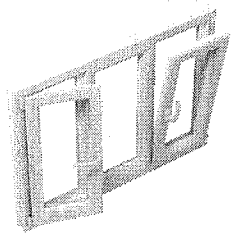
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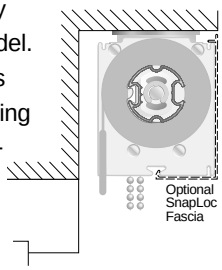
The MechoShade® Manual Shade System



MechoShade,® first developed in 1970, is the original manual chain-driven heavy-duty hardware system. MechoShade's Mecho®/5 system is the only hardware and shadecloth system with a **Lifetime*** Limited Warranty, with 100% replacement and no depreciation over the life of the warranty.

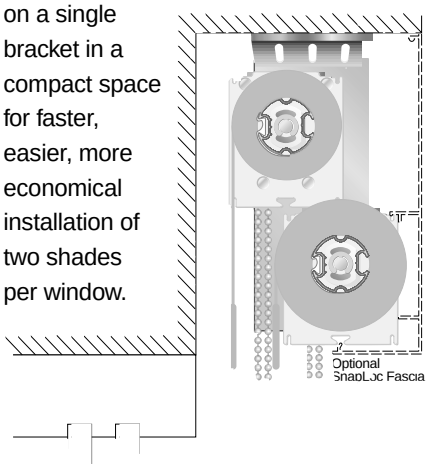
MechoShade brackets are available in SlimLine, Standard, Pocket Extended and Extended sizes. *(Size is determined by the roll up diameter of the shade.)*

Mecho®/5:
MechoShade's new patented over-running clutch drive system provides 67% more lift capacity than the previous model. The Mecho/5 requires no adjustments resulting in faster, easier installation. Available in Standard, Pocket Extended and Extended bracket sizes.



Mecho® SlimLine™:
SlimLine is MechoShade's compact heavy-duty bracket system designed for small shades in narrow spaces and uses the Mecho/3 operating system.

DoubleShade® brackets:
DoubleShade brackets allow for both sunscreen and blackout shades on a single bracket in a compact space for faster, easier, more economical installation of two shades per window.



MechoShades feature:

❑ **Energy-conserving ShadeCloths**. MechoShades offer the most extensive line of sun screens and blackout shade cloths in the industry. ThermoVeil,® EuroVeil® and EuroTwill™ ShadeCloths provide visually transparent shading, with excellent glare control, energy savings and reduction in solar gain. Densities range from 0 to15% openness factor, translucent to highly transparent. **Plus, we offer 96" (244cm) and 126" (320cm) SuperWide™ widths on select items.** *(See Section 5 – ShadeCloths for details.)*

❑ **Optional Lift-Assist Mechanism™ (LAM)** provides the ability to lift heavy, oversized or multibanded manual shades. An important consideration for the frail or infirmed.

❑ **Multiband operation** with one drive chain.

❑ **SnapLoc® Fascia** (optional) — Conceals the entire shade assembly and may be used as a continuous one-piece architectural element to cover one or more shadebands without exposed hardware or butt joints or notching to accommodate the chain.

❑ **SnapLoc® Spline** for easy installation, removal and cleaning of the shadebands without tape or glue and without having to remove the tube or brackets.

❑ **Built-in offset chain** for recessing the chain away from the room or placing it in front of a blackout channel.

❑ **Full line of optional accessories**. Ceiling pockets, side and sill channels, and other optional accessories. *(See Section 6 – Pockets and Section 7 – Room Darkening for details.)*

* Mecho/5 Lifetime Limited Warranty, for the life of the interior project, not to exceed 25 years. *Please contact MechoShade for complete details.*

MechoShade Systems, Inc.
42-03 35th Street, Long Island City, NY 11101
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Fax: 718-729-2941 / 800-899-8081

E-mail: info@mechoshade.com
Internet Web Site: www.mechoshade.com

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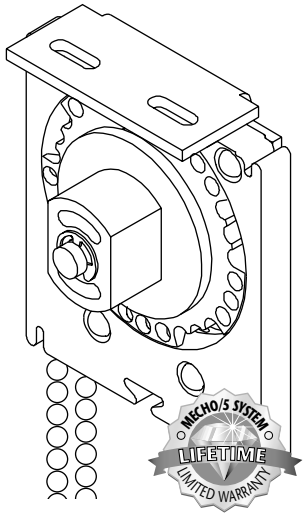
The MechoShade® Manual Drive System

Mecho®/5

Mecho®/5, MechoShade's latest patented design featuring an overrunning clutch, self lubricating components and larger diameter sprocket, providing 67% more lift capacity. As a result, Mecho/5 increases the shade size range that a manual drive system can lift before motorization is required. Plus, the Mecho/5 carries a **Lifetime*** Limited Warranty on the hardware and shadecloth.

Mecho/5 requires no adjustments, resulting in faster, easier installation. Mecho/5 has been field tested and performance proven on hundreds of thousands of shades installed worldwide. Available in Standard, Pocket Extended, Extended and DoubleShade® bracket sizes.

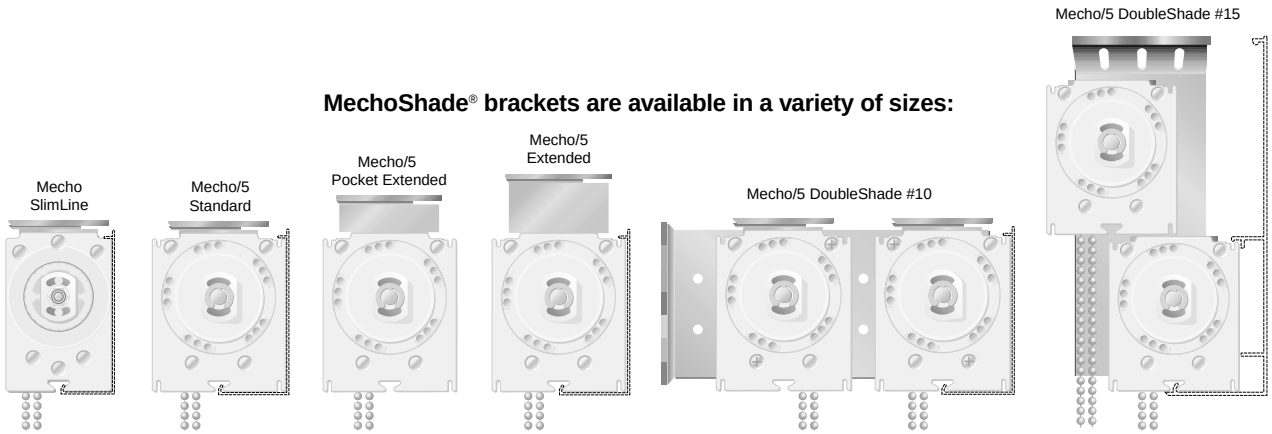
The Mecho/5 can accommodate shades up to 126" (320cm) wide by 180" (457cm) high.



Mecho® SlimLine™:

SlimLine™ is MechoShade's compact heavy-duty bracket system designed for small shades in narrow spaces, uses the Mecho®/3 operating system and carries a 10-Year Limited Warranty† on the hardware and shadecloth.

MechoShade® brackets are available in a variety of sizes:



Bracket Type	Max. Roll Diameter With Fascia	Max. Roll Diameter Without Fascia	Bracket Dimensions Without Optional Fascia, Roll Up Diameter or Wall Mount Bracket
Mecho® SlimLine™	2-1/4" (57mm)	2-3/4" (70mm)	2-3/8" (60mm) W x 3-3/4" (95mm) H
Mecho®/5 Standard	2-3/4" (70mm)	2-3/4" (70mm)	3" (76mm) W x 3-3/4" (95mm) H
Mecho®/5 Pocket Extended	N/A	4" (102mm)	3" (76mm) W x 4-3/8" (111mm) H
Mecho®/5 Extended	3-7/16" (87mm)	5" (127mm)	2-3/4" (70mm) W x 4-7/8" (124mm) H
Mecho®/5 DoubleShades®			
#10 Rear shade Blackout	2-3/4" (70mm)	2-3/4" (70mm)	7-1/2" (191mm) W x 3-3/4" (95mm) H
#10 Front shade Sunscreen	2-3/4" (70mm)	2-3/4" (70mm)	
#15 Top shade Blackout	2-3/4" (70mm)	3-3/8" (86mm)	2-3/4" (70mm) W x 7-5/16" (194mm) H
#15 Bottom shade SunScreen	2-3/4" (70mm)	4-5/16" (110mm)	

*Mecho/5 Lifetime Limited Warranty: for the life of the interior project, not to exceed 25 years. See pages 2.26 – 2.28 for specific details.

† See pages 2.26 – 2.28 for details.

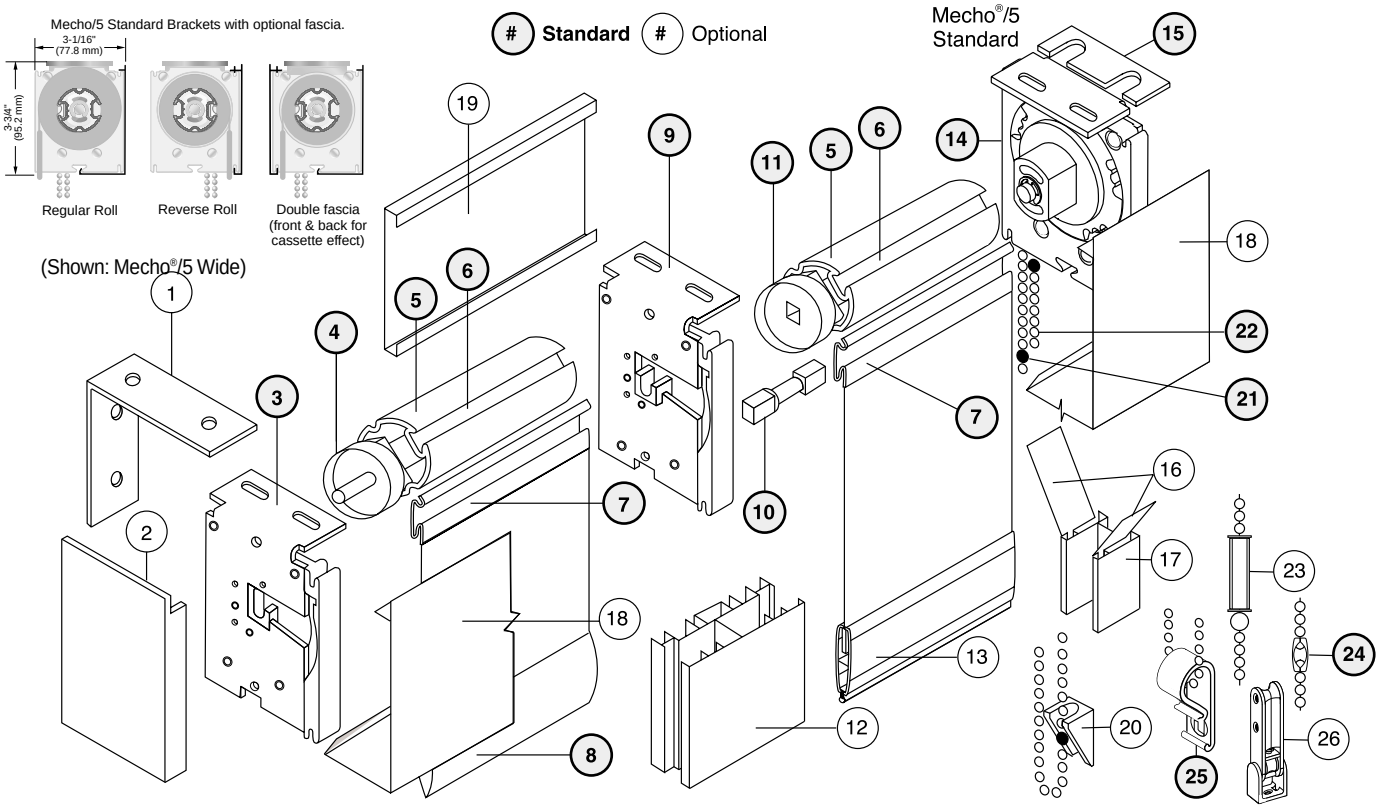
MechoShade Systems, Inc.
42-03 35th Street, Long Island City, NY 11101
Telephone: 718-729-2020
Fax: 718-729-2941 / 800-899-8081

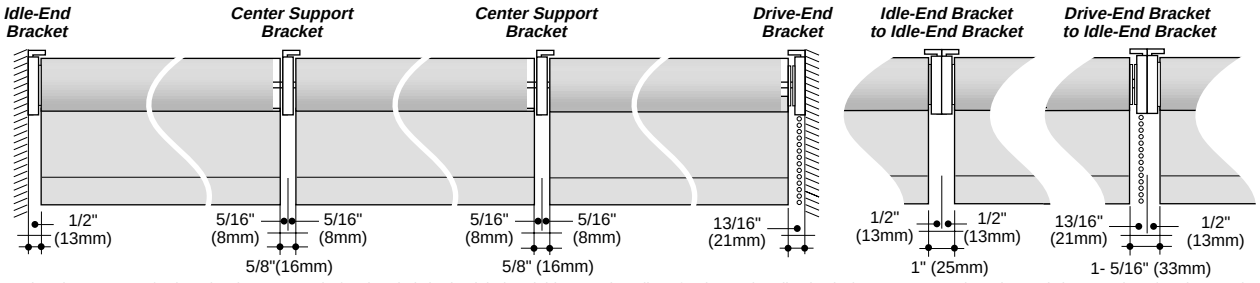
E-mail: info@mechoshade.com
Internet Web Site: www.mechoshade.com

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MechoShade® Parts, Components and Optional Accessories

Multiband MechoShade® exploded view and edge clearances





Edge clearances ≠ 1/8" (3mm). Shown: A Mecho/5 3-banded shade, right-hand drive, regular roll, no fascia. Mecho SlimLine is the same except the Drive-End clearance is 11/16" (17.5mm)

MechoShades are available in a choice of two drive systems in multiple bracket sizes.

1. Wall-Mount Angle
2. Fascia End Caps
3. Idle-End Bracket
4. Tube Plug (idle-end)
5. SnapLoc® Tube
6. SnapLoc Spline Mounting Channel
7. Snaploc Spline
8. Hembar (standard cloth covered)
9. Center Support Bracket
10. Tube Connector ("dog bone")
11. Tube Plug (Center Support)
12. Room Darkening Center Channel (double)
13. Exposed Hembar with Light Seal
14. Mecho®/5 Drive-End Bracket
15. Leveling Shim
16. Room Darkening Shadecloth Guides (pair)
17. Room Darkening Side Channel (single)
18. SnapLoc Regular-Roll Fascia
19. SnapLoc Reverse-Roll Fascia
20. Bead Chain Keeper
21. Upper and Lower Bead Chain Stops
22. Drive Chain (stainless-steel bead chain)
23. Heavy-Duty Bumper
24. Bead Chain Connector
25. Child-Safe Chain Retainer*
26. Optional Child-Safe Chain Retainer*

Aluminum Accessory Finishes: Clear Anodized, White, Grey, Black, Quaker Bronze (Duranodic color) and Colonial White (fascia only)

*** Child-Safe Chain Retainers included for all residential and public facilities.**

Optional Regular-Roll Fascia available for: Mecho/5 Standard and Extended brackets and Mecho SlimLine™ brackets.
Optional Reverse-Roll Fascia available for: Mecho/5 Standard brackets. • No Fascia Available: Mecho/5 Pocket brackets.

For Edge Clearances of specific brackets see the last section of this binder.

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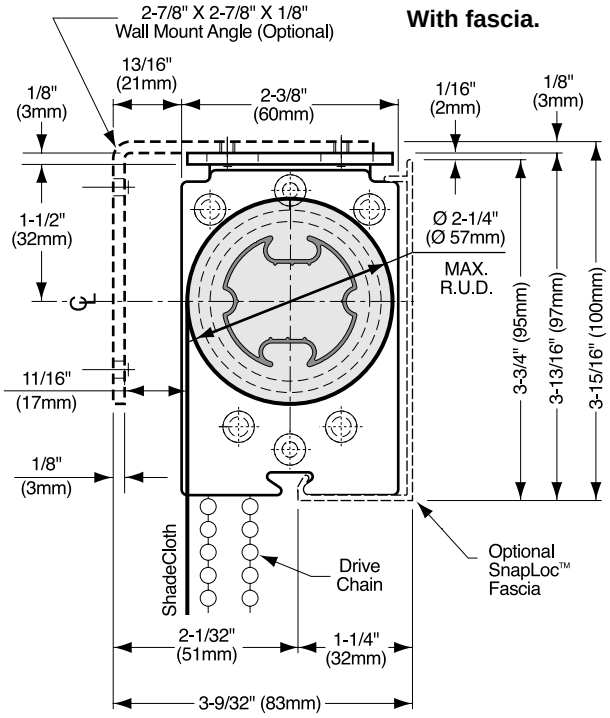
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MechoShade® Details

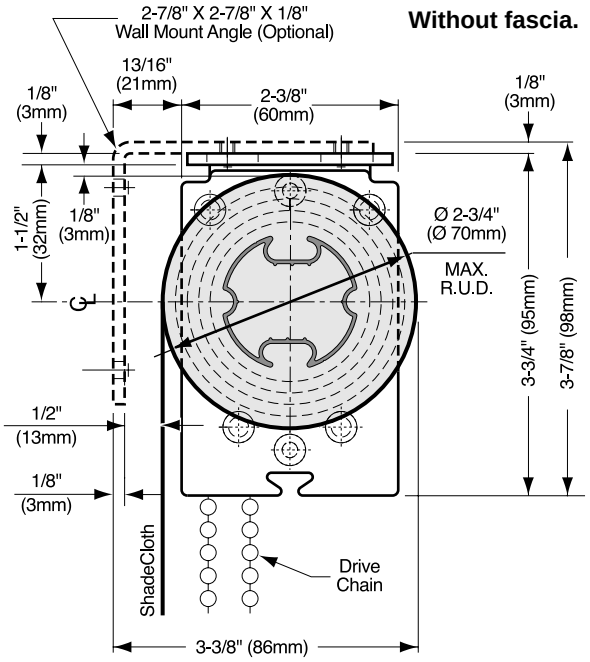
Mecho® SlimLine™ Bracket

Maximum roll up diameter:
2-1/4" (57mm) with optional fascia,
2-3/4" (70mm) without fascia.

With fascia.



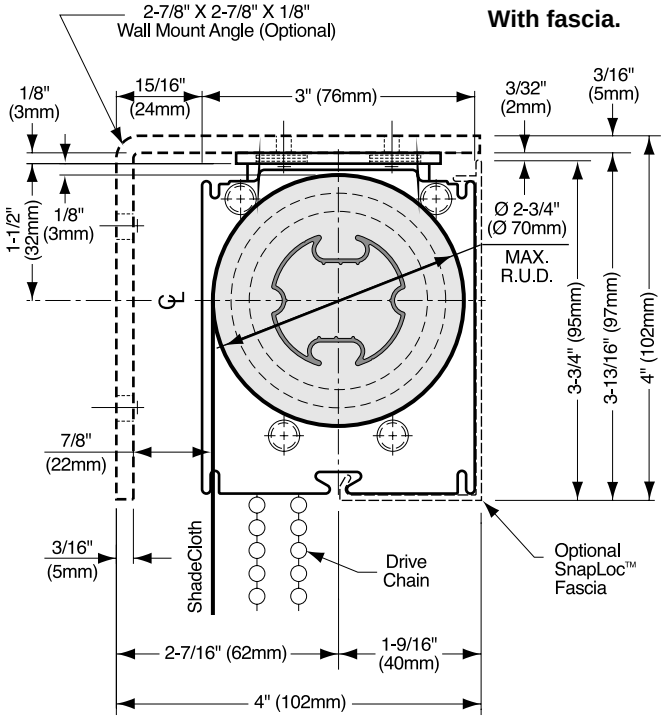
Without fascia.



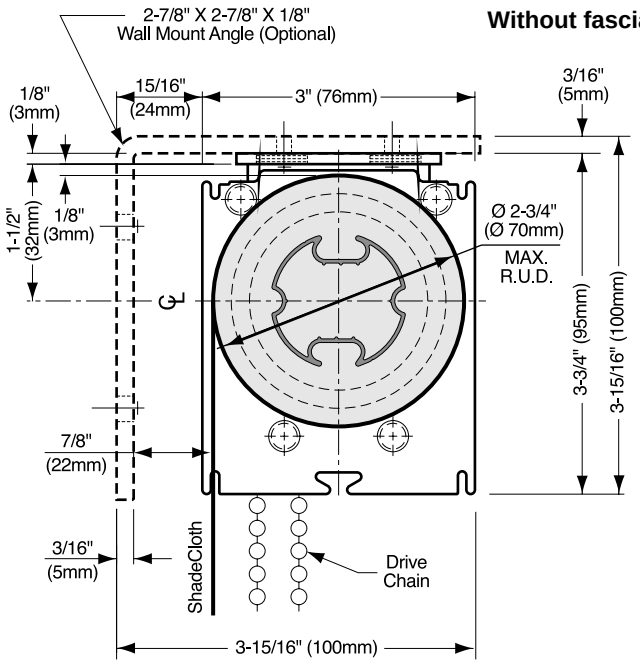
Mecho®/5 Standard Bracket

Maximum roll up diameter:
2-3/4" (70mm) with or without optional fascia.

With fascia.



Without fascia.



See the MechoShade® Bracket Selection Guide on pages 2.7 - 2.11.

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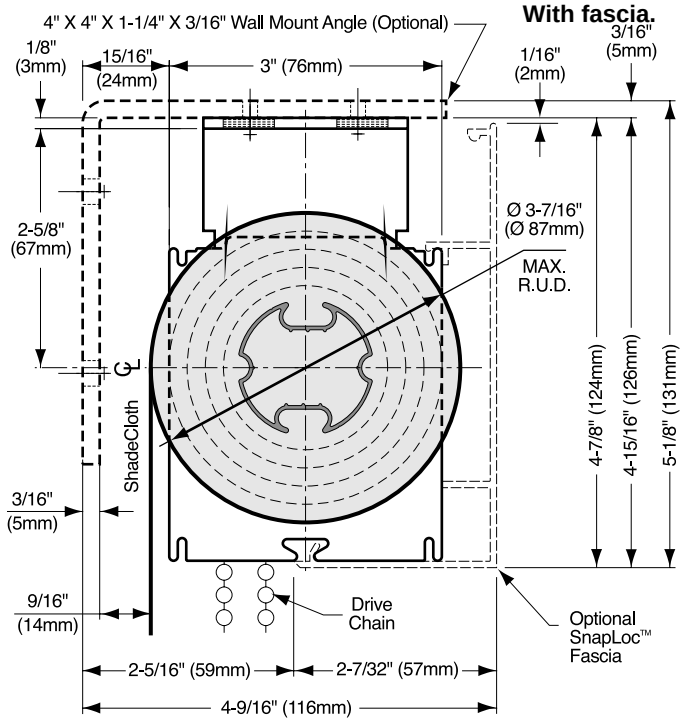
E-mail: info@mechoshade.com
Internet Web Site: www.mechoshade.com

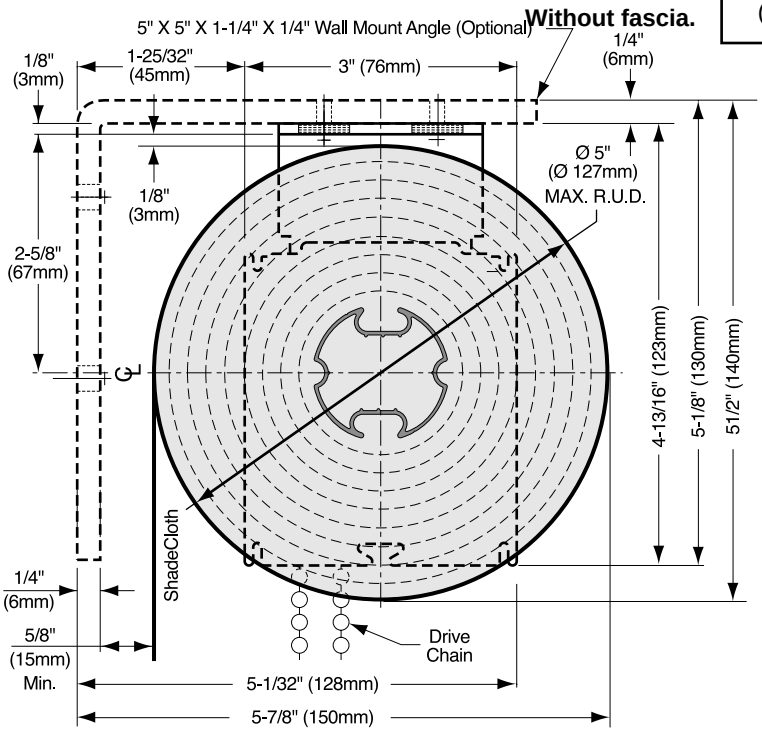
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MechoShade® Details

Mecho®/5 Extended Bracket

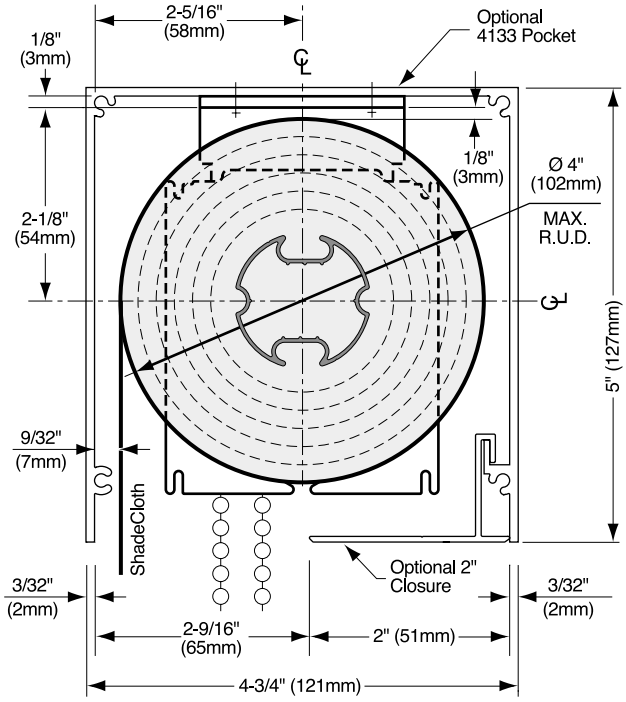
Maximum roll up diameter:
3-7/16" (87mm) with optional fascia,
5" (127mm) without fascia.





Mecho®/5 Pocket Bracket

Maximum roll up diameter:
4" (102mm). Fascia not available.

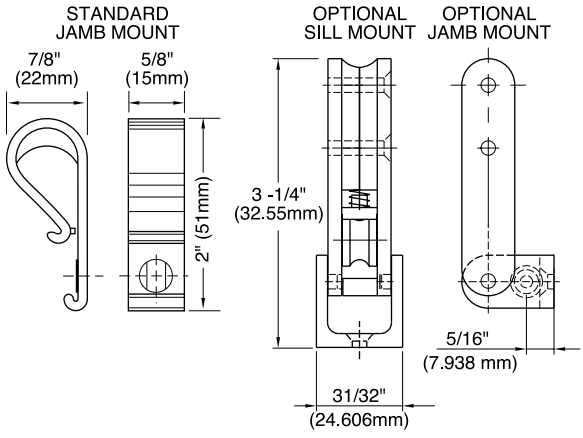


(Shown with optional 4133 Pocket. See Pocket section.)

For Edge Clearances of specific brackets see the last section of this binder.

Child-Safe Chain Retainer

Required for all residential and public facilities.



Optional Blackout Channels available.

See the MechoShade® Bracket Selection Guide on pages 2.7 - 2.11.

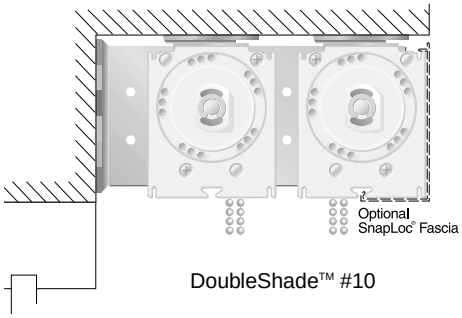
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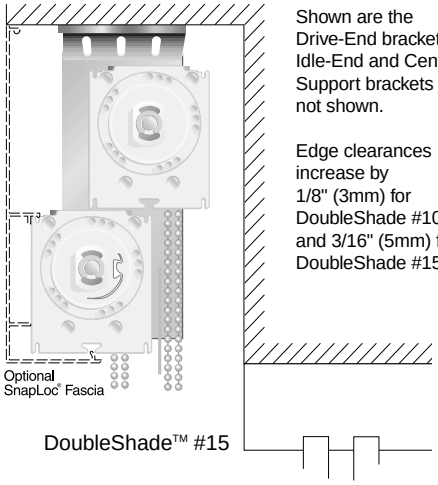
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MechoShade® DoubleShade® Brackets – #10

ThermoVeil® or EuroVeil® SunScreens with Blackout ShadeCloth on a Single Bracket with SnapLoc® Fascia (optional).



DoubleShade™ #10



DoubleShade™ #15

Shown are the Drive-End brackets. Idle-End and Center Support brackets not shown.

Edge clearances increase by 1/8" (3mm) for DoubleShade #10 and 3/16" (5mm) for DoubleShade #15

DoubleShades® have all the same features of the standard Mecho®/5 bracket, plus allow both sun screen and Room Darkening on a single bracket.

Compact Size

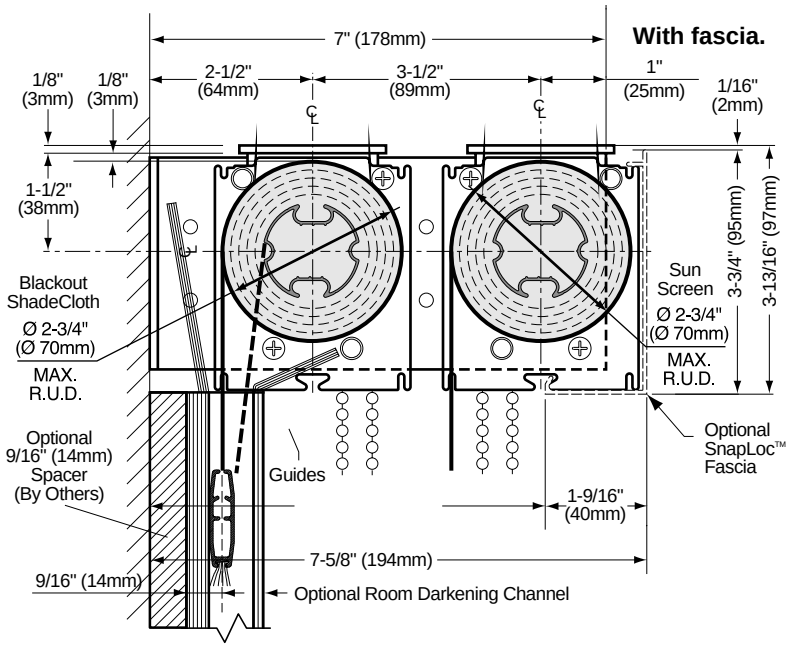
DoubleShade's compact size allows two shades to fit in a smaller room projection than two individually installed shades on the same window.

Ease of Installation

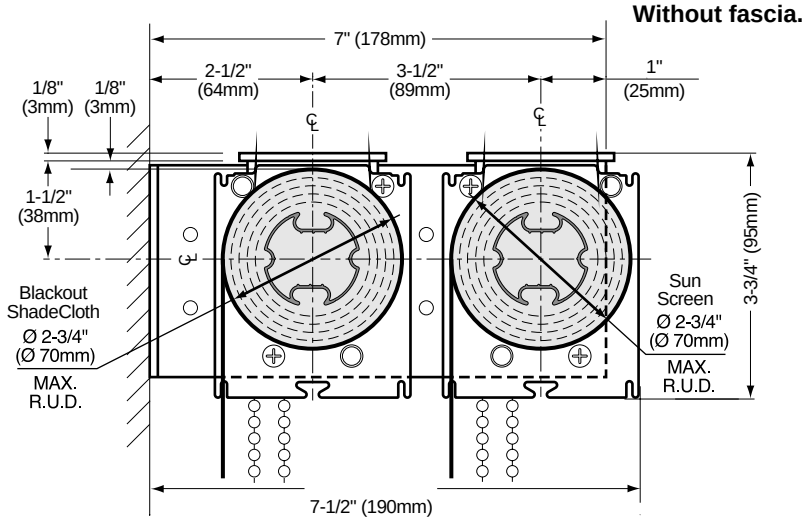
DoubleShades provide faster, easier, more economical installation of two shades per window. The mounting brackets require less measuring and are pre-spaced to insure proper alignment of both shades in relation to each other.

Mecho®/5 DoubleShade® Bracket #10, with and without fascia.

With fascia.



Without fascia.



- **DoubleShade Brackets require that both the solar and blackout operating brackets on a DoubleShade assembly have the same right-hand drive or left-hand drive orientation.**
- **Shade height, span and fabric determine bracket and tube selection. Please see the Maximum Shade Height Guide for DoubleShades on page 2.14.**

Continued ☞

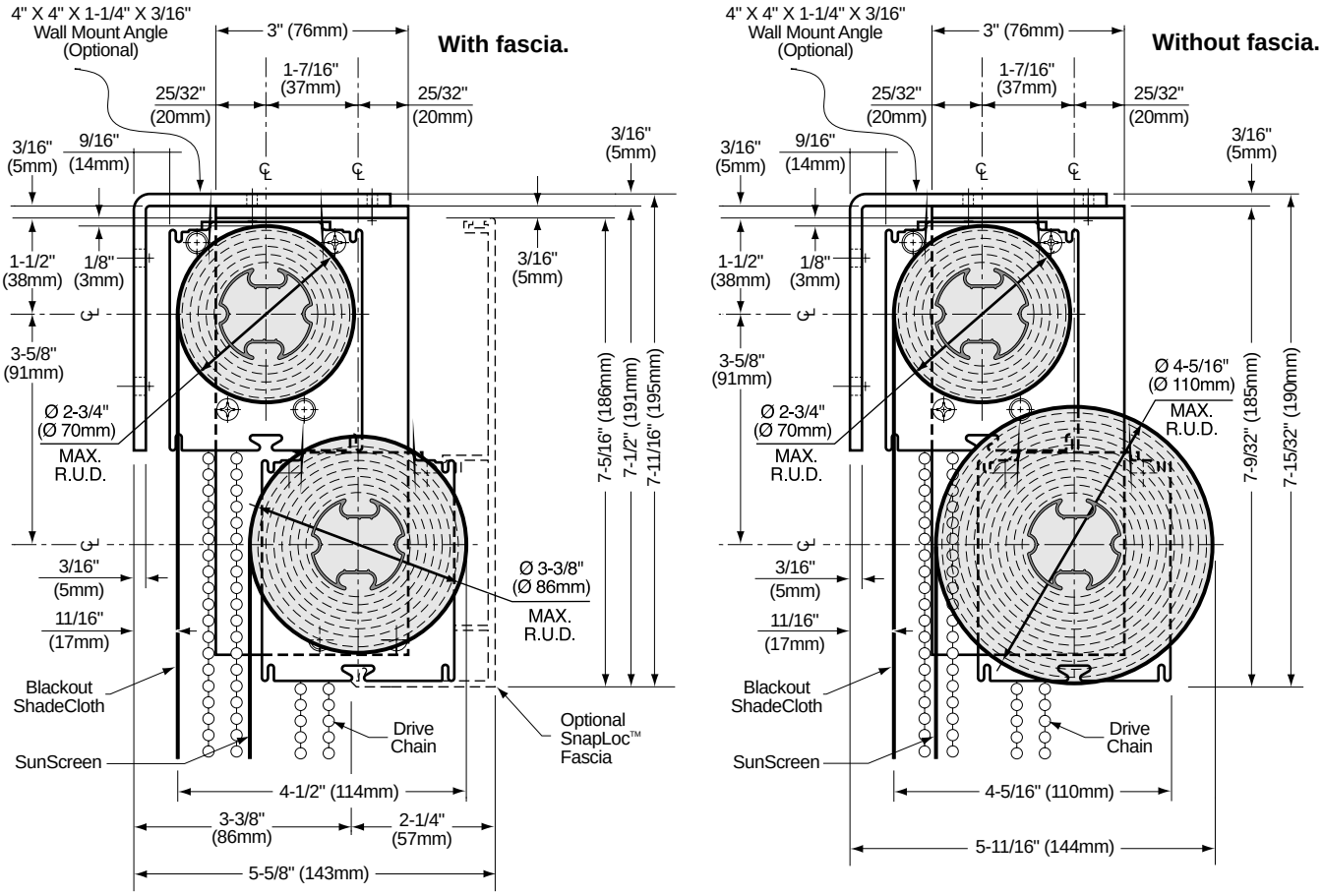
MechoShade Systems, Inc.
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Specifications subject to change without notice.

MechoShade® DoubleShade® Brackets – #15

Mecho®/5 DoubleShade® Bracket #15, with and without fascia.



Maximum Shade Height Guide for DoubleShades

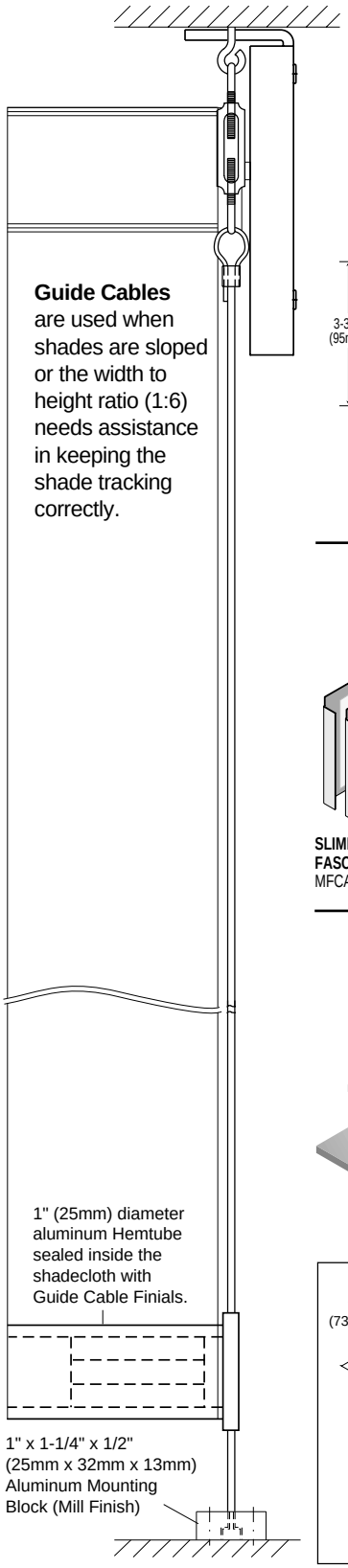
	No Battens		One (1) Batten		Two (2) Battens	
	1-1/2" (38mm) SnapLoc® Tube	**1-7/8" (48mm) SnapLoc® Tube**	**1-1/2" (38mm) SnapLoc® Tube**	**1-7/8" (48mm) SnapLoc® Tube**	**1-1/2" (38mm) SnapLoc® Tube**	**1-7/8" (48mm) SnapLoc® Tube**
DoubleShade #10**						
Blackout (w/wo fascia)	200" (508cm)*	200" (508cm)*	200" (508cm)*	164" (417cm)	192" (488cm)	124" (315cm)
ThermoVeil® (w/wo fascia)	131" (333cm)	97" (246cm)	111" (282cm)	77" (196cm)	92" (234cm)	58" (147cm)
EuroVeil® (w/wo fascia)	159" (404cm)	118" (300cm)	135" (343cm)	95" (241cm)	112" (284cm)	71" (180cm)
DoubleShade #15***						
Blackout (w/wo fascia)	200" (508cm)*	200" (508cm)*	200" (508cm)*	164" (417cm)	192" (488cm)	124" (315cm)
ThermoVeil (with fascia)	200" (508cm)*	197" (500cm)	200" (508cm)*	173" (439cm)	184" (476cm)	150" (380cm)
(without fascia)	200" (508cm)*	200" (508cm)*	200" (508cm)*	200" (508cm)*	200" (508cm)*	200" (508cm)*
EuroVeil (with fascia)	200" (508cm)*	200" (508cm)*	200" (508cm)*	200" (508cm)*	200" (508cm)*	181" (460cm)
(without fascia)	200" (508cm)*	200" (508cm)*	200" (508cm)*	200" (508cm)*	200" (508cm)*	200" (508cm)*

* Actual maximum heights may be greater, but not recommended. ** DoubleShade #10: End caps not available. *** Shade #15: Channels are not available.

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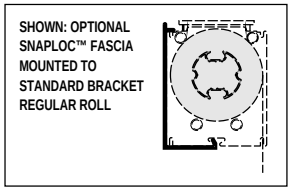
Other MechoShade® Components & Optional Accessories

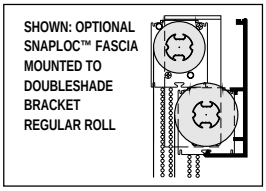


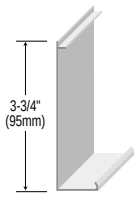
Guide Cables are used when shades are sloped or the width to height ratio (1:6) needs assistance in keeping the shade tracking correctly.

1" (25mm) diameter aluminum Hemtube sealed inside the shadecloth with Guide Cable Finials.

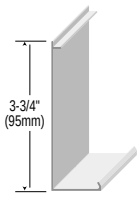
1" x 1-1/4" x 1/2" (25mm x 32mm x 13mm) Aluminum Mounting Block (Mill Finish)



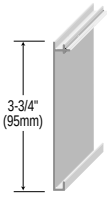




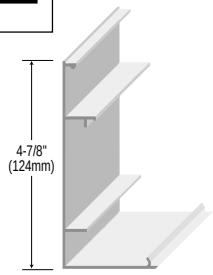
FASCIA FOR SLIMLINE BRACKETS REGULAR ROLL
MFAA SL15 AL _ _



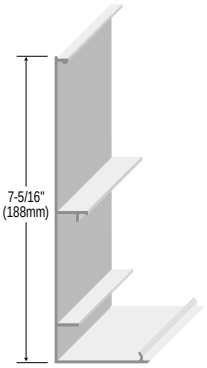
FASCIA FOR STANDARD BRACKETS & DOUBLESHADE #10 BRACKETS REGULAR ROLL
MFAA RG15 AL _ _



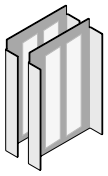
FASCIA FOR STANDARD BRACKETS REVERSE ROLL
MFAA RR15 AL _ _



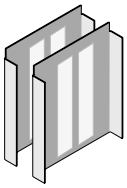
FASCIA FOR EXTENDED BRACKETS REGULAR ROLL
UFAA 4715 AL _ _



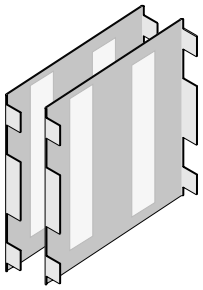
FASCIA FOR DOUBLESHADE #15 BRACKETS REGULAR ROLL
UFAA 7321 AL _ _



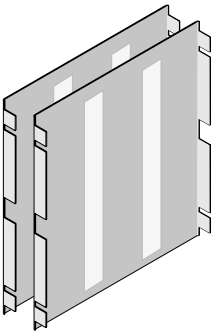
SLIMLINE FASCIA END CAPS (PAIRS)
MFCA 2336 AL _ _



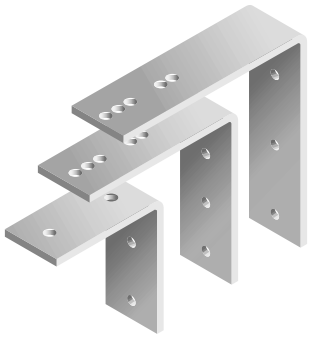
MECHO/5 OR 3 WIDE FASCIA END CAPS (PAIRS)
MFCA 3036 AL _ _



MECHO/5 OR 3 EXTENDED FASCIA END CAPS (PAIRS)
MFCA 3346 AL _ _



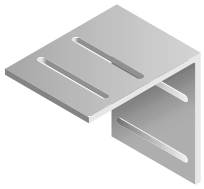
MECHO DOUBLESHADES #15 FASCIA END CAPS (PAIRS)
MFCA 3070 AL _ _



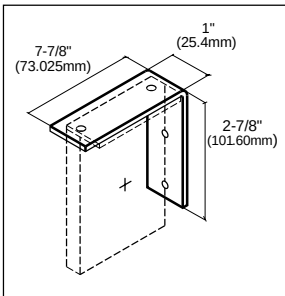
SINGLE WALL-MOUNT ANGLE 5" x 5" x 1-1/4" (127 x 127 x 32 mm) FOR EXTENDED & DOUBLESHADE #15 BRACKETS
UWBX 5050 ST PL

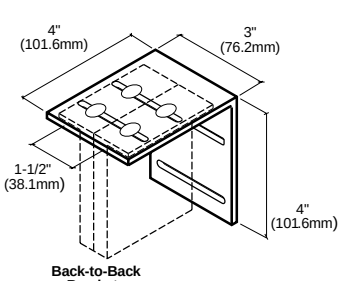
SINGLE WALL-MOUNT ANGLE 4" x 4" x 1-1/4" (102 x 102 x 32 mm) FOR SLIMLINE, WIDE, POCKET & EXTENDED BRACKETS
EWBX 4040 ST ZP

SINGLE WALL-MOUNT ANGLE 2-7/8" x 2/-7/8" (73 x 73 mm) & FOR SLIMLINE, WIDE, POCKET & EXTENDED BRACKETS
MWBX 2727 ST ZP

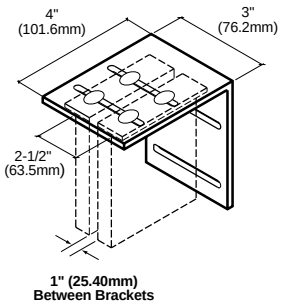


DOUBLE WALL-MOUNT ANGLE 4" x 4" x 3" (102 x 102 x 76 mm) FOR SLIMLINE, WIDE, POCKET & EXTENDED BRACKETS
EWBX 4145 ST ZP





Back-to-Back Brackets



1" (25.40mm) Between Brackets

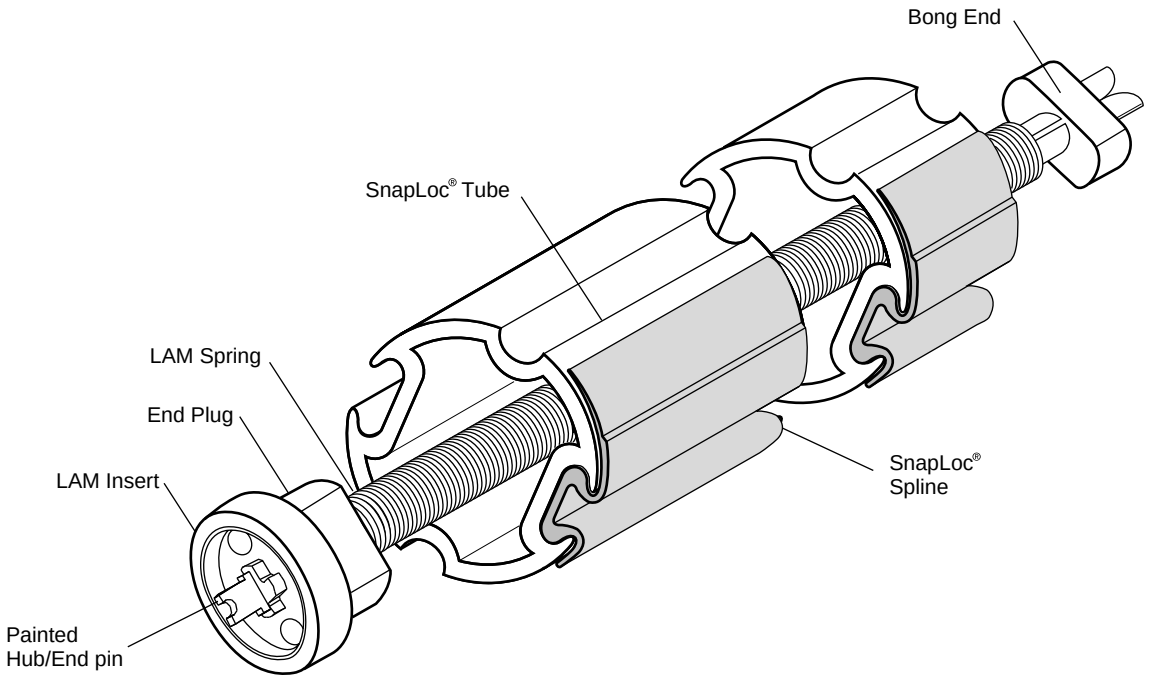
MechoShade Systems, Inc.
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New, Improved Lift-Assist Mechanism™ (LAM™)

Optional Lift-Assist Mechanism™ for heavy, oversized or multibanded manual shades.



MechoShade®'s optional Lift-Assist Mechanism™ (LAM™) enables users to lift heavy, oversized or multibanded manual shades weighing between 10 and 20 lbs. (4.5 kg and 9.0 kg) or more. In many cases a shade that formerly required motorization can now be lifted with the Lift-Assist Mechanism. The Lift-Assist Mechanism can also provide exceptional lifting capacity for shades less than 10 pounds. An important consideration for the frail or infirmed.

The LAM system is comprised of a spring assembly inside the shade tube and one of a wide range of LAM idle-end brackets designed to wind the spring in the proper direction for regular or reverse roll for both right-hand or left-hand drive. LAM's are available for the Mecho®/5 in Wide, Pocket and Extended sizes and the Mecho® SlimLine™ Bracket.

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The MechoShade® Return Air "No Cost Pocket™"

"No Cost Pocket™"

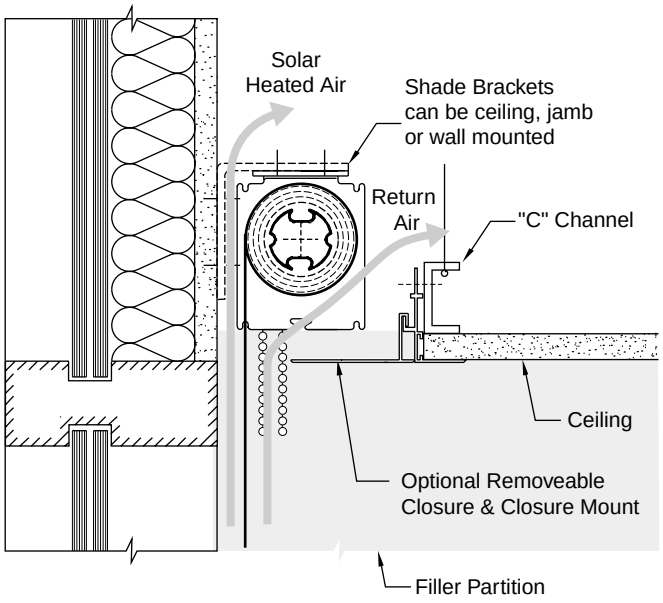
A "No Cost Pocket" can be made by installing an optional closure and closure mount to blocking just above the ceiling grid. The shade bracket is wall, jamb or ceiling mounted above the opposite window wall.

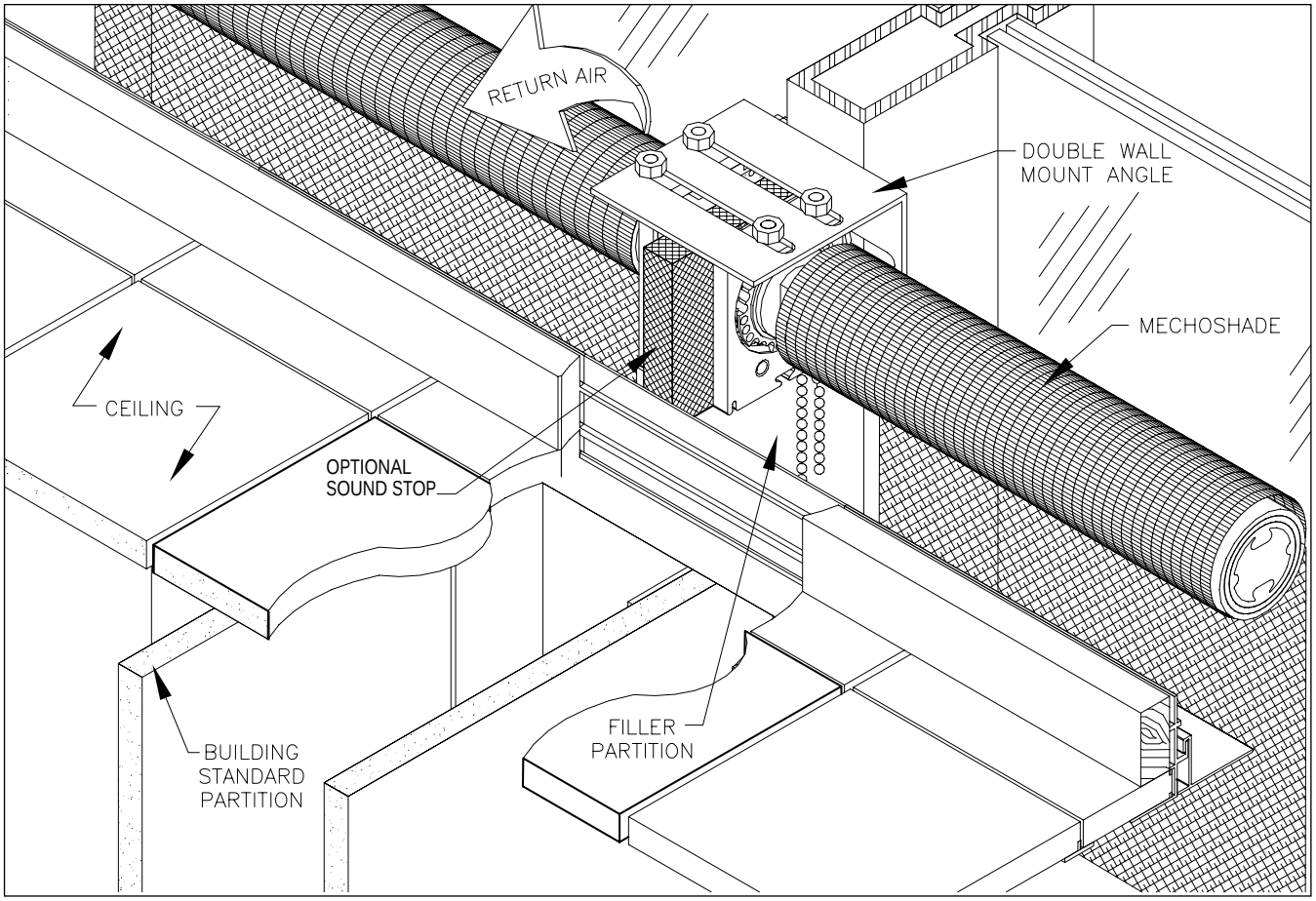
This diagram is for example only and is <u>not</u> to be used as an installation guide. For proper installation instructions, detailed site specific shop drawings are necessary.

Contact MSS Estimating Department, CAD or Engineering departments to obtain proper shop drawings.

Optional Sound Stop

A 1" (25mm) fiberglass sound stop can be installed between shade brackets above partitions to help reduce noise between work areas.



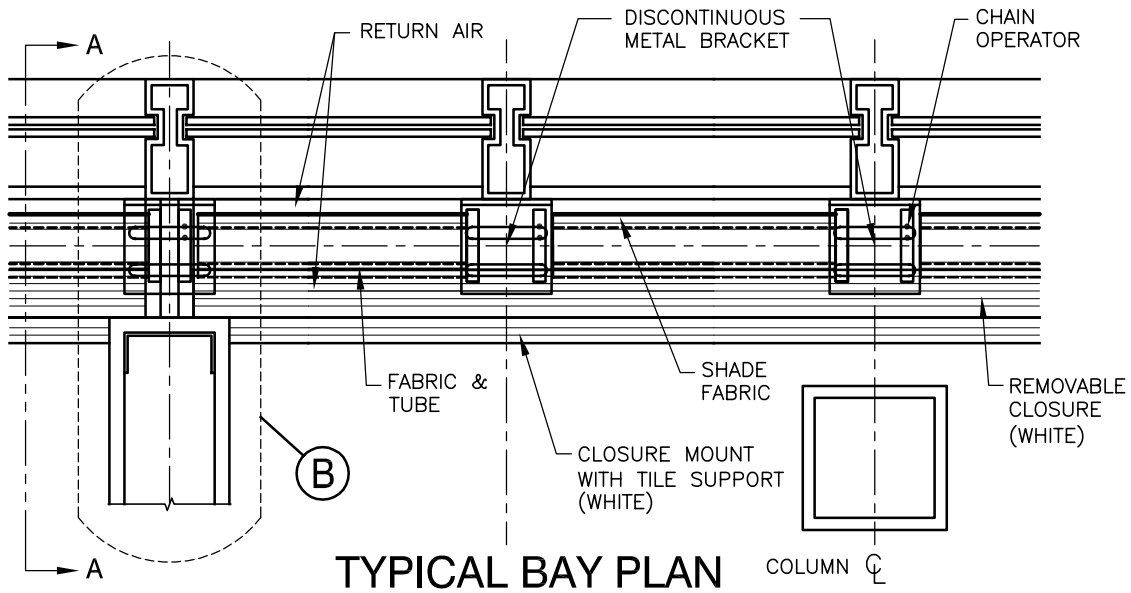


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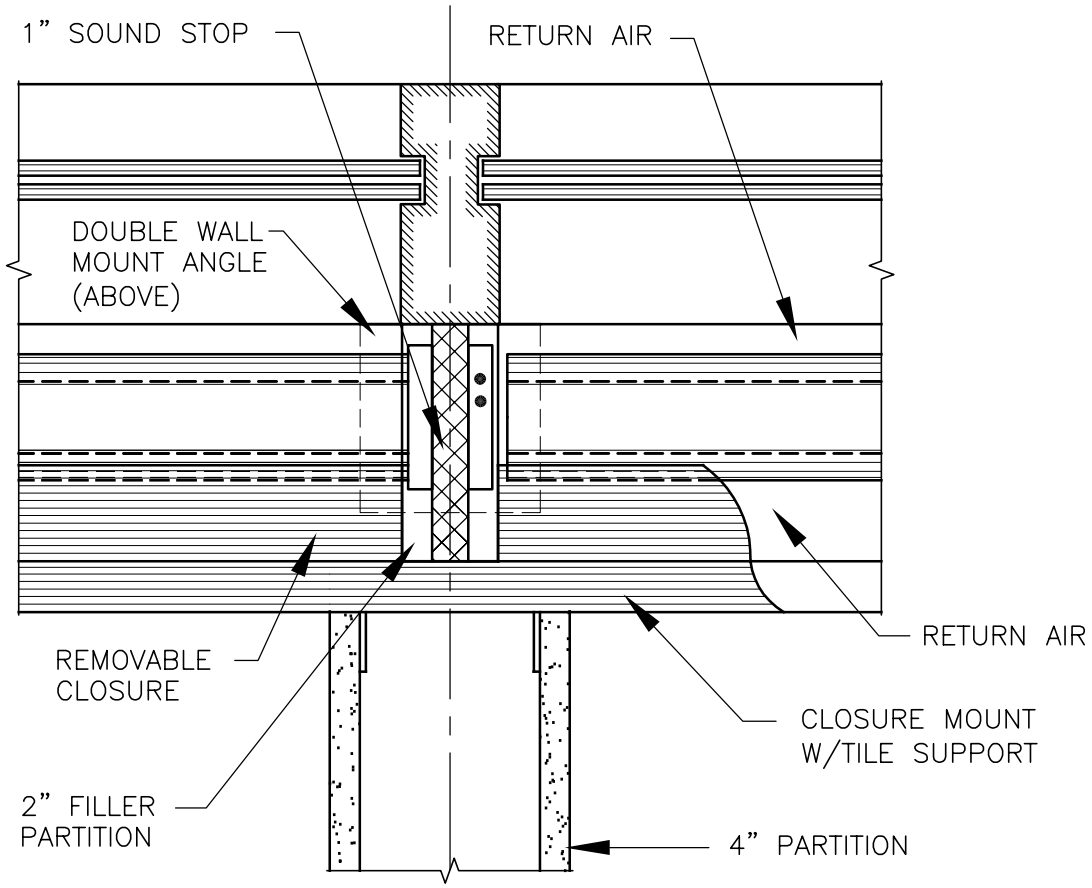
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Typical Bay with Building Standard Partitions



TYPICAL BAY PLAN



PLAN AT PARTITION (B)

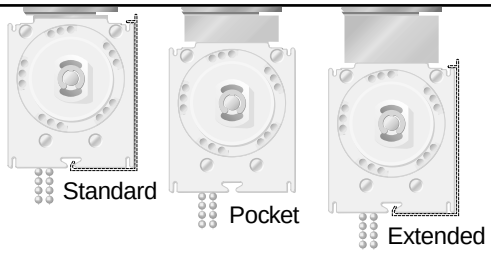
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MechoShade® Hardware Features and Specifications

MECHO®/5



1. Mounting Brackets
The drive assembly, idle-end assembly, and center support systems are attached to an 1/8 in. (3mm) steel universal mounting bracket.

2. No Adjustment Necessary
Mecho®/5 drive-end bracket requires no adjustment, resulting in faster installations.

3. Braking
An overrunning clutch design that disengages to 90% during the raising and lowering of the shade and can withstand a pull force of 40 lbs. (18 kg). Recommended maximum lift shade-band 20 lbs. (9 kg).

4. Braking Surface:
The patented self-lubricating oil impregnated steel hub, on which the brake system is mounted, includes an articulated brake assembly which assures smooth, non-jerky operation in raising and lowering the shades.

5. Sprocket
A one-piece molded Delrin® chain sprocket.

6. Hardware
All hardware is available with a universal offset drive and left-hand or right-hand operations. The offset-drive chain assembly places both operating chains at the same location or to the rear of the shade cloth out of sight. The distance between the center line of the operating chain shall not exceed 1/2 in (13mm).

7. Tube Support
A Delrin® cover plate provides protection from the tube being dislocated. In the event the tube should be pushed out of place, the Delrin end of the mounting plates contains the tube which may prevent the tube from falling out of the bracket.

8. Wide Spans
Depending on the height, weight and shadecloth specified, MechoShades can be made up to 12 feet wide or more. Call your local representative or MechoShade Systems technical support.

9. Interchange or replacement
Bracket components can be interchanged or replaced without having to remove the brackets from the walls or ceilings. This feature is included in both inside and outside mountings.

10. Component Quality
Plastic components are made of strong, dimensionally stable DuPont Delrin™. Not ABS/polystyrene or nylon.

11. Bracket Metal
Support brackets are plated 1/8 in. (3mm) steel. Custom colors are available on special order.

12. Narrow-Edge Clearances
Drive-end: 13/16 in. (21mm), idle-end: 1/2 in. (13mm), and center support: 5/16 in. (8mm).

13. Multi-Band Shade
A single drive bracket can handle two or more shade bands permitting a single operator to operate the shade, assuring simultaneous alignment of all the bands (within MSS recommended weight limits).

14. Faceted Window Installations
The offset drive permits up to a 12-degree (6°+ 6°) angle between any two shades with a single operator. By special order only, up to six degrees each side maximum. Contact MechoShade Systems, Inc. for details.

15. Optional SnapLoc Fascia SnapLoc® fascia shall be provided for standard and extended height brackets and center support brackets. Each bracket assembly permits the fascia to extend past the brackets, creating wall-to-wall fascia, with the brackets mounted inboard from the end of the fascia. SnapLoc fascia can be installed as a single unit over two or more shade band assemblies without exposed joints in lengths up to 15 ft. (457cm). SnapLoc fascia snaps on to the brackets without the use of glue, magnetic strips or any exposed fastening.

The fascia is made of extruded aluminum (hardness/alloy 6063T5) with an average thickness of .062 in. (1.6mm). The fascia is finished in PPG Duracon™ baked enamel in six standard colors plus clear aluminum.

16. Offset-Chain, No-Notch Fascia
The operating chain drops behind the return edge of the fascia without the necessity of notching or otherwise defacing the return leg of the fascia. The MechoShade® Wide, and Extended brackets accommodate fascia returns no less than 1-1/2 in. (38mm) (50%) from the front of the hardware fully concealing the roll and tube.

17. Shade Mounting
The SnapLoc® spline permits positive SnapLoc mounting and demounting of the shadecloth from the tube without having to remove the hardware, the tube or brackets and without the use of two-sided tape, staples or other fasteners.

Continued ☞

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MechoShade® Hardware Features and Specifications

18. Non-Binding Regressed End Plug
The idle-end plug is fitted with a recess which prevents oversized tubes from being forced between brackets. This arrangement assures proper sizing and clearance between the tube and the brackets and minimizes light leaks.

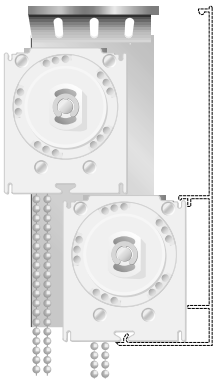
19. End Brackets
Consist of 1/8 in. (3mm) thick sheet steel. Wall, jamb or ceiling mounted as required and permanently installed.

20. Center Support Brackets
For ceiling or wall mounted multibanded shades. Center support brackets shall accept continuous lengths of fascia, which will span two or more MechoShade bands. Minimum length 15 ft. (457cm).

21. Hembar Weights
Mill-finished aluminum bars in single lengths as appropriate for the size shade, concealed in a fabric hem pocket.

22. Optional Exposed Hembars
In painted and baked PPG finishes with key way for shades.

23. DualShade® System:
The patented DualShade system, by MechoShade Systems, Inc., for installing both a ThermoVeil® sun screen together with either a room darkening shade cloth or MirroFilm™ attached to the same roller tube by means of the SnapLoc spline. The shade cloth and film shall be separated by 1/2 in. (13mm) of insulating air space.



24. DoubleShades®
A master mounting bracket assembly for drive-end, idle-end and center supports to facilitate installation of two shades, front-to-back or top and bottom, with perfect alignment and minimum installation labor. DoubleShade® brackets have all the same features of the standard Mecho/5 bracket, plus allow both sun screen and blackout shades on a single bracket. DoubleShade's compact size allow two shades to fit in a smaller room projection than two individually installed shades on the same window.

MECHO® SLIMLINE



SlimLine™ is available in the Mecho/3 design and shares all the features of the Mecho/5 except for the following:

1. Mounting Brackets
At 2-3/8 in. (60mm)W X 3-3/4 in. (95mm) H, the drive-end, idle-end and center supports become the smallest heavy-duty system available.

2. Variable Adjustment
Adjustments can be made in the dynamic mode (free-falling adjustment) or in the static mode (infinite-stop adjustment).

3. Braking
A linear disc brake, as opposed to a flat-steel backing plate, consists of a compression spring with two friction-absorbing nylon washers on a 1/4 in. (6mm) steel shaft. This design provides continuous uniform compensating brake pressure on the one-piece sprocket-brake drive component. The compression spring also acts as a vibration absorber.

3.1. Non-Slip Disc-Brake Adjustment
A shake-proof steel and nylon vibration resistant locking nut is employed to maintain the desired braking friction. Once the desired brake force is applied, the adjustment nut will not require readjustment when slippage of the adjustment nut from vibration and weakening of the braking surfaces occur. The concealed brake-tension adjustment is not accessible to unauthorized personnel.

4. Braking Surface
The linear disc-brake system utilizes a minimum of 2.89 sq. in. of braking surface.

12. Narrow-Edge Clearances
Drive-end: 11/16 in. (17mm), idle-end: 1/2 in. (13mm), and center support: 5/16 in. (8mm).

25. Warranty
Failure of any part or component shall be replaced at no charge, subject to warranty conditions. The drive chain is a fail safe component that is designed to break in two at 60-90 lbs. (27-41 kg) of shock and is not covered by the warranty. The chain may be quickly repaired or spliced on site by maintenance personnel in minutes. *(Contact MechoShade Systems for warranty terms and conditions.)*

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Suburban™/2

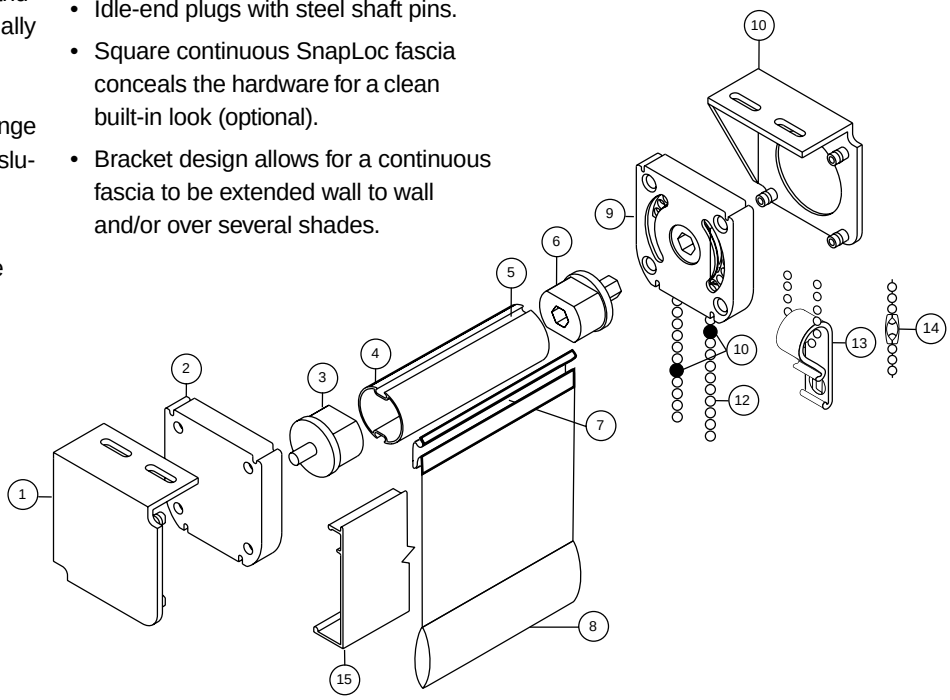


The Suburban™/2 was developed in response to the need for a well designed, high quality, moderately priced roller shade for commercial or residential shades. The Suburban/2's clean lines, care-free maintenance and high quality components are backed by a Ten-Year Limited Warranty that makes it a great value for a limited budgets and/or a tight space requiring a small profile.

The Suburban/2 features:

- Energy-conserving ShadeCloths. Suburban/2 offers the most extensive line of sun screens and blackout shade cloths in the industry. ThermoVeil® and EuroVeil® ShadeCloths provide visually transparent shading, with excellent glare control, energy savings and reduction in solar gain. Densities range from 0 to15% openness factor, translucent to highly transparent. See the ShadeCloth section for details.
- The Suburban/2 is a manual shade comprised of an overrunning clutch braking system that requires no adjustment, and is operated by a nickel plated steel chain.
- Universal end caps allow for wall, ceiling or jamb mounting and are made of high impact ABS for a high quality finish.
- When fully exposed Suburban/2 has a clean finished look with the convenience and flexibility of individual components.
- The Suburban/2 drive and idle mechanisms utilize high quality molded operating components of Delrin® and Delrin® with Teflon®.
- SnapLoc™ Mini Spline allows for easy removal of the shadecloth without removing the roller tube from the brackets.
- SnapLoc extruded aluminum Roller Tubes are available in 1-1/4" (32mm) diameter or 1- 3/8" (35mm) diameter sizes. SnapLoc roller tubes include a mounting channel for the SnapLoc Mini Spline.
- #10 nickel plated steel bead chain with qualified spacing assuring smooth and precise operation at 45 lb. (20kg) minimum breaking strength.
- Chain stop beads control the upper and lower limits of the shade.
- Child-Safe Chain Retainer with SnapLoc base (optional) required for residential applications.
- Drive-end plugs with steel shaft pins.
- Idle-end plugs with steel shaft pins.
- Square continuous SnapLoc fascia conceals the hardware for a clean built-in look (optional).
- Bracket design allows for a continuous fascia to be extended wall to wall and/or over several shades.
- Flat aluminum hembar is concealed within the shadeband or available as an optional exposed light seal hembar.

1. Universal Mounting Bracket for Left-Hand Drive Ceiling Mount or Right-Hand Drive Wall Mount
2. Idle-End Housing
3. Idle-End Tube Plug
4. SnapLoc Tube
5. SnapLoc Spline Mounting Channel
6. Drive-End Tube Plug
7. Snaploc Mini Spline
8. Hembar (standard cloth covered)
9. Drive-End Housing Assembly
10. Universal Mounting Bracket for Right-Hand Drive Ceiling Mount or Left-Hand Drive Wall Mount
11. Upper and Lower Bead Chain Stops
12. Drive Chain (nickel plated bead chain)
13. Child-Safe Chain Retainer
14. Bead Chain Connector
15. Optional SnapLoc Fascia



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Batten and Seam Specifications

Battens vs. Seams: MechoShade Systems, Inc. is one of the only, if not the only, shade manufacturer to use a batten joint vs. a seam joint. This type of construction costs more, but is highly effective in ensuring that certain types of shade bands hang and track straight. See page 2.24 for an illustration of the Batten vs. Seam joint.

Woven ScreenCloth: All woven ScreenCloth, regardless if their core yarns are polyester or fiberglass, will stretch under their hanging weight due to "Woven Fabric Mechanical Extensibility" or "The Hour Glass Effect". In order to assure the proper tracking and rolling of the shadeband, and avoid the "Hour Glass Effect", battens are included by MechoShade as a standard detail when the width-to-height (W:H) ratio exceeds 1:4. Railroaded, multi-width shade bands will receive a 1-1/2" (38mm) batten joint. Battens may be specified for shade bands that otherwise do not need them to align with shade bands that do require battens, at additional cost. Battens will be positioned on the shade band, per the chart below, or at customer specified positions, subject to approval of MechoShade Systems, Inc., and may be at additional cost.

Standard Batten Placement for Non-Railroaded (Standard) ElectroShades:

- Batten placement for non-railroaded shades shall be the minimum required to meet the 1:4 ratio of width to height.
- Battens shall be equally spaced within the shadeband opening height. For example one batten at the mid point, or two battens at 1/3 points, or three battens at 1/4 points.
- Batten placement for blackout shades with side channels shall not exceed 4'-0" (122cm) o.c. and must be specified.

Standard Batten Placement for Railroaded (RR) ElectroShades*

SHADE HEIGHTS

Roll Widths	63" (160cm) RR*	72" (183cm) RR*	96" (244cm) RR*	126" (366cm) RR*
Requires 1 width Railroaded*, +1 seam	54" (137cm) / 54" (137cm)	63" (161cm) / 63" (161cm)	87" (224cm) / 88" (224cm)	117" (297cm) / 117" (297cm)
Requires 1-1/2 widths Railroaded*, +1 seam	24" (609cm), 59" (152cm) / 83" (211cm)	30" (76cm), 68" (173cm) / 98" (249cm)	42" (107cm), 92" (234cm) / 134" (340cm)	57" (145cm), 122" (310cm) / 179" (455cm)
Requires 2 widths Railroaded*, +1 seam	54" (137cm), 59" (152cm) / 113" (287cm)	64" (163cm), 68" (173cm) / 132" (333cm)	88" (224cm), 92" (234cm) / 180" (457cm)	118" (300cm), 122" (310cm) / 240" (610cm)
Requires 2-1/2 widths Railroaded*, +1 seam	24" (609cm), 59" (152cm), 59" (152cm) / 142" (366cm)	30" (762cm), 68" (173cm), 68" (173cm) / 166" (421cm)	42" (107cm), 92" (234cm), 92" (234cm) / 226" (574cm)	57" (145cm), 122" (310cm), 122" (310cm) / 301" (765cm)
Requires 3 widths Railroaded*, +2 seams	54" (137cm), 59" (150cm), 59" (150cm) / 172" (437cm)	64" (163cm), 68" (173cm), 68" (173cm) / 200" (508cm)	88" (224cm), 92" (234cm), 92" (234cm) / 272" (688cm)	118" (300cm), 122" (310cm), 122" (310cm) / 362" (920cm)

* All shades measured from the bottom up to the center line of the batten joint. Railroaded (RR) Shadecloth turned width for height.
An additional 9" to 12" (229mm to 305mm) fabric allowance for wrap. Other combinations of widths available (i.e. 1/4, 1/3) subject to MSS acceptance.

Width-to-Height (W:H) Ratio Guidelines and Edge-Clearance Specifications (fabric used normally or railroaded)

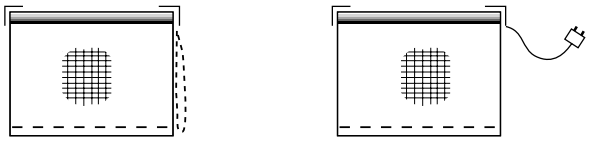
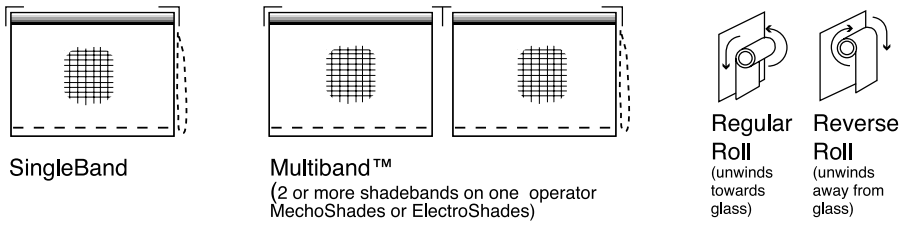
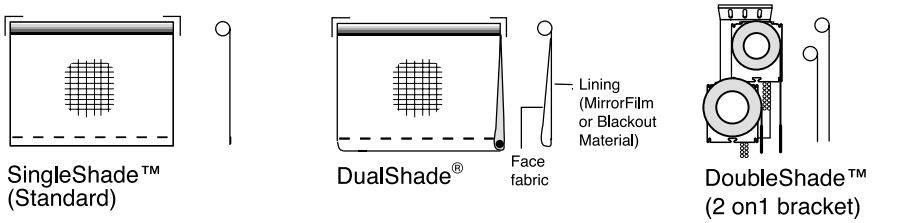
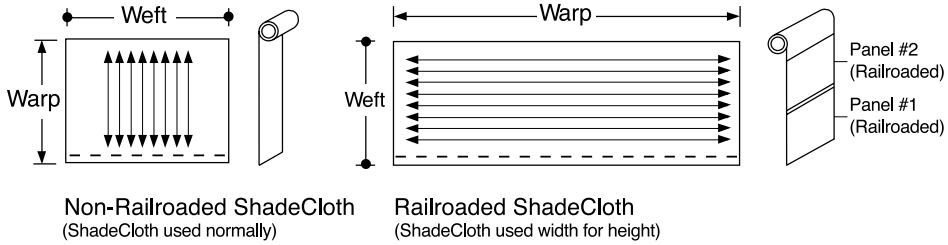
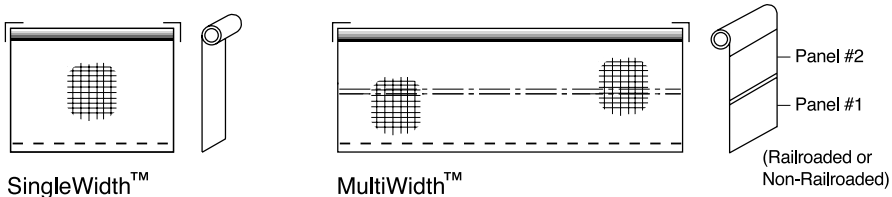
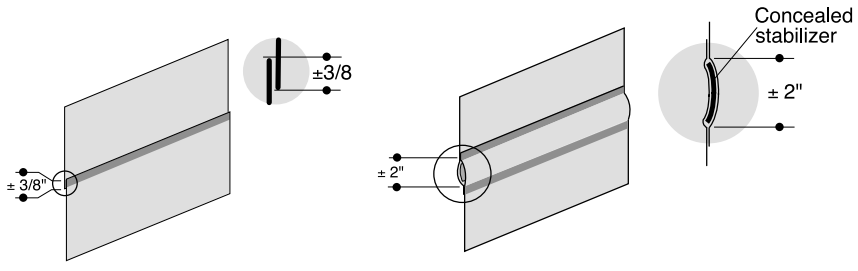
- **Shadebands up to 1:3 W:H ratio,** require the standard edge-clearance deduction except for 30" (76cm) wide shadebands.
- **1:3 to 1:4 W:H ratios,** increase the hardware edge-clearance 1/16" (1.6mm) each side to 1/8" (3.2mm) additional deduction.
- **1:4 to 1:5 W:H ratios,** increase the hardware edge-clearance 1/8" (3.2mm) each side to 1/4" (6.4mm) additional deduction. Battens required.
- **1:5 to 1:6 W:H ratios,** increase the hardware edge-clearance 1/4" (6.4mm) each side to 1/2" (12.8mm) additional deduction. Battens required.
- **Over 1:6 W:H ratios,** increase the hardware edge-clearance 5/16" (8mm) each side to 5/8" (16mm) additional deduction. Battens & guide cables required.
- **Railroaded multi-width shades** with horizontal joints shall have seam joints.
- **Environmental conditions may require** additional use of guide cables and/or battens and increased edge clearance.

MechoShade Systems, Inc.
42-03 35th Street, Long Island City, NY 11101
Telephone: 718-729-2020
Fax: 718-729-2941 / 800-899-8081

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Internet Web Site: www.mechoshade.com

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ShadeWords

Item	Definition
MechoShade® ElectroShade®	
SingleBand™ MultiBand™ Regular- & Reverse-Roll	
SingleShade™ DualShade® DoubleShade™	
Non-Railroaded ShadeCloth (NRR) (Standard) Railroaded ShadeCloth (RR) (Landscape)	
SingleWidth™ MultiWidth™	
Seam joint (Special) Batten joint (Standard)	

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MechoShade® Lifetime Limited Warranty Announcement

One of the best reasons to specify MechoShade is its LIFETIME* of dependability.



Introducing the MechoShade® and ElectroShade® System Lifetime* Limited Warranty.

We are so confident about the quality and dependability of our Manual and Motorized Shading Systems that we gave them a LIFETIME* Limited Warranty. MechoShade Systems, Inc. warrants to original purchasers that the hardware and shade cloths of dependable service of its Mecho/5™ Manual Shade System and ElectroShade Motorized Shade System (interior use products) are free of manufacturing defects in factory materials or workmanship for a LIFETIME*.

LIFETIME* Limited Warranty is defined to be the life of the project for which it was originally purchased, not to exceed 25 years from the date of shipment. This warranty does not depreciate in value.

See full warranty details on page 2.27 – 2.28.

Continued ☞

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MechoShade® Limited Warranty (Non-Depreciating)



LIMITED WARRANTY
(interior product use)

MechoShade Systems, Inc. warrants to original purchasers that its Interior Use Products are free of manufacturing defects in factory materials or workmanship for the specified warranty period.*

- ThermoVeil®, EuroVeil®, Faux Natural™, EuroTwill™, Equinox™ and Soleil® brand **shadecloths** on the associated MechoShade®, ElectroShade®, or Suburban™/2 brand shade systems are warranted to be free of manufacturing defects in factory materials or workmanship for the specified warranty period.
- MechoShade®, ElectroShade®, SlimLine™ and Suburban™/2 brand **hardware** are warranted to be free of manufacturing defects in factory materials or workmanship for the specified warranty period.
- ElectroShade® Motors and Controls are warranted to be free of manu facturing defects in factory materials or workmanship for 5 years from date of shipment.
- Hardware and shadecloths have a Lifetime Warranty not to exceed 25 year from the date of shipment.
- All Limited Warrantees are subject to the general terms and conditions of sale. Copies are available upon request.

All in accordance with MechoShade Systems, Inc. Warranty General Terms and Conditions. The MechoShade Limited Warranties are exclusive and in lieu of all other warranties, whether written, oral or implied (including any implied warranty of merchantability, fitness for a particular purpose, or otherwise).

MechoShade®/5 System*



Lifetime Limited Warranty
to original purchasers on all hardware and shade cloths for the life of the interior project for which it was originally purchased, not to exceed twenty-five years.

MechoShade® SlimLine™ System*



10-Year Limited Warranty
to original purchasers on all hardware and shade cloths.

ElectroShade® System*

Lifetime Limited Warranty
to original purchasers on all hardware and shade cloths for the life of the interior project for which it was originally purchased, not to exceed twenty-five years.



5-Year Limited Warranty
on Motors and Electronics to be free of manufacturing defects in factory materials or workmanship for 5 years from date of shipment.

Suburban™/2 System*



10-Year Limited Warranty
to original purchasers on all hardware and shade cloths.



A 5-Year Limited Warranty
for motors and electronic controls.

Continued ☞

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MechoShade® Warranty General Terms and Conditions

From the Warranty portion of the MechoShade Systems, Inc. General Terms and Conditions of Sale

(INTERIOR USE PRODUCTS)

VII. WARRANTY

MechoShade Systems, Inc. MSS warrants to the original purchaser that its products are free of manufacturing defects in factory materials or workmanship for the following specified warranty periods:

Hardware and ShadeCloth (interior use):

- Lifetime of the interior project for which it was originally purchased, from date of shipment for the Mecho®/5 and ElectroShade Systems, but not to exceed 25 years.
- 10 years from date of shipment for the Mecho SlimLine System.
- 10 years from date of shipment for the Suburban™/2 System.

Controls, Electrical, Electronic Accessories and Motors (interior use):

- 5 years from date of shipment for ElectroShade and Suburban/2 products.

Monumental Shades:

MechoShade Warrantee for Monumental Shades shall be limited to 10 years for hardware and shadecloth; 5 years for motors and electronics. Monumental Shades are defined to be any shade band over 300 Sq. ft. and shall be wider than 20 ft. and/or higher than 30 ft.

If any part of a MSS product (except for images or artwork on shadecloths) is found in the reasonable judgment of MSS to be defective in factory materials or workmanship during the above-prescribed warranty periods, MSS will repair or replace the defective part at its option. Repair or replacement under this warranty does not include labor or costs for installation, reinstallation, or removal of MechoShade products, parts or components. This warranty extends only to the original purchaser for MSS products installed by an authorized MechoShade dealer representative with a valid written dealer representative agreement with MechoShade® Systems, Inc. The MechoShade®/5 System and ElectroShade® System Lifetime Limited Warranty is void unless the warranty card is filled out and returned to MSS within 120 days of shipment.

This warranty does not apply if any of the following exclusions exist:

- The product has been subject to misuse, abuse, neglect, negligence, accident, or has been operated in any way contrary to MSS's operating instructions or specifications.
- Damages or conditions that have resulted from improper cleaning, maintenance, care or repair of the product.
- The product has been improperly installed or not installed according to MSS's guidelines or specifications.
- MSS's written instructions for installation and wiring of electrical connections were not followed.
- The product has been used to perform functions or operated in a manner contrary to its design or otherwise is used in a manner contrary to or in excess of MSS's specifications, drawings, or instructions.
- The product is used with electrical accessories or parts, including switches, relays, or other accessory components, that have not been previously approved in writing by the MSS Engineering Department.
- If any electrical accessories and other components have been used in disregard to the basic wiring diagram for which they were designed.
- Failure to comply with all MSS's written instructions and specifications.
- Repairs made necessary from normal wear of the product or by use of parts or accessories which are either incompatible with the product or otherwise adversely affect its operation, performance, or durability.
- Product used for non interior applications or otherwise exposed to outdoor environmental conditions.

MSS reserves the right to change or improve the design of any MechoShade product without assuming any obligation to modify or retrofit any product previously manufactured or supplied.

MSS does not warrant any images or artwork reproduced, printed, or placed on shade cloth by MSS or any imaging supplier, and MSS is not otherwise responsible or liable for fading, discoloration, color shifts, or any other failure or defect in such images or artwork.

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MSS ASSUMES NO RESPONSIBILITY AND SHALL NOT BE LIABLE TO THE ORIGINAL PURCHASER OR ANY OTHER PARTY OR NON PARTY FOR ANY PERSONAL INJURY, LOSS, OR DAMAGE, WHETHER DIRECT, LIQUIDATED, INCIDENTAL, OR CONSEQUENTIAL, INCLUDING BUT NOT LIMITED TO THE LABOR OR COSTS RELATED TO THE REPLACEMENT OF A DEFECTIVE PRODUCT OR PARTS OR INSTALLATION, REINSTALLATION, OR REMOVAL OF SUCH PRODUCT OR PARTS, EXPENSE OF RETURNING A PRODUCT OR PART TO MSS OR ITS AUTHORIZED DEALER OR THE EXPENSE OF DELIVERING IT BACK TO THE ORIGINAL PURCHASER, LOSS OR DAMAGE TO PERSONAL OR REAL PROPERTY, LOSS OF REVENUE, LOSS OF THE USE OF THE PRODUCT, LOSS OF TIME, OR INCONVENIENCE.

This warranty gives the original purchaser specific legal rights, and the original purchaser may also have other rights which vary from state to state.

For a copy of our General Terms and Conditions of Sale, please see Section 10 of this binder or contact MechoShade Systems, Inc.

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AISLACUSTIC

Piezas precortadas para muros

OWENS CORNING®
INNOVACIONES PARA VIVIR℠

Descripción

El Aislacustic es un aislamiento térmico y acústico de color rosa fabricado con fibra de vidrio flexible en forma de placas cortadas a una medida estándar sin recubrimiento, que permiten una mayor facilidad y rapidez de montaje.

Este producto está diseñado para absorber sonido en el hueco formado en el interior de sistemas hechos con paneles de yeso, además de ofrecer un excelente desempeño térmico.

Usos y aplicaciones

Las piezas de Aislacustic tienen un amplio rango de aplicaciones en el ramo de la construcción, se utilizan como aislamiento térmico y acústico en el interior de muros exteriores de paneles de cemento, así como en muros divisorios interiores a base de paneles de yeso y sobre el plafón, ya sea fijo o registrable.

La fibra de vidrio es un producto inorgánico, no absorbe la humedad, es incombustible y tiene excelentes propiedades térmicas y acústicas.

Ventajas

Máxima eficiencia térmica

Su baja conductividad térmica garantiza la menor pérdida o ganancia de calor, con lo que el ahorro de energía se verá maximizado.

Máxima eficiencia acústica

Goza de muy buenas propiedades de absorción de sonido, ayudando a crear un ambiente más silencioso y cómodo en el hogar, oficina, escuela, hospital, etc.

Fácil de instalar y manejar

Por su flexibilidad, ligereza y facilidad de manejo, es un material de rápida instalación que se adapta perfectamente entre los espacios de los postes metálicos ó de madera, instalados a distancias de 41 ó 61 cm, simplemente presionando hacia dentro del hueco formado por los postes y los paneles de yeso. La presentación de este aislante en placas estándar de 2.44 m. de largo evita posibles desperdicios.

Resistente a la vibración

El diámetro y la longitud de la fibra de vidrio, además del tipo de fibrado, hacen que el producto tenga 0% de shot*; lo cual impide que en los muros sujetos a vibraciones se desprenda el polvo del shot, dando así un mayor tiempo de vida al sistema aislante en óptimas condiciones de servicio, evitando el paso del ruido y del calor.

Ligero

Su ligereza evita que el aislamiento se cuelgue ó patine dentro de los postes.

Bajo mantenimiento y larga duración

La fibra de vidrio se caracteriza por su larga duración, por lo que los gastos de mantenimiento son mínimos y la reposición del aislamiento en un sistema bien instalado es a largo plazo.

Incombustible

Su naturaleza y componentes no combustibles evitan el riesgo de propagación del fuego.

Resilente

Cuando la presión que la deforma se retira, la fibra de vidrio recupera su espesor, y por lo tanto su valor R (resistencia térmica).

Propiedades físicas

Propiedades	Método de Prueba	Valor
Característica de combustión superficial*	ASTM E-84 y UL 723	Propagación de la flama 25 Desprendimiento de humo 50
No combustible	ASTM C 136	Cumple con la norma
Absorción de humedad	ASTM C 1104	Menos de 0.5%
Emisión de olor	ASTM C 1304	Cumple con la norma
Conductividad térmica	ASTM C 518	Cumple con la norma
Dimensiones	ASTM C 167	Cumple con la norma
No corrosión	ASTM C 665	Cumple con la norma
Resistencia a los hongos	ASTM C 1338	Cumple con la norma

*Se ha determinado que las características de combustión superficial de estos productos están de acuerdo con lo dispuesto en UL 723 o ASTM E-84. Se deben usar estas normas para medir y describir las propiedades de los materiales, productos o ensamblados en respuesta al calor y las llamas en condiciones controladas dentro de un laboratorio, pero no deben utilizarse para describir ni evaluar los peligros o riesgos de incendio de los materiales, productos o ensamblados en condiciones reales de incendio. Sin embargo, los resultados de esta prueba pueden usarse como elementos de una evaluación de riesgos de incendio que tenga en cuenta todos los factores que correspondan a una evaluación de peligro de incendio de un determinado uso en particular. Los valores que se indican están redondeados al quíntuple que corresponda por proximidad.

Propiedades térmicas y acústicas

Aislacustic	Valor R		Bandas de Octava (Hertz)*						
	m^2·K/W	(ºF hr ft^2 / Btu)	125	250	500	1000	2000	4000	NRC
R-8	1,71904	(9.686)	0,21	0,62	0,93	0,92	0,91	1,03	0,85
R-11	1,9778	(11.218)	0,48	1,00	1,12	1,03	0,97	0,96	1,05

Normatividad

ASTM C553-02 TIPO I: Aislamiento térmico de fibra mineral para aplicaciones industriales y comerciales.

ASTM C665-01: Aislamiento térmico de fibra mineral para construcciones ligeras y prefabricadas.

International Building Code (ICC): Todos los tipos.

Uniform Building Code (ICBO): Todos los tipos.

NOM-008-ENER-2001: Eficiencia energética en edificaciones, envolvente de edificios no residenciales.

National Building Code (BOCA): Todos los tipos.

Standard Building Code (SBCCI): Todos los tipos.

NOM-018-ENER-2011: Aislantes térmicos para edificaciones, Características, límites y términos de prueba.

Valores Certificados por ONNCCE de acuerdo a la NOM-18-ENER-2011		
AISLACUSTIC		
PARÁMETRO	R-8	R-11
Densidad aparente	14,85 Kg/m^3	10,43 Kg/m^3
Conductividad Térmica	0,03723 W/m·K	0,04500 W/m·K
Resistencia Térmica	1,71904 m^2·K/W	1,9778 m^2·K/W
Permeabilidad de vapor de agua	0,0684 ng/Pa·s·m	0,0866 ng/Pa·s·m
Adsorción de humedad	3,64% (masa) 0,0563% (volumen)	7,00% (masa) 0,0768% (volumen)

Presentación

Placas de aislamiento flexible sin recubrimiento y cortadas en largo de 2.44 m								
		Medidas nominales						
Aislacustic	Valor R	Espesor		Ancho		Largo		Piezas por paquete
	m^2·K/W	cm	(pulg)	cm	(pulg)	cm	(pulg)	
R-8	1,71904	6,4	(2.5)	41 y 61	(16 y 24)	244	(96)	24
R-11	1,97778	8,9	(3.5)	41 y 61	(16 y 24)	244	(96)	17

Recomendaciones de instalación

Los muros de cualquier habitación se pueden aislar usando postes metálicos ó de madera de 6.4 cm ó 8.9 cm (2 1/2" ó 3 1/2") de espesor, espaciados a 41 cm ó 61 cm (16" ó 24") de centro a centro.

Ya fijos los postes de metal o madera al muro y al techo, las placas de Aislacustic se colocan en los espacios libres entre bastidores. Encima de todo el conjunto y si la diferencia entre la temperatura exterior e interior llegara a ser muy alta (como en zonas de climas extremosos), convendrá colocar una barrera de vapor. Esta barrera puede ser de Kraft Asfaltado. Posteriormente, y sobre la barrera de vapor, se procederá a colocar el tipo de acabado que se desee, pudiendo ser un lambrín de madera, o panel de yeso. En el caso de paneles de yeso, podrá adherir papel tapiz o el acabado de su preferencia.

No es necesario utilizar barrera de vapor en climas que no son fríos.

1.- Ruede los paquetes al lugar de instalación donde tenga suficiente espacio, para abrir el paquete y dejar que las piezas recuperen sus espesores originales.

2.- Selle cualquier ruptura o agujero alrededor del piso, techo o pared, solera superior e inferior y detrás de cajas de empalme por donde pueda haber penetración de aire con sellante adhesivo.

3.- Antes de abrir los paquetes colóquelos en el cuarto donde serán instalados. La manera de abrir el paquete es: cortando a lo largo con una navaja. El aislamiento viene comprimido, por lo que al abrirlo se expande. Cuide que tenga suficiente espacio.

4.- Ningún espacio debe quedar sin aislante, use pedazos de aislamiento para llenar los huecos alrededor de ventanas y puertas.

5.- Tome las piezas y ponga al mismo nivel superior de la cavidad y empújelas firmemente en la pared, jale la parte de abajo y asegúrese de que quede ajustada, sin arrugas, huecos o espacios, para garantizar el valor R.

6.- Para espacios irregulares y cajas de electricidad corte el aislamiento 2.5 cm más ancho que el espacio e instálelo. No olvide aislar todos los espacios abiertos.

7.- El aislamiento al instalarse debe ser protegido con un material aprobado como paneles de yeso. En climas templados donde raramente se tienen temperaturas bajo 0oC, no se necesita una barrera de vapor.

8.- Es importante que el material se expanda completamente para obtener el aislamiento apropiado. La barrera de vapor, en caso de ser necesario, debe ir hacia el área más cálida en invierno.

9.- Si la unidad eléctrica tiene las letras IC, puede instalar el aislamiento en contacto con el equipo de iluminación. De otro modo, coloque el aislamiento a una distancia de 7.6 cm del equipo.



"Owens Corning porporciona estas instrucciones "tal y como están" y renuncia a cualquier responsabilidad por cualquier falta de precisión, omisión, error tipográfico causado por el equipo de terceras personas. Al utilizar estas recomendaciones, usted está aceptando estar sujeto a las disposiciones contenidas en este párrafo. Estas recomendaciones proporcionan un método ilustrativo par instalar Aislacustic y/o accesorios de Owens Corning. Las instrucciones de Owens Corning no tienen por objeto resolver toda contingencia posible que pudiera presentarse durante la instalación ni recomendar el uso de una herramienta en particular. Por la presente, Owens Corning renuncia expresamente a toda responsabilidad por cualquier reclamación por lesiones o fallecimiento relacionados o derivados por el uso de estas recomendaicones de instalación y de otras instrucciones de instalación que Owens Corning haya proporcionado de alguna otra forma".

Aislamiento en el interior de muros divisorios prefabricados.

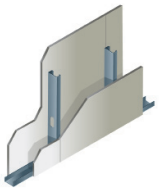
Tanto en cancelería prefabricada metálica o a base de paneles de yeso / cartón o madera, por sus características termoacústicas y su elasticidad, los materiales rígidos de la cancelería reflejan las ondas sonoras. De acuerdo a los diferentes diseños de fabricantes de cancelería, pueden obtenerse tipos apropiados para divisiones de alcobas o especiales para obtener alta privacidad como se requiere en algunas oficinas.

Aislamiento para techos de falso plafón

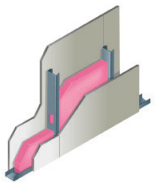
El Aislacustic se convierte en el aislamiento ideal para usarse en estas aplicaciones, ya que por los techos de las casas se absorbe aproximadamente el 70% del calor y el 30% restante por los muros.

LA APLICACIÓN DE LA FIBRA DE VIDRIO REDUCE EL CONSUMO DE ENERGÍA COMO MÍNIMO EN UN 30%*

Sistema con Aislacustic R-8
Separación de postes a 41 cm ó a 61 cm.

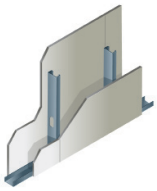


DESEMPEÑO ACÚSTICO ESTÁNDAR STC 34*
Estructura metálica de 6.36 cm a 41 cm ó 61 cm de distancia con paneles de cartón de yeso de 12.7 mm por ambos lados.

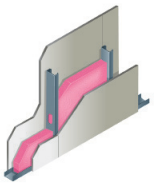


MEJOR DESEMPEÑO ACÚSTICO STC 44*
Estructura metálica de 6.32 cm a 41 cm ó 61 cm de distancia con paneles de cartón de yeso de 12.7 mm por ambos lados y Aislacustic R-8 de 6.35 cm de espesor.

Sistema con Aislacustic R-11
Separación de postes a 41 cm ó a 61cm.



DESEMPEÑO ACÚSTICO ESTÁNDAR STC 36*
Estructura metálica de 9.20 cm a 41 cm ó 61 cm de distancia con paneles de yeso de 15.9 mm por ambos lados.



MEJOR DESEMPEÑO ACÚSTICO STC 47*
Estructura metálica de 9.20 cm a 41 cm ó 61 cm de distancia con paneles de yeso de 15.9 mm por ambos lados y Aislacustic R-8 de 8.9 cm de espesor.

STC = Coeficiente de transmisión de sonido.
Valor R = Resistencia a la transmisión de calor. A mayor Valor R, mejor será el desempeño acústico y térmico del aislamiento
*Para mayor información, consultar el documento "Guía de Control de Sonido 2007" de Owens Corning.

Recomendaciones de almacenaje

- Para evitar la alteración de las propiedades del Aislacustic, Owens Corning le recomienda lo siguiente:
- Almacene el material en lugares protegidos de la intemperie.
- Asegúrese que la primera cama del producto esté sobre una tarima de madera.
- Conserve el producto en su empaque hasta su uso.
- Altura máxima por estiba 10 paquetes.
- Evite colocar el producto sobre pisos mojados.
- Evite someter el producto a esfuerzos mecánicos.
- Para mejor identificación, deje visibles las etiquetas que identifican el producto.

CONTACTANOS:

OWENS CORNING ®
INNOVACIONES PARA VIVIR™

Servicio a clientes
México
(55) 5089-6767
Lada sin costo
01 800 00 OWENS

Email
Soluciones.Comercial@owenscorning.com

Sitio web
www.owenscorning.com.mx

Videos Tutoriales
www.youtube.com/owenscorningmexico

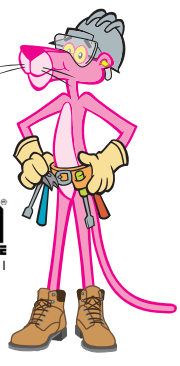
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NOM ONNCCE
NOM-018-ENER-2011



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GOLD BOND® BRAND GRIDSTONE® CLEANROOM GYPSUM CEILING PANELS

MANUFACTURER

National Gypsum Company
2001 Rexford Road
Charlotte, NC 28211
(704) 365-7300

Technical Information:
1-800-NATIONAL
(1-800-628-4662)

Fax: 1-800-FAX NGC1
(1-800-329-6421)

Internet Home Page:
nationalgypsum.com
nationalgypsum.com/espanol

09 56 13/NGC BuyLine: 1100

DESCRIPTION

Gold Bond® BRAND Gridstone® CleanRoom Gypsum Ceiling Panels are prefinished ceiling panels with a noncombustible gypsum core. The 2-mil, white, stipple-textured vinyl laminate combines high light reflectance with easy cleanability. CleanRoom panels are manufactured with the exposed edges sealed, providing a durable coating that completely seals the panel.

BASIC USES

Gridstone CleanRoom panels are for use in systems designed for areas requiring high levels of air cleanliness for airborne particulate levels such as clean rooms and clean zones.

ADVANTAGES

- *Designed for clean room use*. Approved for use in systems Class 100,000, Class 10,000, Class 1,000, Class 100 per federal standard 209E "Airborne Particulate Cleanliness Classes in Clean Rooms and Clean Zones."
- *Fire-resistant*. A noncombustible gypsum core assures fire safety with 1 1/2- and 2-hour fire rating achievable depending on installation.
- *Sag-resistant*. Gridstone CleanRoom panels' rigid gypsum core prevents sagging and warping problems and is backed by a 15-year limited warranty.
- Gridstone CleanRoom panels are USDA accepted for use in food service and food processing areas.

GREENGUARD CERTIFIED

Gridstone CleanRoom Gypsum Ceiling Panels are GREENGUARD Children & Schools℠ Certified for indoor air quality.

LIMITATIONS

- Per ASTM C 840 section 17.3.1.1, do not install panels in areas exposed to extreme or continuous moisture, such as saunas, steam rooms, gang showers and indoor pool enclosures.
- Overlaid insulation may cause excessive panel deflection and is not recommended where high humidity is likely to occur.
- Extreme lighting conditions may distort texture appearance.
- The use of strong organic solvents (such as ketones), harsh abrasive cleaners or steel wool are not recommended. These materials may cause dulling, discoloration, softening and other permanent damage to the vinyl surface.

TECHNICAL DATA

PHYSICAL PROPERTIES

Thickness, nominal	1/2" Type X (12.7 mm)
Width, nominal	2' (610 mm)
Length, standard	GB 5040 - 2' (610 mm) Actual size is 23-3/4" x 23-3/4" GB 5030 - 4' (1219 mm) Actual size is 23-3/4" x 47-3/4"
Weight, lbs./sq.ft., nominal	2.2
Finish	2 mil white stipple vinyl laminate
Surface Burning Characteristics (per ASTM E 84)	Flame Spread: 15 Smoke Developed: 0
Sound Attenuation (per ASTM E 1414) Ceiling Attenuation Class (CAC)	46dB NGC Report #6098001
Light Reflectance	LR 1 (75% or greater)

APPLICABLE STANDARDS AND REFERENCES

ASTM C 1396, Class I

ASTM E 1264, Type XX, Patterns E, G

National Gypsum Company, *Gypsum Construction Guide*

FIRE RATINGS BY TYPE & SIZE

(ASTM E 119)

Type	Size	Design	Rating
1/2" (12.7 mm) Fire-Shield G	2' x 2'	UL G222 FM FC 299	2 hr.
1/2" (12.7 mm) Fire-Shield G	2' x 4'	UL G259 FM FC 300	1 1/2 hr.

Job Name _____

Contractor _____ Date _____

Submittal Approvals: (Stamps or Signatures)

INSTALLATION

RECOMMENDATIONS

Gridstone CleanRoom ceiling panels are designed to be used in a gasket seal suspended grid system using hold down clips.

Recommended use of Gordon DS-20 gasket Seal System or equivalent gasket sealed grid systems designed for clean room applications. Grid installation should be conducted according to manufacturer's specification.

Each panel must be supported on all four (4) edges.

Cross ventilation must be provided in unheated or enclosed space above ceiling panels.

General: Install panels in lay-in suspension systems with edges concealed by flanges of suspension members. Cut panels to fit tightly at borders and penetrations so that cut edges are concealed by trim pieces and escutcheons.

If panel cuts are required, exposed core should be sealed to maintain performance of the system.

Cleaning: Common dirt and stains on the vinyl surface can be removed with mild soap or detergent in lukewarm water. Use a light scrubbing action with a cloth, sponge or soft brush.

If the suitability of any cleaning agent is unknown, check its effect on the Gridstone CleanRoom panel surface in a hidden area or on a scrap piece before attempting to remove a field stain.

NOTE: Vinyl laminate on face of 2' x 2' Gridstone CleanRoom panel is directional. Install with all factory edges parallel (Same direction).

GOLD BOND® BRAND GRIDSTONE® GYPSUM CEILING PANELS

MANUFACTURER

National Gypsum Company
2001 Rexford Road
Charlotte, NC 28211
(704) 365-7300

Technical Information:
1-800-NATIONAL
(1-800-628-4662)

Fax: 1-800-FAX NGC1
(1-800-329-6421)

Internet Home Page:
nationalgypsum.com
nationalgypsum.com/espanol

09 56 13/NGC BuyLine: 1100

DESCRIPTION

Gold Bond® BRAND Gridstone® Gypsum Ceiling Panels are prefinished ceiling panels with a noncombustible, Fire-Shield G gypsum core. The 2-mil, white, stipple-textured vinyl laminate combines high light reflectance with easy cleanability.

BASIC USES

Gridstone panels are ideal for interior and unexposed exterior ceiling applications such as soffits, parking garages, kitchens and baths.

Gridstone panels are accepted by the USDA for use in food service processing areas.

ADVANTAGES

- *Quick, dry installation.* Gridstone panels install easily in standard exposed grid systems.
- *Fire-resistant.* A noncombustible gypsum core assures fire safety with 1 1/2- and 2-hour fire rating achievable depending on installation.
- *Pre-decorated.* The sturdy white vinyl laminate eliminates additional finishing.
- The product shall be maintained at a temperature not to exceed 104° Fahrenehit (40° Centigrade) and not exceed 90% relative humidity prior to, during and after installation.

GREENGUARD CERTIFIED

Gridstone Gypsum Ceiling Panels have achieved GREENGUARD GOLD Certification.

LIMITATIONS

- Per ASTM C 840 section 17.3.1.1, do not install panels in areas exposed to extreme or continuous moisture, such as saunas, steam rooms, gang showers and indoor pool enclosures.
- For exterior application, protect grid panels from direct exposure to weather. water and continuous high humidity. Under no circumstances should water be in contact with the back of the panels.
- Can support 1.6 #/sq. ft. of insulation.
- Overlaid insulation may cause excessive panel deflection and is not recommended where high humidity is ikely to occur.
- Extreme lighting conditions may distort texture appearance.
- The use of strong organic solvents (such as ketones), harsh abrasive cleaners or steel wool are not recommended. These materials may cause dulling, discoloration, softening and other permanent damage to the vinyl surface.

TECHNICAL DATA

PHYSICAL PROPERTIES

Thickness, nominal	1/2" Type X (12.7 mm)
Width, nominal	2' (610 mm)
Length, standard	GB 5044 - 2' (610 mm) Actual size is 23-3/4" x 23-3/4" GB 5045 - 4' (1219 mm) Actual size is 23-3/4" x 47-3/4"
Weight, lbs./sq.ft., nominal	2.18
Finish	2 mil white stipple vinyl laminate
Surface Burning Characteristics (per ASTM E 84)	Flame Spread: 5 Smoke Developed: 0
Sound Attenuation (per ASTM E 1414) Ceiling Attenuation Class (CAC)	46dB NGC Report #6098001
Light Reflectance	LR 1 (75% or greater)

APPLICABLE STANDARDS AND REFERENCES

ASTM C 1396, Class I

ASTM E 1264, Type XX, Patterns E, G

National Gypsum Company, *Gypsum Construction Guide*

Job Name _____

Contractor _____ Date _____

Submittal Approvals: (Stamps or Signatures)

FIRE RATINGS BY TYPE & SIZE
(ASTM E 119)

Type	Size	Design	Rating
1/2" (12.7 mm) Fire-Shield G	2' x 2'	UL G222 FM FC 299	2 hr.
1/2" (12.7 mm) Fire-Shield G	2' x 4'	UL G259 FM FC 300	1 1/2 hr.

INSTALLATION

RECOMMENDATIONS

Gridstone panels are designed to be mounted in standard 15/16" exposed tee grid systems or environmental type grids for severe conditions, with grids either 2' by 2' or 2' by 4'. Grid installation should be conducted according to manufacturer's specification.

Each panel must be supported on all four (4) edges.

Cross ventilation must be provided in unheated or enclosed space above ceiling panels.

General: Install Gridstone panels in lay-in suspension systems with edges concealed by flanges of suspension members. Cut panels to fit tightly at borders and penetrations so that cut edges are concealed by trim pieces and escutcheons.

If panel cuts are required, exposed core should be sealed to maintain performance of the system.

Cleaning: Common dirt and stains on the vinyl surface can be removed with mild soap or detergent in lukewarm water. Use a light scrubbing action with a cloth, sponge or soft brush.

If the suitability of any cleaning agent is unknown, check its effect on the Gridstone panel surface in a hidden area or on a scrap piece before attempting to remove a field stain.

NOTE: Vinyl laminate on face of 2' x 2' Gridstone CleanRoom panel is directional. Install with all factory edges parallel (same direction).

DECORATION

Gridstone panels are factory-finished decorative products which do not require painting. However, if desired, Gridstone can be painted with the following products:

1. Two coats of an alkyd or latex enamel.
2. Oil primer with finish coat of oil or latex paint.
3. Two coats of latex paint.

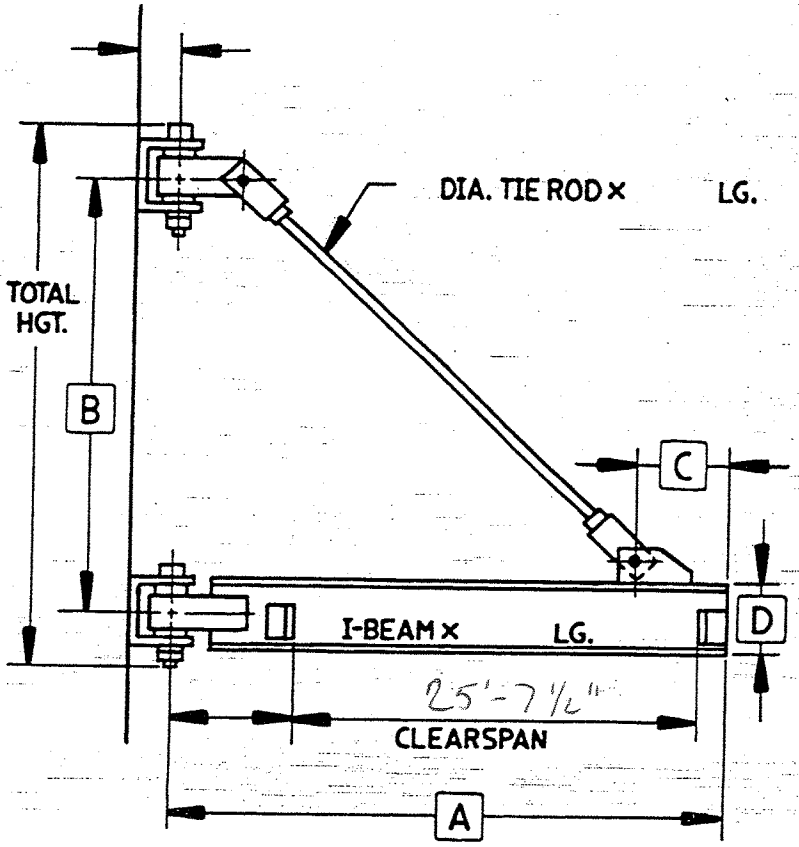
National Gypsum®

SPANCO® Inc.

ORDER Nº: _____
DATE: _____
SER. Nº: _____

WALL BRACKET JIB CRANE - 200° ROTATION
MODEL-301- [200] [27]

CAPACITY: 2 TON
WEIGHT: 1424#
QTY.: _____
DIM. A: 27'-0"
DIM. B: 9'-0"
DIM. C: 3'-6"
DIM. D: S12" x 31.8#



DISTRIBUTOR: _____

DISTR. ORDER Nº: _____

SHIP TO: _____

CUST. ORDER Nº: _____

CUST. REQ. Nº: _____

VIA.: _____

OPTIONS: _____

SPECIALS: _____ SHIP DATE: _____

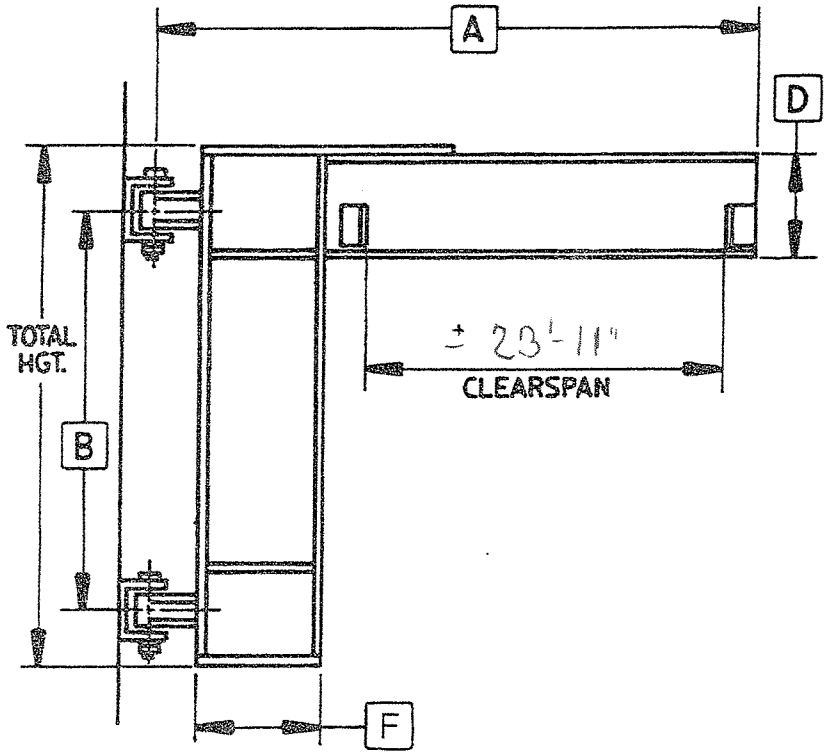
ORDER FORM S-06-05

SPANCO® Inc.

ORDER Nº: _____
DATE: _____
SER.Nº: _____

WALL CANTILEVER JIB CRANE -200° ROTATION
MODEL -300 - 200 27-W

CAPACITY: 2 TON
WEIGHT: (NET.) 4309#
QTY: _____
DIM. A: 27'-0"
DIM. B: 9'-0"
DIM. D: W24" x 103
DIM. F: W24" x 103
DISTRIBUTOR: _____



DISTR. ORDER Nº: _____

SHIP TO: _____

CUST. ORDER Nº: _____

CUST. REQ. Nº: _____

VIA.: _____

OPTIONS: _____

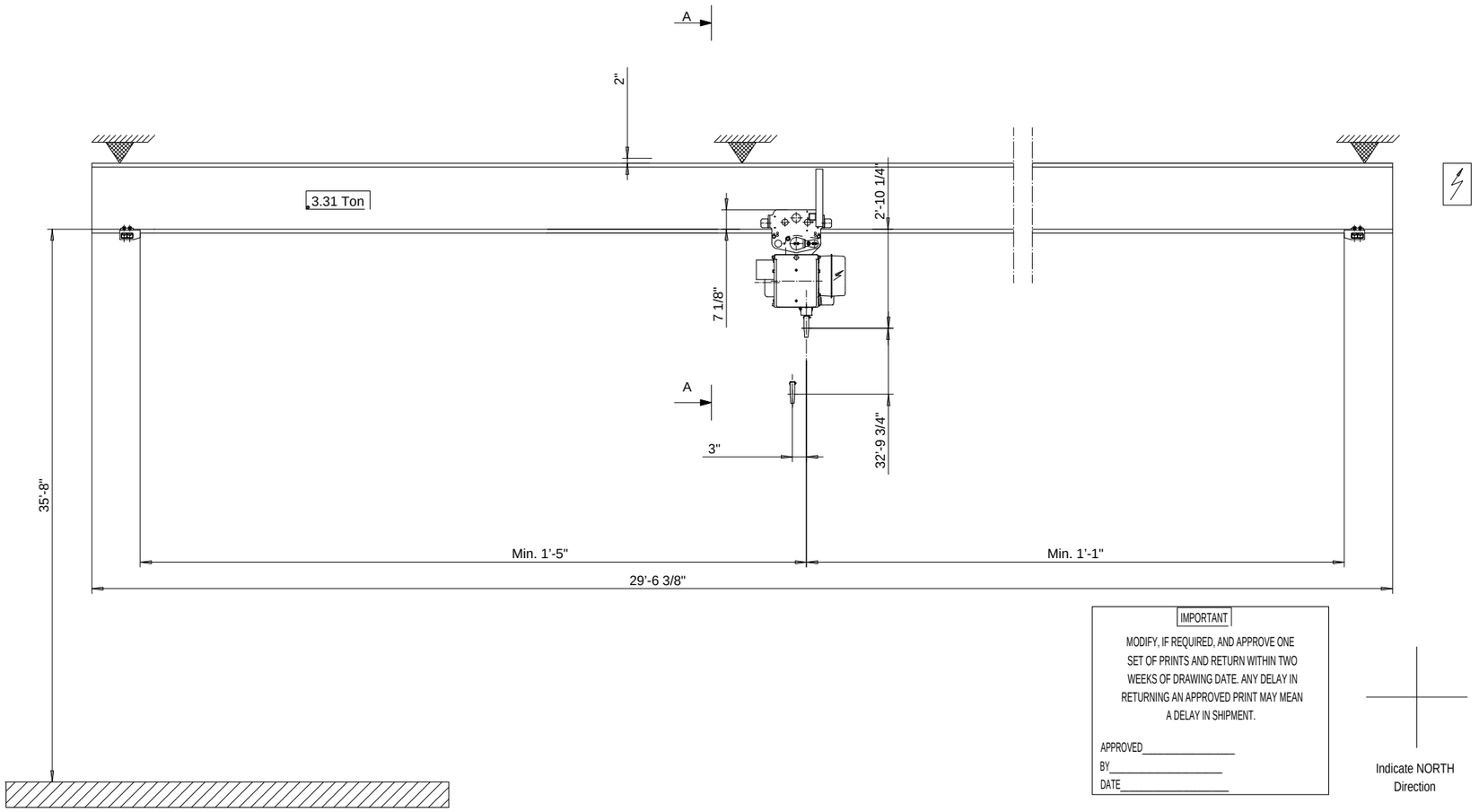
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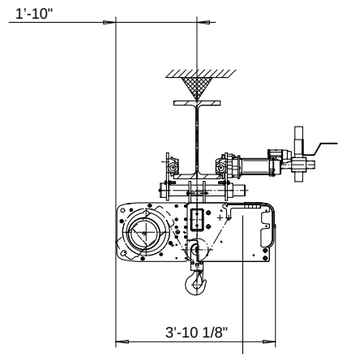
SHIP DATE: _____

ORDER FORM S-06-04

CLMP00B1

M3-PN147005 3.6 - Cranes





A - A

IMPORTANT

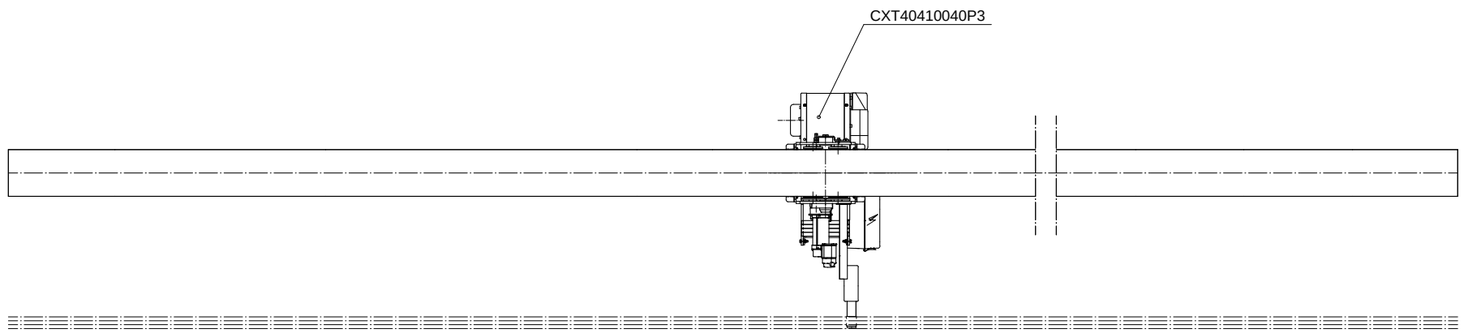
MODIFY, IF REQUIRED, AND APPROVE ONE SET OF PRINTS AND RETURN WITHIN TWO WEEKS OF DRAWING DATE. ANY DELAY IN RETURNING AN APPROVED PRINT MAY MEAN A DELAY IN SHIPMENT.

APPROVED_____

BY_____

DATE_____

Indicate NORTH Direction



TECHNICAL DATA

LOAD.....	3.31 Ton
LIFTING HEIGHT.....	32'-9 3/4
HOISTING SPEED.....	19/3.3 ft/min 2-SPEED
TROLLEY SPEED.....	65 ft/min STEPLESS
WEIGHT OF TROLLEY.....	990 lbs
POWER SUPPLY.....	460 V / 115 V / 60 Hz

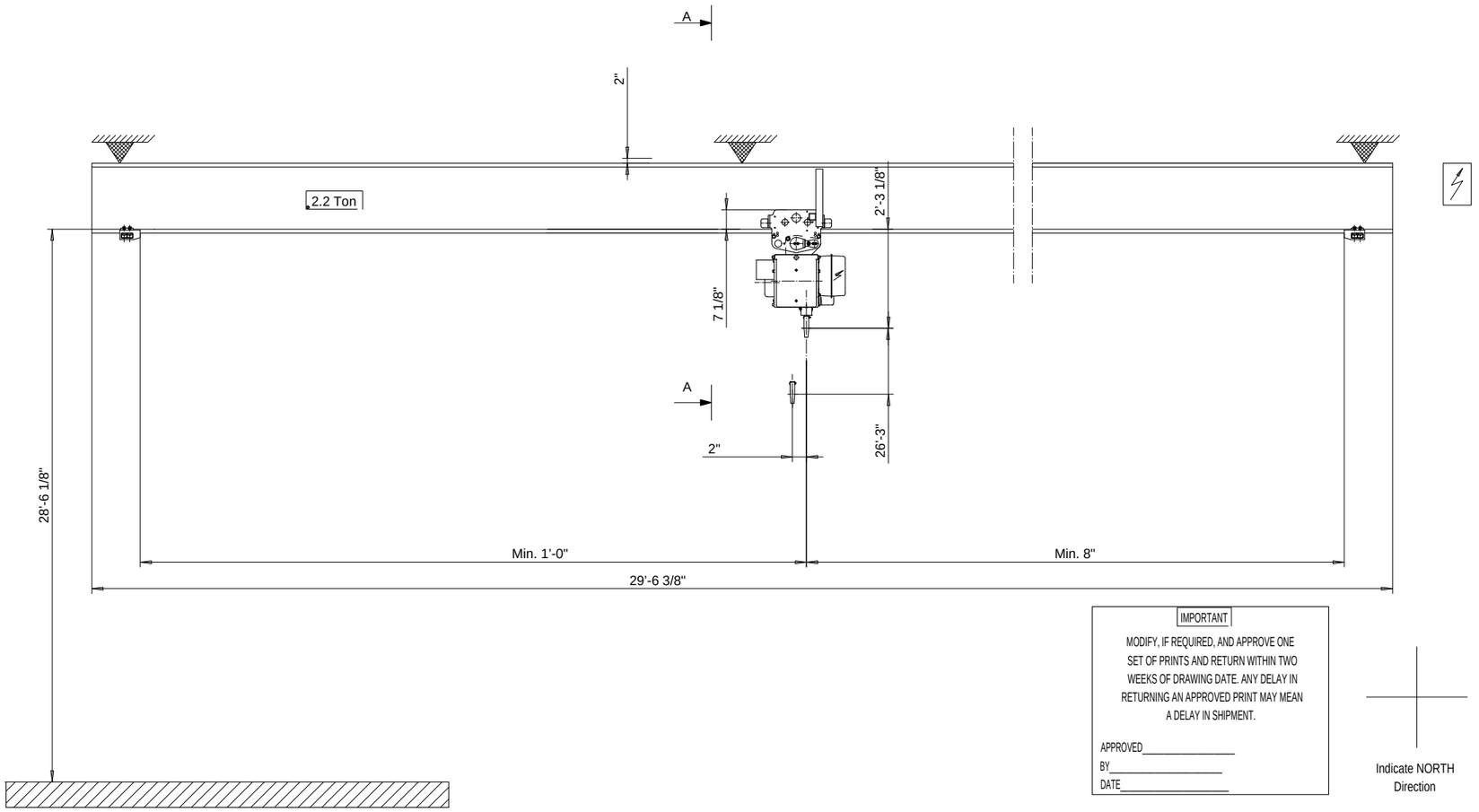
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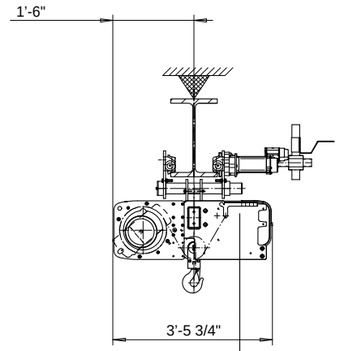
PART LIST

JBR/PSF	
5/21/2014	3.31 Ton CXTM Crane
	San Pedro Project (JBR-140710-2)
KONECRANES	INQ-114735-3t

CLMP00B1

M3-PN147005 3.6 - Cranes





A - A

IMPORTANT

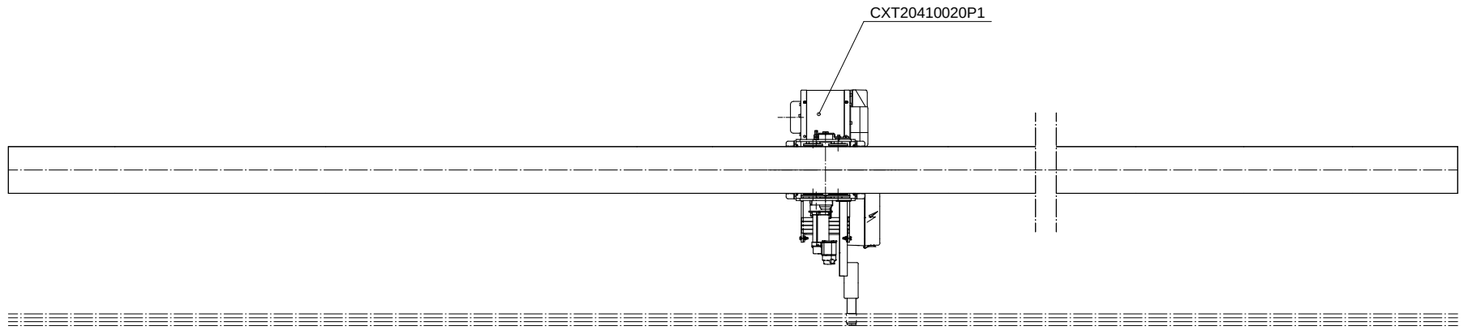
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APPROVED_____

BY_____

DATE_____

Indicate NORTH Direction



TECHNICAL DATA

LOAD.....	2.2 Ton
LIFTING HEIGHT.....	26'-3
HOISTING SPEED.....	19/3.3 ft/min 2-SPEED
TROLLEY SPEED.....	65 ft/min STEPLESS
WEIGHT OF TROLLEY.....	570 lbs
POWER SUPPLY.....	460 V / 115 V / 60 Hz

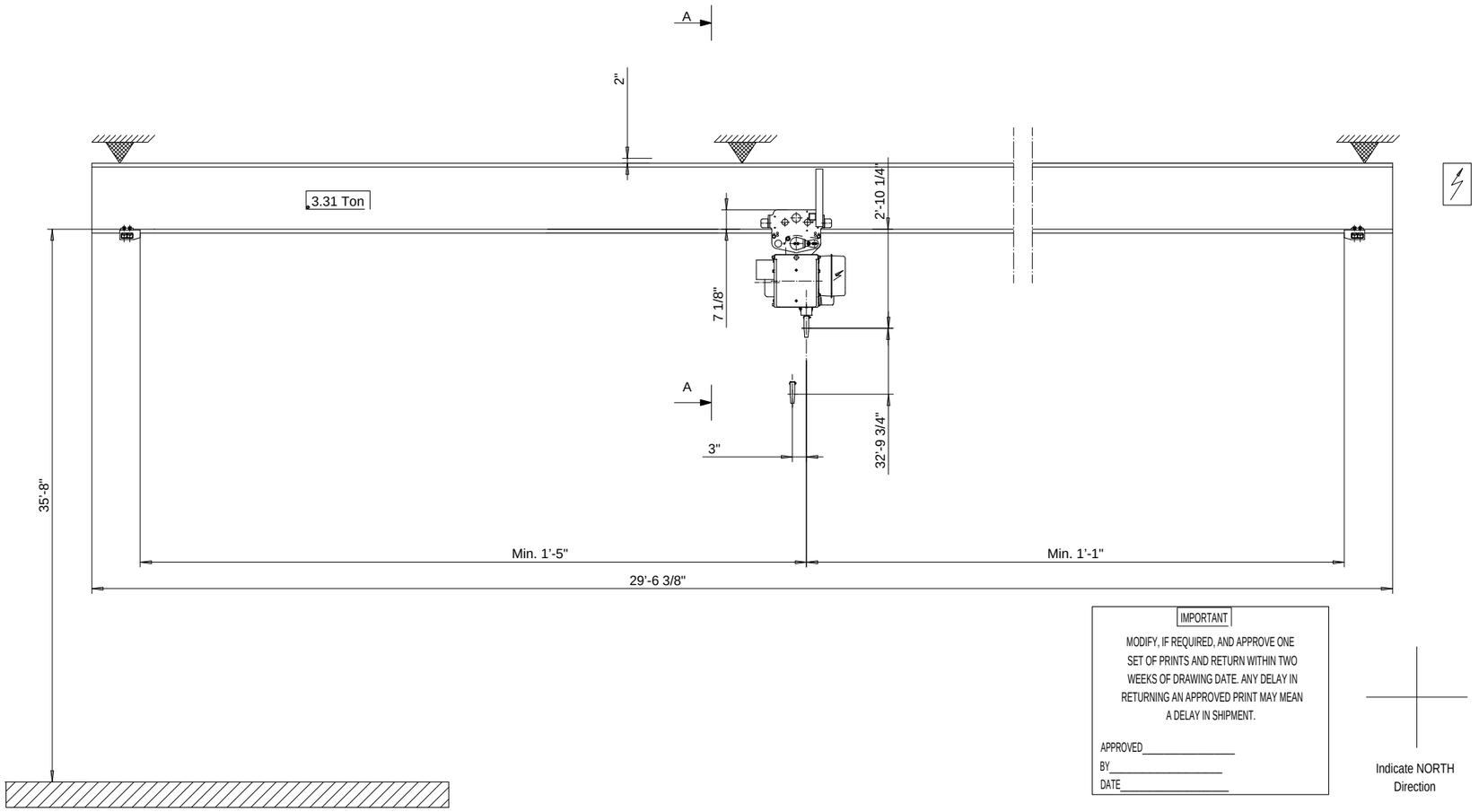
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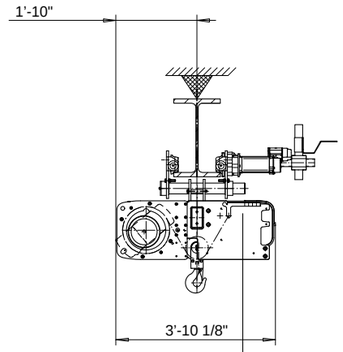
PART LIST

JBR/PSF	
5/14/2014	2.2 Ton CXTM Jib Crane Hoist
	San Pedro Project
KONECRANES	JBR-14-0710-1

CLMP00B1

M3-PN147005 3.6 - Cranes





A - A

IMPORTANT

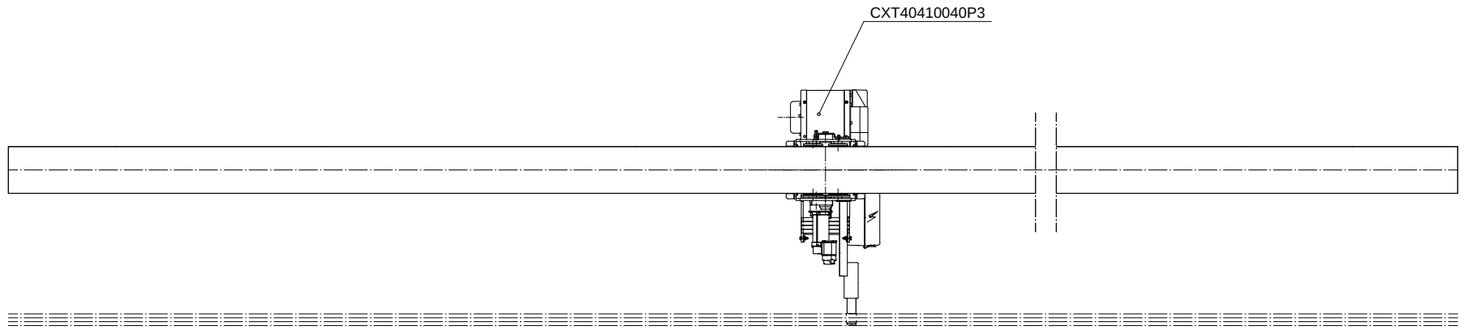
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APPROVED_____

BY_____

DATE_____

Indicate NORTH Direction



TECHNICAL DATA

LOAD.....	3.31 Ton
LIFTING HEIGHT.....	32'-9 3/4
HOISTING SPEED.....	19 ft/min Stepless
TROLLEY SPEED.....	65 ft/min STEPLESS
WEIGHT OF TROLLEY.....	990 lbs
POWER SUPPLY.....	460 V / 115 V / 60 Hz

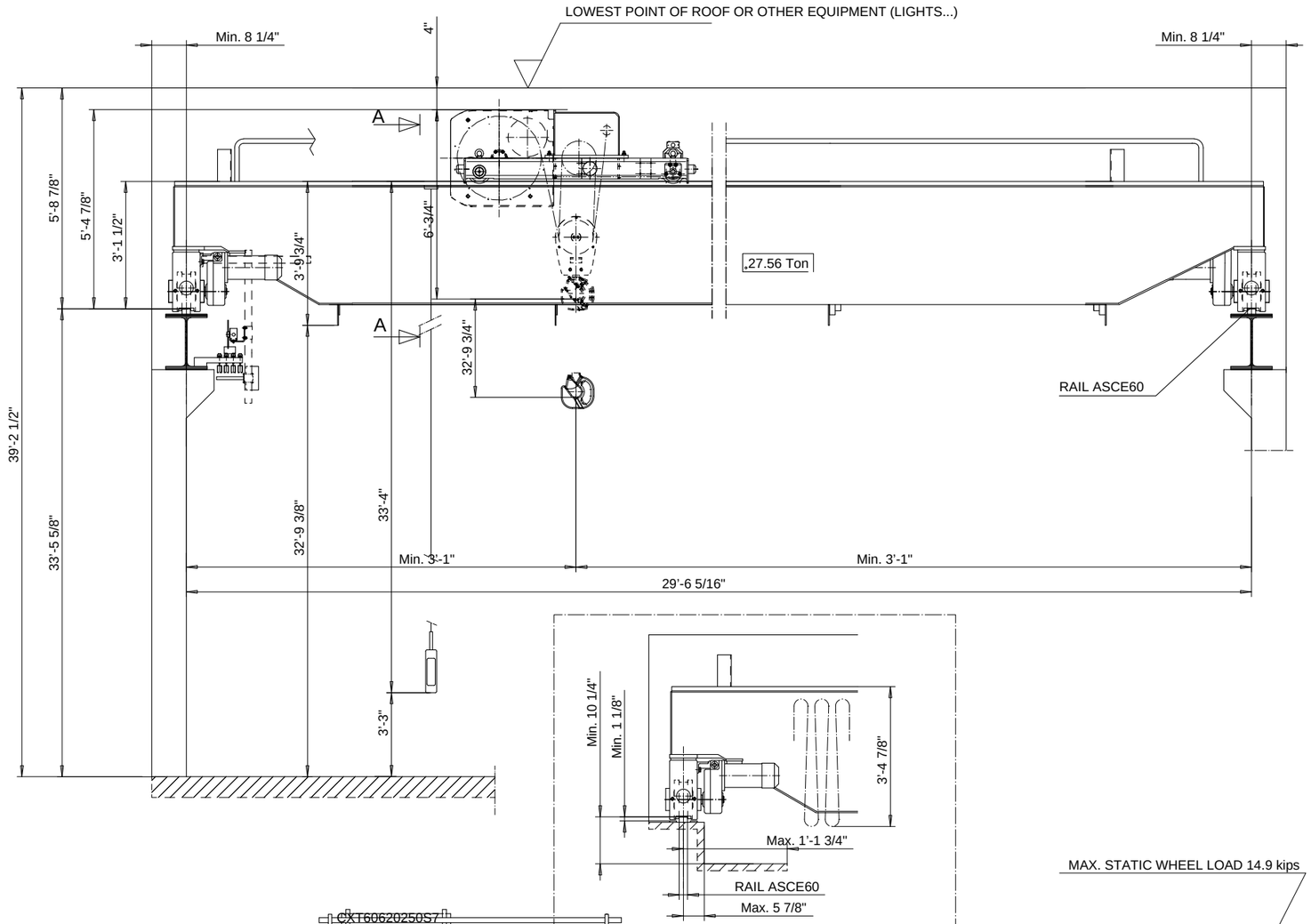
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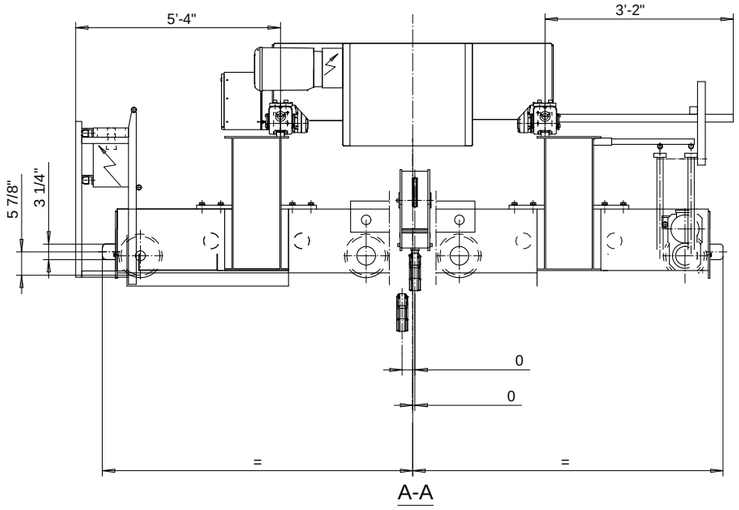
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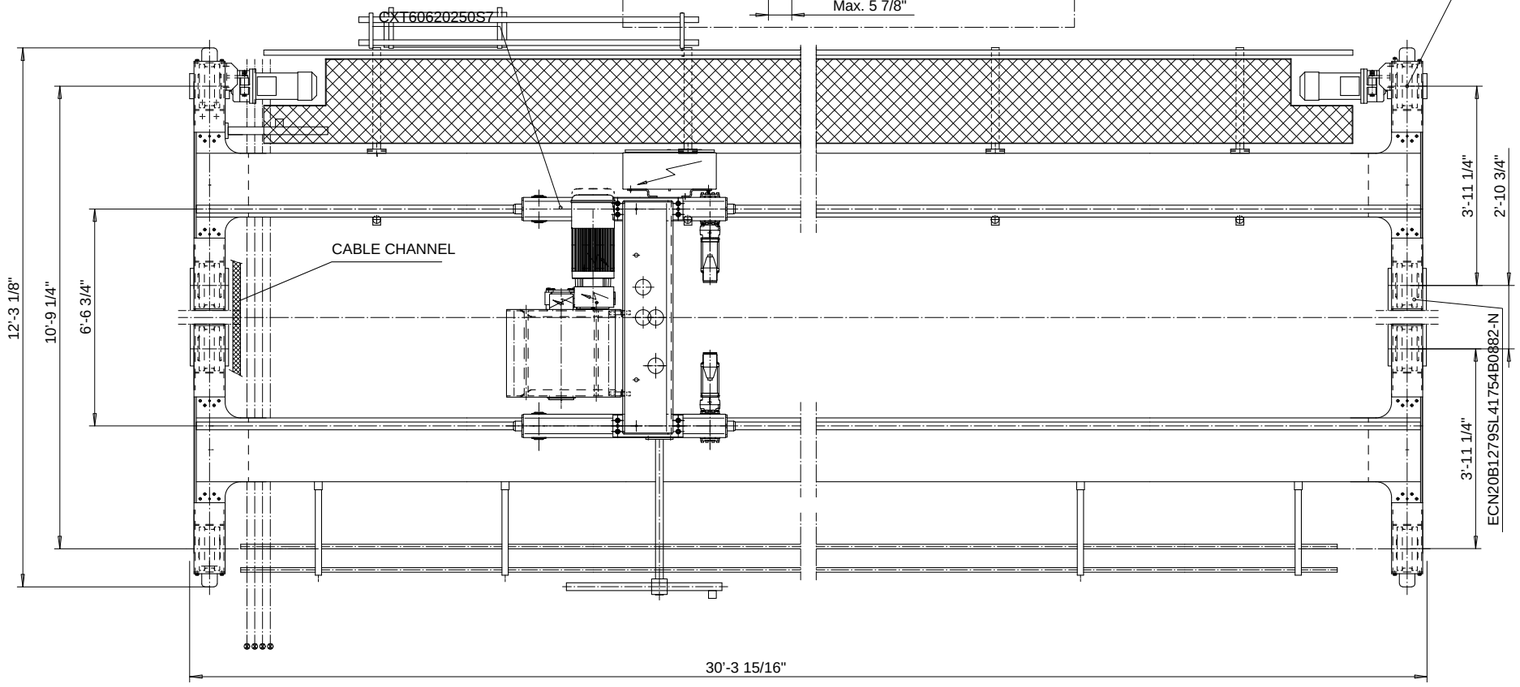
JBR/PSF	
5/14/2014	3.31 Ton CXTM Crane
	San Pedro Project
KONECRANES	JBR-140710-2

CLDB01B2

M3-PN147005 3.6 - Cranes







TECHNICAL DATA

LOAD.....	27.56 Ton
SPAN.....	29'-6 5/16"
LIFTING HEIGHT.....	32'-9 3/4
HOISTING SPEED.....	12/0.26 ft/min STEPLESS
TROLLEY SPEED.....	65 ft/min STEPLESS
BRIDGE SPEED.....	100 ft/min STEPLESS
WEIGHT OF TROLLEY.....	4110 lbs
WEIGHT OF BRIDGE.....	9830 lbs
POWER SUPPLY.....	460 V / 115 V / 60 Hz
CRANE GROUP.....	CMAA C

INDICATE NORTH DIRECTION

IMPORTANT

MODIFY, IF REQUIRED, AND APPROVE ONE SET OF PRINTS AND RETURN WITHIN TWO WEEKS OF DRAWING DATE. ANY DELAY IN RETURNING AN APPROVED PRINT MAY MEAN A DELAY IN SHIPMENT.

APPROVED_____
BY_____
DATE_____

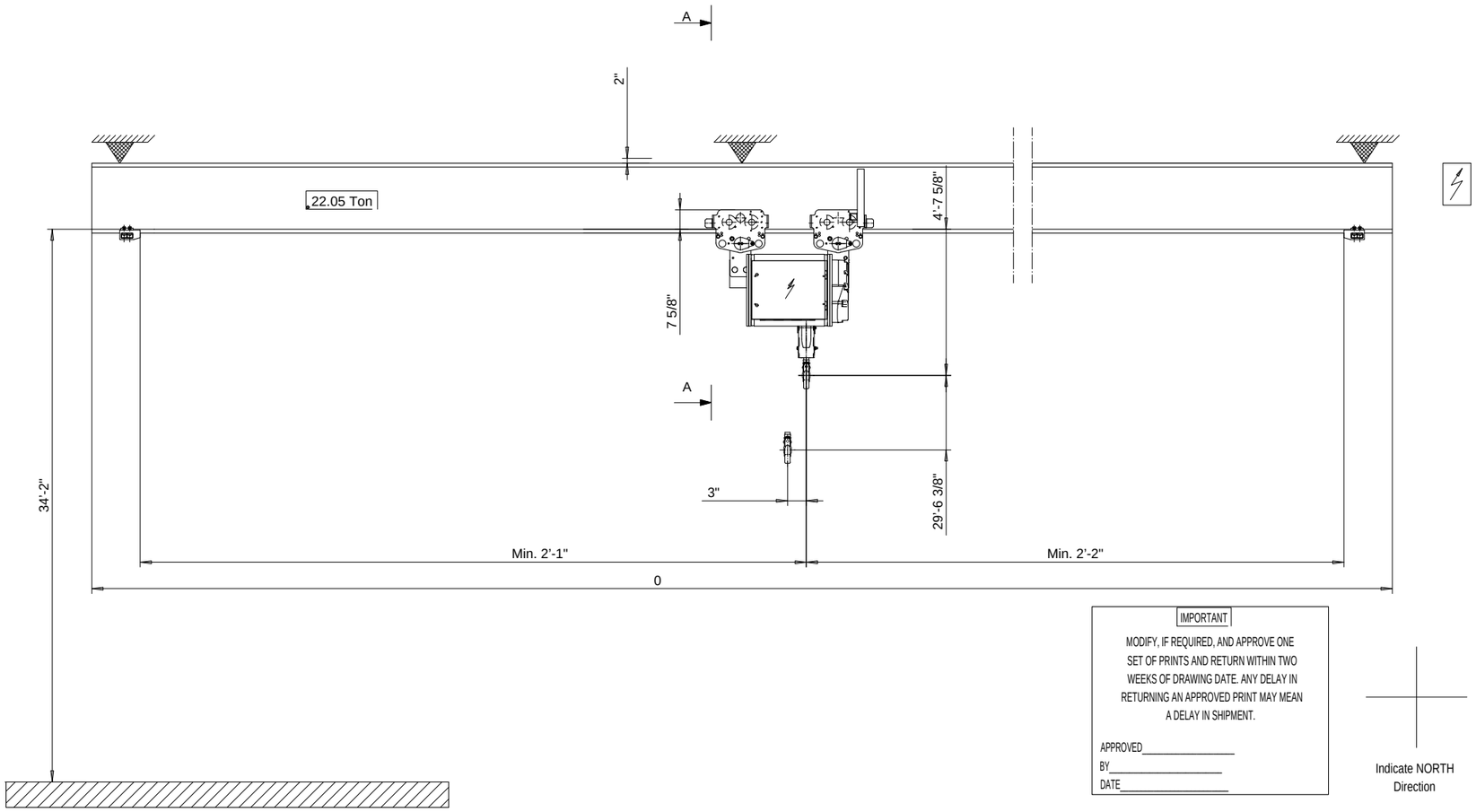
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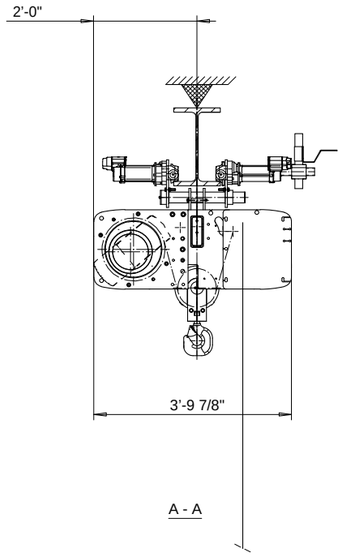
PART LIST

JBR/PSF	
5/14/2014	27.56 Ton CXTD Crane
	San Pedro Project
KONECRANES	JBR-14-0710-3

CLMP00B1

M3-PN147005 3.6 - Cranes





A - A

IMPORTANT

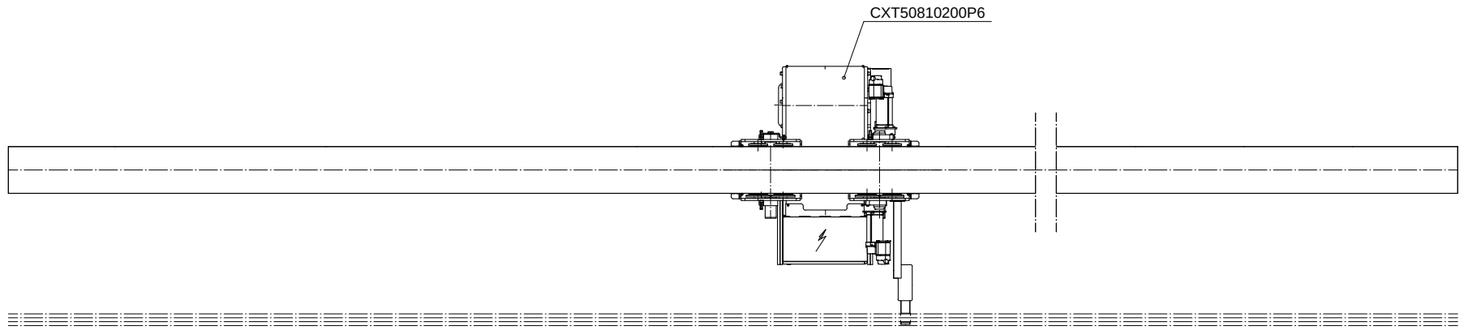
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APPROVED_____

BY_____

DATE_____

Indicate NORTH Direction



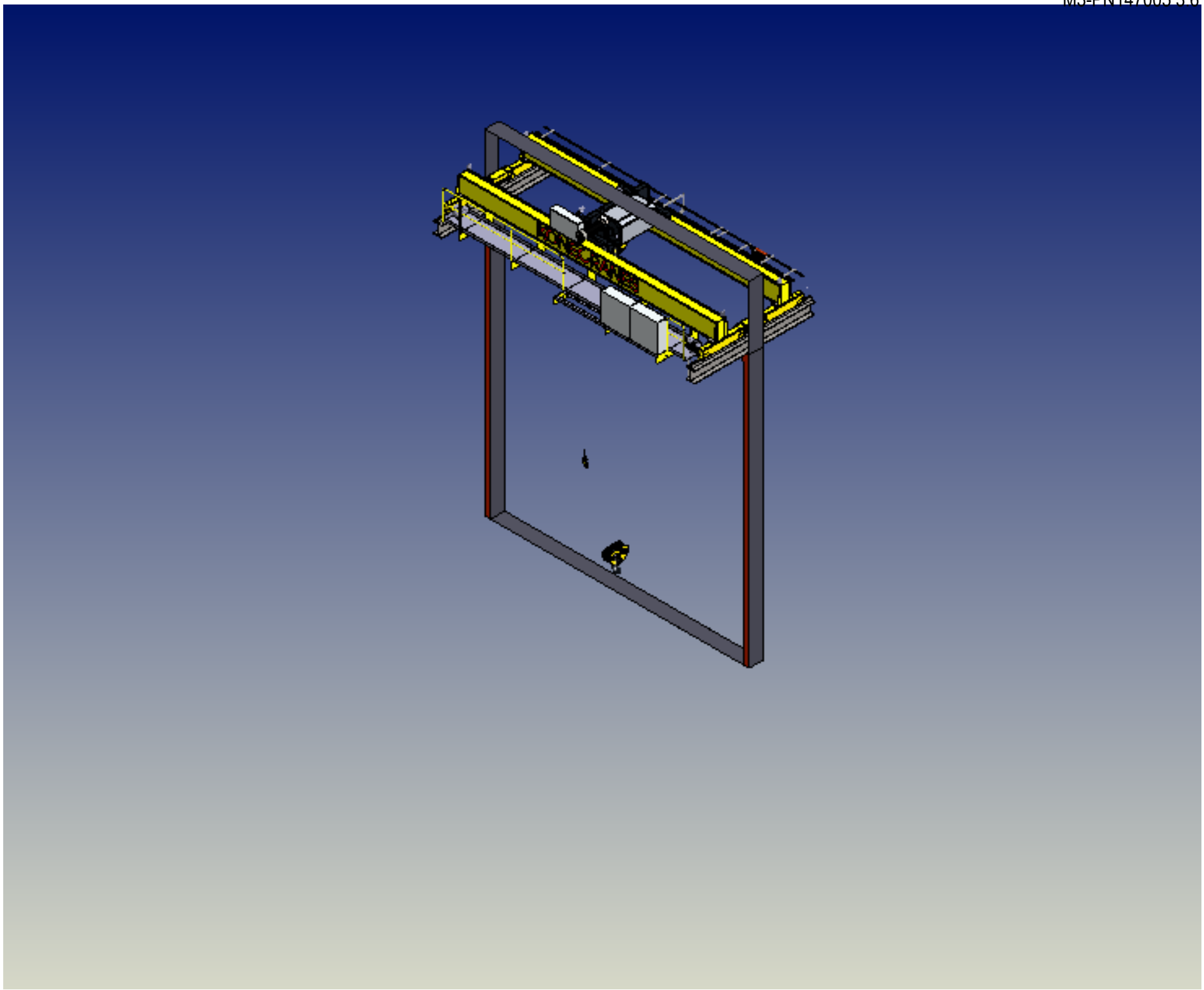
TECHNICAL DATA

LOAD.....	22.05 Ton
LIFTING HEIGHT.....	29'-6 3/8
HOISTING SPEED.....	15 FPM Stepless
TROLLEY SPEED.....	65 ft/min STEPLESS
WEIGHT OF TROLLEY.....	2760 lbs
POWER SUPPLY.....	460 V / 115 V / 60 Hz

DRAWING NOT IN SCALE

PART LIST

JBR/PSF	
5/14/2014	22.05 Ton CXTM Crane
	San Pedro Project
KONECRANES	JBR-14-0710-4



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ISSUED May 2014
09 91 13 - EXTERIOR SPECIFICATION

THE SHERWIN-WILLIAMS COMPANY

COMMERCIAL PAINTING SPECIFICATION GUIDE

This Painting Schedule is furnished only as a guide to select exterior paint systems, and is not all-inclusive of available Sherwin-Williams products. Although it is written in the CSI format and can be included in its entirety in a master specification, one should review the contents and edit to suit the particular needs of the project and its respective location. This specification does not take into consideration wet areas or areas needing high performance coatings.

The schedule is arranged by substrates, and offers latex, & alkyd systems. For High Performance Industrial Coatings refer to 09 96 00. Each system also includes the various degrees of gloss available. Architectural and Industrial products are specified in this document.

Local and National V.O.C. (Volatile Organic Compound) regulations have been taken into consideration, but because these regulations vary greatly around the country and are constantly changing, we suggest verifying that product selections meet the requirements of the area in which they are to be used. If the project is located within the OTC, CARB, SCAQMD or other VOC regulated regions; one must comply with the regulations regarding VOCs. It is always recommended that you consult with a Sherwin-Williams Company Representative or call our Sherwin-Williams Architectural Services Department before finalizing the selection.

If you need more specific information on a particular product, refer to the current Sherwin-Williams Painting Systems Catalog or the www.sherwin-williams.com website, or call our Architectural Services Department toll free.

The Sherwin-Williams Company
Architectural Services Department
1-800-321-8194 (Telephone)
216-566-1392 (Fax)

SECTION 09 91 13

EXTERIOR COMMERCIAL PAINTS AND COATINGS

Part 1 GENERAL

1.1 SECTION INCLUDES

A Exterior paint and coating systems.

1.2 RELATED SECTIONS

A Section 05 05 13 - Shop Applied Coatings for Metal

B Section 06 01 40 - Architectural Woodwork Refinishing

C Section 06 05 83 - Shop Applied Wood Coatings

D Section 07 19 00 - Water Repellents

E Section 09 67 00 - Fluid Applied Flooring for Concrete

F Section 09 93 00 - Stains and Transparent Finishes

G Section 09 96 00 - High-Performance Coatings

1.3 REFERENCES

A SSPC-SP 1 - Solvent Cleaning

B SSPC-SP 2 - Hand Tool Cleaning

C SSPC-SP 3 - Power Tool Cleaning

D SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete

1.4 SUBMITTALS

A Submit under provisions of Section 01 33 00, Submittal Procedures.

B Product Data: Manufacturer's data sheets on each paint and coating product should include:

1 Product characteristics
2 Surface preparation instructions and recommendations
3 Primer requirements and finish specification
4 Storage and handling requirements and recommendations
5 Application methods
6 Clean-up Information

C Selection Samples: Submit a complete set of color chips that represent the full range of manufacturer's color samples available.

D Coating Maintenance Manual: upon conclusion of the project, the Contractor or paint manufacture/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams “Custodian Project Color and Product Information” report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.5 MOCK-UP

Include a mock-up if the project size and/or quality warrant taking such a precaution. The following is one example of how a mock-up on a large project might be specified. When deciding on the extent of the mock-up, consider all the major different types of painting on the project.

A. Finish surfaces for verification of products, colors, & sheens.
B. Finish area designated by Architect.
C. Provide samples that designate prime & finish coats.
D. Do not proceed with remaining work until the Architect approves the mock-up samples.

1.6 DELIVERY, STORAGE, AND HANDLING

A Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacturers name, label, and the following list of information:

1 Product name, and type (description)
2 Application & use instructions
3 Surface preparation
4 VOC content
5 Environmental handling
6 Batch date
7 Color number

B Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
Store materials in an area that is within the acceptable temperature range, per manufacturer’s instructions. Protect from freezing.

C Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

1.7 PROJECT CONDITIONS

Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not apply coatings under environmental conditions outside manufacturer's absolute limits.

Part 2 PRODUCTS

2.1 MANUFACTURERS

A Acceptable Manufacturer:
The Sherwin-Williams Company
101 Prospect Avenue NW
Cleveland, OH 44115
Tel: (800) 321-8194
Fax: (216) 566-1392
www.sherwin-williams.com

B Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 Product Requirements.
When submitting request for substitution, provide complete product data specified above under Submittals, for each substitute product.

2.2 APPLICATIONS/SCOPE

A Use this article to define the scope of painting if not fully defined in a Finish Schedule or on the drawings. This article must be carefully edited to reflect the surfaces actually found on the project. In some cases, it may be enough to use the first paragraph that says, in effect, "paint everything" along with a list of items not to paint, without exhaustively defining all the different surfaces and items that must be painted.

B If the project involves repainting some but not all existing painted surfaces, be sure to indicate the extent of the repainting.

C The descriptions of each system can also be used to further refine the definition of what is to be painted, stained, or clear finished.

D Surfaces to Be Coated:

Concrete: Cementitious Siding, Flexboard, Transite, and Shingles (Non-Roof)
Masonry: Concrete Masonry Units, Cinder or Concrete Block
Concrete: Concrete Floors, Patios, Porches, Steps & Platforms.
Metal: Aluminum/ Galvanized
Metal Ferrous: Misc. Iron, Ornamental Iron,
Wood: Floors, and Platforms
Wood: Siding, Trim, Shutters, Sash, and Misc. Hardboard
Architectural PVC, Plastic, Fiberglass
Drywall: Gypsum Board, and Exterior Drywall
Vinyl: Siding, EIFS, Synthetic Stucco

2.3 SCHEDULE INDEX - EXTERIOR SURFACES (NORMAL EXPOSURE)

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Index of Data pages

DATAPAGES AND MSDS SHEETS: (To open any of the Data page Files, please click here)

Refer to the current MSDS/EDS for specific VOCs (calculated per 40 CFR 59.406). VOCs may vary by base and sheen.

EDIT THIS SCHEDULE TO SELECT PRODUCT AND FINISH DESIRED

2.3 SCHEDULE

A. CONCRETE - (Cementitious Siding, Flexboard, Transite Board, Shingles (Non-Roof), Common Brick, Stucco, Tilt-up, Precast, and Poured-in-place Cement)

1. Latex Systems

a. Gloss Finish

1st Coat: S-W Loxon® Concrete & Masonry Primer Sealer, A24W8300
(8.0 mils wet, 3.2 dry)
2nd Coat: S-W A-100® Exterior Latex Gloss, A8 Series
3rd Coat: S-W A-100 Exterior Latex Gloss, A8 Series
(4.0 mils wet, 1.3 mils dry per coat)

Early Moisture Resistant Finish

1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300
(8.0 mils wet, 3.2 dry)
2nd Coat: S-W Resilience® Latex Gloss, K44 Series
3rd Coat: S-W Resilience Latex Gloss, K44 Series
(4.0 mils wet, 1.6 mils dry per coat)

b. Semi-Gloss Finish

1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300
(8.0 mils wet, 3.2 mils dry)
2nd Coat: S-W Solo® Acrylic Semi-Gloss, A76 Series
3rd Coat: S-W Solo Acrylic Semi-Gloss, A76 Series
(4.0 mils wet, 1.5 mils dry per coat)

c. Satin Finish

1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300
(8.0 mils wet, 3.2 dry)
2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series
3rd Coat: S-W A-100 Exterior Latex Satin, A82 Series
(4.0 mils wet, 1.5 mils dry per coat)

Early Moisture Resistant Finish

1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300
(8.0 mils wet, 3.2 mils dry)
2nd Coat: S-W Resilience Latex Satin, K43 Series
3rd Coat: S-W Resilience Latex Satin, K43 Series
(4.0 mils wet, 1.52 mils dry per coat)

d. Low Sheen Finish

1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300
(8.0 mils wet, 3.2 dry)
2nd Coat: S-W A-100 Exterior Latex Low Sheen, A12 Series
3rd Coat: S-W A-100 Exterior Latex Low Sheen, A12 Series
(4.0 mils wet, 1.5 mils dry per coat)

e. Flat Finish

1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300
(8.0 mils wet, 3.2 mils dry)
2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series
3rd Coat: S-W A-100 Exterior Latex Flat, A6 Series
(4.0 mils wet, 1.2 mils dry per coat)

A. CONCRETE - (Cementitious Siding, Flexboard, Transite Board, Shingles (Non-Roof), Common Brick, Stucco, Tilt-up, Precast, and Poured-in-place Cement) (Cont.)

1. Latex Systems

e. Flat Finish

Early Moisture Resistant Finish

1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300
(8.0 mils wet, 3.2 mils dry)
2nd Coat: S-W Resilience Latex Flat, K42 Series
3rd Coat: S-W Resilience Latex Flat, K42 Series
(4.0 mils wet, 1.56 mils dry per coat)

High Build Coating

1st Coat: S-W Loxon XP, A24-1400 Series
(14.0 mils wet; 6.4 mils dry per coat)

2. Elastomeric System (not including; cementitious siding, Flexboard, Transite board, shingles (Non-Roof))

a. Flat Finish

1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300
(8.0 mils wet, 3.2 mils dry)
2nd Coat: S-W ConFlex XL Elastomeric High Build Coating, A5-400 Series
3rd Coat: S-W ConFlex XL Elastomeric High Build Coating, A5-400 Series
(16.0 mils wet, 7.5 mils dry per coat)

Alternate:

1st Coat: S-W Loxon Block Surfacer, A24W200
(50-100 sq ft/gal)
2nd Coat: S-W SherLastic® Elastomeric Coating, A5 Series
3rd Coat: S-W SherLastic Elastomeric Coating, A5 Series
(14.0 mils wet, 6.0 mils dry per coat)

3. Textured Elastomeric System

a. Textured Finish

1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300
(8.0 mils wet, 3.2 mils dry)
2nd Coat: S-W ConFlex XL Elastomeric High Build Coating, A5-400 Series
(16.0 mils wet, 7.5 mils dry per coat)
3rd Coat: S-W ConFlex XL Textured Elastomeric High Build Coating, A5-800
(Fine, Medium, Extra Coarse) (20.0 mils wet, 9.4 mils dry per coat)

4. Textured & Smooth Systems

a. Textured (Waterbased Finish)

1st Coat: S-W Loxon Block Surfacer, A24W200
(50-100 sq ft/gal)
2nd Coat: S-W UltraCrete Textured Masonry Topcoat, A44-800 Series
(Fine, Medium, Extra Coarse) (50-80 sq ft/gal)

b. Textured Finish (Solvent Based)

1st Coat: S-W UltraCrete Smooth Masonry Water Proof Topcoat, B46 Series
(100-160 sq ft/gal)
2nd Coat: S-W UltraCrete Textured Masonry Water Proof Topcoat, B46 Series
(Fine, Medium, Extra Coarse) (50-80 sq ft/gal)

c. Smooth (Waterbased Finish)

1st Coat: S-W Loxon XP, A24-1400 Series
2nd Coat: S-W Loxon XP, A24-1400 Series
(14.0 mils wet, 6.4mils dry per coat) optional

A. CONCRETE (Cont.)

5. Stain System

a. Solid Color Waterborne Finish
- 1st Coat: S-W Loxon Vertical Concrete Stain, A31 Series
- 2nd Coat: S-W Loxon Vertical Concrete Stain, A31 Series (50-250 sq/ft gal)

6. Clear Water Repellant

a. Clear
- 1st Coat: S-W Loxon 7% Siloxane Water Repellant, A10T7
- 2nd Coat: S-W Loxon 7% Siloxane Water Repellant, A10T7 (50-200 sq ft/ gal)

B. MASONRY (Concrete Masonry Units [CMU]- Cinder or Concrete Block)

1. Latex Systems

a. Gloss Finish
- 1st Coat: S-W PrepRite® Block Filler, B25W25 (75-125 sq ft/gal)
- 2nd Coat: S-W A-100 Exterior Latex Gloss, A8
- 3rd Coat: S-W A-100 Exterior Latex Gloss, A8 (4.0 mils wet, 1.3 mils dry per coat)

Early Moisture Resistant Finish
- 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal)
- 2nd Coat: S-W Resilience Latex Gloss, K44 Series
- 3rd Coat: S-W Resilience Latex Gloss, K44 Series (4.0 mils wet, 1.6 mils dry per coat)

b. Semi-Gloss Finish
- 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal)
- 2nd Coat: S-W Solo Acrylic Semi-Gloss, A76 Series
- 3rd Coat: S-W Solo Acrylic Semi-Gloss, A76 Series (4.0 mils wet, 1.5 mils dry per coat)

c. Satin Finish
- 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal)
- 2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series
- 3rd Coat: S-W A-100 Exterior Latex Satin, A82 Series (4.0 mils wet, 1.5 mils dry per coat)

Early Moisture Resistant Finish
- 1st Coat: S-W Loxon Block Surfacer, A24W200 (50-100 sq ft/gal)
- 2nd Coat: S-W Resilience Latex Satin, K43 Series
- 3rd Coat: S-W Resilience Latex Satin, K43 Series (4.0 mils wet, 1.52 mils dry per coat)

d. Low Sheen Finish
- 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal)
- 2nd Coat: S-W A-100 Exterior Latex Low Sheen, A12 Series
- 3rd Coat: S-W A-100 Exterior Latex Low Sheen, A12 Series (4.0 mils wet, 1.5 mils dry per coat)

B. MASONRY (Concrete Masonry Units [CMU]- Cinder or Concrete Block) (Cont.)

1. Latex Systems

e. Flat Finish

1st Coat: S-W PrepRite Block Filler, B25W25
(75-125 sq ft/gal)
2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series
3rd Coat: S-W A-100 Exterior Latex Flat, A6 Series
(4.0 mils wet, 1.2 mils dry per coat)

Early Moisture Resistant Finish

1st Coat: S-W Loxon Block Surfacer, A24W200
(50-100 sq ft/gal)
2nd Coat: S-W Resilience Latex Flat, K42 Series
3rd Coat: S-W Resilience Latex Flat, K42 Series
(4.0 mils wet, 1.56 mils dry per coat)

High Build Coating

1st Coat: S-W Loxon XP, A24-1400 Series
(14.0 mils wet, 6.4 mils dry per coat)

2. Elastomeric System

a. Flat Finish

1st Coat: S-W Loxon Block Surfacer, A24W200
(50-100 sq ft/gal)
2nd Coat: S-W ConFlex XL Elastomeric High Build Coating, A5-400 Series
3rd Coat: S-W ConFlex XL Elastomeric High Build Coating, A5-400 Series
(16.0 mils wet, 7.5 mils dry per coat)

Alternate:

1st Coat: S-W Loxon Block Surfacer, A24W200
(50-100 sq ft/gal)
2nd Coat: S-W Sherlastic Elastomeric Coating, A5 Series
3rd Coat: S-W Sherlastic Elastomeric Coating, A5 Series
(14.0 mils wet, 6.0 mils dry per coat)

3. Textured Elastomeric System

a. Textured Finish

1st Coat: S-W Loxon Block Surfacer, A24W200
(50-100 sq ft/gal)
2nd Coat: S-W ConFlex XL Elastomeric High Build Coating, A5-400 Series
(16.0 mils wet, 7.5 mils dry per coat)
3rd Coat: S-W ConFlex XL Textured Elastomeric High Build Coating, A5-800
(Fine, Medium, Extra Coarse) (20.0 mils wet, 9.4 mils dry per coat)

4. Textured & Smooth Masonry System

a. Textured (Water Based Finish)

1st Coat: S-W Loxon Block Surfacer, A24W200
(50-100 sq ft/gal)
2nd Coat: S-W UltraCrete Textured Masonry Topcoat, A44-800 Series
(Fine, Medium, Extra Coarse) (50-80 sq ft/ gal)

b. Textured Finish (Solvent Based)

1st Coat: S-W UltraCrete Smooth Masonry Water Proof Topcoat, B46 Series
(100-160 sq ft/gal)
2nd Coat: S-W UltraCrete Textured Masonry Water Proof Topcoat, B46 Series
(Fine, Medium, Extra Coarse) (50-80 sq ft/gal)

B. MASONRY (Concrete Masonry Units [CMU]- Cinder or Concrete Block)(Cont.)

4. Textured & Smooth Masonry System

c. Smooth (Water Based Finish)
1st Coat: S-W Loxon XP, A24-1400 Series
2nd Coat: S-W Loxon XP, A24-1400 Series
(14.0 mils wet 6.4 mils dry per coat) optional

5. Stain System

a. Solid Color Waterborne Finish
1st Coat: S-W Loxon Vertical Concrete Stain, A31 Series
2nd Coat: S-W Loxon Vertical Concrete Stain, A31 Series
(50-250 sq/ft gal)

6. Clear Water Repellant

a. Clear
1st Coat: S-W Loxon 7% Siloxane Water Repellant, A10T7
2nd Coat: S-W Loxon 7% Siloxane Water Repellant, A10T7
(50-200 sq ft/ gal)

C. CONCRETE- (Concrete Floors, Patios, Porches, Steps & Platforms, non-vehicular)

1. Acrylic System Water-Based

a. Floor Finish
1st Coat: S-W Porch & Floor Enamel, A32-Series
2nd Coat: S-W Porch & Floor Enamel, A32-Series
(4.0 mils wet; 1.5 mils dry per coat)
Alternate:
1st Coat: S-W Sher-Crete Flexible Concrete Waterproofer, A5 Series
2nd Coat: S-W Sher-Crete Flexible Concrete Waterproofer, A5 Series
(10.0-12.0 mils wet per coat)

2. Solid Stain Finish

a. Low Luster Finish
1st Coat: S-W H&C Concrete Stain Solid Color Water Based
2nd Coat: S-W H&C Concrete Stain Solid Color Water Based
(50-250 sq ft/ gal)

D. METAL – Aluminum/ Galvanized

1. Latex Systems

a. Gloss Finish
1st Coat: S-W A-100 Exterior Latex Gloss, A8
2nd Coat: S-W A-100 Exterior Latex Gloss, A8
(4.0 mils wet, 1.3 mils dry per coat)

Early Moisture Resistant Finish
1st Coat: S-W Resilience Latex Gloss, K44 Series
2nd Coat: S-W Resilience Latex Gloss, K44 Series
(4.0 mils wet, 1.6 mils dry per coat)

b. Semi-Gloss Finish
1st Coat: S-W Solo Acrylic Semi-Gloss, A76 Series
2nd Coat: S-W Solo Acrylic Semi-Gloss, A76 Series
(4.0 mils wet, 1.5 mils dry per coat)

c. Satin Finish
1st Coat: S-W A-100 Exterior Latex Satin, A82 Series
2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series
(4.0 mils wet, 1.5 mils dry per coat)

D. METAL – Aluminum/ Galvanized (Cont.)

1. Latex Systems

c. **Early Moisture Resistant Finish**
1st Coat: S-W Resilience Latex Satin, K43 Series
2nd Coat: S-W Resilience Latex Satin, K43 Series
(4.0 mils wet, 1.52 mils dry per coat)

d. Low Sheen Finish
1st Coat: S-W A-100 Exterior Latex Low Sheen, A12 Series
2nd Coat: S-W A-100 Exterior Latex Low Sheen, A12 Series
(4.0 mils wet, 1.5 mils dry per coat)

e. Flat Finish
1st Coat: S-W A-100 Exterior Latex Flat, A6 Series
2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series
(4.0 mils wet, 1.4 mils dry per coat)

Early Moisture Resistant Finish
1st Coat: S-W Resilience Latex Flat, K42 Series
2nd Coat: S-W Resilience Latex Flat, K42 Series
(4.0 mils wet, 1.2 mils dry per coat)

** NOTE TO SPECIFIER** For High Performance Metal Systems refer to 09 96 00

E. METAL Ferrous- (Misc. Iron, Ornamental Iron, Structural Iron & Steel,)

1. Latex Systems

a. Gloss Finish
1st Coat: S-W Pro Industrial™ Pro-Cryl® Universal Primer, B66-310 Series
(5.0 mils wet, 2.0 mils dry)
2nd Coat: S-W A-100 Exterior Latex Gloss, A8 Series
3rd Coat: S-W A-100 Exterior Latex Gloss, A8 Series
(4.0 mils wet, 1.3 mils dry per coat)

b. Semi-Gloss Finish
1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series
(5.0 mils wet, 2.0 mils dry)
2nd Coat: S-W Solo Acrylic Semi-Gloss, A76 Series
3rd Coat: S-W Solo Acrylic Semi-Gloss, A76 Series
(4.0 mils wet, 1.5 mils dry per coat)

** NOTE TO SPECIFIER** For High Performance Metal Systems refer to 09 96 00

F. WOOD- Decks, (including pressure treated lumber) (Floors, Platforms non-vehicular)

1. Acrylic System

a. Satin Floor Finish
1st Coat: S-W Porch & Floor Enamel, A32 Series
2nd Coat: S-W Porch & Floor Enamel, A32 Series
(4.0 mils wet, 1.5 mils dry per coat)

2. Stain Systems

a. Solid Color Acrylic Latex
1st Coat: S-W DeckScapes Exterior Acrylic Solid Color Deck Stain, A15-150 Series
2nd Coat: S-W DeckScapes Exterior Acrylic Solid Color Deck Stain, A15-150 Series
(200-400 s/f per gal.)

F. WOOD- Decks, (including pressure treated lumber) (Floors, Platforms non-vehicular)
2. Stain Systems (Cont.)

b. Semi-Transparent Stain
1st Coat: S-W DeckScapes Exterior Waterborne Deck Stain, A15T215 Series
2nd Coat: S-W DeckScapes Exterior Waterborne Deck Stain, A15T215 Series
(100-350 s/f per gal)

c. Clear Stain
1st Coat: S-W DeckScapes Exterior Waterborne Clear, A15T260
2nd Coat: S-W DeckScapes Exterior Waterborne Clear, A15T260
(150-300 sq/ft gal)

G. WOOD (Siding, Trim, Shutters, Sashes, Hardboard-Bare/Primed)
1. Latex Systems

a. Gloss Finish
1st Coat: S-W Exterior Latex Wood Primer, B42W8041
(4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W A-100 Exterior Latex Gloss, A8
3rd Coat: S-W A-100 Exterior Latex Gloss, A8
(4.0 mils wet, 1.3 mils dry per coat)

Early Moisture Resistant Finish
1st Coat: S-W Exterior Latex Wood Primer, B42W8041
(4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W Resilience Latex Gloss, K44 Series
3rd Coat: S-W Resilience Latex Gloss, K44 Series
(4.0 mils wet, 1.6 mils dry per coat)

b. Semi-Gloss Finish
1st Coat: S-W Exterior Latex Wood Primer, B42W8041
(4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W Solo Acrylic Semi-Gloss, A76 Series
3rd Coat: S-W Solo Acrylic Semi-Gloss, A76 Series
(4.0 mils wet, 1.5 mils dry per coat)

c. Satin Finish
1st Coat: S-W Exterior Latex Wood Primer, B42W8041
(4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series
3rd Coat: S-W A-100 Exterior Latex Satin, A82 Series
(4.0 mils wet, 1.5 mils dry per coat)

Early Moisture Resistant Finish
1st Coat: S-W Exterior Latex Wood Primer, B42W8041
(4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W Resilience Latex Satin, K43 Series
3rd Coat: S-W Resilience Latex Satin, K43 Series
(4.0 mils wet, 1.52 mils dry per coat)

d. Low Sheen Finish
1st Coat: S-W Exterior Latex Wood Primer, B42W8041
(4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W A-100 Exterior Latex Low Sheen, A12 Series
3rd Coat: S-W A-100 Exterior Latex Low Sheen, A12 Series
(4.0 mils wet, 1.5 mils dry per coat)

G. WOOD (Siding, Trim, Shutters, Sashes, Hardboard-Bare/Primed) (Cont.)

1. Latex Systems

e. Flat Finish

1st Coat: S-W Exterior Latex Wood Primer, B42W8041
(4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series
3rd Coat: S-W A-100 Exterior Latex Flat, A6 Series
(4.0 mils wet, 1.2 mils dry per coat)

Early Moisture Resistant Finish

1st Coat: S-W Exterior Latex Wood Primer, B42W8041
(4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W Resilience Latex Flat, K42 Series
3rd Coat: S-W Resilience Latex Flat, K42 Series
(4.0 mils wet, 1.56 mils dry per coat)

2. Stain - Water Reducible Systems

a. Semi-Transparent

1st Coat: S-W WoodScapes® Semi-Transparent Stain, A15T5
2nd Coat: S-W WoodScapes Semi-Transparent Stain, A15T5
(100-350 sq ft/gal)

Satin Finish

1st Coat: S-W Log Home Semi-Transparent Stain Satin, A15T1000
2nd Coat: S-W Log Home Semi-Transparent Stain Satin, A15T1000
(100-350 sq ft/gal)

b. Solid Color

1st Coat: S-W WoodScapes Solid Color Stain, A15 Series
2nd Coat: S-W WoodScapes Solid Color Stain, A15 Series
(200-400 sq ft/gal)

Alternate:

1st Coat: S-W ProMar Solid Color Stain, A16 Series
2nd Coat: S-W ProMar Solid Color Stain, A16 Series
(200-400 sq ft/gal)

H. ARCHITECTURAL PVC, PLASTIC, FIBERGLASS
(due to the variety of substrate, check for compatibility)

1. Latex Systems

a. Gloss Finish
1st Coat: S-W PrepRite ProBlock Latex Primer/ Sealer, B51 Series (4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W A-100 Exterior Latex Gloss, A8
3rd Coat: S-W A-100 Exterior Latex Gloss, A8
(4.0 mils wet, 1.3 mils dry per coat)

Early Moisture Resistant Finish
1st Coat: S-W PrepRite ProBlock Latex Primer/ Sealer, B51 Series (4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W Resilience Latex Gloss, K44 Series
3rd Coat: S-W Resilience Latex Gloss, K44 Series
(4.0 mils wet, 1.6 mils dry per coat)

b. Semi-Gloss
1st Coat: S-W PrepRite ProBlock Latex Primer/ Sealer, B51 Series (4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W Solo Acrylic Semi-Gloss, A76 Series
3rd Coat: S-W Solo Acrylic Semi-Gloss, A76 Series
(4.0 mils wet, 1.5 mils dry per coat)

c. Satin Finish
1st Coat: S-W PrepRite ProBlock Latex Primer/ Sealer, B51 Series (4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series
3rd Coat: S-W A-100 Exterior Latex Satin, A82 Series
(4.0 mils wet, 1.5 mils dry per coat)

Early Moisture Resistant Finish
1st Coat: S-W PrepRite ProBlock Latex Primer/ Sealer, B51 Series (4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W Resilience Latex Satin, K43 Series
3rd Coat: S-W Resilience Latex Satin, K43 Series
(4.0 mils wet, 1.52 mils dry per coat)

d. Low Sheen Finish
1st Coat: S-W PrepRite® ProBlock® Latex Primer/ Sealer, B51 Series (4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W A-100 Exterior Latex Low Sheen, A12 Series
3rd Coat: S-W A-100 Exterior Latex Low Sheen, A12 Series
(4.0 mils wet, 1.5 mils dry per coat)

e. Flat Finish
1st Coat: S-W PrepRite ProBlock Latex Primer/ Sealer, B51 Series (4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series
3rd Coat: S-W A-100 Exterior Latex Flat, A6 Series
(4.0 mils wet, 1.2 mils dry per coat)

Early Moisture Resistant Finish
1st Coat: S-W PrepRite ProBlock Latex Primer/ Sealer, B51 Series (4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W Resilience Latex Flat, K42 Series
3rd Coat: S-W Resilience Latex Flat, K42 Series

(4.0 mils wet, 1.56 mils dry per coat)

I. DRYWALL (Gypsum Board, Exterior Drywall)

1. Latex Systems

a. Gloss Finish

1st Coat: S-W Exterior Latex Wood Primer, B42W8041
(4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W A-100 Exterior Latex Gloss, A8
3rd Coat: S-W A-100 Exterior Latex Gloss, A8
(4.0 mils wet, 1.3 mils dry per coat)

Early Moisture Resistant Finish

1st Coat: S-W Exterior Latex Wood Primer, B42W8041
(4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W Resilience Latex Gloss, K44 Series
3rd Coat: S-W Resilience Latex Gloss, K44 Series
(4.0 mils wet, 1.6 mils dry per coat)

b. Semi-Gloss Finish

1st Coat: S-W Exterior Latex Wood Primer, B42W8041
(4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W Solo Acrylic Semi-Gloss, A76 Series
3rd Coat: S-W Solo Acrylic Semi-Gloss, A76 Series
(4.0 mils wet, 1.5 mils dry per coat)

c. Satin Finish

1st Coat: S-W Exterior Latex Wood Primer, B42W8041
(4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series
3rd Coat: S-W A-100 Exterior Latex Satin, A82 Series
(4.0 mils wet, 1.5 mils dry per coat)

Early Moisture Resistant Finish

1st Coat: S-W Exterior Latex Wood Primer, B42W8041
(4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W Resilience Latex Satin, K43 Series
3rd Coat: S-W Resilience Latex Satin, K43 Series
(4.0 mils wet, 1.52 mils dry per coat)

d. Low Sheen Finish

1st Coat: S-W Exterior Latex Wood Primer, B42W8041
(4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W A-100 Exterior Latex Low Sheen, A12 Series
3rd Coat: S-W A-100 Exterior Latex Low Sheen, A12 Series
(4.0 mils wet, 1.5 mils dry per coat)

e. Flat Finish

1st Coat: S-W Exterior Latex Wood Primer, B42W8041
(4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series
3rd Coat: S-W A-100 Exterior Latex Flat, A6 Series
(4.0 mils wet, 1.2 mils dry per coat)

Early Moisture Resistant Finish

1st Coat: S-W Exterior Latex Wood Primer, B42W8041
(4.0 mils wet, 1.4 mils dry)
2nd Coat: S-W Resilience Latex Flat, K42 Series
3rd Coat: S-W Resilience Latex Flat, K42 Series

(4.0 mils wet, 1.56 mils dry per coat)

J. VINYL SIDING EIFS, SYNTHETIC STUCCO

1. Latex Systems

a. Gloss Finish
1st Coat: S-W A-100 Exterior Latex Gloss, A8
2nd Coat: S-W A-100 Exterior Latex Gloss, A8
(4.0 mils wet, 1.3 mils dry per coat)

VinylSafe™ Early Moisture Resistant Finish
1st Coat: S-W Resilience Latex Gloss, K44 Series
2nd Coat: S-W Resilience Latex Gloss, K44 Series
(4.0 mils wet, 1.6 mils dry per coat)

b. Semi-Gloss Finish
1st Coat: S-W Solo Acrylic Semi-Gloss, A76 Series
2nd Coat: S-W Solo Acrylic Semi-Gloss, A76 Series
(4.0 mils wet, 1.5 mils dry per coat)

c. Satin Finish
1st Coat: S-W A-100 Exterior Latex Satin, A82 Series
2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series
(4.0 mils wet, 1.5 mils dry per coat)

VinylSafe™ Early Moisture Resistant Finish
1st Coat: S-W Resilience Latex Satin, K43 Series
2nd Coat: S-W Resilience Latex Satin, K43 Series
(4.0 mils wet, 1.52 mils dry per coat)

d. Low Sheen Finish
1st Coat: S-W A-100® Exterior Latex Low Sheen, A12 Series
2nd Coat: S-W A-100 Exterior Latex Low Sheen, A12 Series
(4.0 mils wet, 1.5 mils dry per coat)

e. Flat Finish
1st Coat: S-W A-100 Exterior Latex Flat, A6 Series
2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series
(4.0 mils wet, 1.2 mils dry per coat)

VinylSafe™ Early Moisture Resistant Finish
1st Coat: S-W Resilience Latex Flat, K42 Series
2nd Coat: S-W Resilience Latex Flat, K42 Series
(4.0 mils wet, 1.56 mils dry per coat)

2.4 MATERIALS - GENERAL REQUIREMENTS

A Paints and Coatings - General:
1 Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such a procedure is specifically described in manufacturer's product instructions. VOCs need to be confirmed by using the products MSDS sheets.

B Primers:
1 Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

2.5 ACCESSORIES:

A Coating Application Accessories:
1 Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required per manufacturer’s specifications.

Part 3 EXECUTION

3.1 EXAMINATION

A Do not begin application of coatings until substrates have been properly examined and prepared. Notify Architect of unsatisfactory conditions before proceeding

B If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C Proceed with work only after conditions have been corrected, and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

D Previously Painted Surfaces: Verify that existing painted surfaces do not contain lead based paints, notify Architect immediately if lead based paints are encountered.

*(**Specifier Note**: Verify the existence of lead based paints on the project. Buildings constructed after 1978 are less likely to contain lead based paints. If lead based paints are suspected on the project, all removal must be done in accordance with the EPA Renovation, Repair and Painting rule and all applicable state and local regulations. State and local regulations may be more strict than those set under the federal regulations Verify that Owner has completed a Hazardous Material Assessment Report for the project prior to issuing of Drawings. Concluding that no lead based paints were found on project site, delete paragraph regarding lead based paints.)*

3.2 SURFACE PREPARATION:

WARNING! Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as a properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or contact your local health authority. Removal must be done in accordance with EPA Renovation, Repair and Painting Rule and all related state and local regulations. Care should be taken to follow all state and local regulations which may be more strict than those set under the federal RRP Rule.

A. Proper product selection, surface preparation, and application affect coating performance. Coating integrity and service life will be reduced because of improperly prepared surfaces. Selection and implementation of proper surface preparation ensures coating adhesion to the substrate and prolongs the service life of the coating system.

B. Selection of the proper method of surface preparation depends on the substrate, the environment, and the expected service life of the coating system. Economics, surface contamination, and the effect on the substrate will also influence the selection of surface preparation methods.

C. The surface must be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.

D. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow the surface to dry 48 hours before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.

E. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50°F, unless products are designed specifically for these conditions. On large expanses of metal siding, the air, surface and material temperatures must be 50°F or higher to use low temperature products.

F. Methods:

1 Aluminum
Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP1, Solvent Cleaning.

2 Block (Cinder and Concrete)
Remove all loose mortar and foreign material. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement, and hardeners. Concrete and mortar must be cured at least 30 days at 75°F, unless the manufactures products are designed for application prior to the 30-day period. The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments. On tilt-up and poured-in-place concrete, commercial detergents and abrasive blasting may be necessary to prepare the surface. Fill bug holes, air pockets, and other voids with a cement patching compound.

3 Concrete, SSPC-SP13 or NACE 6
This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems. The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces. An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.

4 Cement Composition Siding/Panels
Remove all surface contamination by washing with an appropriate cleaner, rinse thoroughly and allow to dry. Existing peeled or checked paint should be scraped and sanded to a sound surface. Pressure clean, if needed, with a minimum of 2100 psi pressure to remove all dirt, dust, grease, oil, loose particles, laitance, foreign material, and peeling or defective coatings. Allow the surface to dry thoroughly. The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments.

5 Copper and Stainless Steel
Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP 2, Hand Tool Cleaning.

6 Drywall—Exterior
Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting. Exterior surfaces must be spackled with exterior grade compounds.

7 Exterior Composition Board (Hardboard)
Some composition boards may exude a waxy material that must be removed with a solvent prior to coating. Whether factory primed or unprimed, exterior composition board siding (hardboard) must be cleaned thoroughly and primed with an alkyd primer.

8 Galvanized Metal
Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP7 is necessary to remove these treatments.

9 Steel: Structural, Plate, etc.
Should be cleaned by one or more of the surface preparations described below. These methods are used throughout the world for describing methods for cleaning structural steel. Visual standards are available through the Society of Protective Coatings. A brief description of these standards together with numbers by which they can be specified follow.

10 Solvent Cleaning, SSPC-SP1
Solvent cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.

11 Hand Tool Cleaning, SSPC-SP2
Hand Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before hand tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.

12 Power Tool Cleaning, SSPC-SP3
Power Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before power tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.

13 White Metal Blast Cleaning, SSPC-SP5 or NACE 1
A White Metal Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.

14 Commercial Blast Cleaning, SSPC-SP6 or NACE 3
A Commercial Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 33 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.

15 Brush-Off Blast Cleaning, SSPC-SP7 or NACE 4
A Brush-Off Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose paint. Tightly adherent mill scale, rust, and paint may remain on the surface. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP 1 or other agreed upon methods.

16 Power Tool Cleaning to Bare Metal, SSPC-SP11
Metallic surfaces that are prepared according to this specification, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxide corrosion products, and other foreign matter. Slight residues of rust and paint may be left in the lower portions of pits if the original surface is pitted. Prior to power tool surface preparation, remove visible deposits of oil or grease by any of the methods specified in SSPC-SP1, Solvent Cleaning, or other agreed upon methods.

17 Near-White Blast Cleaning, SSPC-SP10 or NACE 2
A Near White Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 5 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.

18 High- and Ultra-High Pressure Water Jetting for Steel and Other Hard Materials
SSPC-SP12 or NACE 5
This standard provides requirements for the use of high- and ultra-high pressure water jetting to achieve various degrees of surface cleanliness. This standard is limited in scope to the use of water only without the addition of solid particles in the stream.

19 Water Blasting, NACE Standard RP-01-72
Removal of oil grease dirt, loose rust, loose mill scale, and loose paint by water at pressures of 2,000 to 2,500 psi at a flow of 4 to 14 gallons per minute.

20 Stucco
Must be clean and free of any loose stucco. If recommended procedures for applying stucco are followed, and normal drying conditions prevail, the surface may be painted in 30 days. The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments such as Loxon®.

21 Wood—Exterior
Must be clean and dry. Knots and pitch streaks must be scraped, sanded, and spot primed before a full priming coat is applied. Patch all nail holes and imperfections with a wood filler or putty and sand smooth.

22 Vinyl Siding, Architectural Plastics, EIFS and Fiberglass
Clean vinyl siding thoroughly by scrubbing with a warm, soapy water solution. Rinse thoroughly. Do not paint with any color darker than the original siding, unless the paint system features Sherwin-Williams VinylSafe technology. Painting with darker colors that are not Sherwin-Williams VinylSafe may cause siding to warping.

3.3 INSTALLATION

A Apply all coatings and materials with the manufacturer's specifications in mind. Mix and thin coatings according to manufacturer's recommendation.

B Do not apply to wet or damp surfaces.

1 Wait at least 30 days before applying to new concrete or masonry. Or follow manufacturer's procedures to apply appropriate coatings prior to 30 days.
2 Test new concrete for moisture content.
3 Wait until wood is fully dry after rain or morning fog or dew.

C Apply coatings using methods recommended by manufacturer.

D Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

E Apply coatings at spreading rate required to achieve the manufacturer's recommended dry film thickness.

F Regardless of number of coats specified, apply as many coats as necessary for complete hide.

G Exterior Woodwork: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 2 weeks.

H Inspection: The coated surface must be inspected and approved by the Architect or Engineer just prior to the application of each coat.

3.4 PROTECTION

A Protect finished coatings from damage until completion of project.

B Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

3.5 SCHEDULES

Specifier Note: Cut and paste the coatings system schedule here (specified in section 2.3 PAINT SCHEDULE), otherwise delete this section.

END OF SECTION5132014

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ISSUED May 2013

09 91 23–INTERIOR PAINTING

THE SHERWIN-WILLIAMS COMPANY

COMMERCIAL PAINTING SCHEDULE GUIDE

This Painting Schedule is furnished only as a guide to select interior paint systems, and is not all-inclusive of available Sherwin-Williams products. Although it is written in the CSI format and can be included in its entirety in a master specification, one should review the contents and edit to suit the particular needs of the project and its respective location.

The schedule is arranged by substrates, and offers latex, & alkyd systems. For Higher Performance Industrial Coatings refer to 09 96 00. Each system also includes the various degrees of gloss available. Architectural and Industrial products are specified in this document.

Local and National V.O.C. (Volatile Organic Compound) regulations have been taken into consideration, but because these regulations vary greatly around the country and are subject to change, we suggest verifying product selections meet the requirements of the area in which they are to be used. If the project is located within the OTC, CARB, SCAQMD or other VOC regulated regions; one must comply with the regulations regarding VOCs. It is always recommended that you consult with a Sherwin-Williams Company Representative or call our Sherwin-Williams Architectural Services Department before finalizing the selection.

If you need more specific information on a particular product, refer to the current Sherwin-Williams Painting Systems Catalog or the www.sherwin-williams.com, website or call our Architectural Services Department toll free.

The Sherwin-Williams Company
Architectural Services Department
1-800-321-8194 (Telephone)
216-566-1392 (Fax)

SECTION 09 91 23

INTERIOR PAINTS AND COATINGS

Part 1 GENERAL

1.1 SECTION INCLUDES

A Interior paint and coatings systems including: paint, stains, transparent coatings, and opaque finishes

1.2 RELATED SECTIONS

A Section 05 05 13- Shop Applied Coatings for Metal

B Section 06 01 40 - Architectural Woodwork Refinishing

C Section 06 05 83 - Shop Applied Wood Coatings

D Section 07 19 00 - Water Repellents

E Section 09 67 00 - Fluid Applied Flooring for Concrete

F Section 09 93 00 - Stains and Transparent Finishes

G Section 09 96 00 - High-Performance Coatings

1.3 REFERENCES

A SSPC-SP 1 - Solvent Cleaning

B SSPC-SP 2 - Hand Tool Cleaning

C SSPC-SP 3 - Power Tool Cleaning

D SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete

1.4 SUBMITTALS

A Submit under provisions of Section 01 33 00, Submittal Procedures.

B Product Data: Manufacturer's data sheets on each paint and coating product should include:

1 Product characteristics
2 Surface preparation instructions and recommendations
3 Primer requirements and finish specification
4 Storage and handling requirements and recommendations
5 Application methods
6 Cleanup Information

C Selection Samples: Submit a complete set of color chips that represent the full range of manufacturer's color samples available.

D Coating Maintenance Manual: upon conclusion of the project, the Contractor or paint manufacture/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.5 MOCK-UP

Include a mock-up if the project size and/or quality warrant taking such a precaution. The following is one example of how a mock-up on a large project might be specified. When deciding on the extent of the mock-up, consider all the major different types of painting on the project.

A Finish surfaces for verification of products, colors, & sheens
B Finish area designated by Architect
C Provide samples that designate prime & finish coats
D Do not proceed with remaining work until the Architect approves the mock-up samples

1.6 DELIVERY, STORAGE, AND HANDLING

A Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacture's name, label, and the following list of information:

Product name and type (description)
Application & use instructions
Surface preparation
VOC content
Environmental handling
Batch date
Color number

B Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
Store materials in an area that is within the acceptable temperature range, per manufacturers instructions. Protect from freezing.

C Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

1.7 PROJECT CONDITIONS

A Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not apply coatings under environmental conditions outside manufacturer's absolute limits.

Part 2 PRODUCTS

2.1 MANUFACTURERS

A Acceptable Manufacturer:

The Sherwin-Williams Company
101 Prospect Avenue NW
Cleveland, OH 44115
Tel: (800) 321-8194
Fax: (216) 566-1392
www.sherwin-williams.com

B Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 Product Requirements.
When submitting request for substitution, provide complete product data specified above under Submittals, for each substitute product.

2.2 APPLICATION/SCOPE

A Use this article to define the scope of painting if not fully defined in a Finish Schedule or on the drawings. This article must be carefully edited to reflect the surfaces actually found on the project. In some cases, it may be enough to use the first paragraph that says, in effect, "paint everything" along with a list of items not to paint, without exhaustively defining all the different surfaces and items that must be painted.

B If the project involves repainting some but not all existing painted surfaces, be sure to indicate the extent of the repainting.

C The descriptions of each system can also be used to further refine the definition of what is to be painted, stained, or clear finished.

D Surfaces to Be Coated:
Concrete: Poured, Precast, Tilt-Up, Cast-In-Place, Cement Board, Plaster
Concrete: Floors
Masonry: (CMU - Concrete, Split Face, Scored, Smooth, etc.)
Metal: Aluminum/ Galvanizing
Metal Ferrous: (Structural Steel, Joists, Trusses, Beams, Partitions, etc.)
Wood: Walls, Ceilings, Doors, Trim, etc
Wood: Floors-Painted
Drywall: Drywall board, Gypsum board

**** NOTE TO SPECIFIER** For High Performance Systems and Dryfall refer to 09 96 00**

2.3 SCHEDULE

A. CONCRETE.....Pages 6-7
(Walls & Ceilings, Poured, Precast, Unglazed Brick, Cement Board, Tilt-Up, Cast-In-Place) Including Plaster
1. Latex Systems
2. Alkyd Systems (Waterbased Acrylic-Alkyd)
3. Concrete Stain (Water Base)

B. CONCRETE- FLOORS .....Page 7
1. Acrylic System
2. Concrete Stain (Water Base)

C. MASONRY .....Pages 8-9
(CMU - Concrete, Split Face, Scored, Smooth, High/Low Density, Fluted)
1. Latex Systems
2. Alkyd Systems (Waterbased Acrylic-Alkyd)
3. Concrete Stain (Water Base)

D. METAL - (Aluminum, Galvanized) .....Pages 9-10
1. Latex Systems
2. Alkyd Systems (Waterbased Acrylic-Alkyd)
3. Dryfall Systems

E. METAL-FERROUS .....Pages 10-12
(Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous & Ornamental Iron, Sashes, Doors, Partitions)
1. Latex Systems
2. Alkyd Systems (Waterbased Acrylic-Alkyd)
3. Dryfall Systems

F. WOOD .....Pages 13-14
(Walls, Ceilings, Doors, Trim, Partitions, Frames)
1. Latex Systems
2. Alkyd Systems (Waterbased Acrylic-Alkyd)
3. Stain & Varnish
4. Satin, Sealer & Varnish

G. WOOD - (Floors, light foot traffic-Painted, Stained & Varnished) .....Page 15
1. Acrylic System
2. Urethane System (Solvent Base)

H. DRYWALL.....Pages 16-17
(Walls, Ceilings, Gypsum Board, Plaster Board, etc.)
1. Latex Systems
2. Alkyd Systems (Waterbased Acrylic-Alkyd)

Index of Data pages

DATAPAGES AND MSDS SHEETS: (To open any of the Data Page Files, please click here)

Refer to the current MSDS/EDS for specific VOCs (calculated per 40 CFR 59.406). VOCs may vary by base and sheen.

EDIT THIS SCHEDULE TO SELECT PRODUCT AND FINISH DESIRED AND VOC NEEDS

2.3 SCHEDULE

A CONCRETE - (Walls & Ceilings, Poured Concrete, Precast Concrete, Unglazed Brick, Cement Board, Tilt-Up, Cast-In-Place)

1. Latex Systems

a. Gloss
- 1st Coat: S-W Loxon® Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry)
- 2nd Coat: S-W ProMar® 200 Latex Gloss, B21-2200 Series
- 3rd Coat: S-W ProMar 200 Latex Gloss, B21-2200 Series (4 mils wet, 1.5 mils dry per coat)

b. Semi-Gloss Finish
- 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry)
- 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series
- 3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series (4 mils wet, 1.6 mils dry per coat)

c. Eg-Shel Finish
- 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry)
- 2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series
- 3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series (4 mils wet, 1.7 mils dry per coat)

d. Low Sheen Finish
- 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry)
- 2nd Coat: S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series
- 3rd Coat: S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series (4 mils wet, 1.6 mils dry per coat)

e. Flat Finish
- 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry)
- 2nd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series
- 3rd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series (4 mils wet, 1.6 mils dry per coat)

A. CONCRETE (Cont.)

2. Alkyd Systems (Waterbased Acrylic-Alkyd)

a. Gloss Finish

1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300
(8 mils wet, 3.2 mils dry)
2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series
3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series
(4 mils wet, 1.7 mils dry per coat)

b. Semi-Gloss Finish

1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300
(8 mils wet, 3.2 mils dry)
2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series
3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series
(4 mils wet, 1.7 mils dry per coat)

c. Eg-Shel Finish

1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300
(8 mils wet, 3.2 mils dry)
2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Eg-Shel, B33-8200 Series
3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Eg-Shel, B33-8200 Series
(4 mils wet, 1.4 mils dry per coat)

3. Concrete Stain (Water Base)

a. Flat Finish Opaque

1st Coat: S-W H&C® Concrete Stain Solid Color Water Based
2nd Coat: S-W H&C Concrete Stain Solid Color Water Based
(50-300 sq/ft per gallon)

**** NOTE TO SPECIFIER** For High Performance Systems refer to 09 96 00**

B. CONCRETE- FLOORS (Non-Vehicular)

1. Acrylic System

a. Satin Finish

1st Coat: S-W Porch & Floor Enamel, A32-200 Series
2nd Coat: S-W Porch & Floor Enamel, A32-200 Series
(4 mils wet, 1.5 mils dry)

Alternate

1st Coat: S-W Sher-Crete Flexible Concrete Waterproofer, A5 Series
2nd Coat: S-W Sher-Crete Flexible Concrete Waterproofer, A5 Series
(10-12 mils wet per coat)

2. Concrete Stain (Water Base)

a. Low Luster Finish Opaque

1st Coat: S-W H&C Concrete Stain Solid Color Water Based
2nd Coat: S-W H&C Concrete Stain Solid Color Water Based
(50-300 sq/ft per gallon)

C. MASONRY - (CMU - Concrete, Split, Scored, Smooth, High/Low Density, Fluted)

1. Latex Systems

a. Gloss Finish
- 1st Coat: S-W PrepRite® Block Filler, B25W25 (75-125 sq ft/gal)
- 2nd Coat: S-W ProMar 200 Latex Gloss B21-2200 Series
- 3rd Coat: S-W ProMar 200 Latex Gloss B21-2200 Series (4 mils wet, 1.5 mils dry per coat)

b. Semi-Gloss Finish
- 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal)
- 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series
- 3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series (4 mils wet, 1.6 mils dry per coat)

c. Eg-Shel Finish
- 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal)
- 2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series
- 3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series (4 mils wet, 1.7 mils dry per coat)

d. Low Sheen Finish
- 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal)
- 2nd Coat: S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series
- 3rd Coat: S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series (4 mils wet, 1.6 mils dry per coat)

e. Flat Finish
- 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal)
- 2nd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series
- 3rd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series (4 mils wet, 1.6 mils dry per coat)

2. Alkyd Systems (Waterbased Acrylic-Alkyd)

a. Gloss Finish
- 1st Coat: S-W Loxon® Block Surfacer, A24W200 (50-100 sq ft/gal)
- 2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series
- 3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series (4 mils wet, 1.7 mils dry per coat)

b. Semi-Gloss Finish
- 1st Coat: S-W Loxon Block Surfacer, A24W200 (50-100 sq ft/gal)
- 2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series
- 3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series (4 mils wet, 1.7 mils dry per coat)

c. Eg-Shel Finish
- 1st Coat: S-W Loxon Block Surfacer, A24W200 (50-100 sq ft/gal)
- 2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Eg-Shel, B33-8200 Series
- 3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Eg-Shel, B33-8200 Series (4 mils wet, 1.4 mils dry per coat)

C. MASONRY - (CMU - Concrete, Split, Scored, Smooth, High/Low Density, Fluted)(Cont.)

3. Concrete Stain (Water Base)

a. Flat Finish Opaque
- 1st Coat: S-W H&C Concrete Stain Solid Color Water Based
- 2nd Coat: S-W H&C Concrete Stain Solid Color Water Based
(50-300 sq/ft per gallon)

**** NOTE TO SPECIFIER** For High Performance Systems refer to 09 96 00**

D. METAL – Aluminum/ Galvanized

1. Latex Systems

a. Gloss Finish
- 1st Coat: S-W Pro Industrial™ Pro-Cryl® Universal Primer, B66-310 Series
(5-10 mils wet, 2-4 mils dry)
- 2nd Coat: S-W ProMar 200 Latex Gloss Enamel, B21-2200 Series
- 3rd Coat: S-W ProMar 200 Latex Gloss Enamel, B21-2200 Series
(4 mils wet, 1.5 mils dry per coat)

b. Semi-Gloss Finish
- 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series
(5-10 mils wet, 2-4 mils dry)
- 2nd Coat: S-W ProClassic® Waterborne Acrylic Semi-Gloss Enamel, B31 Series
- 3rd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss Enamel, B31 Series
(4 mils wet, 1.3 mils dry per coat)

Alternate:
- 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series
(5-10 mils wet, 2-4 mils dry)
- 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series
- 3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series
(4 mils wet, 1.6 mils dry per coat)

c. Eg-Shel Finish
- 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series
(5-10 mils wet, 2-4 mils dry)
- 2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series
- 3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series
(4 mils wet, 1.7 mils dry per coat)

d. Low Sheen Finish
- 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series
(5-10 mils wet, 2-4 mils dry)
- 2nd Coat: S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series
- 3rd Coat: S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series
(4 mils wet, 1.6 mils dry per coat)

e. Flat Finish
- 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series
(5-10 mils wet, 2-4 mils dry)
- 2nd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series
- 3rd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series
(4 mils wet, 1.6 mils dry per coat)

D. METAL - Aluminum/ Galvanized (Cont.)

2. Alkyd Systems (Waterbased Acrylic-Alkyd)

a. Gloss Finish

1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series
(5-10 mils wet, 2.0 - 4.0 mils)
2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series
3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series
(4 mils wet, 1.7 mils dry per coat)

b. Semi-Gloss Finish

1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series
(5-10 mils wet, 2.0 - 4.0 mils dry)
2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series
3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series
(4 mils wet, 1.7 mils dry per coat)

3. Dryfall Waterborne Topcoats

a. Semi-Gloss Finish

1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Semi-Gloss, B42-80 Series
2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Semi-Gloss, B42-80 Series
(5.8 mils wet, 2.3 mils dry per coat)

b. Eg-Shel Finish

1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Eg-Shel, B42-80 Series
2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Eg-Shel, B42-80 Series
(6.0 mils wet, 1.9 mils dry per coat)

c. Flat Finish

1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Flat, B42-80 Series
2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Flat, B42-80 Series
(6.0 mils wet, 1.7 mils dry per coat)

**** NOTE TO SPECIFIER** For High Performance Systems refer to 09 96 00**

E. METAL Ferrous- (Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous & Ornamental Iron, Sashes, Doors, Partitions)

1. Latex Systems

a. Gloss Finish
- 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series (5-10 mils wet, 2-4 mils dry)
- 2nd Coat: S-W ProMar 200 Latex Gloss, B21-2200 Series
- 3rd Coat: S-W ProMar 200 Latex Gloss, B21-2200 Series (4 mils wet, 1.5 mils dry per coat)

b. Semi-Gloss Finish
- 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series (5-10 mils wet, 2-4 mils dry)
- 2nd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss Enamel, B31 Series
- 3rd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss Enamel, B31 Series (4 mils wet, 1.3 mils dry per coat)

Alternate:
- 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series (5-10 mils wet, 2-4 mils dry)
- 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series
- 3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series (4 mils wet, 1.6 mils dry per coat)

c. Eg-Shel / Satin Finish
- 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series (5-10 mils wet, 2-4 mils dry)
- 2nd Coat: S-W ProClassic Waterborne Acrylic Satin Enamel, B20 Series
- 3rd Coat: S-W ProClassic Waterborne Acrylic Satin Enamel, B20 Series (4 mils wet, 1.2 mils dry per coat)

Alternate:
- 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series (5-10 mils wet, 2-4 mils dry)
- 2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series
- 3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series (4 mils wet, 1.7 mils dry per coat)

d. Low Sheen Finish
- 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series (5-10 mils wet, 2-4 mils dry)
- 2nd Coat: S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series
- 3rd Coat: S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series (4 mils wet, 1.6 mils dry per coat)

e. Flat Finish
- 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series (5-10 mils wet, 2-4 mils dry)
- 2nd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series
- 3rd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series (4 mils wet, 1.6 mils dry per coat)

E. METAL Ferrous- (Structural Steel, etc.)(Cont.)

2. Alkyd Systems (Waterbased Acrylic-Alkyd)

a. Gloss Finish

1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series
(5-10 mils wet, 2-4 mils dry)
2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series
3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series
(4 mils wet, 1.7 mils dry per coat)

b. Semi-Gloss Finish

1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series
(5-10 mils wet, 2.0 - 4.0 mils dry)
2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series
3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series
(4 mils wet, 1.7 mils dry per coat)

3. Dryfall Waterborne Topcoats

a. Semi-Gloss Finish

1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series
(5-10 mils wet, 2-4 mils dry)
2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Semi-Gloss, B42-80 Series
3rd Coat: Optional
(5.8 mils wet, 2.3 mils dry per coat)

b. Eg-Shel Finish

1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series
(5-10 mils wet, 2-4 mils dry)
2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Eg-Shel, B42-80 Series
3rd Coat: Optional
(6.0 mils wet, 1.9 mils dry per coat)

c. Flat Finish

1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series
(5-10 mils wet, 2-4 mils dry)
2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Flat, B42-80 Series
3rd Coat: Optional
(6.0 mils wet, 1.7 mils dry per coat)

F. WOOD- (Walls, Ceilings, Doors, Trim, Partitions, Frames)

1. Latex Systems

a. High Gloss Finish

1st Coat: S-W Premium Wall & Wood Primer, B28W8111
(4 mils wet, 1.8 mils dry)
2nd Coat: S-W ProClassic Waterborne Acrylic High Gloss Enamel, B21 Series
3rd Coat: S-W ProClassic Waterborne Acrylic High Gloss Enamel, B21 Series
(4 mils wet, 1.5 mils dry per coat)

b. Gloss Finish

1st Coat: S-W Premium Wall & Wood Primer, B28W8111
(4 mils wet, 1.8 mils dry)
2nd Coat: S-W ProClassic Waterborne Acrylic Gloss Enamel, B21 Series
3rd Coat: S-W ProClassic Waterborne Acrylic Gloss Enamel, B21 Series
(4 mils wet, 1.5 mils dry per coat)

Alternate:
1st Coat: S-W Premium Wall & Wood Primer, B28W8111
(4 mils wet, 1.8 mils dry)
2nd Coat: S-W ProMar 200 Latex Gloss, B21-2200 Series
3rd Coat: S-W ProMar 200 Latex Gloss, B21-2200 Series
(4 mils wet, 1.5 mils dry per coat)

c. Semi-Gloss Finish

1st Coat: S-W Premium Wall & Wood Primer, B28W8111
(4 mils wet, 1.8 mils dry)
2nd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss Enamel, B31 Series
3rd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss Enamel, B31 Series
(4 mils wet, 1.3 mils dry per coat)

Alternate:
1st Coat: S-W Premium Wall & Wood Primer, B28W8111
(4 mils wet, 1.8 mils dry)
2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series
3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series
(4 mils wet, 1.7 mils dry per coat)

d. Satin Finish

1st Coat: S-W Premium Wall & Wood Primer, B28W8111
(4 mils wet, 1.8 mils dry)
2nd Coat: S-W ProClassic Waterborne Acrylic Satin, B20 Series
3rd Coat: S-W ProClassic Waterborne Acrylic Satin, B20 Series
(4 mils wet, 1.2 mils dry per coat)

F. WOOD (Walls, Ceilings, Doors, Trim, etc.)(Cont.)

2. Alkyd Systems (Waterbased Acrylic-Alkyd)

a. Gloss Finish

1st Coat: S-W Premium Wall & Wood Primer, B28W8111
(4 mils wet, 1.8 mils dry)
2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series
3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series
(4 mils wet, 1.7 mils dry per coat)

b. Semi-Gloss Finish

1st Coat: S-W Premium Wall & Wood Primer, B28W8111
(4 mils wet, 1.8 mils dry)
2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series
3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series
(4 mils wet, 1.7 mils dry per coat)

c. Eg-Shel Finish

1st Coat: S-W Premium Wall & Wood Primer, B28W8111
(4 mils wet, 1.8 mils dry)
2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Eg-Shel, B33-8200 Series
3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Eg-Shel, B33-8200 Series
(4 mils wet, 1.4 mils dry per coat)

3. Stain & Varnish

a. Clear Finish

1st Coat: S-W Wood Classics® 250 Oil Stain, A49-800 Series
Or S-W Wood Classics Interior Oil Stain, A49 Series
2nd Coat: S-W Wood Classics Waterborne Polyurethane Varnish, Gloss or Satin
3rd Coat: S-W Wood Classics Waterborne Polyurethane Varnish, Gloss or Satin
(4 mils wet, 1.0 mil dry per coat)

Alternate:
1st Coat: S-W Wood Classics 250 Oil Stain, A49-800 Series
Or S-W Wood Classics Interior Oil Stain, A49 Series
2nd Coat: S-W Minwax® High Build Polyurethane, Gloss, Semi-Gloss, Satin
3rd Coat: S-W Minwax High Build Polyurethane, Gloss, Semi-Gloss, Satin
(4 mils wet, 1.3 mils dry per coat)

Alternate:
1st Coat: S-W Wood Classics 250 Oil Stain, A49-800 Series
Or S-W Wood Classics Interior Oil Stain, A49 Series
2nd Coat: S-W Wood Classics Fast Dry Varnish, Gloss, A66V391
3rd Coat: S-W Wood Classics Fast Dry Varnish, Gloss or Satin, A66 Series
(4 mils wet, 1.3 mils dry per coat)

4. Stain, Sealer & Varnish

a. Clear Finish

1st Coat: S-W Wood Classics 250 Oil Stain, A49-800 Series
Or S-W Wood Classics Interior Oil Stain, A49 Series
2nd Coat: S-W Wood Classics FastDry Sanding Sealer, B26V43
3rd Coat: S-W Wood Classics FastDry Varnish, Gloss or Satin, A66 Series
(4 mils wet, 1.3 mils dry per coat)

G. WOOD (Floors, light foot traffic-Painted or Stained & Varnished)

1. Acrylic System

a. Satin Finish

1st Coat: S-W Porch & Floor Enamel, A32-200 Series
2nd Coat: S-W Porch & Floor Enamel, A32-200 Series
(4 mils wet, 1.5 mils dry per coat)

2. Urethane System (solvent base)

a. Gloss Finish

1st Coat: S-W Minwax 250 Oil Stain (Optional)
2nd Coat: S-W Minwax High Build Polyurethane, Gloss
3rd Coat: S-W Minwax High Build Polyurethane, Gloss
(4 mils wet, 1.3 mils dry per coat)

Alternate:

1st Coat: S-W Wood Classics 250 Oil Stain, A49-800 Series (Optional)
Or S-W Wood Classics Interior Oil Stain, A49 Series (Optional)
2nd Coat: S-W Wood Classics Polyurethane Varnish, Gloss or Satin, A67 Series
3rd Coat: S-W Wood Classics Polyurethane Varnish, Gloss or Satin, A67 Series
(4 mils wet, 1.7 mils dry per coat)

**** NOTE TO SPECIFIER** For High Performance Floor systems refer to 09 67 00**

H. DRYWALL (Walls, Ceilings, Gypsum Board, Plaster Board, etc.)

1. Latex Systems

a. Gloss Finish

1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W2600
(4 mils wet, 1.5 mils dry)
2nd Coat: S-W ProMar 200 Latex Gloss, B21-2200 Series
3rd Coat: S-W ProMar 200 Latex Gloss, B21-2200 Series
(4 mils wet, 1.5 mils dry per coat)

b. Semi-Gloss Finish

1st Coat: S-W Harmony® Interior Latex Primer, B11 Series
(4 mils wet, 1.3 mils dry per coat)
2nd Coat: S-W Harmony Interior Latex Semi-Gloss, B10 Series
3rd Coat: S-W Harmony Interior Latex Semi-Gloss, B10 Series
(4 mils wet, 1.6 mils dry per coat)

Alternate:
1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W2600
(4 mils wet, 1.5 mils dry)
2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series
3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series
(4 mils wet, 1.6 mils dry per coat)

c. Eg-Shel Finish

1st Coat: S-W Harmony Interior Latex Primer, B11 Series
(4 mils wet, 1.3 mils dry per coat)
2nd Coat: S-W Harmony Interior Latex Eg-Shel, B9 Series
3rd Coat: S-W Harmony Interior Latex Eg-Shel, B9 Series
(4 mils wet, 1.7 mils dry per coat)

Alternate:
1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W2600
(4 mils wet, 1.5 mils dry)
2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series
3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series
(4 mils wet, 1.7 mils dry per coat)

d. Low Sheen Finish

1st Coat: S-W Harmony® Interior Latex Primer, B11 Series
(4 mils wet, 1.3 mils dry per coat)
2nd Coat: S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series
3rd Coat: S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series
(4 mils wet, 1.6 mils dry per coat)

H. DRYWALL (Walls, Ceilings, Gypsum Board, Plaster Board, etc.)(Cont.)

1. Latex Systems

e. Flat Finish

1st Coat: S-W Harmony Interior Latex Primer, B11 Series
(4 mils wet, 1.3 mils dry per coat)
2nd Coat: S-W Harmony Interior Latex Flat, B5 Series
3rd Coat: S-W Harmony Interior Latex Flat, B5 Series
(4 mils wet, 1.8 mils dry per coat)

Alternate:
1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W2600
(4 mils wet, 1.5 mils dry)
2nd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series
3rd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series
(4 mils wet, 1.6 mils dry per coat)

2. Alkyd Systems (Waterbased Acrylic-Alkyd)

a. Gloss Finish

1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W2600
(4 mils wet, 1.5 mils dry)
2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series
3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series
(4 mils wet, 1.7 mils dry per coat)

b. Semi- Gloss Finish

1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W2600
(4 mils wet, 1.5 mils dry)
2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series
3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series
(4 mils wet, 1.7 mils dry per coat)

c. Eg-Shel Finish

1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W2600
(4 mils wet, 1.5 mils dry)
2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Eg-Shel, B33-8200 Series
3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Eg-Shel, B33-8200 Series
(4 mils wet, 1.4 mils dry per coat)

2.4 MATERIALS - GENERAL REQUIREMENTS

A Paints and Coatings - General:
1 Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

B Primers:
1 Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

2.5 ACCESSORIES

A Coating Application Accessories:
1 Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer’s specifications.

Part 3 EXECUTION

3.1 EXAMINATION

A Do not begin application of coatings until substrates have been properly examined and prepared. Notify Architect of unsatisfactory conditions before proceeding.

B If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C Proceed with work only after conditions have been corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

D Previously Painted Surfaces: Verify that existing painted surfaces do not contain lead based paints, notify Architect immediately if lead based paints are encountered.

*(**Specifier Note**: Verify the existence of lead based paints on the project. Buildings constructed after 1978 are less likely to contain lead based paints. If lead based paints are suspected on the project, all removal must be done in accordance with the EPA Renovation, Repair and Painting rule and all applicable state and local regulations. State and local regulations may be more strict than those set under the federal regulations. Verify that Owner has completed a Hazardous Material Assessment Report for the project prior to issuing of Drawings. Concluding that no lead based paints were found on project site, delete this paragraph regarding lead based paints.)*

3.2 SURFACE PREPARATION

WARNING! Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as a properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or contact your local health authority. Removal must be done in accordance with EPA Renovation, Repair and Painting Rule and all related state and local regulations. Care should be taken to follow all state and local regulations which may be more strict than those set under the federal RRP Rule.

A Proper product selection, surface preparation and application affect coating performance. Coating integrity and service life will be reduced because of improperly prepared surfaces. Selection and implementation of proper surface preparation ensures coating adhesion to the substrate and prolongs the service life of the coating system.

B Selection of the proper method of surface preparation depends on the substrate, the environment, and the expected service life of the coating system. Economics, surface contamination, and the effect on the substrate will also influence the selection of surface preparation methods.

C The surface must be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.

D Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow the surface to dry a minimum of 48 hours before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.

E Methods

1 Aluminum
Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP1, Solvent Cleaning.

2 Block (Cinder and Concrete)
Remove all loose mortar and foreign material. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement, and hardeners. Concrete and mortar must be cured at least 30 days at 75°F.The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments. On tilt-up and poured-in-place concrete, commercial detergents and abrasive blasting may be necessary to prepare the surface. Fill bug holes, air pockets, and other voids with a cement patching compound.

3 Concrete, SSPC-SP13 or NACE 6
This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems. The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces. An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.

4 Cement Composition Siding/Panels
Remove all surface contamination by washing with an appropriate cleaner, rinse thoroughly and allow to dry. Existing peeled or checked paint should be scraped and sanded to a sound surface. Pressure clean, if needed, with a minimum of 2100 psi pressure to remove all dirt, dust, grease, oil, loose particles, laitance, foreign material, and peeling or defective coatings. Allow the surface to dry thoroughly. The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments.

5 Drywall—Interior
Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting.

6 Galvanized Metal
Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP7 is necessary to remove these treatments.

7 Plaster
Must be allowed to dry thoroughly for at least 30 days before painting, unless the products are designed to be used in high pH environments. Room must be ventilated while drying; in cold, damp weather, rooms must be heated. Damaged areas must be repaired with an appropriate patching material. Bare plaster must be cured and hard. Textured, soft, porous, or powdery plaster should be treated with a solution of 1 pint household vinegar to 1 gallon of water. Repeat until the surface is hard, rinse with clear water and allow to dry.

8 Steel: Structural, Plate, etc.
Should be cleaned by one or more of the surface preparations described below. These methods are used throughout the world for describing methods for cleaning structural steel. Visual standards are available through the Society of Protective Coatings. A brief description of these standards together with numbers by which they can be specified follow.

9 Solvent Cleaning, SSPC-SP1
Solvent cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.

10 Hand Tool Cleaning, SSPC-SP2
Hand Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before hand tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.

11 Power Tool Cleaning, SSPC-SP3
Power Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before power tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.

12 White Metal Blast Cleaning, SSPC-SP5 or NACE 1
A White Metal Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.

13 Commercial Blast Cleaning, SSPC-SP6 or NACE 3
A Commercial Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 33 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.

14 Brush-Off Blast Cleaning, SSPC-SP7 or NACE 4
A Brush-Off Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose paint. Tightly adherent mill scale, rust, and paint may remain on the surface. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP 1 or other agreed upon methods.

15 Power Tool Cleaning to Bare Metal, SSPC-SP11
Metallic surfaces that are prepared according to this specification, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxide corrosion products, and other foreign matter. Slight residues of rust and paint may be left in the lower portions of pits if the original surface is pitted. Prior to power tool surface preparation, remove visible deposits of oil or grease by any of the methods specified in SSPC-SP1, Solvent Cleaning, or other agreed upon methods.

16 Near-White Blast Cleaning, SSPC-SP10 or NACE 2
A Near White Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 5 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.

17 High- and Ultra-High Pressure Water Jetting for Steel and Other Hard Materials SSPC-SP12 or NACE 5
This standard provides requirements for the use of high- and ultra-high pressure water jetting to achieve various degrees of surface cleanliness. This standard is limited in scope to the use of water only without the addition of solid particles in the stream.

18 Water Blasting, NACE Standard RP-01-72
Removal of oil grease dirt, loose rust, loose mill scale, and loose paint by water at pressures of 2,000 to 2,500 psi at a flow of 4 to 14 gallons per minute.

19 Wood
Must be clean and dry. Knots and pitch streaks must be scraped, sanded, and spot primed before a full priming coat is applied. Patch all nail holes and imperfections with a wood filler or putty and sand smooth.

3.3 INSTALLATION

A Apply all coatings and materials with the manufacturer's specifications in mind. Mix and thin coatings according to manufacturer's recommendations.

B Do not apply to wet or damp surfaces.
1 Wait at least 30 days before applying to new concrete or masonry. Or follow manufacturer's procedures to apply appropriate coatings prior to 30 days.
2 Test new concrete for moisture content.
3 Wait until wood is fully dry.

C Apply coatings using methods recommended by manufacturer.

D Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

E Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness.

F Regardless of number of coats specified, apply as many coats as necessary for complete hide, and uniform appearance.

G Inspection: The coated surface must be inspected and approved by the Architect or Engineer just prior to the application of each coat.

3.4 PROTECTION

A Protect finished coatings from damage until completion of project.

B Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

3.5 SCHEDULES

Specifier Note: Cut and paste the coatings system schedule here (specified in section 2.3 PAINT SCHEDULE), otherwise delete this section.

END OF SECTION05162013

BADGER *Standard* Stored Pressure Hand Portables

ABC Multipurpose Dry Chemical

BADGER
A UTC Fire & Security Company



Suitable for Class A, B and C fires

The Badger Standard multipurpose dry chemical line of fire extinguishers are economical and extremely versatile. They are ideal for tackling the majority of fire risks typically found in commercial and domestic applications.

Badger dry chemical extinguishing agent formulations contain the highest percentage of essential base ingredients found in the fire extinguisher industry. "Multipurpose" agent models are suitable for use on Class A, B and C fires.

Badger Standard models offer compliance and protection at a competitive price.

Features:

- *Multipurpose agent contains 90% M.A.P.*
- *Stainless steel hose band and nozzle retainer*
- *UL Listed and USCG Approved – Meets D.O.T. requirements*
- *12 year periodic hydrostatic test interval*
- *Six year warranty*
- *Machined aluminum valves*
- *Aluminum and plated steel handles*
- *2.5, 5, 10 and 20 pound models available*



Badger Fire Protection
944 Glenwood Station Lane, Suite 303, Charlottesville, VA 22901
Tel.: 434.964.3200 • Fax: 434.964.3202 • www.badgerfire.com

Technical Data:

BADGER *Standard* ABC Multipurpose Dry Chemical Stored Pressure Extinguishers

MODEL	250MB-1	5MB-6HB	5MB-6H	10MB-8H	20MB-6H
PART NUMBER	22430	22486	22435	22603	22682
CAPACITY (lb.)	2.5	5	5	10	20
CAPACITY (kg)	1.1	2.3	2.3	4.5	9.1
UL FIRE RATING	1-A:10-B:C	3-A:40-B:C	3-A:40-B:C	4-A:80-B:C	20-A:120-B:C
AGENT TYPE	ABC	ABC	ABC	ABC	ABC
CYLINDER MATERIAL	Steel	Steel	Steel	Steel	Steel
VALVE MATERIAL	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum
HANDLE/LEVER MATERIAL	Aluminum	Aluminum	Aluminum	Plated Steel	Plated Steel
EXPELLANT	Nitrogen	Nitrogen	Nitrogen	Nitrogen	Nitrogen
Operating Pressure @ 70°F	195	195	195	195	195
TEMPERATURE RANGE (°F)	-40 to 120	-40 to 120	-40 to 120	-40 to 120	-40 to 120
TEMPERATURE RANGE (°C)	-40.0 to 48.9	-40.0 to 48.9	-40.0 to 48.9	-40.0 to 48.9	-40.0 to 48.9
AGENT FLOW RATE (lb./sec)	0.31	0.39	0.39	0.51	0.75
AGENT FLOW RATE (kg/sec)	0.14	0.18	0.18	0.23	0.34
NOM. DISCHARGE TIME (sec)	9.5	14	14	22	28
DISCHARGE RANGE (ft.)	10.0 to 15.0	12.0 to 18.0	12.0 to 18.0	16.0 to 20.0	16.0 to 20.0
DISCHARGE RANGE (m)	3.0 to 4.6	3.7 to 5.5	3.7 to 5.5	4.9 to 6.1	4.9 to 6.1
UNIT HEIGHT (in.)	14.87	15.25	15.25	18.94	21.13
UNIT HEIGHT (cm)	37.8	38.7	38.7	48.1	53.7
UNIT WIDTH (in.)	5.5	7.25	7.25	7.75	9.25
UNIT WIDTH (cm)	14.0	18.4	18.4	19.7	23.5
UNIT DEPTH (in.)	3	4.25	4.25	5.25	7.25
UNIT DEPTH (cm)	7.6	10.8	10.8	13.3	18.4
SHIPPING WEIGHT (lb.)	5.4	10	10	17	33
SHIPPING WEIGHT (kg)	2.4	4.5	4.5	7.7	15.0
USCG APPROVAL	Type B:C Size-I	Type A Size-II Type B:C Size-I	Type A Size-II Type B:C Size-I	Type A Size-II Type B:C Size-II	Type A Size-II Type B:C Size-III
BRACKET	MB-250 Included	MB-5 Included	MB-5 Optional	UB-10 Optional	UB-20 Optional

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ISSUED May 2014

09 93 23 INTERIOR STAINS & TRANSPARENT FINISHES

THE SHERWIN-WILLIAMS COMPANY

COMMERCIAL PAINTING SPECIFICATION GUIDE

INTERIOR

This Painting Schedule is furnished only as a guide to select interior stains, and transparent systems, and is not all-inclusive of available Sherwin-Williams products. Although it is written in the CSI format and can be included in its entirety in a master specification, one should review the contents and edit to suit the particular needs of a given project and its respective location.

The schedule is arranged by systems, and offers latex, acrylic, alkyd, polyurethane, and water-reducible coatings. Each system also includes the various degrees of gloss available.

Local and National V.O.C. (Volatile Organic Compound) regulations have been taken into consideration, but because these regulations vary greatly around the country and are subject to change, we suggest verifying that product selections meet the requirements of the area in which they are to be used. If the project is located within the OTC, CARB, SCAQMD or other VOC regulated regions, one must comply with the regulations regarding VOC's. It is always recommended that you consult with a Sherwin-Williams Company Representative or call our Sherwin-Williams Architectural Services Department before finalizing the selection.

If you need more specific information on a particular product, refer to the current Sherwin-Williams Painting Systems Catalog or the www.sherwin-williams.com, Website or call our Architectural Services Department toll free.

The Sherwin-Williams Company
Architectural Services Department
1-800-321-8194 (Telephone)
216-566-1392 (Fax)

SECTION 09 93 23

Stains and Transparent Finishes

Part 1 GENERAL

1.1 SECTION INCLUDES

A Interior coating with transparent and semi-transparent finishes.

1.2 RELATED SECTIONS

A Section 05 05 13 - Shop Applied Coatings for Metal

B Section 06 01 40 - Architectural Woodwork Refinishing

C Section 06 05 83 - Shop Applied Wood Coatings

D Section 07 19 00 - Water Repellents

E Section 09 67 00 - Fluid Applied Flooring for Concrete

F Section 09 9100 - Painting

G Section 09 96 00 - High-Performance Coatings

1.3 REFERENCES

A SSPC-SP 1 - Solvent Cleaning.

B SSPC-SP 2 - Hand Tool Cleaning.

C SSPC-SP 3 - Power Tool Cleaning.

D SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00, Submittal Procedures.

B. Product Data: Manufacturer's data sheets on each paint and coating product should include:

1 Product characteristics
2 Surface preparation instructions and recommendations
3 Primer requirements and finish specification
4 Storage and handling requirements and recommendations
5 Application methods
6 Cleanup information

C. Selection Samples: Submit a complete set of color chips that represent the full range of manufacture's color samples available.

D. Coating Maintenance Manual: upon conclusion of the project, the Contractor or paint manufacture/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams “Custodian Project Color and Product Information” report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.5 MOCK-UP

Include a mock-up if the project size and/or quality warrant taking such a precaution. The following is one example of how a mock-up on a large project might be specified. When deciding on the extent of the mock-up, consider all the major different types of painting on the project.

A. Finish surfaces for verification of products, colors, & sheens
B. Finish area designated by Architect
C. Provide samples that designate prime & finish coats
D. Do not proceed with remaining work until the Architect approves the mock-up samples

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacture’s name, label, and the following list of information:

1 Product name, and type (description)
2 Application & use instructions
3 Surface preparation
4 VOC content
5 Environmental handling
6 Batch date
7 Color number

B. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
Store materials in an area that is within the acceptable temperature range, per manufacturer’s instructions. Protect from freezing.

C. Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not apply coatings under environmental conditions outside manufacturer's absolute limits.

Part 2 PRODUCTS

2.1 MANUFACTURERS

A Acceptable Manufacturer:

The Sherwin-Williams Company
101 Prospect Avenue NW
Cleveland, OH 44115
Tel: (800) 321-8194
Fax: (216) 566-1392
www.sherwin-williams.com

B. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 Product Requirements.
When submitting request for substitution, provide complete product data specified above under Submittals, for each substitute product.

2.2 APPLICATIONS/SCOPE

A Use this article to define the scope of painting if not fully defined in a Finish Schedule or on the drawings. This article must be carefully edited to reflect the surfaces actually found on the project. In some cases, it may be enough to use the first paragraph that says, in effect, "paint everything" along with a list of items not to paint, without exhaustively defining all the different surfaces and items that must be painted.

B If the project involves repainting some but not all existing painted surfaces, be sure to indicate the extent of the repainting.

C The descriptions of each system can also be used to further refine the definition of what is to be painted, stained, or clear finished.

D Surfaces to Be Coated:

Masonry Interior Systems- Opaque
Masonry Interior Systems- Transparent
Masonry Interior Floors
Wood Interior Systems - Transparent
Wood Interior Systems - Semi-Transparent
Wood Interior Floors

2.3 SCHEDULE INDEX - STAIN &TRANSPARENT FINISHES

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2 Silicone Acrylic System
B Masonry Interior Systems (vertical)- Transparent .....Page 6
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2 Acrylic System
3 Silicone Acrylic System
C Masonry Interior Floors .....Pages 7-8
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3 Silicone Acrylic System
4 Reactive & Non-Reactive Concrete Stain System
5 Acrylic System
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2 Alkyd System
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E Wood Interior Systems (vertical) - Semi-Transparent .....Page 9
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2 Alkyd System
3 Polyurethane System
F Wood Interior Floors .....Page 9
1 Water Reducible Polyurethane
2 Polyurethane System

Index of Data pages
DATAPAGES AND MSDS SHEETS: (To open any of the Data page Files, please click here)

Refer to the current MSDS/EDS for specific VOCs (calculated per 40 CFR 59.406). VOCs may vary by base and sheen.

EDIT THIS SCHEDULE TO SELECT PRODUCT AND FINISH DESIRED AND V.O.C. NEEDS

2.3 SCHEDULE

A Masonry Interior Systems (vertical) - Opaque

1. Acrylic System

a Solid Color Acrylic Latex
1st Coat: H&C Concrete Stain Solid Color Water Based
2nd Coat: H&C Concrete Stain Solid Color Water Based
(50-300 sq ft/gal)

2. Silicone Acrylic System

a Silicone Acrylic System
1st Coat: H&C Concrete Sealer Solid Color Solvent Based
2nd Coat: H&C Concrete Sealer Solid Color Solvent Based
(75-250 sq ft/gal)

B Masonry Interior Systems (vertical) - Transparent

1. Latex System

a Transparent Finish
1st Coat: H&C Concrete & Masonry Waterproofing Sealer Clear
2nd Coat: H&C Concrete & Masonry Waterproofing Sealer Clear
(100-250 sq ft/gal)

2. Acrylic System

a Transparent Finish
1st Coat: H&C Concrete Stain Water Based Clear
2nd Coat: H&C Concrete Stain Water Based Clear
(50-300 sq ft/gal)

b 1st Coat: H&C Concrete Sealer Wet Look Gloss Water Based
2nd Coat: H&C Concrete Sealer Wet Look Gloss Water Based
(75-300 sq ft/gal)

3. Silicone Acrylic System

a Transparent Finish
1st Coat: H&C Concrete Sealer Solvent Based Clear
2nd Coat: H&C Concrete Sealer Solvent Based Clear
(75-250 sq ft/gal)

Alternate:
1st Coat: H&C Clear Sealer Clear Gloss Oil Based
2nd Coat: H&C Clear Sealer Clear Gloss Oil Based
(75-250 sq ft/gal)

C Masonry Interior Floors

1. Latex System

a Transparent Finish
1st Coat: H&C Concrete & Masonry Waterproofing Sealer Clear
2nd Coat: H&C Concrete & Masonry Waterproofing Sealer Clear
(100-250 sq ft/gal)

2. Acrylic System

a Transparent Finish
1st Coat: H&C Concrete Stain Water Based Clear
2nd Coat: H&C Concrete Stain Water Based Clear
(50-300 sq ft/gal)

b 1st Coat: H&C Concrete Sealer Wet Look Gloss Water Based
2nd Coat: H&C Concrete Sealer Wet Look Gloss Water Based
(75-300 sq ft/gal)

3. Silicone Acrylic System

a Transparent Finish
1st Coat: H&C Concrete Sealer Solvent Based Clear
2nd Coat: H&C Concrete Sealer Solvent Based Clear
(75-250 sq ft/gal)

Alternate:
1st Coat: H&C Clear Sealer Clear Gloss Oil Based
2nd Coat: H&C Clear Sealer Clear Gloss Oil Based
(75-250 sq ft/gal)

4. Reactive Concrete Stain System (bare concrete only)

a Gloss Solventbased Sealer With Industrial Finish
1st Coat: H&C Infusion Reactive Concrete Stain
(2nd ct to achieve desired color)
2nd Coat: H&C Infusion Solvent Base Sealer
3rd Coat: H&C Infusion Solvent Base Sealer
(300-400 sq ft/gal)
4th Coat: H&C Infusion Industrial Floor Finish Gloss
5th Coat: H&C Infusion Industrial Floor Finish Gloss
6th Coat: H&C Infusion Industrial Floor Finish Gloss (optional)
(1000 sq ft/gal)

b Gloss Waterbased Sealer With Industrial Finish
1st Coat: H&C Infusion Reactive Concrete Stain
(2nd ct to achieve desired color)
2nd Coat: H&C Infusion Waterbased Sealer
3rd Coat: H&C Infusion Waterbased Sealer
(300-400 sq ft/gal)
4th Coat: H&C Infusion Industrial Floor Finish Gloss
5th Coat: H&C Infusion Industrial Floor Finish Gloss
6th Coat: H&C Infusion Industrial Floor Finish Gloss (optional)
(1000 sq ft/gal)

C Masonry Interior Floors (continued)

4. Non-Reactive Waterbased Concrete Stain Systems (bare concrete only)

a Gloss Solventbased Finish

1st Coat: H&C Semi-Transparent Concrete Stain
(second coat to achieve desired color)
(200 sq ft/gal)
2nd Coat: H&C Concrete Sealer Solvent Based Clear Gloss
3rd Coat: H&C Concrete Sealer Solvent Based Clear Gloss
(200-250 sq ft/gal)

b Gloss Waterbased Finish

1st Coat: H&C Semi-Transparent Concrete Stain
(second coat to achieve desired color)
(200 sq ft/gal)
2nd Coat: H&C Concrete Sealer Wet Look Gloss Water Based
3rd Coat: H&C Concrete Sealer Wet Look Gloss Water Based
(200-250 sq ft/gal)

Non-Reactive Solventbased Concrete Stain Systems (bare concrete only)

a Gloss Solventbased Finish

1st Coat: H&C Acetone Dye Stain
(second coat to achieve desired color)
(300-400 sq ft/gal)
2nd Coat: H&C Concrete Sealer Solvent Based Clear Gloss
3rd Coat: H&C Concrete Sealer Solvent Based Clear Gloss
(200-250 sq ft/gal)

b Gloss Waterbased Finish

1st Coat: H&C Acetone Dye Stain
(second coat to achieve desired color)
(300-400 sq ft/gal)
2nd Coat: H&C Concrete Sealer Wet Look Gloss Water Based
3rd Coat: H&C Concrete Sealer Wet Look Gloss Water Based
(200-250 sq ft/gal)

5. Acrylic System: Opaque

a Solid Color Acrylic Latex

1st Coat: H&C Concrete Stain Solid Color Water Based
2nd Coat: H&C Concrete Stain Solid Color Water Based
(50-300 sq ft/gal)

6. Silicone Acrylic System: Opaque

a Silicone Acrylic System

1st Coat: H&C Concrete Sealer Solid Color Solvent Based
2nd Coat: H&C Concrete Sealer Solid Color Solvent Based
(75-250 sq ft/gal)

D Wood Interior Systems (vertical) - Transparent

1. Water Reducible Polyurethane

a Transparent Finish

1st Coat: S-W Wood Classics® Waterborne Polyurethane Varnish, A68 Series
2nd Coat: S-W Wood Classics Waterborne Polyurethane Varnish, A68 Series (400-500 sq ft/gal)

2. Alkyd System

a Transparent Finish

1st Coat: S-W Wood Classics Fast Dry Oil Base Varnish, A66-300 Series
2nd Coat: S-W Wood Classics Fast Dry Oil Base Varnish, A66-300 Series (350-400 sq ft/gal)

3. Polyurethane System

a Transparent Finish

1st Coat: S-W Wood Classics Polyurethane Varnish, A67 Series
2nd Coat: S-W Wood Classics Polyurethane Varnish, A67 Series (350-400 sq ft/gal)

E Wood Interior Systems (vertical) - Semi-Transparent

1. Water Reducible Polyurethane (topcoat)

a Semi-Transparent Stain

1st Coat: S-W Wood Classics 250 Oil Stain, A49-800 Series (Optional)
Or S-W Wood Classics Interior Oil Stain, A49 Series (Optional)
2nd Coat: S-W Wood Classics Waterborne Polyurethane Varnish, A68 Series
3rd Coat: S-W Wood Classics Waterborne Polyurethane Varnish, A68 Series (400-500 sq ft/gal)

2. Alkyd (topcoat)

a Semi-Transparent Stain

1st Coat: S-W Wood Classics 250 Oil Stain, A49-800 Series (Optional)
Or S-W Wood Classics Interior Oil Stain, A49 Series (Optional)
2nd Coat: S-W Wood Classics Fast Dry Oil Base Varnish, A66-300 Series
3rd Coat: S-W Wood Classics Fast Dry Oil Base Varnish, A66-300 Series (350-400 sq ft/gal)

3. Polyurethane (topcoat)

a Semi-Transparent Stain

1st Coat: S-W Wood Classics 250 Oil Stain, A49-800 Series (Optional)
Or S-W Wood Classics Interior Oil Stain, A49 Series (Optional)
2nd Coat: S-W Wood Classics Polyurethane Varnish, A67 Series
3rd Coat: S-W Wood Classics Polyurethane Varnish, A67 Series (350-400 sq ft/gal)

F Wood Interior Floors

1. Water Reducible Polyurethane (topcoat, light foot traffic)

a Semi-Transparent Stain

1st Coat: S-W Wood Classics 250 Oil Stain, A49-800 Series (Optional)
Or S-W Wood Classics Interior Oil Stain, A49 Series (Optional)
2nd Coat: S-W Wood Classics Waterborne Polyurethane Varnish, A68 Series
3rd Coat: S-W Wood Classics Waterborne Polyurethane Varnish, A68 Series (400-500 sq ft/gal)

2. Polyurethane (topcoat)

a Semi-Transparent Stain

1st Coat: S-W Wood Classics 250 Oil Stain, A49-800 Series (Optional)
Or S-W Wood Classics Interior Oil Stain, A49 Series (Optional)
2nd Coat: S-W Wood Classics Polyurethane Varnish, A67 Series
3rd Coat: S-W Wood Classics Polyurethane Varnish, A67 Series (350-400 sq ft/gal)

2.4 MATERIALS - GENERAL REQUIREMENTS

A Paints and Coatings - General:
1 Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
2 For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.

B Primers:
1 Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
2 The execution of backpriming of woodwork is usually specified in the woodwork section, although the materials may be specified here.

2.5 ACCESSORIES:

A Coating Application Accessories:
1 Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer’s specifications.

PART 3 EXECUTIONTION

3.1 EXAMINATION

A Do not begin application of coatings until substrates have been properly examined and prepared. Notify Architect of unsatisfactory conditions before proceeding.

B If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C Proceed with work only after conditions have been corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

D Previously Painted Surfaces: Verify that existing painted surfaces do not contain lead based paints, notify Architect immediately if lead based paints are encountered.

*(**Specifier Note**: Verify the existence of lead based paints on the project. Buildings constructed after 1978 are less likely to contain lead based paints. If lead based paints are suspected on the project, all removal must be done in accordance with the EPA Renovation, Repair and Painting rule and all applicable state and local regulations. State and local regulations may be more strict than those set under the federal regulations. Verify that Owner has completed a Hazardous Material Assessment Report for the project prior to issuing of Drawings. Concluding that no lead based paints were found on project site, delete paragraph regarding lead based paints.)*

3.2 SURFACE PREPARATION

WARNING! Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as a properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or contact your local health authority. Removal must be done in accordance with EPA Renovation, Repair and Painting Rule and all related state and local regulations. Care should be taken to follow all state and local regulations which may be more strict than those set under the federal RRP Rule.

A Proper product selection, surface preparation, and application affect coating performance. Coating integrity and service life will be reduced because of improperly prepared surfaces. Selection and implementation of proper surface preparation ensures coating adhesion to the substrate and prolongs the service life of the coating system.

B Selection of the proper method of surface preparation depends on the substrate, the environment, and the expected service life of the coating system. Economics, surface contamination, and the effect on the substrate will also influence the selection of surface preparation methods.

C The surface must be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.

D Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow the surface to dry at least 48 hours before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.

E No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50°F, unless products are designed specifically for these conditions.

F Surface Preparation

1 Wood—Interior
All finishing lumber and flooring must be stored in dry, warm rooms to prevent absorption of moisture, shrinkage, and roughening of the wood. All surfaces must be sanded smooth, with the grain, never across it. Surface blemishes must be corrected and the area cleaned of dust before coating. Patching compounds will generally be visible through clear coatings.

2 Bare Concrete:
New concrete must be cured (28 days min.). If the concrete feels like 120-grit sandpaper, the pores are open enough for this product to bond properly with the substrate. If the surface does not have this texture, etch the surface (unless acid staining). Rough textured concrete does not need to be etched. Do not etch painted surfaces. Prepared concrete should have a pH between 7 and 10. Not adequately degreasing, etching, or allowing the substrate to dry completely will result in poor adhesion.

3 Repair:
For the best waterproofing protection on exterior, vertical concrete and masonry, patch and repair cracks and crevices where water can enter with ConSeal Patches and Sealants. Interior cracks on floor surfaces, use ArmorSeal patch or appropriate patching material. Patching compounds will generally be visible through clear coatings.

4 Slip Resistance:
Some surfaces such as inclined driveways, garages, steps, patios, etc., may require a slip resistant additive for safety. Add H&C™ SharkGrip® Slip Resistant Additive to the final coat applied following label directions. This product should not be used in place of a non-skid finish.

3.3 INSTALLATION

A Testing: Due to the wide variety of substrates, preparation methods, application methods and environments, one should test the product in an inconspicuous spot for adhesion and compatibility prior to full-scale application.

B Apply all coatings and materials with manufacturer's specifications in mind. Mix and thin coatings according to manufacturer's recommendation.

C Do not apply to wet or damp surfaces.
1.Wait at least 30 days before applying to new concrete or masonry. Or follow manufacturer's procedures to apply appropriate coatings prior to 30 days.
2.Test new concrete for moisture content.
3.Wait until wood is fully dry

D Apply coatings using methods recommended by manufacturer.

E Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

F Apply coatings at spreading rate required to achieve the manufacturer' recommended dry film thickness.

G Regardless of number of coats specified, apply as many coats as necessary for complete hide and uniform appearance.

H Inspection: The coated surface must be inspected and approved by the Architect or Engineer just prior to the application of each coat.

3.4 PROTECTION

A Protect finished coatings from damage until completion of project.

B Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

3.5 SCHEDULES

Specifier Note: Cut and paste the coatings system schedule here (specified in section 2.3 Stain & Transparent Finishes), otherwise delete this section.

END OF SECTION05122014

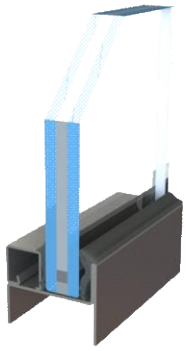
CONTRAFLAM® 45

Fire-Rated Clear Tempered Safety Glass

CLASSIFICATION



PRODUCT FEATURES



TECHNICAL SPECIFICATIONS

Fire Rating	45 min. Fire-Protection-Rated
Testing / Standard Conformity	UL 9, 10b, 10c | NFPA 80/252/257 | ASTM N/A | CAN/ULC-S104, S106
Building Code Marking	D-H-NT-45, OH-45
Impact Safety Rating	CPSC 16CFR 1201-CAT II; CAN/CGSB-12.1-M
Nominal Thickness (in.; mm)	3/4" (18mm)
Tolerance (in.; mm)	+1/16" to -1/16" (+1.5 mm to -1.5 mm)
U-Value (BTU/hr*sq.ft*°F)	0.79
STC Rating (dB)	39
Visible Light Transmission (%)	84
Weight (lbs./ft.²; kg/m²)	8.0 (39.0)
Groove (in.; mm)	Depth: 5/8" (16mm) Width: 7/8" (22mm)

MAXIMUM DIMENSIONS

	Window, Transom Sidelight	Door Non-Temp Rise	Door Temp Rise
Maximum Exposed Height (in.; m)*	95-1/2 (2.43)	95-1/2 (2.43)	N/A
Maximum Exposed Width (in.; m)*	95-1/2 (2.43)	35-13/16 (0.91)	N/A
Maximum Exposed Area (in.²; m²)	3,419 (2.21)	3,419 (2.21)	N/A

*Height multiplied by width cannot exceed maximum exposed area.

APPLICATION OPTIONS

- ☐ VDS Door
- ☐ VDS Frame
- ☑ VDS Curtain Wall
- ☑ VDS Lite Door
- ☑ VDS Lite Frame
- ☐ Hollow Metal Temp Rise Door
- ☐ Hollow Metal Non-Temp Rise Door
- ☑ Hollow Metal Frame

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DATA SHEET

PRODUCT WARRANTY / TERMS AND CONDITIONS

CONTRAFLAM® / SWISSFLAM® / CONTRAFLAM® STRUCTURE / KERALITE®-ULTRA

1. General: This document applies to CONTRAFLAM®, SWISSFLAM®, CONTRAFLAM® STRUCTURE, KERALITE®-ULTRA of all types and fire ratings including their combination in insulated glass units. When fire-resistant glass is used, it is assumed that the buyer will incorporate abovementioned glass into glazing systems approved by a valid and independent institution, e.g. UL/Underwriters Laboratories. Copies of authorized listing and specifications, as well as instructions for handling and installation are available online at vetrotechusa.com, or by calling 1-888-803-9533.

2. Limited 5 Year Warranty: Vetrotech Saint-Gobain warrants that its CONTRAFLAM®, SWISSFLAM®, CONTRAFLAM® STRUCTURE, KERALITE®-ULTRA fire rated glazing to be free of substantial obstruction of vision from dust or other foreign substances due to defective materials or workmanship for a period of five years from the date of shipment. When assembled to an Insulated Glass Unit (IGU), Vetrotech warrants only that its CONTRAFLAM®-IGU, SWISSFLAM®-IGU, CONTRAFLAM® STRUCTURE-IGU, KERALITE®-ULTRA-IGU will be free of substantial obstruction of vision from dust, film formation or moisture accumulation between glass lites resulting from seal failure due to defective materials or workmanship for a period of ten years from the date of shipment.

CONTRAFLAM®, SWISSFLAM®, CONTRAFLAM® STRUCTURE, KERALITE®-ULTRA is an engineered specialty fire resistant glazing material. Certain optical and visual faults are inherent to the production process. These characteristics may be evaluated according to the manufacturer's quality standards, but do not impair the transparency or affect the performance of the glass in case of fire, and shall not be considered cause for rejection.

This warranty shall not apply if the failure is caused by acts of God, intervening cause, mishandling, misuse, abuse, improper installation, installation by unqualified glaziers or by any other cause whatsoever not within our exclusive control, and shall not apply unless the failure occurs within five or ten years after the date of shipment. The obligation of this warranty is to replace the defective glass, F.O.B. manufacturer's warehouse, but in no event shall Vetrotech Saint-Gobain be responsible to cover any cost of removal, installation or reinstallation, loss of use, incidentals or any consequential cost associated with defective product. Any glass replaced under this warranty is limited to the original warranty period and shall not be extended beyond the original five or ten years.

Vetrotech Saint-Gobain makes no warranty of merchantability nor that the product is fit for any particular purpose for use and no other warranty than the abovementioned warranty of any kind, expressed or implied.

3. Transportation and Storage Conditions: Transport and storage of CONTRAFLAM®, SWISSFLAM®, CONTRAFLAM® STRUCTURE, KERALITE®-ULTRA products must be in a vertical and dry state and at temperatures above 14˚F (-10˚C) and below 113˚F (45˚C). Extreme climatic conditions and exposure to direct sunlight or other heat sources must be avoided. When glass is installed in a not temperature controlled building, above storage conditions apply likewise.

4. Handling and Installation Requirements: The product warranty is subject to CONTRAFLAM®, SWISSFLAM®, CONTRAFLAM® STRUCTURE, KERALITE®-ULTRA glass having been handled and installed in accordance with published instructions. It is essential that glazing contractors or other handlers or installers be familiar with such instructions. All subsequent product processing, additions or alterations not authorized and monitored by Vetrotech Saint-Gobain are specifically prohibited. If the products are used in fire-rated applications not covered by Vetrotech Saint-Gobain product specifications, all warranty is null and void.

All notes and instructions on labels must be respected. If adhesives or sealing materials are applied during installation, compatibility must be verified and confirmed with Vetrotech Saint-Gobain beforehand or all warranty is null and void.

5. Product Use: CONTRAFLAM®, SWISSFLAM®, CONTRAFLAM® STRUCTURE, KERALITE®-ULTRA products must be used in temperature controlled environments ensuring a maximum glass temperature range between 14˚F (-10˚C) and 113˚F (45˚C). All circumstances resulting into heat build-up of the glass caused by window blinds, curtains, etc. must be avoided.

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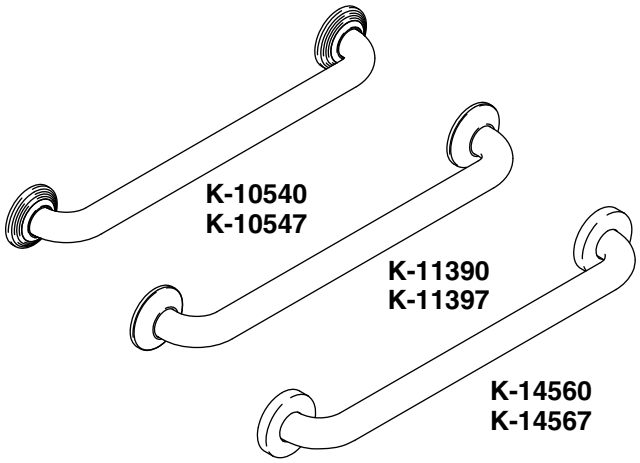
KOHLER®

Features

- *Metal construction*
- *Includes installation hardware*
- *ADA compliant when located and mounted into a structural support per ADA guidelines*
- *Available with traditional, transitional, or contemporary styling*

GRAB BAR
K-10540

ADA



Codes/Standards Applicable

Specified model meets or exceeds the following:

- *ADA*
- *ICC/ANSI A117.1*
- *ASTM F446*

Colors/Finishes

- S: Polished Stainless Steel
- Other: Refer to Price Book for additional colors/finishes

Specified Model

Model	Description	Colors/Finishes	
Traditional Styling			
K-10540	12″ (305 mm) grab bar	❑ S	❑ Other_____
K-10541	18″ (457 mm) grab bar	❑ S	❑ Other_____
K-10542	24″ (610 mm) grab bar	❑ S	❑ Other_____
K-10543	32″ (813 mm) grab bar	❑ S	❑ Other_____
K-10544	36″ (914 mm) grab bar	❑ S	❑ Other_____
K-10545	42″ (1067 mm) grab bar	❑ S	❑ Other_____
K-10546	48″ (1219 mm) grab bar	❑ S	❑ Other_____
K-10547	54″ (1372 mm) grab bar	❑ S	❑ Other_____
Transitional Styling			
K-11390	12″ (305 mm) grab bar	❑ S	❑ Other_____
K-11391	18″ (457 mm) grab bar	❑ S	❑ Other_____
K-11392	24″ (610 mm) grab bar	❑ S	❑ Other_____
K-11393	32″ (813 mm) grab bar	❑ S	❑ Other_____
K-11394	36″ (914 mm) grab bar	❑ S	❑ Other_____
K-11395	42″ (1067 mm) grab bar	❑ S	❑ Other_____
Additional models listed on Page 2.			

Product Specification

Grab bar shall be made of metal construction. Product shall include installation hardware. Product shall be ADA compliant when located and mounted into a structural support per ADA guidelines. Product shall be available with traditional, transitional, or contemporary styling. Product shall be Kohler Model K-_____-_____.

USA/Canada: 1-800-4KOHLER
(1-800-456-4537)
www.kohler.com

Transitional Styling (continued)			
K-11396	48″ (1219 mm) grab bar	❑ S	❑ Other_____
K-11397	54″ (1372 mm) grab bar	❑ S	❑ Other_____
Contemporary Styling			
K-14560	12″ (305 mm) grab bar	❑ S	❑ Other_____
K-14561	18″ (457 mm) grab bar	❑ S	❑ Other_____
K-14562	24″ (610 mm) grab bar	❑ S	❑ Other_____
K-14563	32″ (813 mm) grab bar	❑ S	❑ Other_____
K-14564	36″ (914 mm) grab bar	❑ S	❑ Other_____
K-14565	42″ (1067 mm) grab bar	❑ S	❑ Other_____
K-14566	48″ (1219 mm) grab bar	❑ S	❑ Other_____
K-14567	54″ (1372 mm) grab bar	❑ S	❑ Other_____

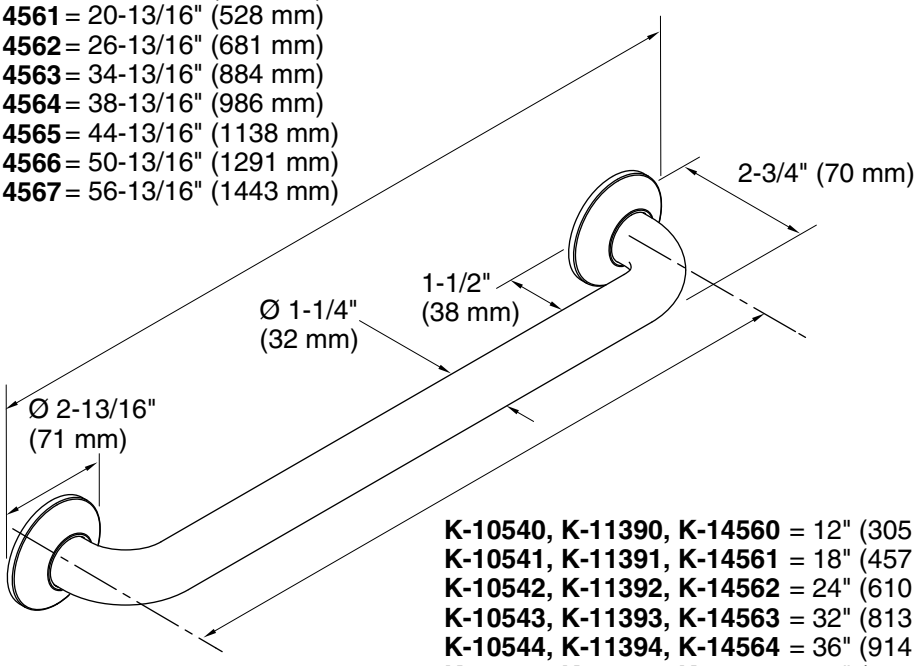
Installation Notes

WARNING: Risk of personal injury. The wall plates on the grab bar must be mounted to a brace between the wall studs. Doing so will ensure that the weight of the user is adequately supported.

Install this product according to the installation guide.

The appearance of the product may differ from the product diagram. The dimensions still apply.

K-10540, K-11390, K-14560 = 14-13/16" (376 mm)
K-10541, K-11391, K-14561 = 20-13/16" (528 mm)
K-10542, K-11392, K-14562 = 26-13/16" (681 mm)
K-10543, K-11393, K-14563 = 34-13/16" (884 mm)
K-10544, K-11394, K-14564 = 38-13/16" (986 mm)
K-10545, K-11395, K-14565 = 44-13/16" (1138 mm)
K-10546, K-11396, K-14566 = 50-13/16" (1291 mm)
K-10547, K-11397, K-14567 = 56-13/16" (1443 mm)



K-10540, K-11390, K-14560 = 12" (305 mm)
K-10541, K-11391, K-14561 = 18" (457 mm)
K-10542, K-11392, K-14562 = 24" (610 mm)
K-10543, K-11393, K-14563 = 32" (813 mm)
K-10544, K-11394, K-14564 = 36" (914 mm)
K-10545, K-11395, K-14565 = 42" (1067 m)
K-10546, K-11396, K-14566 = 48" (1219 mm)
K-10547, K-11397, K-14567 = 54" (1372 mm)

Product Diagram

THE BOLD LOOK OF KOHLER®

GOLD BOND® BRAND GYPSUM BOARD

MANUFACTURER

National Gypsum Company
2001 Rexford Road
Charlotte, NC 28211
(704) 365-7300

Technical Information:
1-800-NATIONAL
(1-800-628-4662)

Fax: 1-800-FAX NGC1
(1-800-329-6421)

Internet Home Page:
nationalgypsum.com
nationalgypsum.com/espanol

09 29 00/NGC BuyLine: 1100

DESCRIPTION

Gold Bond® BRAND Gypsum Board panels consist of a fire-resistant gypsum core encased in heavy natural-finish, 100% recycled paper on the face and back sides. The face paper is folded around the long edges to reinforce and protect the core, and the ends are square-cut and finished smooth. For speed of installation, GridMarX® guide marks are printed on the paper surface.

Long edges of the panels are tapered or square. Tapered edges allow joints to be reinforced with ProForm® BRAND Joint Tape and concealed with ProForm® BRAND Ready Mix or ProForm® BRAND Quick Set Setting Compounds.

BASIC USES

1/4" - Lightweight, low-cost utility gypsum panel for interior use as a base layer for improving sound control in double-layer steel and/or wood stud partitions. Also for use over old wall and ceiling surfaces. Also applicable for forming curved surfaces with short radii.

3/8" - Lightweight for interior use in the double-wall systems over wood framing, and for repair and remodeling.

1/2" - For single-layer interior use in residential construction and non-rated commercial construction.

ADVANTAGES

- Lightweight, cost-efficient material that readily accepts a wide range of decorative finishes.
- Gypsum Board is easily cut for quick installation, permitting painting or other decoration and the installation of metal or wood trim almost immediately.
- The gypsum core will not support combustion or transmit temperatures greatly in excess of 212°F (100°C) until completely calcined, a slow process.
- Expansion and contraction under normal atmospheric changes are negligible.

GREENGUARD CERTIFIED

Gypsum Board is GREENGUARD Children & Schools℠ Certified for indoor air quality.

LIMITATIONS

- Exposure to excessive or continuous moisture and extreme temperatures should be avoided. Gypsum Board is not recommended where it will be exposed to temperatures exceeding 125°F (52°C) for extended periods of time.
- To prevent objectional sag in gypsum paneled ceilings, the weight of overlaid unsupported insulation should not exceed the following recommendations:

PSF (Lbs./Sq. Ft.)	Type	Frame Spacing
1.3 (6.3 kg/M²)	1/2" Regular	24" o.c.
2.2 (10.7 kg/M²)	1/2" Regular	16" o.c.

Panels 3/8" thick must not be overlaid with unsupported insulation. If required, a vapor retarder can be installed in exterior ceilings, and plenum or attic spaces should be properly vented.

- Installing Gypsum Board panels over an insulating blanket, installed continuously across the face of the framing members, is not recommended. Blankets should be recessed and flanges attached to the sides of the studs or joists.
- Gypsum Board must be stored off the ground and under cover. Sufficient risers must be used to assure support for the entire length of the gypsum board to prevent sagging.
- Gypsum Board must be kept dry to minimize the potential for mold growth. Adequate care should be taken while transporting, storing, applying and maintaining gypsum board. For additional information, refer to the Gypsum Association publication, *"Guidelines for the Prevention of Mold Growth on Gypsum Wallboard"* (GA-238-03), which is available at www.gypsum.org under the "Download Free Gypsum Association Publications" section.

COMPOSITION & MATERIALS

Gypsum Board is a manufactured panel with a gypsum core encased with paper. Gypsum Board contains no asbestos.

ACCESSORIES

- Fasteners: drywall screws, nails or adhesives
- ProForm Joint Tape
- ProForm Ready Mix or ProForm Quick Set/Quick Set Lite Setting Compound
- Furring channels
- E-Z Strip control joints or .093 zinc control joints

(Continued next page)

Job Name _____

Contractor _____ Date _____

Submittal Approvals: (Stamps or Signatures)

TECHNICAL DATA

PHYSICAL PROPERTIES

Thickness, nominal	1/4" Regular (6.4 mm)
Thickness, nominal	3/8" Regular (9.5 mm)
Thickness, nominal	1/2" Regular (12.7 mm)
Width, nominal*	4' (1,219 mm)
Length, standard	6' through 16' (1,829 mm - 4,877 mm)
Weight, lbs./sq. ft., nominal	1/4" Regular - 1.2
Weight, lbs./sq. ft., nominal	3/8" Regular - 1.2
Weight, lbs./sq. ft., nominal	1/2" Regular - 1.6
Edges	Square or Tapered
Surface Burning Characteristics (per ASTM E 84)	Flame Spread: 15 Smoke Developed: 0

**54" wide Gypsum Board available in 1/2" thickness*

APPLICABLE STANDARDS AND REFERENCES

ASTM C 1396

ASTM C 840

Gypsum Association GA-216

Gypsum Association GA-214

Federal Specification SS-L-30D Type III (Grade R)

National Gypsum Company, *Gypsum Construction Guide*

INSTALLATION

RECOMMENDATIONS

Installation of Gypsum Board should be consistent with methods described in the standards and references noted.

GRIDMARX®

Gypsum Board comes standard with GridMarX guide marks printed on the paper surface. These guide marks align with standard building dimensions and help to quickly identify fastener lines for stud and joist framing. Using GridMarX, accurate cuts can be made without having to draw lines. The use of GridMarX also provides quick identification and uniform nail/screw patterns.

GridMarX guide marks run the machine direction of the board at five points in 4" increments. Marks run along the edge in both tapers and at 16", 24" and 32" in the field of the board. The marks cover easily with no bleed-through using standard paint products.

Vertical Application - In a vertical application, GridMarX serve as a **guide mark** to help identify the exact location of framing members behind the gypsum board, eliminating the need for field-applied vertical lines.

Horizontal Application - In a horizontal application, GridMarX serve as a **reference mark** to help identify the location of framing members behind the gypsum board. (If framing member is located 2" to the right of the GridMarX at the top edge of the board, it will be located 2" to the right down the face of the board.)

DECORATION

For best painting results, all surfaces, including joint compound, should be clean, dust-free and not glossy. To improve fastener and joint concealment, a coat of a quality drywall primer is recommended to equalize the porosities between surface paper and joint compound.

The selection of a paint to give the specified or desired finished characteristics is the responsibility of the architect or contractor.

Gypsum Board that is to have a wall covering applied to it should be prepared and primed as described for painting.

Gypsum Association GA-214, *Recommended Specification for Levels of Gypsum Board Finish*, should be referred to in order to determine the level of finishing needed to assure a surface properly prepared to accept the desired decoration.

National Gypsum®

GOLD BOND® BRAND XP® GYPSUM BOARD

MANUFACTURER

National Gypsum Company
2001 Rexford Road
Charlotte, NC 28211
(704) 365-7300

Technical Information:
1-800-NATIONAL
(1-800-628-4662)

Fax: 1-800-FAX NGC1
(1-800-329-6421)

Internet Home Page:
nationalgypsum.com
nationalgypsum.com/espanol

09 29 00/NGC BuyLine: 1100

DESCRIPTION

Gold Bond® BRAND XP® Gypsum Board with Sporgard™* was developed as an improved moisture resistant board, offering the same advantages of a traditional moisture resistant board with added mold resistance in the core and paper. XP Gypsum Board panels consist of a specially treated, fire-resistant, gypsum core encased in a heavy mold/mildew/moisture resistant, 100% recycled, National Gypsum's original PURPLE® paper on the face side and a heavy, mold/mildew/moisture resistant, 100% recycled gray paper on the back side.

XP Gypsum Board was designed to provide extra protection against mold and mildew compared to standard gypsum board products. The face paper is folded around the long edges to reinforce and protect the core, and the ends are square-cut and finished smooth. Long edges of the panels are tapered.

Tapered edges allow joints to be reinforced with ProForm® BRAND Joint Tape and concealed with ProForm BRAND Ready Mix or ProForm BRAND Quick Set Setting Compounds. For optimum mold and mildew performance, ProForm BRAND XP® Ready Mix is recommended for use.

BASIC USES

XP Gypsum Board may be used in all wall and ceiling applications and is ideally suited where enhanced moisture and mold resistance is desired.

ADVANTAGES

- Resists the growth of mold per ASTM G 21 with a score of 0, the best possible score.
- Resists the growth of mold per ASTM D 3273 with a score of 10, the best possible score.
- XP Gypsum Board is moisture resistant and can be used as a tile backer board in dry areas or areas with limited water exposure such as toilet/sink areas and wall and ceiling areas above tile in tubs and showers.
- The gypsum core will not support combustion or transmit temperatures greatly in excess of 212°F (100°C) until completely calcined, a slow process.
- Scores and snaps easily, no special handling requirements.
- Less than 5% water absorption per ASTM C 473.

GREENGUARD CERTIFIED

XP Gypsum Board is GREENGUARD Children & Schools℠ Certified for indoor air quality.

MOLD AND MILDEW RESISTANCE

XP Gypsum Board products were designed to provide extra protection against mold and mildew compared to standard gypsum board products. When tested by an independent laboratory, XP Gypsum Board products received the highest possible ratings on ASTM G 21 and ASTM D 3273.

No material can be considered "mold proof," nor is it certain that any material will resist mold or mildew indefinitely. When used in conjunction with good design, handling and construction practices, XP Gypsum Board products can provide increased mold resistance versus standard gypsum board products. As with any building material, avoiding water exposure during handling, storage and installation, and after installation is complete, is the best way to avoid the formation of mold or mildew.

LIMITATIONS

- For interior use only.
- Exposure to excessive or continuous moisture and extreme temperatures should be avoided.
- XP Gypsum Board is not recommended where it will be exposed to temperatures exceeding 125°F (52°C) for extended periods of time
- XP Gypsum Board should not be used as a backer board directly behind tile and wall panels in tub and shower areas.
- Maximum framing spacing for ceiling applications not to exceed 16" o.c. for installation parallel to framing and maximum 24" o.c. for installation perpendicular to framing. On ceilings to receive hand- or spray-applied water-based texture material, XP Gypsum Board products are to be installed perpendicular to framing.
- XP Gypsum Board should not be used in areas subject to constant and/or excessive moisture and high humidity such as gang showers, saunas, steam rooms and swimming pool enclosures. PermaBase® BRAND Cement Board is recommended for these areas.

Job Name _____

Contractor _____ Date _____

Submittal Approvals: (Stamps or Signatures)

*Sporgard is a trademark of LANXESS Corporation

- Installing XP Gypsum Board panels over an insulating blanket, installed continuously across the face of the framing members, is not recommended. Blankets should be recessed and flanges attached to the sides of the studs or joists.
- XP Gypsum Board must be stored off the ground and under cover. Sufficient risers must be used to assure support for the entire length of the gypsum board to prevent sagging.
- XP Gypsum Board must be kept dry to minimize the potential for mold growth. Adequate care should be taken while transporting, storing, applying and maintaining gypsum board. For additional information, refer to the Gypsum Association publication, *"Guidelines for the Prevention of Mold Growth on Gypsum Board"* (GA-238-03), which is available at www.gypsum.org under the "Download Free Gypsum Association Publications" section.

COMPOSITION & MATERIALS

XP Gypsum Board is a manufactured panel with a gypsum core encased with paper. XP Gypsum Board contains no asbestos.

ACCESSORIES

- Fasteners: drywall screws
- ProForm Joint Tape
- ProForm Ready Mix or ProForm Quick Set/Quick Set Lite Setting Compound
- Cornerbead, trims, casing beads
- Furring Channels
- E-Z Strip control joints or .093 zinc control joints

TECHNICAL DATA

PHYSICAL PROPERTIES

Thickness, nominal	1/2" Regular (12.7 mm)
Width, nominal	4' (1219 mm)
Length, standard	8' through 12' (2438-3657 mm)
Weight, lbs./sq.ft., nominal	1/2" Regular - 1.5 - 1.6
Edges	Square or Tapered
Surface Burning Characteristics (per ASTM E 84)	Flame Spread: 15 Smoke Developed: 0
Water Absorption (per ASTM C 473)	<5%
Mold Resistance (per ASTM D 3273)	10
Mold Resistance (per ASTM G 21)	0
Permeability (per ASTM E 96)	37*

**Not classified a vapor barrier*

APPLICABLE STANDARDS AND REFERENCES

ASTM C 1396
ASTM C 840
ASTM D 3273
ASTM G 21
ASTM G 473
Gypsum Association GA-216
Gypsum Association GA-214
Gypsum Association GA-801
Federal Specification SS-L-30D Type VII (Grade R)
National Gypsum Company, *Gypsum Construction Guide*

INSTALLATION

RECOMMENDATIONS

Installation of XP Gypsum Board should be consistent with methods described in the standards and references noted.

GridMarX® XP Gypsum Board comes standard with GridMarX guide marks printed on the paper surface. These guide marks align with standard building dimensions and help to quickly identify fastener lines for stud and joist framing. Using GridMarX, accurate cuts can be made without having to draw lines. The use of GridMarX also provides quick identification and uniform nail/screw patterns.

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Horizontal Application -

In a horizontal application, GridMarX serve as a **reference mark** to help identify the location of framing members behind the gypsum board. (If framing member is located 2" to the right of the GridMarX at the top edge of the board, it will be located 2" to the right down the face of the board.)

DECORATION

For best painting results, all surfaces, including joint compound, should be clean, dust-free and not glossy. To improve fastener and joint concealment, a coat of high quality drywall primer is recommended to equalize the absorption between surface paper and joint compound.

The selection of a paint to give the specified or desired finished characteristics is the responsibility of the architect or contractor.

XP Gypsum Board that is to have a wall covering applied to it should be prepared and primed as described for painting.

Gypsum Association GA-214, *Recommended Specification for Levels of Gypsum Board Finish*, should be referred to in order to determine the level of finishing needed to assure a surface properly prepared to accept the desired decoration.

National Gypsum®

The color PURPLE® is a registered trademark of National Gypsum Properties, LLC

Republic doors • frames

TECHNICAL DATA SHEET No. 101

DOORS - DM SERIES

DM Series Doors shall be as manufactured or furnished by Republic Doors and Frames, McKenzie, Tennessee 38201.

Thickness - 1-3/4”

Actual Door Size - Door undersized from nominal by 1/4” in width and 7/8” in height. Standard undercut is 3/4”.

Hinge Rail & Reinforcement - Hinge edge is non-beveled and reinforced with a 16 gage steel channel, projection welded at a maximum 5” on center. Additional reinforcement plates are provided at the hinge locations to give a total 3/16” reinforcement. (Backset 1/4”)

Lock Rail - Lock edge is non-beveled and is continuous lap seam welded and planished. 16 gage reinforcements for mortise or cylindrical locks are of the box type configuration.

Top Channel - Top Channel is a 16 gage flush channel, projection welded at a maximum 2-1/2” on center.

Bottom Channel - Bottom Channel is an inverted 16 gage channel, projection welded at a maximum 2-1/2” on center.

Core - A 3/4” cell honeycomb core is bonded to steel face sheets with a proprietary adhesive that provides a superior bond and results in a flatter stronger door. A section of 3/4” honeycomb core, weighing less than three ounces, will support 48 pounds per square inch (over three tons per square foot) when bonded to steel face sheets. This honeycomb core door is available in a complete range of fire ratings (20 minutes to three hours) and with either U.L. or W.H. labels. In a fire situation, honeycomb core will not ignite unless directly exposed to flame. If it ignites, the honeycomb core will emit significantly less toxic gases than doors of other core constructions.

Face Skins - 20 gage and 18 gage, Cold Rolled Steel

Closer Reinforcement (Optional) - 14 gage channel (18” x 6”)

Size Availability - Minimum 2’4” x 6’8”, Maximum 4’0” x 7’0”

SDI 100 Grade/Model - Grade 1 Model 1 (Standard Duty, minimum 20 gage, hollow steel composite)
Grade 2 Model 1 (Heavy Duty, minimum 18 gage, hollow steel composite)

Label Range - Consult Label Section. (Stock doors have a U.L. 1-1/2 hr. mylar label)

Universal Standard/Heavy Weight Hinge - Hinge fillers are used allowing for an easy modification from standard to heavy weight hinge prep.

Handing Design - Non-Handed

Revised 8/09

Republic doors • frames

TECHNICAL DATA SHEET No. 101a

DM SERIES - SPECIFICATIONS

I. DM Series Doors as manufactured by Republic Doors and Frames, McKenzie, TN 38201 have been tested or adhere to the criteria set forth by the following published standards:

A. ANSI A250.8-1998 (SDI 100) - Recommended Specifications -Standard Steel Doors & Frames; Steel Door Institute.
B. ANSI A250.4 - Test Procedure & Acceptance Criteria for Physical Endurance for Steel Doors & Hardware Reinforcings.
C. SDI 111 - Recommended Standard Details - Steel Doors & Frames.
D. SDI 112-97 - Zinc Coated Standard Steel Doors and Frames.
E. SDI 113-79 - Test Procedure and Acceptance Criteria for Acoustical Performance for Steel Door and Frame Assemblies.
F. ASTM A366/A366M - Standard Specification for Steel, Sheet, Carbon, and High Strength, Low Alloy, Hot Rolled and Cold Rolled, General Requirements.
G. ASTM A568/A568M - Standard Specification for Steel, Sheet, Carbon and High Strength, Low-Alloy, Hot Rolled and Cold Rolled, General Requirements For.
H. ASTM A569/A569M - Standard Steel Specification for Steel, Carbon (0.15 Maximum Percent), Hot Rolled Sheet and Strip Commercial Quality.
I. ASTM A591/A591M - Standard Steel Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Mass Applications.
J. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvanized) by Hot Dipped Process.
K. NFPA 80 - Standard for Fire Doors and Windows.
L. ANSI A151.1 - Performance Test for Steel Doors, Hinge, Lock and Exit Device Reinforcing.

II. Door Construction

A. Doors will be constructed of 20 or 18 gage steel.
B. Top Channel will be 16 gage, flush with the top of the door and will be projection welded on maximum 2-1/2” centers to each face sheet.
C. Bottom Channel will be 16 gage, inverted and will be projection welded on maximum 2-1/2” centers to each face sheet.
D. Hinge reinforcing will be a full height 16 gage channel with additional reinforcing at hinge locations to total 3/16” thickness, projection welded to both face sheets with a maximum of 5” on center.
E. Lock edge is non beveled and is continuous lap seam welded and planished. 16 gage reinforcements for cylindrical and mortise locks will be box type according to ANSI A115.
F. Cores:
1. Standard - 3/4” cell honeycomb with a “U” factor of .34.
2. Optional Cores- 1 lb density expanded Polystyrene per ASTM 578 with a “U” factor of .13.

III. Door Finish

Doors will be cleaned and phosphatized with one coat of force-cured grey primer applied in accordance with ANSI A224.1-1990 or ASTM specification B117 for finishes capable of passing 120 hour salt spray test and a 240 hour humidity test in compliance with ASTM D1735.

SDI Classifications:
Grade I Standard Duty Model 1.
Grade II Heavy Duty Model 1.

Revised 8/09

Republic doors • frames

TECHNICAL DATA SHEET No. 101b

DOORS - DM SERIES (OPTIONS)

Cores: Polystyrene - A solid core, efficient in extreme weather conditions.

Face Skins*-Galvanealed*: Republic's standard is a hot dipped process of not less than 0.6 oz of zinc per square foot. The galvanizing process adheres to the criteria set forth by ASTM A924, ASTM A653/A653M and SDI 112-97. **Republic's standard supplied light kits or louvers for galvanized doors will be galvanized.**

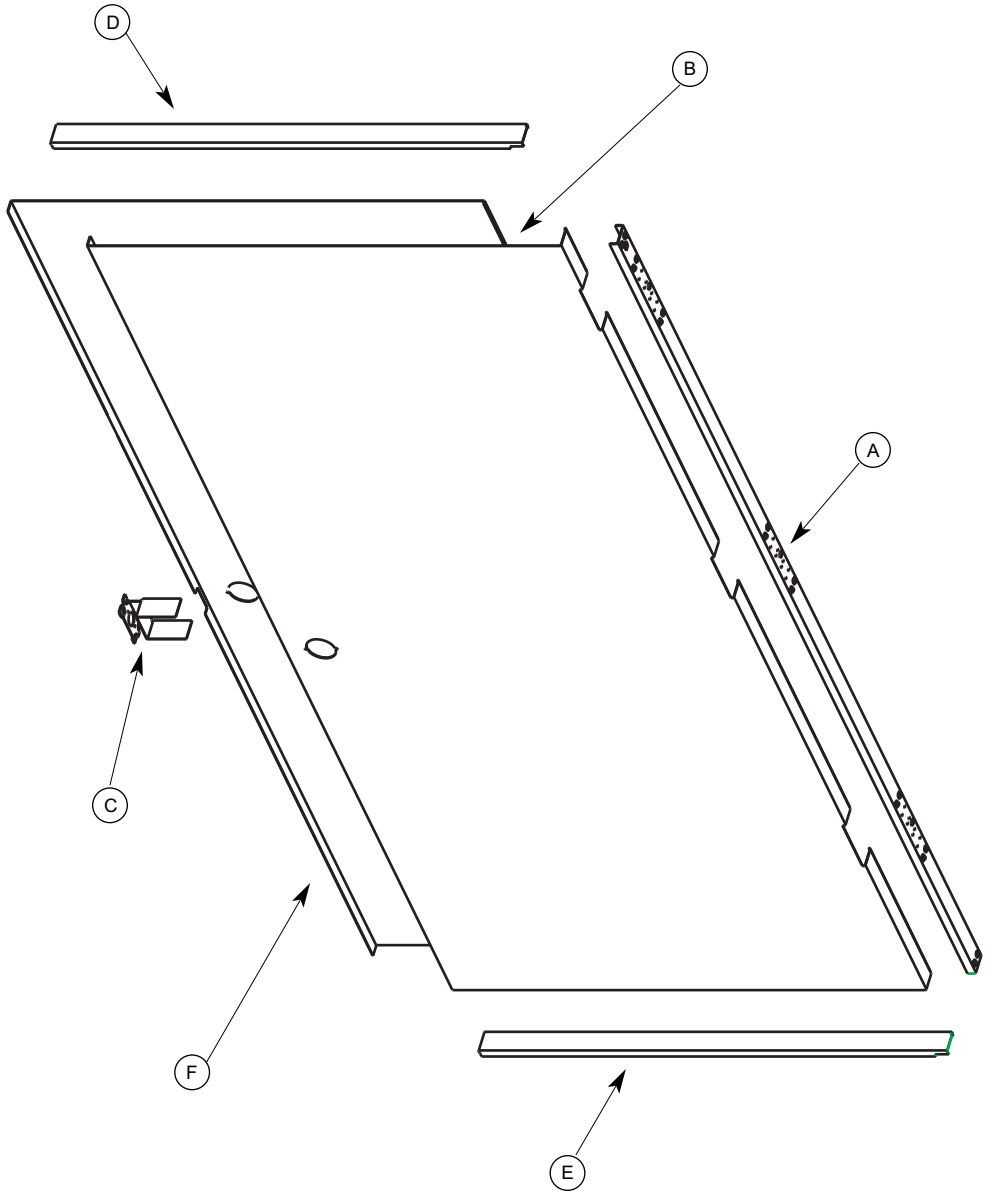
Closer Reinforcement - 14 gage channel (18" x 6")

Revised 11/07

Republic doors • frames

TECHNICAL DATA SHEET No. 101c

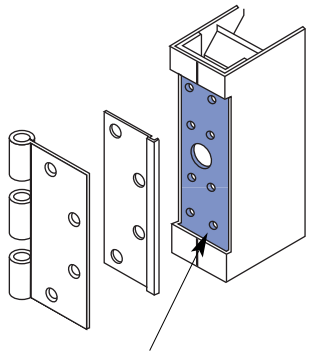
DM SERIES - 1-3/4" DOOR CONSTRUCTION DETAILS



NOTE:
See Details on back of page.

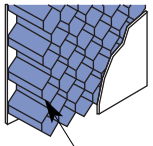
Revised 6/05

A



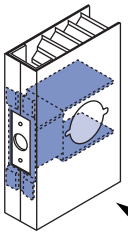
Continuous 16 gage steel channel with integral 10 gage reinforcement with provision for 4-1/12" or 5" full mortise template hinges

B

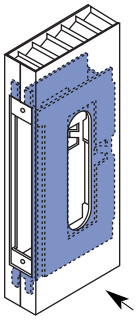


3/4" Cell Honeycomb Core U Factor of .34

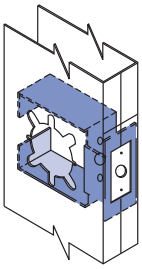
C



16 gage steel cylindrical lock reinforcement with provisions for Gov't Series 160 or 161 cylindrical lock sets (2-3/4" backset) and ANSI A115.2 lock front (1-1/8" x 2-1/4")



16 gage mortise lock reinforcement with provisions for Gov't Series 86 mortise lockset and ANSI A115.1 lock front (1-1/4" x 8")



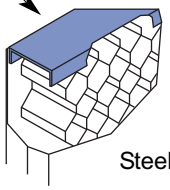
Lever Lock Prep - 161 DT (Modified 161 Prep) Conforms with the ANSI 115.18 161 lever lock specifications.

WARNING: Use rose trim with a minimum diameter of 3-5/16" to cover prep.

D

Flush Top Continuous 16 gage steel channel

DOOR TOP



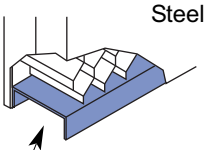
Steel Panel

14 gage closer reinforcement when requested

E

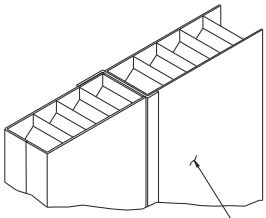
DOOR BOTTOM

Steel Panel



Continuous 16 gage steel channel

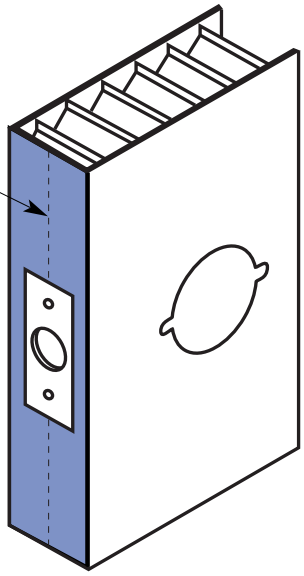
F



Inactive Leaf (outside)

14 gage astragal for double doors (optional)

Continuously welded edge seam



DM STOCK DOORS

2468	2470
2668	2670
2868	2870
3068	3070
3468	3470
3668	3670
3868	3870
4068	4070

Revised 8/09

Republic doors • frames

TECHNICAL DATA SHEET No. 201

UNIVERSAL FRAMES - ME SERIES/MITERED

ME Series Mitered Frames shall be as manufactured or furnished by Republic Doors and Frames, McKenzie, Tennessee 38201.

Thickness - Made for two basic door thicknesses: 1-3/8" or 1-3/4"

Gages - 16 or 14 (12 gage available with coped bolted corner connections)

Faces - 1" to 4"

Standard Rabbets - 1-3/8" (actual dimension 1-9/16"); 1-3/4" (actual dimension 1-15/16"). Rabbet dimension is 3/16" greater than the door thickness.

Stop - 5/8" standard - (3/4" available)

Closer Reinforcement (Optional) - 1-3/8" x 14" x 12 gage plate; 12 gage Snap-In, or 12" long x 12 gage sleeve.

Size Availability - Maximum Size 5'0" x 10'0" Single; Maximum Size 10'0" x 10'0" Double.

Label Range - Consult Label Section. (Embossed UL Listing Marks shall be provided on all stock frames.)

Universal Standard/Heavy Weight Hinge - Frames for 1-3/4" doors shall have a 9 gage steel hinge reinforcement plate, projection welded with provisions for 4-1/2" x 4-1/2" template hinges. Hinge plate is designed to be modified to accept a heavy weight hinge by removing four projections. Frames for 1-3/8" doors shall have a 11 gage steel hinge reinforcement plate, projection welded with provisions for 3-1/2" x 3-1/2" standard weight template hinges. (Optional - 8" or 10", 7 gage reinforcement)

Strike Prep - Frames for 1-3/4" doors shall have a 14 gage steel strike reinforcement plate, extruded and formed to the equivalent of 10 gage, projection welded with provisions for Universal ANSI A115.1 or ANSI A115.2 strike (4-7/8"). Frames for 1-3/8" doors shall have a 14 gage steel strike reinforcement plate, extruded and formed to the equivalent of 10 gage projection welded with provision for Universal ANSI A115.3 strike (2-3/4".)

Hinge Backset - 5/16"

Backbend - 7/16"

Anchors - Sill anchors are included with all ME frames (either integral or welded on sill anchor). All other anchors must be ordered separately.

Silencer Prep - 9/32" dia. holes shall be provided as standard on strike jambs and double headers, (3 per strike jamb and 2 per double head). Mutes are not supplied and must be ordered separately.

Double Heads - Double heads are undersized 1/16" (except for cased open heads, which are nominal).

Mortar Guards - Mortar guards of 26 gage steel shall be welded to each hinge and strike reinforcement plate.

Profiles - Equal Rabbet, Unequal Rabbet, Single Rabbet, Double Egress, Cased Opening.

Shipping - Frames are shipped as components, bundled as one pair of jambs (hinge & strike for single openings or 2 hinge jambs for double openings). Heads ar packaged separately.

Handing - Frames are handed.

Revised 8/09

Republic doors • frames

TECHNICAL DATA SHEET No. 201a

ME SERIES - SPECIFICATIONS

I. ME Series Mitered Frames as manufactured by Republic Doors and Frames, McKenzie, TN 38201 have been tested or adhere to the criteria set forth by the following published standards:

A. ANSI A250.8-1998 (SDI 100) - Recommended Specifications -Standard Steel Doors & Frames; Steel Door Institute.
B. SDI 111 - Recommended Standard Details - Steel Doors & Frames.
C. SDI 112-97 - Zinc Coated Standard Steel Doors and Frames.
D. SDI 113-79 - Test Procedure and Acceptance Criteria for Acoustical Performance for Steel Door and Frame Assemblies.
E. ASTMA 366/A 366M - Standard Specification for Steel, Sheet, Carbon, and High Strength, Low Alloy, Hot Rolled and Cold Rolled, General Requirements.
F. ASTM A 568/A 568M - Standard Specification for Steel, Sheet, Carbon and High Strength, Low-Alloy, Hot Rolled and Cold Rolled, General Requirements.
G. ASTM A 569/A 569M - Standard Steel Specification for Steel, Carbon (0.15 Maximum Percent), Hot Rolled Sheet and Strip Commercial Quality.
H. ASTMA 591/A 591M - Standard Steel Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Mass Applications.
I. ASTMA 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvanized) by Hot Dipped Process.
J. NFPA 80 - Standard for Fire Doors and Windows.
K. A250.4 1994 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings.

II. Frame Construction

A. Frames shall be formed from 18,16,14 or 12 gage cold-rolled, hot-rolled or galvanized steel. (A60 galvanealed standard)
B. Frames shall be either knocked-down or have corners welded and ground smooth. Corners shall have aligning tabs and slots for secure and easy interlocking of jambs to head. (12 gage frames shall have coped bolted corner connections.)
C. Frames shall be provided with 9/32” silencer preparation, (3) per strike jamb and (2) per head for double openings, for field application after finish painting.
D. Frames for 1-3/4” doors shall have 9 gage steel universal hinge tap plate, projection welded, with provisions for 4-1/2” x 4-1/2” template hinges, and 14 gage steel strike reinforcement plate, extruded and formed to the equivalent of 10 gage, projection welded, with provision for Universal ANSI A115.1 or ANSI A115.2 strike. Mortar guards of 26 gage steel shall be welded to each hinge or strike reinforcing plate.
E. Frames for 1-3/8” doors shall have 11 gage steel hinge reinforcement plates, projection welded, with provisions for 3-1/2” x 3-1/2” template hinges, and 14 gage steel strike reinforcement plate, projection welded, with provision for cylindrical ANSI A115.3 strike.
F. Reinforcement for surface closer shall be 12 gage steel. Proper reinforcement shall be provided for other hardware when required.

III. Frame Finish

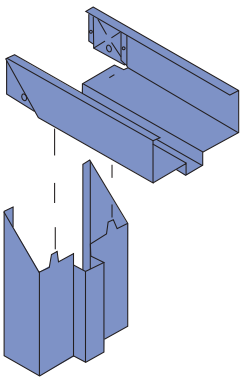
Frames will be cleaned and phosphatized with one coat of force-cured grey primer, that meets or exceeds ANSI A224.1-1990 and ASTM specification B117 for finishes. (Capable of passing 120 hour salt spray test and a 240 hour humidity test in compliance with ASTM D1735.)

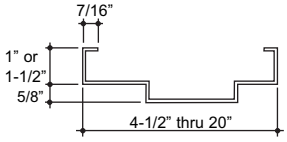
Revised 8/08

Republic doors • frames

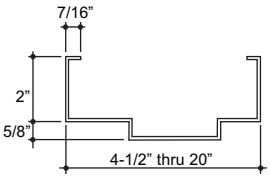
TECHNICAL DATA SHEET No. 201b

ME SERIES - FRAME CONSTRUCTION

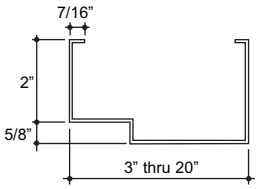




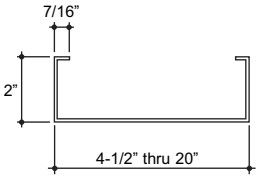
Narrow Face
(NON STOCK)



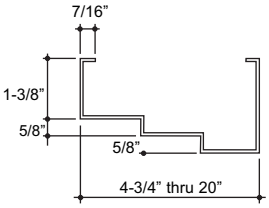
Double Rabbet
STOCK=4-3/4", 5-3/4", 6-1/4", 6-3/4", 7-3/4", 8-1/4", 8-3/4"



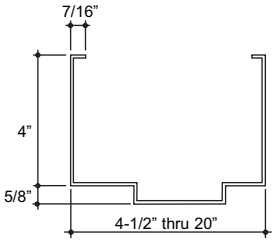
Single Rabbet
(NON STOCK)



Cased Opening
STOCK=5-3/4"



Double Egress
STOCK=5-3/4"

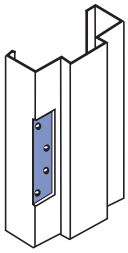


Double Rabbet
STOCK=4-3/4", 5-3/4", 6-3/4", 7-3/4", 8-3/4"

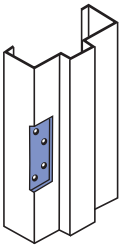
Rough Opening Required for
Butted Universal Frame
Door Width Opening + 2 Times Face Dimension + 1/2"
Door Heigth Opening + Face Dimension + 1/4"

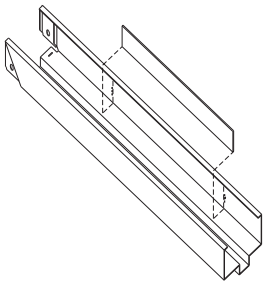
HARDWARE PREPARATION

9 gage hinge reinforcement with 4-1/2" or 5" full mortise universal hinge provision for 1-3/4" doors.

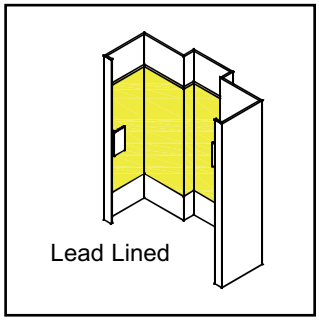


11 gage hinge reinforcement with 3-1/2" x 3-1/2" full mortise universal hinge provision for 1-3/8" doors.



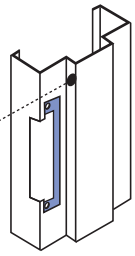


12 gage Flat Plate Closer Reinforcement (Primary option)

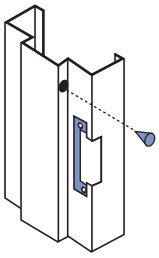


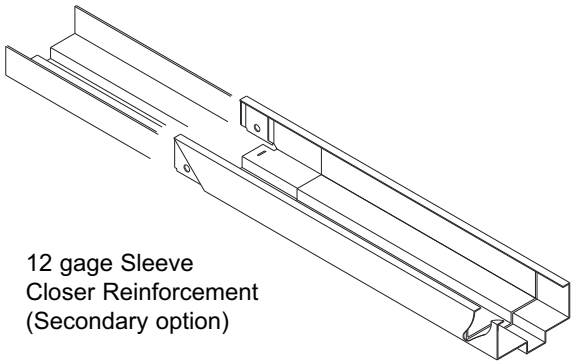
Lead Lined

1-3/4" - 14 gage strike reinforcement with ANSI-A115.1 or ANSI A115.2 universal strike provision - 4-7/8"



1-3/8" - 14 gage strike reinforcement with ANSI-A115.3 cylindrical strike provision - 4-7/8"





12 gage Sleeve Closer Reinforcement (Secondary option)

Revised 8/09

MEMBER OF: SDI STEEL DOOR INSTITUTE

Republic Doors and Frames
155 Republic Drive • McKenzie, Tennessee 38201 • (731) 352-3383

NAAMM

Republic doors • frames

TECHNICAL DATA SHEET No. 201c

ME SERIES - BULLET RESISTANT FRAME - LEVELS 1 THRU 8

ME Series Bullet Resistant Mitered Frames shall be as manufactured or furnished by Republic Doors and Frames, McKenzie, Tennessee 38201.

Thickness - Made for standard door thickness 1-3/4”

Gages - 14 gage only

Faces - 1” to 4”

Standard Rabbets - 1-3/8” (actual dimension 1-9/16”); 1-3/4” (actual dimension 1-15/16”). Rabbet dimension is 3/16” greater than the door thickness.

Stop - 5/8” standard

Closer Reinforcement (Optional)- 1-3/8” x 14” x 12 gage plate; 12 gage Snap-In, or 12” long x 12 gage sleeve.

Size Availability - Maximum Size 5’0” x 10’0” Single; Maximum Size 10’0” x 10’0” Double.

Universal Standard/Heavy Weight Hinge - Frames shall have 9 gage steel hinge reinforcement plate, projection welded for provisions for 4-1/2” x 4-1/2” and 5” template hinges or reinforced for continuous hinges.

Strike Prep - Frames shall have a 14 gage steel strike reinforcement plate, extruded and formed to the equivalent of 10 gage, projection welded with provisions for Universal ANSI A115.1 or ANSI A115.2 strike (4-7/8”).

Hinge Backset - 5/16”

Backbend - 7/16”

Anchors - Masonry wire, tee and existing opening punch and dimple. Sill anchors are included with all ME frames (either integral or welded on sill anchor).

Silencer Prep - 9/32” dia. holes shall be provided as standard on strike jambs and double headers, (3 per strike jamb and 2 per double head). Mutes are not supplied and must be ordered separately.

Double Heads - Double heads are undersized 1/16”.

Mortar Guards - Mortar guards of 26 gage steel shall be welded to each hinge and strike reinforcement plate.

Profiles - Equal Rabbet, Unequal Rabbet, Single Rabbet.

Handing - Frames are handed.

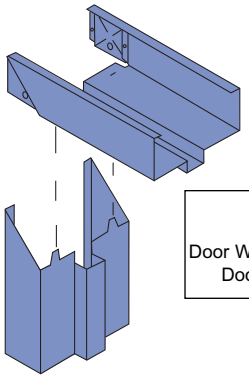
Special Requirements - Frames must be welded - Masonry frames fully grouted do not require armor plating.

Revised 8/09

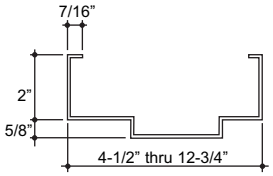
Republic doors · frames

TECHNICAL DATA SHEET No. 201d

ME SERIES - BULLET RESISTANT FRAME - LEVEL 1 CONSTRUCTION



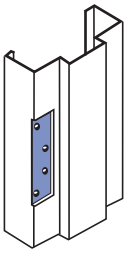
Rough Opening Required for
Butted Universal Frame
Door Width Opening + 2 Times Face Dimension + 1/2"
Door Heigth Opening + Face Dimension + 1/4"

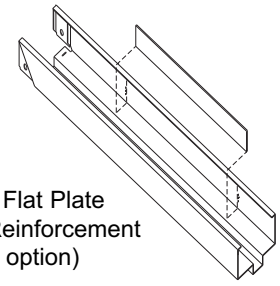


Double Rabbet
STOCK=4-3/4", 5-3/4", 6-1/4",
6-3/4", 7-3/4", 8-1/4", 8-3/4"

HARDWARE PREPARATION

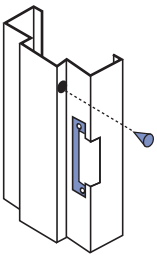
9 gage hinge reinforcement with 4-1/2" or 5" full mortise universal hinge provision for 1-3/4" doors.

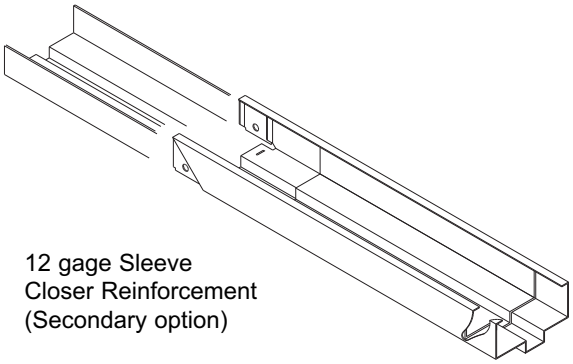




12 gage Flat Plate Closer Reinforcement (Primary option)

1-3/8" - 14 gage strike reinforcement with ANSI-A115.3 cylindrical strike provision - 4-7/8"





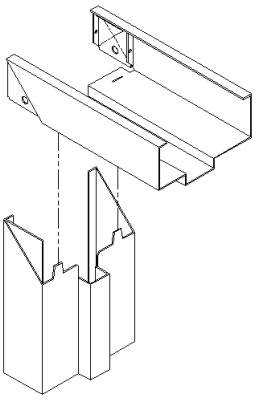
12 gage Sleeve Closer Reinforcement (Secondary option)

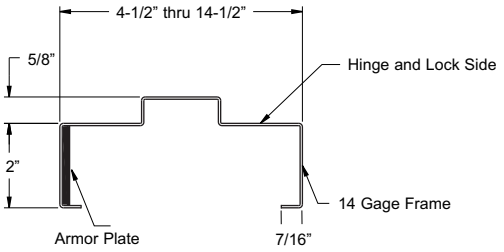
Revised 6/05

Republic doors • frames

TECHNICAL DATA SHEET No. 201e

ME SERIES - BULLET RESISTANT FRAME - LEVEL 2 & 3 CONSTRUCTION





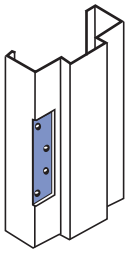
Double Rabbet

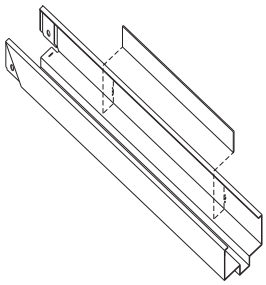
Rough Opening Required for
Butted Universal Frame
Door Width Opening + 2 Times Face Dimension + 1/2"
Door Heigth Opening + Face Dimension + 1/4"

Note: Masonry frames fully grouted do not require armor plating.

HARDWARE PREPARATION

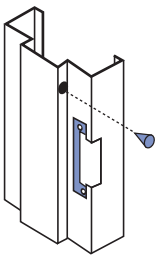
9 gage hinge reinforcement with 4-1/2" or 5" full mortise universal hinge provision for 1-3/4" doors.





12 gage Flat Plate Closer Reinforcement (Optional)

1-3/8" - 14 gage strike reinforcement with ANSI-A115.3 cylindrical strike provision - 4-7/8"

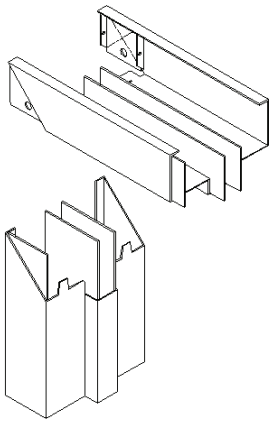


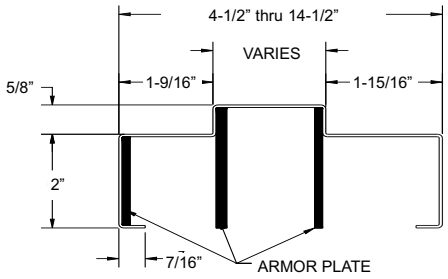
Revised 8/09

Republic doors • frames

TECHNICAL DATA SHEET No. 201f

ME SERIES - BULLET RESISTANT FRAME - LEVEL 4 THRU 8 CONSTRUCTION





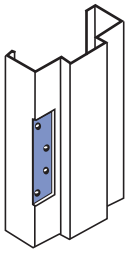
Double Rabbet

Rough Opening Required for Butted Universal Frame
Door Width Opening + 2 Times Face Dimension + 1/2"
Door Heigth Opening + Face Dimension + 1/4"

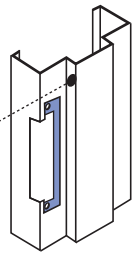
NOTE: Masonry frames fully grouted do not require armor plating.

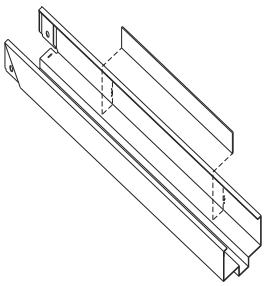
HARDWARE PREPARATION

9 gage hinge reinforcement with 4-1/2" or 5" full mortise universal hinge provision for 1-3/4" doors.



1-3/4" - 14 gage strike reinforcement with ANSI-A115.1 or ANSI A115.2 universal strike provision - 4-7/8"





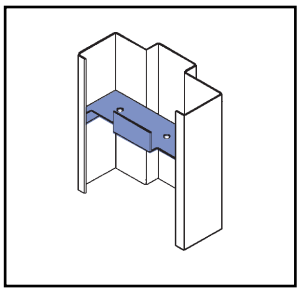
12 gage Flat Plate Closer Reinforcement (Optional)

Revised 8/09

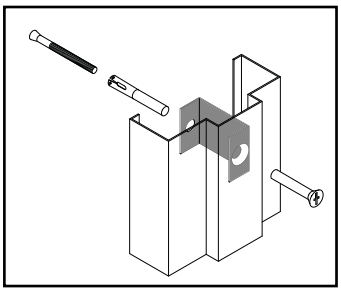
Republic doors • frames

TECHNICAL DATA SHEET No. 201g

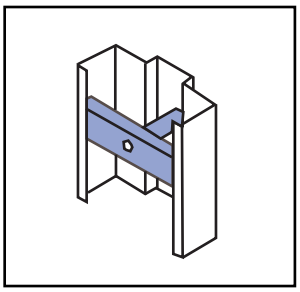
ME SERIES - ANCHOR DETAILS



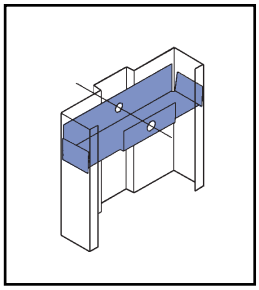
Steel Stud Anchor



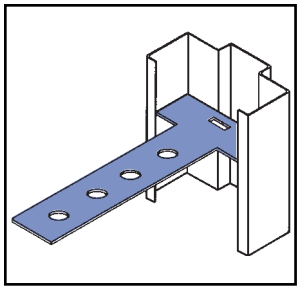
Prepared Opening Anchor



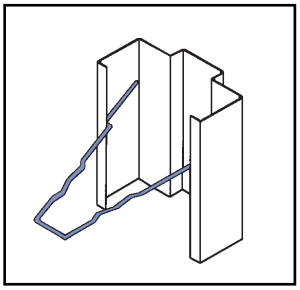
Twist in Prepared Opening Anchor



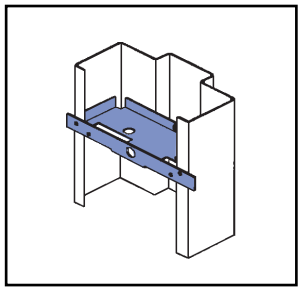
Snap-in Prepared Opening Anchor



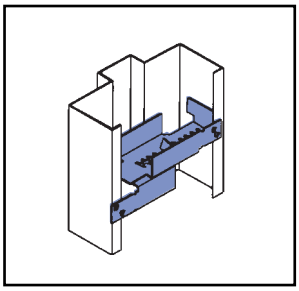
Tee Masonry Anchor



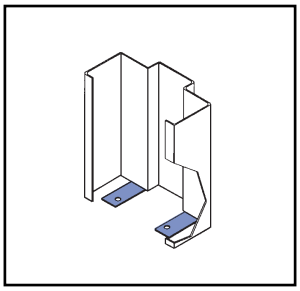
Wire Masonry Anchor



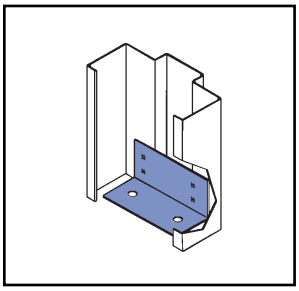
Wood Stud Anchor



Adjustable Wood/Steel Stud Anchor (Assembled)



Integral Sill Anchor (5-3/4 Stock Only)



One Piece Sill Anchor Welded On

Revised 8/08

Ternium

METAL-PANEL

Metal Panel S. de R.L solo con lideres!

Ternium

Especificación Técnica de Producto
Ternium Multymuro

Contenido

1. Descripción

2. Usos

3. Sustrato y Recubrimientos

4. Características del Producto

5. Rango Dimensional

6. Geometría

7. Propiedades y Capacidades de Carga

8. Certificaciones

1. Descripción

Panel sándwich para muros prefabricados, que se fabrica en un proceso continuo; esta compuesto por un núcleo de espuma rígida de poliuretano y dos caras de acero Ternium Pintro, ambas caras van adheridas químicamente en forma continua mediante el propio núcleo.
Este producto está diseñado para una gran diversidad de aplicaciones en fachadas, con el atributo de ocultar los accesorios de fijación dentro de la junta longitudinal.

2. Usos

Muros, Fachadas, Faldones de Naves Industriales, Centros Comerciales, Cámaras de refrigeración y Congelación, Casetas, etc.

3. Sustrato y Recubrimientos

Sustratos y Recubrimientos

Producto	ETP
Ternium Pintro	N3 ETP MEX P09 TER CONST 001

Acero Grado SS37 (Fy=37 Ksi)

Colores Estándar	Tipo de Pintura
Blanco	Poliéster Estándar
Arena	Poliéster Estándar

4. Características del Producto

- Excelente aislamiento térmico, resistencia estructural y a la intemperie; fácil y rápido de instalar, adaptable a un gran número de aplicaciones constructivas.
- **Bajo pedido puede suministrarse con espuma Clase I (F.M.)**

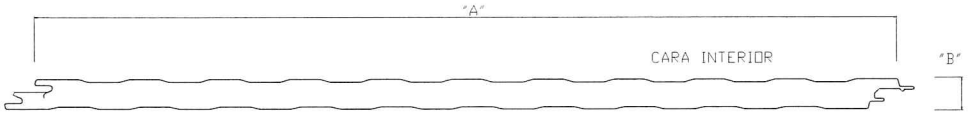
Producto	Espesor	Calibre Cara exterior	Presentación Cara exterior	Calibre Cara Interior	Presentación Cara Interior
Ternium Multymuro	1.5", 2", 2.5", 3", 4", 5" y 6"	26	Blanco Liso Arena Embozado	26	Blanco Liso Arena Embozado

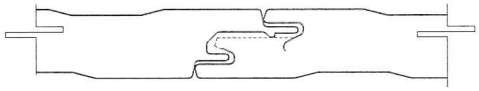
5. Rango Dimensional

- Disponible en anchos efectivos de 1100 mm (43.300") y 1067 mm (42")

- Longitudes disponibles
  - Min 3.5 mts. (11'-6")
  - Max 12 mts (~40')

6. Geometría





Detalle Unión

Poder Cubriente (A)	Espesor (B)
1100 mm (43.300")	1.5", 2", 2.5", 3", 4", 5" y 6"
1067 mm (42.000")	

Características de la espuma de poliuretano

	Características	Norma
Conductividad térmica	Factor inicial K= 0.132 Btu-in/hr-fr^2-°F medio a una temperatura media de 75°F y con diferencia de temperatura de 40°F	ASTM C-518
Compresión	1.0 kg/cm^2 (14.22 psi) con 10% de deflexión de cedencia	ASTM D-1621
Tensión	1.4 kg/cm2 (19.91 psi)	ASTM D-1623
Densidad	40 kg/m^3 tolerancia según fórmula y espesor	ASTM D-1622
Celda Cerrada	90% mínimo en su estructura	ASTM D-2856
Temperatura de trabajo	80 °C (176 °F) máx. -40°C (-40°F) min.	N.A.

7. Propiedades y Capacidades de Carga

Propiedades				Capacidades de carga (kg/m^2)														
e mm (pulg)	Factores de aislamiento		Peso Panel 1100 mm	Apoyo Simple					Apoyo Doble					Triple o Más				
	R	U	Kg/M^2	Claros (mts)					Claros (mts)					Claros (mts)				
	hrFT^2 °F/BTU	BTU hrFT^2 °F	CAL. 26/26	2.0	2.5	3.0	3.5	4.0	2.0	2.5	3.0	3.5	4.0	2.0	2.5	3.0	3.5	4.0
38.1 (1.5")	11.36	0.088	10.74	137	87	57			194	138	100	74	51	188	129	91	65	42
50.8 (2.0")	15.15	0.066	11.44	235	158	110	79	53	298	219	165	127	92	294	211	156	117	82
63.5 (2.5")	18.94	0.053	11.98	300	229	163	119	81	300	300	230	180	133	300	293	221	169	122
76.2 (3.0")	22.73	0.044	12.22	300	300	221	164	113	300	300	297	235	189	300	300	289	224	164
101.6 (4.0")	30.30	0.033	13.61	300	300	300	249	173	300	300	300	300	286	300	300	300	300	246
127.0 (5..0")	37.88	0.026	14.75	300	300	300	300	233	300	300	300	300	300	300	300	300	300	300

(1) Deflexión máxima permisible = L/180

(2) Módulo de elasticidad del acero 2.1 X 10^6 kg/cm^2

(3) Esfuerzo máximo de cedencia 2,604 kg/cm^2

(4) Factores de aislamiento no consideran películas de aire.

(5) Cálculo de capacidad de carga de acuerdo a "Design of Foam-Filled Structures por John A. Hartsock".

(6) Consultar con Asesoría Técnica patrones de fijación.

(7) Los proyectos deben de ser calculados por un Ingeniero responsable del mismo para satisfacer los códigos, normas y procedimientos aceptados por la industria de la construcción

8. Certificaciones

° Fuego y Viento

Cobertura	Standard	Clasificación		Apoyos	Espesor	Construcción	Identificación
		Fuego	Viento	c. c.	(pulg)	(Ver Nota 1)	FM
Clasificación de Fuego	**FM 4880** Altura ilimitda	Clase 1			6 max		J. I. 3029172
Propagación de Flama	**ASTM E84**	25					
Generación de Humo		285					

Nota: Las aprobaciones Factory Mutual (FM) aplican para paneles con las siguientes características: ambas caras de acero calibre 26 (mínimo), con espuma Clase 1 y en rango de espesores de 1" hasta 6". Consulte "FM RoofNav"

NOTA IMPORTANTE: La espuma Clase I se suministra solo bajo pedido especial, favor de consultar a su ejecutivo de ventas

- Ternium Multymuro en acabado poliéster estándar en colores blanco y arena, tanto en acabado liso como embozado, cumplen con los requisitos de composición y estándares exigidos por el United States Department of Agiculture (U.S.D.A.).

- Ternium Multymuro cumple con los puntos 4.8 y 5.4.3 de la Norma NOM-008-ZOO-1994 de las "Especificaciones Zoosanitarias para la Construcción y Equipamiento de Rastros" en espesores que van de 1.5" a 6" recubiertos con los acabados Poliéster Estándar y Duraplus. Esto en cumplimiento a lo solicitado por la Comisión Nacional de Sanidad Agropecuaria de la Dirección General de Salud Animal, perteneciente a la Secretaria de Agricultura, Ganadería y Desarrollo Rural.

- Ternium Multymuro en espesores de 1.5" a 6", en acabados Poliéster Estándar, Duraplus, cumple con los requerimientos establecidos por el "Distintivo H", de acuerdo al Apéndice Normativo "A" de la Norma Mexicana NMX-F-605-NORMEX-2000 "Manejo Higiénico en el servicio de alimentos preparados para la obtención del Distintivo H", para ser utilizado en la construcción de Cámaras de Refrigeración y Congelación en Restaurantes, Hoteles, Comedores Industriales y Escolares.

METAL-PANEL

Metal Panel S. de R.L solo con lideres!

Datos de contacto:

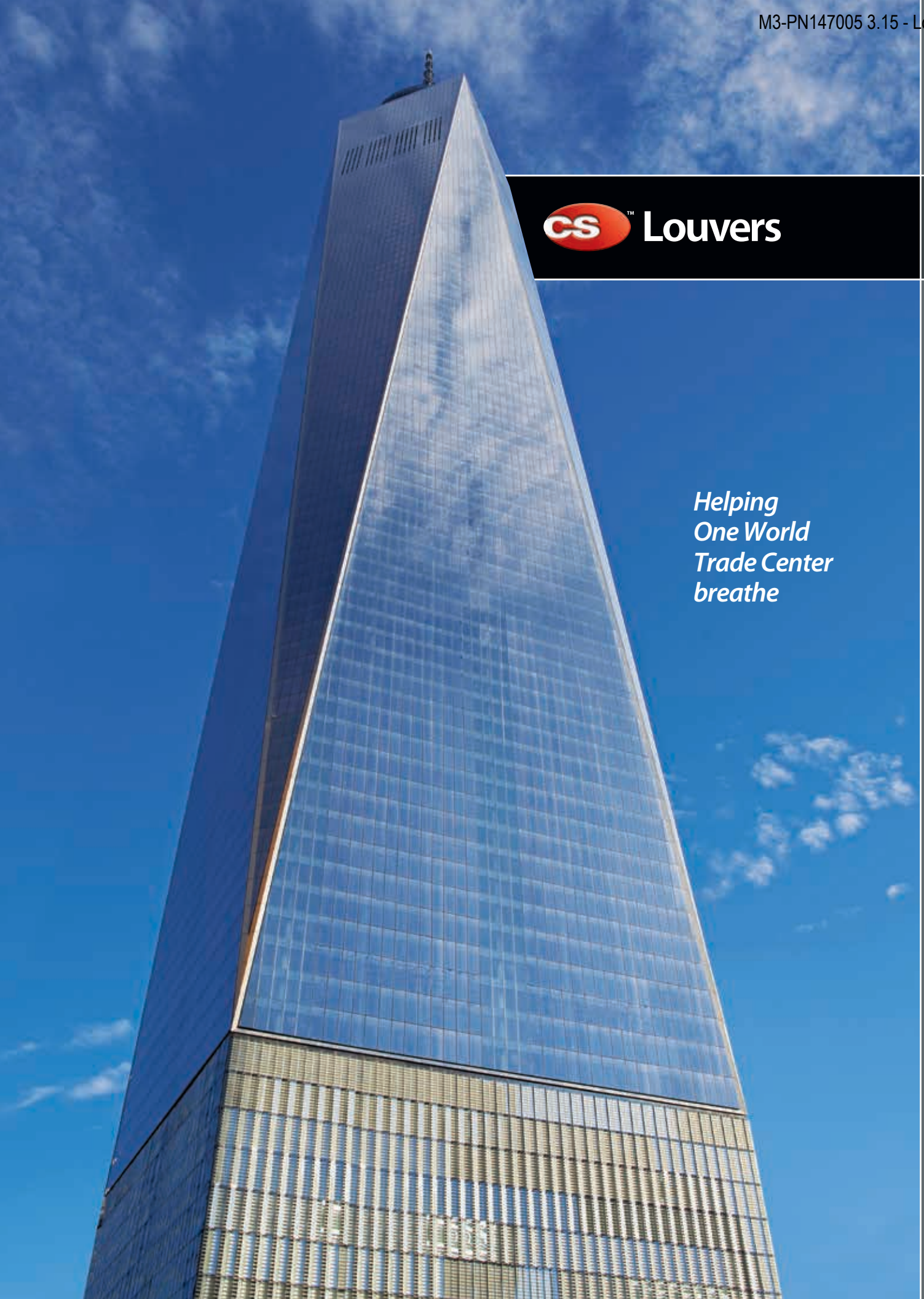
Dirección:
Calle Cartagena #8841
Col. El Porvenir c.p. 22224, Tijuana B.C.

Tel/Fax: (664)903-0198
Nextel: 152*17 11 10*6

Email:
info@metalpanel.com.mx
multypanelbc@prodigy.net.mx

Pagina web: www.metalpanel.com.mx

CS™ Louvers



Helping One World Trade Center breathe

Providing a unique air movement solution for the world's most iconic building.

C/S is proud to have been selected to provide louvers for America's symbol of freedom and strength.

Challenge

For the WTC1, architect SOM wanted louvers that didn't look like louvers but required lots of airflow, low pressure drop and absolutely no water entry.

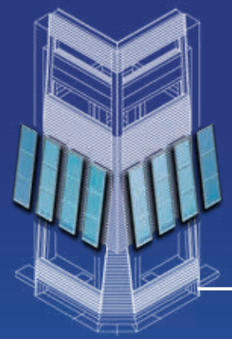
Solution

C/S worked with SOM and the mechanical contractors to design and develop a custom wind driven A-rated louver system specifically for the project's needs. Using elements from three different standard louver models, C/S created a new custom model that would supply the required free area and water resistance for the building's HVAC system housed on 18 floors.

Creating a concealed airflow system to work with the building's monolithic design

On the lower floors of WTC1 a security grille is positioned 7 feet in front of the louvers and behind open glass panes. C/S proved the louver's performance by replicating the exact conditions in our exclusive test chamber.





Providing air and stopping water 100 stories up

The C/S Louvers act as a reverse plenum to stop water. With no windows in front of them, the storm resistant louvers are fully exposed to the elements. The louvers are also angled back 18 degrees and notched at the corners to match the building's exterior skin.

One World Trade Center Facts:

18 Floors of Louvers

166,636 Sq Ft of Louvers

429 Tons of aluminum

9,158 Gallons of PVDF Finish

989,780 Fasteners

We made our legendary Louver performance disappear...

Introducing C/S Perform Louvers



Facade Options

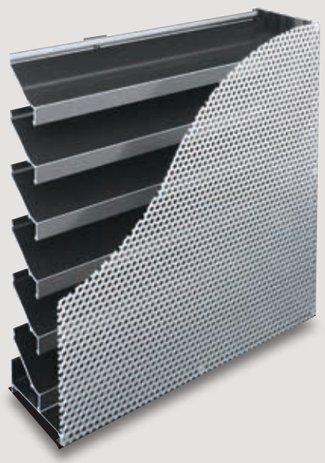
The Perform custom perforated aluminum skin is engineered to work in harmony with the interior rain fins to provide uncompromised air and water performance.

New C/S Perform provides all the air movement, security and sight screening of our standard louvers, but with our exclusive perforated facade that gives it a fresh modern appearance. We even have a model that provides 100% rain defense. So why settle for the same old look? Specify C/S Perform.



Storm Resistant Model PL-5700

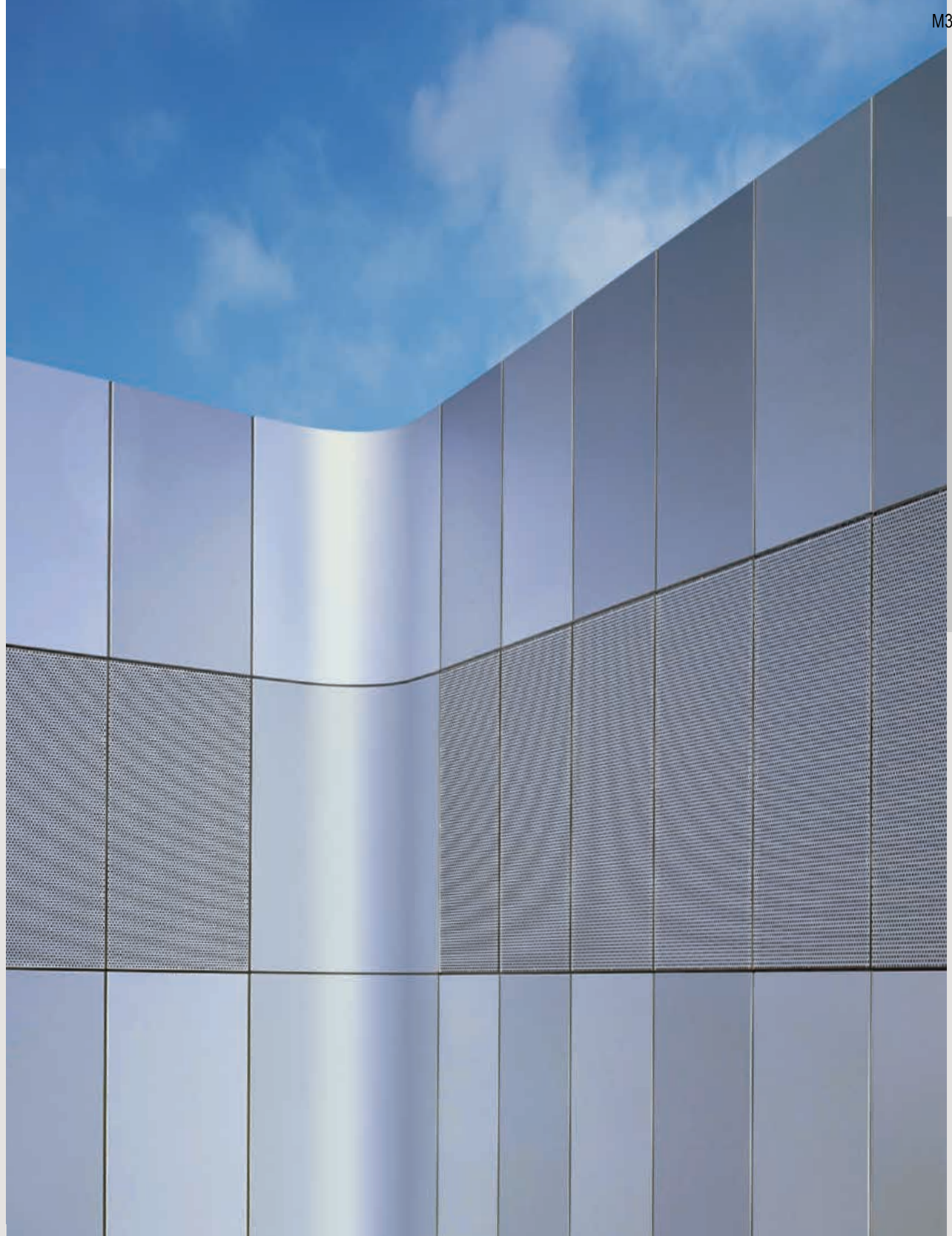
Free Area: 44.5% for a 4' x 4' unit
Static Pressure Drop: 0.13 @ 900 FPM



Conventional Model PL-4080

Free Area: 46.8% for a 4' x 4' unit
Static Pressure Drop: 0.16 @ 900 FPM

** Please call 800-631-7379 for additional material options.*



Weather Considerations

C/S Perform louvers are not designed for specification or use in areas where the louver's perforations may clog or become blocked. This includes areas where debris, snow, ice or other obstructions or occlusions may occur. C/S Perform louvers should be regularly inspected and maintained free of occlusion and blockage. To maximize performance and avoid property damage or personal injury, C/S Perform louvers must be cleared of occlusions and blockage as they occur, including blockages caused by accumulations of debris, snow, ice, or any other type or kind of obstruction.

Perform Sizes and Joints

Perform comes in standard modules. Butt joint will provide a continuous look that can cover an entire facade. Reveal option provides a dramatic accent and blends well with any exterior wall system.

C/S Perform BSRIA Tested

C/S Perform Louvers are tested in accordance with BSRIA test standards for air performance and water penetration. For complete data, call 800-631-7379.

Bring color, drama and excitement to your facade...

Introducing C/S Bold Line Louvers



Finishes

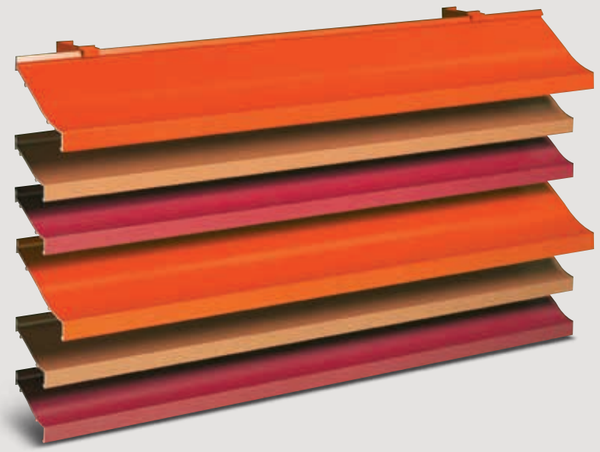
Bold Line is finished with C/S' environmentally friendly 20-year powder coat finish. We can supply any color, including metallics.

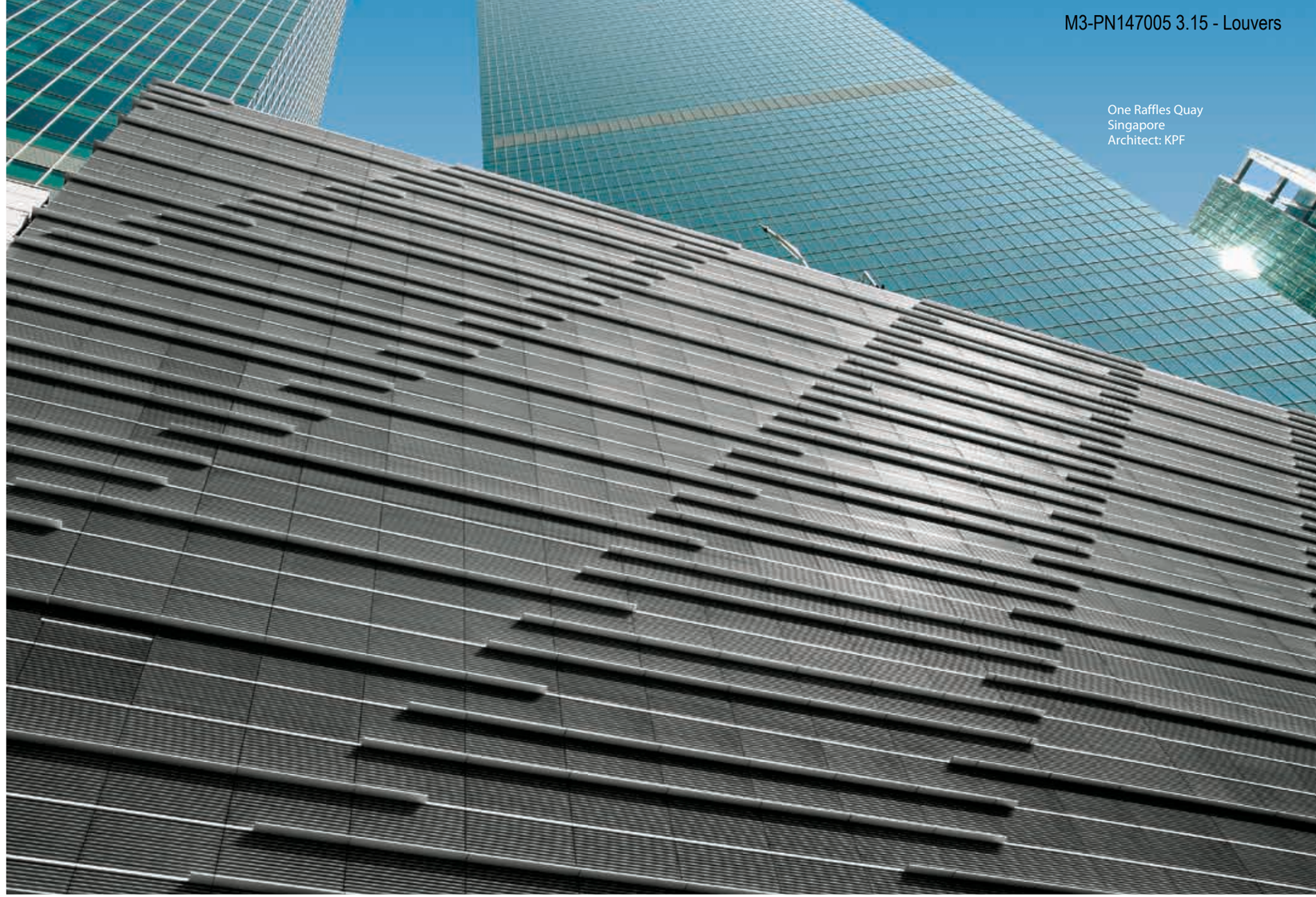
C/S 20-year AAMA 2605 powder coat finish lets designers use multiple colors without breaking the budget.

Who says a louver is just a louver? Not us! After decades of creating the industry's best made, best performing louvers, we focused on what a louver looks like. We now can provide architects new tools to use on their facades. Texture, color and enhanced shadow lines can transform the louvers from something you want to hide into a major design feature of the building. All without sacrificing performance. Welcome to the era of C/S Bold Line. You'll never look at louvers the same way again.

Colors:

Each C/S louver blade is finished separately, then assembled using our exclusive mechanical fastening method, which is much stronger than others' welded method. There is almost no limit to the color options designers have.





One Raffles Quay
Singapore
Architect: KPF

C/S Bold Line Storm Resistant Louvers

- Model B-7505 is available with mullions or architectural line
- Offer superior protection against water
- Offer design flexibility
- AMCA tested and certified

Conventional models on pages 4 & 5

Exposed Mullion Model B-7505



Free area: 4' x 4' – 45.8%, 8' x 8' – 49.0%
Pressure Drop: 0.12 @ 900FPM

Architectural Line Model B-7505A



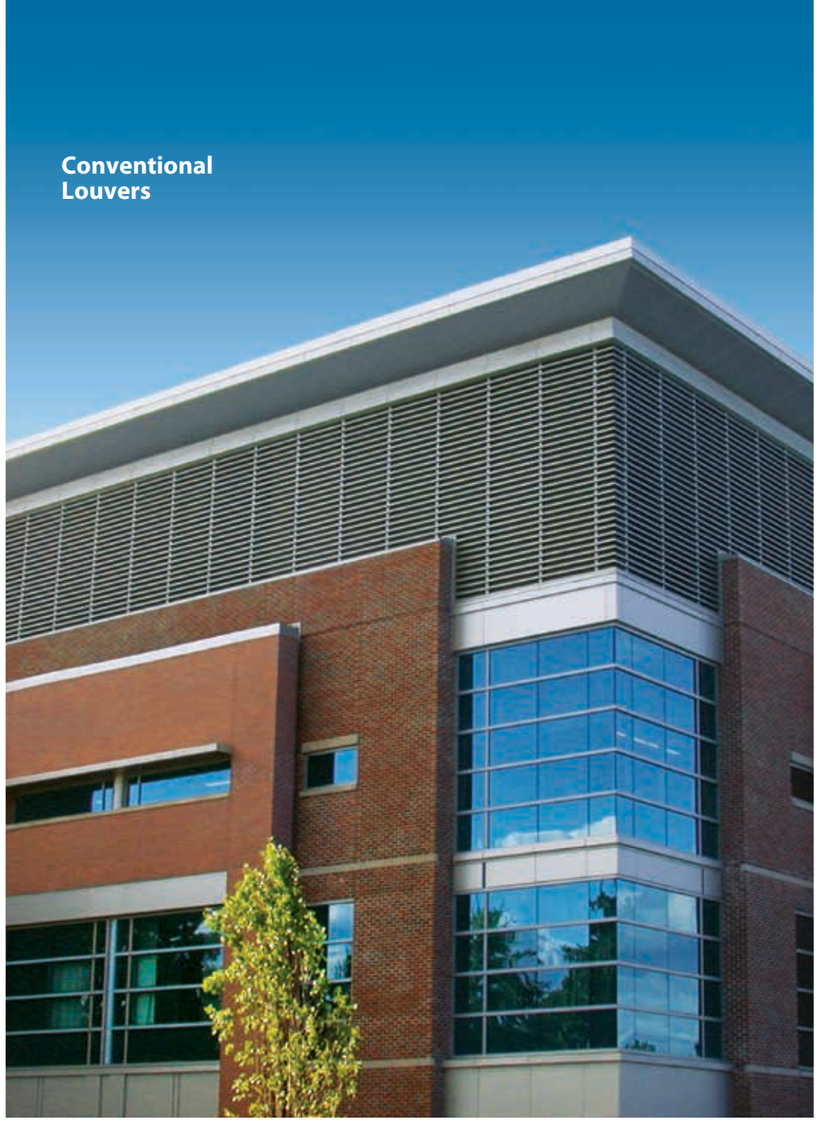
Free Area: 4' x 4' – 45.8%, 8' x 8' – 49.0%
Pressure Drop: 0.12 @ 900FPM

Infinite Design Possibilities

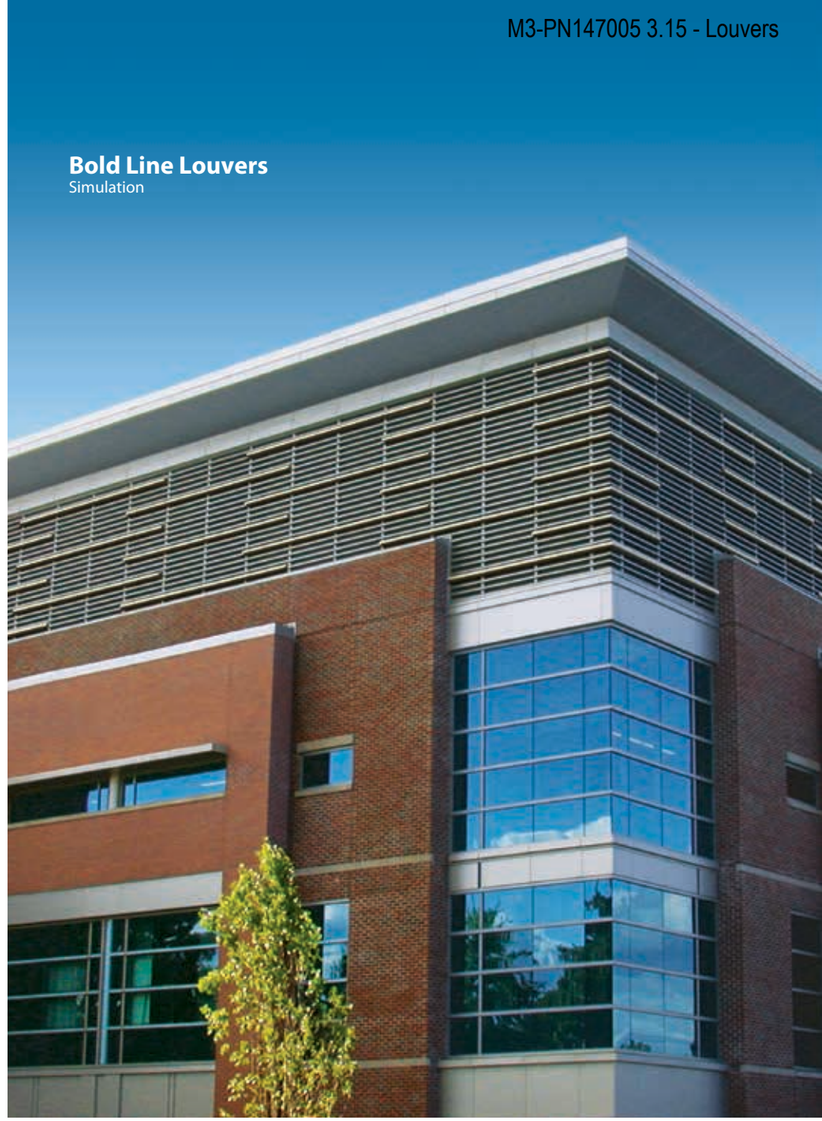




Conventional Louvers



Bold Line Louvers
Simulation



C/S Bold Line Conventional Louvers

- Model B-6485 is available with mullions or architectural line
- Frameless option available
- High free area, low pressure drop (see at right)
- AMCA tested and certified

amca CERTIFIED RATINGS — WATER PENETRATION — AIR PERFORMANCE — AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.

Exposed Mullion
Model B-6485M



Free Area: 4' x 4' – 52.9%, 8' x 8' – 56.8%
Pressure Drop: 0.16 @ 900FPM

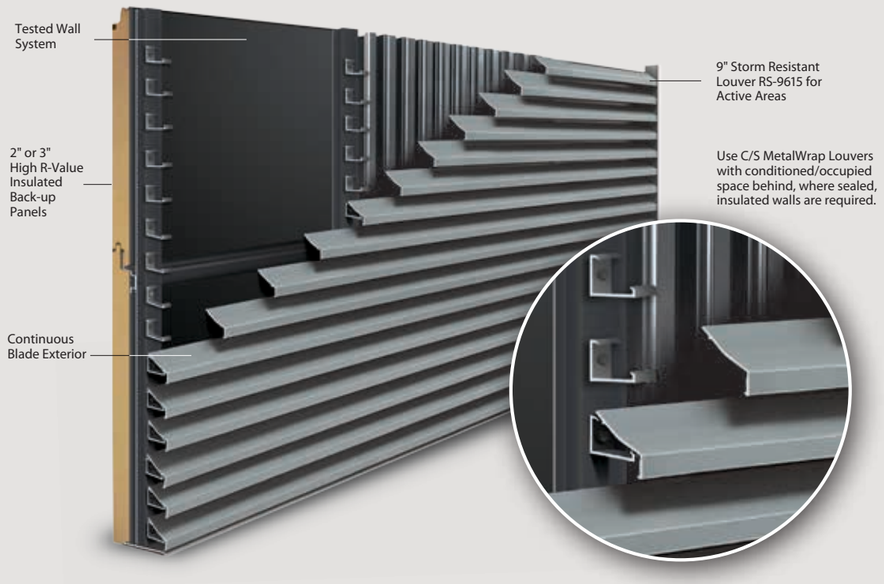
Architectural Line
Model B-6485A



Free Area: 4' x 4' – 52.9%, 8' x 8' – 56.8%
Pressure Drop: 0.16 @ 900FPM

New High-Performance C/S MetalWrap Louvers for use with CENTRIA Wall Systems

The new integrated C/S MW-9615 is designed to have a continuous appearance in elevations that have both active and inactive louver requirements. Unlike typical blank-offs, the C/S MW-9615 features a tested, high R-value insulated wall system behind it for occupied areas. C/S MetalWrap Louvers feature highly effective, continuous 9" C/S Storm Resistant Louvers to prevent water from entering the building. Blades are shipped loose in lengths up to 20'. The thermally broken wall system used in occupied areas acts as an air, water and vapor barrier.

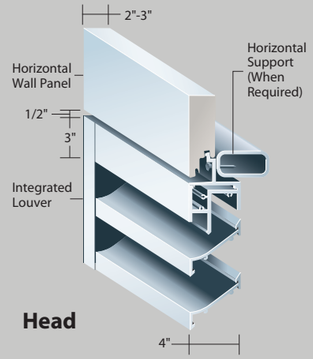




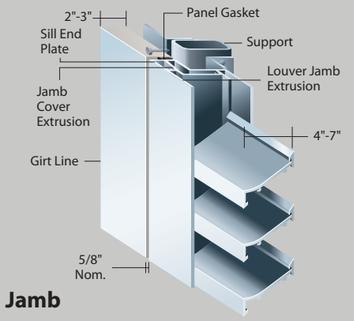
UT Southwestern Medical Center University Hospital Dallas, Texas

C/S Louvers for use with CENTRIA Formawall® Dimension Series® Panel Systems

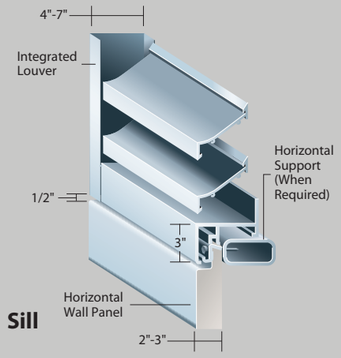
CENTRIA and Construction Specialties have formed a unique partnership to share the design, manufacturing and innovation that has made each company a leader in its respective field. **This collaboration assures complete integration of C/S Louvers and Sunshades into CENTRIA's Formawall® Dimension Series® Panels** and CENTRIA's Formavue™ Windows. **C/S Integrated Louvers are available in 4", 5", 6" and 7" depths.** Fixed, drainable and storm resistant models **with Class A ratings** can be specified. C/S louver models include **common joinery elements** with Formawall® panels to provide a seamless exterior facade. All C/S Louvers have been **tested to meet or exceed both AMCA and BSRIA test standards** and can be finished in any of CENTRIA's Colorstorm™ colors.



Head



Jamb



Sill

Architects no longer have to specify dangerous liquid fluoropolymers...

New C/S 20-year powder coat finish is non-toxic, VOC-free and more durable than liquid fluoropolymers!

For decades the standard architectural metal finish has been liquid fluoropolymers. They are color fast and pretty durable—but they are labor intensive to apply, use a lot of energy and produce VOCs and lots of hazardous waste. Now architects have an environmentally friendly alternative! C/S 20-year powder coat finish is just as fade-resistant, and even more durable than liquid fluoropolymer. And it's totally non-toxic, produces virtually no waste and has no VOCs. C/S powder coat is the right choice for your project—and the environment!

US Environmental Protection Agency rates C/S powder coat finish as non-toxic.

No VOCs are released in the plant, and there is no hazardous waste produced—in fact there is virtually no waste. Converting from liquid fluoropolymer finishes has eliminated over 60 tons of solvent waste being generated by our plants per year.

Liquid fluoropolymer finishes are solvent based and produce hazardous waste.

Only 40% of these finishes are the resin, the rest are solvents. These finishes are usually applied in three coats and produce a lot of waste—all of which ends up in landfills.



State-of-the-art powder coat finishing

C/S is heavily invested in powder coat finishing technology. Our plants utilize the most advanced finishing equipment to ensure a perfect finish on all C/S Louvers.

Which finish do you want on your building?



The most fade-resistant finish available

Not only is our finish harder than liquid fluoropolymer and polyester powder finishes—it's just as fade-resistant as liquid fluoropolymer and many times more color fast than polyester powder finishes. Make sure you specify: "must meet AAMA-2605" to make sure you get the proper finish.



Conventional liquid fluoropolymer finish ***contains 50-70% fluoropolymer resin and 60% hazardous*** **solvents.**

C/S 20-year powder coat ***contains 100% non-toxic fluoropolymer resin.***



The pencil test proves C/S 20-year powder coat finish is the most durable.

The pencil scratch test is the industry standard for hardness and scratch resistance. Our C/S powder coat achieved a hardness rating of 4H. Liquid fluoropolymer rated H.

Our powder coat finishes are warrantied for 20 years.

That's against flaking, chipping, peeling—AND fading. To get this exclusive finish, make sure to specify: "must meet AAMA 2605" so you don't wind up with a substitution that won't hold up.

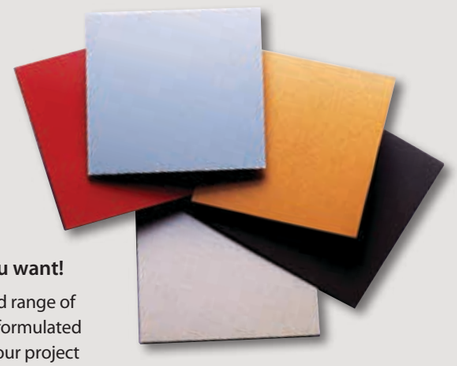
And they cost no more than liquid fluoropolymers!





Isn't powder coat what's chipping off my patio furniture?

The powder coat used on residential applications is not the same as our 20-year powder coat finish. Those are usually polyester based finishes applied over poorly prepared metal. Our finish is not only more durable than those residential grade finishes, it's even harder and more scratch resistant than conventional liquid fluoropolymer finishes.



Color? How about anything you want!

C/S has a broad range of standard, pre-formulated colors, but if your project requires a special color, no problem. We can match it.

Follow the steps below to ensure you get the right powder coat finish.

Cheaper polyester powder finishes will be warrantied against chipping and flaking but not against fading. In order to get a powder coat finish that performs better than even liquid fluoropolymer finishes, specify...

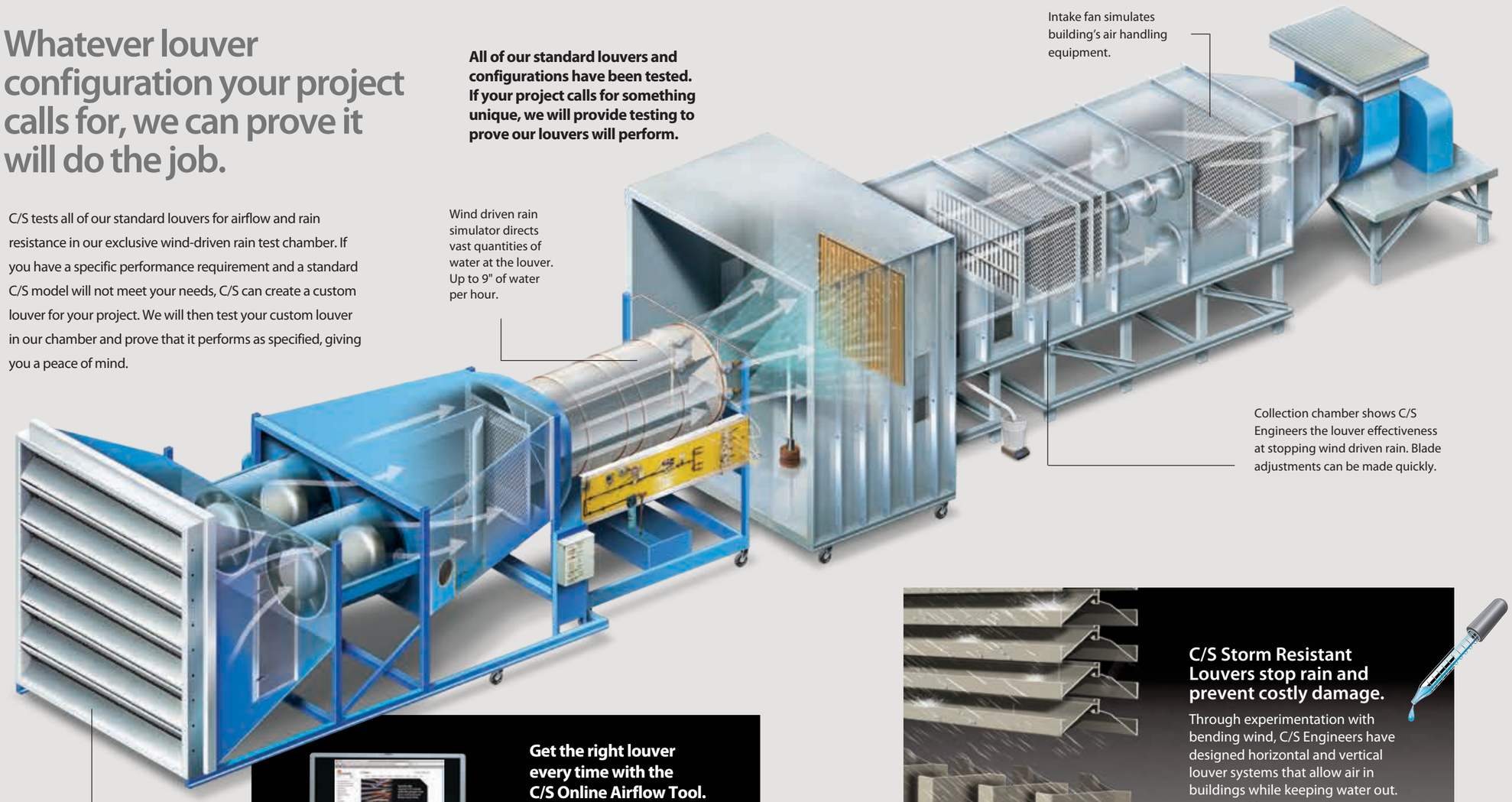
- ☑ 20-year warranty for color integrity in accordance with AAMA-2605
- ☑ Zero VOCs released at the manufacturing facility or at the job site
- ☑ Polyester powder finishes are not acceptable
- ☑ Solvent based fluoropolymer finishes will not be accepted
- ☑ 100% fluoropolymer powder

Get the exceptional performance you want without paying more!

Whatever louver configuration your project calls for, we can prove it will do the job.

C/S tests all of our standard louvers for airflow and rain resistance in our exclusive wind-driven rain test chamber. If you have a specific performance requirement and a standard C/S model will not meet your needs, C/S can create a custom louver for your project. We will then test your custom louver in our chamber and prove that it performs as specified, giving you a peace of mind.

All of our standard louvers and configurations have been tested. If your project calls for something unique, we will provide testing to prove our louvers will perform.



The external wind generator can produce hurricane force winds up to 100 mph creating wind driven rains.



Get the right louver every time with the C/S Online Airflow Tool.

The C/S airflow tool @ www.c-sgroup.com takes the guesswork out of louver selection. Get the correct louver, free area and pressure drop every time.



C/S Storm Resistant Louvers stop rain and prevent costly damage.

Through experimentation with bending wind, C/S Engineers have designed horizontal and vertical louver systems that allow air in buildings while keeping water out. Horizontal louvers are designed to "twist" the incoming air twice to maximize water removal. **Up to 100% effective at stopping wind driven rain.**

See our complete collection of louvers @ www.c-sgroup.com/louvers

Construction Specialties, Inc. certifies that louver models shown herein are licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with AMCA publication 511 and comply with requirements of the AMCA certified ratings program. The AMCA certified rating seal applies to air performance ratings and water penetration ratings.

AMCA Certified Models

BL-6709
BL-7709
BL-6809
A4097
A4177
A6080-A60085
A6097
A6155
A6177
B5157
B6485
B7505
BL-4089
BL-4179
BL-6089
BL-6179
BLH-5709
BLV-5709
DC-4174
DC-5304
DC-6174
DCH-5704
DCV-5704
GS-407
GS-410
GS-607
GS-610
LS-100/4080
LS-105
RS-2300
RS-4605
RS-5300
RS-5605
RS-7305
RS-7315
RS-7705
RS-8400
RS-8615
RS-9615
RSH-5700
RSV-5700
A4080
A4085
A4100-A4120
A4105-A4125
A4110-A4130
A4115-A4135
RS-3200

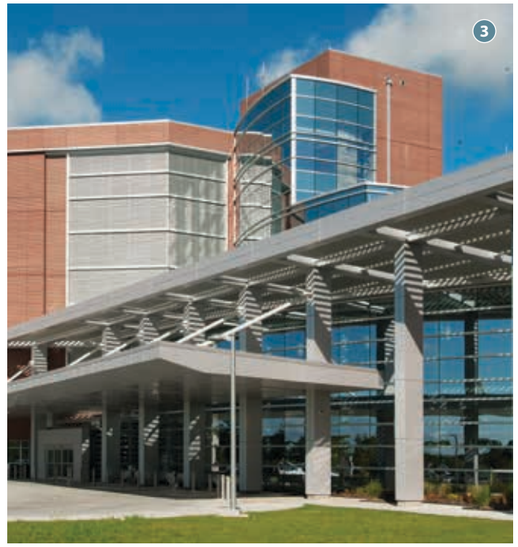
C/S Louvers Projects

Get the performance you need and the look you want with C/S Louvers.













1 *Lurie Children's Hospital*
Chicago, IL
Architect: Solomon Cordwell Buenz (SCB)

2 *Amway Center*
Orlando, FL
Architect: Populous

3 *Women's Hospital*
Baton Rouge, LA
Architect: HKS

4 *Princeton University – Frick Chemistry Lab*
Princeton, NJ
Architect: Payette Associates

5 *The Constitution Center*
Washington, DC
Architect: SmithGroupJJR

6 *Children's Hospital and Medical Center*
Omaha, NE
Architect: HDR

Louvers Selection Chart

How to use this selection chart

Aesthetics:

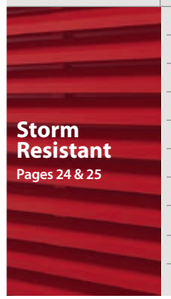
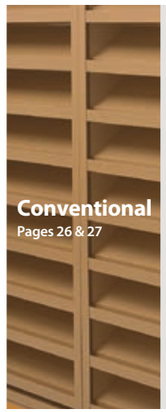
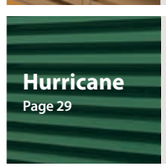
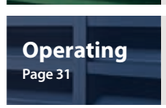
Decide what you want the louvers to look like on your building. Horizontal or vertical blades? Uninterrupted louver line or vertical breaks? A 2" louver blade providing no shadow lines or a 6" louver with heavy shadow lines?

Rain Defense:

Does it matter if rain enters your building? Would rain entry cause water sensitive equipment to shut down, thereby preventing the building from functioning? Select a Storm Resistant or Hurricane Louver when stopping rain entry is important.

Air Flow:

Free area can be very misleading when determining airflow – see pages 16 & 17 and go to our website for project specific information.

Models				Rain Defense	Airflow		Aesthetics					
Louver Type	Louver Model	Description	AMCA Certified	Wind Driven Rain Resistance Low – High	Free Area 4' x 4'	Free Area 8' x 8'	Blade Orientation	Exposed Mullions	Continuous Line	Approx. Blade Spacing (in.)	Blade Angle (in degrees)	Louver Depth (in.)
 Storm Resistant Pages 24 & 25	RS-8615	LOCATION SMART™	Yes	■■■■■■■	53.3%	56.6%	Horiz	No	Yes	4"	45°	8"
	RS-4605	VERTICAL	Yes	■■■■■■■	53.3%	56.6%	Vert	No	Yes	2"	N/A	4"
	RS-9615	LOCATION SMART™	Yes	■■■■■■■	59.1%	62.9%	Horiz	No	Yes	4"	45°	9"
	RS-5605	VERTICAL	Yes	■■■■■■■	59.1%	62.9%	Vert	No	Yes	1"	N/A	5"
	RS-4300	CHEVRON	N/A	■■■■	46.9%	50.1%	Horiz	Yes	No	2-1/8"	N/A	4"
	RS-7705	CHEVRON	Yes	■■■■■	50.5%	52.8%	Horiz	No	Yes	3-1/8"	N/A	7"
	RS-5300	CHEVRON	Yes	■■■■■	47.3%	51.5%	Horiz	Yes	No	2-3/4"	N/A	5"
	RS-2300	INVERTED CHEVRON	Yes	■■■■	41.9%	44.0%	Horiz	Yes	No	1-1/2"	N/A	2"
	RSH-5700	CHEVRON SIGHTPROOF	Yes	■■■■■■	45.8%	49.0%	Horiz	Yes	No	2"	N/A	5"
	RSV-5700	CHEVRON SIGHTPROOF	Yes	■■■■■■■	45.8%	44.0%	Vert	Yes	No	2"	N/A	5"
 Conventional Pages 26 & 27	A4080/A6080	30° STD. "Z" BLADE	Yes	■■	54.0% / 56.1%	58.0% / 60.0%	Horiz	Yes	No	4" / 6"	30°	4" / 6"
	A4100/A6100	STD. "Z" BLADE	Yes	■■	46.0% / 48.0%	50.0% / 52.0%	Horiz	Yes	No	6" / 6-13/16"	45°	4" / 6"
	A4110/A6110	STEP BLADE	Yes	■■	46.0% / 48.0%	50.0% / 52.0%	Horiz	Yes	No	6" / 6-13/16"	45°	4" / 6"
	A4115/A6115	CONTINUOUS STEP BLADE	Yes	■■	46.0% / 48.0%	50.0% / 52.0%	Horiz	No	Yes	6" / 6-13/16"	45°	4" / 6"
	A4097	DRAINABLE	Yes	■■	50.4%	54.9%	Horiz	Yes	No	4"	37°	4"
	A4177	DRAINABLE	Yes	■■	56.1%	59.5%	Horiz	Yes	No	3-1/4"	39°	4"
	A6097	DRAINABLE	Yes	■■	52.1%	57.9%	Horiz	Yes	No	6"	37°	6"
	A6177	DRAINABLE	Yes	■■	57.6%	62.4%	Horiz	Yes	No	5-3/4"	42°	6"
	A6155	DOUBLE DRAINABLE	Yes	■■	48.8%	53.9%	Horiz	No	Yes	5-5/8"	38°	6"
	A2097	DRAINABLE	N/A	■	53.4%	55.9%	Horiz	Yes	No	1-7/8"	41°	2"
	2272	THINLINE PROFILES	N/A	■	55.2%	57.5%	Horiz	Yes	No	1-1/2"	30°	2"
	2282	THINLINE PROFILES	N/A	■	39.1%	41.1%	Horiz	Yes	No	1-7/8"	N/A	2"
	1302G	THINLINE PROFILES	N/A	■	58.1%	59.3%	Horiz	Yes	No	3/4"	45°	1-3/8"
	0292	THINLINE PROFILES	N/A	■	62.4%	63.2%	Horiz	Yes	No	1-1/4"	26°	1"
 Hurricane Page 29	DCH-5704	CHEVRON SIGHTPROOF	Yes	■■■■■■	45.8%	49.0%	Horiz	Yes	No	2"	N/A	5"
	DCV-5704	CHEVRON SIGHTPROOF	Yes	■■■■■■■	45.8%	49.0%	Vert	Yes	No	2"	N/A	5"
	DC-6174	DRAINABLE	Yes	■■	57.6%	62.0%	Horiz	Yes	No	5-3/4"	37°	6"
	DC-5304	STORM RESISTANT	Yes	■■■■■	45.3%	51.0%	Horiz	Yes	No	2-3/4"	N/A	5"
	DC-4174	DRAINABLE	Yes	■■	56.1%	59.5%	Horiz	Yes	No	3-1/4"	39°	4"
 Operating Page 31	6917	DRAINABLE	N/A	■■ *	40.5%	47.3%	Horiz	Yes	No	6-3/16"	43°	6"
	6870	STD. "Z" BLADE	N/A	■■ *	53.2%	60.2%	Horiz	Yes	No	5-5/8"	30°	6"
	4830	STD. "Z" BLADE	N/A	■■ *	33.1%	35.6%	Horiz	Yes	No	5-5/8"	40°	4"
 Acoustical Page 30	A12350	CHEVRON	N/A	■■	23.3%	31.1%	Horiz	Yes	No	11-3/4"	N/A	12"
	A12970	OPERATING	N/A	■■ *	22.0%	25.5%	Horiz	Yes	No	12"	45°	12"
	A12370	STD. "Z" BLADE	N/A	■■	22.0%	28.3%	Horiz	Yes	No	12"	45°	12"
	A8370	STD. "Z" BLADE	N/A	■■	23.0%	28.8%	Horiz	Yes	No	8-1/2"	45°	8"
	A6370	STD. "Z" BLADE	N/A	■■	21.6%	24.3%	Horiz	Yes	No	10"	45°	6"
	A8890	AIRFOIL	N/A	■■	28.5%	33.3%	Horiz	Yes	No	6"	46°	8-3/4"
 Insulated See website	8990	OPERATING THERMAL BREAK	N/A	■■ *	43.0%	51.0%	Horiz	Yes	No	8"	N/A	8"
	9880	OPERATING AIRFOIL	N/A	■■ *	55.3%	65.0%	Horiz	Yes	No	12-3/8"	N/A	9-1/2"

Brick vents, door vents, and penthouses available. Visit www.c-sgroup.com or call 800-631-7379.

**In closed position louver offers highest rain defense.*

For additional models please refer to the product pages following this selection chart.



C/S Blast Resistant Louvers... capable of withstanding 12 PSI blast loads

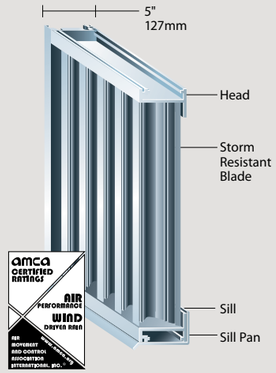
Government buildings, VA hospitals, computing centers and power plants are particularly vulnerable to explosive threats. C/S has developed seven blast resistant models designed to withstand blasts up to 12 PSI and capable of meeting the government requirement. This requirement states, "Louvers must remain in their frame and anchored adequately to resist the blast or a catch device... to prevent the louver from becoming a projectile."

C/S Blast Resistant Louvers



- Seven models all capable of blast loads up to 12 PSI
- Vertical and horizontal storm resistant models provide excellent protection from water infiltration
- High performance drainable louvers offer high free area and low pressure drop
- Two conventional models meet blast requirements at highly affordable prices
- 20-year AAMA 2605 powder coat finish

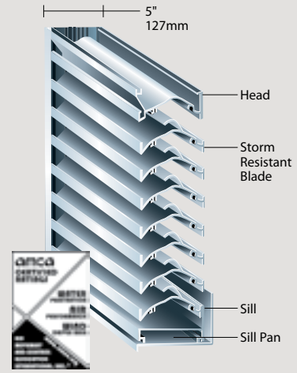
BLV-5709



BLV-5709

- Capable of handling 12 PSI blast loads
- Maximum protection against wind driven rain
- Low pressure drop
- Dade County approved to 150 psf
- Unlimited width with heights up to 12 feet
- Special shapes
- AMCA Certified

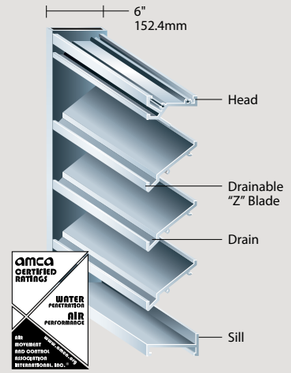
BLH-5709



BLH-5709

- Capable of handling 12 PSI blast loads
- Superior protection against wind driven rain
- Low pressure drop
- Dade County approved up to 150 psf
- Unlimited height with widths up to 12 feet
- Special shapes
- AMCA Certified

BL-6179



BL-6179 & BL-4179

- Capable of handling 12 PSI blast loads
- High free area
- Low pressure drop
- Installs easily
- 20-year powder coat finishes
- Dade County approved to 170 psf
- AMCA Certified

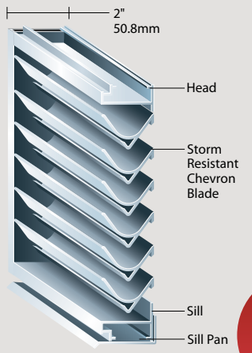
Storm Resistant



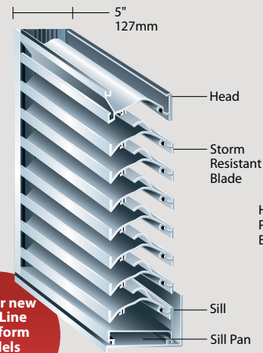
Shown:
Model RS-7705

Choose Storm Resistant Louvers when:

- Keeping up to 100% of rain out of your building is a priority
- Wind driven rain is prevalent
- Using a plenum is impractical because of cost or space considerations
- Sensitive equipment will be housed close to the louver system

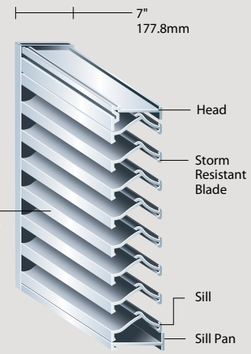


Model RS-2300



See our new Bold Line & Perform models on pages 4-9

Model RSH-5700



Model RS-7705

Louver Model	Description	Configuration	Blade Spacing	Louver Depth	Rain Defense Low High	Free Area 4' X 4'	Free Area 8' X 8'	PD @ 900 FPM
RS-5300	Chevron Sightproof	Mullion	2-3/4"	5"	■■■■	47.3%	51.5%	0.32
RSH-5700	Chevron Sightproof	Mullion	2"	5"	■■■■■	45.8%	49.0%	0.13
RS-4300	Chevron Sightproof	Mullion	2-1/8"	4"	■■■■	46.9%	50.1%	0.26
RS-2300	Inverted Chevron Sightproof	Mullion	1-1/2"	2"	■■■■	41.9%	44.0%	0.51
RSV-5700	Vertical Chevron Sightproof	Mullion	2"	5"	■■■■■■	45.8%	49.0%	0.13
RS-7705	Chevron Sightproof	Cont. Line	3-1/8"	7"	■■■■■	50.5%	52.8%	0.25

For CAD Details & Specs. for all louvers visit www.c-sgroup.com/louvers

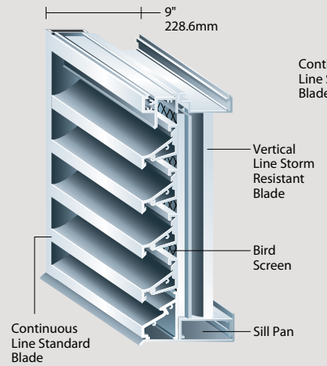
Storm Resistant



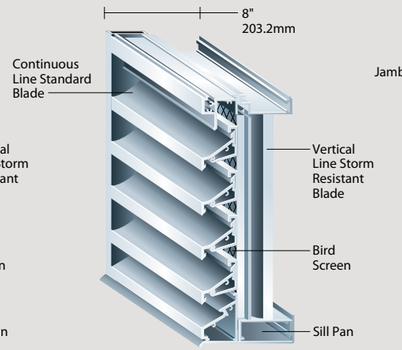
Shown:
Model RS-8615

Choose Storm Resistant Louvers when:

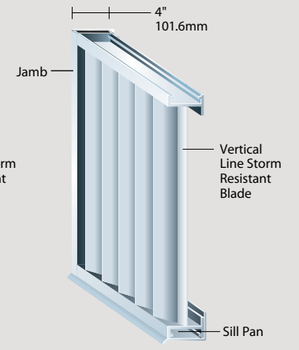
- Keeping 100% of water out of your building is an absolute necessity
- If your building is subjected to wind driven rain up to 50 mph with 8" of water per hour
- Integrating the louver into the building design is a priority. Louvers can be housed behind architectural grilles, architectural detailing or continuous line louvers



Model RS-9615



Model RS-8615



Model RS-4605

Louver Model	Description	Configuration	Blade Spacing	Louver Depth	Rain Defense Low High	Free Area 4' X 4'	Free Area 8' X 8'	PD @ 900 FPM
RS-8615	Location Smart™	Cont. Line	4"	8"	■■■■■■	53.3%	56.6%	0.37
RS-4605	Chevron	Vertical	2"	4"	■■■■■■	53.3%	56.6%	0.25
RS-9615	Location Smart™	Cont. Line	4"	9"	■■■■■■	59.1%	62.9%	0.30
RS-5605	Chevron	Vertical	1"	5"	■■■■■■	59.1%	62.9%	0.08

Check out our new environmentally friendly powder coat finishes, page 12

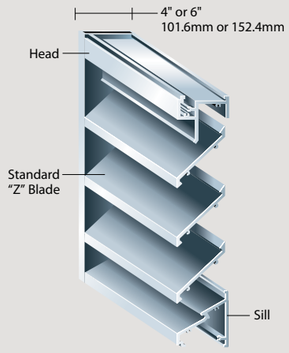
Conventional



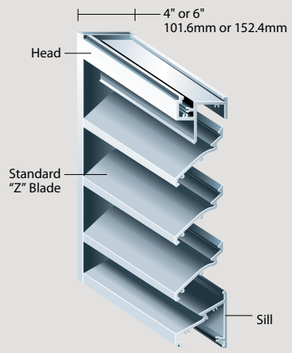
Shown:
Model A6100

Choose Standard Louvers when:

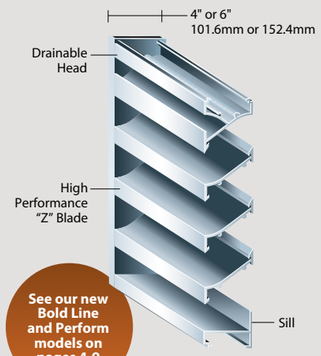
- Occasional water penetration will not cause significant problems
- Economy is the primary consideration
- High free area is important
- A variety of blade and frame styles/options are important



Models A4100 & A6100



Models A4110 & A6110



See our new Bold Line and Perform models on pages 4-9

Models A4080 & A6080

Louver Model	Description	Configuration	Blade Spacing	Louver Depth	Rain Defense Low	Rain Defense High	Free Area 4' X 4'	Free Area 8' X 8'	PD @ 900 FPM
A4080/A4085	30° Flat Blade	Mullion/Cont. Line	4"	4"	■■		54.0%	58.0%	0.15
A4100/A4105	45° Flat Blade•	Mullion/Cont. Line	6"	4"	■■		46.0%	50.0%	0.16
A4110/A4115	45° Step Blade•	Mullion/Cont. Line	6"	4"	■■		46.0%	50.0%	0.17
4180	Chevron Sightproof	Mullion/Cont. Line	4-1/8"	4"	■■		26.0%	35.0%	0.35
4190	Chevron Tamperproof	Mullion	3-3/4"	4"	■■		32.0%	35.0%	0.50
A6080/A6085	30° Flat Blade	Mullion/Cont. Line	6"	6"	■■		56.1%	60.0%	0.16
A6100/A6105	45° Flat Blade•	Mullion/Cont. Line	6-13/16"	6"	■■		48.0%	52.0%	0.15
A6110/A6115	45° Step Blade	Mullion/Cont. Line	6-13/16"	6"	■■		48.0%	52.0%	0.17
GS-410	45° Step Blade Steel	Mullion/Cont. Line	4-1/2"	4"	■■		42.5%	47.0%	0.13
GS-610	45° Step Blade Steel	Mullion/Cont. Line	6-1/4"	6"	■■		43.8%	51.0%	0.12

• 0.125 (3.18mm) thickness available.

For CAD Details & Specs. for all louvers visit www.c-sgroup.com/louvers

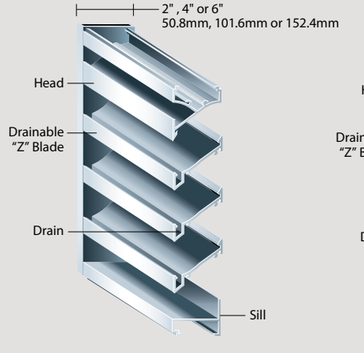
Conventional



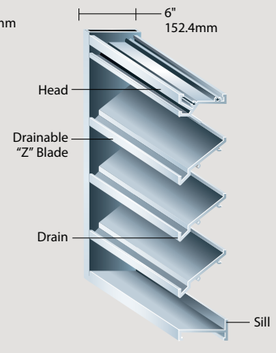
Shown:
Model A6097

Choose Drainable Louvers when:

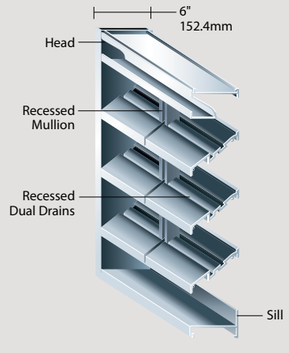
- The periodic entry of water from non-wind driven rain is not a prime concern
- Some drainage of cascading water is necessary
- A variety of blade sizes, styles and frames are important



Models A2097 & A4097 & A6097



Model A6177



Model A6155

Louver Model	Description	Configuration	Blade Spacing	Louver Depth	Rain Defense Low	Rain Defense High	Free Area 4' X 4'	Free Area 8' X 8'	PD @ 900 FPM
A2097	Drainable	Mullion	1-7/8"	2"	■		53.4%	55.9%	0.13
A4097	Drainable	Mullion	4"	4"	■■		50.4%	54.9%	0.15
A6097	Drainable	Mullion	6"	6"	■■		52.1%	57.9%	0.13
A4177	Drainable	Mullion	3-1/4"	4"	■■		56.1%	59.5%	0.13
5157	Chevron Drainable	Mullion	2-1/2"	5"	■■		52.6%	56.2%	0.33
A6177	High Perf. Drainable	Mullion/Cont. Line	5-3/4"	6"	■■		57.6%	55.9%	0.14
A6155	Double Drainable	Cont. Line	5-5/8"	6"	■■		48.8%	53.9%	0.11
A6157	Double Drainable	Mullion	6"	6"	■■		45.8%	48.9%	0.12
GS-407	Drainable Steel	Mullion	3-7/8"	4"	■■		52.5%	57.6%	0.12
GS-607	Drainable Steel	Mullion	5-3/8"	6"	■■		53.0%	59.7%	0.13

Check out our new environmentally friendly powder coat finishes, page 12

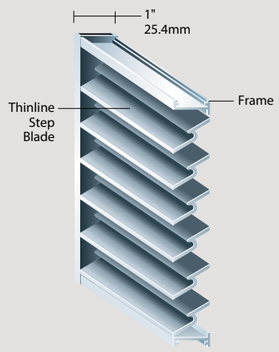
Thinline



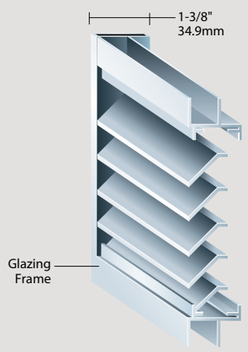
Shown:
Model 2252

Choose Thinline Louvers when:

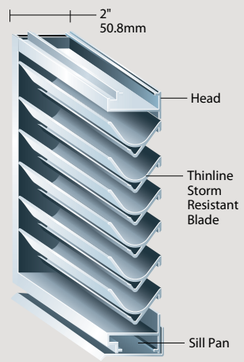
- Standard 4" or 6" deep louvers are not practical in applications such as storefronts, interior and exterior partitions and window walls
- High free area and low pressure drop requirements are a priority: specify air conditioning louvers
- Water is a problem: specify RS-2300
- Channel, flange or glazing frames are required



Model 0292



Model 1302G

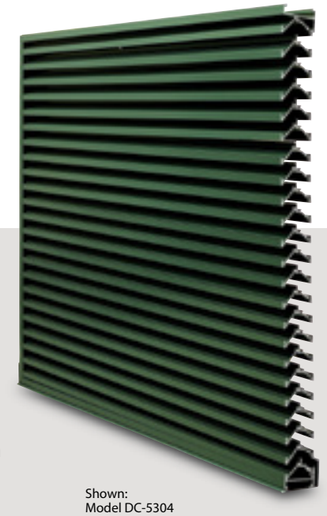


Model RS-2300

Louver Model	Description	Configuration	Blade Spacing	Louver Depth	Rain Defense Low High	Free Area 4' X 4'	Free Area 8' X 8'	PD @ 900 FPM
0292	30° Step Blade	Cont. Line	1-1/4"	1"	■	62.4%	63.2%	0.095
1242	30° Step Blade	Cont. Line	1-1/8"	1-3/8"	■	46.1%	46.2%	0.07
2272	30° Step Blade	Cont. Line	1-1/2"	2"	■	55.2%	57.5%	0.095
2252	Step Blade	Cont. Line	3"	2-1/4"	■	35.4%	37.2%	0.13
1322	Flat Blade	Cont. Line	1-3/4"	1-3/8"	■	32.4%	32.5%	0.10
2322	Flat Blade	Cont. Line	2-1/2"	2"	■	39.3%	40.2%	0.13
1282	Chevron Sightproof	Cont. Line	1-3/8"	1-3/8"	■	39.3%	40.0%	0.50
2282	Chevron Sightproof	Cont. Line	1-7/8"	2"	■	39.1%	41.1%	0.64
1302G	Air Cond. PTAC Louver	Cont. Line	3/4"	1-3/8"	■	58.1%	59.3%	0.09
RS-2300	Storm Resistant	Cont. Line	1-1/2"	2"	■■■■	41.9%	44.0%	0.32

For CAD Details & Specs. for all louvers visit www.c-sgroup.com/louvers

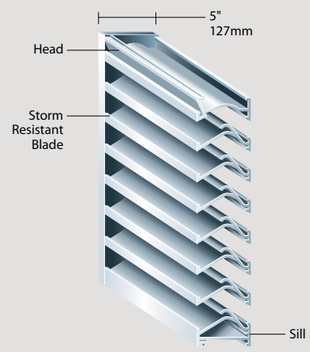
Hurricane



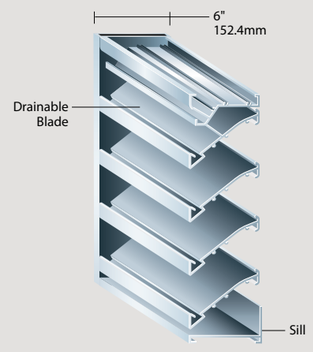
Shown:
Model DC-5304

Choose Hurricane Louvers when:

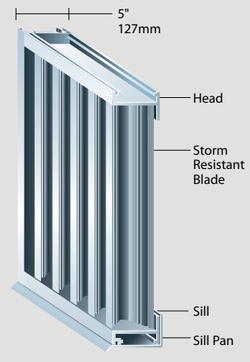
- Your building is subjected to severe weather from hurricanes, tropical storms and tornadoes
- Total envelope protection is required from hurricanes including: up to 175 PSF winds, missile protection and 100% water penetration
- All models below are Miami Dade County Impact Test approved



Model DCH-5704



Model DC-6174



Model DCV-5704

Louver Model	Description	Configuration	Blade Spacing	Louver Depth	Rain Defense Low High	Free Area 4' X 4'	Free Area 8' X 8'	PD @ 900 FPM
DC-5304	Chevron Storm Resistant	Mullion	2-3/4"	5"	■■■■■	45.3%	51.0%	0.32
DC-7034	Louver Blade Front	Cont. Line	4"	11"	■■	40.6%	47.0%	0.20
DC-4174	Drainable	Mullion/Cont. Line	3-1/4"	4"	■■	56.1%	59.5%	0.13
DC-6174	Drainable	Mullion/Cont. Line	5-3/4"	6"	■■	57.6%	62.0%	0.14
DC-7044	Louver Blade Front	Cont. Line	4"	11"	■■	48.7%	55.1%	0.20
DC-7024	Louver Blade Front	Cont. Line with Rain Rejection Module	4"	11"	■■■■■■■	36.0%	42.0%	0.25
DCV-5704	Chevron Sightproof	Mullion	2"	5"	■■■■■■■	45.8%	49.0%	0.13
DCH-5704	Chevron Sightproof	Mullion	2"	5"	■■■■■■	45.8%	49.0%	0.13

• In closed position louver offers highest rain defense.

Check out our new environmentally friendly powder coat finishes, page 12

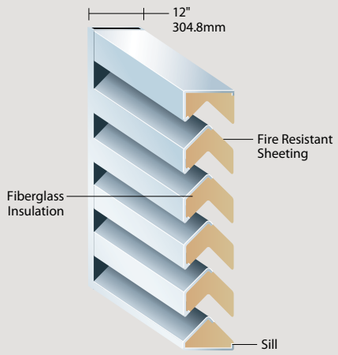
Acoustical



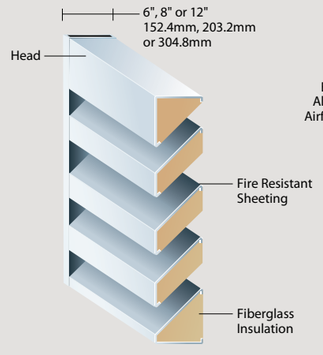
Shown:
Model A12350

Choose Acoustical Louvers when:

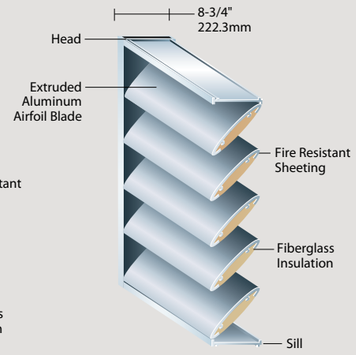
- Sound attenuation or minimizing noise is essential
- Reducing sound levels that escape from exterior or interior walls is necessary
- Maximum noise reduction is required: specify model A12350
- Maximum free area and reducing noise is important: specify model A8890 or A8860



Model A12350



Model A12370



Model A8890

Louver Model	Description	Configuration	Blade Spacing	Louver Depth	Rain Defense Low High	Free Area 4' X 4'	Free Area 8' X 8'	PD @ 900 FPM
A6370	Flat Blade	Mullion	10"	6"	■■	21.6%	24.3%	0.09
A8370	Flat Blade	Mullion	8-1/2"	8"	■■	23.0%	28.8%	0.07
A12350	Chevron Sightproof	Mullion	11-3/4"	12"	■■	23.3%	31.1%	0.17
A12360	Flat Blade	Mullion	15"	12"	■■	24.3%	30.4%	0.09
A12370	Flat Blade	Mullion	12"	12"	■■	22.0%	28.3%	0.07
A12970	Flat Blade Operating	Mullion	12"	12"	■■	22.0%	25.5%	0.06
A8890	Airfoil Blade	Mullion	6"	8-3/4"	■■	28.5%	33.3%	0.05
A8860	Operating Airfoil	Mullion	6"	9-1/2"	■■	28.5%	33.3%	0.06

• In closed position louver offers highest rain defense.

For CAD Details & Specs. for all louvers visit www.c-sgroup.com/louvers

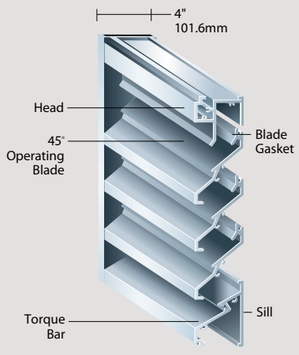
Operating



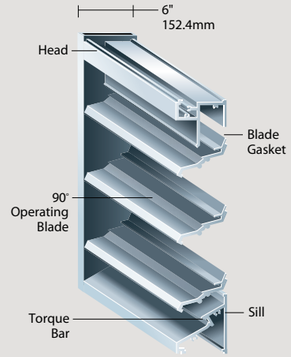
Shown:
Model 6917

Choose Operating Louvers when:

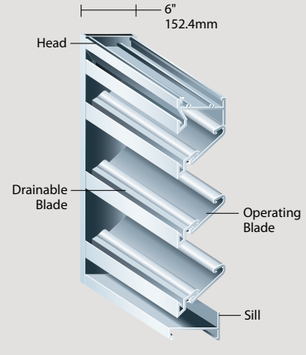
- Controlling the amount of airflow through the louver at any given time is a requirement
- Preventing rain, sleet or snow from entering the building is important (closed position only)
- Providing security from external intrusion is a priority
- The louver must close, but must have a fixed blade appearance: specify model 6917 or 6967



Model 4830



Model 6870



Model 6917

Louver Model	Description	Configuration	Blade Spacing	Louver Depth	Rain Defense Low High	Free Area 4' X 4'	Free Area 8' X 8'	PD @ 900 FPM
4830	45° Step Blade	Mullion	5-5/8"	4"	■■	33.1%	35.6%	0.13
6870	90° Step Blade	Mullion	5-5/8"	6"	■■	53.2%	60.2%	0.10
6917	Single Drainable	Mullion	6-3/16"	6"	■■	40.5%	47.3%	0.18
6967	Double Drainable	Mullion	5-3/4"	6"	■■	45.2%	48.4%	0.12

• In closed position louver offers highest rain defense.

Check out our new environmentally friendly powder coat finishes, page 12

Construction Specialties™

49 Meeker Avenue, Cranford, New Jersey 07016 U.S.A., 908-272-5200
895 Lakefront Promenade, Mississauga, Ontario L5E 2C2 Canada, 905-274-3611
www.c-sgroup.com



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For more than 60 years, Construction Specialties has been a leader in architectural specialty products, including: Acrovyn® Wall and Door Protection, Pedisystems® Entrance Flooring, Expansion Joint Covers, Cubicle Track and Curtains, Smoke and Explosion Venting Systems, Architectural Grilles, Architectural Louvers and Sun Controls.

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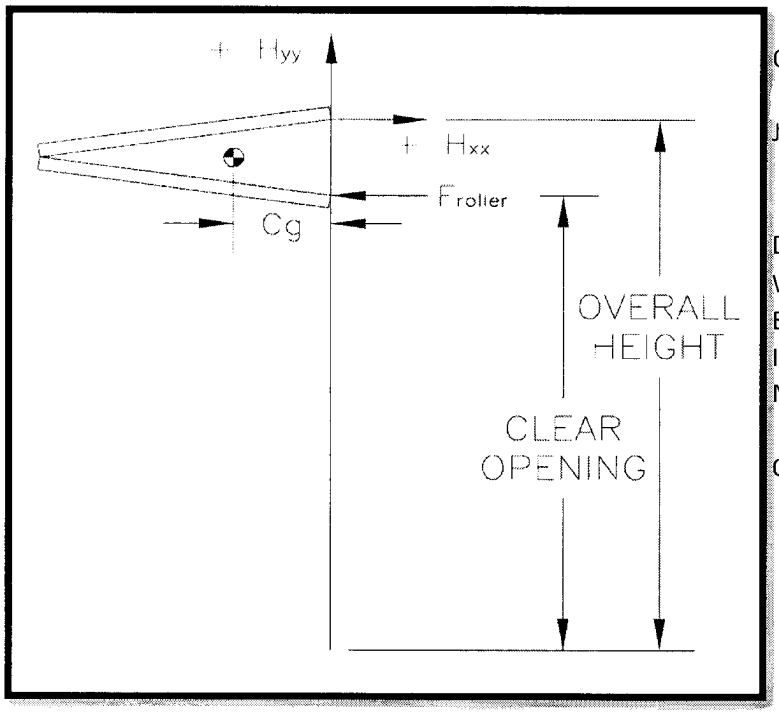
For the nearest C/S representative, or literature and samples, call toll free 800-631-7379 in U.S.A. and 888-895-8955 in Canada, or visit www.c-sgroup.com

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Paper from responsible sources
FSC® C103087

PRELIMINARY CALCULATIONS



Customer Name	**Vortex**
Job Location	Phoenix, AZ

Wind Load Parameters

Design Building Code	IBC2006
Wind Speed [MPH]	90
Exposure Factor	B
Importance Factor	1
Mean Roof Height (assumed) [ft]	20
Cladding Weight [lbs/ft^2]	2 psf

Note: Hinge reactions may vary +/-10% due to stress interactions

Frame Weight	**2000 lbs**
Overall Height	19.08 ft
Clear Opening Height	16.71 ft
Overall Width	54.48 ft
Vertical Members	11
Sheeting Weight	2 psf
Sheeting Area	1040 sf
Sheeting Weight	2079 lbs
Miscellaneous Weight	50 lbs
Extra Weight [lb/ linear in]	0.4147425
Door Weight	**4129 lbs**
Center of Gravity [ft]	3.08 ft
Number of Hinges	9
Load per Hinge (Hyy)	458.81 lbs
Roller Compression Force	**2677.91 lbs**

Maximum Door Loadings

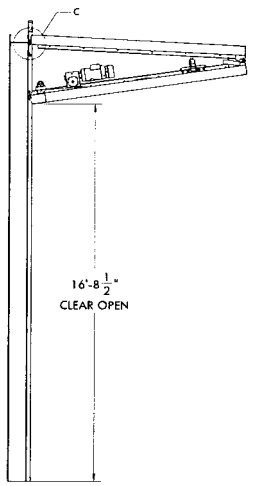
Total Hyy (any position)	**4129.29 lbs**
Total Hxx (Door Open)	**-5355.82 lbs**
Total Hxx (Door 2/3 Open)	**-2144.07 lbs**
Total Hxx (Door 1/3 Open)	**-1162.42 lbs**
Pressure Hxx (Door closed/ wind load)	**12324.96 lbs**
Suction Hxx (Door closed/ wind load)	**-13369.45 lbs**

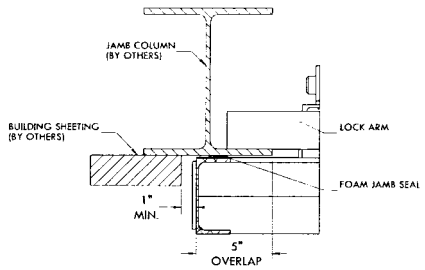
Wind loading is assumed to be evenly distributed throughout the door.

Wind Loading Pressures

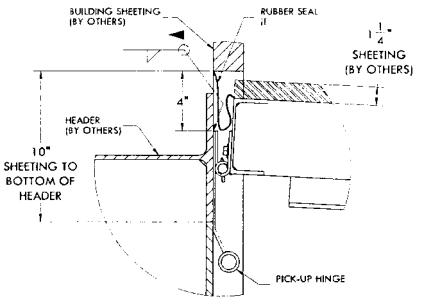
Pressure	11.85 psf
Suction	-12.86 psf
Pressure [lb/ linear in]	2.400654165
Suction [lb / linear in]	-2.604099433

M3-PM147005 3.16 - Overhead Bi-Fold Doors

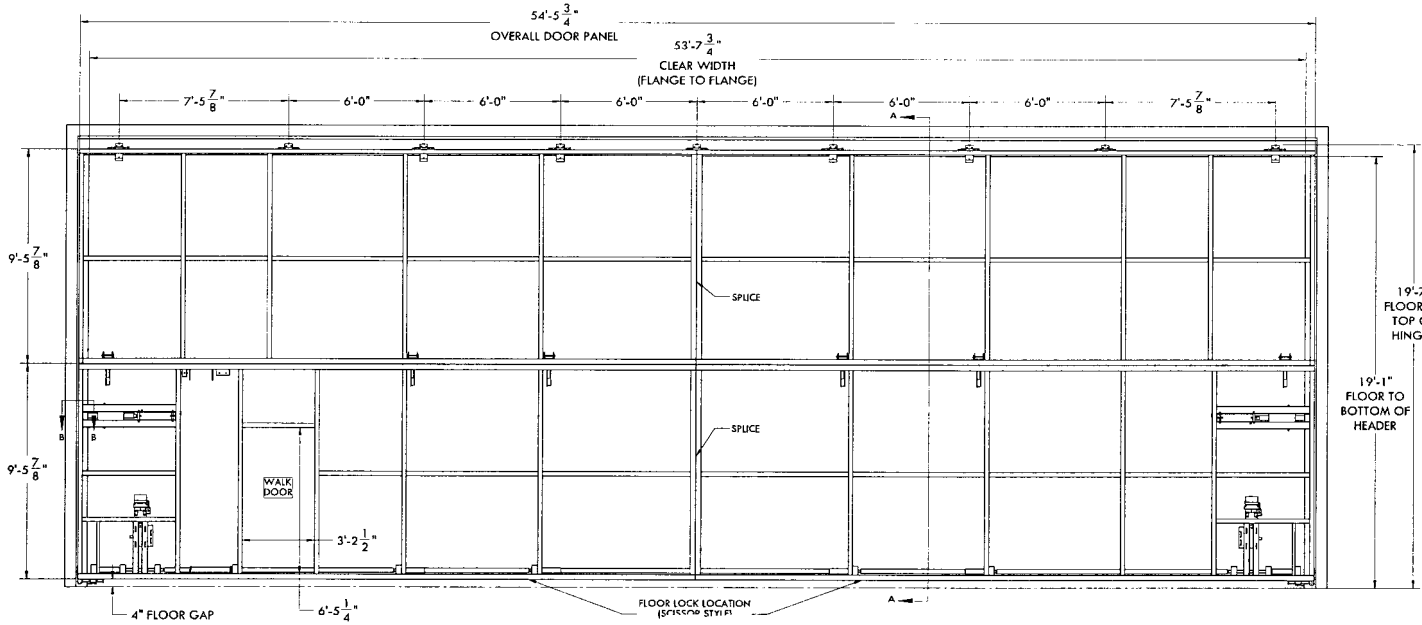


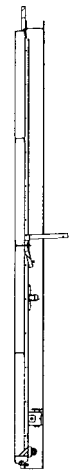


SECTION B-B
SCALE 1 : 4



DETAIL C
SCALE 1 : 4





SECTION A-A

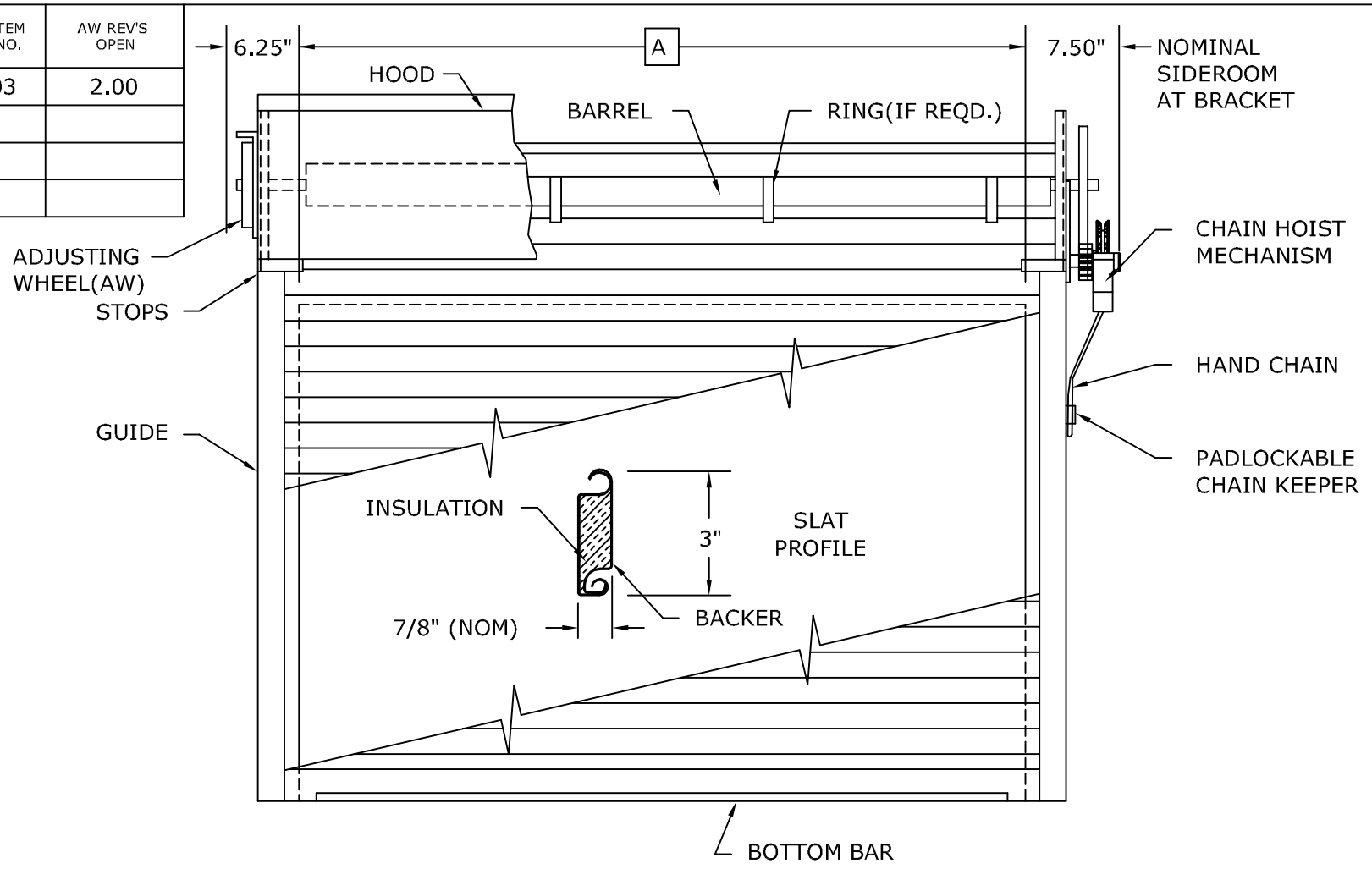
VIEWED FROM OUTSIDE

NOTE: SPLICES ARE BOLTED CONNECTIONS

REVISIONS			
PER	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE	10/9/2015	

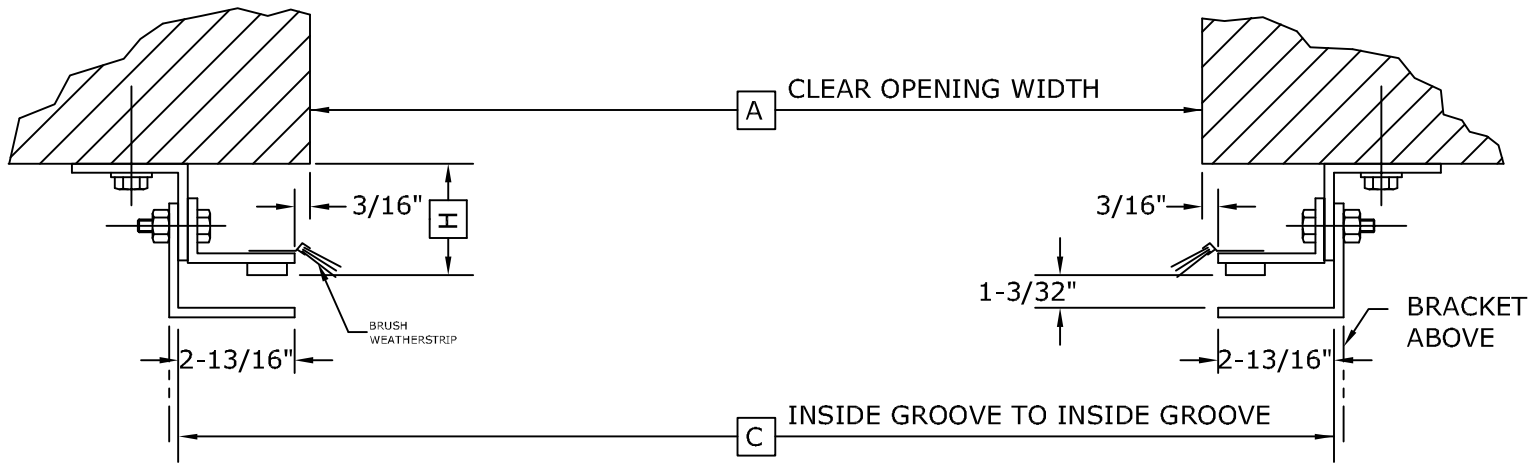
X	± .030	WEIGHT 2000lbs
XX	± .015	*ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED.
XXX	± .005	
FRACT	1/16	*DE-BURR ALL EDGES.
FAB	1/16	*WELDMENTS MUST BE FREE OF WELD SPATTER.
ANGLE	1°	*ALL SPECIAL INSTRUCTIONS PER TRAVELER SPECIFICATION.
FRAME	1/32	

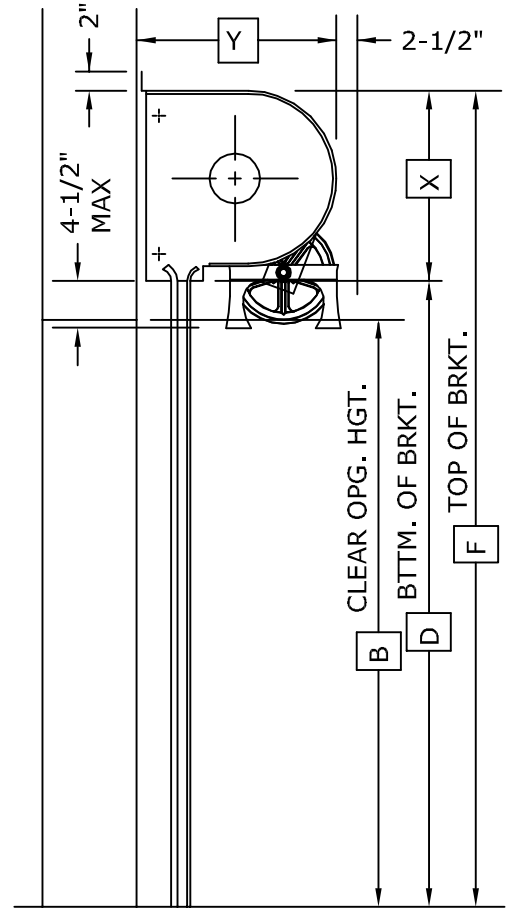
ITEM NO.	AW REV'S OPEN
03	2.00



COILSIDE ELEVATION

RIGHT HAND OPERATED DOOR SHOWN
LEFT HAND OPERATED DOOR OPPOSITE





VERTICAL SECTION

GUIDE SECTION

NOTE : WIDTH C IS IMPORTANT AND MUST BE HELD

DOOR QTY.	ITEM NO.	HAND OF OPER.	CUST. OPG. NO.	WIDTHS			HEIGHTS			GUIDE	FOR BRACKET			SLAT LENGTH
				A	C	E	B	D	F	H	X	Y		
2	03	RH		9' 1/4"	9' 6-1/4"		9' 1/4"	9' 2-1/4"	10' 8-3/4"	3-1/4"	18-1/2"	17-1/4"		9' 3-1/2"

SDF2

GENERAL NOTES

DESIGNED TO WITHSTAND 20 #/SqFt WINDLOAD.
CURTAIN IS 22 GA STEEL INSULATED.
WINDLOCKS ON EACH END OF EVERY SLAT.
BOTTOM BAR IS GALVANIZED STEEL.
DOUBLE ANGLE WITH ASTRAGAL STANDARD.
GUIDES ARE STRUCTURAL THREE ANGLE.
HOODS ARE 24 GA GALVANIZED STEEL.
SHOP COAT OF RUST INHIBITIVE PRIMER ON NONGALVANIZED STEEL SURFACES. ALL GALVANIZING PER ASTM A-653 STANDARDS.

DOOR(S) OPERATED BY MEANS OF REDUCTION GEARS OR ROLLER CHAIN SPROCKETS WITH LIFT EFFORT NOT TO EXCEED 25 LBS. ELECTRO GALVANIZED HAND CHAIN FURNISHED WITH PADLOCKABLE CHAIN KEEPER.

NOTES

CURTAIN FINISH : G90 STEEL PAINTED GRAY
BACKER FINISH : GALV STEEL PAINTED GRAY
BOTTOM BAR FINISH : STEEL SHOP PRIMED BLACK
GUIDE FINISH : STEEL SHOP PRIMED BLACK
HOOD(S) FINISH : GALV STEEL PAINTED GRAY

OPTIONS ON THIS/THESE DOORS :
LINTEL BRUSH WEATHERSTRIP
NEOPRENE BAFFLE INSIDE HOOD
STANDARD 20,000 CYCLE BARREL
R VALUE OF 7.7

**** approval drawing ****

Wayne Dalton
a Division of Overhead Door Corporation
Rolling Door Division
Kinnear
North American

THERMOTITE DOOR MODEL : 823C

PROJECT :
Job Info: M3 ENG.

ARCH :

G.C. :

DISTR : TAMU INC

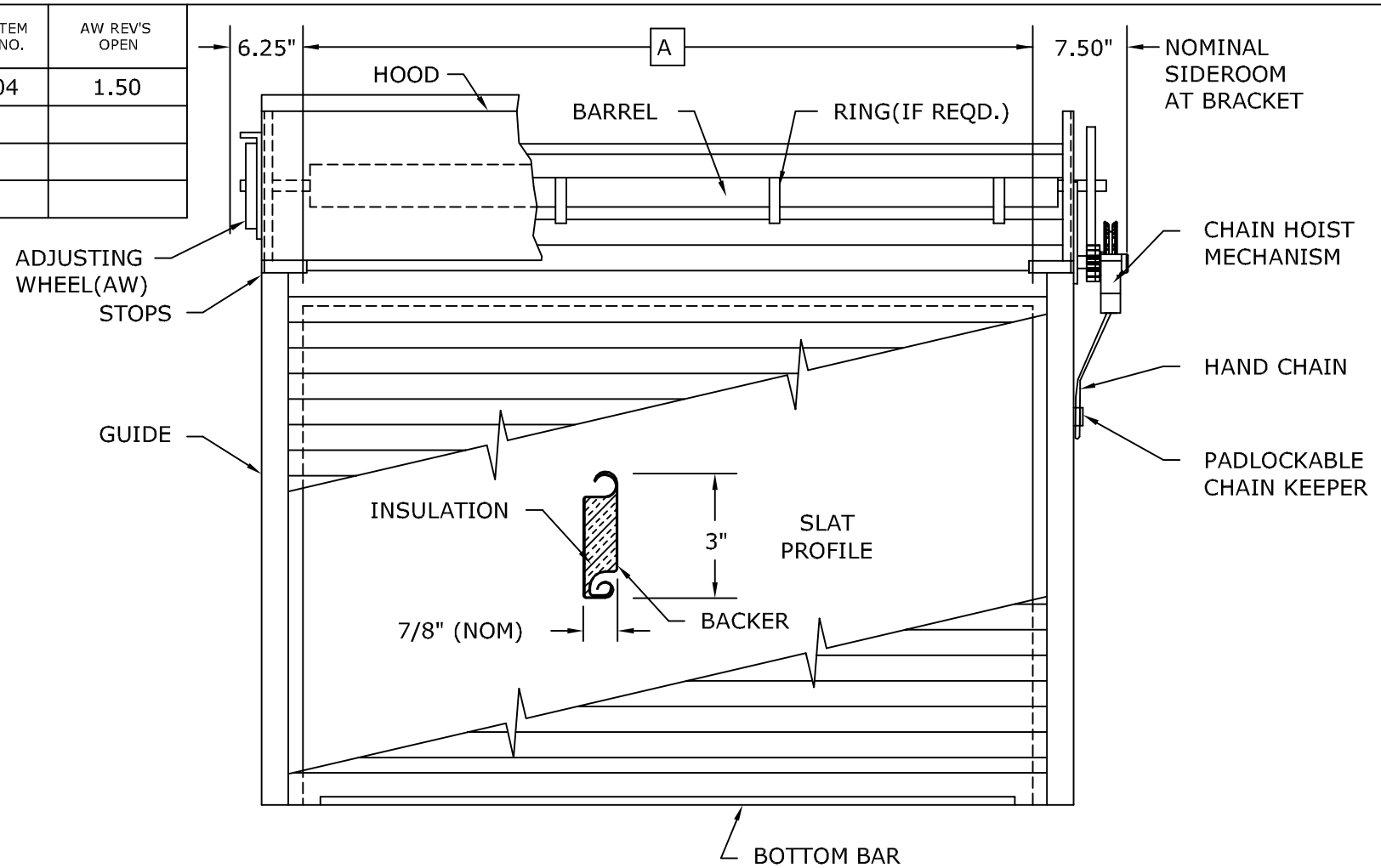
DISTR P.O. NO. :

PREPARED BY : J.Davis

DATE : 05/23/2014

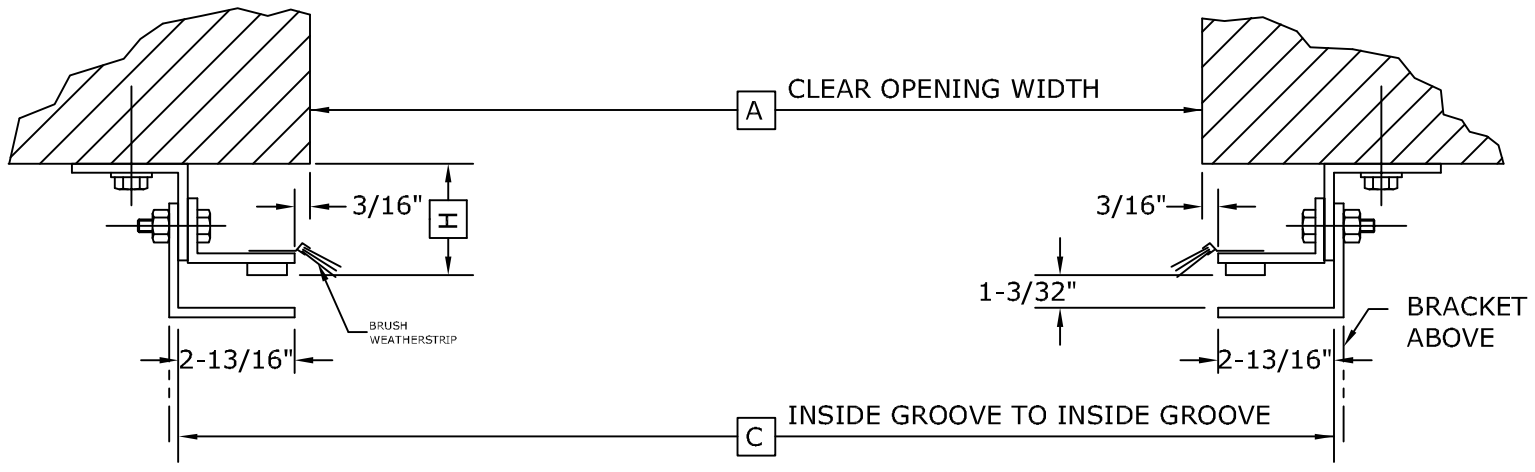
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	00001838526	OF

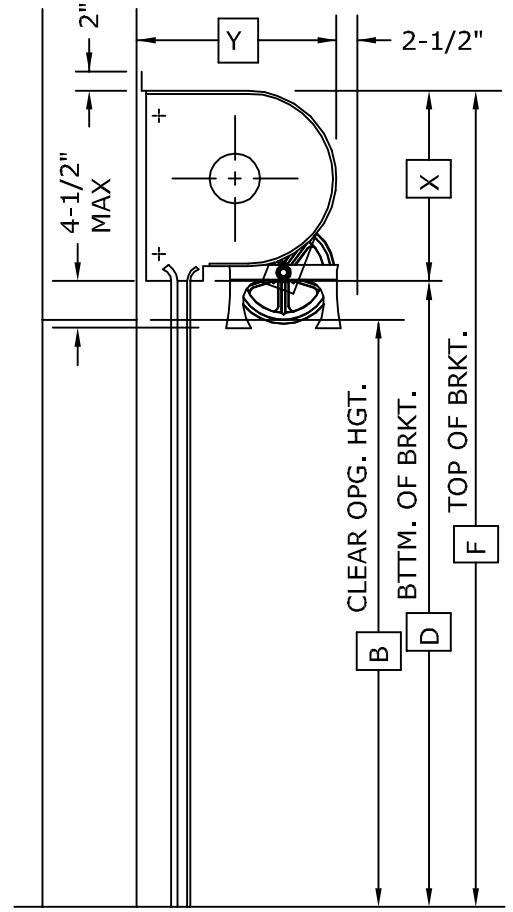
ITEM NO.	AW REV'S OPEN
04	1.50



COILSIDE ELEVATION

RIGHT HAND OPERATED DOOR SHOWN
LEFT HAND OPERATED DOOR OPPOSITE





VERTICAL SECTION

GUIDE SECTION

NOTE : WIDTH C IS IMPORTANT AND MUST BE HELD

DOOR QTY.	ITEM NO.	HAND OF OPER.	CUST. OPG. NO.	WIDTHS			HEIGHTS			GUIDE	FOR BRACKET			SLAT LENGTH
				A	C	E	B	D	F	H	X	Y		
1	04	RH		13' 1-1/2"	13' 7-1/2"		11' 5-7/8"	11' 7-7/8"	13' 5-7/8"	3-3/4"	22"	20-3/4"		13' 4-7/8"

SDF2

GENERAL NOTES

DESIGNED TO WITHSTAND 20 #/SqFt WINDLOAD.
CURTAIN IS 22 GA STEEL INSULATED.
WINDLOCKS ON EACH END OF EVERY SLAT.
BOTTOM BAR IS GALVANIZED STEEL.
DOUBLE ANGLE WITH ASTRAGAL STANDARD.
GUIDES ARE STRUCTURAL THREE ANGLE.
HOODS ARE 24 GA GALVANIZED STEEL.
SHOP COAT OF RUST INHIBITIVE PRIMER ON NONGALVANIZED STEEL SURFACES. ALL GALVANIZING PER ASTM A-653 STANDARDS.

DOOR(S) OPERATED BY MEANS OF REDUCTION GEARS OR ROLLER CHAIN SPROCKETS WITH LIFT EFFORT NOT TO EXCEED 25 LBS. ELECTRO GALVANIZED HAND CHAIN FURNISHED WITH PADLOCKABLE CHAIN KEEPER.

NOTES

CURTAIN FINISH : G90 STEEL PAINTED GRAY
BACKER FINISH : GALV STEEL PAINTED GRAY
BOTTOM BAR FINISH : STEEL SHOP PRIMED BLACK
GUIDE FINISH : STEEL SHOP PRIMED BLACK
HOOD(S) FINISH : GALV STEEL PAINTED GRAY

OPTIONS ON THIS/THESE DOORS :
LINTEL BRUSH WEATHERSTRIP
NEOPRENE BAFFLE INSIDE HOOD
STANDARD 20,000 CYCLE BARREL
R VALUE OF 7.7

**** approval drawing ****

Wayne Dalton
a Division of Overhead Door Corporation
Rolling Door Division
Kinnear
North American

THERMOTITE DOOR MODEL : 823C

PROJECT :
Job Info: M3 ENG.

ARCH :

G.C. :

DISTR : TAMU INC

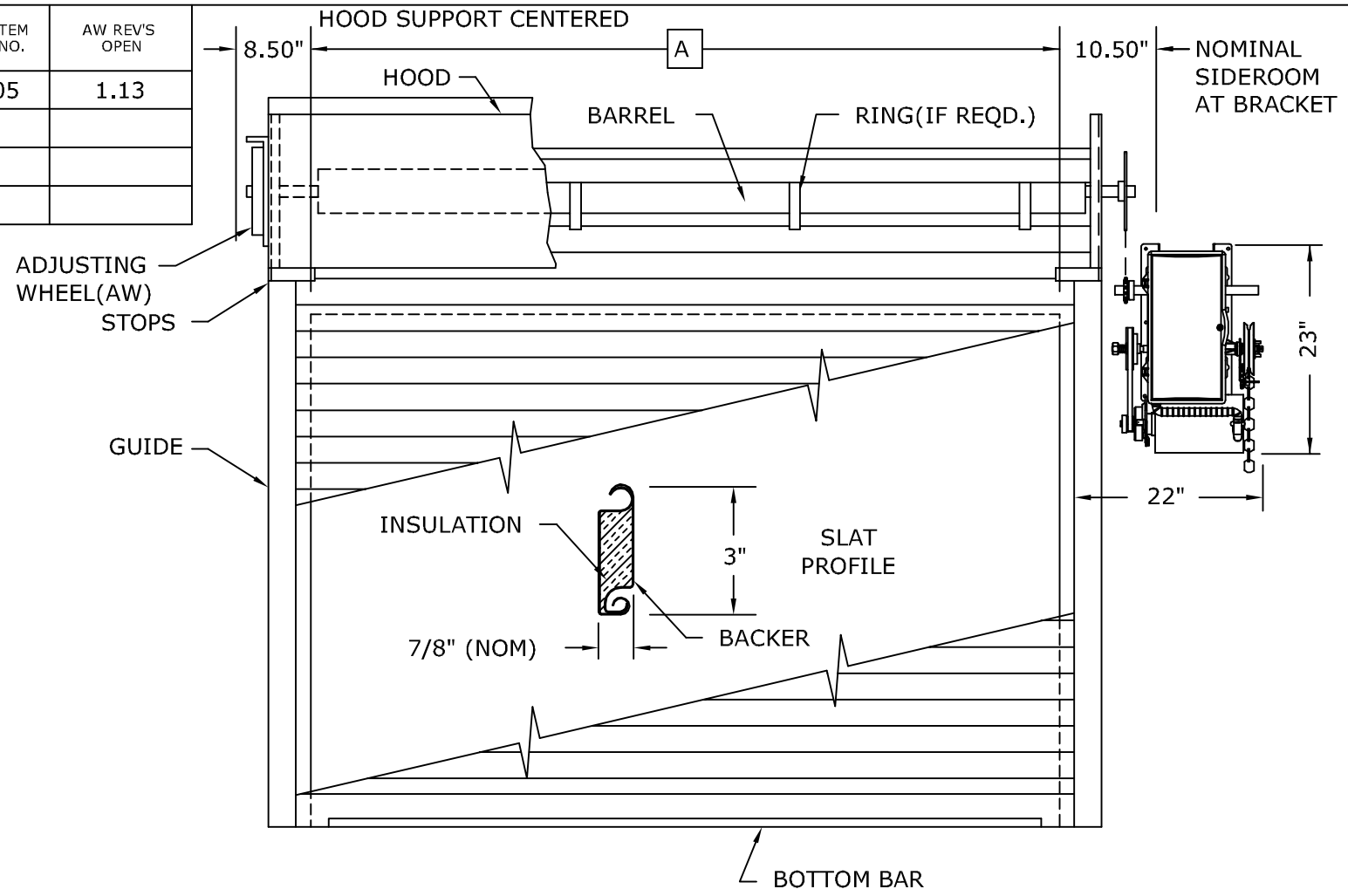
DISTR P.O. NO. :

PREPARED BY : J.Davis

DATE : 05/23/2014

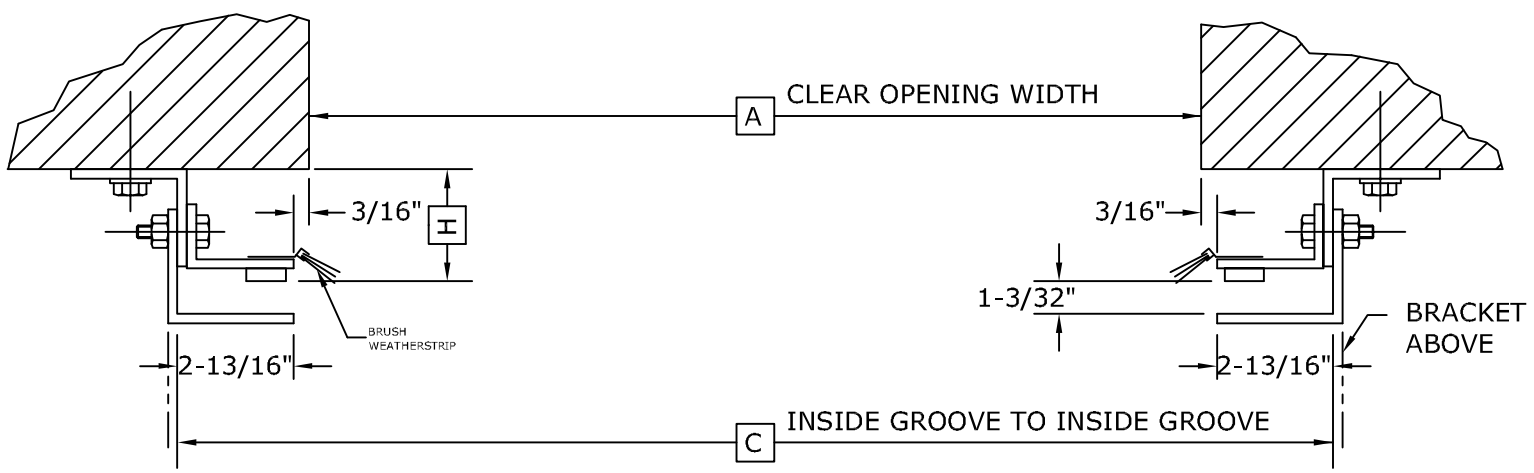
REVISION	ORDER NO.	DWG. NO.
	00001838526	OF

ITEM NO.	AW REV'S OPEN
05	1.13



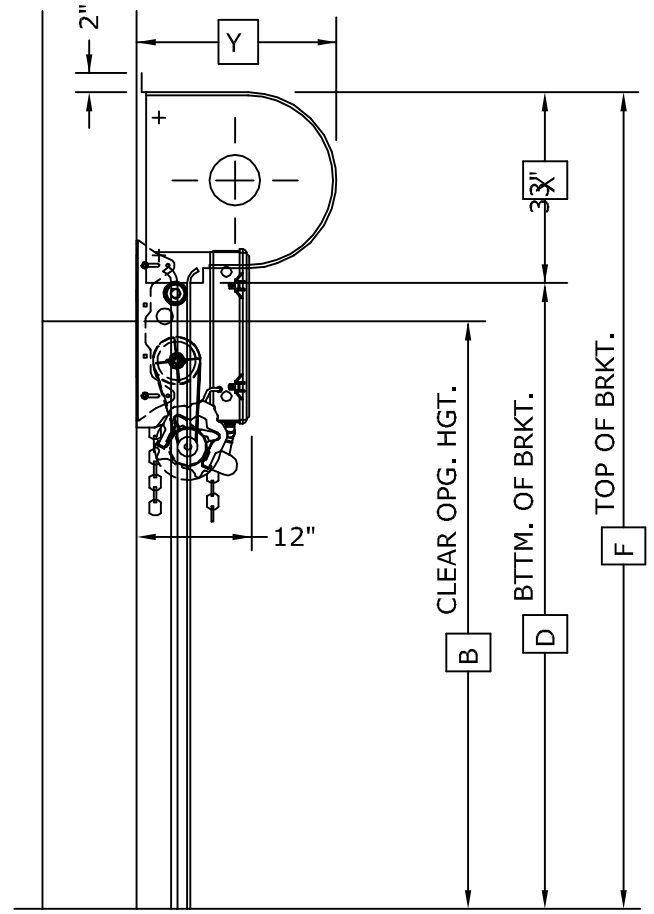
COILSIDE ELEVATION

RIGHT HAND OPERATED DOOR SHOWN
LEFT HAND OPERATED DOOR OPPOSITE



GUIDE SECTION

NOTE : WIDTH C IS IMPORTANT AND MUST BE HELD



VERTICAL SECTION

DOOR QTY.	ITEM NO.	HAND OF OPER.	CUST. OPG. NO.	WIDTHS			HEIGHTS			GUIDE	FOR BRACKET			SLAT LENGTH
				A	C	E	B	D	F	H	X	Y		
2	05	RH		24' 7-1/4"	25' 1-1/4"		11' 5-7/8"	11' 7-7/8"	13' 7-7/8"	3-3/4"	24"	22-3/4"		24' 10-5/8"

SDF7

GENERAL NOTES

DESIGNED TO WITHSTAND 20 #/SqFt WINDLOAD.
CURTAIN IS 18 GA STEEL INSULATED.
WINDLOCKS ON EACH END OF EVERY SLAT.
BOTTOM BAR IS GALVANIZED STEEL.
DOUBLE ANGLE WITH ASTRAGAL STANDARD.
GUIDES ARE STRUCTURAL THREE ANGLE.
HOODS ARE 24 GA GALVANIZED STEEL.
SHOP COAT OF RUST INHIBITIVE PRIMER ON NONGALVANIZED STEEL SURFACES. ALL GALVANIZING PER ASTM A-653 STANDARDS.

MOTOR OPERATOR IS BELT DRIVE TYPE EQUIPPED WITH DOOR SPROCKET, ROLLER CHAIN, MOUNTING SUPPORT, PADLOCKABLE HAND CHAIN KEEPER, AND ONE PUSH BUTTON STATION (SAME NEMA RATING AS OPERATOR).

CIRCUIT : 1.0 HP 115/208/230 VAC 1 PH 60 HZ

NOTES

CURTAIN FINISH : G90 STEEL PAINTED GRAY
BACKER FINISH : GALV STEEL PAINTED GRAY
BOTTOM BAR FINISH : STEEL SHOP PRIMED BLACK
GUIDE FINISH : STEEL SHOP PRIMED BLACK
HOOD(S) FINISH : GALV STEEL PAINTED GRAY

OPTIONS ON THIS/THESE DOORS :
LINTEL BRUSH WEATHERSTRIP
NEOPRENE BAFFLE INSIDE HOOD
STANDARD 20,000 CYCLE BARREL
R VALUE OF 7.7
STANDARD PHOTOEYE ENTRAPMENT

**** approval drawing ****

SHAFT DIA = 1-3/4" KEY SIZE = 3/8" FOR ITEM 05

Wayne Dalton — a Division of Overhead Door Corporation
Rolling Door Division — Kinnear — North American

THERMOTITE DOOR MODEL : 819C

PROJECT :
Job Info: 3M ENG.

ARCH :

G.C. :

DISTR : TAMU INC

DISTR P.O. NO. :

PREPARED BY : J.Davis

DATE : 05/23/2014

REVISION	ORDER NO.	DWG. NO.
	00001838526	OF

CONSTRUCTION SPECIALTIES

11 de junio de 2014

CLIENTE: **M3 ENG**
OBRA: **TELESCOPIO**
UBICACIÓN: **SAN QUINTIN B.C.**

ATENCION: COLEBENNINGER
TEL/FAX: 520.293.1488 ext. 8306
E-MAIL: cbenninger@m3eng.com

COTIZACION

CANTIDAD	DESCRIPCION	PRECIO	TOTAL	weight
	Steel Roll-up Door, Insulated / 3mW x 3mW / EXTERIOR / wind speed 55m/s			
	CORTINA ENROLLABLE MARCA WAYNE DALTON MODELO 823C THERMOTITE, HEAVY DUTY CON GUIAS EN ANGULO ESTRUCTURAL ACABADO PRIMER NEGRO. FABRICADA EN CALIBRE 24, ACABADO EN PRIMER GRIS G90, CALIBRE 22, SLAT PLANO DE 3" INTERCALADOS CON AISLAMIENTO Y UN VALOR R=6.7, CUBRE ROLLO EN CALIBRE 24, ASTRAGAL INFERIOR DE ANGULO GALVANIZADO CON SELLO DE INTERPERIE, DE OPERACIÓN MANUAL POR MEDIO DE POLEA Y CADENA, RESORTES DE 20,000 CICLOS. RESISTENCIA A VIENTO DE **55 PSF**			
21	9' 10-1/8" X 9' 10-1/8"	$ 3,559.00	$ 74,739.00	1350 lbs
1	8' 2-7/16" X 8' 2-7/16"	$ 2,705.00	$ 2,705.00	950 lbs
	Steel Roll-up Door, Insulated /2.75mW x 2.75mW / INTERIOR			
	CORTINA ENROLLABLE MARCA WAYNE DALTON, MODELO 823C, INSULADA, DUELA PLANA DE 3" EN CALIBRE 22 ACABADO EN PRIMER GRIS, BARRA INFERIOR DE DOBLE ANGULO EN ACERO GALVANIZADO CON SELLO INFERIOR, RESISTENCIA A VIENTO **20 PSF (88 MPH)**, GUIAS EN ACERO ROLLADO, INCLUYE SELLO PERIMETRAL DE VINIL, CUBIERTA EN ACERO GALVANIZADO CON ACABADO PRIMER GRIS EN CALIBRE 24, RESORTES DE 20,000 LBS CICLOS, MANUAL POR MEDIO DE CADENA Y POLEA. PARA CLARO DE			
2	9' 1/4" X 9' 1/4"	$ 2,321.00	$ 4,642.00	1095 lbs
	Steel Roll-up Door, Insulated /4mW x 3.5mW / INTERIOR			
	CORTINA ENROLLABLE MARCA WAYNE DALTON, MODELO 823C, INSULADA, DUELAPLANA DE 3" EN CALIBRE 22 ACABADO EN PRIMER GRIS, BARRA INFERIOR DE DOBLEANGULO EN ACERO GALVANIZADO CON SELLO INFERIOR, RESISTENCIA A VIENTO **20PSF (88 MPH)**, GUIAS EN ACERO ROLLADO, INCLUYE SELLOPERIMETRAL DE VINIL,CUBIERTA EN ACERO GALVANIZADO CON ACABADO PRIMER GRIS EN CALIBRE 24,RESORTES DE 20,000 LBS CICLOS, MANUAL POR MEDIO DE CADENA Y POLEA. PARA CLARO DE			
1	13' 1-1/2" X 11' 5-13/16"	$ 3,961.00	$ 3,961.00	2095 lbs
	Steel Roll-up Door, Insulated /7.5mW x 3.5mW / INTERIOR			
	CORTINA ENROLLABLE MARCA WAYNE DALTON MODELO 819C THERMOTITE, HEAVY DUTY CON GUIAS EN ANGULO ESTRUCTURAL ACABADO PRIMER NEGRO. FABRICADA EN CALIBRE 24, ACABADO EN PRIMER GRIS G90, CALIBRE 18, SLAT PLANO DE 3" INTERCALADOS CON AISLAMIENTO Y UN VALOR R=6.7, CUBRE ROLLO EN CALIBRE 24, ASTRAGAL INFERIOR DE ANGULO GALVANIZADO CON SELLO DE INTERPERIE, DE OPERACIÓN POR MEDIO DE MOTOR H, 115V, 1.5HP, 60HZ, RESORTES DE 20,000 CICLOS. RESISTENCIA A VIENTO DE **20 PSF**			
1	24' 7-1/4" X 11' 5-13/16"	$ 10,685.00	$ 10,685.00	4190 lbs

	Steel Roll-up Door, Insulated / 7.5mW x 3.5mW / EXTERIOR / wind speed 55m/s			
	CORTINA ENROLLABLE MARCA WAYNE DALTON MODELO 819C THERMOTITE, HEAVY DUTY CON GUIAS EN ANGULO ESTRUCTURAL ACABADO PRIMER NEGRO. FABRICADA EN CALIBRE 18, ACABADO EN PRIMER GRIS G90, SLAT PLANO NO.14 DE 3" INTERCALADOS CON AISLAMIENTO Y UN VALOR R=6.7, CUBRE ROLLO EN CALIBRE 24, ASTRAGAL INFERIOR DE ANGULO GALVANIZADO CON SELLO DE INTERPERIE, DE OPERACIÓN POR MEDIO DE MOTOR GH, 115V, 1.5HP, 60HZ, RESORTES DE 20,000 CICLOS. INCLUYE RESISTENCIA DE VIENTO DE **55 PSF**			
1	24' 7-1/4" X 11' 5-13/16"	$ 11,790.00	$ 11,790.00	4190 lbs
25	INSTALACION DE CORTINA ENROLLABLE (MENOR A 200 PIES CUADRADOS)	$ 130.00	$ 3,250.00	
2	INSTALACION DE CORTINA ENROLLABLE (MAYOR A 200 PIES CUADRADOS)	$ 230.00	$ 460.00	
1	VIATICOS DE ESTANCIA Y VIAJE	$ 1,100.00	$ 1,100.00	
1	INSTALACION FIN DE SEMANA	$ 400.00	$ 400.00	
1	DESCARGA DE EQUIPO	$ 300.00	$ 300.00	
1	REVISION E INSPECCION DE TRAMO	$ 300.00	$ 300.00	
2	INSTALACION DE MOTOR	$ 130.00	$ 260.00	
1	FLETE DIRECTO A SAN QUINTIN B.C.	$ 5,550.00	$ 5,550.00	
		SUB-TOTAL	**$ 120,142.00**	
		16% IVA	**$ 19,222.72**	
		TOTAL	**$ 139,364.72**	

NOTA: LOS PRECIOS NO INCLUYEN MANIOBRAS EN LA OBRA

Pedro Saavedra | Gerente de Zona

Cell: (662)1706861
e-mail: ps@cons-spec.com

www.construction-specialties.com

COTIZACION VALIDA POR 30 DIAS
PRECIO INCLUYE GASTOS DE IMPORTACION
PRECIO EN DOLARES AMERICANOS
CONDICIONES: ANTICIPO 50% RESTO: FRONTERA
ENTREGA: 4-5 SEMANAS aprox.

San Pedro Martir Telescope

San Pedro Martir, Mexico

M3-PN147005

Steel Roll-Up Door Requirements

Updated: May 12, 2014

No.	Type	Size (Width x Height)	Quantiy	Location	Notes
1	Steel Roll-up Door, Insulated	3mW x 3mH	21	Exterior	Wind Speed: 55m/s
2	Steel Roll-up Door, Insulated	2.5mW x 2.5mH	1	Exterior	Wind Speed: 55m/s
3	Steel Roll-up Door, Insulated	2.75mW x 2.75mH	2	Interior	
4	Steel Roll-up Door, Insulated	4mW x 3.5mH	1	Interior	
5	Steel Roll-up Door, Insulated	7.5mW x 3.5mH	1	Interior	
6	Steel Two-Leaf Folding, Overhead, Insulated	7.5mW x 3.5mH	1	Exterior	Wind Speed: 55m/s--

GLOBAL PARTITIONS

SEARCH GO

OUR COMPANY | MATERIALS | OTHER PARTITIONS | STYLES | TECHNICAL SPECIFICATONS | 48-HOUR FAST TRACK | OUR REPRESENTATIVES

PRIVACY AND URINAL SCREENS

Global Privacy and Urinal Screens are available in three, easy to maintain mounting configurations and are offered in six materials: polymer, plastic laminate, phenolic-black core, phenolic-color-thru, stainless steel and powder coated. Construction styles include wall hung, floor anchored and post-to-ceiling screens.



Wall-Hung Screens
Available in 3 standard heights: 42", 48"and 58".



Pilaster-Mounted Screens
Floor Mounted screen shown. Also available in Overhead Braced, Ceiling Hung and Floor to Ceiling.



Post-Mounted Screens
1-¾" sq. aluminum post in Floor Mounted or Floor to Ceiling Mounted.

©2014 Global Partitions, an ASI Group Company

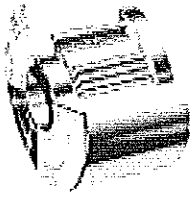
CYR series cam yoke roller

Cam follower type bearings without studs for shaft mounting — sealed (with or without crowned O.D.), and unsealed.

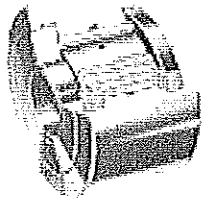
Illustrated are the options available in cam yoke roller bearings. These may be combined to best serve any application and combinations regularly stocked are shown in the following table. Others would be special and should be discussed with the McGill Engineering Department.

CYR, CYR-S & CCYR-S series

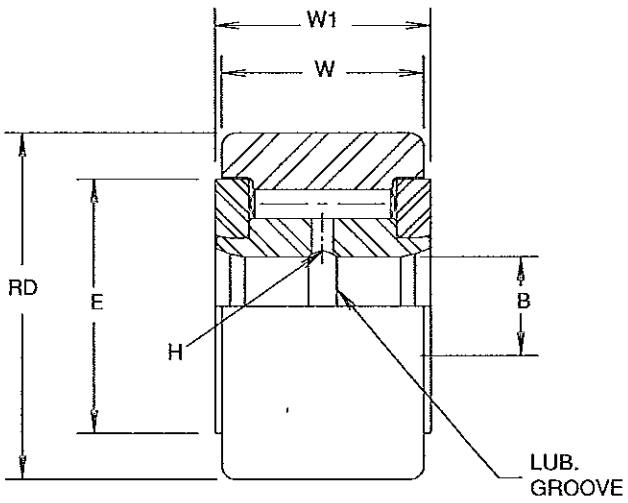
Cam followers without studs for shaft mounting, with and without LUBRI-DISC® seals

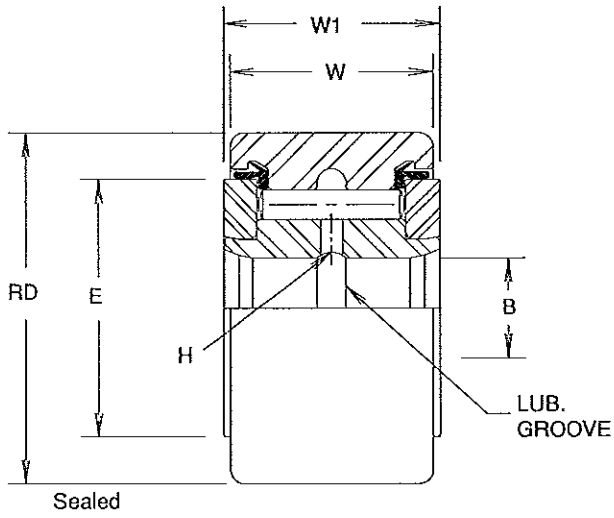


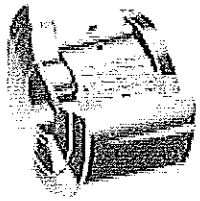
Unsealed



With LUBRI-DISC seals





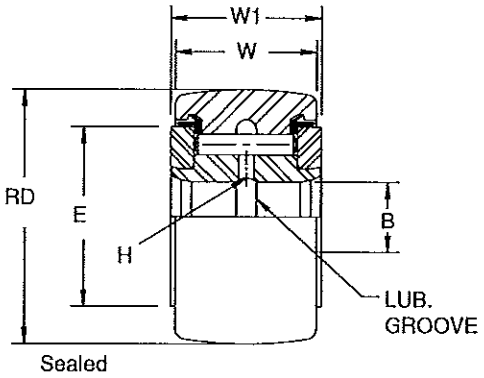


With LUBRI-DISC® seals
add letter "S"
Ex. CYR-1¾-S



Crowned O.D.
add letter "C"
Ex. CCYR-1¾-S

See page 14 for crown details.



CYR, CYR-S & CCYR-S series

Cam followers without studs for shaft mounting, with and without LUBRI-DISC® seals

UNSEALED BRG. NO.	SEALED BRG. NO.	SEALED BRG. NO.	ROLLER DIA. (RD) +.000 -.001	ROLLER WIDTH (W) +.000 -.005	BORE (B)		WIDTH OVER END PLATES (W1) +.005 -.010	DIA. OF END PLATES (E)	OIL HOLE (H) DIA.	MIN. BOSS DIA.	SHAFT DIA.						MAX. STATIC CAPACITY LBS.	BASIC DYN. RATING LBS.
											PUSH FIT		DRIVE FIT		PRESS FIT			
					NOM.	TOL.					NOM.	TOL.	NOM.	TOL.	NOM.	TOL.		
CYR-3/4	CYR-3/4-S	CCYR-3/4-S	.750	.500	.250	+.0002 -.0004	.5625	39/64	3/32	1/2	.2495	±.0002	.2501	±.0002	.2503	±.0002	4130	1660
CYR-7/8	CYR-7/8-S	CCYR-7/8-S	.875	.500	.250		.5625	39/64		1/2	.2495		.2501		.2503		4130	1660
CYR-1	CYR-1-S	CCYR-1-S	1.000	.625	.3125		.6875	25/32		41/64	.3120		.3126		.3128		6120	2225
CYR-1 1/8	CYR-1 1/8-S	CCYR-1 1/8-S	1.125	.625	.3125		.6875	25/32		41/64	.3120		.3126		.3128		6120	2225
CYR-1 1/4	CYR-1 1/4-S	CCYR-1 1/4-S	1.250	.750	.375		.8125	63/64		49/64	.3745		.3751		.3753		8500	3930
CYR-1 3/8	CYR-1 3/8-S	CCYR-1 3/8-S	1.375	.750	.375		.8125	63/64		49/64	.3745		.3751		.3753		8500	3930
CYR-1 1/2	CYR-1 1/2-S	CCYR-1 1/2-S	1.500	.875	.4375		.9375	1 3/32		57/64	.4370		.4376		.4378		11280	4840
CYR-1 5/8	CYR-1 5/8-S	CCYR-1 5/8-S	1.625	.875	.4375		.9375	1 3/32		57/64	.4370		.4376		.4378		11280	4840
CYR-1 3/4	CYR-1 3/4-S	CCYR-1 3/4-S	1.750	1.000	.500		1.0625	1 1/4		1 3/64	.4995		.5001		.5005		15840	6385
CYR-1 7/8	CYR-1 7/8-S	CCYR-1 7/8-S	1.875	1.000	.500		1.0625	1 1/4		1 3/64	.4995		.5001		.5005		15840	6385
CYR-2	CYR-2-S	CCYR-2-S	2.000	1.250	.625		1.3125	1 13/32		1 13/64	.6245		.6251		.6255		21140	8090
CYR-2 1/4	CYR-2 1/4-S	CCYR-2 1/4-S	2.250	1.250	.625		1.3125	1 13/32		1 13/64	.6245		.6251		.6255		21140	8090
CYR-2 1/2	CYR-2 1/2-S	CCYR-2 1/2-S	2.500	1.500	.750		1.5625	1 11/16	1/8	1 5/16	.7495		.7501		.7505		32900	11720
CYR-2 3/4	CYR-2 3/4-S	CCYR-2 3/4-S	2.750	1.500	.750		1.5625	1 11/16		1 5/16	.7495		.7501		.7505		32900	11720
CYR-3	CYR-3-S	CCYR-3-S	3.000	1.750	1.000	+.0001 -.0005	1.8125	2 1/8		1 3/4	.9991	+.0002 -.0003	1.0002	+.0002 -.0003	1.0006	+.0002 -.0003	49820	15720
CYR-3 1/4	CYR-3 1/4-S	CCYR-3 1/4-S	3.250	1.750	1.000		1.8125	2 1/8		1 3/4	.9991		1.0002		1.0006		49820	15720
CYR-3 1/2	CYR-3 1/2-S	CCYR-3 1/2-S	3.500	2.000	1.125		2.0625	2 7/16		1 59/64	1.1244		1.1252		1.1256		63250	22800
CYR-4	CYR-4-S	CCYR-4-S	4.000	2.250	1.250		2.3125	2 51/64		2 9/32	1.2494		1.2502		1.2506		89540	29985
	CYR-5-S	†CCYR-5-S	5.000	2.750	1.750		2.8750	3 9/16		2 7/8	1.7494		1.7502		1.7506		135900	46575
	CYR-6-S	†CCYR-6-S	6.000	3.250	2.250		3.3750	4 15/32	3/16	3 3/8	2.2494		2.2502		2.2506		160900	60000
	CYR-7-S	†CCYR-7-S	7.000	3.750	2.750		3.8750	5 3/16		3 7/8	2.7494		2.7502		2.7506		213860	75380
	†CYR-8-S◆	†CCYR-8-S◆	8.000	4.250	3.255	+.001 -.000	4.500	4 3/8	1/4	4 3/8	3.2545	±.0005	3.2560	±.0005	3.2565	±.0005	288200	92200
	†CYR-9-S◆	†CCYR-9-S◆	9.000	4.750	3.755		5.000	5 1/16	5/16	5 1/16	3.7545		3.7560		3.7565		366850	113260
	†CYR-10-S◆	†CCYR-10-S◆	10.000	5.250	4.255		5.500	5 15/32	3/8	5 15/32	4.2545		4.2560		4.2565		431130	131545

† Not available from stock. Consult McGill Customer Service for availability.
◆ Standard tolerances do not apply. Consult McGill Customer Service.
NOTE: Consult McGill Customer Service for limiting speeds.

INDUCTIVE SENSOR
QUICK SELECTION GUIDE

	Product Family	Product Features	Housing Diameter/ Dimensions (mm)	Sensing Range Shielded (mm)	Sensing Range Unshielded (mm)	Enclosure Ratings	2-wire DC	3-wire DC	4-wire DC	2-wire AC	2-wire AC/DC
General Purpose	**872C WorldProx™** 	• Nickel-plated brass barrel with plastic face • Standard length and short barrel versions (3-wire DC versions) • Extended range versions available (3-wire DC and 2-wire AC) • Wide variety of cable and connector options	6.5	2 & 3	3	IP67	✔	✔	✔	✔	✔
			8	2 & 3	3, 4, 6						
			12	3, 4, 6	4, 8, 10						
			18	5, 8, 12	8, 12, 20						
			30	10, 15, 22	15, 20, 40						
	872C/871C Plastic Housing 	• Plastic barrel and sensing face • Cable and QD models (AC units only available with cable) • AC units available in 871C product family	12	3	4	IP67		✔		✔	
			18	5	8						
			30	10	15						
Harsh Duty	**871TM** 	• Rugged stainless steel 304 barrel and sensing face • Extended Range units available (3-wire DC versions) • Wide variety of sensing types available (standard inductive, submersible units, low energy AC/DC units, and intrinsically safe versions)	8	3	6	All units IP67 & 1200 psi wash down rated (Selected units meet IP69K)	✔	✔		✔	✔
			12	2 & 6	4 & 10						
			18	5 & 10	8 & 20						
			30	10 & 20	15 & 40						
	871T Ferrous 	• Rugged stainless steel 304 barrel and sensing face • Ferrous versions only sense ferrous materials	18	5	NA	All units IP67				✔	
Food & Beverage	**871TS** 	• Stainless steel 316L barrel and FDA approved PPS plastic sensing face • ECOLAB certified • Extended temperature ratings (-40˚ to 100 ˚C) • Extended range units available • Laser engraved part numbers • Threaded or smooth barrel	12	2 & 4	4 & 8	IP67, IP68 & IP69K					
			18	5 & 8	8 & 12			✔			
	871T 	• Stainless steel 304 barrel with plastic sensing face • AC housing and sensing face constructed of stainless steel 304 • Extended low end temperature ratings (-40˚ to 70 ˚C)	12	2	4	IP67		✔		✔	
			18	5	8						
	871C Extended Temperature 	• Nickel-plated brass barrel and plastic sensing face • Operating temperature from -40˚ to 100 ˚C • PUR cable and QD connector options	12	2	4	IP67		✔			
			18	5	8						
			30	10	15						
Hazardous Locations	**871C NAMUR** 	• Conform to NAMUR specifications (DIN 19 234) • Sensors are appropriate for intrinsically safe applications when used with NAMUR style isolators/amplifiers	8	1	2	IP67	✔				
			12	2	4						
			18	5	8						
			30	10	15						

Specialty Solutions

871D WorldClamp™ 	• Designed for use in power clamp and gripper applications to indicate open and closed position • Weld Field Immune • 2 different sensor head styles • 3-wire DC and 2-wire AC/DC versions	**871D Cylinder Position Indicator** 	• Designed to detect the extended or retracted position of a hydraulic or pneumatic cylinder • Weld Field Immune • Multiple probe lengths to accommodate different size cylinders • 3-wire DC and 2-wire AC/DC versions

SEW-EURODRIVE

PT Pilot® Quotation

Date 06/19/2014 **Quotation # 20140619-000162**

From	SEW-Western Region (CA) SEW-Eurodrive, Inc. 30599 San Antonio Street Hayward CA, 94544	**Phone** (510) 487-3560 **Fax** (510) 487-6433	**To**	M3 Engineering 2051 W Sunset Road Tucson AZ, 85704	**Phone** (520) 293-1488 **Fax** (520) 293-8349
Email	cshayward@seweurodrive.com		**Attn**	John Reid	

Purchase Order	N/A	**Tag/Ref**	**SO#**

Model	K87DRE132M4BE11HR/AS7Y/TH/V/C			**Base Price**	$3,637 List
Gear Ratio	56.64				
Prim/Sec Stages	3 / 0	**Shaft Location**	B (ex: MxB)	**Cable Entry Loc**	Unsure
Output Speed	31 RPM	**Output Shaft Dia**	60 mm	**Overhung Load**	6,000 lbs
Motor HP	7.5 HP	**Output Shaft Style**	Solid Shaft	**Output Torque**	15,000 lb-in
Motor Voltage	460 VAC	**Input Shaft Dia**	--	**Torque Capacity**	23,900 lb-in
Frequency	60 Hz	**Flange Diameter**	--	**Nameplate S.F.**	1.60
Brake Voltage	460V	**Flange Location**	--	**Load S.F.**	1.96
Mtg. Position	M4	**Conduit Box Loc**	Unsure	**Weight** (includes oil)	346 lbs

GEAR OPTIONS (List)

60 mm Shaft [$0], Shaft B [$0], 5001 Green/Blue Paint [$0], Shell Omala S2 G 220 mineral oil (standard) [$0]

MOTOR AND BRAKE OPTIONS (List)

115V Space Heater [$620], IP54 Enclosure [$0], 5001 Green Blue Paint [$0], AS7Y - Spreadshaft SSI Encoder [$1718], TH - Thermostat switches (x3) Class F [$172], C - Protective Canopy on Motor [$76], Inverter/Vector Duty Nameplate [$0], Class F Insulation on Nameplate [$0], V - Constant Fan (220V-3Ph, 110V-1Ph) [$528], Standard Aluminum Conduit Box - NPT holes [$0], 15m Encoder Cable w/Wire Leads + (2) 15-pin Plugs (P/N 1360 2640-15) [$400], BMH Rectifier [$111], HR - Hand Release Brake [$90], Brake Release Location: 303 degrees [$0], BE11 with 708 lb-in Brake Torque [$708]

ELECTRONIC OPTIONS / MECHANICAL VARIABLE SPEED (List)

MCV40A0055-5A3-4-00 [$2157], Output Filter HF055-503 [$754], Resistor BW347 [$1269], USB11A [$190], Line Filter NF014-503 [$469], DFE33B + UOH11B - Ethernet/IP Gateway [$720]

COMMENTS / SPECIAL INSTRUCTIONS

Load Torque: 12225 lb-in. Ambient = 25C (77F) or lower.

OFFICE USE ONLY



DELIVERY

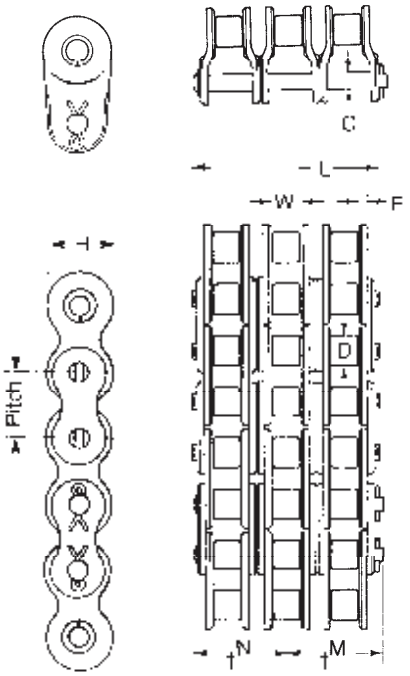
Need by N/A
Ship Via N/A
FOB SEW Eurodrive, Inc.

Qty 1	**List Ea** $13,619	**Disc** 0.556	**Net Adders Ea** $0	**Net Ea** $7,572.16	**TOTAL** $7,572.16

Quotation is valid for 30 days and subject to SEW-Eurodrive terms and conditions of sale.
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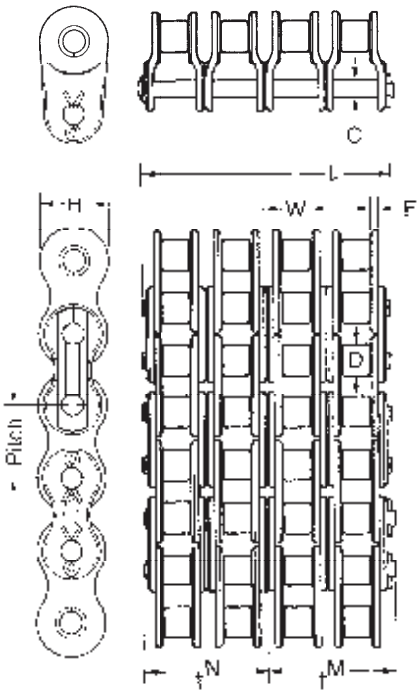
Morse PERFORMANCE CHAIN

ANSI ROLLER CHAIN
TRIPLE and QUADRUPLE STRAND



Standard series-triple strand

Catalog No.	Dimensions (Inches)									Average Tensile Strength	Weight Per Foot
	Pitch	W-Roller Width	D-Roller Dia.	C-Pin Dia.	F-Plate Thick-ness	L-Width Over Pins	H-Inside Plate Height	†N	†M		
35-3*	3/8	3/16	.200	.141	.050	1.265	.350	.632	.703	6,300	.66
40-3	1/2	5/16	.312	.156	.060	1.780	.466	.880	.968	11,100	1.23
50-3	5/8	3/8	.400	.200	.080	2.220	.584	1.110	1.203	18,300	2.02
60-3	3/4	1/2	.468	.234	.094	2.790	.700	1.395	1.500	25,500	2.96
80-3	1	5/8	.625	.312	.125	3.585	.934	1.792	1.905	43,500	5.09
100-3	1 1/4	3/4	.750	.375	.156	4.371	1.166	2.186	2.329	72,000	7.61
120-3	1 1/2	1	.875	.437	.187	5.538	1.400	2.769	2.938	102,000	11.43
140-3	1 3/4	1	1.000	.500	.219	5.965	1.634	2.982	3.156	138,000	14.63
160-3	2	1 1/4	1.125	.562	.250	7.132	1.866	3.566	3.782	174,000	19.58
200-3	2 1/2	1 1/2	1.562	.781	.312	8.754	2.250	4.377	4.704	285,000	32.04
Heavy series-triple strand											
60-3H	3/4	1/2	.468	.234	.125	3.176	.700	1.588	1.680	25,500	3.60
80-3H	1	5/8	.625	.312	.156	3.971	.934	1.985	2.090	43,500	6.00
100-3H	1 1/4	3/4	.750	.375	.187	4.767	1.166	2.383	2.528	72,000	8.60
120-3H	1 1/2	1	.875	.437	.219	5.943	1.400	2.971	3.141	102,000	12.60
140-3H	1 3/4	1	1.000	.500	.250	6.356	1.634	3.178	3.334	138,000	16.10
160-3H	2	1 1/4	1.125	.562	.281	7.253	1.866	3.761	3.952	174,000	21.20
200-3H	2 1/2	1 1/2	1.562	.781	.375	9.545	2.334	4.772	4.990	285,000	36.20



Standard series-quadruple strand

Catalog No.	Dimensions (Inches)									Average Tensile Strength	Weight Per Foot
	Pitch	W-Roller Width	D-Roller Dia.	C-Pin Dia.	F-Plate Thick-ness	L-Width Over Pins	H-Inside Plate Height	†N	†M		
*35-4	3/8	3/16	.200	.141	.050	1.664	.350	.832	.906	8,400	.88
40-4	1/2	5/16	.312	.156	.060	2.345	.466	1.162	1.250	14,800	1.64
50-4	5/8	3/8	.400	.200	.080	2.933	.584	1.466	1.547	24,400	2.76
60-4	3/4	1/2	.468	.234	.094	3.688	.700	1.844	1.938	34,000	3.94
80-4	1	5/8	.625	.312	.125	4.738	.934	2.369	2.469	58,000	6.77
100-4	1 1/4	3/4	.750	.375	.156	5.779	1.166	2.889	3.031	96,000	10.12
120-4	1 1/2	1	.875	.437	.187	7.327	1.400	3.663	3.828	136,000	15.20
140-4	1 3/4	1	1.000	.500	.219	7.889	1.634	3.945	4.125	184,000	19.48
160-4	2	1 1/4	1.125	.562	.250	9.437	1.866	4.718	4.938	232,000	26.07
200-4	2 1/2	1 1/2	1.562	.781	.312	11.571	2.334	5.785	6.109	380,000	42.59
Heavy series-quadruple strand											
60-4H	3/4	1/2	.468	.234	.125	4.204	.700	2.102	2.194	34,000	4.80
80-4H	1	5/8	.625	.312	.156	5.524	.934	2.627	2.731	58,000	7.90
100-4H	1 1/4	3/4	.750	.375	.187	6.306	1.166	3.153	3.297	96,000	11.50
120-4H	1 1/2	1	.875	.437	.219	7.867	1.400	3.933	4.103	136,000	16.80
140-4H	1 3/4	1	1.000	.500	.250	8.411	1.634	4.205	4.362	184,000	21.50
160-4H	2	1 1/4	1.125	.562	.281	9.959	1.866	4.979	5.170	232,000	28.30
200-4H	2 1/2	1 1/2	1.562	.781	.375	12.628	2.334	6.314	6.531	380,000	48.20

* Rollerless

All sizes available in Riveted construction. Sizes 60 and above available in Cottered construction. Please specify desired construction when ordering.

Standard multiple-strand chains are supplied with loose-fit center plates. Morse press-lit center plates are available on special order.

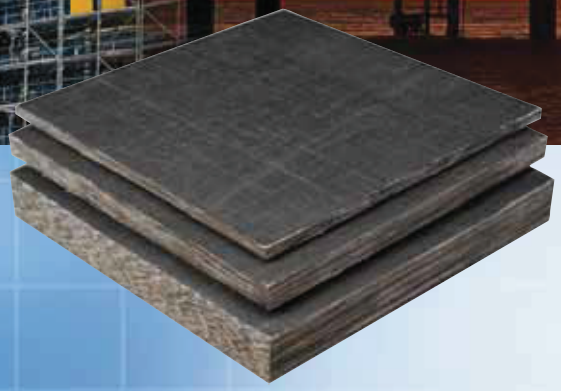
Chains on this page should not be used for Hoisting applications. Consult Morse for Hoist application recommendations.

† For cotter chain and connector link clearance.

Fabreeka® Pads

FABREEKA
VIBRATION & SHOCK CONTROL





Fabreeka® Pads

Reducing structure-borne noise & Impact shock and vibration

These tables can be used to select the desired Fabreeka pad thickness when forcing frequency and load are known.

Percent Reduction in Transmitted Vibration

Fabreeka 15/64" (6 mm) Thick

Forcing Freq.	Load - P.S.I. (MPa)							
C.P.S. (Hz)	50 (0.35)	100 (0.69)	150 (1.04)	200 (1.40)	400 (2.80)	600 (4.10)	800 (5.50)	1000 (6.90)
50	-	-	-	-	-	28	37	41
60	-	-	-	-	40	55	61	62
70	-	-	12	27	59	68	71	72
80	15	29	40	49	69	76	78	79
90	38	48	56	61	76	82	84	85
100	53	60	64	69	81	86	88	88
120	69	73	76	79	88	92	93	93
140	78	80	84	86	93	94	94	95
160	84	86	88	90	94	95	96	96
180	88	90	92	93	95	97	97	97
200	91	93	93	94	97	97	98	98
240	94	94	95	96	97	98	98	98
280	95	96	97	97	98	98	98	98
320	97	97	98	98	98	99	99	99

Fabreeka 1/2" (13 mm) Thick

Forcing Freq.	Load - P.S.I. (MPa)							
C.P.S. (Hz)	50 (0.35)	100 (0.69)	150 (1.04)	200 (1.40)	400 (2.80)	600 (4.10)	800 (5.50)	1000 (6.90)
50	-	-	-	-	20	39	48	53
60	-	-	-	17	52	62	67	69
70	6	23	35	44	67	73	76	78
80	38	46	55	61	75	80	82	83
90	54	61	66	70	80	84	86	87
100	65	70	73	76	84	87	88	89
120	76	79	82	83	89	91	92	93
140	83	85	87	88	92	94	94	94
160	87	88	90	91	94	95	95	95
180	89	90	92	93	95	95	95	95
200	91	93	94	94	95	95	95	95
240	94	95	95	95	95	96	96	96
280	95	95	95	95	96	96	96	96
320	95	95	96	96	97	97	97	97

Fabreeka 5/8" (16 mm) Thick

Forcing Freq.	Load - P.S.I. (MPa)							
C.P.S. (Hz)	50 (0.35)	100 (0.69)	150 (1.04)	200 (1.40)	400 (2.80)	600 (4.10)	800 (5.50)	1000 (6.90)
40	-	-	-	-	-	-	13	25
50	-	-	-	-	33	53	54	58
60	-	-	17	28	58	67	70	73
70	20	34	45	53	71	76	78	80
80	45	54	60	66	78	82	83	85
90	59	66	70	74	83	86	87	88
100	69	73	76	79	86	88	89	91
120	79	81	83	85	91	92	93	94
140	84	86	88	89	93	94	94	95
160	88	89	91	92	94	95	95	95
180	91	92	93	94	95	95	95	95
200	93	94	94	94	95	95	95	96
240	94	95	95	95	96	96	96	96
280	95	95	95	95	96	96	96	97
320	95	95	96	96	97	97	97	98

Fabreeka 1" (25 mm) Thick

Forcing Freq.	Load - P.S.I. (MPa)							
C.P.S. (Hz)	50 (0.35)	100 (0.69)	150 (1.04)	200 (1.40)	400 (2.80)	600 (4.10)	800 (5.50)	1000 (6.90)
40	-	-	-	-	10	32	39	48
50	-	-	6	23	53	61	65	69
60	14	33	45	54	69	74	77	79
70	44	55	63	69	77	81	83	84
80	60	67	73	76	83	85	87	88
90	70	75	79	80	87	88	90	90
100	76	80	83	85	89	91	93	93
120	83	86	88	90	93	94	94	94
140	87	90	91	92	94	95	95	95
160	90	92	94	94	95	95	95	95
180	93	94	94	95	95	95	96	96
200	94	95	95	95	95	96	96	96
240	95	95	95	96	96	96	96	97
280	95	95	96	96	96	97	97	97
320	96	96	97	97	97	98	98	98

Fabreeka 2" (50 mm) Thick

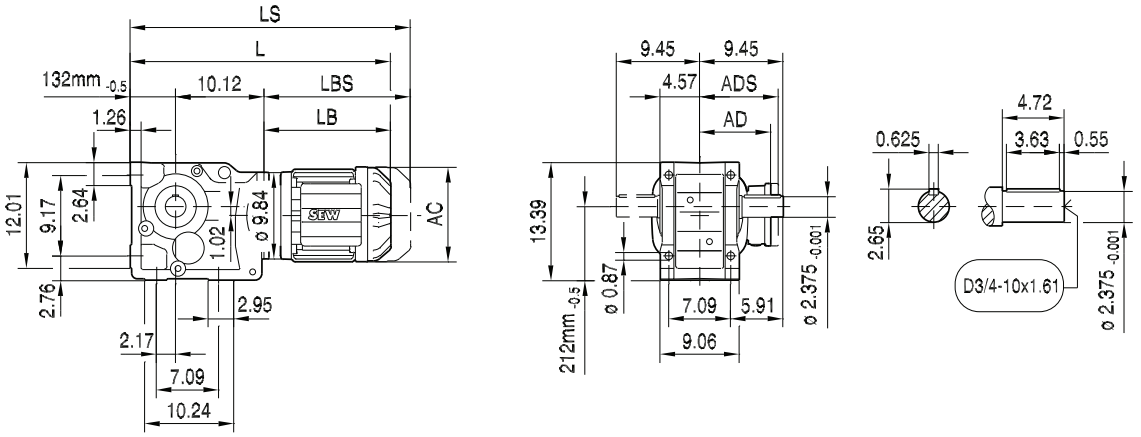
Forcing Freq.	Load - P.S.I. (MPa)							
C.P.S. (Hz)	50 (0.35)	100 (0.69)	150 (1.04)	200 (1.40)	400 (2.80)	600 (4.10)	800 (5.50)	1000 (6.90)
30	-	-	-	-	-	25	35	45
40	-	-	24	38	57	63	68	70
50	24	46	58	64	72	78	80	81
60	52	64	72	75	83	85	88	89
70	67	74	79	84	88	90	92	93
80	74	81	85	88	92	93	94	94
90	80	86	90	92	94	94	95	95
100	85	90	92	94	95	95	96	96
110	88	92	94	94	96	96	96	96
120	91	93	94	95	96	96	96	96
130	93	94	95	96	97	97	97	97
140	94	95	96	97	97	97	97	97

Fabreeka 4" (100 mm) Thick

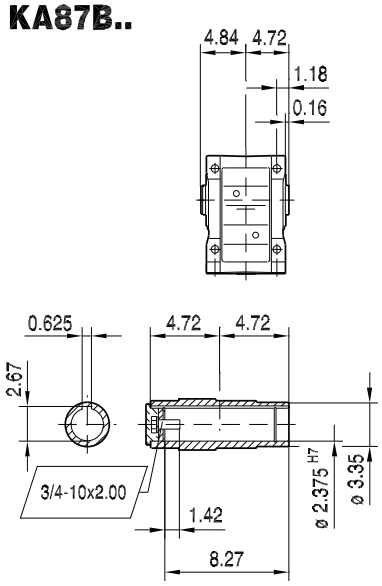
Forcing Freq.	Load - P.S.I. (MPa)							
C.P.S. (Hz)	50 (0.35)	100 (0.69)	150 (1.04)	200 (1.40)	400 (2.80)	600 (4.10)	800 (5.50)	1000 (6.90)
30	-	-	18	33	54	61	65	69
40	28	50	61	68	75	79	81	84
50	59	69	76	79	85	88	90	91
60	72	79	85	87	92	93	94	94
70	80	86	90	92	94	94	95	95
80	86	90	93	94	95	96	96	97
90	90	93	94	95	96	97	97	97
100	93	94	95	96	97	97	97	98
110	94	94	95	95	95	95	96	96
120	95	95	95	95	96	96	96	96
130	95	95	96	96	97	97	97	98

33 070 00 09

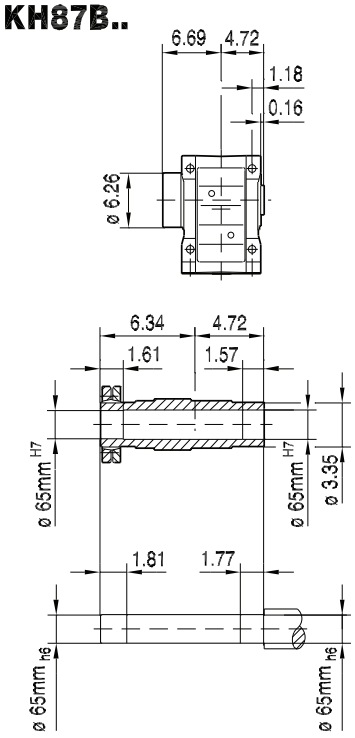
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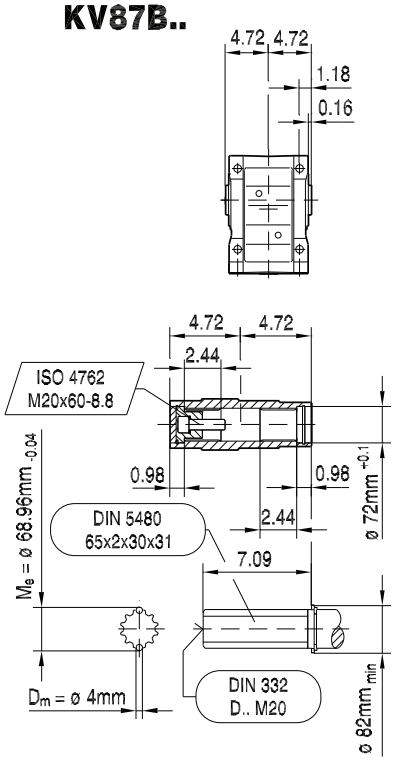
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(→ 125)	DR80S	DR90M	DR90L	DR100L/LC	DR132S	DR132M/MC	DR160..	DR180S/M	DR180L/LC
AC	6.14	7.05	7.05	7.76	8.70	8.70	10.63	12.44	12.44
AD	5.04	5.51	5.51	6.18	6.69	6.69	8.98	9.96	9.96
ADS	5.47	5.91	5.91	6.22	6.77	6.77	8.98	9.96	9.96
L	23.90	25.20	25.98	28.35	30.04	32.01	33.62	36.34	38.70
LS	27.09	28.86	29.65	32.01	34.45	36.42	39.02	43.78	46.14
LB	8.58	9.88	10.67	13.03	14.72	16.69	18.31	21.02	23.39
LBS	11.77	13.54	14.33	16.69	19.13	21.10	23.70	28.46	30.83

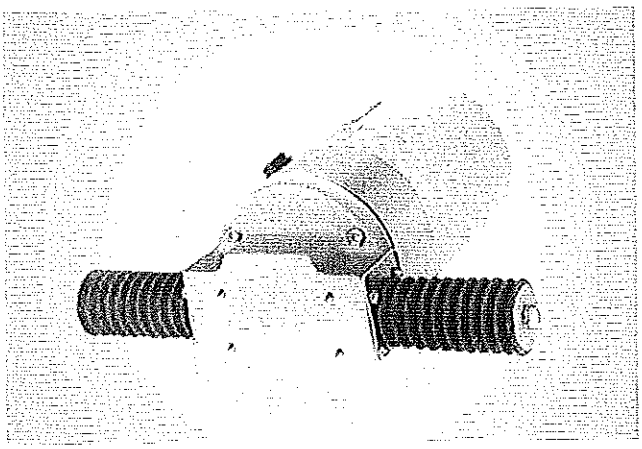
LA-1100/LA-1500 SERIES LINEAR ACTUATORS

Jordan CONTROLS

GENERAL DESCRIPTION

The LA-1100 and LA-1500 Series are linear, bi-directional actuators, designed to meet the exacting requirements for closed-loop modulating positioning control. They can be applied to a variety of sliding stem valves to provide remote valve positioning for control of gases, steam or other liquids in various process control applications.

All LA-1100 and LA-1500 Series actuators are also available with an internal amplifier (AC voltage only). These amplifiers are all full-featured ac switching devices designed to work seamlessly with the actuator for closed loop control.



FEATURES

- Permanently lubricated for any position mounting
- A wide variety of speed/thrust combinations
- AC or DC input power versions
- Wide ambient temperature range
- Full one year warranty

AMPLIFIER FEATURES

- Isolated, two-wire, 4-20mA feedback
- Customer-adjustable deadband
- Customer-adjustable zero and span
- Accepts either voltage or current command inputs
- Selectable options for Loss-of-Signal action:
  - Lock in place
  - Run to preset
- Field selectable dynamic brake
- AC triac switching of motor for increased life

BASE MODEL INCLUDES:

- Motor
- End of travel switches, not for customer use
- Aluminum NEMA 4 (IP65), explosion-proof enclosure with screw-on cover
- Rack bellows on both ends
- Internal spur and rack and pinion gear train
- 1000 ohm potentiometer feedback (amplifier models only)

POPULAR OPTIONS *(See Pages 197-206)*

- Potentiometer or 4 to 20 mA position feedback
- Anti-condensation heater and thermostat
- Custom mounting and interface hardware
- Motor brake (LA-1500 only)
- Handcrank (LA-1500 only)

SPECIFICATIONS

	LA-1100	LA-1500
Thrust Range lbf. (N)	3.5 to 200 (16 to 890)	74 to 500 (329 to 2224)
Stroke in. (mm)	0.75 to 18 (19 to 457)	0.75 to 21 (19 to 533)
Speed in./min. (mm/min.)	2 to 61 (51 to 1549)	1 to 56 (25 to 1422)
Approx. Weight lbs. (kg)	15 to 20 (7 to 9)	20 to 27 (9 to 12)

Temperature Limits: -40°F to 150°F (-40°C to 65°C)
For greater temperature ranges, consult factory.

Field Wiring: To barrier terminal blocks

Approvals: See page 207

Position Switch Rating: 120/240 Vac, 10 Amp

Additional Specifications on next page

LA-1100/LA-1500 SPECIFICATION CHART

Actuator Model	Input Power Volts/Phase/Hz	Current (Amps)		Command Input	Input Impedance in ohms	Feedback	Modulation Rate *
		Run	Stall				
LA-1110-N	120/1/50/60	0.25	0.26	N/A	N/A	N/A	2000 starts/hr
LA-1110-D	120/1/50/60	0.25	0.26	4-20 mA 0-5 Vdc or 0-10 Vdc	200 100,000	4-20 mA loop powered	2000 starts/hr
LA-1140-N	24 Vdc	1.2	4.8	N/A	N/A	N/A	4000 starts/hr
LA-1170-N	240/1/50/60	0.14	0.15	N/A	N/A	N/A	2000 starts/hr
LA-1170-D	240/1/50/60	0.14	0.15	4-20 mA 0-5 Vdc or 0-10 Vdc	200 100,000	4-20 mA loop powered	2000 starts/hr
LA-1510-N	115/1/50/60	0.44	0.65	N/A	N/A	N/A	2000 starts/hr
LA-1510-D	115/1/50/60	0.44	0.65	4-20 mA 0-5 Vdc or 0-10 Vdc	200 100,000	4-20 mA loop powered	2000 starts/hr
LA-1570-N	240/1/50/60	0.27	0.4	N/A	N/A	N/A	2000 starts/hr
LA-1570-D	240/1/50/60	0.27	0.4	4-20 mA 0-5 Vdc or 0-10 Vdc	200 100,000	4-20 mA loop powered	2000 starts/hr

** Rated for continuous modulating service at 1% minimum position change.*

N/A = Not Applicable

REMOTE AMPLIFIER CHART

Actuator	Remote Mounted Amplifier	Catalog Page
LA-1110-N	AD-8240	173
LA-1140-N	AD-7530	170
LA-1170-N	AD-8240	173
LA-1510-N	AD-8240	173
LA-1570-N	AD-8240	173

LA-1500 SERIES SELECTION CHART

				Selection
1	Basic Model	**LA-1510-N**	1 phase, 115 Vac, 50/60 Hz, without built-in digital amplifier	
		LA-1510-D	1 phase, 115 Vac, 50/60 Hz, with built-in digital amplifier	
		LA-1570-N	1 phase, 240 Vac, 50/60 Hz, without built-in digital amplifier	
		LA-1570-D	1 phase, 240 Vac, 50/60 Hz, with built-in digital amplifier	
2	Input Voltage	**1**: 120 Vac, 1 Phase, 50/60 Hz (LA-1510-N, LA-1510-D)		
		2: 240 Vac, 1 Phase, 50/60 Hz (LA-1570-N, LA-1570-D)		
3	Speed in./min. (mm/min.)	**1.8/500** (46/2224)		
		6.5/500 (165/2224)		
		14/420 (356/1868)		
4	Thrust lbf. (Nm)	**22/300** (559/1334)		
		47/150 (1184/667)		
		82/74 (2083/329)		
5	Linear Travel	**Specify Travel** - 0.75 inch (19 mm) to 21 inches (533 mm) stroke available. (3 inch increments)		

LA-1500 STANDARD OPTIONS

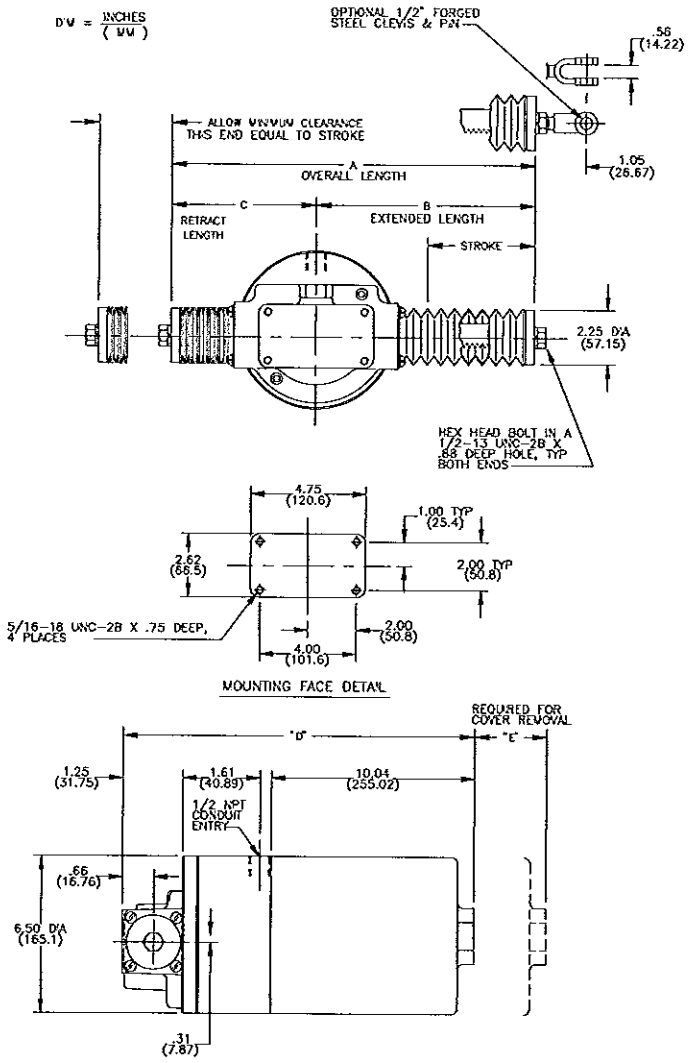
Code	Description	Selection
Toggles, Lights		
A008	Local Auto/Manual INC/OFF/DEC (Close Coupled Enclosure)	
Brake		
B001	Electrically Operated Brake 120 Vac	
B002	Electrically Operated Brake 240 Vac	
Drive Arm/Adapter Clevis/Driven Arm		
D039	Clevis, one end	
Feedback		
F001	Potentiometer, 1000 ohms	
F002	Tandem Potentiometer, 1000 ohms each (not for use with units with internal amps)	
F003	Potentiometer, 5000 ohms (Not for use with models with internal amplifiers)	
F004	Potentiometer, 10,000 ohms (Not for use with models with internal amplifiers)	
F005	Transmitter, 4-20 mA	
F006	One Potentiometer, 1000 ohms plus Transmitter, 4-20 mA (not for use with units with internal amps)	
F010	Anti Backlash Feedback Gearing	
F999	Special Potentiometer (consult factory)	
Heater		
H002	Anti-Condensation Heater (120 VAC)	
H003	Anti-Condensation Heater (240 VAC)	

Code	Description	Selection
Identification/Certifications		
J001	CE Marking, AC input only (only available for units with amplifiers)	
J002	Stainless Steel Tags	
J004	One year extended warranty	
J005	Two year extended warranty	
Handcrank		
K002	Manual Handcrank	
Auxiliary Switches		
S005	Aluminum Cam (Single turn)	
S006	Aluminum Feedback Frame (Single Turn)	
S008	Two nonadjustable end of travel position switches, SPST, 10 Amp, 120/240 Vac	
S009	Two Adjustable Position Switches, SPDT, 10 Amp, 120/240 Vac	
S010	Two Adjustable Position Switches, DPDT, 10 Amp, 120/240 Vac	
S013	Two nonadjustable end of travel position switches, SPDT, 10 Amp, 120/240 Vac	
Painting/Coating		
W001	JCI Standard Polyurethane Blue	
W002	Two Part Epoxy	
W003	Food Grade Epoxy	
W004	Baked On Epoxy	
W005	Teflon	
Special Mechanical Options		
Y016	Metric mounting holes, 8mm	

For a full description of options, go to the Complete Listing of Options starting on page 197.

LA-1500 MAJOR DIMENSIONS

INCHES
(MILLIMETERS)



Stroke in. (mm)	A	B	C
0.75 to 3	15.08	9.04	6.04
(19 to 76)	(383)	(230)	(153)
3 to 6	20.08	13.04	7.04
(76 to 152)	(510)	(331)	(179)
6 to 9	25.08	17.04	8.04
(152 to 229)	(637)	(433)	(204)
9 to 12	30.08	21.04	9.04
(229 to 305)	(764)	(534)	(230)
12 to 15	35.08	25.04	10.04
(305 to 381)	(891)	(636)	(255)
15 to 21	45.08	33.04	12.04
(381 to 533)	(1145)	(839)	(306)

D		E	
W/out Amp	With Amp	W/out Amp	With Amp
11.95	13.53	8.45	10.03
(304)	(344)	(215)	(255)

These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.jordancontrols.com.

Product Detail



MST BUSHING
R1 2 3/8

UPC: 697950130095

MST Bushings are easy to install and remove. They are split through the barrel and have a taper to provide a true clamp on the shaft. They are keyed to both the shaft and the hub to help during “blind” installations.

Product Specifications | Misc Info

Material	Ductile Iron	Flange Diameter	5.375 in.
Bore Type	Standard	Length Thru Bore	2.875 in.
Finished Bore Size	2.375 in.	Cap Screw Bolt Circle	4.625 in.
Key Way Size	5/8 X 5/16 in.	Number of Mounting Cap Screws	3
Set Screw Size	5/16-18 X 5/16 in.	Cap Screw Size	3/8 X 1 3/4 in.
Min Bore Size	2.375 in.	Bushing Construction	Type 1
Max Bore Size	2.813 in.		

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Product Detail



MST BUSHING
R1 3 1/2

UPC: 697950130255

MST Bushings are easy to install and remove. They are split through the barrel and have a taper to provide a true clamp on the shaft. They are keyed to both the shaft and the hub to help during “blind” installations.

Product Specifications | Misc Info

Material	Ductile Iron	Flange Diameter	5.375 in.
Bore Type	Standard	Length Thru Bore	2.875 in.
Finished Bore Size	3.500 in.	Cap Screw Bolt Circle	4.625 in.
Key Way Size	7/8 X 7/16 in.	Number of Mounting Cap Screws	3
Set Screw Size	5/16-18 X 5/16 in.	Cap Screw Size	3/8 X 1 3/4 in.
Min Bore Size	3.500 in.	Bushing Construction	Type 2
Max Bore Size	3.750 in.		

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Product Detail



SPK ROLLER TRIPLE MST (R1
E80R21H

UPC: 697950219011

Martin Split taper sprocket is another style of bushed sprocket. The split taper bushing, when installed, offers a wide range of bore sizes.

Product Specifications | Misc Info

Material	Steel	Hardened Teeth	Yes
Chain Number	80	Hub Recessed For Chain Clearance	No
Chain Pitch	1.000 in.	Construction Detail	Solid
Number of Chain Rows	3	Bore Type	Bushed MST
Number of Teeth	21	Key Way Size	.750 WIDE in.
Outside Diameter	7.235 in.	Bushing Part Number	R1
Pitch Diameter	6.710 in.	Bushing Min Bore Size	1.125 in.
Single Strand Tooth Thickness	0.557 in.	Bushing Max Bore Size	3.750 in.

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Product Detail



SPK ROLLER TRIPLE MST (R1
E80R30

UPC: 697950219097

Martin Split taper sprocket is another style of bushed sprocket. The split taper bushing, when installed, offers a wide range of bore sizes.

Product Specifications | Misc Info

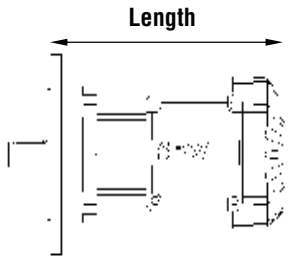
Material	Steel	Hardened Teeth	No
Chain Number	80	Hub Recessed For Chain Clearance	No
Chain Pitch	1.000 in.	Construction Detail	Solid
Number of Chain Rows	3	Bore Type	Bushed MST
Number of Teeth	30	Key Way Size	.750 WIDE in.
Outside Diameter	10.114 in.	Bushing Part Number	R1
Pitch Diameter	9.567 in.	Bushing Min Bore Size	1.125 in.
Single Strand Tooth Thickness	0.557 in.	Bushing Max Bore Size	3.750 in.

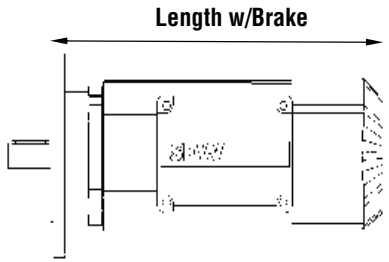
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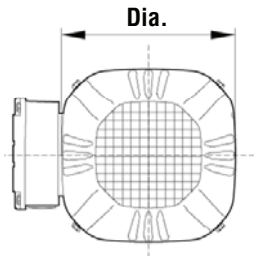
Dimension Comparison – DR & DT/DV Motors

DT/DV Series Motor	DRS Series Standard Efficiency	DRE Series High Efficiency	DRP Series PREMIUM Efficiency	Power [Hp]	Power [kW]	DT/DV/DR			DRS			DRE			DRP			New Standard vs. DT/DV		
						Length	w/BMG	Diameter	Length	w/BE	Dia.	Length	w/BE	Dia.	Length	w/BE	Dia.	Length	w/Brake	Dia.
DT56M4	-	-	-	0.13	0.09	136	172	109	-	-	-	-	-	-	-	-	-	-	-	-
DR63S4	-	-	-	0.15	0.12	187	242	132	-	-	-	-	-	-	-	-	-	-	-	-
DT56L4	-	-	-	0.2	0.15	136	172	109	-	-	-	-	-	-	-	-	-	-	-	-
DR63M4	DRS71S4	-	-	0.25	0.18	187	242	132	198	266	139	-	-	-	-	-	-	+11	+24	+7
DT71K4						202	266	145				-	-	-	-	-	-	-4	0	-6
DR63L4	DRS71S4	-	-	0.33	0.25	187	242	132	198	266	139	-	-	-	-	-	-	+11	+24	+7
DT71C4						202	266	145				-	-	-	-	-	-	-4	0	-6
DT71D4	DRS71S4	-	-	0.5	0.37	202	266	145	198	266	139	-	-	-	-	-	-	-4	0	-6
DT80K4	DRS71M4	-	-	0.75	0.55	252	316	145	223	291	139	-	-	-	-	-	-	-29	-25	-6
DT80N4	DRS80S4	DRE80M4	DRP90M4	1.0	0.75	252	316	145	241	322	156	272	353	156	266	359	179	+20	+37	+11
DT90S4	DRS80M4	DRE90M4	DRP90L4	1.5	1.1	257	342	197	272	353	156	266	359	179	286	379	179	+9	+17	-18
DT90L4	DRS90M4	DRE90L4	DRP90L4	2.0	1.5	257	342	197	266	359	179	286	379	179	286	379	179	+29	+37	-18
DT100LS4	DRS90L4	DRE100L4	DRP112M4	3.0	2.2	311	396	197	286	379	179	346	439	197	352	464	221	+41	+43	0
DV100M4	DRS90L4	DRE100L4	DRP112M4	3.0	2.2	341	426	197	316	409	197	346	439	197	387	499	221	+5	+13	0
DT100L4	DRS100M4	DRE100LC4	DRP132S4	5.0	3.7	341	426	197	316	409	197	346	439	197	387	499	221	+5	+13	0
DV100L4																				
DV112M4	DRS100L4	DRE132S4	-	5.4	4.0	349	429	221	346	439	197	387	499	221	-	-	-	+38	+70	0
DV132S4	DRS132S4	DRE132M4	DRP160S4	7.5	5.5	394	474	221	387	499	221	437	549	221	460	597	272	+43	+75	0
DV132M4	DRS132M4	DRE132MC4	DRP160S4	10	7.5	407	519	275	437	549	221	437	549	221	460	597	272	+30	+30	-54
DV132ML4	DRS132MC4	DRE160M4	DRP160M4	12.5	9.2	462	574	275	437	549	221	460	597	272	460	597	272	-2	+23	-3
DV160M4	DRS160M4	DRE160MC4	DRP160MC4	15	11	462	574	275	460	597	272	460	597	272	460	597	272	-2	+23	-3
DV160L4	DRS160MC4	DRE180M4	DRP180M4	20	15	509	665	331	460	597	272	540	739	317	540	739	317	+31	+74	-14
DV180M4	DRS180M4	DRE180L4	DRP180L4	25	18.5	581	737	331	540	739	317	600	799	317	583	772	317	+19	+62	-14
DV180L4	DRS180L4	DRE180LC4	DRP180LC4	30	22	581	737	331	600	799	317	600	799	316	600	799	316	+19	+62	-15
DV200L4	DRS180LC4	DRE200L4	DRP225S4	40	30	616	772	394	600	799	317	649	869	394	649	869	394	+33	+97	0
DV225S4	DRS225S4	DRE225S4	DRP225M4	50	37	690	846	394	649	869	394	649	869	394	699	919	394	-41	+23	0
DV225M4	DRS225M4	DRE225M4	-	60	45	690	846	394	699	919	394	699	919	394	-	-	-	+9	+73	0
DV250M4	DRS225MC4	DVE250M4	-	75	55	772	957	510	699	919	394	772	957	510	-	-	-	0	0	0
DV280S4	-	DVE280S4	-	100	75	772	957	510	-	-	-	772	957	510	-	-	-	0	0	0
DV280M4	-	DVE280M4	-	125	90	-	-	-	-	-	-	772	957	510	-	-	-	-	-	-
-	-	DRE315K4	-	150	110	-	-	-	-	-	-	941	1192	624	-	-	-	-	-	-
-	-	DRE315S4	-	200	150	-	-	-	-	-	-	941	1192	624	-	-	-	-	-	-
-	-	DRE315M4	-	250	185	-	-	-	-	-	-	1071	1322	624	-	-	-	-	-	-
-	-	DRE315L4	-	275	200	-	-	-	-	-	-	1071	1322	624	-	-	-	-	-	-
-	-	DRE315L4	-	300	225	-	-	-	-	-	-	1071	1322	624	-	-	-	-	-	-

NOTES:
1. BLUE denotes USA standard motor
2. Copper rotor always selected for non-standard motor
3. All dimension units are metric [mm]
4. Dia. (diameter) dimension does not include conduit box
5. Longest flange selected for Length, w/BMG, and /BE dimensions
6. **New Standard vs. DT/DV** useful when replacing motors
7. RED = larger new dimension Δ, GREEN = smaller Δ







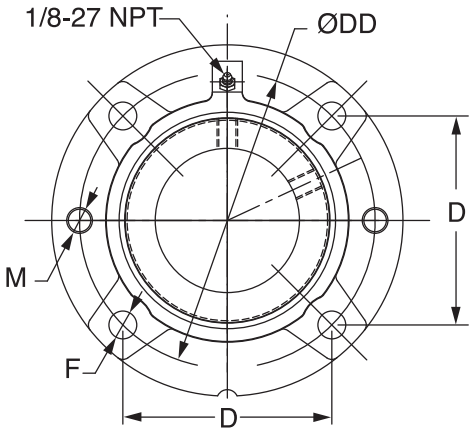
SEW EURODRIVE

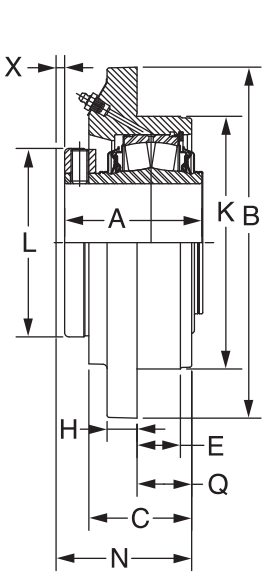
Technical Note

M-111-02

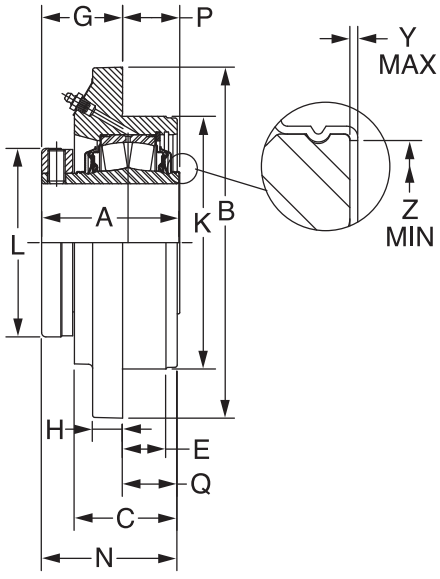
DIMENSIONS

S-2000 Piloted Flange

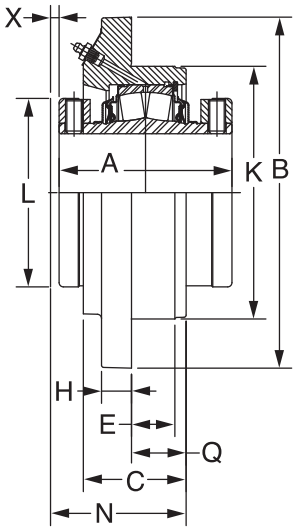




EXPANSION

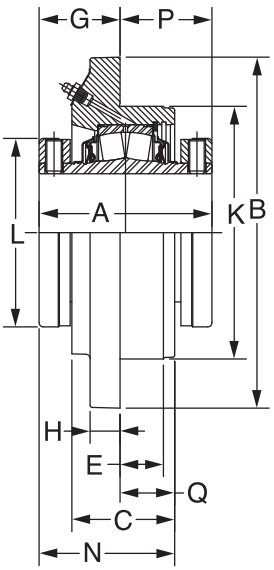


NON-EXPANSION



4-7/16 THRU 5" CONSTRUCTION

EXPANSION



4-7/16 THRU 5" CONSTRUCTION

NON-EXPANSION

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DIMENSIONS

S-2000 Piloted Flange



Bearing	Shaft Size Inch	TRIDENT Seal				Labyrinth Seal			
		Non-Expansion		Expansion		Non-Expansion		Expansion	
		Part No.	Part Name	Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
22208	1-3/8	**070644**	FC-S2-106R	**070671**	FC-S2-106RE	**070698**	FC-S2-106L	**070725**	FC-S2-106LE
	1-7/16	**070645**	FC-S2-107R	**070672**	FC-S2-107RE	**070699**	FC-S2-107L	**070726**	FC-S2-107LE
	1-1/2	**070646**	FC-S2-108R	**070673**	FC-S2-108RE	**070700**	FC-S2-108L	**070727**	FC-S2-108LE
22209	1-11/16	**070648**	FC-S2-111R	**070675**	FC-S2-111RE	**070702**	FC-S2-111L	**070729**	FC-S2-111LE
	1-3/4	**070649**	FC-S2-112R	**070676**	FC-S2-112RE	**070703**	FC-S2-112L	**070730**	FC-S2-112LE
22210	1-15/16	**070650**	FC-S2-115R	**070677**	FC-S2-115RE	**070704**	FC-S2-115L	**070731**	FC-S2-115LE
	2	**070651**	FC-S2-200R	**070678**	FC-S2-200RE	**070705**	FC-S2-200L	**070732**	FC-S2-200LE
22211	2-3/16	**070652**	FC-S2-203R	**070679**	FC-S2-203RE	**070706**	FC-S2-203L	**070733**	FC-S2-203LE
22213	2-7/16	**070654**	FC-S2-207R	**070681**	FC-S2-207RE	**070708**	FC-S2-207L	**070735**	FC-S2-207LE
22215	2-11/16	**070656**	FC-S2-211R	**070683**	FC-S2-211RE	**070710**	FC-S2-211L	**070737**	FC-S2-211LE
	2-15/16	**070657**	FC-S2-215R	**070684**	FC-S2-215RE	**070711**	FC-S2-215L	**070738**	FC-S2-215LE
	3	**070658**	FC-S2-300R	**070685**	FC-S2-300RE	**070712**	FC-S2-300L	**070739**	FC-S2-300LE
22218	3-7/16	**070660**	FC-S2-307R	**070687**	FC-S2-307RE	**070714**	FC-S2-307L	**070741**	FC-S2-307LE
22220	3-15/16	**070662**	FC-S2-315R	**070689**	FC-S2-315RE	**070716**	FC-S2-315L	**070743**	FC-S2-315LE
22222	4-7/16 **	**070664**	FC-S2-407R	**070691**	FC-S2-407RE	**070718**	FC-S2-407L	**070745**	FC-S2-407LE
22226	4-15/16 **	**070666**	FC-S2-415R	**070693**	FC-S2-415RE	**070720**	FC-S2-415L	**070747**	FC-S2-415LE

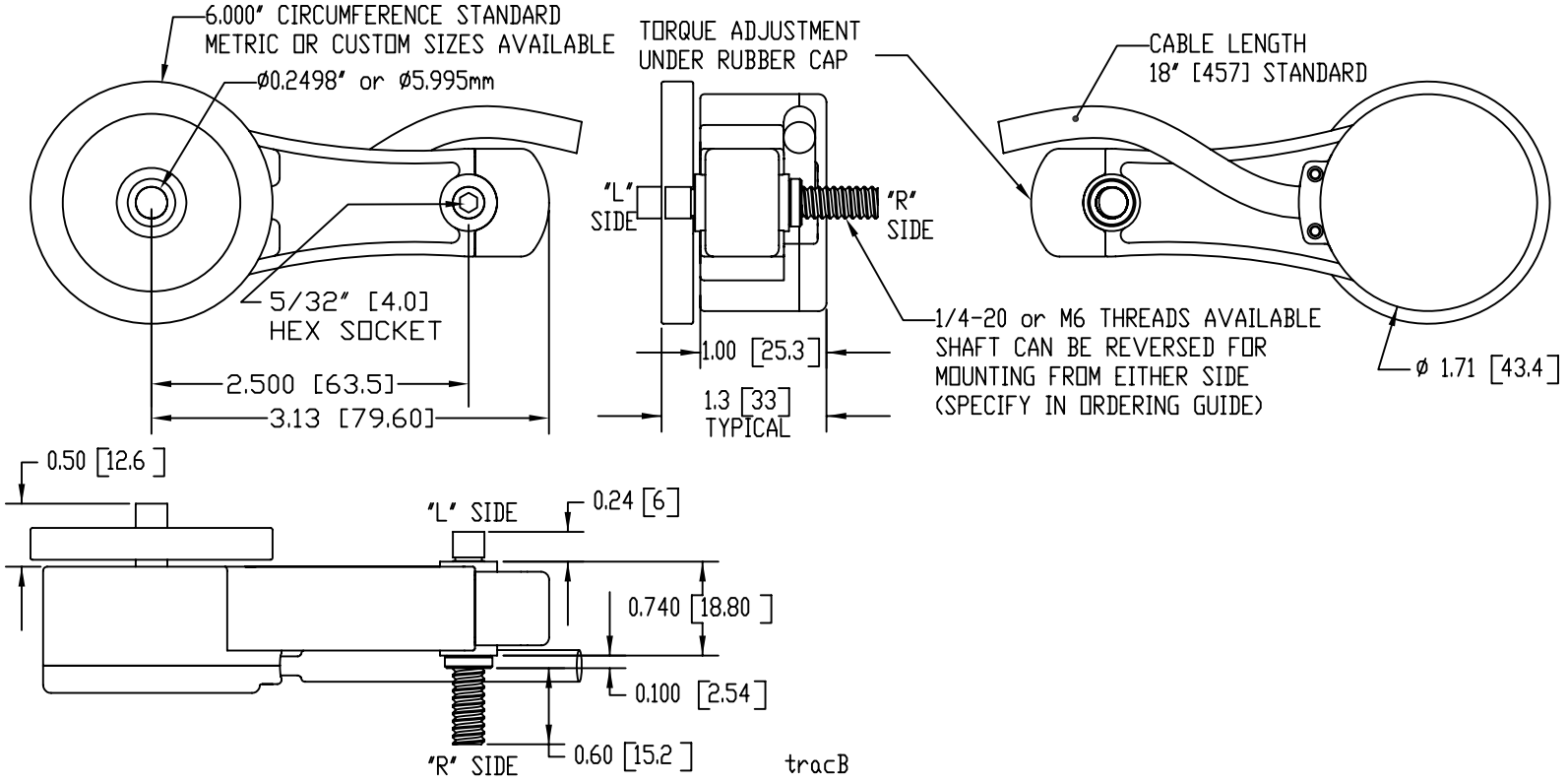
Shaft Size	A	B	C	D	DD	E	F Bolt Dia.	G	H	* K	L	M	N	P	Q	X Total Exp.	Y	Z
1-3/8 1-7/16 1-1/2	2.53	5.25	1.84	3.09	4.38	0.75	3/8	1.31	0.50	3.63	2.75	3/8-16	2.55	1.22	1.22	3/16	0.020	1.80
1-11/16 1-3/4	2.67	6.13	1.91	3.63	5.13	0.88	7/16	1.45	0.50	4.25	3.19	7/16-14	2.72	1.22	1.27	1/4	0.020	2.08
1-15/16 2	2.84	6.38	2.00	3.80	5.38	0.88	7/16	1.59	0.56	4.50	3.44	7/16-14	2.86	1.25	1.27	1/4	0.020	2.30
2-3/16	2.94	7.13	2.19	4.25	6.00	1.00	1/2	1.56	0.56	5.00	3.75	1/2-13	2.98	1.38	1.42	1/4	0.025	2.59
2-7/16	3.20	7.63	2.50	4.59	6.50	1.00	1/2	1.64	0.63	5.50	4.06	1/2-13	3.20	1.56	1.56	1/4	0.025	2.94
2-11/16 2-15/16 3	3.59	8.75	2.63	5.30	7.50	1.25	5/8	2.03	0.75	6.38	4.70	5/8-11	3.64	1.56	1.63	1/4	0.025	3.47
3-7/16	4.00	10.25	3.00	6.09	8.63	1.27	3/4	2.36	0.94	7.38	5.50	3/4-10	3.88	1.64	1.52	1/4	0.025	4.05
3-15/16	4.47	10.88	3.50	6.63	9.38	1.47	3/4	2.66	1.13	8.13	6.00	3/4-10	4.56	1-31	1.91	5/16	0.025	4.50
4-7/16	6.53	13.58	4.00	5.88	11.75	1.45	3/4**	3.53	1.00	10.25	6.45	3/4-10	5.50	3.00	1.98	3/8	N/A	N/A
4-15/16	6.91	14.84	4.38	6.38	12.75	1.70	7/8**	3.44	1.25	11.00	7.45	7/8-9	5.86	3.47	2.42	3/8	N/A	N/A

** Housing utilize 6 bolts equally spaced

* +.000/-.002"

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REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
--	INITIAL RELEASE		
A	CHANGED SOME DIMENSION LOCATIONS		
B	CHANGED PIVOT ARM BOLT HEAD		



THIRD ANGLE PROJECTION		ENCODER PRODUCTS COMPANY	
DIMENSIONS ARE IN INCHES		APPROVALS	DATE
ISSUE DATE: xx/xx/xx	TOLERANCES	DRAWN: J.Meschko	10/25/04
NEXT ASSEM. XXX	DECIMAL ± .005	CHECKED	
PREV. ASSEM. XXX	DECIMAL ± .01	RESP ENG	
PART NUMBER ◇	ANGULAR ± 1	MFG ENG	
		QUAL ENG	
NAME AND TITLE: Model TR1			
DWG. NO. trac-01		REV. B	
SCALE: NONE	DWG. SIZE: B	SHEET 1 OF 1	

Model TR1 - Tru-Trac™



Features

- **Encoder And Measuring Wheel Solution Integrated Into One Compact Unit**
- **Spring Loaded Torsion Arm Makes Wheel Pressure Adjustments A Snap**
- **Easily Installed In A Vertical, Horizontal, or Upside-Down Orientation**
- **Operates Over A Variety Of Surfaces At Speeds Up To 3000 Feet Per Minute**
- **Integrated Module Simplifies Your System Design, Reducing Cost**

FINALLY! An integrated encoder and spring loaded measuring wheel assembly available in one, easy-to-use, compact unit. The NEW Tru-Trac™ by Encoder Products Company is a versatile solution for tracking velocity, position, or distance over a wide variety of surfaces in almost any application. It's spring-loaded torsion arm provides a simple-to-adjust torsion load, allowing the Tru-Trac™ to be mounted in almost any orientation, even upside-down. The threaded shaft on the pivot axis is field reversible providing mounting access from either side. The Tru-Trac™ housing is a durable, conductive composite material that will eliminate static build up. With operating speeds up to 3000 feet per minute and a wide variety of configuration options, it's easy to see the Tru-Trac™ is the ideal solution for countless applications.

Common Applications

Web Tension Control, Paper Monitoring, Glue Dispensing, Linear Material Monitoring, Conveyor Systems, Printing, Labeling, Document Handling

Model TR1 - Tru-Trac™ Ordering Guide

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Mechanical | **Electrical** | **Optional Features** (Leave Blank For Standard Options)

TR1	–	U1	R4	–	0500	N	V1	A	OC	–	F00	–	[ ]	[ ]	[ ]	[ ]
														-20° to +85°C Std	IP50 Std	None Std

MODEL
TR1 Tru-Trac™

WHEEL TYPE & CIRCUMFERENCE
- U1 Urethane 6" cir
- U2 Urethane 200 mm cir
- K1 Knurled 6" cir
- K2 Knurled 200 mm cir
- 19 No Wheel - 1/4" shaft
- 20 No Wheel - 6 mm shaft

PIVOT SHAFT MOUNTING[1]
- R4 Right side 1/4-20 thread
- L4 Left side 1/4-20 thread
- R6 Right side M6 thread
- L6 Left side M6 thread

CYCLES PER REVOLUTION
See *CPR Options* below
Price adder >1999

COMMUTATION
- N None

INPUT VOLTAGE
- V1 5 to 28 VDC

NUMBER OF CHANNELS[2]
- A Channel A

Channel A Leads B
- Q Quadrature A & B
- R Quadrature A & B with Index

Channel B Leads A[8]
- K Reverse Quadrature A & B
- D Reverse Quadrature A & B with Index

OUTPUT TYPE
- OC Open Collector
- PP Push-Pull
- HV Line Driver
- PU Pull-Up Resistor[7]
- OD Open Collector with Differential Outputs

CONNECTOR TYPE
- F00 18" Cable[3] (Std)
- F01 12" Cable
- F02 24" Cable
- F03 36" Cable
- M00 2M Cable[4]
- J00 18" Cable with 5-pin M12[6]
- K00 18" Cable with 8-pin M12[6]

MAXIMUM FREQUENCY
Standard
F3 Extended
See Specifications

OPERATING TEMPERATURE
-20° to +85° C (Std)
- T1 -40° to +85° C
- T2 -20° to +100° C

SEALING
IP50 (Std)
- S2 IP65

CERTIFICATION
None (Std)
- CE CE Marked[5]



Accessory Angle Mounting Bracket for TR1 Tru-Trac™ can be ordered separately as part # 140104 Dimensional drawing available at www.encoder.com.

Model TR1 - Tru-Trac™ CPR Options

0001 thru 0189*		0198	0200	0250
0256	0300	0315	0360	0400
0500	0512	0580	0600	0750
0800	1000	1024	1125	1200
1250	1500	1800	2000	2048
2500	2540	3000	3600	4000
4096	5000	6000	7200	8192
10,000				

*Contact Customer Service For Availability

New CPR values are periodically added to those listed. Contact Customer Service to determine all currently available values. Special disk resolutions are available upon request and may be subject to a one-time NRE fee.

For specification assistance call Customer Service at 1-800-366-5412

NOTES:
1. See mechanical drawing. Shaft is reversible in the field.
2. Contact Customer Service for non-standard index gating or phase relationship options.
3. For non-standard English cable lengths enter 'F' plus cable length expressed in feet. Example: F06 = 6 feet of cable. Frequency above 300 kHz standard cable lengths only.
4. For non-standard metric cable lengths enter 'M' plus cable length expressed in meters. Example: M06 = 6 meters of cable.
5. Please refer to **Technical Bulletin TB100: *When to Choose the CE Option*** at www.encoder.com.
6. 5-pin not available with Line Driver (HV) output. Additional cable lengths available. Please consult Customer Service.
7. With Input Voltage above 16 VDC, operating temperature is limited to 85° C.
8. Reverse Quadrature not available with PU output type.

Model TR1 - Tru-Trac™

Model TR1 - Tru-Trac™ Specifications

Electrical

Input Voltage	4.75 to 28 VDC max for temperatures up to 85° C 4.75 to 24 VDC for temperatures between 85° C to 100° C
Input Current	100 mA max (65 mA typical) with no output load
Output Format	Incremental- Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the wheel side. See *Waveform Diagrams* below.
Output Types	Open Collector- 20 mA max per channel Push-Pull- 20 mA max per channel Pull-Up- Open collector with 2.2K ohm Pull-Up 20mA max per channel Line Driver- 20 mA max per channel (Meets RS 422 at 5 VDC supply)
Index	Once per revolution. 0190 to 10,000 CPR: Gated to output A 0001 to 0189 CPR: Ungated See *Waveform Diagrams* below.
Max. Frequency	Standard Frequency Response is 200 kHz for CPR 1 to 2540 500 kHz for CPR 2541 to 5000 1 MHz for CPR 5001 to 10,000 Extended Frequency Response (optional) is 300 kHz for CPR 2000, 2048, 2500, and 2540
Noise Immunity	Tested to BS EN61000-6-2; BS EN50081-2; BS EN61000-4-2; BS EN61000-4-3; BS EN61000-4-6, BS EN500811
Symmetry	180° (±18°) electrical
Quad. Phasing	90° (±22.5°) electrical
Min. Edge Sep	67.5° electrical
Accuracy	Within 0.017° mechanical or 1 arc-minute from true position. (for CPR>189)

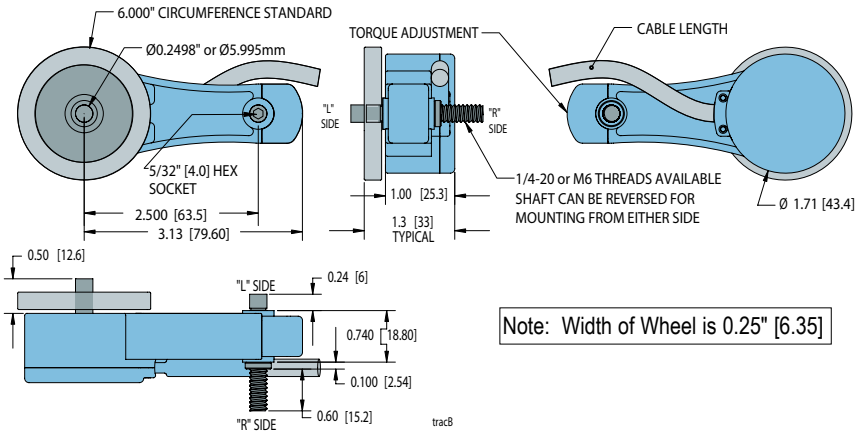
Mechanical

Max Shaft Speed	6000 RPM. Higher speeds may be achievable, contact Customer Service.
Shaft Material	Stainless Steel
Shaft Tolerance	+0.0000/-0.0004" [+0.000/-0.010 mm]
Radial Shaft Load	5 lb max. Rated load of 2 to 3 lb for bearing life of 1.2 x 10^{10} revolutions
Axial Shaft Load	5 lb max. Rated load of 2 to 3 lb for bearing life of 1.2 x 10^{10} revolutions
Starting Torque	IP50 0.05 oz-in IP65- 0.4 oz-in
Electrical Conn	18" cable (foil and braid shield, 24 AWG conductors), 5- or 8-pin M12 (12 mm) in-line connector with 18" cable (braid shield)
Mounting	Pivot shaft can be mounted from either side of the Tru-Trac™ housing, and is reversible in the field. Specify 1/4-20 or M6 threads
Housing	Stainless steel fibers in a high temperature nylon composite
Wheel Width	0.25"
Weight	5 oz typical

Environmental

Operating Temp	-20° to +85° C for standard models -40° to +85° C for low temperature option -20° to +100° C for high temperature option
Storage Temp	-25° to +85° C
Humidity	98% RH non-condensing
Vibration	10 g @ 58 to 500 Hz
Shock	80 g @ 11 ms duration
Sealing	IP50 standard; IP65 available

Model TR1 - Tru-Trac™



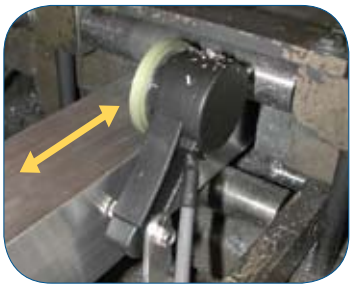
Note: Width of Wheel is 0.25" [6.35]

All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified
Metric dimensions are given in brackets [mm]

Model TR1 - Tru-Trac™ Applications



For **Linear Applications** the Tru-Trac™ can be mounted above or below the moving object, and the tension on the wheel adjusted for a wide range of applications such as packaging, conveyors, mail sorting, cut to length, labeling, gantries etc.

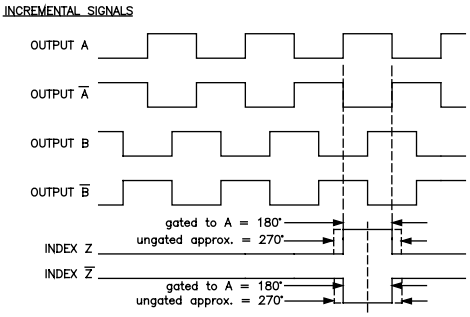




For **Rotational Applications** the Tru-Trac™ can be mounted in any orientation to monitor the position or velocity of many types of otating equipment such as web tension control drums, rotary tables, printing, spooling, etc.



Waveform Diagram



Waveform shown with optional complementary signals A, B, Z for HV and OD outputs only.

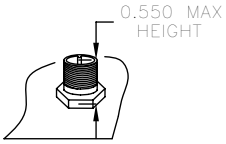
Wiring Table

Function	Cable Wire Color	5-pin M12**	8-pin M12**
Com	Black	3	7
+VDC	White	1	2
A	Brown	4	1
A'	Yellow	--	3
B	Red	2	4
B'	Green	--	5
Z	Orange	5	6
Z'	Blue	--	8
Shield	Bare *	--	--

* CE Option: Cable shield (bare wire) is connected to internal case.
** Non-CE Option: Cable shield is connected to M12 connector body.
CE Option: Cable shield is connected to M12 connector body, and internal case.





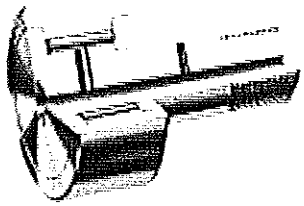


CF Series Standard

Sealed and unsealed bearings showing optional features available in combination as shown in the following table (see following page).

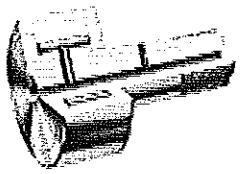
Illustrated are each of 4 possible options available on standard cam follower bearings. These may be combined to best serve any application and combinations regularly stocked are shown in the following tables. Others would be special and should be discussed with the McGill Engineering Department.

Maximum static load should not exceed the rating given in charts, or excessive permanent stud deflection will occur. Maximum dynamic load should not exceed 50% of Basic Dynamic Rating. If radial load and/or Root Mean Load exceed 50% of Basic Dynamic Rating, life calculations must be reviewed by McGill. If dynamic loads exceed 25% of Basic Dynamic Rating, consideration should be given to use of CFH or CYR series CAMROL® bearings. Applications involving reversing radial loads should be reviewed by the McGill Engineering Department.

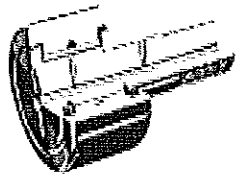


CF & CF-S Series

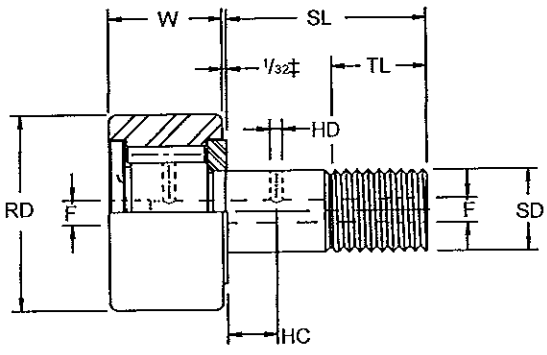
Cam followers with and without LUBRI-DISC® seals



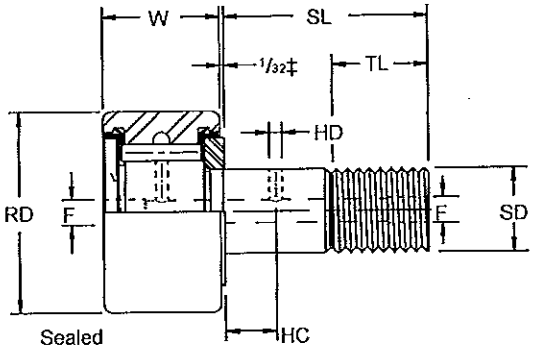
Unsealed



With LUBRI-DISC seals



‡1/16" on CF-5, CF-6, CF-7

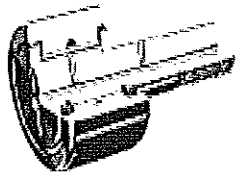


‡1/16" on CF-5-S, CF-6-S, CF-7-S

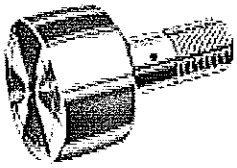
McGILL®

CAMROL® CAM FOLLOWER BEARINGS

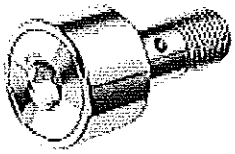
CF & CF-S SERIES



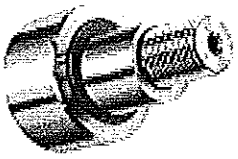
With LUBRI-DISC® seals
add letter "S"
Ex. CF-1 3/4-S



Crowned O.D.
add letter "C"
Ex. CCF-1 3/4-S



Hex Hole
add letter "B"
Ex. CF-1 3/4-SB



Eccentric Stud
add letter "E"
Ex. CFE-1 3/4-SB

CAMROL® Cam Followers

UNSEALED BRG. NO.	SEALED BRG. NO.	ROLLER DIA. (RD) +.000 -.001	ROLLER WIDTH (W) +.000 -.005	STUD DIA. (SD) +.001 -.000	STUD L'GTH. (SL)	MIN. THR'D L'GTH. (TL)	FINE THR'DS.	OIL HOLE		LUB. FIT-TING SIZE (F)*	MIN. BOSS DIA.	HOUSING BORE DIA. +.0002 -.0003	***RECOM. CLAMPING TORQUE LBS.-IN.	MAX. STATIC CAPACITY LBS.	BASIC DYN. RATING LBS.
								HOLE CENTER (HC)	HOLE DIA. (HD)						
CF-1/2-N	CF-1/2-N-S	.500	.344	.190	1/2	1/4	10-32	-	-	1/8*	19/64	.1903	15	720	620
CF-1/2	CF-1/2-S	.500	.375	.190	5/8	1/4	10-32	-	-	1/8*	19/64	.1903	15	790	680
CF-9/16	CF-9/16-S	.5625	.375	.190	5/8	1/4	10-32	-	-	1/8*	19/64	.1903	15	790	680
CF-5/8-N	CF-5/8-N-S	.625	.406	.250	5/8	5/16	1/4-28	-	-	1/8*	23/64	.2503	35	1085	930
CF-5/8	CF-5/8-S	.625	.4375	.250	3/4	5/16	1/4-28	-	-	1/8*	23/64	.2503	35	1215	955
CF-11/16	CF-11/16-S	.6875	.4375	.250	3/4	5/16	1/4-28	-	-	1/8*	23/64	.2503	35	1215	955
CF-3/4	CF-3/4-S	.750	.500	.375	7/8	3/8	3/8-24	1/4	3/32	3/16	1/2	.3753	95	2065	1650
CF-7/8	CF-7/8-S	.875	.500	.375	7/8	3/8	3/8-24	1/4	3/32	3/16	1/2	.3753	95	2065	1650
CF-1	CF-1-S	1.000	.625	.4375	1	1/2	7/16-20	1/4	3/32	3/16	41/64	.4378	250	3060	2225
CF-1 1/8	CF-1 1/8-S	1.125	.625	.4375	1	1/2	7/16-20	1/4	3/32	3/16	41/64	.4378	250	3060	2225
CF-1 1/4	CF-1 1/4-S	1.250	.750	.500	1 1/4	5/8	1/2-20	5/16	3/32	3/16	49/64	.5003	350	4250	3930
CF-1 3/8	CF-1 3/8-S	1.375	.750	.500	1 1/4	5/8	1/2-20	5/16	3/32	3/16	49/64	.5003	350	4250	3930
CF-1 1/2	CF-1 1/2-S	1.500	.875	.625	1 1/2	3/4	5/8-18	3/8	3/32	3/16	57/64	.6253	650	5640	4840
CF-1 5/8	CF-1 5/8-S	1.625	.875	.625	1 1/2	3/4	5/8-18	3/8	3/32	3/16	57/64	.6253	650	5640	4840
CF-1 3/4	CF-1 3/4-S	1.750	1.000	.750	1 3/4	7/8	3/4-16	7/16	3/32	3/16	1 3/64	.7503	1250	7920	6385
CF-1 7/8	CF-1 7/8-S	1.875	1.000	.750	1 3/4	7/8	3/4-16	7/16	3/32	3/16	1 3/64	.7503	1250	7920	6385
CF-2	CF-2-S	2.000	1.250	.875	2	1	7/8-14	1/2	1/8	3/16	1 13/64	.8753	1500	10570	8090
CF-2 1/4	CF-2 1/4-S	2.250	1.250	.875	2	1	7/8-14	1/2	1/8	3/16	1 13/64	.8753	1500	10570	8090
CF-2 1/2	CF-2 1/2-S	2.500	1.500	1.000	2 1/4	1 1/8	1-14	9/16	1/8	3/16	1 5/16	1.0003	2250	16450	11720
CF-2 3/4	CF-2 3/4-S	2.750	1.500	1.000	2 1/4	1 1/8	1-14	9/16	1/8	3/16	1 5/16	1.0003	2250	16450	11720
CF-3	CF-3-S	3.000	1.750	1.250	2 1/2	1 1/4	1 1/4-12	5/8	1/8	1/4	1 3/4	1.2503	3450	24910	15720
CF-3 1/4	CF-3 1/4-S	3.250	1.750	1.250	2 1/2	1 1/4	1 1/4-12	5/8	1/8	1/4	1 3/4	1.2503	3450	24910	15720
CF-3 1/2	CF-3 1/2-S	3.500	2.000	1.375	2 3/4	1 3/8	1 3/8-12	11/16	1/8	1/4	1 59/64	1.3753	4200	31625	22800
CF-4	CF-4-S	4.000	2.250	1.500	3 1/2	1 1/2	1 1/2-12	3/4	1/8	1/4	2 9/32	1.5003	5000	44770	29985
	CF-5-S	5.000	2.750	2.000	5 1/16	2 9/16	2-12	7/8	3/16	1/4 N.P.T.	2 7/8	2.0003	5000	67950	46575
	CF-6-S	6.000	3.250	2.500	6	3	2 1/2-12	1	3/16	1/4 N.P.T.	3 3/8	2.5003	5000	80450	60000
	†CF-7-S	7.000	3.750	3.000	7 11/16	4 1/8	3-12	1 1/4	3/16	1/4 N.P.T.	3 7/8	3.0003	5000	106930	75380
	†CF-8-S ◆	8.000	4.250**	3.250	8 1/2	4 1/4	3 1/4-4•	-	-	1/4 N.P.T.*	4 3/4	3.2503	5000	144100	92200
	†CF-9-S ◆	9.000	4.750**	3.750	9 1/2	4 3/4	3 1/2-4•	-	-	1/4 N.P.T.*	5 7/16	3.7503	5000	183430	113260
	†CF-10-S◆	10.000	5.250**	4.250	10	4 3/4	3 1/2-4•	-	-	1/4 N.P.T.*	5 59/64	4.2503	5000	215565	131545

† Not available from stock. Consult McGill Customer Service for availability.
◆ Standard tolerances do not apply. Consult McGill Customer Service.
* Oil hole (F) drilled from the flange end of the stud to the radial oil hole only.
** Flange extends 3/4" beyond face of outer race, and endplate extends 1/8" beyond face of outer race.
*** Clamping torque is based on dry threads. If threads are lubricated, use half of values shown.
• Coarse threads.



Browning®

Morse®

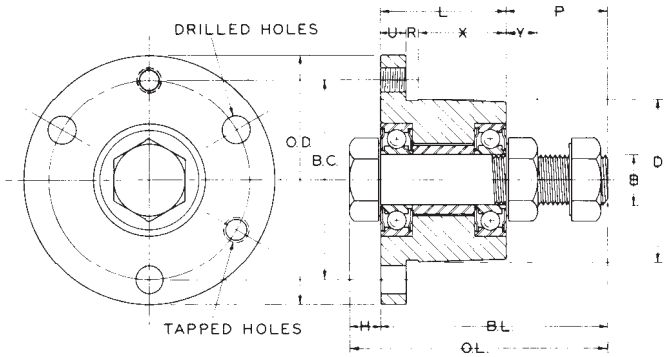
- *V-Belt Sheaves & Bushings*
- *Poly V Sheaves*
- *Synchronous Belt Drives*
- *Gears*
- *Sprockets*
- *Chain Drives*
- *Tighteners & Idlers*

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Idler Bushings



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SHEAVES
- FHP
- Multiple
- Poly-V
- 358

GEARBELT PULLEYS GEARS

HARDENED AND STANDARD SPROCKETS
- Single
- Double
- Triple



Available for H, P1, Q1 and R1 Bore Items.

Specifications

Table No. 1

Part Number	Dimensions												Tapped holes		Drilled holes		Approx Wt. Lbs.
	O.D.	B.C.	D	B	O.L.	B.L.	H & Y	L	P	U	R	X	No.	Size	No.	Size	
*IDH1 — 1/2	2 1/2"	2"	1.625"	1/2"	2 9/16"	2 1/4"	5/16"	1 1/4"	1"	1/4"	1/8"	7/8"	2	1/4" — 20	2	5/16"	.9
*IDP1 — 5/8	3"	2 7/16"	1.937"	5/8"	3 41/64"	3 1/4"	25/64"	1 15/16"	1 5/16"	13/32"	7/32"	1 5/16"	2	5/16" — 18	3	3/8"	1.9
*IDQ1 — 3/4	4 1/8"	3 3/8"	2.875"	3/4"	4 7/32"	3 3/4"	15/32"	2 1/2"	1 1/4"	17/32"	7/32"	1 3/4"	2	3/8" — 16	3	7/16"	5.5
*IDQ1 — 1	4 1/8"	3 3/8"	2.875"	1"	4 39/64"	4"	39/64"	2 1/2"	1 1/2"	17/32"	7/32"	1 3/4"	2	3/8" — 16	3	7/16"	5.9
IDR1 — 1 1/2	5 3/8"	4 5/8"	4.000"	1 1/2"	6 1/2"	5 1/2"	1"	2 7/8"	2 5/8"	5/8"	1/4"	2"	2	3/8" — 16	3	7/16"	14.1

*These sizes fit H, P, Q, and Q1 Drive Tighteners shown on pages J-2, J-3 and J-4.

NOTE—Mount Stud Bolt in either direction.

Load Ratings — Idler Bushings

Table No. 2

Part No.	Radial Load Capacity in Pounds Based on 2500 Hours Average Life at RPM Shown							
	100	500	1000	1500	2000	2500	3000	3500
IDH1 — 1/2	1518	1016	854	772	718	678	648	624
IDP1 — 5/8	1518	1016	854	772	718	678	648	624
IDQ1 — 3/4	3320	2222	1868	1688	1568	1486	1420	1366
IDQ1 — 1	3554	2378	2000	1806	1680	1590	1518	1462
IDR1 — 1 1/2	8326	5570	4684	4232	3936	3726	3560	3424

Average Life Factors

Radial Load Capacities shown for NEEDLE BEARING IDLERS and IDLER BUSHINGS are based on 2500 Hours Average Life. If another average life is desired, these ratings must be modified by factors as follows:

500 Hours — 1.71	4000 Hours — .85	9000 Hours — .65
1000 Hours — 1.36	5000 Hours — .79	10000 Hours — .63
1500 Hours — 1.19	6000 Hours — .75	15000 Hours — .55
2000 Hours — 1.07	7000 Hours — .71	20000 Hours — .50
3000 Hours — .94	8000 Hours — .68	

BROWNING® DRIVE TIGHTENERS AND IDLERS

Correct operating tension is an important factor in the satisfactory performance and life of any V-belt or chain drive. As V-belts wear they seat themselves deeper in the sheave grooves. This seating, along with belt stretch, lessens the initial tension. The result is slippage and loss in horsepower capacity unless some form of take up is used to restore and maintain original tension.

As chains wear they elongate, which results in sway or slap and increased vibration. This puts undue shock into the drive and increases bearing wear.

Both V-belt and chain drives wear at an increased rate if allowed to run with insufficient tension. Adjustment of center distance is the best method of maintaining proper tension. In cases of fixed centers, BROWNING® Drive Tighteners and Idlers provide the necessary means of take up. The BROWNING Drive Tighteners also provide a means of obtaining extra belt or chain wrap frequently needed for extremely high ratios, multiple shaft or serpentine drives.

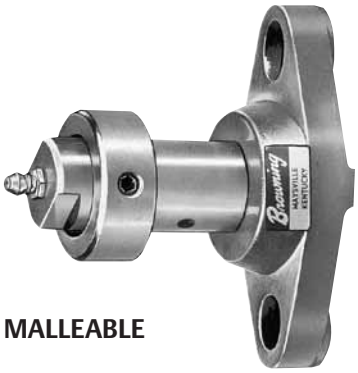
Careful consideration must be given to the following when using idlers:

1. Too much tension in a drive causes excessive belt, chain and bearing wear.
2. Too little tension in a drive allows belt slippage or chain vibration, resulting in loss of power and additional wear.
3. All idlers should be used on the slack side of the drive.
4. V-belt drive idlers should be used on the inside of the belt. Allowance should be made for horsepower loss due to the reduced arc of contact.
5. Where necessary to use V-belt drive idlers on the outside of the belt, the reverse bending will reduce belt life.
6. Flat face pulley idlers can be used on either inside or outside of the belt.
7. Sprocket idlers should be used on the outside of chain drives, and with at least three teeth engaged in the chain.
8. Idlers used on the inside of a drive should be located approximately 1/3 of the center distance from the large sheave, pulley or sprocket.
9. Idlers used on the outside of a drive should be located approximately 1/3 of the center distance from the small sheave, pulley or sprocket.

J

Browning®

Drive Tighteners and Idlers



MALLEABLE

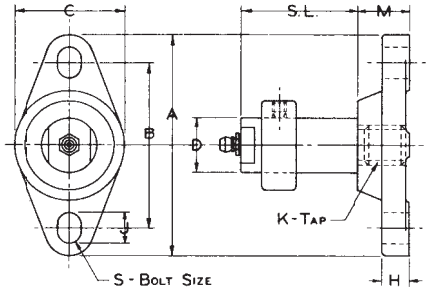


Table No. 1

Fixed Flange Tighteners

Part No.	Shaft	DIMENSIONS										Wt. Lbs.
		A	B▲	C	D	H	J▲	K	M	S.L.	S▲	
FFTN1	N1①	2 3/8"	1 3/4"	1 1/8"	.500"	1/4"	9/32"	3/8 — 16	1/2"	1 1/2"	1/4"	.3
FFTH	None②	4	3	2	—	1/2	9/16	1/2 — 13	15/16	—	3/8	.9
FFTP	None②	4	3	2	—	1/2	9/16	5/8 — 11	15/16	—	3/8	.9
FFTQ	None②	4	3	2	—	1/2	9/16	3/4 — 10	15/16	—	3/8	.8
FFTQ	N2③	4	3	2	1.000	1/2	9/16	3/4 — 10	15/16	2 1/8	3/8	1.6
FFTQ	N3③	4	3	2	1.000	1/2	9/16	3/4 — 10	15/16	3 1/8	3/8	1.8
FFTQ	N4③	4	3	2	1.000	1/2	9/16	3/4 — 10	15/16	4 1/8	3/8	2.1
FFTQ-1	None②	7 1/2	6	3 1/2	—	3/4	15/16	1 — 8	1 7/16	—	5/8	4.8
FFTQ-1	N5③	7 1/2	6	3 1/2	1.500	3/4	15/16	1 — 8	1 7/16	4	5/8	7.3
FFTQ-1	N6③	7 1/2	6	3 1/2	1.500	3/4	15/16	1 — 8	1 7/16	6	5/8	8.5

▲Slots are cast, some variations may be expected.
①Shaft is included.
②No shaft is required when used with Idler Bushings shown on page J-8.
③SHAFT MUST BE ORDERED SEPARATELY.

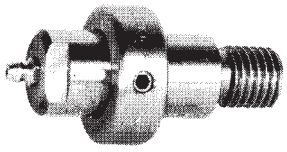
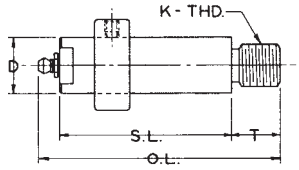


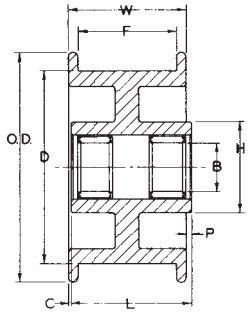
Table No. 2

Tightener Shafts

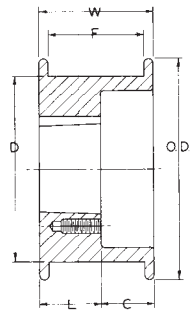
Part No.	DIMENSIONS					Wt. Lbs.
	O.L.	D	K	T	S.L.	
N1	2 5/16"	.500"	3/8 — 16	7/16"	1 1/2"	.13
N2	3 3/8	1.000	3/4 — 10	7/8	2 1/8	.6
N3	4 3/8	1.000	3/4 — 10	7/8	3 1/8	.9
N4	5 3/8	1.000	3/4 — 10	7/8	4 1/8	1.0
N5	5 11/16	1.500	1 — 8	1 5/16	4	2.8
N6	7 11/16	1.500	1 — 8	1 5/16	6	3.8







Type 1



Type 2

Table No. 3

Flat Face Idlers

Part No.	Type	Shaft Length	DIMENSIONS									Wt. Lbs.	Radial Load Capacity in Pounds Based on 2500 Hours Average Life at RPM Shown ■							
			O.D.	D	B	H	W	F	L	P	C		100	500	1000	1500	2000	2500	3000	3500
N1D05F	1	1 1/2" *	1 3/4"	1 3/8"	1/2"	1 1/4"	3/4"	9/16"	3/4"	1/8"	1/8"	.3	665	406	331	294	269	250	237	226
N4D1F	1	2 1/8*	4 3/8	4	1	1 7/8	1 7/16	1 1/16	1 1/4	1/8	5/16	3.0	2927	1787	1458	1295	1185	1104	1047	997
N4D2F	1	3 1/8*	4 3/8	4	1	1 7/8	2 7/16	2 1/16	2 1/2	1/8	1/16	5.0	4348	2654	2166	1922	1760	1640	1544	1482
N4D3F	1	4 1/8*	4 3/8	4	1	1 7/8	3 7/16	3 1/16	3 1/2	1/8	1/16	7.8	5854	3574	2916	2590	2370	2208	2094	1994
N6D4F	1	6*	7	6	1 1/2	2 5/8	5	4 1/2	4	1/8	1 1/8	22.5	5884	3592	2930	2602	2380	2218	2102	2004
N6D6F	1	6*	7	6	1 1/2	2 5/8	6 3/4	6 1/4	5	1/8	1 7/8	29.5	5884	3592	2930	2602	2380	2218	2102	2004
4D1FH	2	H1▲	4 3/8	4	▲	—	1 7/16	1 1/16	7/8	—	9/16	3.4	1518	1016	854	772	718	678	648	624
4D2FP	2	P1▲	4 3/8	4	▲	—	2 7/16	2 1/16	1 5/16	—	1 1/8	4.6	1518	1016	854	772	718	678	648	624
4D3FP	2	P1▲	4 3/8	4	▲	—	3 7/16	3 1/16	1 5/16	—	2 1/8	5.6	1518	1016	854	772	718	678	648	624

*For use with Drive Tighteners shown on pages J-2 and J-3 and above with shaft lengths indicated.
▲ For use with H-1 1/2 or P1-5/8 IDLER BUSHINGS shown on page J-8.
■See page J-8 for factors to use for Average Life of more or less than 2500 hours.
All Browning Stock Idlers furnished with needle bearings have retainers that insure minimum internal friction and wear by separating the needle rollers. These bearings are inset approximately 1/8" on either end of the Idler hubs to form a grease cavity.

Rigging Information

Crosby RIGGING HARDWARE 3

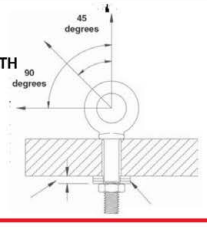
Crosby SHOULDER EYEBOLTS



SHANK DIMENSIONS	WLL IN - LINE PULL	WLL 0° < β ≤ 45°	WLL 45° < β ≤ 90°
MM	t	t	t
M6 X 13	0.20	0.06	0.05
M8 X 13	0.40	0.12	0.10
M10 X 17	0.64	0.19	0.16
M12 X 20.5	1.00	0.30	0.25
M16 X 27	1.80	0.54	0.45
M20 X 30	2.50	0.75	0.62
M24 X 36	4.00	1.20	1.00
M30 X 45	6.00	1.80	1.50
M36 X 54	8.50	2.55	2.12

EYE BOLTS WITH UNC THREADING ARE AVAILABLE

- NEVER EXCEED WORKING LOAD LIMITS
- ONLY USE EYE BOLTS IN NON AGEABLE STEEL IN ACCORDANCE WITH THE MACHINERY DIRECTIVE FOR LIFTING APPLICATIONS.
- ALWAYS USE SHOULDER NUT EYEBOLTS FOR ANGULAR LIFTS
- FOR ANGULAR LIFTS ADJUST WORKING LOAD AS SHOWN ABOVE
- ALWAYS TIGHTEN NUTS SECURELY AGAINST THE LOAD
- ALWAYS APPLY LOAD TO EYE BOLT IN THE PLANE OF THE EYE



Crosby SWIVEL HOIST RING



THREAD SHANK SIZE & EFF. THREAD PROJ.		WLL D.F. 5/1	WLL D.F. 4/1	TORQUE
MM	MM	t	t	Nm
M8 X 40	16.9	0.40	0.50	10
M10 X 40	16.9	0.45	0.55	16
M12 X 50	17.2	1.05	1.30	38
M16 X 60	27.2	1.90	2.40	81
M20 X 65	31.2	2.15	2.70	136
M20 X 75	28.1	3.00	3.75	136
M24 X 80	33.1	4.20	5.25	312
M30 X 120	65.1	7.00	8.75	637
M36 X 150	60.6	11.00	13.75	1005
M42 X 160	70.6	12.50	15.60	1005
M48 X 160	70.6	13.50	16.90	1350

- THE SWIVEL HOIST RING MAINTAINS 100% OF ITS WLL AT ANGULAR LOADING. IT IS SUBJECTED TO THE SAME LOAD AS THE SLING.
- APPLY PROPER TORQUE DURING INSTALLATION.
- NEVER USE SPACERS BETWEEN BUSHING FLANGE AND MOUNTING SURFACE.
- ALWAYS ENSURE FREE MOVEMENT OF BAIL. THERE SHOULD BE NO INTERFERENCE BETWEEN LOAD AND HOIST RING BAIL.



REFER TO THE Crosby GROUP WARNINGS FOR ADDITIONAL INFORMATION

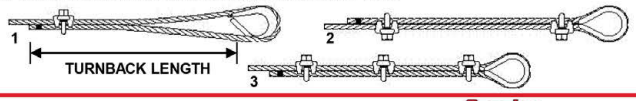
Crosby RIGGING HARDWARE 4

Crosby WIRE ROPE CLIPS

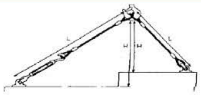


SIZE INCH	SIZE MM	EFFICIENCY	NUMBER OF CLIPS	TURNBACK LENGTH MM	TORQUE Nm
1/8	3 - 4	80%	2	85	6.1
3/16	5	80%	2	95	10.2
1/4	6 - 7	80%	2	120	20.3
5/16	8	80%	2	133	40.7
3/8	9 - 10	80%	2	165	61
7/16	11	80%	2	178	88
1/2	12 - 13	80%	3	292	88
9/16	14 - 15	80%	3	305	129
5/8	16	80%	3	305	129
3/4	18 - 20	80%	4	460	176
7/8	22	80%	4	480	305
1	24 - 26	90%	5	660	305

- APPLY U-BOLT OVER DEAD END OF THE WIRE ROPE, LIVE END OF THE ROPE RESTS IN THE SADDLE; NEVER SADDLE A DEAD HORSE!
- USE THE RECOMMENDED NUMBER OF CLIPS AND APPLY THE RECOMMENDED TORQUE AS SPECIFIED IN THE TABLE.
- A TERMINATION IS ONLY FINISHED WHEN IT HAS BEEN LOADED AT THE REQUIRED WLL AND THE NUTS HAVE BEEN RETORQUED A SECOND TIME.

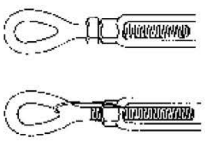


Crosby TURNBUCKLES



SIZE INCH	SIZE MM	WLL (t) JAW AND EYE D.F. 5/1	WLL (t) HOOK END FITTING D.F. 5/1
1/4	6.3	230	180
5/16	8	360	320
3/8	9.5	540	450
1/2	13	1.000	680
5/8	16	1.590	1.020
3/4	19	2.360	1.360
7/8	22	3.270	1.810
1	25	4.540	2.270
1-1/4	32	6.890	-
1-1/2	38	9.710	-
1-3/4	45	12.700	-
2	51	16.780	-

THE USE OF LOCKNUTS OR MOUSING IS AN EFFECTIVE METHOD OF PREVENTING TURNBUCKLES FROM ROTATING.



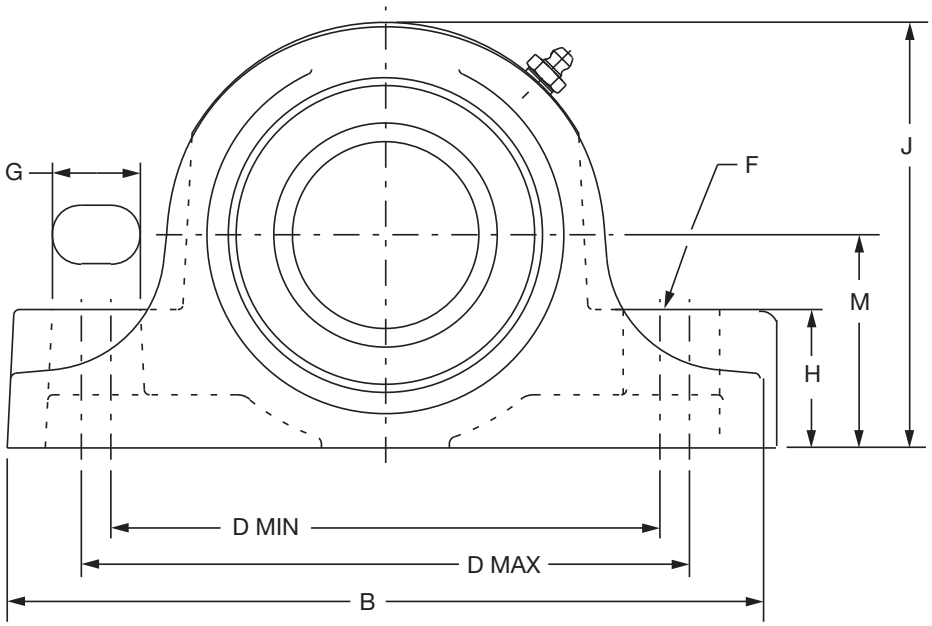
REFER TO THE Crosby CATALOG FOR ADDITIONAL INFORMATION

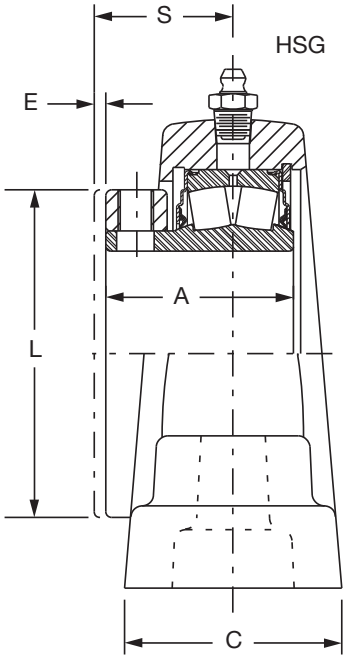
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DIMENSIONS

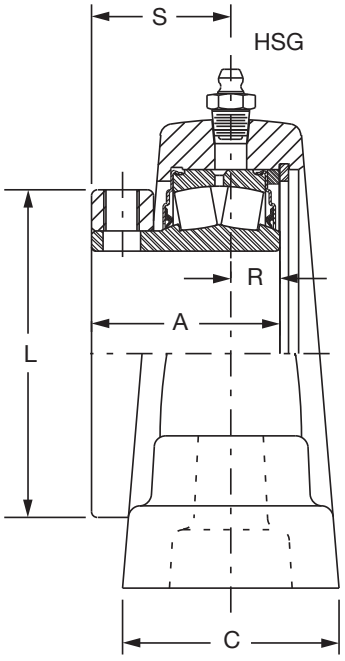
UNISPHERE II Pillow Block - Inch

NOTE: All sizes use a 1/8-27 NPT hydraulic grease fitting





EXPANSION



NON-EXPANSION

FEATURES/BENEFITS PAGE B13-2	SPECIFICATION PAGE B13-3	NOMENCLATURE PAGE B13-3	SELECTION PAGE B13-4

DIMENSIONS



UNISPHERE II Pillow Block - Inch

Bearing	Shaft Size Inch Δ	Non-Expansion*		Expansion		Approx. Wt. Lbs.
		Part No.	Part Name	Part No.	Part Name	
22208	1-7/16	**048000**	P2B-UN2-107	**048017**	P2B-UN2-107E	5.5
	1-1/2	**048001**	P2B-UN2-108	**048018**	P2B-UN2-108E	5.4
22209	1-11/16	**048002**	P2B-UN2-111	**048019**	P2B-UN2-111E	6.9
	1-3/4	**048003**	P2B-UN2-112	**048020**	P2B-UN2-112E	6.8
22210	1-15/16	**048004**	P2B-UN2-115	**048021**	P2B-UN2-115E	8.0
	2	**048005**	P2B-UN2-200	**048022**	P2B-UN2-200E	7.6
22211	2-3/16	**048006**	P2B-UN2-203	**048023**	P2B-UN2-203E	9.8
22213	2-7/16	**048007**	P2B-UN2-207	**048024**	P2B-UN2-207E	13.6
	2-1/2	**048008**	P2B-UN2-208	**048025**	P2B-UN2-208E	13.4
22215	2-11/16	**048009**	P2B-UN2-211	**048026**	P2B-UN2-211E	19.3
	2-3/4	**048010 †**	P2B-UN2-212	**048027 †**	P2B-UN2-212E	19.0
	2-15/16	**048011**	P2B-UN2-215	**048028**	P2B-UN2-215E	18.2
	3	**048012**	P2B-UN2-300	**048029**	P2B-UN2-300E	18.1
22218	3-7/16	**048013**	P2B-UN2-307	**048030**	P2B-UN2-307E	28.4
	3-1/2	**048014 †**	P2B-UN2-308	**048031 †**	P2B-UN2-308E	27.0
22220	3-15/16	**048015**	P2B-UN2-315	**048032**	P2B-UN2-315E	37.4
	4	**048016 †**	P2B-UN2-400	**048033 †**	P2B-UN2-400E	37.0

† Assembled to order. Consult DODGE for delivery.
Δ Consult DODGE for sizes not listed.
* Furnished unless otherwise specified.

UNISPHERE II - Pillow Block - Dimensions ●

Shaft Size Inch	A	B	C	D		E Total Exp.	F Bolt Dia.	G	H	J	L	M	R	S
				Min.	Max.									
1-7/16 1-1/2	1.69	6.88	1.95	4.69	5.50	5/32	1/2	0.97	0.97	3.88	2.75	1.88	0.50	1.19
1-11/16 1-3/4	1.91	7.38	2.06	5.19	5.88	5/32	1/2	0.91	1.31	4.25	3.00	2.13	0.47	1.44
1-15/16 2	1.91	8.38	2.06	5.94	6.69	5/32	5/8	1.06	1.38	4.56	3.25	2.25	0.47	1.44
2-3/16	2.00	8.88	2.31	6.44	7.13	5/32	5/8	1.03	1.63	5.00	3.50	2.50	0.52	1.48
2-7/16 2-1/2	2.20	9.25	2.56	6.81	7.44	3/16	5/8	1.00	1.75	5.69	4.06	2.75	0.66	1.55
2-11/16 2-3/4 2-15/16 3	2.45	10.44	2.56	7.81	8.44	3/16	3/4	1.13	2.25	6.44	4.72	3.25	0.77	1.69
3-7/16 3-1/2	2.86	13.00	2.81	9.25	10.75	3/16	7/8	1.69	2.25	7.50	5.50	3.75	0.94	1.91
3-15/16 4	3.33	14.25	3.31	10.00	11.88	7/32	1	2.00	2.50	8.44	6.47	4.13	1.13	2.19

● Dimensions shown are for non-expansion units. The expansion bearing center and housing center are on the same centerline.

FEATURES/BENEFITS PAGE B13-2	SPECIFICATION PAGE B13-3	NOMENCLATURE PAGE B13-3	SELECTION PAGE B13-4

Lifelign® Gear Coupling Nomenclature

Type GC (Pages 16 thru 18 & 37 thru 41)

1010	GC	02
SIZE	PRODUCT CLASSIFICATION	TYPE

Gear — Continuous Sleeve

GC02 = Double Engagement
GC05 = Single Engagement/Floating Shaft

Type G (Pages 19 thru 41)

1010	G	20
SIZE	PRODUCT CLASSIFICATION	**TYPE** (Shrouded and Exposed Bolts)

Gear — Standard Flanged Sleeve

G10/20 = Double Engagement (Shrouded/Exposed)
G51/52 = Single Engagement/Floating Shaft (Shrouded/Exposed)
GV10/20 = Vertical Double Engagement (Shrouded/Exposed)
GV51/52 = Vert. Single Engage./Floating Shaft (Shrouded/Exposed)
G62 = Brakewheel Double Engagement (Exposed)
G63 = Disc Brake Double Engagement (Exposed)
G66 = Brakewheel Single Engagement (Exposed)
GL20 = Slide Double Engagement (Exposed)
GL52 = Slide Single Engagement/Floating Shaft (Exposed)
G70 = Disconnect Inching Drives
G72 = Disconnect (Exposed)
G31/32 = Spacer (Shrouded/Exposed)
GP20 = Insulated Double Engagement (Exposed)
GP52 = Insulated Single Engagement/Floating Shaft (Exposed)
GP82 = Insulated Rigid (Exposed)
G81/82 = Rigid (Shrouded/Exposed)
GV82 = Vertical Rigid (Exposed)
GR20 = Shear Pin (Exposed)

Type G (Pages 42 thru 56)

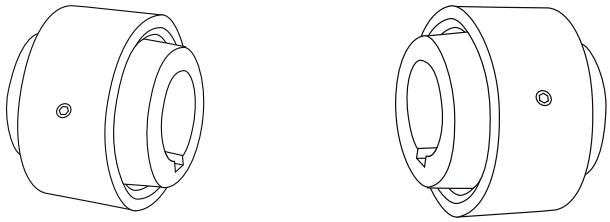
1080	G	20
SIZE	PRODUCT CLASSIFICATION	**TYPE** (Exposed Bolts Only)

Gear — Large Flanged Sleeve

Type G20 = Double Engagement
Type G52 = Single Engagement/Floating Shaft
Type GV20 = Vertical Double Engagement
Type GV52 = Vertical Single Engagement//Floating Shaft
Type GL20 = Slide Double Engagement
Type G70 = Disconnect/Inching Drives
Type G32 = Spacer
Type G82 = Rigid
Type GV82 = Vertical Rigid
Type GR20 = Shear Pin

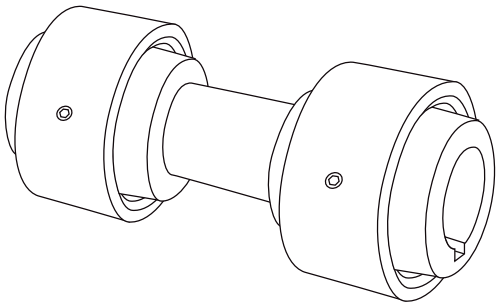
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Lifelign Gear Coupling Types



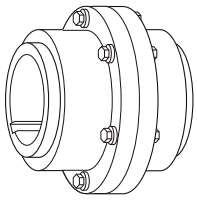
Type GC02 & GC05

With two hubs and one sleeve, the simplicity of this continuous sleeve coupling allows it to be easily adapted to a wide variety of applications. It's very compact, low in rotating mass, and has a lower initial cost than flanged types. (See Pages 16 & 17.)

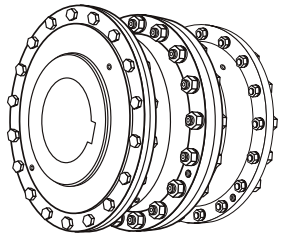


Type GC05 Floating Shaft

Floating shaft assemblies are used when distance between equipment is too great for spacer couplings. A standard floating shaft assembly consists of two standard single engagement couplings and a connecting shaft. A floating shaft can eliminate the need for additional bearing supports along spanning shafts because the shaft is supported by connected equipment through the single engagement couplings. (See Page 18.)



Types G20, GV20

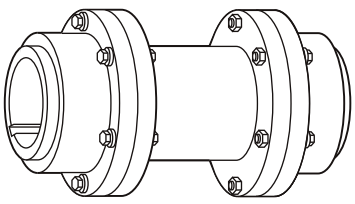


Type G Large Gear Coupling

The Type G20 double engagement, close coupled type has two flex halves to accommodate both offset and angular misalignment or a combination of the two, as well as end float. It is ideal for all horizontal, close coupled applications including fans, overhead cranes, conveyors, steel and paper mill equipment. It is adaptable with limited end float kits for use on electric motors, generators or any machines fitted with sleeve or straight roller bearings. (See Page 19.)

Type GV20 vertical double engagement coupling is a standard horizontal double engagement gear coupling modified to accommodate the sleeve centering assembly. Recommended for inclinations over 10°. (See Pages 24 and 45.)

The Type G Large Gear Coupling is available in all types for capacities up to 72,450,00 lb-in., 8,185,000 Nm. (See Page 42.)

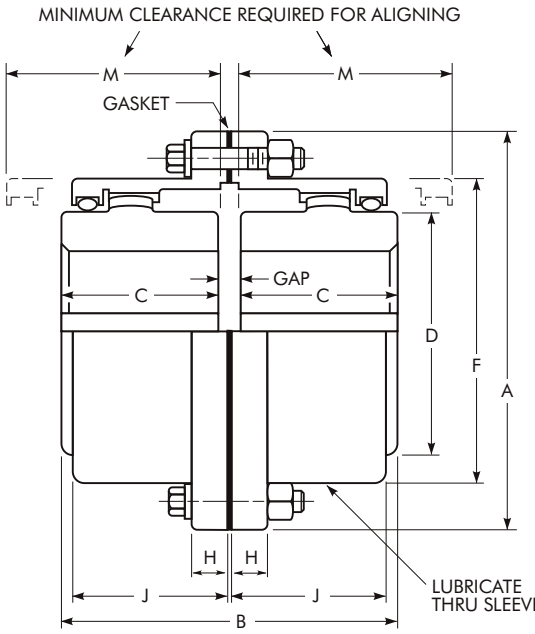


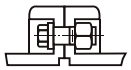
Types G32

Spacer couplings for pump and compressor applications simplify servicing connected equipment. Spacer couplings use a standard double engagement coupling with a spacer tube and an additional set of fasteners. Stock spacer lengths for quick delivery are available in the popular sizes. Special lengths are also available. (See Page 20.)

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Type G20 Standard Flanged Sleeve
Double Engagement/Dimensions — Inches





For Sizes 1010G thru 1055G, Type G10 Shrouded Bolts furnished only when specified on order.

SIZE ★	Torque Rating (lb–in) †	Allow Speed rpm ‡	Max Bore ●	Min Bore ■	Cplg Wt With No Bore-lb G10	Cplg Wt With No Bore-lb G20	Lube Wt lb	A	B	C	D	F	H	J	M	Gap	SIZE ★
1010G	10,080	8,000	1.875	.50	9	10	.09	4.56	3.50	1.69	2.70	3.30	.55	1.53	2.00	.125	**1010G**
1015G	20,790	6,500	2.375	.75	17	20	.16	6.00	4.00	1.94	3.40	4.14	.75	1.88	2.40	.125	**1015G**
1020G	37,800	5,600	2.875	1.00	30	35	.25	7.00	5.00	2.44	4.14	4.98	.75	2.34	3.00	.125	**1020G**
1025G	66,150	5,000	3.625	1.25	55	65	.50	8.38	6.25	3.03	5.14	6.10	.86	2.82	3.60	.188	**1025G**
1030G	107,100	4,400	4.125	1.50	85	95	.80	9.44	7.37	3.59	6.00	7.10	.86	3.30	4.20	.188	**1030G**
1035G	163,800	3,900	4.875	2.00	135	150	1.20	11.00	8.63	4.19	7.00	8.32	1.12	3.84	5.10	.250	**1035G**
1040G	270,900	3,600	5.750	2.50	195	215	2.00	12.50	9.75	4.75	8.25	9.66	1.12	4.38	5.70	.250	**1040G**
1045G	371,700	3,200	6.750	3.00	280	300	2.30	13.62	10.93	5.31	9.25	10.79	1.12	4.84	6.50	.312	**1045G**
1050G	500,900	2,900	7.375	3.50	390	420	3.90	15.31	12.37	6.03	10.00	12.04	1.50	5.54	7.20	.312	**1050G**
1055G	655,200	2,650	8.250	4.00	525	550	4.90	16.75	13.56	6.62	11.00	13.16	1.50	6.22	8.00	.312	**1055G**
1060G	800,100	2,450	9.125	4.50	. . .	675	7.00	18.00	15.13	7.41	12.00	14.41	1.00	6.66	9.00	.312	**1060G**
1070G	1,197,000	2,150	10.875	5.00	. . .	1070	9.60	20.75	17.75	8.69	14.00	16.73	1.12	7.70	10.50	.375	**1070G**

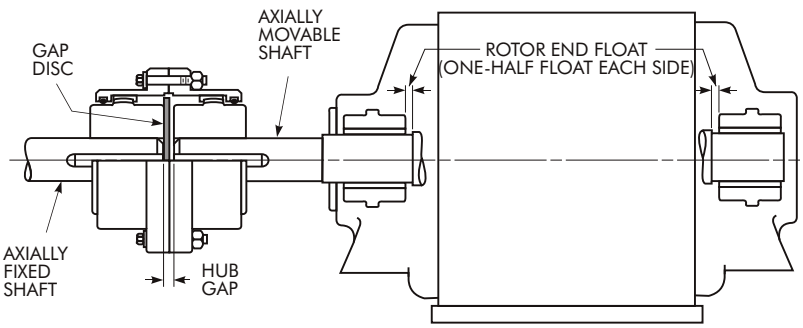
★ See page 15 for General Information and other Reference Notes.

TABLE 7— Limited End Float & Standard Gap Disc Dimensions – Inches

SIZE	B	End Float ♦	Gap Disc ✱ Thickness	Gap Disc ✱ Dia	Gap
1010G	3.58	.094	.156	2.95	.203
1015G	4.08	.094	.156	3.70	.203
1020G	5.11	.094	.188	4.50	.234
1025G	6.39	.094	.281	5.55	.328
1030G	7.54	.094	.312	6.50	.359
1035G	8.79	.188	.312	7.55	.406
1040G	9.91	.188	.312	8.95	.406
1045G	11.15	.188	.438	9.95	.531
1050G	12.59	.188	.438	10.95	.531
1055G	13.80	.188	.469	12.00	.563
1060G	15.45	.188	.532	13.12	.625
1070G	18.10	.188	.625	15.10	.718

♦ If these values exceed one-half rotor end float or equivalent manufacturer's specification, refer to Falk.

✱ Gap disc material: Neoprene, 70 durometer.



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Product Detail



SPK ROLLER DOUBLE MST (P1
D80P13H

UPC: 697950217963

Martin Split taper sprocket is another style of bushed sprocket. The split taper bushing, when installed, offers a wide range of bore sizes.

Product Specifications | Misc Info

Material	Steel	Hub Outside Diameter	3.000 in.
Chain Number	80	Hub Recessed For Chain Clearance	No
Chain Pitch	1.000 in.	Construction Detail	Solid
Number of Chain Rows	2	Bore Type	Bushed MST
Number of Teeth	13	Key Way Size	.375 WIDE in.
Outside Diameter	4.657 in.	Bushing Part Number	P1
Pitch Diameter	4.179 in.	Bushing Min Bore Size	0.500 in.
Single Strand Tooth Thickness	0.557 in.	Bushing Max Bore Size	1.750 in.
Hardened Teeth	Yes		

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Product Detail



SPK ROLLER DOUBLE MST (R1
D80R26

UPC: 697950218090

Martin Split taper sprocket is another style of bushed sprocket. The split taper bushing, when installed, offers a wide range of bore sizes.

Product Specifications | Misc Info

Material	Steel	Hub Outside Diameter	5.500 in.
Chain Number	80	Hub Recessed For Chain Clearance	No
Chain Pitch	1.000 in.	Construction Detail	Solid
Number of Chain Rows	2	Bore Type	Bushed MST
Number of Teeth	26	Key Way Size	.750 WIDE in.
Outside Diameter	8.836 in.	Bushing Part Number	R1
Pitch Diameter	8.296 in.	Bushing Min Bore Size	1.125 in.
Single Strand Tooth Thickness	0.557 in.	Bushing Max Bore Size	3.750 in.
Hardened Teeth	No		

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Product Detail



SPK IDLER NEEDLE BEARING
80NB13H 1

UPC: 697950341668

Martin idlers are smooth-running and available in oil-impregnated, sintered bronze, extra-duty bearing press-fitted in sprocket and a hardened steel journal case for maximum resistance to wear. Steel sprockets used in Martin idlers are accurately machined (not stamped) the same as sprockets normally supplied for power transmission use. Martin can also alter existing sprockets and install bearings to make custom idlers.

Product Specifications | Misc Info

Material	Steel	Hardened Teeth	Yes
Chain Number	80	Hub Configuration	B
Chain Pitch	1.000 in.	Bearing Type	Needle Bearing
Number of Teeth	13	Bearing Bore Size	1.000 in.
Outside Diameter	4.660 in.	Hub Outside Diameter	3.000 in.
Pitch Diameter	4.179 in.	Length thru Bore	1.250 in.
Single Strand Tooth Thickness	0.575 in.		

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Product Detail



MST BUSHING
P1 1 3/8

UPC: 697950127743

MST Bushings are easy to install and remove. They are split through the barrel and have a taper to provide a true clamp on the shaft. They are keyed to both the shaft and the hub to help during “blind” installations.

Product Specifications | Misc Info

Material	Steel	Flange Diameter	3.000 in.
Bore Type	Standard	Length Thru Bore	1.937 in.
Finished Bore Size	1.375 in.	Cap Screw Bolt Circle	2.438 in.
Key Way Size	5/16 X 5/32 in.	Number of Mounting Cap Screws	3
Min Bore Size	1.375 in.	Cap Screw Size	5/16-18 X 1 in.
Max Bore Size	1.438 in.	Bushing Construction	Type 1

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Product Detail



MST BUSHING
R1 1 3/4

UPC: 697950129785

MST Bushings are easy to install and remove. They are split through the barrel and have a taper to provide a true clamp on the shaft. They are keyed to both the shaft and the hub to help during “blind” installations.

Product Specifications | Misc Info

Material	Ductile Iron	Flange Diameter	5.375 in.
Bore Type	Standard	Length Thru Bore	2.875 in.
Finished Bore Size	1.750 in.	Cap Screw Bolt Circle	4.625 in.
Key Way Size	3/8 X 3/16 in.	Number of Mounting Cap Screws	3
Set Screw Size	5/16-18 X 5/16 in.	Cap Screw Size	3/8 X 1 3/4 in.
Min Bore Size	1.750 in.	Bushing Construction	Type 1
Max Bore Size	2.813 in.		

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Product Detail



BUSHING QD
SDS 1 3/4

UPC: 697950037530

QD (quick detachable) bushings are designed for conventional mounting or reverse mounting. These bushings have a flange.

Product Specifications | Misc Info

Material	Ductile Iron	Max Bore Size	1.938 in.
Bore Type	Standard	Flange Diameter	3.188 in.
Finished Bore Size	1.750 in.	Length Thru Bore	1.375 in.
Key Way Size	3/8 X 1/8 in.	Cap Screw Bolt Circle	2.688 in.
Set Screw Size	1/4-20 X 1/4 in.	Number of Mounting Cap Screws	3
Min Bore Size	1.750 in.	Cap Screw Size	1/4 X 1 7/8 in.

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Product Detail



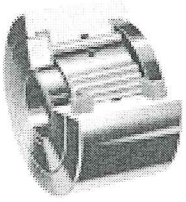
SPK ROLLER B QD SABER
80SDS13H

UPC: 697950042121

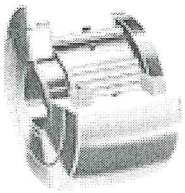
Martin saber tooth sprockets have hardened teeth, which provide longer chain and sprocket life. The hardened teeth on the smaller sprocket of a roller chain drive are recommended if the drive ratio is four to one or greater if the smaller sprocket has 24 teeth or less and is running at a speed of over 600 RPM.

Product Specifications | Misc Info

Material	Steel	Hub Configuration	B
Chain Number	80	Hub Outside Diameter	3.209 in.
Chain Pitch	1.000 in.	Hub Recessed For Chain Clearance	No
Number of Chain Rows	1	Construction Detail	Solid
Number of Teeth	13	Bore Type	Bushed QD
Outside Diameter	4.657 in.	Bushing Part Number	SDS
Pitch Diameter	4.179 in.	Bushing Min Bore Size	0.500 in.
Single Strand Tooth Thickness	0.575 in.	Bushing Max Bore Size	2.000 in.
Hardened Teeth	Yes		

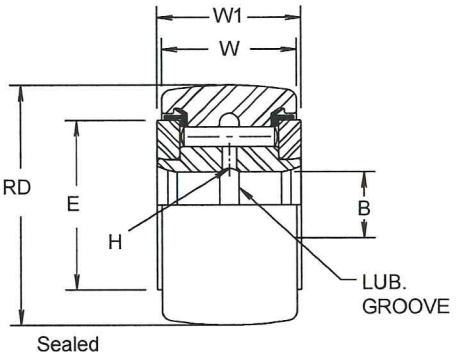


With LUBRI-DISC® seals
add letter "S"
Ex. CYR-1¾-S



Crowned O.D.
add letter "C"
Ex. CCYR-1¾-S

See page 14 for crown details.



CYR, CYR-S & CCYR-S series

Cam followers without studs for shaft mounting, with and without LUBRI-DISC® seals

UNSEALED BRG. NO.	SEALED BRG. NO.	SEALED BRG. NO.	ROLLER DIA. (RD) +.000 -.001	ROLLER WIDTH (W) +.000 -.005	BORE (B)		WIDTH OVER END PLATES (W1) +.005 -.010	DIA. OF END PLATES (E)	OIL HOLE (H) DIA.	MIN. BOSS DIA.	SHAFT DIA.						MAX. STATIC CAPACITY LBS.	BASIC DYN. RATING LBS.
											PUSH FIT		DRIVE FIT		PRESS FIT			
					NOM.	TOL.					NOM.	TOL.	NOM.	TOL.	NOM.	TOL.		
CYR-3/4	CYR-3/4-S	CCYR-3/4-S	.750	.500	.250		.5625	39/64		1/2	.2495		.2501		.2503		4130	1660
CYR-7/8	CYR-7/8-S	CCYR-7/8-S	.875	.500	.250		.5625	39/64		1/2	.2495		.2501		.2503		4130	1660
CYR-1	CYR-1-S	CCYR-1-S	1.000	.625	.3125		.6875	25/32		41/64	.3120		.3126		.3128		6120	2225
CYR-1 1/8	CYR-1 1/8-S	CCYR-1 1/8-S	1.125	.625	.3125		.6875	25/32		41/64	.3120		.3126		.3128		6120	2225
CYR-1 1/4	CYR-1 1/4-S	CCYR-1 1/4-S	1.250	.750	.375		.8125	63/64		49/64	.3745		.3751		.3753		8500	3930
CYR-1 3/8	CYR-1 3/8-S	CCYR-1 3/8-S	1.375	.750	.375		.8125	63/64		49/64	.3745		.3751		.3753		8500	3930
CYR-1 1/2	CYR-1 1/2-S	CCYR-1 1/2-S	1.500	.875	.4375	+.0002 -.0004	.9375	1 3/32	3/32	57/64	.4370	±.0002	.4376	±.0002	.4378	±.0002	11280	4840
CYR-1 5/8	CYR-1 5/8-S	CCYR-1 5/8-S	1.625	.875	.4375		.9375	1 3/32		57/64	.4370		.4376		.4378		11280	4840
CYR-1 3/4	CYR-1 3/4-S	CCYR-1 3/4-S	1.750	1.000	.500		1.0625	1 1/4		1 3/64	.4995		.5001		.5005		15840	6385
CYR-1 7/8	CYR-1 7/8-S	CCYR-1 7/8-S	1.875	1.000	.500		1.0625	1 1/4		1 3/64	.4995		.5001		.5005		15840	6385
CYR-2	CYR-2-S	CCYR-2-S	2.000	1.250	.625		1.3125	1 13/32		1 13/64	.6245		.6251		.6255		21140	8090
CYR-2 1/4	CYR-2 1/4-S	CCYR-2 1/4-S	2.250	1.250	.625		1.3125	1 13/32		1 13/64	.6245		.6251		.6255		21140	8090
CYR-2 1/2	CYR-2 1/2-S	CCYR-2 1/2-S	2.500	1.500	.750		1.5625	1 11/16		1 5/16	.7495		.7501		.7505		32900	11720
CYR-2 3/4	CYR-2 3/4-S	CCYR-2 3/4-S	2.750	1.500	.750		1.5625	1 11/16		1 5/16	.7495		.7501		.7505		32900	11720
CYR-3	CYR-3-S	CCYR-3-S	3.000	1.750	1.000		1.8125	2 1/8	1/8	1 3/4	.9994		1.0002		1.0006		49820	15720
CYR-3 1/4	CYR-3 1/4-S	CCYR-3 1/4-S	3.250	1.750	1.000		1.8125	2 1/8		1 3/4	.9994		1.0002		1.0006		49820	15720
CYR-3 1/2	CYR-3 1/2-S	CCYR-3 1/2-S	3.500	2.000	1.125		2.0625	2 7/16		1 59/64	1.1244		1.1252		1.1256		63250	22800
CYR-4	CYR-4-S	CCYR-4-S	4.000	2.250	1.250	+.0001 -.0005	2.3125	2 51/64		2 9/32	1.2494	+.0002 -.0003	1.2502	+.0002 -.0003	1.2506	+.0002 -.0003	89540	29985
	CYR-5-S	†CCYR-5-S	5.000	2.750	1.750		2.8750	3 9/16		2 7/8	1.7494		1.7502		1.7506		135900	46575
	CYR-6-S	†CCYR-6-S	6.000	3.250	2.250		3.3750	4 15/32	3/16	3 3/8	2.2494		2.2502		2.2506		160900	60000
	CYR-7-S	†CCYR-7-S	7.000	3.750	2.750		3.8750	5 3/16		3 7/8	2.7494		2.7502		2.7506		213860	75380
	†CYR-8-S◆	†CCYR-8-S◆	8.000	4.250	3.255		4.500	4 3/8	1/4	4 3/8	3.2545		3.2560		3.2565		288200	92200
	†CYR-9-S◆	†CCYR-9-S◆	9.000	4.750	3.755	+.001 -.000	5.000	5 1/16	5/16	5 1/16	3.7545	±.0005	3.7560	±.0005	3.7565	±.0005	366850	113260
	†CYR-10-S◆	†CCYR-10-S◆	10.000	5.250	4.255		5.500	5 15/32	3/8	5 15/32	4.2545		4.2560		4.2565		431130	131545

† Not available from stock. Consult McGill Customer Service for availability.
◆ Standard tolerances do not apply. Consult McGill Customer Service.
NOTE: Consult McGill Customer Service for limiting speeds.

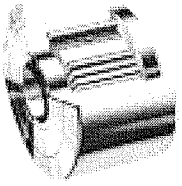
CYR series cam yoke roller

Cam follower type bearings without studs for shaft mounting — sealed (with or without crowned O.D.), and unsealed.

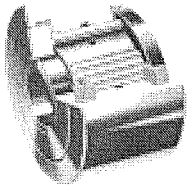
Illustrated are the options available in cam yoke roller bearings. These may be combined to best serve any application and combinations regularly stocked are shown in the following table. Others would be special and should be discussed with the McGill Engineering Department.

CYR, CYR-S & CCYR-S series

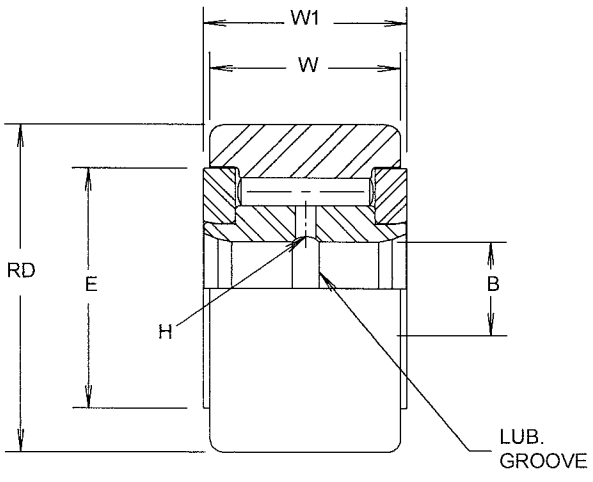
Cam followers without studs for shaft mounting, with and without LUBRI-DISC® seals

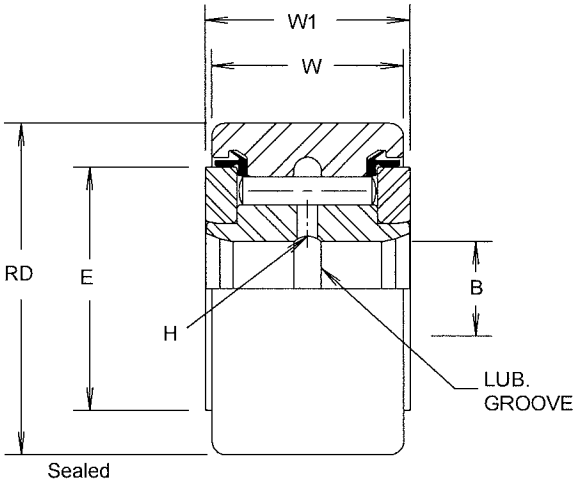


Unsealed



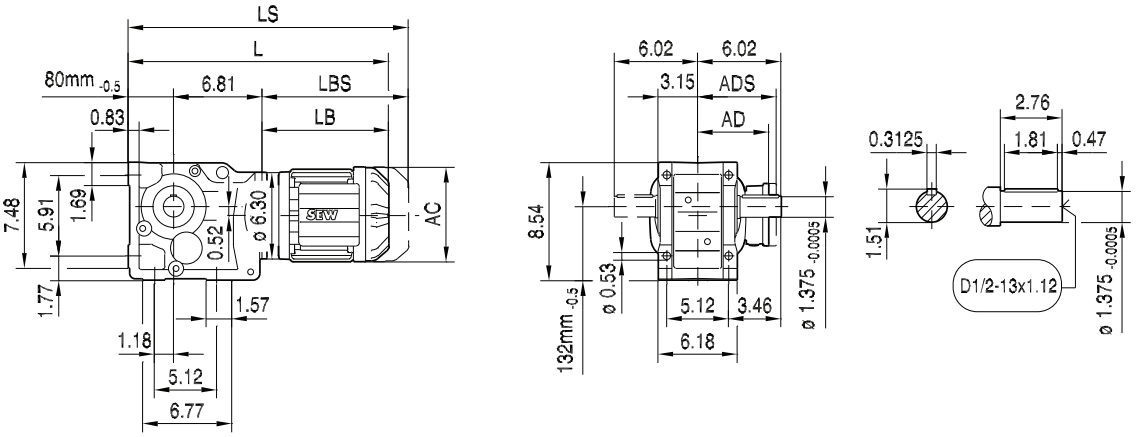
With LUBRI-DISC seals



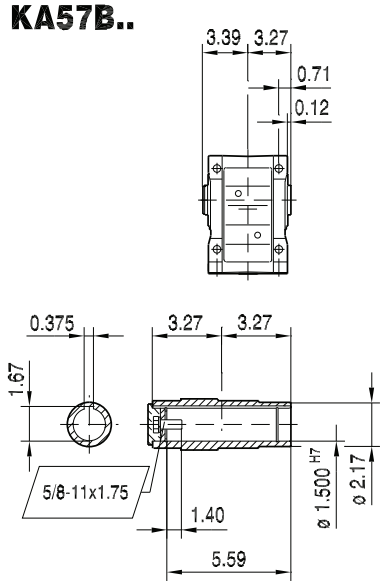


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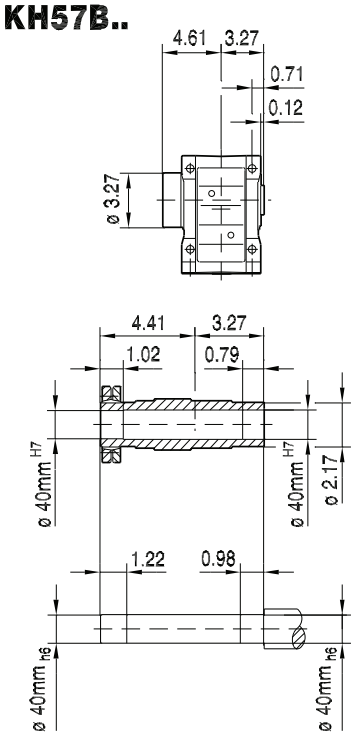
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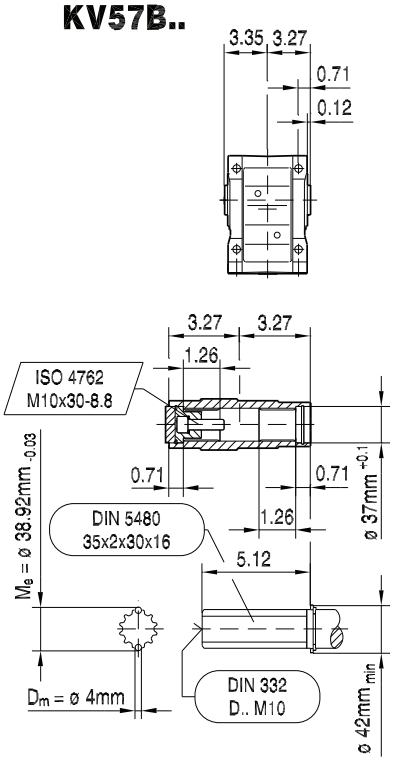
KA57B..



KH57B..



KV57B..



(→ 125)	DR63..	DR71S	DR71M	DR80S	DR80M	DR90M	DR90L	DR100M	DR100L/LC	DR132S	DR132M/MC
AC	5.20	5.47	5.47	6.14	6.14	7.05	7.05	7.76	7.76	8.70	8.70
AD	4.13	4.69	4.69	5.04	5.04	5.51	5.51	6.18	6.18	6.69	6.69
ADS	4.13	5.08	5.08	5.47	5.47	5.91	5.91	6.22	6.22	6.77	6.77
L	17.24	17.68	18.66	19.02	20.24	20.31	21.10	22.28	23.46	25.31	27.28
LS	19.41	20.35	21.34	22.20	23.43	23.98	24.76	25.94	27.13	29.72	31.69
LB	7.28	7.72	8.70	9.06	10.28	10.35	11.14	12.32	13.50	15.35	17.32
LBS	9.45	10.39	11.38	12.24	13.46	14.02	14.80	15.98	17.17	19.76	21.73

SEW-EURODRIVE

PT Pilot® Quotation

Date 09/24/2014 **Quotation # 20140924-00071**

From	SEW-Western Region (CA) SEW-Eurodrive, Inc. 30599 San Antonio Street Hayward CA, 94544	**Phone** (510) 487-3560 **Fax** (510) 487-6433	**To**	M3 Engineering 2051 W Sunset Road Tucson AZ, 85704	**Phone** (520) 293-1488 **Fax** (520) 293-8349
Email	cshayward@seweurodrive.com		**Attn**	John Reid	

Purchase Order	N/A	**Tag/Ref**	**SO#**

Model	K57DRE80M4BE1/AS7Y/TF			**Base Price**	$1,790 List
Gear Ratio	60.81				
Prim/Sec Stages	3 / 0	**Shaft Location**	B (ex: MxB)	**Cable Entry Loc**	3
Output Speed	29 RPM	**Output Shaft Dia**	35 mm	**Overhung Load**	2,130 lbs
Motor Power	1 HP	**Output Shaft Style**	Solid Shaft	**Output Torque**	2,210 lb-in
Motor Voltage	460 VAC	**Input Shaft Dia**	--	**Torque Capacity**	5,310 lb-in
Frequency	60 Hz	**Flange Diameter**	--	**Nameplate S.F.**	2.40
Brake Voltage	460V	**Flange Location**	--	**Load S.F.**	--
Mtg. Position	M1	**Conduit Box Loc**	270	**Weight** (includes oil)	83 lbs

GEAR OPTIONS (List)

35 mm Shaft [$0], Shaft B [$0], 5001 Green/Blue Paint [$0], Shell Omala S2 G 220 mineral oil (standard) [$0]

MOTOR AND BRAKE OPTIONS (List)

Thermistor Control Switch (#99999ABB) [$305], 115V Space Heater [$188], IP54 Enclosure [$0], 5001 Green Blue Paint [$0], AS7Y - Spreadshaft SSI Encoder [$1632], TF - PTC Thermistors (x3) Class H [$195], Inverter/Vector Duty Nameplate [$0], Standard Aluminum Conduit Box - NPT holes [$0], Class H Insulation [$170], 15m Encoder Cable w/Wire Leads + (2) 15-pin Plugs (P/N 1360 2640-15) [$400], No Brake Release [$0], BE1 with 88 lb-in Brake Torque [$302]

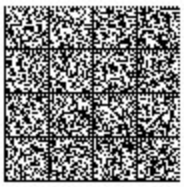
ELECTRONIC OPTIONS / MECHANICAL VARIABLE SPEED (List)

MCF41A0015-5A3-4-00 [$1426], Output Filter HF015-503 [$531], USB11A [$190], Line Filter NF009-503 [$367]

COMMENTS / SPECIAL INSTRUCTIONS

Ambient = 25C (77F) or lower.

OFFICE USE ONLY



DELIVERY

Need by N/A
Ship Via N/A
FOB SEW Eurodrive, Inc.

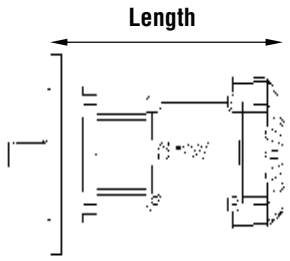
Qty 1	**List Ea** $7,496	**Disc** 0.556	**Net Adders Ea** $0	**Net Ea** $4,167.78	**TOTAL** $4,167.78

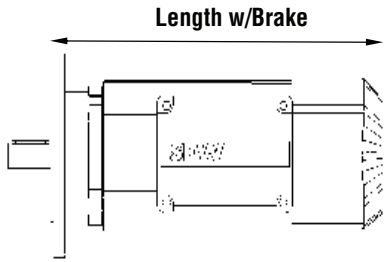
Quotation is valid for 30 days and subject to SEW-Eurodrive terms and conditions of sale.
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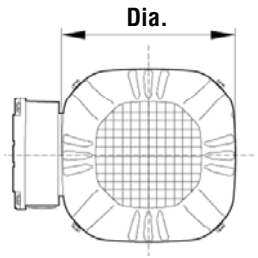
Dimension Comparison – DR & DT/DV Motors

DT/DV Series Motor	DRS Series Standard Efficiency	DRE Series High Efficiency	DRP Series PREMIUM Efficiency	Power [Hp]	Power [kW]	DT/DV/DR			DRS			DRE			DRP			New Standard vs. DT/DV		
						Length	w/BMG	Diameter	Length	w/BE	Dia.	Length	w/BE	Dia.	Length	w/BE	Dia.	Length	w/Brake	Dia.
DT56M4	-	-	-	0.13	0.09	136	172	109	-	-	-	-	-	-	-	-	-	-	-	-
DR63S4	-	-	-	0.15	0.12	187	242	132	-	-	-	-	-	-	-	-	-	-	-	-
DT56L4	-	-	-	0.2	0.15	136	172	109	-	-	-	-	-	-	-	-	-	-	-	-
DR63M4	DRS71S4	-	-	0.25	0.18	187	242	132	198	266	139	-	-	-	-	-	-	+11	+24	+7
DT71K4						202	266	145				-	-	-	-	-	-	-4	0	-6
DR63L4	DRS71S4	-	-	0.33	0.25	187	242	132	198	266	139	-	-	-	-	-	-	+11	+24	+7
DT71C4						202	266	145				-	-	-	-	-	-	-4	0	-6
DT71D4	DRS71S4	-	-	0.5	0.37	202	266	145	198	266	139	-	-	-	-	-	-	-4	0	-6
DT80K4	DRS71M4	-	-	0.75	0.55	252	316	145	223	291	139	-	-	-	-	-	-	-29	-25	-6
DT80N4	DRS80S4	DRE80M4	DRP90M4	1.0	0.75	252	316	145	241	322	156	272	353	156	266	359	179	+20	+37	+11
DT90S4	DRS80M4	DRE90M4	DRP90L4	1.5	1.1	257	342	197	272	353	156	266	359	179	286	379	179	+9	+17	-18
DT90L4	DRS90M4	DRE90L4	DRP90L4	2.0	1.5	257	342	197	266	359	179	286	379	179	286	379	179	+29	+37	-18
DT100LS4	DRS90L4	DRE100L4	DRP112M4	3.0	2.2	311	396	197	286	379	179	346	439	197	352	464	221	+41	+43	0
DV100M4	DRS90L4	DRE100L4	DRP112M4	3.0	2.2	341	426	197	316	409	197	346	439	197	387	499	221	+5	+13	0
DT100L4	DRS100M4	DRE100LC4	DRP132S4	5.0	3.7	341	426	197	316	409	197	346	439	197	387	499	221	+5	+13	0
DV100L4																				
DV112M4	DRS100L4	DRE132S4	-	5.4	4.0	349	429	221	346	439	197	387	499	221	-	-	-	+38	+70	0
DV132S4	DRS132S4	DRE132M4	DRP160S4	7.5	5.5	394	474	221	387	499	221	437	549	221	460	597	272	+43	+75	0
DV132M4	DRS132M4	DRE132MC4	DRP160S4	10	7.5	407	519	275	437	549	221	437	549	221	460	597	272	+30	+30	-54
DV132ML4	DRS132MC4	DRE160M4	DRP160M4	12.5	9.2	462	574	275	437	549	221	460	597	272	460	597	272	-2	+23	-3
DV160M4	DRS160M4	DRE160MC4	DRP160MC4	15	11	462	574	275	460	597	272	460	597	272	460	597	272	-2	+23	-3
DV160L4	DRS160MC4	DRE180M4	DRP180M4	20	15	509	665	331	460	597	272	540	739	317	540	739	317	+31	+74	-14
DV180M4	DRS180M4	DRE180L4	DRP180L4	25	18.5	581	737	331	540	739	317	600	799	317	583	772	317	+19	+62	-14
DV180L4	DRS180L4	DRE180LC4	DRP180LC4	30	22	581	737	331	600	799	317	600	799	316	600	799	316	+19	+62	-15
DV200L4	DRS180LC4	DRE200L4	DRP225S4	40	30	616	772	394	600	799	317	649	869	394	649	869	394	+33	+97	0
DV225S4	DRS225S4	DRE225S4	DRP225M4	50	37	690	846	394	649	869	394	649	869	394	699	919	394	-41	+23	0
DV225M4	DRS225M4	DRE225M4	-	60	45	690	846	394	699	919	394	699	919	394	-	-	-	+9	+73	0
DV250M4	DRS225MC4	DVE250M4	-	75	55	772	957	510	699	919	394	772	957	510	-	-	-	0	0	0
DV280S4	-	DVE280S4	-	100	75	772	957	510	-	-	-	772	957	510	-	-	-	0	0	0
DV280M4	-	DVE280M4	-	125	90	-	-	-	-	-	-	772	957	510	-	-	-	-	-	-
-	-	DRE315K4	-	150	110	-	-	-	-	-	-	941	1192	624	-	-	-	-	-	-
-	-	DRE315S4	-	200	150	-	-	-	-	-	-	941	1192	624	-	-	-	-	-	-
-	-	DRE315M4	-	250	185	-	-	-	-	-	-	1071	1322	624	-	-	-	-	-	-
-	-	DRE315L4	-	275	200	-	-	-	-	-	-	1071	1322	624	-	-	-	-	-	-
-	-	DRE315L4	-	300	225	-	-	-	-	-	-	1071	1322	624	-	-	-	-	-	-

NOTES:
1. BLUE denotes USA standard motor
2. Copper rotor always selected for non-standard motor
3. All dimension units are metric [mm]
4. Dia. (diameter) dimension does not include conduit box
5. Longest flange selected for Length, w/BMG, and /BE dimensions
6. **New Standard vs. DT/DV** useful when replacing motors
7. RED = larger new dimension Δ, GREEN = smaller Δ



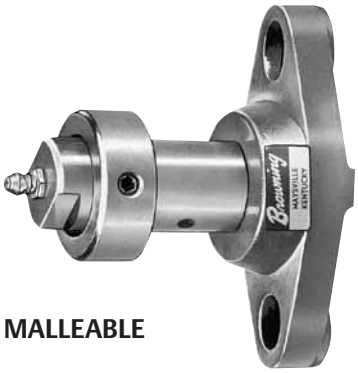




SEW EURODRIVE

Technical Note

M-111-02



MALLEABLE

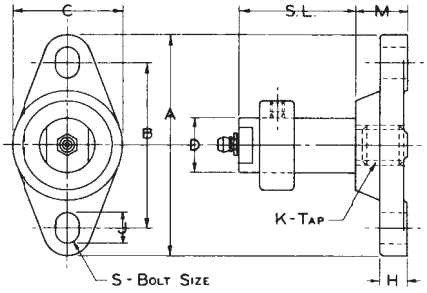


Table No. 1

Fixed Flange Tighteners

Part No.	Shaft	DIMENSIONS										Wt. Lbs.
		A	B▲	C	D	H	J▲	K	M	S.L.	S▲	
FFTN1	N1①	2 3/8"	1 3/4"	1 1/8"	.500"	1/4"	9/32"	3/8 — 16	1/2"	1 1/2"	1/4"	.3
FFTH	None②	4	3	2	—	1/2	9/16	1/2 — 13	15/16	—	3/8	.9
FFTP	None②	4	3	2	—	1/2	9/16	5/8 — 11	15/16	—	3/8	.9
FFTQ	None②	4	3	2	—	1/2	9/16	3/4 — 10	15/16	—	3/8	.8
FFTQ	N2③	4	3	2	1.000	1/2	9/16	3/4 — 10	15/16	2 1/8	3/8	1.6
FFTQ	N3③	4	3	2	1.000	1/2	9/16	3/4 — 10	15/16	3 1/8	3/8	1.8
FFTQ	N4③	4	3	2	1.000	1/2	9/16	3/4 — 10	15/16	4 1/8	3/8	2.1
FFTQ-1	None②	7 1/2	6	3 1/2	—	3/4	15/16	1 — 8	1 7/16	—	5/8	4.8
FFTQ-1	N5③	7 1/2	6	3 1/2	1.500	3/4	15/16	1 — 8	1 7/16	4	5/8	7.3
FFTQ-1	N6③	7 1/2	6	3 1/2	1.500	3/4	15/16	1 — 8	1 7/16	6	5/8	8.5

▲Slots are cast, some variations may be expected.
①Shaft is included.
②No shaft is required when used with Idler Bushings shown on page J-8.
③SHAFT MUST BE ORDERED SEPARATELY.

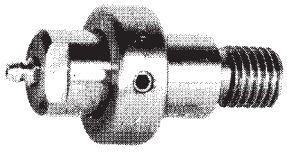
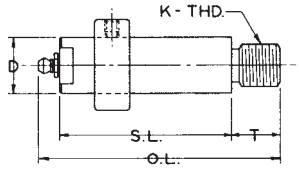


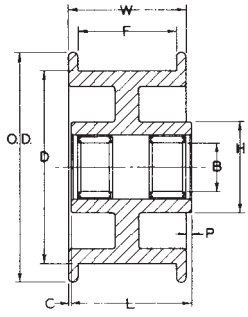
Table No. 2

Tightener Shafts

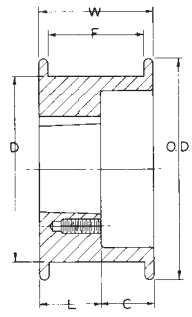
Part No.	DIMENSIONS					Wt. Lbs.
	O.L.	D	K	T	S.L.	
N1	2 5/16"	.500"	3/8 — 16	7/16"	1 1/2"	.13
N2	3 3/8	1.000	3/4 — 10	7/8	2 1/8	.6
N3	4 3/8	1.000	3/4 — 10	7/8	3 1/8	.9
N4	5 3/8	1.000	3/4 — 10	7/8	4 1/8	1.0
N5	5 11/16	1.500	1 — 8	1 5/16	4	2.8
N6	7 11/16	1.500	1 — 8	1 5/16	6	3.8







Type 1



Type 2

Table No. 3

Flat Face Idlers

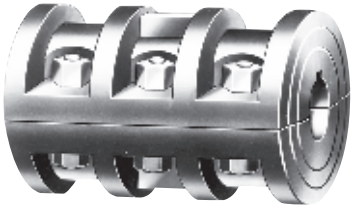
Part No.	Type	Shaft Length	DIMENSIONS									Wt. Lbs.	Radial Load Capacity in Pounds Based on 2500 Hours Average Life at RPM Shown ■							
			O.D.	D	B	H	W	F	L	P	C		100	500	1000	1500	2000	2500	3000	3500
N1D05F	1	1 1/2" *	1 3/4"	1 3/8"	1/2"	1 1/4"	3/4"	9/16"	3/4"	1/8"	1/8"	.3	665	406	331	294	269	250	237	226
N4D1F	1	2 1/8*	4 3/8	4	1	1 7/8	1 7/16	1 1/16	1 1/4	1/8	5/16	3.0	2927	1787	1458	1295	1185	1104	1047	997
N4D2F	1	3 1/8*	4 3/8	4	1	1 7/8	2 7/16	2 1/16	2 1/2	1/8	1/16	5.0	4348	2654	2166	1922	1760	1640	1544	1482
N4D3F	1	4 1/8*	4 3/8	4	1	1 7/8	3 7/16	3 1/16	3 1/2	1/8	1/16	7.8	5854	3574	2916	2590	2370	2208	2094	1994
N6D4F	1	6*	7	6	1 1/2	2 5/8	5	4 1/2	4	1/8	1 1/8	22.5	5884	3592	2930	2602	2380	2218	2102	2004
N6D6F	1	6*	7	6	1 1/2	2 5/8	6 3/4	6 1/4	5	1/8	1 7/8	29.5	5884	3592	2930	2602	2380	2218	2102	2004
4D1FH	2	H1▲	4 3/8	4	▲	—	1 7/16	1 1/16	7/8	—	9/16	3.4	1518	1016	854	772	718	678	648	624
4D2FP	2	P1▲	4 3/8	4	▲	—	2 7/16	2 1/16	1 5/16	—	1 1/8	4.6	1518	1016	854	772	718	678	648	624
4D3FP	2	P1▲	4 3/8	4	▲	—	3 7/16	3 1/16	1 5/16	—	2 1/8	5.6	1518	1016	854	772	718	678	648	624

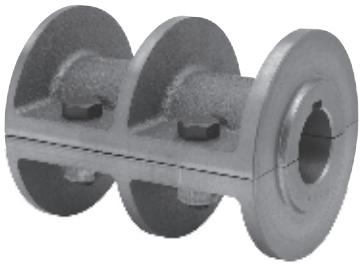
*For use with Drive Tighteners shown on pages J-2 and J-3 and above with shaft lengths indicated.
▲ For use with H-1 1/2 or P1-5/8 IDLER BUSHINGS shown on page J-8.
■See page J-8 for factors to use for Average Life of more or less than 2500 hours.
All Browning Stock Idlers furnished with needle bearings have retainers that insure minimum internal friction and wear by separating the needle rollers. These bearings are inset approximately 1/8" on either end of the Idler hubs to form a grease cavity.

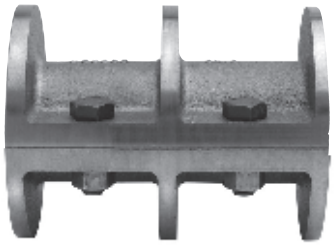
DODGE®

SELECTION/DIMENSIONS

Ribbed Rigid







For Nominal Shaft of:	Style Cplg. Figure no.	Part Number	Max RPM	Torque (In-Lb)	Weight	Coupling Dia x Length	Keyway Size	Key Furnished	Bolts	
									No.	Dia.
1	1	**009001**	5360	1200	6.0	3-5/8 x 5-1/4	1/4 x 1/8	1/4 x 1/4 x 5-1/4	4	3/8
1-3/16	1	**009002**	5360	2000	5.5					
1-1/4	1	**009003**	5360	2300	5.2					
1-3/8	1	**009004**	4130	3100	11.0	4-5/8 x 6-3/16	5/16 x 5/32	5/16 x 5/16 x 6-3/16	4	1/2
1-7/16	1	**009005**	4130	3500	10.5	4-5/8 x 6-3/16	3/8 x 3/16	3/8 x 3/8 x 6-3/16	4	1/2
1-1/2	1	**009006**	4130	4000	10.2					
1-11/16	1	**009007**	3965	5700	13.7	4-13/16 x 7-1/16	3/8 x 3/16	3/8 x 3/8 x 7-1/16	4	1/2
1-3/4	1	**009008**	3965	6300	13.3					
1-7/8	★	**009009**	3635	7800	19.4	5-1/4 x 7-15/16	1/2 x 1/4	1/2 x 1/2 x 7-15/16	4	1/2
1-15/16		**009010**	3635	8600	20.6					
2		**009011**	3635	9400	20.0					
2-3/16	★	**009013**	3180	12400	29.1	6 x 8-5/8	1/2 x 1/4	1/2 x 1/2 x 8-5/8	4	5/8
2-1/4		**009012**	3180	13400	29.0					
2-7/16	2	**009015**	2965	17100	37.3	6-7/16 x 9-11/16	5/8 x 5/16	5/8 x 5/8 x 9-11/16	6	5/8
2-1/2	2	**009016**	2965	18400	36.6					
2-11/16	2	**009017**	2830	22900	43.4	6-3/4 x 10-9/16	5/8 x 5/16	5/8 x 5/8 x 10-9/16	6	5/8
2-3/4	2	**009014**	2830	24500	43.0					
2-15/16	2	**009019**	2545	29900	58.7	7-1/2 x 11-3/8	3/4 x 3/8	3/4 x 3/4 x 11-3/8	6	3/4
3	2	**009020** ✻	2545	31800	56.2					
3-3/16	2	**009022**	2315	38200	80.5	8-1/4 x 12-1/4	3/4 x 3/8	3/4 x 3/4 x 12-1/4	6	7/8
3-1/4	2	**009021** ✻	2315	40500	80.0	8-1/4 x 12-1/4	3/4 x 3/8	3/4 x 3/4 x 12-1/4	6	7/8
3-7/16	2	**009023**	2165	47900	94.6	8-13/16 x 13-3/16	7/8 x 7/16	7/8 x 7/8 x 13-3/16	6	7/8
3-1/2	2	**009024** ✻	2165	50500	94.0	8-13/16 x 13-3/16	7/8 x 7/16	7/8 x 7/8 x 13-3/16	6	7/8
3-15/16	2	**009025**	1900	72000	146.6	10-1/16 x 15-1/4	1 x 1/2	1 x 1 x 15-1/4	6	1
4	2	**009027** ✻	1900	75400	146.0	10-1/16 x 15-1/4	1 x 1/2	1 x 1 x 15-1/4	6	1
4-7/16	3	**009026**	1775	103000	215.0	10-3/4 x 18-3/16	1 x 1/2	1 x 1 x 18-3/16	6	1-1/8
4-1/2	3	**009031** ✻	1775	107400	214.4	10-3/4 x 18-3/16	1 x 1/2	1 x 1 x 18-3/16	6	1-1/8
4-15/16	3	**009028**	1625	142000	276.3	11-3/4 x 19-5/8	1-1/4 x 5/8	1-1/4 x 1-1/4 x 19-5/8	6	1-1/8
5	3	**009043** ✻	1625	147500	275.6	11-3/4 x 19-5/8	1-1/4 x 5/8	1-1/4 x 1-1/4 x 19-5/8	6	1-1/8
5-7/16	4	**009029**	1390	190000	426.2	13-3/4 x 20-3/8	1-1/4 x 5/8	1-1/4 x 1-1/4 x 20-3/8	8	1-1/8
5-1/2	4	**009050** ✻	1390	196000	425.4	13-3/4 x 20-3/8	1-1/4 x 5/8	1-1/4 x 1-1/4 x 20-3/8	8	1-1/8
5-15/16	3	**009042** ✻	1365	247000	426.0	14 x 20-3/4	1-1/2 x 3/4	1-1/2 x 1-1/2 x 20-3/4	6	1-1/4
6	3	**009054** ✻	1365	255000	425.3	14 x 20-3/4	1-1/2 x 3/4	1-1/2 x 1-1/2 x 20-3/4	6	1-1/4
7	4	**009044** ✻	1230	404000	560.8	15-1/2 x 21-15/16	1-3/4 x 3/4	1-3/4 x 1-1/2 x	8	1-1/4

★ Same as Fig. 1 except with a rib parallel to the bore between each pair of flanges

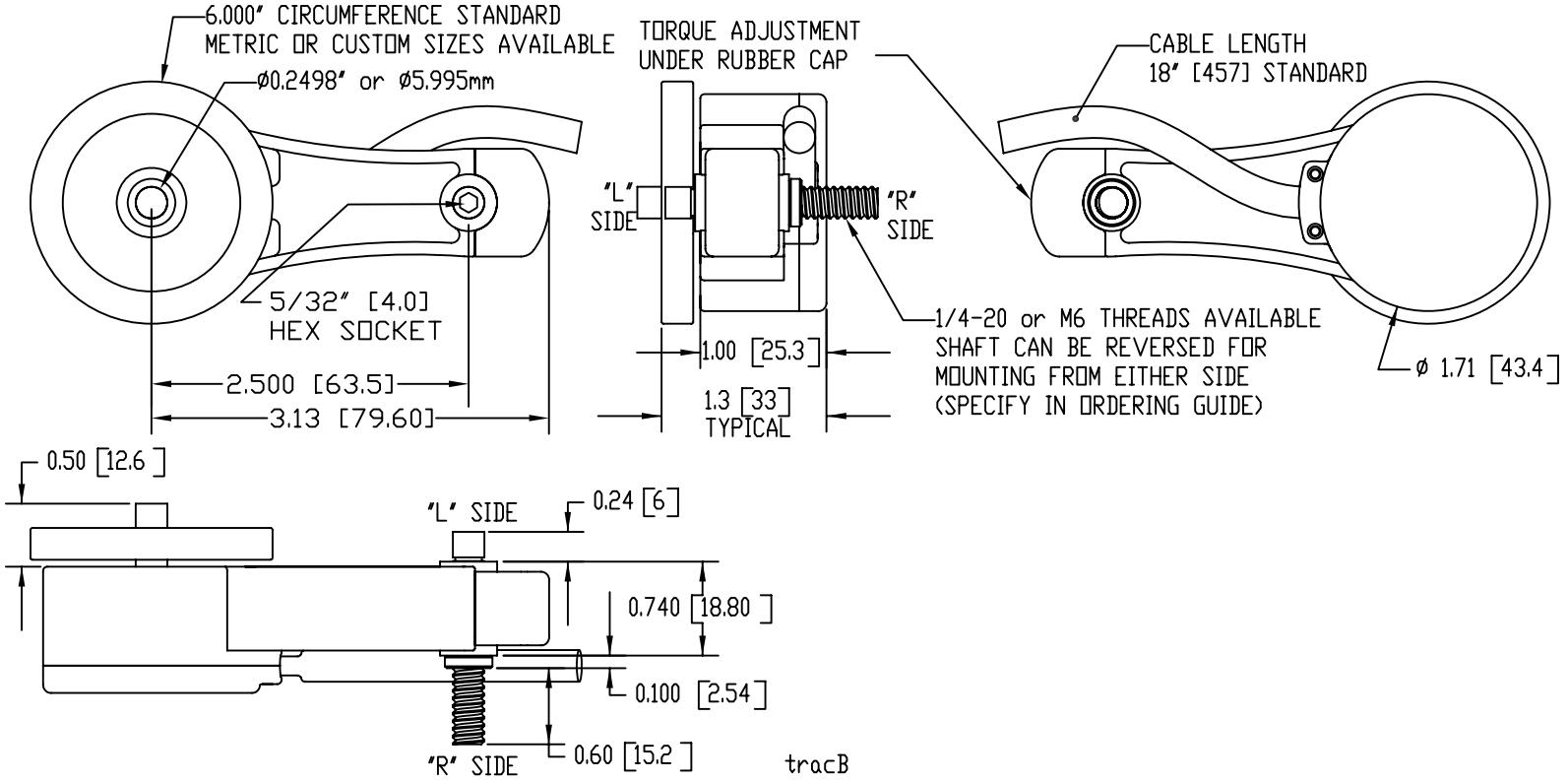
✻ Standard non-stock size. Consult DODGE for delivery

Note: Coupled shafts must be the same diameters

NOTE: Instruction manuals for Ribbed Rigid Couplings available on www.dodge-pt.com

FEATURES/BENEFITS PAGE PT1-66	SPECIFICATION/HOW TO ORDER PAGE PT1-72	MODIFICATION/ACCESSORIES PAGE PT1-81	ENGINEERING/TECHNICAL PAGE PT1-83

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
--	INITIAL RELEASE		
A	CHANGED SOME DIMENSION LOCATIONS		
B	CHANGED PIVOT ARM BOLT HEAD		



THIRD ANGLE PROJECTION		ENCODER PRODUCTS COMPANY	
DIMENSIONS ARE IN INCHES		APPROVALS	DATE
ISSUE DATE: xx/xx/xx	TOLERANCES	DRAWN: J.Meschko	10/25/04
NEXT ASSEM. XXX	DECIMAL ± .005	CHECKED	
PREV. ASSEM. XXX	DECIMAL ± .01	RESP ENG	
PART NUMBER ◇	ANGULAR ± 1	MFG ENG	
		QUAL ENG	

NAME AND TITLE: Model TR1

DWG. NO. trac-01 REV. B

SCALE: NONE DWG. SIZE: B SHEET 1 OF 1

ENCODER PRODUCTS COMPANY

Model TR1 - Tru-Trac™



Features

- **Encoder And Measuring Wheel Solution Integrated Into One Compact Unit**
- **Spring Loaded Torsion Arm Makes Wheel Pressure Adjustments A Snap**
- **Easily Installed In A Vertical, Horizontal, or Upside-Down Orientation**
- **Operates Over A Variety Of Surfaces At Speeds Up To 3000 Feet Per Minute**
- **Integrated Module Simplifies Your System Design, Reducing Cost**

FINALLY! An integrated encoder and spring loaded measuring wheel assembly available in one, easy-to-use, compact unit. The NEW Tru-Trac™ by Encoder Products Company is a versatile solution for tracking velocity, position, or distance over a wide variety of surfaces in almost any application. It's spring-loaded torsion arm provides a simple-to-adjust torsion load, allowing the Tru-Trac™ to be mounted in almost any orientation, even upside-down. The threaded shaft on the pivot axis is field reversible providing mounting access from either side. The Tru-Trac™ housing is a durable, conductive composite material that will eliminate static build up. With operating speeds up to 3000 feet per minute and a wide variety of configuration options, it's easy to see the Tru-Trac™ is the ideal solution for countless applications.

Common Applications

Web Tension Control, Paper Monitoring, Glue Dispensing, Linear Material Monitoring, Conveyor Systems, Printing, Labeling, Document Handling

Model TR1 - Tru-Trac™ Ordering Guide

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Mechanical | **Electrical** | **Optional Features** (Leave Blank For Standard Options)

TR1	–	U1	R4	–	0500	N	V1	A	OC	–	F00	–	[ ]	[ ]	[ ]	[ ]
														-20° to +85°C Std	IP50 Std	None Std

MODEL
TR1 Tru-Trac™

WHEEL TYPE & CIRCUMFERENCE
- U1 Urethane 6" cir
- U2 Urethane 200 mm cir
- K1 Knurled 6" cir
- K2 Knurled 200 mm cir
- 19 No Wheel - 1/4" shaft
- 20 No Wheel - 6 mm shaft

PIVOT SHAFT MOUNTING[1]
- R4 Right side 1/4-20 thread
- L4 Left side 1/4-20 thread
- R6 Right side M6 thread
- L6 Left side M6 thread

CYCLES PER REVOLUTION
See *CPR Options* below
Price adder >1999

COMMUTATION
- N None

INPUT VOLTAGE
- V1 5 to 28 VDC

NUMBER OF CHANNELS[2]
- A Channel A

Channel A Leads B
- Q Quadrature A & B
- R Quadrature A & B with Index

Channel B Leads A[8]
- K Reverse Quadrature A & B
- D Reverse Quadrature A & B with Index

OUTPUT TYPE
- OC Open Collector
- PP Push-Pull
- HV Line Driver
- PU Pull-Up Resistor[7]
- OD Open Collector with Differential Outputs

CONNECTOR TYPE
- F00 18" Cable[3] (Std)
- F01 12" Cable
- F02 24" Cable
- F03 36" Cable
- M00 2M Cable[4]
- J00 18" Cable with 5-pin M12[6]
- K00 18" Cable with 8-pin M12[6]

MAXIMUM FREQUENCY
Standard
F3 Extended
See Specifications

OPERATING TEMPERATURE
-20° to +85° C (Std)
- T1 -40° to +85° C
- T2 -20° to +100° C

SEALING
IP50 (Std)
- S2 IP65

CERTIFICATION
None (Std)
- CE CE Marked[5]



Accessory Angle Mounting Bracket for TR1 Tru-Trac™ can be ordered separately as part # 140104
Dimensional drawing available at www.encoder.com.

Model TR1 - Tru-Trac™ CPR Options

0001 thru 0189*		0198	0200	0250
0256	0300	0315	0360	0400
0500	0512	0580	0600	0750
0800	1000	1024	1125	1200
1250	1500	1800	2000	2048
2500	2540	3000	3600	4000
4096	5000	6000	7200	8192
10,000				

*Contact Customer Service For Availability

New CPR values are periodically added to those listed. Contact Customer Service to determine all currently available values. Special disk resolutions are available upon request and may be subject to a one-time NRE fee.

For specification assistance call Customer Service at 1-800-366-5412

NOTES:
1. See mechanical drawing. Shaft is reversible in the field.
2. Contact Customer Service for non-standard index gating or phase relationship options.
3. For non-standard English cable lengths enter 'F' plus cable length expressed in feet. Example: F06 = 6 feet of cable. Frequency above 300 kHz standard cable lengths only.
4. For non-standard metric cable lengths enter 'M' plus cable length expressed in meters. Example: M06 = 6 meters of cable.
5. Please refer to **Technical Bulletin TB100: *When to Choose the CE Option*** at www.encoder.com.
6. 5-pin not available with Line Driver (HV) output. Additional cable lengths available. Please consult Customer Service.
7. With Input Voltage above 16 VDC, operating temperature is limited to 85° C.
8. Reverse Quadrature not available with PU output type.

Model TR1 - Tru-Trac™

Model TR1 - Tru-Trac™ Specifications

Electrical

Input Voltage	4.75 to 28 VDC max for temperatures up to 85° C 4.75 to 24 VDC for temperatures between 85° C to 100° C
Input Current	100 mA max (65 mA typical) with no output load
Output Format	Incremental- Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the wheel side. See *Waveform Diagrams* below.
Output Types	Open Collector- 20 mA max per channel Push-Pull- 20 mA max per channel Pull-Up- Open collector with 2.2K ohm Pull-Up 20mA max per channel Line Driver- 20 mA max per channel (Meets RS 422 at 5 VDC supply)
Index	Once per revolution. 0190 to 10,000 CPR: Gated to output A 0001 to 0189 CPR: Ungated See *Waveform Diagrams* below.
Max. Frequency	Standard Frequency Response is 200 kHz for CPR 1 to 2540 500 kHz for CPR 2541 to 5000 1 MHz for CPR 5001 to 10,000 Extended Frequency Response (optional) is 300 kHz for CPR 2000, 2048, 2500, and 2540
Noise Immunity	Tested to BS EN61000-6-2; BS EN50081-2; BS EN61000-4-2; BS EN61000-4-3; BS EN61000-4-6, BS EN500811
Symmetry	180° (±18°) electrical
Quad. Phasing	90° (±22.5°) electrical
Min. Edge Sep	67.5° electrical
Accuracy	Within 0.017° mechanical or 1 arc-minute from true position. (for CPR>189)

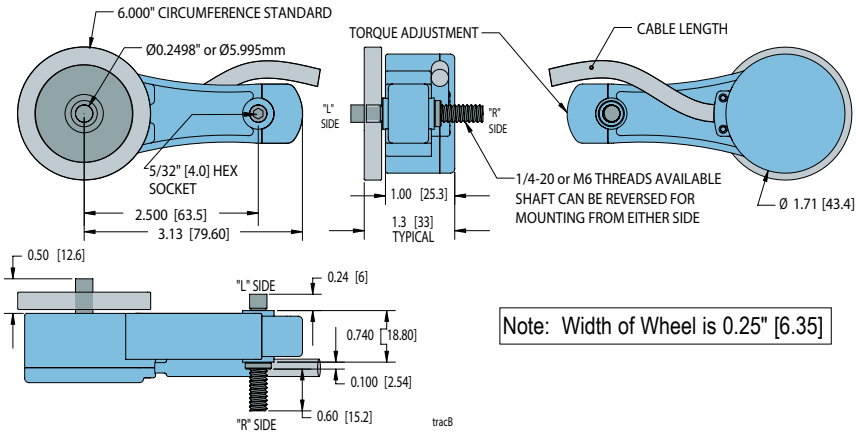
Mechanical

Max Shaft Speed	6000 RPM. Higher speeds may be achievable, contact Customer Service.
Shaft Material	Stainless Steel
Shaft Tolerance	+0.0000/-0.0004" [+0.000/-0.010 mm]
Radial Shaft Load	5 lb max. Rated load of 2 to 3 lb for bearing life of 1.2 x 10^{10} revolutions
Axial Shaft Load	5 lb max. Rated load of 2 to 3 lb for bearing life of 1.2 x 10^{10} revolutions
Starting Torque	IP50 0.05 oz-in IP65- 0.4 oz-in
Electrical Conn	18" cable (foil and braid shield, 24 AWG conductors), 5- or 8-pin M12 (12 mm) in-line connector with 18" cable (braid shield)
Mounting	Pivot shaft can be mounted from either side of the Tru-Trac™ housing, and is reversible in the field. Specify 1/4-20 or M6 threads
Housing	Stainless steel fibers in a high temperature nylon composite
Wheel Width	0.25"
Weight	5 oz typical

Environmental

Operating Temp	-20° to +85° C for standard models -40° to +85° C for low temperature option -20° to +100° C for high temperature option
Storage Temp	-25° to +85° C
Humidity	98% RH non-condensing
Vibration	10 g @ 58 to 500 Hz
Shock	80 g @ 11 ms duration
Sealing	IP50 standard; IP65 available

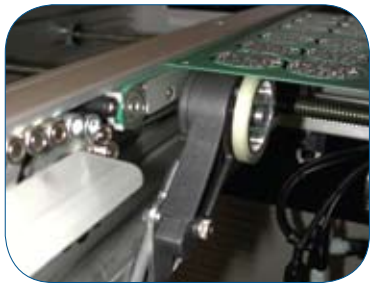
Model TR1 - Tru-Trac™



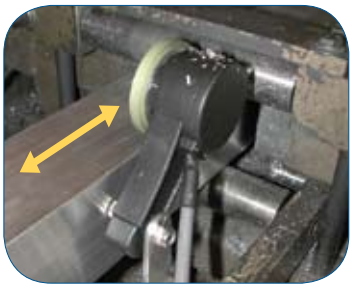
Note: Width of Wheel is 0.25" [6.35]

All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified
Metric dimensions are given in brackets [mm]

Model TR1 - Tru-Trac™ Applications



For **Linear Applications** the Tru-Trac™ can be mounted above or below the moving object, and the tension on the wheel adjusted for a wide range of applications such as packaging, conveyors, mail sorting, cut to length, labeling, gantries etc.

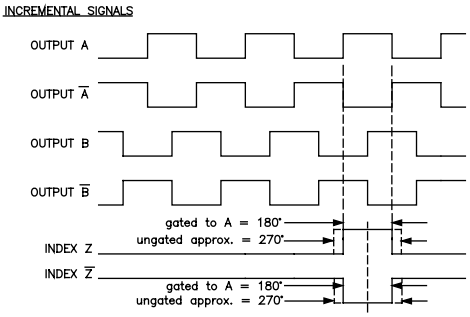




For **Rotational Applications** the Tru-Trac™ can be mounted in any orientation to monitor the position or velocity of many types of otating equipment such as web tension control drums, rotary tables, printing, spooling, etc.



Waveform Diagram



Waveform shown with optional complementary signals A, B, Z for HV and OD outputs only.

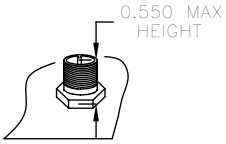
Wiring Table

Function	Cable Wire Color	5-pin M12**	8-pin M12**
Com	Black	3	7
+VDC	White	1	2
A	Brown	4	1
A'	Yellow	--	3
B	Red	2	4
B'	Green	--	5
Z	Orange	5	6
Z'	Blue	--	8
Shield	Bare *	--	--

* CE Option: Cable shield (bare wire) is connected to internal case.
** Non-CE Option: Cable shield is connected to M12 connector body.
CE Option: Cable shield is connected to M12 connector body, and internal case.







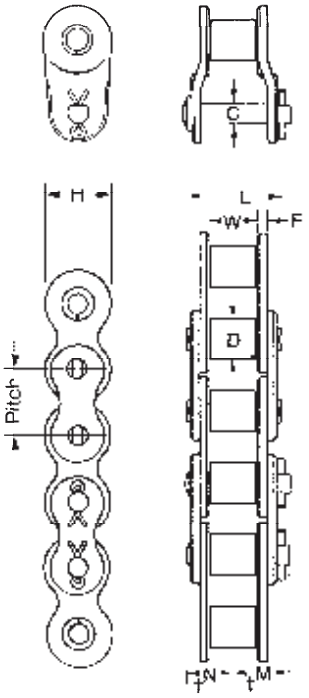
Morse PERFORMANCE CHAIN®

ANSI ROLLER CHAIN
SINGLE and DOUBLE STRAND

Standard series-single strand

Catalog No.	Dimensions (Inches)									Average Tensile Strength	Weight Per Foot
	Pitch	W-Roller Width	D-Roller Dia.	C-Pin Dia.	F-Plate Thick-ness	L-Width Over Pins	H-Inside Plate Height	†N	†M		
*25	1/4	1/8	.130	.0905	.030	.312	.234	.156	.188	875	.09
*35	3/8	3/16	.200	.141	.050	.466	.350	.233	.267	2,100	.21
41	1/2	1/4	.306	.141	.050	.512	.383	.256	.322	2,000	.25
40	1/2	5/16	.312	.156	.060	.630	.466	.315	.380	3,700	.42
50	5/8	3/8	.400	.200	.080	.790	.584	.395	.460	6,100	.69
60	3/4	1/2	.468	.234	.094	.990	.700	.495	.586	8,500	1.00
80	1	5/8	.625	.312	.125	1.274	.934	.637	.741	14,500	1.71
100	1 1/4	3/4	.750	.375	.156	1.555	1.166	.778	.923	24,000	2.58
120	1 1/2	1	.875	.437	.187	1.960	1.400	.980	1.150	34,000	3.87
140	1 3/4	1	1.000	.500	.219	2.117	1.634	1.059	1.215	46,000	4.95
160	2	1 1/4	1.125	.562	.250	2.522	1.866	1.261	1.451	58,000	6.61
200	2 1/2	1 1/2	1.562	.781	.312	3.120	2.250	1.560	1.777	95,000	10.96
Heavy series-single strand											
60-H	3/4	1/2	.468	.234	.125	1.115	.700	.558	.627	8,500	1.22
80-H	1	5/8	.625	.312	.156	1.400	.934	.700	.804	14,500	2.03
100-H	1 1/4	3/4	.750	.375	.187	1.684	1.166	.842	.986	24,000	3.00
120-H	1 1/2	1	.875	.437	.219	2.090	1.400	1.045	1.214	34,000	4.30
140-H	1 3/4	1	1.000	.500	.250	2.241	1.634	1.121	1.276	46,000	5.50
160-H	2	1 1/4	1.125	.562	.281	2.646	1.866	1.323	1.513	58,000	7.20
200-H	2 1/2	1 1/2	1.562	.781	.375	3.374	2.334	1.687	1.904	95,000	12.30

* Rollerless



Standard series-double strand

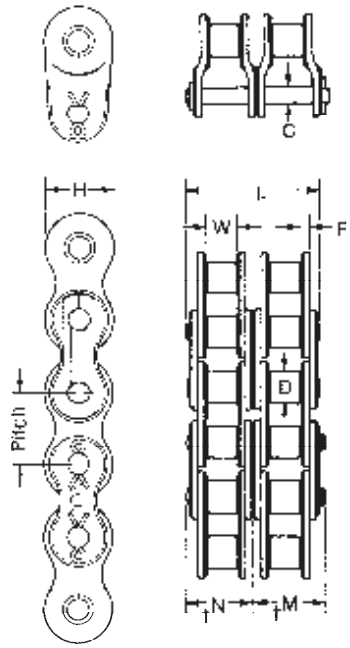
Catalog No.	Dimensions (Inches)									Average Tensile Strength	Weight Per Foot
	Pitch	W-Roller Width	D-Roller Dia.	C-Pin Dia.	F-Plate Thick-ness	L-Width Over Pins	H-Inside Plate Height	†N	†M		
*35-2	3/8	3/16	.200	.141	.050	.866	.350	.433	.467	4,200	.40
40-2	1/2	5/16	.312	.156	.060	1.215	.466	.597	.662	7,400	.82
50-2	5/8	3/8	.400	.200	.080	1.507	.584	.753	.832	12,200	1.36
60-2	3/4	1/2	.468	.234	.094	1.893	.700	.947	1.038	17,000	1.99
80-2	1	5/8	.625	.312	.125	2.432	.934	1.216	1.320	29,000	3.40
100-2	1 1/4	3/4	.750	.375	.156	2.963	1.166	1.482	1.625	48,000	5.10
120-2	1 1/2	1	.875	.437	.187	3.749	1.400	1.874	2.047	68,000	7.65
140-2	1 3/4	1	1.000	.500	.219	4.041	1.634	2.020	2.187	92,000	9.80
160-2	2	1 1/4	1.125	.562	.250	4.827	1.866	2.414	2.625	116,000	13.10
200-2	2 1/2	1 1/2	1.562	.781	.312	5.937	2.250	2.968	3.281	190,000	21.50
Heavy series-double strand											
60-2H	3/4	1/2	.468	.234	.125	2.148	.700	1.074	1.166	17,000	2.41
80-2H	1	5/8	.625	.312	.156	2.688	.934	1.344	1.448	29,000	4.00
100-2H	1 1/4	3/4	.750	.375	.187	3.228	1.166	1.614	1.758	48,000	5.70
120-2H	1 1/2	1	.875	.437	.220	4.019	1.400	2.009	2.179	68,000	8.40
140-2H	1 3/4	1	1.000	.500	.250	4.301	1.634	2.150	2.307	92,000	10.80
160-2H	2	1 1/4	1.125	.562	.281	5.087	1.866	2.593	2.684	116,000	14.20
200-2H	2 1/2	1 1/2	1.562	.781	.375	6.462	2.334	3.231	3.448	190,000	24.30

* Rollerless

All sizes available in Riveted construction. Sizes 60 and above available in Cottered construction. Please specify desired construction when ordering.

Standard multiple-strand chains are supplied with loose-fit center plates. Morse press-lit center plates are available on special order.

Chains on this page should not be used for Hoisting applications. Consult Morse for Hoist application recommendations.



† For cotter chain and connector link clearance.

SPRING HANGERS

Fig. 98, C-98

Double Spring

Fig. 98 Type A

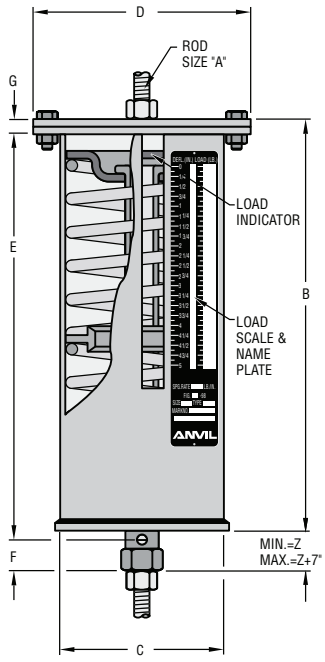


Fig. 98 Type B

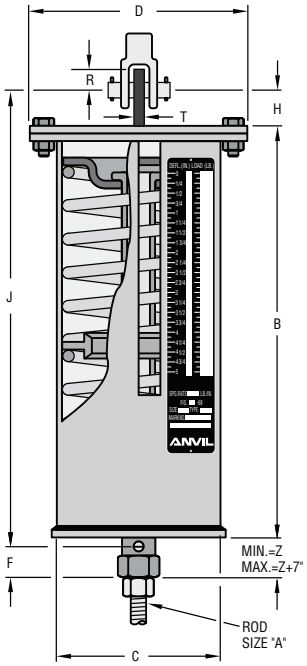


Fig. 98 Type C

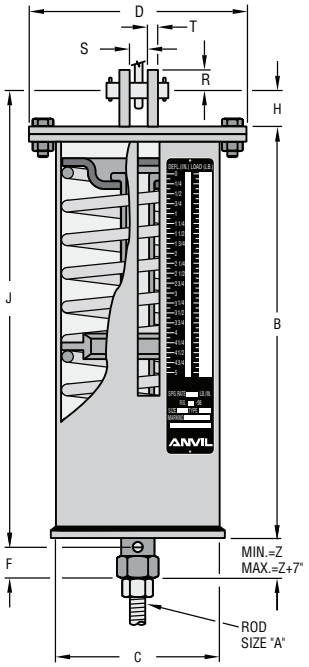


Fig. 98 Type D

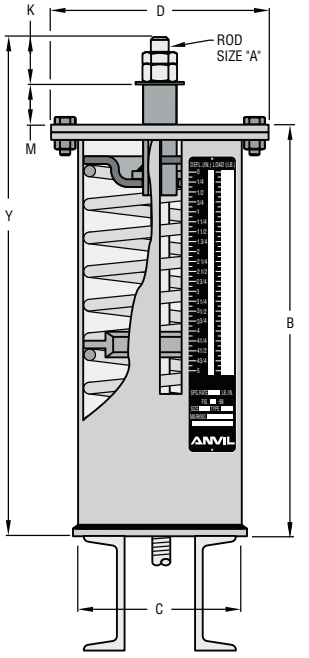


Fig. 98 Type E

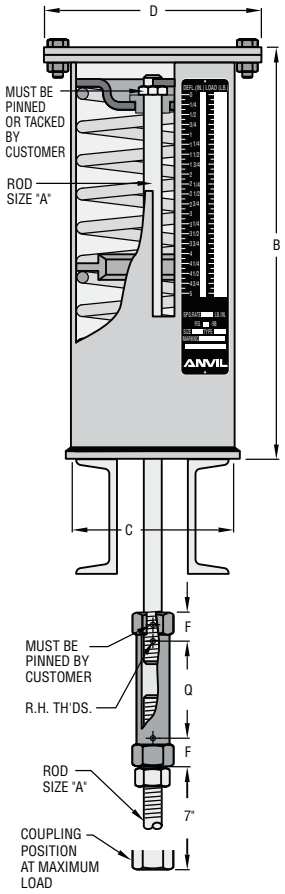


Fig. 98 Type F

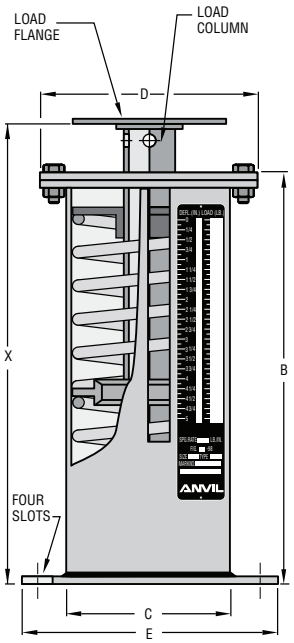
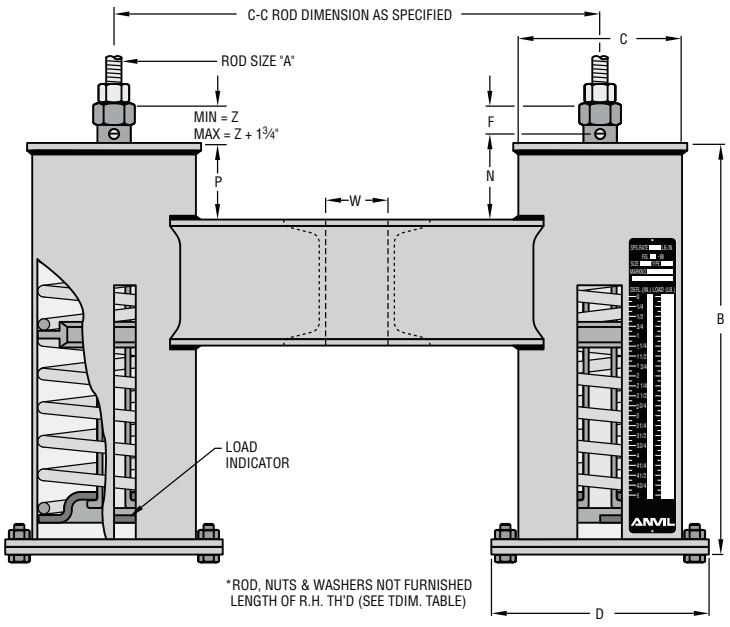


Fig. 98 Type G



The Anvil Variable Double Spring Hanger, Fig. 98, embodies all of the Fig. B-268 features and is designed to the same exacting specifications. Each basic unit consists of two springs arranged in series within a single casing. A centering guide is provided to assure the permanent alignment of the spring assembly. This hanger is offered in the seven basic types as shown here.

The load table and instructions for sizing and ordering this hanger may be found on page 142 through 145.

SPRING HANGERS

FIG. 98, C-98 DOUBLE SPRING: WEIGHT (LBS) • DIMENSIONS (IN)

Hanger Size	Rod Size A	R.H. Thread Length	Casing Length B	Casing Dia. C	Flange Dia. D	Min. Thread Engage F	Z	Rod Take Out By Type A	Rod Take Out By Type B, C	Rod Take Out By Type E	Rod Take Out By Type G	Type A Thread Depth G	Types B, C Lug Hole Size	Types B, C Pin Hgt H	Types B, C R	Types B, C Clevis Opening S	Types B, C Thk. T	Type D Rod Length Y	Type D Nut Allow. K	Type D Height Spacer M
								E	J	Q	N									
0	½	9	12⅝	4	5⅛	15/16	15/16	12 3/16	14⅛	9	1½	7/16	11/16	1½	1¼	⅞	¼	19⅜	1¼	5½
1			14⅜				15/16	13 15/16	15⅞		1½							21⅛		
2			15⅞				11/16	15 3/16	17⅛		1¼							22½		
3	½	9	14	5 9/16	6 15/16	15/16	13/16	13 7/16	15⅜	9	1⅞	7/16	11/16	1½	1¼	⅞	¼	20¾	1¼	5½
4			15¼				1 3/16	15 3/16	17⅛		2⅜							22		
5			16⅝				11/16	15 15/16	17⅞		1¾							23⅜		
6	⅝	9	16 11/16	6⅝	8⅜	15/16	13/16	15 15/16	18 1/16	9	1⅞	⅝	13/16	1½	1¼	1 1/16	¼	23 11/16	1½	5½
7			18⅝				1⅛	18 3/16	20 5/16		2 3/16							25⅝		
8			19 9/16				11/16	18 11/16	20 13/16		1¾							26 9/16		
9	¾	9	20 3/16	8⅝	10¾	1¼	15/16	18⅞	21⅜	9	2 11/16	1	15/16	1½	1¼	1¼	⅜	27 7/16	1¾	5½
10			22⅝				1	21⅜	23⅞		2¾							29⅞		
11		10	18¼				⅞	16⅞	19⅜	12	2⅝							25½		
12	1	10	19½	8⅝	10¾	1¼	⅝	17⅞	20⅞	12	3⅜	1	1¼	2	1½	1⅝	½	27¼	2¼	5½
13			24¾				¾	23¼	26¼		3½							32⅜		
14	1¼		24⅞				½	23⅛	27⅛		3¼		1½	3	2	2	⅝	33⅜	3	
15	1¼	10	24⅞	8⅝	10¾	1 15/16	½	23⅛	27⅛	12	3¼	1	1½	3	2	2	⅝	33¾	3	5½
16	1½	11	29⅞		11⅜		2	28 9/16	32 15/16	7	4 1/16	1⅜	1¾		2½	2⅜		38⅞	3½	
17	1¾	12	34				2⅛	32 13/16	37 3/16		4 3/16		2			2⅝	¾	43½	4	
18	2	12	33¼	12¾	15⅞	2¾	2 11/16	31⅛	37 3/16	7	4⅛	2¼	2⅜	4	3	2⅞	¾	43 3/16	4 9/16	5½
19	2¼	13	37¾				2 9/16	35½	42⅛		4		2⅝	4½		3⅛		48⅛	5	
20	2½	14	44¼				2 11/16	42⅛	48¾		4⅛		2⅞		4	3⅜	1	55 3/16	5 9/16	
21	2¾	14	49⅞	12¾	16⅞	3⅝	2 11/16	45 7/16	52 11/16	7	3 5/16	2¾	3⅛	4½	4	3⅝	1	60⅝	6¼	5½
22	3	15	62				3½	58⅛	66⅛		4⅛	3	3⅜	5		3⅞		73⅛	6⅝	

Hanger Size	Type F E' Bottom Flange Size Sq.	Type F E' Bottom Flange Bolt Circle Min	Type F E' Bottom Flange Bolt Circle Max	Type F Bottom Flange Bolts	Type F Bottom Flange Thick	Type F Load Col. Dia.	Type F Load Flange Dia.	Type F Load Flange Thick	Type F Length X ■ Min	Type F Length X ■ Max	Type G Channel Size (lbs/ft)	Type G Max C-C	Type G Space Between Channels - W	Type G P	Weight Type A,B,C	Weight Type D,E	Weight Type F	Weight Type G*
0	7½	7	8¾	⅝	¼	1.90	3⅞	3/16	14 3/16	16 3/16	C3 x 4.1	24	⅝	1½	12	12	20	37
1									15 15/16	17 15/16					14	14	21	41
2									17 7/16	19 7/16					16	16	23	45
3	7½	7	8¾	¾	¼	2.88	5¾	3/16	15⅝	17⅝	C3 x 4.1	30	¾	2	22	21	35	55
4									16⅞	18⅞					25	24	39	61
5									18¼	20¼					27	26	41	65
6	9	8	10⅞	¾	⅜	3.50	6⅜	¼	18⅜	20⅜	C3 x 4.1	36	1	2	41	40	62	93
7									20 5/16	22 5/16					49	48	72	109
8									21¼	23¼					61	52	75	133
9	13¼	10 9/16	16½	¾	½	4.50	8⅜	½	21⅞	23⅞	C4 x 5.4	36	1¼	3	97	94	136	207
10									24 5/16	26 5/16					114	108	150	241
11									19 15/16	21 15/16					96	95	134	209
12	13¼	10 9/16	16½	¾	½	4.50	8⅜	½	21 3/16	23 3/16	C5 x 6.7	36	1½	4	108	104	144	223
13									26 7/16	28 7/16					144	139	181	305
14									26 9/16	28 9/16		33			153	147	188	323
15	13¼	10 9/16	16½	¾	½	4.50	8⅜	½	26 9/16	28 9/16	C6 x 10.5	36	1½	4	172	163	201	368
16						2.00			31⅞	33⅞	C8 x 11.5		2⅛		218	202	241	462
17									36	38					273	247	287	572
18	17¼	15¾	22	¾	⅝	2.50	12½	½	35 5/16	37 5/16	C12 x 20.7	42	2⅜	4	512	477	550	1,056
19									39 13/16	41 13/16					600	548	624	1,231
20									46 5/16	48 5/16		40			802	723	807	1,633
21	17¼	15¾	22	¾	⅝	3.00	12½	½	51⅞	53⅞	C15 x 33.9	48	3⅛	4	940	845	872	1,965
22									64	66			3⅜		1,240	1,140	1,184	2,566

■ Hanger take-out or installed height. With pipe movement up, cold to hot, installed height should be the mid point between the minimum and maximum "X" dimension, plus thickness of load flange. With pipe movement down, cold to hot installed height should be mid-point between the minimum and maximum "X" dimension, plus the amount of vertical movement and load flange thickness. (Type F only).

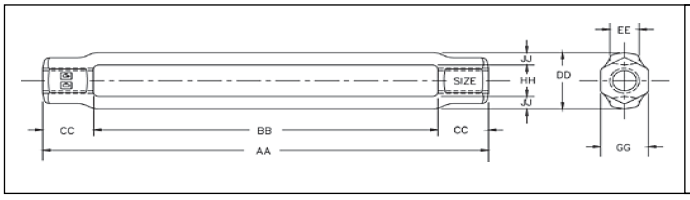
* Weight based on 24" center-to-center dimension. See page 150 for Type F roller and guided load column information.

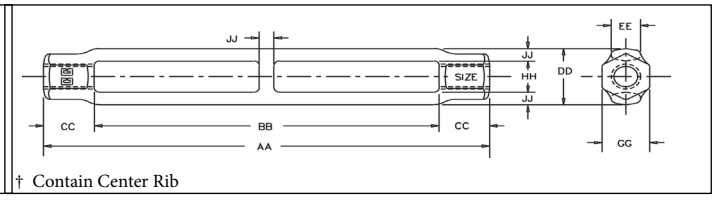
Attachment rods and nuts not furnished.

Turnbuckle- Body Only

HG-2510 BODY

- Heat treat by normalizing.
- Hot Dip galvanized.
- UNC threads
- Fatigue Rated.
- Meets the performance requirements of Federal Specifications FF-T-791b,Type 1, Form 1 - Class 2, except for those provisions required by the contractor.





† Contain Center Rib

Shank Dia. & Take Up (in.)	HG-2510 Stock No.	Working Load Limit (lbs)	Weight Each (lbs.)	Dimensions (in)							
				AA	BB	CC	DD	EE	GG	HH	JJ
* 1/4 x 4	1033893	500	.15	4.87	4.07	.40	.72	.34	.50	.38	.17
* 5/16 x 4-1/2	1033919	800	.22	5.59	4.58	.51	.82	.38	.56	.44	.19
* 3/8 x 6	1033937	1200	.29	7.29	6.10	.60	.88	.38	.63	.50	.19
1/2 x 6	1033955	2200	.70	7.70	6.03	.84	1.19	.68	.81	.63	.28
† 1/2 x 9	1033973	2200	1.03	11.03	9.36	.84	1.19	.68	.81	.63	.28
† 1/2 x 12	1033991	2200	1.27	14.03	12.36	.84	1.19	.68	.81	.63	.28
5/8 x 6	1034017	3500	1.11	8.02	6.03	1.00	1.43	.83	1.00	.75	.34
† 5/8 x 9	1034035	3500	1.59	11.38	9.39	1.00	1.43	.83	1.00	.75	.34
† 5/8 x 12	1034053	3500	1.96	14.38	12.39	1.00	1.43	.83	1.00	.75	.34
3/4 x 6	1034071	5200	1.50	8.26	6.13	1.07	1.74	.94	1.13	.94	.40
† 3/4 x 9	1034099	5200	2.17	11.72	9.59	1.07	1.74	.94	1.13	.94	.40
† 3/4 x 12	1034115	5200	2.66	14.72	12.59	1.07	1.74	.94	1.13	.94	.40
† 3/4 x 18	1034133	5200	3.63	20.66	18.53	1.07	1.74	.94	1.13	.94	.40
7/8 x 12	1034179	7200	3.61	14.62	12.16	1.23	2.00	1.13	1.31	1.06	.47
† 7/8 x 18	1034197	7200	5.27	21.09	18.63	1.23	2.00	1.13	1.31	1.06	.47
1 x 6	1034213	10000	3.32	9.00	6.18	1.41	2.45	1.25	1.50	1.25	.60
1 x 12	1034231	10000	5.34	15.00	12.18	1.41	2.45	1.25	1.50	1.25	.60
1 x 18	1034259	10000	7.35	21.00	18.18	1.41	2.45	1.25	1.50	1.25	.60
† 1 x 24	1034277	10000	9.85	27.66	24.84	1.41	2.45	1.25	1.50	1.25	.60
1-1/4 x 12	1034339	15200	5.72	15.40	12.06	1.67	2.62	1.25	1.88	1.50	.56
1-1/4 x 18	1034357	15200	7.58	21.40	18.06	1.67	2.62	1.25	1.88	1.50	.56
† 1-1/4 x 24	1034375	15200	9.45	27.96	24.62	1.67	2.62	1.25	1.88	1.50	.56
1-1/2 x 12	1034437	21400	8.01	15.82	12.32	1.75	2.99	1.50	2.25	1.75	.62
1-1/2 x 18	1034455	21400	10.4	21.82	18.32	1.75	2.99	1.50	2.25	1.75	.62
† 1-1/2 x 24	1034473	21400	12.9	28.45	24.94	1.75	2.99	1.50	2.25	1.75	.62
1-3/4 x 18	1034552	28000	15.7	22.44	18.37	2.04	3.62	1.75	2.62	2.12	.75
1-3/4 x 24	1034570	28000	19.2	28.44	24.37	2.04	3.62	1.75	2.62	2.12	.75
2 x 24	1034632	37000	25.8	29.13	24.48	2.33	4.14	2.00	3.00	2.38	.88
2-1/2 x 24	1034678	60000	55.9	31.66	24.60	3.53	5.62	2.75	3.88	3.12	1.25
2-3/4 x 24	1034696	75000	54.0	31.66	24.65	3.51	5.62	2.75	3.88	4.48	1.25

* Mechanical Galvanized
† Contains Center Rib for additional body support.

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Crosby® Turnbuckles



HG-223
Hook & Hook

Meets the performance requirements of Federal Specifications FF-T-79lb, Type 1, Form 1 - Class 5, and ASTM F-1145, except for those provisions required of the contractor.



HG-225
Hook & Eye

Meets the performance requirements of Federal Specifications FF-T-79lb, Type 1, Form 1 - Class 6, and ASTM F-1145, except for those provisions required of the contractor.



HG-226
Eye & Eye

Meets the performance requirements of Federal Specifications FF-T-79lb, Type 1, Form 1 - Class 4, and ASTM F-1145, except for those provisions required of the contractor.



HG-227
Jaw & Eye

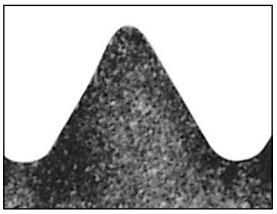
Meets the performance requirements of Federal Specifications FF-T-79lb, Type 1, Form 1 - Class 8, and ASTM F-1145, except for those provisions required of the contractor.



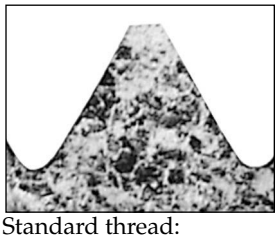
HG-228
Jaw & Jaw

Meets the performance requirements of Federal Specifications FF-T-79lb, Type 1, Form 1 - Class 7, and ASTM F-1145, except for those provisions required of the contractor.

- Turnbuckle assembly combinations include: Eye and Eye, Hook and Hook, Hook and Eye, Jaw and Jaw & Jaw and Eye.
- End fittings are Quenched and Tempered or Normalized, bodies heat treated by normalizing.
- Crosby's Quenched and Tempered end fittings and normalized bodies have enhanced impact properties for greater toughness at all temperatures.
- Hot Dip galvanized.
- Hooks are forged with a greater cross sectional area that results in a stronger hook with better fatigue properties.
- Modified UNJ thread on end fittings for improved fatigue properties. Body has UNC threads.
- Turnbuckle eyes are forged elongated, by design, to maximize easy attachment in system and minimize stress in the eye. For turnbuckle size 1/4" through 2-1/2" a shackle one size smaller can be reeved through eye.
- Forged jaw ends are fitted with bolts and nuts on size 1/4" - 5/8", and pins and cotter on sizes 3/4" through 2-3/4".
- TURNBUCKLES RECOMMENDED FOR STRAIGHT OR IN-LINE PULL ONLY.
- Lock Nuts available for all sizes.
- Typical hardness levels, Tensile Strengths and Ductility Properties are available for all sizes.
- Turnbuckles can be furnished proof tested or magnaflux inspected with certificates if requested at time of order.
- Meets or exceeds all the requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements. Importantly, these turnbuckles meet other critical performance requirements including fatigue life, impact properties and material traceability, not addressed by ASME B30.26.



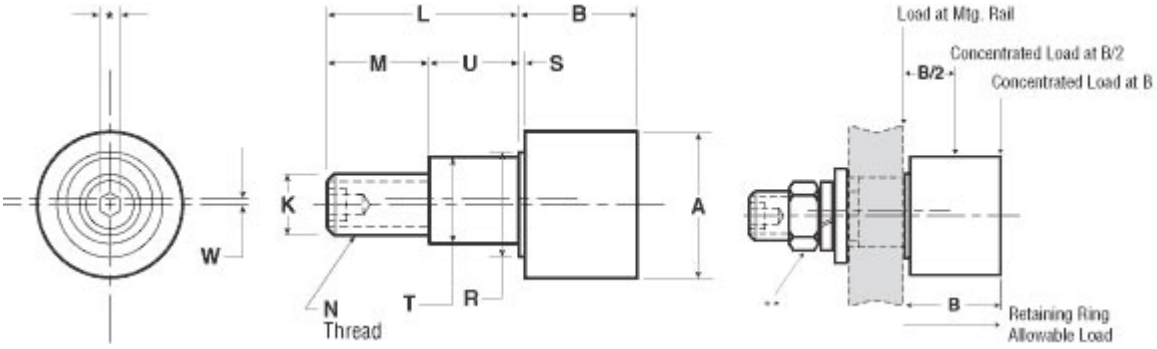
Modified thread:
Note stress relieving radii in this unretouched photo enlargement of the supabuckle.



Standard thread:
Note stress building sharp "V" in this untouched photo enlargement.

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Plain Eccentric Stud



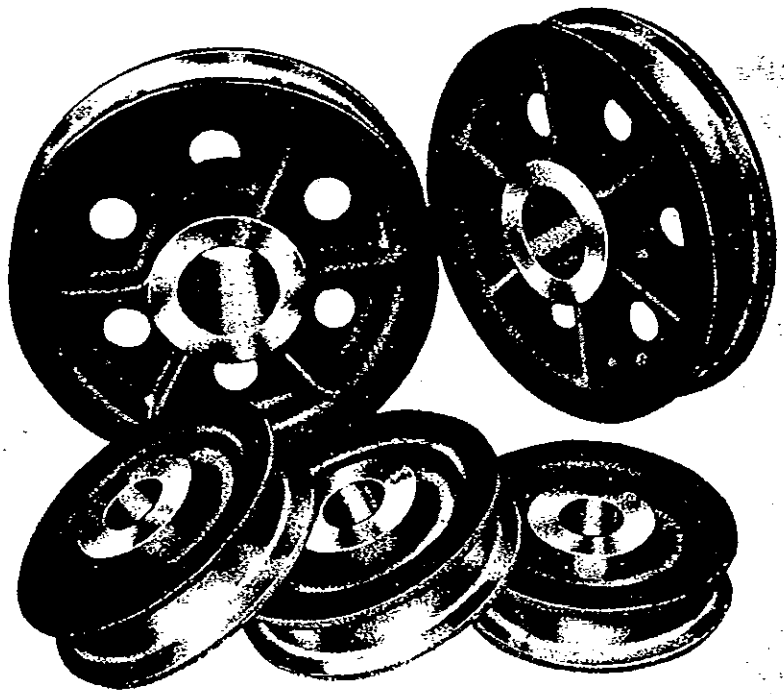
Item No.	95876
Description	PLRE-3
Detail	
List Price	$ 139.60
Wt Std Pk lbs	4.5 lbs
Std Pk	1
Type	LR Imperial
Brand	Osborn
Part Number	PLRE-3
Scale	Imperial
A Roller Dia In	3 In
A Tolerance	+0.000 -0.001
B Roller Width In	2 In
K Stud Dia In	1-1/4 In
L Stud Length In	2-1/2 In
M Thread Length In	1.27 In
N Thread	1 1/4-12
R Shoulder Dia In	2.312 In
S Shoulder Length In	0.062 In
T Eccentric Dia In	1-3/4 In
U Eccentric Length In	1.23 In
W Eccentricity In	0.06 In
Recommended Mounting Hole Size In	1.752 In
Recommended Mounting Hole Tolerance	+0.000 -0.001
Approx Wt lbs	4.5 lbs
Bearing	TRB
Radial Capacity 3000hrs L10 Life @100 RPM lbs	6000 lbs
Radial Capacity 500hrs L10 Life @33-1/3 RPM lbs	14270 lbs
Radial Capacity Static Limit lbs	20000 lbs
Thrust Capacity Static Limit lbs	12000 lbs
Mounting Member Thickness Max In	1-3/8 In
Mounting Member Thickness Min In	1-1/4 In
Stud Capacity Bend @B/2 lbs	12430 lbs
Stud Capacity Bend @B lbs	6370 lbs
Stud Capacity Shear lbs	40500 lbs

PLRE-3 Data Sheet Page

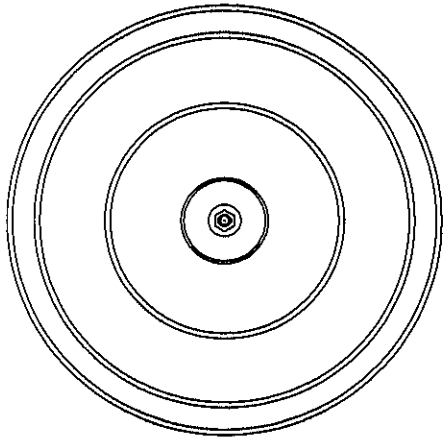
Plain Eccentric Stud General Data Sheet Page

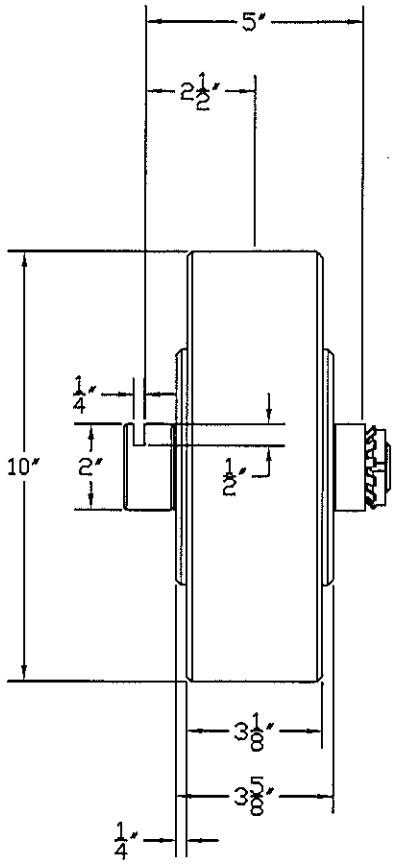
US CRANE & HOIST CO.
LOS ANGELES CALIFORNIA, U.S.A.

CRANE WHEELS AND WHEEL ASSEMBLIES



TELEPHONE (213) 589-6061 FAX (213) 589-6066





PART NO.	NO. REQD	BILL OF MATERIAL	SHEET NO.	65
		DOWNS PIN & KEEPER TIMKEN Ø10" FLAT TREAD		

DOWNS CRANE & HOIST COMPANY
EQUIPMENT DESIGN • MANUFACTURERS
LOS ANGELES, CALIFORNIA

DES FOR STOCK S.O. — W.O. —
DRN. BY RCV DATE 4/9/07 CH. BY SCALE HALF
SHEET NO. 1 OF 1 A-4-TIM DROP 412574
FILE NAME

REVISIONS	BY	DATE

M3-PN147005 4.37 - Shutter Bogie

Back

Product Detail



20PA 3-1/2"X2"X4' RACK
R204X4

UPC: 697950058986

Martin Rack is made from low carbon cold drawn steel. It is available in 14 1 / 2 ° and 20° pressure angle in 2, 4, and 6 foot lengths. Allowance is made for cutting and machining. Pinions to run with the rack may be selected from the Spur Gear section of the catalog. Special rack can be supplied in other materials, sizes, and pitches. Each Martin facility can mill and match rack for longer continuous runs.

Product Specifications | Misc Info

Storage Dimension Length	4.000 in.	Storage Dimension Height	2.000 in.
Storage Dimension Width	3.500 in.	Weight	84.00 lbs.

Back

Product Detail



20PA 3-1/2"X2"X4' RACK
R204X4

UPC: 697950058986

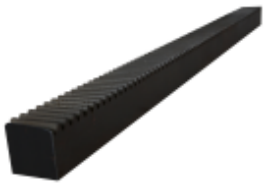
Martin Rack is made from low carbon cold drawn steel. It is available in 14 1 / 2 ° and 20° pressure angle in 2, 4, and 6 foot lengths. Allowance is made for cutting and machining. Pinions to run with the rack may be selected from the Spur Gear section of the catalog. Special rack can be supplied in other materials, sizes, and pitches. Each Martin facility can mill and match rack for longer continuous runs.

Product Specifications | Misc Info

Material	Steel	Face Width	3.500 in.
Diametral Pitch	4	Overall Thickness	2.000 in.
Pressure Angle (Degrees)	20.000 deg.	Pitch Line Backing	1.750 in.
Length	48.000 in.		

Back

Product Detail



20PA 3-1/2"X2"X6' RACK
R204X6

UPC: 697950059020

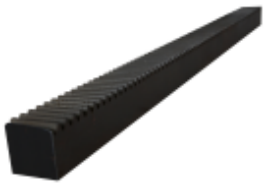
Martin Rack is made from low carbon cold drawn steel. It is available in 14 1 / 2 ° and 20° pressure angle in 2, 4, and 6 foot lengths. Allowance is made for cutting and machining. Pinions to run with the rack may be selected from the Spur Gear section of the catalog. Special rack can be supplied in other materials, sizes, and pitches. Each Martin facility can mill and match rack for longer continuous runs.

Product Specifications | Misc Info

Storage Dimension Length	6.000 in.	Storage Dimension Height	2.000 in.
Storage Dimension Width	3.500 in.	Weight	126.00 lbs.

Back

Product Detail



20PA 3-1/2"X2"X6' RACK
R204X6

UPC: 697950059020

Martin Rack is made from low carbon cold drawn steel. It is available in 14 1 / 2 ° and 20° pressure angle in 2, 4, and 6 foot lengths. Allowance is made for cutting and machining. Pinions to run with the rack may be selected from the Spur Gear section of the catalog. Special rack can be supplied in other materials, sizes, and pitches. Each Martin facility can mill and match rack for longer continuous runs.

Product Specifications | Misc Info

Material	Steel	Face Width	3.500 in.
Diametral Pitch	4	Overall Thickness	2.000 in.
Pressure Angle (Degrees)	20.000 deg.	Pitch Line Backing	1.750 in.
Length	72.000 in.		

INDUCTIVE SENSOR
QUICK SELECTION GUIDE

	Product Family	Product Features	Housing Diameter/ Dimensions (mm)	Sensing Range Shielded (mm)	Sensing Range Unshielded (mm)	Enclosure Ratings	2-wire DC	3-wire DC	4-wire DC	2-wire AC	2-wire AC/DC
General Purpose	**872C WorldProx™** 	• Nickel-plated brass barrel with plastic face • Standard length and short barrel versions (3-wire DC versions) • Extended range versions available (3-wire DC and 2-wire AC) • Wide variety of cable and connector options	6.5	2 & 3	3	IP67	✔	✔	✔	✔	✔
			8	2 & 3	3, 4, 6						
			12	3, 4, 6	4, 8, 10						
			18	5, 8, 12	8, 12, 20						
			30	10, 15, 22	15, 20, 40						
	872C/871C Plastic Housing 	• Plastic barrel and sensing face • Cable and QD models (AC units only available with cable) • AC units available in 871C product family	12	3	4	IP67		✔		✔	
			18	5	8						
			30	10	15						
Harsh Duty	**871TM** 	• Rugged stainless steel 304 barrel and sensing face • Extended Range units available (3-wire DC versions) • Wide variety of sensing types available (standard inductive, submersible units, low energy AC/DC units, and intrinsically safe versions)	8	3	6	All units IP67 & 1200 psi wash down rated (Selected units meet IP69K)	✔	✔		✔	✔
			12	2 & 6	4 & 10						
			18	5 & 10	8 & 20						
			30	10 & 20	15 & 40						
	871T Ferrous 	• Rugged stainless steel 304 barrel and sensing face • Ferrous versions only sense ferrous materials	18	5	NA	All units IP67				✔	
Food & Beverage	**871TS** 	• Stainless steel 316L barrel and FDA approved PPS plastic sensing face • ECOLAB certified • Extended temperature ratings (-40˚ to 100 ˚C) • Extended range units available • Laser engraved part numbers • Threaded or smooth barrel	12	2 & 4	4 & 8	IP67, IP68 & IP69K					
			18	5 & 8	8 & 12			✔			
	871T 	• Stainless steel 304 barrel with plastic sensing face • AC housing and sensing face constructed of stainless steel 304 • Extended low end temperature ratings (-40˚ to 70 ˚C)	12	2	4	IP67		✔		✔	
			18	5	8						
	871C Extended Temperature 	• Nickel-plated brass barrel and plastic sensing face • Operating temperature from -40˚ to 100 ˚C • PUR cable and QD connector options	12	2	4	IP67		✔			
			18	5	8						
			30	10	15						
Hazardous Locations	**871C NAMUR** 	• Conform to NAMUR specifications (DIN 19 234) • Sensors are appropriate for intrinsically safe applications when used with NAMUR style isolators/amplifiers	8	1	2	IP67	✔				
			12	2	4						
			18	5	8						
			30	10	15						

Specialty Solutions

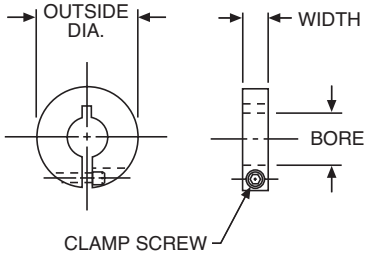
871D WorldClamp™ 	• Designed for use in power clamp and gripper applications to indicate open and closed position • Weld Field Immune • 2 different sensor head styles • 3-wire DC and 2-wire AC/DC versions	**871D Cylinder Position Indicator** 	• Designed to detect the extended or retracted position of a hydraulic or pneumatic cylinder • Weld Field Immune • Multiple probe lengths to accommodate different size cylinders • 3-wire DC and 2-wire AC/DC versions

Clamping Collars

CSC/CSSC/CASC Series

1 Piece Type Steel, Stainless Steel and Aluminum





STANDARD TOLERANCES

DIMENSIONS		TOLERANCE
Bore	All	+ .003 – .000

DESIGN PROVIDES CONVENIENT SETTING, ADJUSTING AND REMOVAL prevents shaft damage
OSHA CONFORMANCE collars have completely recessed screw head.
BORE THREADS FROM 1/8" TO 3"

ALL DIMENSIONS IN INCHES
ORDER BY CATALOG NUMBER OR ITEM CODE

Bore	O.D.	Width	Clamp Screws	Steel		Stainless Steel		Aluminum	
				Catalog Number	Item Code	Catalog Number	Item Code	Catalog Number	Item Code
1/8	13/16	1/4	4-40	CSC12	49000	CSSC12	49094	—	—
3/16				CSC18	49001	CSSC18	49095	CASC18	49048
1/4				CSC25	49002	CSSC25	49096	CASC25	49049
5/16				CSC31	49003	CSSC31	49097	CASC31	49050
3/8	1-1/16	5/16	6-32	CSC37	49004	CSSC37	49098	CASC37	49051
7/16				CSC43	49005	CSSC43	49099	—	—
1/2	1-1/4	3/8	8-32	CSC50	49006	CSSC50	49100	CASC50	49053
9/16				CSC56	49007	CSSC56	49101	CASC56	49054
5/8	1-1/2	13/32	10-32	CSC62	49008	CSSC62	49102	CASC62	49055
11/16				CSC68	49009	—	—	—	—
3/4	1-3/4			CSC75	49010	CSSC75	49104	CASC75	49057
13/16				CSC81	49011	—	—	—	—
7/8	1-7/8			CSC87	49012	CSSC87	49106	CASC87	49059
15/16				CSC93	49013	CSSC93	49107	—	—
1	2			CSC100	49014	CSSC100	49108	CASC100	49061
1-1/16				CSC106	49015	CSSC106	49109	—	—
1-1/8	2-1/8	1/2	1/4-28	CSC112	49016	CSSC112	49110	CASC125	49065
1-3/16				CSC118	49017	CSSC118	49111	—	—
1-3/8	2-3/8			CSC137	49020	—	—	—	—
1-5/16				CSC143	49021	CSSC143	49115	—	—
1-1/2	2-1/2			CSC150	49022	CSSC150	49116	CASC150	49069
1-9/16				CSC156	49023	—	—	—	—
1-5/8	3			CSC162	49024	—	—	—	—
1-11/16				CSC168	49025	—	—	—	—
1-3/4				CSC175	49026	—	—	CASC175	49073
1-7/8	3-1/4	5/8	5/16-24	CSC187	49028	—	—	—	—
1-15/16				CSC193	49029	CSSC193	49123	—	—
2				CSC200	49030	CSSC200	49124	CASC200	49077
2-3/16	3-1/2			CSC218	49033	—	—	—	—
2-1/4				CSC225	49034	—	—	—	—
2-3/8				CSC237	49036	—	—	—	—
2-7/16	4			CSC243	49037	—	—	—	—
2-1/2				CSC250	49038	—	—	—	—
2-5/8	4-1/4	3/4	3/8-24	CSC262	49040	—	—	—	—
2-11/16				CSC268	49041	—	—	—	—
2-3/4				CSC275	49042	—	—	—	—
2-7/8	4-1/2			CSC287	49044	—	—	—	—
2-15/16				CSC293	49045	—	—	—	—
3				CSC300	49046	—	—	—	—

Materials

Steel—Low Carbon
Black Oxide Finish Stainless—Type 303 Austenitic

Load Data

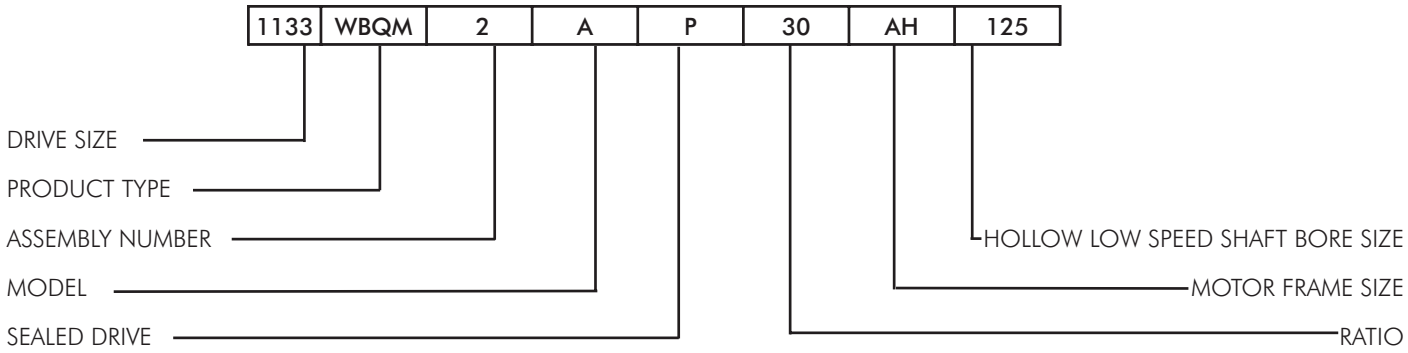
Capacity is based on a standard steel, one-piece collar mounted with recommended screw torque on a lightly oiled shaft. Capacity is load to move collar .010". Data shown is for guidance only. In applications involving control of axial loads, capacity should be determined experimentally on actual parts involved.

DIMENSION IN INCHES

Bore	Axial Load Capacity (Lbs.)	Screw Size	Recommended Screw Torque (Lb. Ins.)	
			Steel	Stainless Steel
1/8-5/16	400	4-40	20	16
3/8-7/16	600	6-32	30	24
1/2-9/16	1400	8-32	55	35
5/8-11/16	1800	10-32	90	72
3/4-1-9/16	4000	1/4-28	220	170
1-5/8-2-3/8	6500	5/16-24	435	340
2-7/16-3	8500	3/8-24	710	550

E

Drive Nomenclature



Drive Size (Shaft Centers)

1133 = 1.33	1262 = 2.62	1525 = 5.25
1154 = 1.54	1300 = 3.00	1600 = 6.00
1175 = 1.75	1325 = 3.25	1700 = 7.00
1206 = 2.06	1326 = 3.26	1800 = 8.00
1238 = 2.38	1425 = 4.25	11000 = 10.00

Product Type ✷

Expressed 2 to 5 letters, including Primary Type, Output Shaft, and Motor Flange, as required.
WB — Basic drive without Feet (Single Reduction)
WU — Worm Under (Horizontal LSS)
WO — Worm Over (Horizontal LSS)
WX — Vertical Low Speed Shaft
WJ — Vertical High Speed Shaft (Horizontal LSS)
WL — Flange Mounted drive
WR — Extended Output Shaft

Primary/Type

H — Helical drives (Double Reduction)
W — Worm drives (Double Reduction)

Output Shaft

Q — Hollow Low Speed Shaft

Motor Flange

F — Flange Mounted Electric Motor with Coupling
M — Flange Mounted Electric Motor without Coupling (Hollow Input Shaft)

Assembly Number

See Individual Dimension Pages

Model

A, B, C, etc.
S — Modified or Special

Sealed Drive

P — Sealed Drive with Pressure Compensation System & Synthetic Lube.
- — Standard Drive (Not Sealed)

Ratio

Nominal Ratio Expressed 1 to 4 digits, as required

Motor Frame Size

NEMA Frame Sizes
AH— 48C
AA— 56C
AB— 140TC
AC— 180TC
AD— 210TC
AE — 250TC

IEC Frame Sizes
GA — 63D
GB — 71D
GD — 80D
GF — 90D
GH — 100LD
GK — 112D
GM— 132D

Hollow Low Speed Shaft Bore Size

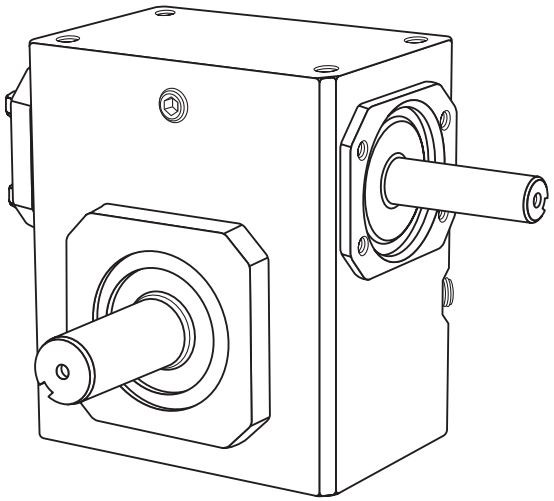
For Sizes 1133-1525, Output Shaft= "Q" Drives Only (Decimal Omitted)

(See Page 5 for footnotes.)

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Selection Guide *

Drivers with Solid Input Shaft and Solid Output Shaft



Single Reduction

Selections — Pages 22 through 27
Dimensions — Pages 28 through 51

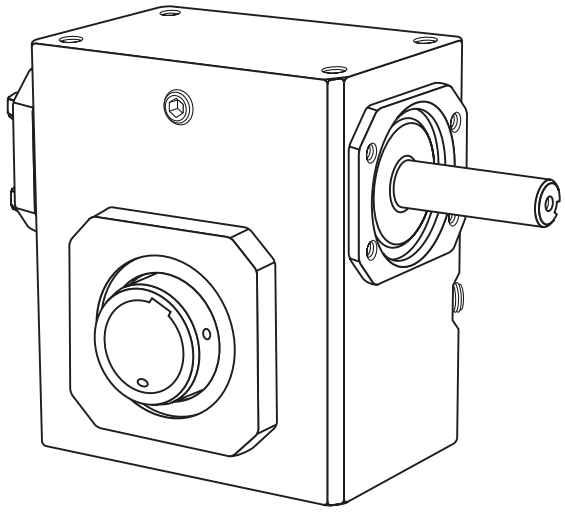
Double Reduction Worm-Worm

Selections — Pages 52 through 57
Dimensions — Pages 58 through 81

Double Reduction Helical-Worm

Selections — Pages 82 through 85
Dimensions — Pages 86 through 117

Drivers with Solid Input Shaft and Hollow Output Shaft



Single Reduction

Selections — Pages 22 through 27
Dimensions — Pages 28 through 51

Double Reduction Worm-Worm

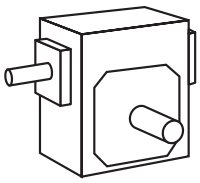
Selections — Pages 52 through 57
Dimensions — Pages 58 through 81

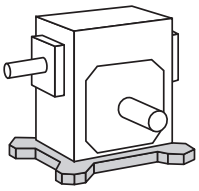
Double Reduction Helical-Worm

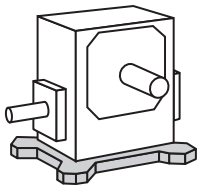
Selections — Pages 82 through 85
Dimensions — Pages 86 through 117

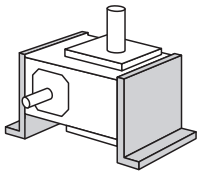
(See Page 5 for footnotes.)

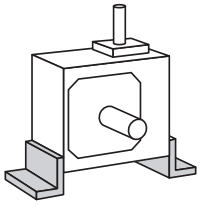
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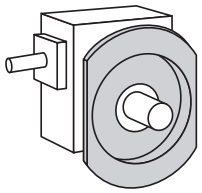

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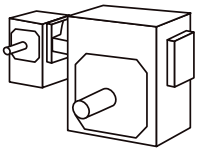

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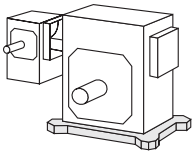

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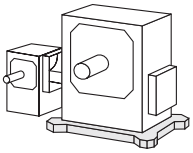

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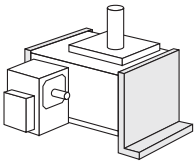

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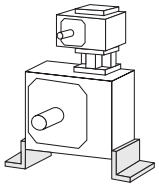

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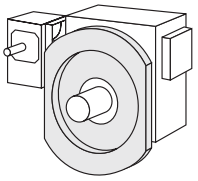

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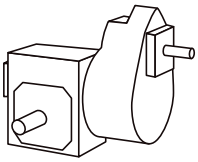

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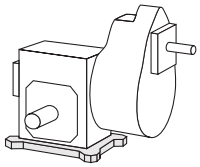

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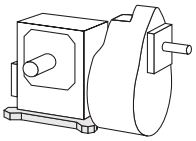

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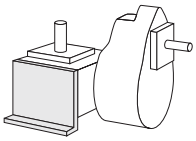

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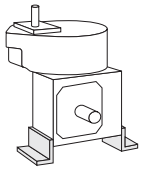

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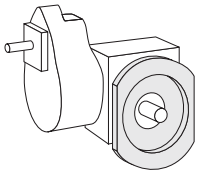

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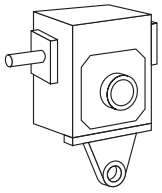

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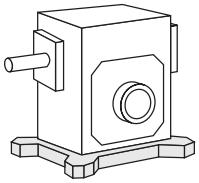

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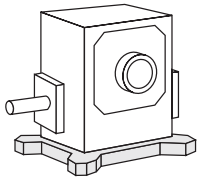

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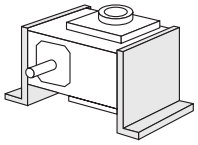

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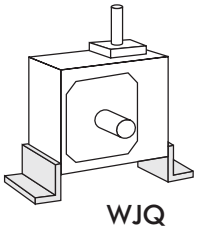

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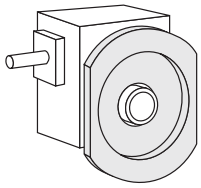

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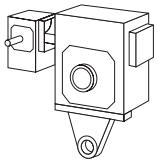

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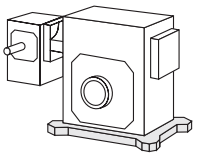

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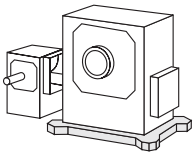

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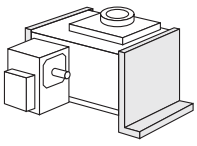

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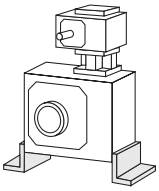

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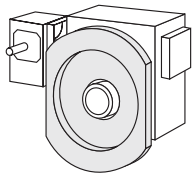

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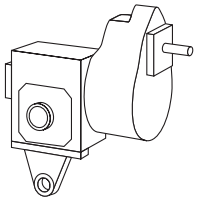

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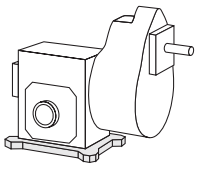

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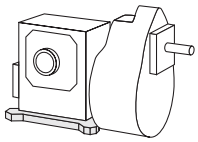

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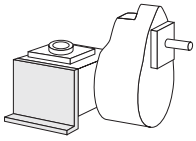

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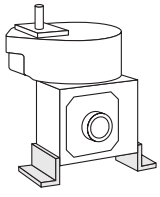

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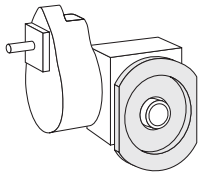

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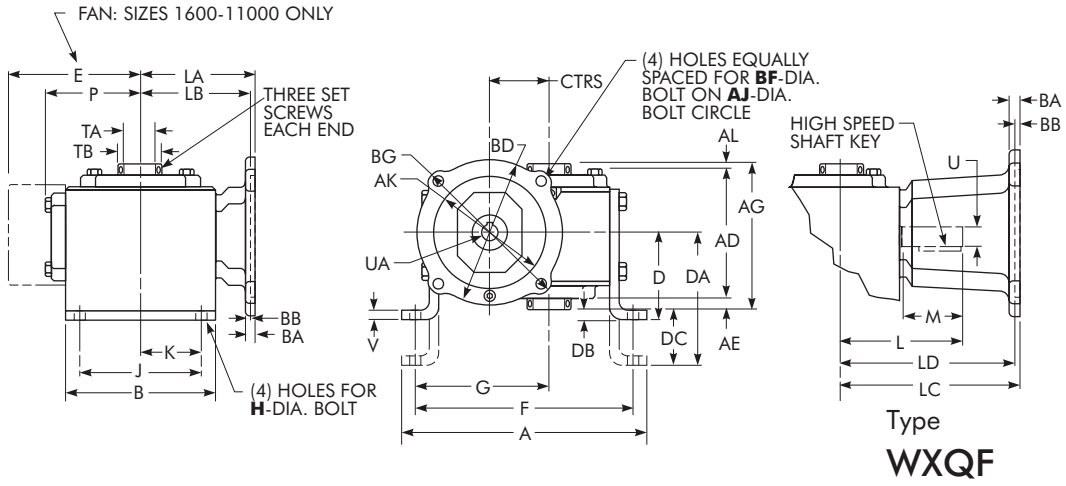

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WJHQ


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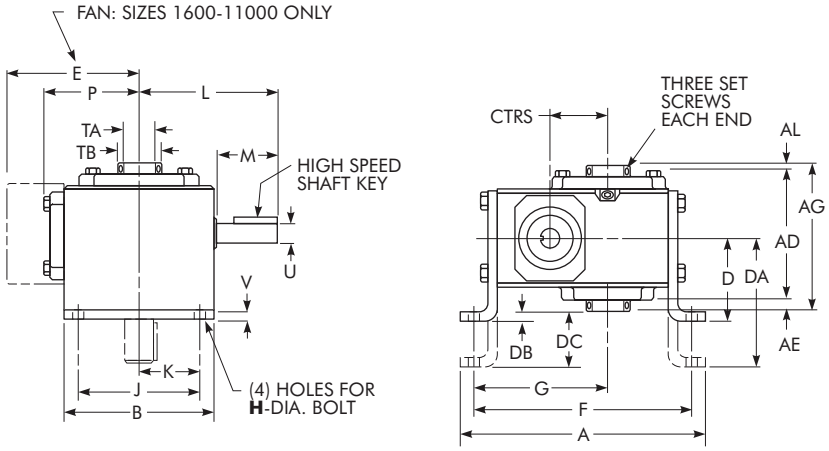
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Type
WXQM



Type
WXQF

Type
WXQ



SEE PAGE 43 FOR MOTOR MOUNTING DIMENSIONS.

(Continued from preceding page)

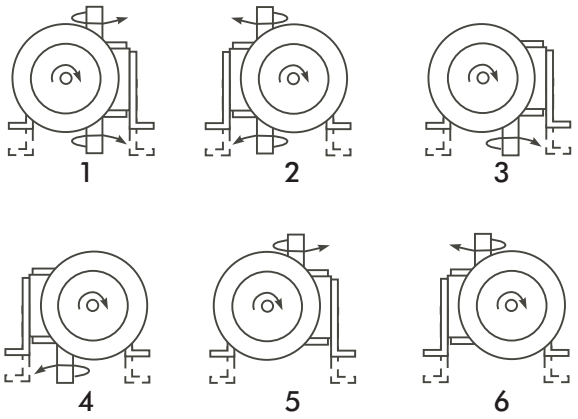
DRIVE SIZE ★	Hollow Low Speed Shaft			High Speed Shaft		V	AD	AE	AG	AL	DA	DB	DC	Approx. Wt – lb					
	TA Max ■ +.002 −.000	TB	Key	U −.0005 −.0015	Key									WXM	WXF	WX	WXQM	WXQF	WXQ
1133	.625	1.00	.188 x .188 x 1.25	.5000	.125 x .125 x 1.44	.25	3.90	.53	4.75	.32	3.56	.25	1.19	20	25	18	20	25	18
1154	.625	1.00	.188 x .188 x 1.25	.6250	.188 x .188 x 1.50	.25	4.61	.51	5.42	.30	4.38	.29	1.87	26	31	24	26	31	24
1175	1.000	1.44	.250 x .250 x 2.50	.6250	.188 x .188 x 1.50	.25	4.73	.49	5.50	.28	4.38	.25	1.63	27	33	26	27	33	26
1206	1.438	1.94	.375 x .375 x 3.00	.6250	.188 x .188 x 1.50	.38	4.99	.61	6.00	.40	4.88	.13	1.88	48	42	35	48	42	35
1238	1.438	1.94	.375 x .375 x 3.00	.7500	.188 x .188 x 1.75	.38	5.18	.51	6.00	.31	5.25	.38	2.25	54	55	46	54	55	46
1262	1.438	1.94	.375 x .375 x 3.00	.7500	.188 x .188 x 1.75	.38	6.01	.60	7.00	.39	5.56	.13	2.06	70	71	62	70	71	62
1300	1.938	2.51	.500 x .500 x 3.00	.8750	.188 x .188 x 1.75	.38	6.53	.60	7.50	.36	5.88	.19	2.13	94	105	90	94	105	90
1325	1.938	2.51	.500 x .500 x 3.00	.8750	.188 x .188 x 1.75	.38	7.04	.54	7.88	.29	6.25	.75	2.31	97	108	93	97	108	93
1425	2.188	2.75	.500 x .500 x 3.00	1.2500	.250 x .250 x 2.88	.50	7.53	.63	8.50	.34	7.50	.75	3.25	174	182	164	174	182	164
1525	3.438	4.26	.875 x .875 x 4.00	1.2500	.250 x .250 x 3.00	.50	8.85	.97	10.50	.68	9.16	–.09	3.91	282	289	267	282	289	267
1600	3.438	4.18	.875 x .875 x 4.00	1.5000	.375 x .375 x 3.00	.50	10.52	.52	11.50	.52	9.63	1.56	3.88	371	378	348	371	378	348
1700	3.938	4.92	1.000 x 1.000 x 7.00	1.6250	.375 x .375 x 2.87	.75	11.36	1.09	13.50	1.09	. . .	.25	. . .	. . .	500	470	. . .	500	470
1800	4.438	5.55	1.000 x 1.000 x 7.00	1.8750	.500 x .500 x 2.81	.75	12.48	1.03	14.50	1.03	. . .	.75	. . .	. . .	690	660	. . .	690	660
11000	5.438	6.67	1.250 x 1.250 x 12.00	2.2500	.500 x .500 x 3.69	1.00	15.78	1.39	18.50	1.39	. . .	–.25	. . .	. . .	. . .	1060	. . .	. . .	1060

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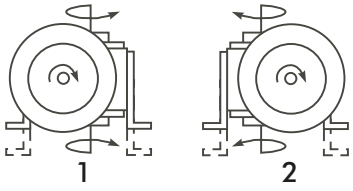
Assemblies ✷

Reverse all arrows for opposite rotation of high speed shaft.

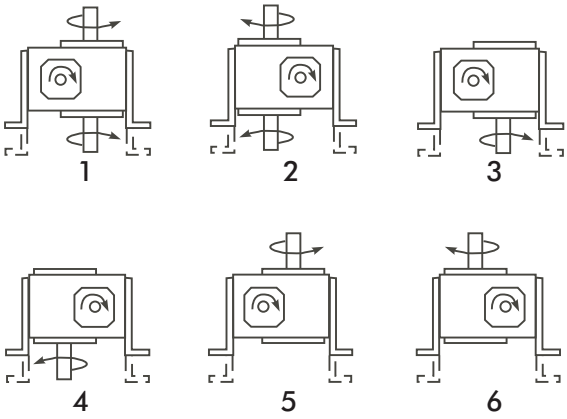
WXM & WXF



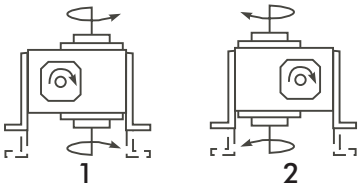
WXQM & WXQF



WX



WXQ



(See Page 5 for footnotes.)

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NOMENCLATURE



S-2000

S E P2B - S2 - 207 - R E

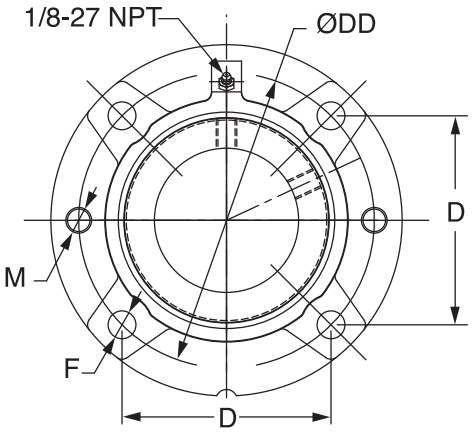
	HOUSING STYLE	BEARING TYPE	SIZE	SEAL	OTHER DATA
"E" prefix denotes Type E dimensioned housing with S2000 spherical roller bearing insert *	P2B = Pillow Block 2-Bolt Base, Cast Iron	S2 = S-2000	Inches and 16th	R = TRIDENT Triple Lip Rubbing Seal	E = Expansion Type Bearing - If "E" Does Not Appear, Bearing Is Non Expansion Type
"S" prefix denotes cast steel housing	P4B = Pillow Block 4-Bolt Base, Cast Iron		2 = 2"	L = Labyrinth Metallic Seal	
	F3R = Flange Bearing 3-Bolt, Cast Iron, Round		07 = 7/16"		
	F4S = Flange Bearing 4-Bolt, Cast Iron, Square		207 = 2-7/16"		
	F4R = Flange Bearing 4-Bolt, Cast Iron, Round				
	FC = Piloted Flanged (Flanged Cartridge)				
	WSTU = Wide Slot Take-Up Bearing For Use In Center-Pull Frames				
	TPHU = TPHU Take-up Bearing For Use In TPHU Or Top Angle Take-Up Frames				

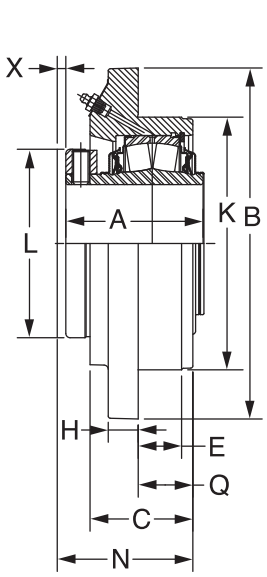
* Available in two or four bolt pillow blocks, four bolt square flanges and piloted flanges

FEATURES/BENEFITS PAGE B12-2	SPECIFICATION PAGE B12-4	SELECTION PAGE B12-7	DIMENSIONS PAGE B12-14

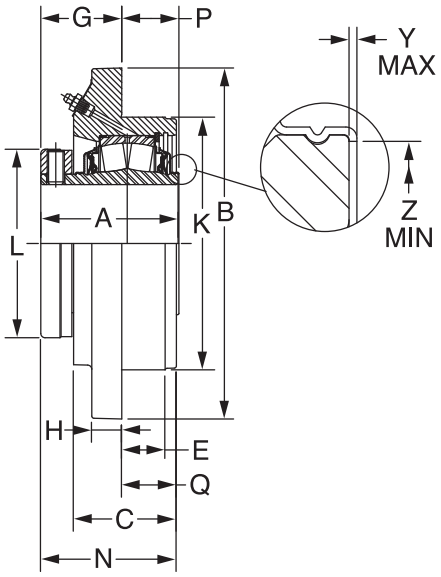
DIMENSIONS

S-2000 Piloted Flange with Type E Dimensions

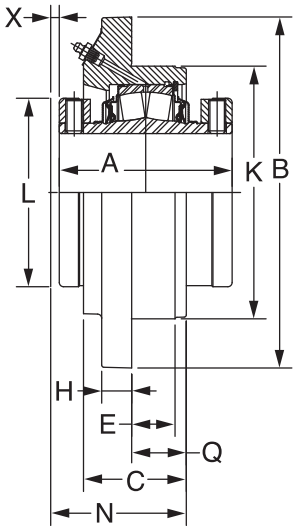




EXPANSION

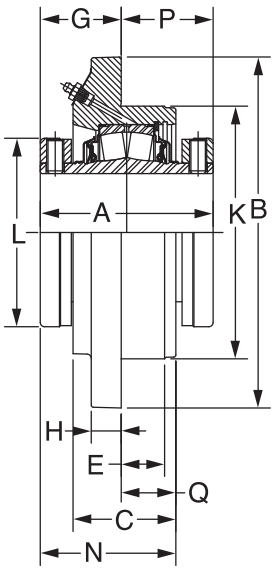


NON-EXPANSION



4-7/16 THRU 5" CONSTRUCTION

EXPANSION



4-7/16 THRU 5" CONSTRUCTION

NON-EXPANSION

DIMENSIONS



S-2000 Piloted Flange with Type E Dimensions

Bearing Series	Shaft Size*	TRIDENT SEAL				Labyrinth Seal			
		Non Expansion		Expansion		Non Expansion		Expansion	
		Part No.	Part Name	Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
22208	1-3/8	**070644**	FC-S2-106R	**070671**	FC-S2-106RE	**070698**	FC-S2-106L	**070725**	FC-S2-106LE
	1-7/16	**070645**	FC-S2-107R	**070672**	FC-S2-107RE	**070699**	FC-S2-107L	**070726**	FC-S2-107LE
22209	1-11/16	**070648**	FC-S2-111R	**070675**	FC-S2-111RE	**070702**	FC-S2-111L	**070729**	FC-S2-111LE
22210	1-15/16	**070650**	FC-S2-115R	**070677**	FC-S2-115RE	**070704**	FC-S2-115L	**070731**	FC-S2-115LE
	2	**070651**	FC-S2-200R	**070678**	FC-S2-200RE	**070705**	FC-S2-200L	**070732**	FC-S2-200LE
22211	2-3/16	**070652**	FC-S2-203R	**070679**	FC-S2-203RE	**070706**	FC-S2-203L	**070733**	FC-S2-203LE
22213	2-7/16	**070654**	FC-S2-207R	**070681**	FC-S2-207RE	**070708**	FC-S2-207L	**070735**	FC-S2-207LE
22215	2-11/16	**070656**	FC-S2-211R	**070683**	FC-S2-211RE	**070710**	FC-S2-211L	**070737**	FC-S2-211LE
	2-15/16	**070657**	FC-S2-215R	**070684**	FC-S2-215RE	**070711**	FC-S2-215L	**070738**	FC-S2-215LE
	3	**070658**	FC-S2-300R	**070685**	FC-S2-300RE	**070712**	FC-S2-300L	**070739**	FC-S2-300LE
22218	3-7/16	**070660**	FC-S2-307R	**070687**	FC-S2-307RE	**070714**	FC-S2-307L	**070741**	FC-S2-307LE
22220	3-15/16	**070662**	FC-S2-315R	**070689**	FC-S2-315RE	**070716**	FC-S2-315L	**070743**	FC-S2-315LE
22222	4-7/16	**071521**	EFC-S2-407R	**071523**	EFC-S2-407RE	**071525**	EFC-S2-407L	**071527**	EFC-S2-407LE
22226	4-15/16	**071522**	EFC-S2-415R	**071524**	EFC-S2-415RE	**071526**	EFC-S2-415L	**071528**	EFC-S2-415LE

Shaft Size	A	B #	C #	D	DD	E #	F Bolt Dia.	G	H #	K ##	L	M	N	P	Q #	X Total Exp.	Y	Z	Set Screw Size	S/S Torque In/Lbs
1-3/8 1-7/16	2.53	5.25	1.84	3.09	4.38	0.75	3/8	1.31	0.50	3.625	2.55	3/8-16	2.53	1.22	1.22	3/16	0.020	1.80	5/16	165
1-11/16	2.67	6.13	1.91	3.63	5.13	0.88	7/16	1.45	0.50	4.250	3.01	7/16-14	2.72	1.22	1.26	1/4	0.020	2.08	5/16	165
1-15/16 2	2.84	6.38	2.00	3.80	5.38	0.88	7/16	1.59	0.56	4.500	3.44	7/16-14	2.86	1.25	1.26	1/4	0.020	2.30	3/8	290
2-3/16	2.94	7.13	2.19	4.25	6.00	1.00	1/2	1.56	0.56	5.000	3.50	1/2-13	2.98	1.38	1.42	1/4	0.025	2.59	3/8	290
2-7/16	3.20	7.63	2.50	4.59	6.50	1.00	1/2	1.64	0.63	5.500	4.06	1/2-13	3.20	1.56	1.56	1/4	0.025	2.94	3/8	290
2-11/16 2-15/16 3	3.59	8.75	2.63	5.30	7.50	1.25	5/8	2.03	0.75	6.375	4.61	5/8-11	3.64	1.56	1.63	1/4	0.025	3.47	1/2	620
3-7/16	4.01	10.25	3.00	6.09	8.63	1.26	3/4	2.36	0.94	7.375	5.50	3/4-10	3.88	1.65	1.52	1/4	0.025	4.05	1/2	620
3-15/16	4.47	10.88	3.50	6.63	9.38	1.47	3/4	2.66	1.13	8.125	6.00	3/4-10	4.56	1.81	1.91	5/16	0.025	4.50	5/8	1325
4-7/16	6.53	13.50	4.58	5.88	11.75	1.45	3/4 **	3.00	0.94	10.250	6.45	3/4-10	5.63	3.53	2.63	3/8	N/A	N/A	5/8	1325
4-15/16	6.91	14.75	4.88	6.38	12.75	1.70	7/8 **	2.97	1.25	11.000	7.45	7/8-9	5.95	3.94	3.01	3/8	N/A	N/A	5/8	1325

- +0.000
-0.002

- Reference Dimension Only

Note(S): "P" And "G" Dimensions Are For Non-Expansion Only

"A" And "P" Dimensions Do Not Include "Y" Dimension

REVOLVING HANDLES

BODY: BLACK PHENOLIC PLASTIC OR NYLON THERMOPLASTIC
THREADED SPINDLE: MILD STEEL, ZINC PLATED CLEAR CHROMATE

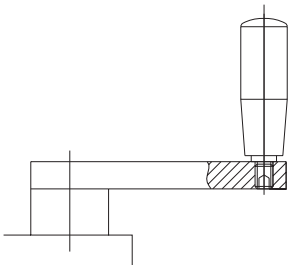


Phenolic with Steel Body

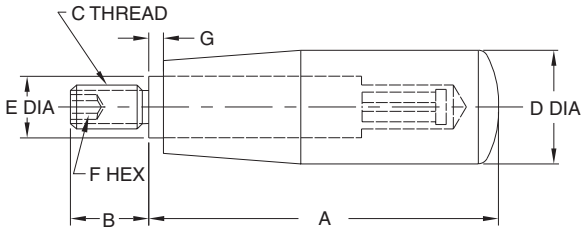


Thermoplastic with Steel Body

Modern square-design handle with a threaded steel spindle. Revolving Handles have an internal bearing that allows the handle to remain fixed in your hand, for firm gripping while turning a Hand Wheel or crank. Threaded spindle has a hex socket for easy installation. Available in two handle materials: Black phenolic plastic (glossy smooth finish, extremely hard, electrical insulator, operating temperatures to 300°F, resistant to oils and most common chemicals) or matte black nylon thermoplastic (textured surface for secure gripping, excellent impact resistance, operating temperatures to 230°F).



Revolving Handles can be used to make custom crank handles.



USA

PART NO. PHENOLIC	PART NO. THERMOPLASTIC	SIZE	A	B	C	D DIA	E DIA	F	G
CL-100-RH-F	CL-100-RH-P	1	1.67	.47	1/4-20	.71	.39	3mm	.10
CL-200-RH-F	CL-200-RH-P	2	2.07	.51		.83			
CL-300-RH-F	CL-300-RH-P	3	2.66	.55	5/16-18	.91	.51	4mm	
CL-400-RH-F	CL-400-RH-P	4	3.25	.63	3/8-16	1.02		5mm	
CL-500-RH-F	—	5	4.12	.79	1/2-13	1.22	.55	6mm	

METRIC

CLM-100-RH-F	CLM-100-RH-P	1	1.67	.47	M6	.71	.39	3mm	.10
CLM-200-RH-F	CLM-200-RH-P	2	2.07	.51	M6	.83		3mm	
CLM-201-RH-F	—				M8			4mm	
CLM-300-RH-F	CLM-300-RH-P	3	2.66	.55	M8	.91	.51	4mm	
CLM-400-RH-F	CLM-400-RH-P	4	3.25	.63	M10	1.02		5mm	
CLM-500-RH-F	—	5	4.12	.79	M12	1.22	.55	6mm	

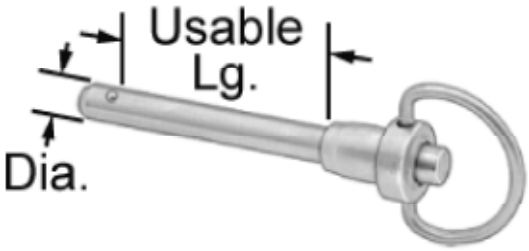
CarrLane MANUFACTURING CO.
4200 Carr Lane Ct., P.O. Box 191970 • St. Louis, Missouri 63119-7970 USA
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(562) 695-2323 (fax)
la.sales@mcmaster.com
Text 75930

Ring Grip Push-Button Quick-Release Pin

All-Stainless Steel, 3/16" Diameter, 2-1/2" Usable Length

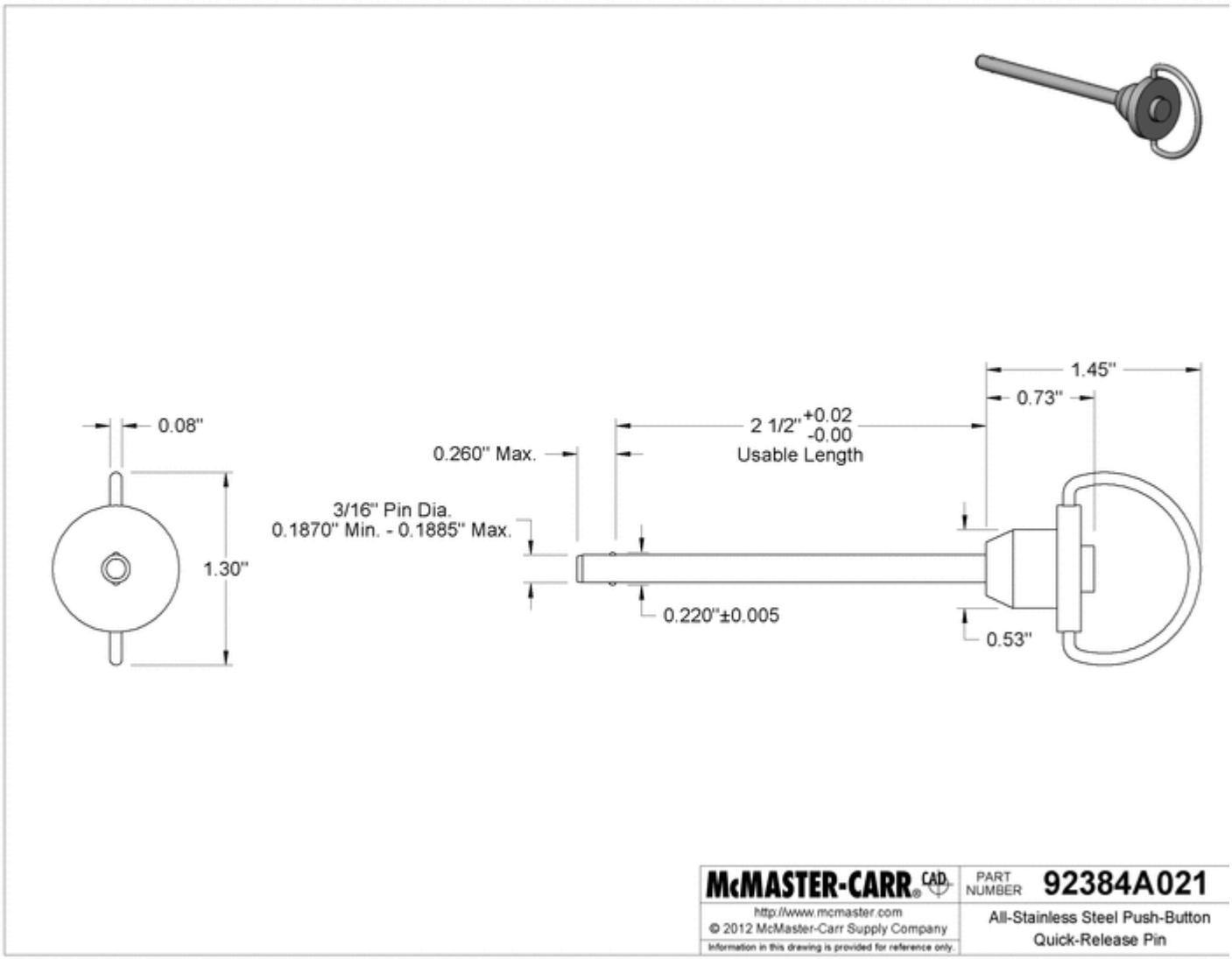
In stock
$24.75 Each
92384A021



Usable Length	2 1/2"
Additional Specifications	Ring Grip—17-4 PH Stainless Steel 3/16" Dia.—Breaks at 4,600 lbs.

For improved corrosion resistance in harsh environments, choose these pins. Shaft diameter tolerance is -0.0015". Breaking strength is measured as double shear, which is the force required to break a pin into three pieces.

Ring Grip—Also known as R-style marine pins, they have an easy-to-pull ring. 17-4 PH stainless steel pins are stronger than Type 316 pins. Rockwell hardness is C40.



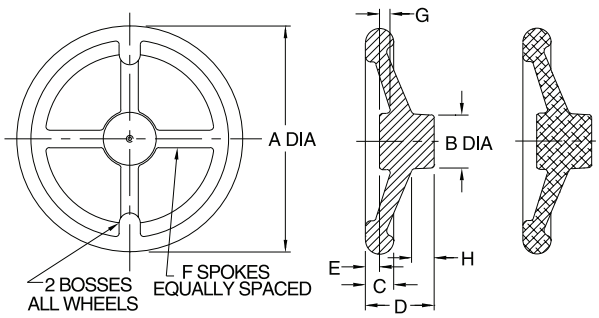
The information in this 3-D model is provided for reference only.

HAND WHEELS

CAST IRON PER ASTM-A48 CLASS 30 OR 319 ALUMINUM ALLOY



Angled-Spoke
Rounded Design
Cast Iron or Aluminum



Cast Iron HWAF **Aluminum HWAFA**

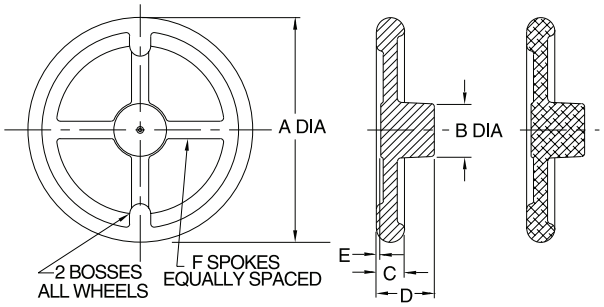
Utility-grade Hand Wheels that can be easily customized for any application. See page 109 for factory modifications available. Wide range of sizes from 4 to 12" in diameter. Choose either cast iron for maximum strength, or aluminum for light weight.

ANGLED SPOKES

PART NO. CAST IRON	PART NO. ALUMINUM	A DIA	B DIA	C	D	E	F	G	H	J DIA	HANDLE SIZE	HANDLE SOLID	HANDLE REVOLVING
CL-4-HWAF	CL-4-HWAFA	4	1-1/4	5/8	1-11/16	1/8	4	9/32	3/4	11/16	SIZE 2	SEE PAGE 120	SEE PAGES 121-123
CL-5-HWAF	CL-5-HWAFA	5	1-1/2	3/4	1-7/8	3/8		5/16		1			
CL-6-HWAF	CL-6-HWAFA	6	1-5/8		2	13/32		3/8	13/16	1	SIZE 4		
CL-8-HWAF	CL-8-HWAFA	8	1-7/8	1	2-7/16	1/2				1-3/8			
CL-10-HWAF	CL-10-HWAFA	10	2-1/4		3-1/32	11/16	8	7/16	1-1/16	1-3/4	SIZE 5		
CL-12-HWAF	CL-12-HWAFA	12	1		4-3/32	1-1/16			1-3/4	2-1/2			



Straight-Spoke
Rounded Design
Cast Iron or Aluminum



Cast Iron HWSF **Aluminum HWSFA**

Same as the Hand Wheels shown above, except with straight spokes for a flatter profile.

STRAIGHT SPOKES

PART NO. CAST IRON	PART NO. ALUMINUM	A DIA	B DIA	C	D	E	F	J DIA	HANDLE SIZE	HANDLE SOLID	HANDLE REVOLVING
CL-4-HWSF	CL-4-HWSFA	4	1-1/4	5/8	1-11/16	1/8	4	11/16	SIZE 2	SEE PAGE 120	SEE PAGES 121-123
CL-5-HWSF	CL-5-HWSFA	5	1-1/2	3/4				1			
CL-6-HWSF	CL-6-HWSFA	6	1-5/8		1-13/16			1	SIZE 4		
CL-8-HWSF	CL-8-HWSFA	8	1-7/8	1	2-1/16	5/32	8	1-3/8			
CL-10-HWSF	CL-10-HWSFA	10	2-1/4		2-1/2			1-3/4	SIZE 5		
CL-12-HWSF	CL-12-HWSFA	12	3		3-1/4	1/8		2-1/2			

Carr Lane MANUFACTURING CO.
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Phone: 314/647-6200 • Fax: 314/647-5736 • Web Site: www.carrlane.com

Lifelign® Gear Coupling Nomenclature

Type GC (Pages 16 thru 18 & 37 thru 41)

1010	GC	02
SIZE	PRODUCT CLASSIFICATION	TYPE

Gear — Continuous Sleeve

GC02 = Double Engagement
GC05 = Single Engagement/Floating Shaft

Type G (Pages 19 thru 41)

1010	G	20
SIZE	PRODUCT CLASSIFICATION	**TYPE** (Shrouded and Exposed Bolts)

Gear — Standard Flanged Sleeve

G10/20 = Double Engagement (Shrouded/Exposed)
G51/52 = Single Engagement/Floating Shaft (Shrouded/Exposed)
GV10/20 = Vertical Double Engagement (Shrouded/Exposed)
GV51/52 = Vert. Single Engage./Floating Shaft (Shrouded/Exposed)
G62 = Brakewheel Double Engagement (Exposed)
G63 = Disc Brake Double Engagement (Exposed)
G66 = Brakewheel Single Engagement (Exposed)
GL20 = Slide Double Engagement (Exposed)
GL52 = Slide Single Engagement/Floating Shaft (Exposed)
G70 = Disconnect Inching Drives
G72 = Disconnect (Exposed)
G31/32 = Spacer (Shrouded/Exposed)
GP20 = Insulated Double Engagement (Exposed)
GP52 = Insulated Single Engagement/Floating Shaft (Exposed)
GP82 = Insulated Rigid (Exposed)
G81/82 = Rigid (Shrouded/Exposed)
GV82 = Vertical Rigid (Exposed)
GR20 = Shear Pin (Exposed)

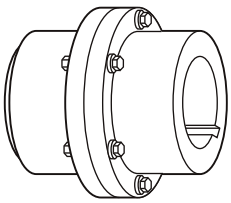
Type G (Pages 42 thru 56)

1080	G	20
SIZE	PRODUCT CLASSIFICATION	**TYPE** (Exposed Bolts Only)

Gear — Large Flanged Sleeve

Type G20 = Double Engagement
Type G52 = Single Engagement/Floating Shaft
Type GV20 = Vertical Double Engagement
Type GV52 = Vertical Single Engagement//Floating Shaft
Type GL20 = Slide Double Engagement
Type G70 = Disconnect/Inching Drives
Type G32 = Spacer
Type G82 = Rigid
Type GV82 = Vertical Rigid
Type GR20 = Shear Pin

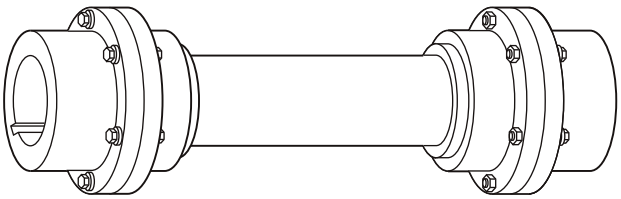
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Types G52, GV52

The Type G52 single engagement design is used with floating shafts or three bearing drive trains. It has one flex half and one rigid half and only accepts angular misalignment. (See Pages 21 and 43.)

The GV52 vertical single engagement gear coupling is a standard horizontal single engagement gear coupling modified to accommodate the sleeve centering assembly. It recommended for inclinations over 10°. Downward thrust capacity for Sizes 1010 thru 1030GV52 is 10,000 lbs.; Sizes 1035 thru 1070GV52 is 30,000 lbs. and Sizes 1080GV52 and larger is 87,000 lbs. (See Pages 25 & 46.)

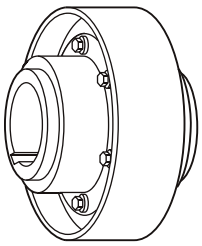


Types G52, GV52

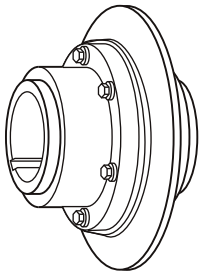
Floating shaft assemblies are used when distance between equipment is too great for spacer couplings. A standard floating shaft assembly consists of two standard single engagement couplings, two gap discs and a connecting shaft. A floating shaft can eliminate the need for additional bearing supports along spanning shafts because the shaft is supported by connected equipment through the single engagement couplings. (See Pages 22, 23, and 44.) When used with a vertical floating shaft on inclinations over 10°, the Type GV52 coupling is used as the lower coupling to support the shaft. (See Pages 25 and 46.)

Flex Hubs on Floating Shaft (RFFR) — Assembly of the flex hubs on the floating shaft allows for easier replacement and allows the rigid hubs with greater bore capacity to be used on the connected equipment shafts. This frequently means a smaller coupling size can be utilized.

Rigid Hubs on Floating Shaft (FRRF) — When the rigid hubs are on the floating shaft, shorter shaft spans can be accommodated, since no cover drawback is required.

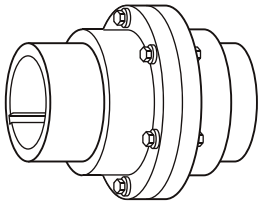


Types G62 & 66



Type G63

Double or single engagement brakewheel and disc brake couplings are used for applications, such as cranes, hoists and conveyors. Brakewheel and disc brake couplings accommodate misalignment between connected equipment and eliminate the need for double shaft extensions on motors and gear drives for applications requiring brakes. (See Pages 26 and 27.)

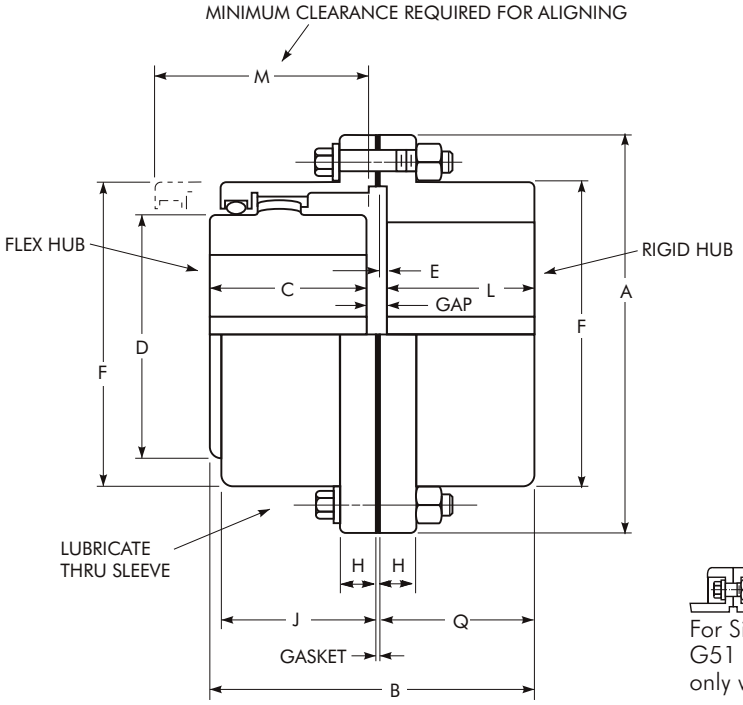


Types GL20 & GL52

Double and single engagement Slide couplings are used for applications requiring axial movement to accommodate thermal shaft expansion or adjustment. (See Pages 28, 29, and 47.)

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Type G52 Standard Flanged Sleeve
Single Engagement/Dimensions — Inches





For Sizes 1010G thru 1055G, Type G51 Shrouded Bolts furnished only when specified on order.

SIZE ★	Torque Rating (lb-in) †	Allow Speed rpm ‡	Max Bore●		Min Bore ■	Cplg Wt With No Bore-lb		Lube Wt lb	A	B	C	D	E	F	H	J	L	M	Q	Gap	SIZE ★
			Flex Hub	Rigid Hub		G51	G52														
1010G	10,080	8,000	1.875	2.375	.50	9	10	.05	4.56	3.41	1.69	2.70	.10	3.30	.55	1.53	1.56	2.00	1.66	.156	**1010G**
1015G	20,790	6,500	2.375	2.938	.75	18	20	.09	6.00	3.92	1.94	3.40	.10	4.14	.75	1.88	1.82	2.40	1.92	.156	**1015G**
1020G	37,800	5,600	2.875	3.625	1.00	30	35	.15	7.00	4.90	2.44	4.14	.10	4.98	.75	2.34	2.30	3.00	2.40	.156	**1020G**
1025G	66,150	5,000	3.625	4.375	1.25	55	60	.26	8.38	6.12	3.03	5.14	.10	6.10	.86	2.82	2.90	3.60	3.00	.188	**1025G**
1030G	107,100	4,400	4.125	5.125	1.50	85	95	.40	9.44	7.24	3.59	6.00	.10	7.10	.86	3.30	3.46	4.20	3.56	.188	**1030G**
1035G	163,800	3,900	4.875	5.875	2.00	135	150	.60	11.00	8.43	4.19	7.00	.10	8.32	1.12	3.84	4.02	5.10	4.12	.218	**1035G**
1040G	270,900	3,600	5.750	7.250	2.50	200	220	1.03	12.50	9.56	4.75	8.25	.16	9.66	1.12	4.38	4.54	5.70	4.70	.281	**1040G**
1045G	371,700	3,200	6.750	8.125	3.00	285	300	1.25	13.62	10.75	5.31	9.25	.16	10.79	1.12	4.84	5.14	6.50	5.30	.312	**1045G**
1050G	500,900	2,900	7.375	9.000	3.50	400	430	2.00	15.31	12.17	6.03	10.00	.20	12.04	1.50	5.54	5.80	7.20	6.00	.344	**1050G**
1055G	655,200	2,650	8.250	10.000	4.00	555	580	2.50	16.75	13.76	6.62	11.00	.20	13.16	1.50	6.22	6.80	8.00	7.00	.344	**1055G**
1060G	800,100	2,450	9.125	11.000	4.50	. . .	715	3.75	18.00	15.16	7.41	12.00	.26	14.41	1.00	6.66	7.34	9.00	7.60	.406	**1060G**
1070G	1,197,000	2,150	10.875	13.000	5.00	. . .	1120	5.00	20.75	17.86	8.69	14.00	.33	16.73	1.12	7.70	8.67	10.50	9.00	.500	**1070G**

★ See page 15 for General Information and other Reference Notes.

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Lifelign® Gear Coupling Nomenclature

Type GC (Pages 16 thru 18 & 37 thru 41)

1010	GC	02
SIZE	PRODUCT CLASSIFICATION	TYPE

Gear — Continuous Sleeve

GC02 = Double Engagement
GC05 = Single Engagement/Floating Shaft

Type G (Pages 19 thru 41)

1010	G	20
SIZE	PRODUCT CLASSIFICATION	**TYPE** (Shrouded and Exposed Bolts)

Gear — Standard Flanged Sleeve

G10/20 = Double Engagement (Shrouded/Exposed)
G51/52 = Single Engagement/Floating Shaft (Shrouded/Exposed)
GV10/20 = Vertical Double Engagement (Shrouded/Exposed)
GV51/52 = Vert. Single Engage./Floating Shaft (Shrouded/Exposed)
G62 = Brakewheel Double Engagement (Exposed)
G63 = Disc Brake Double Engagement (Exposed)
G66 = Brakewheel Single Engagement (Exposed)
GL20 = Slide Double Engagement (Exposed)
GL52 = Slide Single Engagement/Floating Shaft (Exposed)
G70 = Disconnect Inching Drives
G72 = Disconnect (Exposed)
G31/32 = Spacer (Shrouded/Exposed)
GP20 = Insulated Double Engagement (Exposed)
GP52 = Insulated Single Engagement/Floating Shaft (Exposed)
GP82 = Insulated Rigid (Exposed)
G81/82 = Rigid (Shrouded/Exposed)
GV82 = Vertical Rigid (Exposed)
GR20 = Shear Pin (Exposed)

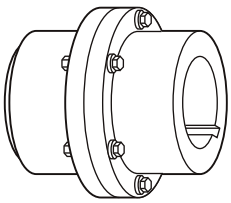
Type G (Pages 42 thru 56)

1080	G	20
SIZE	PRODUCT CLASSIFICATION	**TYPE** (Exposed Bolts Only)

Gear — Large Flanged Sleeve

Type G20 = Double Engagement
Type G52 = Single Engagement/Floating Shaft
Type GV20 = Vertical Double Engagement
Type GV52 = Vertical Single Engagement//Floating Shaft
Type GL20 = Slide Double Engagement
Type G70 = Disconnect/Inching Drives
Type G32 = Spacer
Type G82 = Rigid
Type GV82 = Vertical Rigid
Type GR20 = Shear Pin

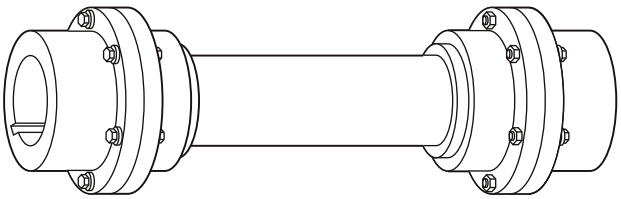
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Types G52, GV52

The Type G52 single engagement design is used with floating shafts or three bearing drive trains. It has one flex half and one rigid half and only accepts angular misalignment. (See Pages 21 and 43.)

The GV52 vertical single engagement gear coupling is a standard horizontal single engagement gear coupling modified to accommodate the sleeve centering assembly. It recommended for inclinations over 10°. Downward thrust capacity for Sizes 1010 thru 1030GV52 is 10,000 lbs.; Sizes 1035 thru 1070GV52 is 30,000 lbs. and Sizes 1080GV52 and larger is 87,000 lbs. (See Pages 25 & 46.)

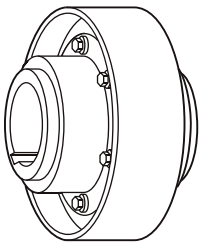


Types G52, GV52

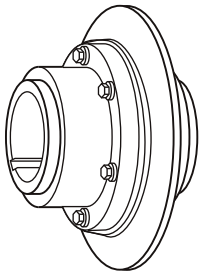
Floating shaft assemblies are used when distance between equipment is too great for spacer couplings. A standard floating shaft assembly consists of two standard single engagement couplings, two gap discs and a connecting shaft. A floating shaft can eliminate the need for additional bearing supports along spanning shafts because the shaft is supported by connected equipment through the single engagement couplings. (See Pages 22, 23, and 44.) When used with a vertical floating shaft on inclinations over 10°, the Type GV52 coupling is used as the lower coupling to support the shaft. (See Pages 25 and 46.)

Flex Hubs on Floating Shaft (RFFR) — Assembly of the flex hubs on the floating shaft allows for easier replacement and allows the rigid hubs with greater bore capacity to be used on the connected equipment shafts. This frequently means a smaller coupling size can be utilized.

Rigid Hubs on Floating Shaft (FRRF) — When the rigid hubs are on the floating shaft, shorter shaft spans can be accommodated, since no cover drawback is required.

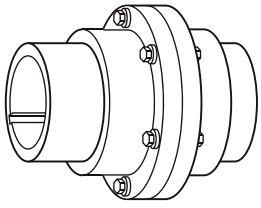


Types G62 & 66



Type G63

Double or single engagement brakewheel and disc brake couplings are used for applications, such as cranes, hoists and conveyors. Brakewheel and disc brake couplings accommodate misalignment between connected equipment and eliminate the need for double shaft extensions on motors and gear drives for applications requiring brakes. (See Pages 26 and 27.)

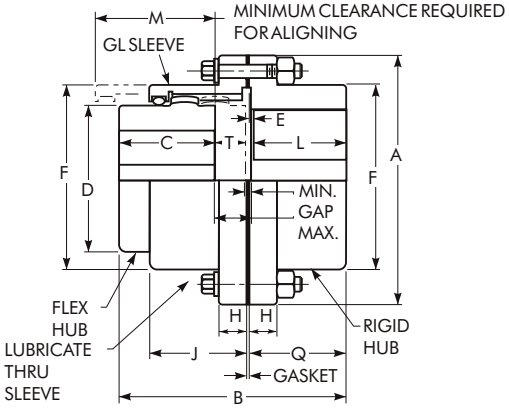


Types GL20 & GL52

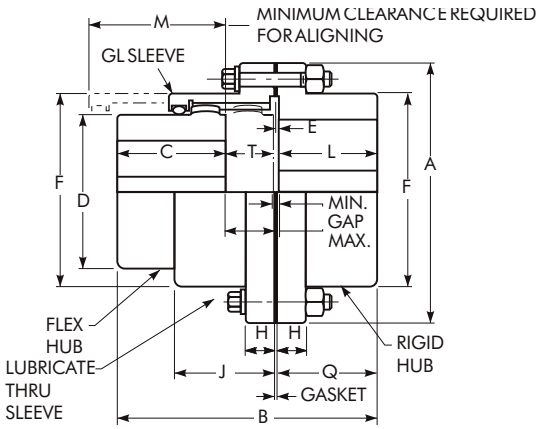
Double and single engagement Slide couplings are used for applications requiring axial movement to accommodate thermal shaft expansion or adjustment. (See Pages 28, 29, and 47.)

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Type GL52 Standard Flanged Sleeve
Slide Single Engagement/Dimensions — Inches



Type GL52-1 Long Tooth Sleeve
Reversed Std. Hub



Type GL52-2 Long Tooth Sleeve
Cutoff Long Hub

Choosing an Assembly

Select the assembly that provides a Total "T" dimension from the table below equal to the application requirements.

GL52-1 — Moderate slide capacity, moderate price.
GL52-2 — Greatest slide capacity, highest price.

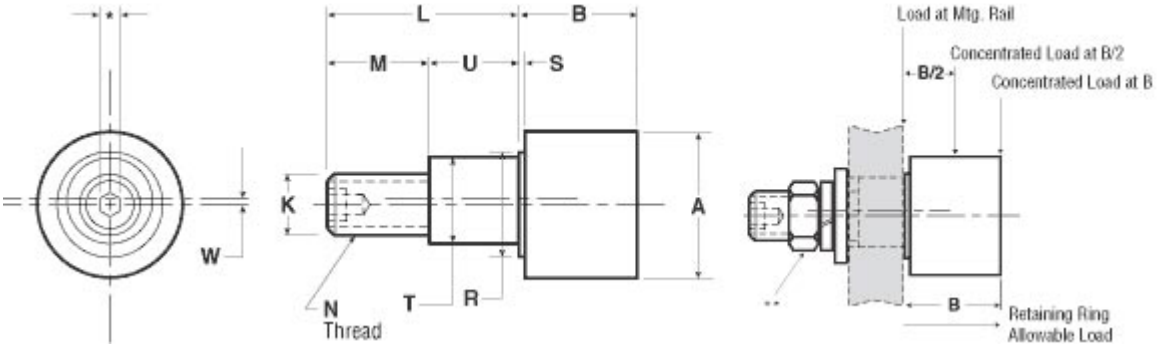
SIZE ★	Torque Rating (lb-in) †	Allow Speed rpm ‡	Max Bore •		Min Bore ■	Cplg Wt with No Bore-lb	Lube Wt lb	A	C	D	E	F	H	J	L	Q	SIZE ★
			Flex Hub	Rigid Hub													
1010GL	10,080	5,300	1.875	2.375	.50	10	.03	4.56	1.69	2.70	.10	3.30	.55	1.53	1.56	1.66	**1010GL**
1015GL	20,790	4,300	2.375	2.938	.75	20	.05	6.00	1.94	3.40	.10	4.14	.75	1.88	1.82	1.92	**1015GL**
1020GL	37,800	3,700	2.875	3.625	1.00	35	.08	7.00	2.44	4.14	.10	4.98	.75	2.34	2.30	2.40	**1020GL**
1025GL	66,150	3,300	3.625	4.375	1.25	65	.14	8.38	3.03	5.14	.10	6.10	.86	2.82	2.90	3.00	**1025GL**
1030GL	107,100	2,900	4.125	5.125	1.50	95	.25	9.44	3.59	6.00	.10	7.10	.86	3.30	3.46	3.56	**1030GL**
1035GL	163,800	2,600	4.875	5.875	2.00	150	.40	11.00	4.19	7.00	.10	8.32	1.12	3.84	4.02	4.12	**1035GL**
1040GL	270,900	2,400	5.750	7.250	2.50	220	.60	12.50	4.75	8.25	.16	9.66	1.12	4.38	4.54	4.70	**1040GL**
1045GL	371,700	2,100	6.750	8.125	3.00	300	.75	13.62	5.31	9.25	.16	10.79	1.12	4.84	5.14	5.30	**1045GL**
1050GL	500,900	1,900	7.375	9.000	3.50	430	1.20	15.31	6.03	10.00	.20	12.04	1.50	5.54	5.80	6.00	**1050GL**
1055GL	655,200	1,800	8.250	10.000	4.00	580	1.60	16.75	6.62	11.00	.20	13.16	1.50	6.22	6.80	7.00	**1055GL**
1060GL	800,100	1,600	9.125	11.000	4.50	715	2.12	18.00	7.41	12.00	.26	14.41	1.00	6.66	7.34	7.60	**1060GL**
1070GL	1,197,000	1,400	10.875	13.000	5.00	1125	3.00	20.75	8.69	14.00	.33	16.73	1.12	7.70	8.67	9.00	**1070GL**

★ See Page 15 for General Information and Reference Notes.

SIZE ★	Type GL52-1					Type GL52-2				
	B Max	M	T Max	Gap Min	Gap Max	B Max	M	T Max	Gap Min	Gap Max
1010GL	3.55	2.12	.14	.16	.30	4.14	2.30	.73	.16	.89
1015GL	4.42	2.35	.50	.16	.66	4.92	2.70	1.00	.16	1.16
1020GL	5.36	3.34	.46	.16	.62	6.06	3.30	1.16	.16	1.32
1025GL	6.68	3.68	.57	.19	.76	7.55	4.00	1.43	.19	1.62
1030GL	8.03	4.26	.79	.19	.98	8.74	3.60	1.50	.19	1.69
1035GL	9.50	4.90	1.07	.22	1.29	10.31	4.10	1.88	.22	2.10
1040GL	11.00	5.46	1.43	.28	1.71	11.83	4.70	2.26	.28	2.54
1045GL	12.39	6.08	1.53	.31	1.84	13.30	5.10	2.52	.31	2.83
1050GL	14.02	6.91	1.85	.34	2.19	15.03	5.90	2.86	.34	3.20
1055GL	16.24	7.51	2.48	.34	2.82	17.03	6.60	3.27	.34	3.61
1060GL	17.51	8.33	2.35	.41	2.76	18.68	7.20	3.52	.41	3.93
1070GL	20.63	9.66	2.77	.50	3.27	22.06	8.30	4.20	.50	4.70

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Plain Eccentric Stud

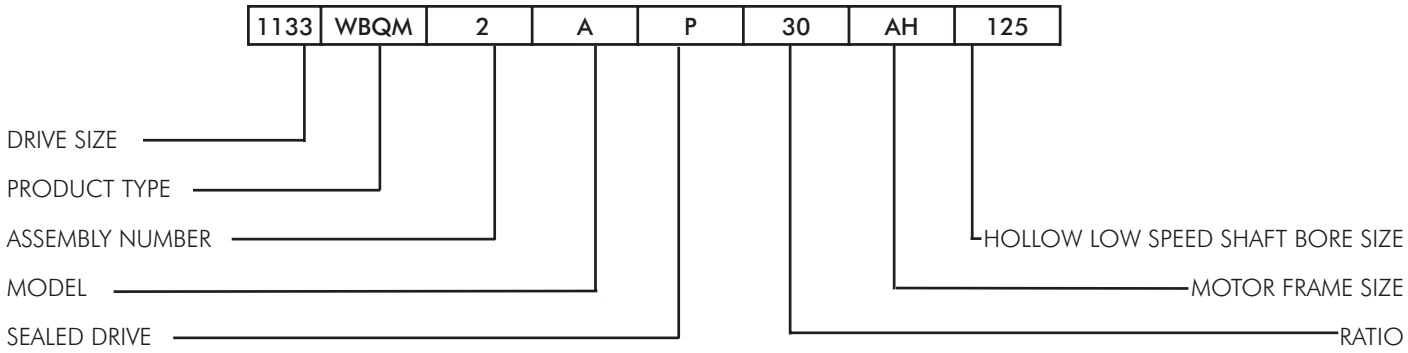


Item No.	95876
Description	PLRE-3
Detail	
List Price	$ 139.60
Wt Std Pk lbs	4.5 lbs
Std Pk	1
Type	LR Imperial
Brand	Osborn
Part Number	PLRE-3
Scale	Imperial
A Roller Dia In	3 In
A Tolerance	+0.000 -0.001
B Roller Width In	2 In
K Stud Dia In	1-1/4 In
L Stud Length In	2-1/2 In
M Thread Length In	1.27 In
N Thread	1 1/4-12
R Shoulder Dia In	2.312 In
S Shoulder Length In	0.062 In
T Eccentric Dia In	1-3/4 In
U Eccentric Length In	1.23 In
W Eccentricity In	0.06 In
Recommended Mounting Hole Size In	1.752 In
Recommended Mounting Hole Tolerance	+0.000 -0.001
Approx Wt lbs	4.5 lbs
Bearing	TRB
Radial Capacity 3000hrs L10 Life @100 RPM lbs	6000 lbs
Radial Capacity 500hrs L10 Life @33-1/3 RPM lbs	14270 lbs
Radial Capacity Static Limit lbs	20000 lbs
Thrust Capacity Static Limit lbs	12000 lbs
Mounting Member Thickness Max In	1-3/8 In
Mounting Member Thickness Min In	1-1/4 In
Stud Capacity Bend @B/2 lbs	12430 lbs
Stud Capacity Bend @B lbs	6370 lbs
Stud Capacity Shear lbs	40500 lbs

PLRE-3 Data Sheet Page

Plain Eccentric Stud General Data Sheet Page

Drive Nomenclature



Drive Size (Shaft Centers)

1133 = 1.33	1262 = 2.62	1525 = 5.25
1154 = 1.54	1300 = 3.00	1600 = 6.00
1175 = 1.75	1325 = 3.25	1700 = 7.00
1206 = 2.06	1326 = 3.26	1800 = 8.00
1238 = 2.38	1425 = 4.25	11000 = 10.00

Product Type ✷

Expressed 2 to 5 letters, including Primary Type, Output Shaft, and Motor Flange, as required.
WB — Basic drive without Feet (Single Reduction)
WU — Worm Under (Horizontal LSS)
WO — Worm Over (Horizontal LSS)
WX — Vertical Low Speed Shaft
WJ — Vertical High Speed Shaft (Horizontal LSS)
WL — Flange Mounted drive
WR — Extended Output Shaft

Primary/Type

H — Helical drives (Double Reduction)
W — Worm drives (Double Reduction)

Output Shaft

Q — Hollow Low Speed Shaft

Motor Flange

F — Flange Mounted Electric Motor with Coupling
M — Flange Mounted Electric Motor without Coupling (Hollow Input Shaft)

Assembly Number

See Individual Dimension Pages

Model

A, B, C, etc.
S — Modified or Special

Sealed Drive

P — Sealed Drive with Pressure Compensation System & Synthetic Lube.
- — Standard Drive (Not Sealed)

Ratio

Nominal Ratio Expressed 1 to 4 digits, as required

Motor Frame Size

NEMA Frame Sizes
AH— 48C
AA— 56C
AB— 140TC
AC— 180TC
AD— 210TC
AE — 250TC

IEC Frame Sizes
GA — 63D
GB — 71D
GD — 80D
GF — 90D
GH — 100LD
GK — 112D
GM— 132D

Hollow Low Speed Shaft Bore Size

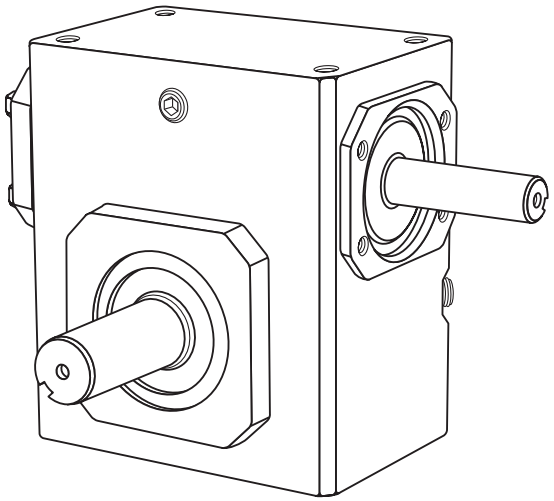
For Sizes 1133-1525, Output Shaft= "Q" Drives Only (Decimal Omitted)

(See Page 5 for footnotes.)

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Selection Guide *

Drivers with Solid Input Shaft and Solid Output Shaft

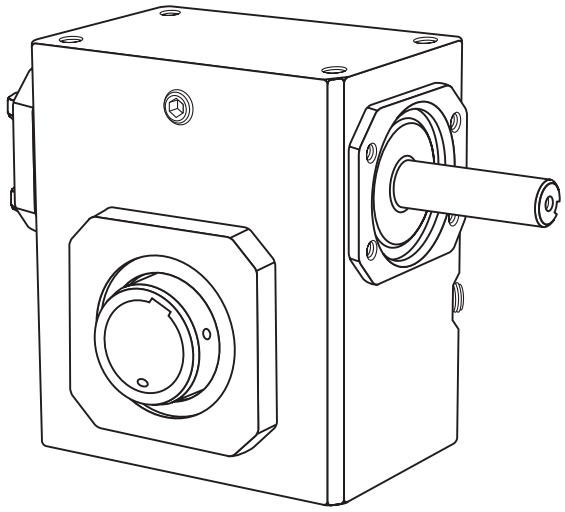


Single Reduction
Selections — Pages 22 through 27
Dimensions — Pages 28 through 51

Double Reduction Worm-Worm
Selections — Pages 52 through 57
Dimensions — Pages 58 through 81

Double Reduction Helical-Worm
Selections — Pages 82 through 85
Dimensions — Pages 86 through 117

Drivers with Solid Input Shaft and Hollow Output Shaft



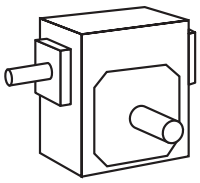
Single Reduction
Selections — Pages 22 through 27
Dimensions — Pages 28 through 51

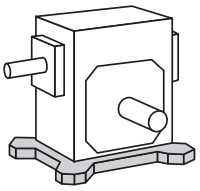
Double Reduction Worm-Worm
Selections — Pages 52 through 57
Dimensions — Pages 58 through 81

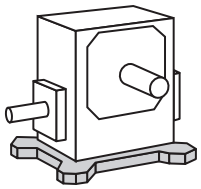
Double Reduction Helical-Worm
Selections — Pages 82 through 85
Dimensions — Pages 86 through 117

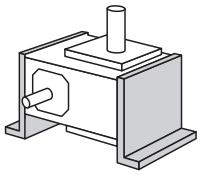
(See Page 5 for footnotes.)

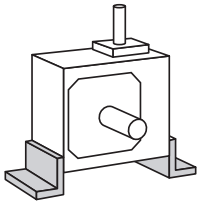
© Rexnord Industries, LLC, 1986, 2000.

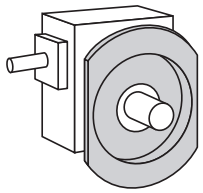

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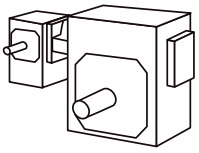

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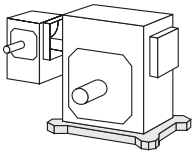

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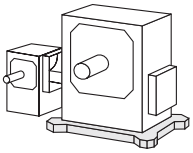

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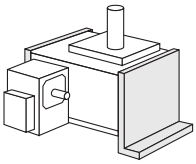

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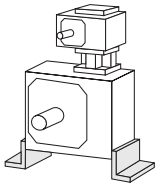

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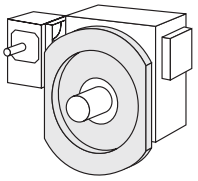

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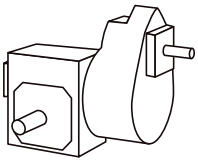

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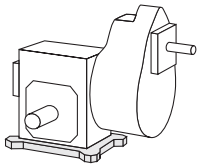

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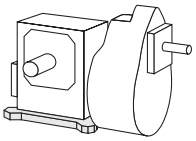

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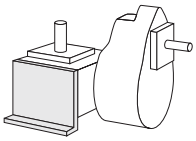

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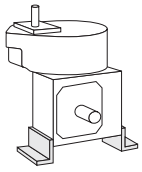

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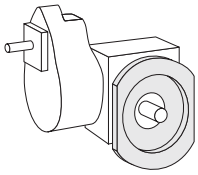

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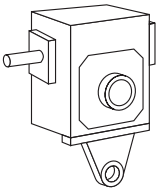

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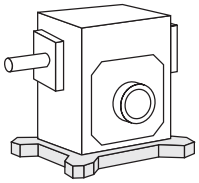

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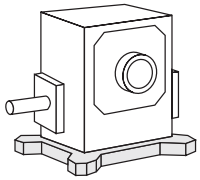

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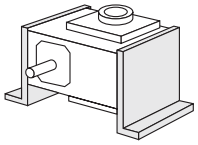

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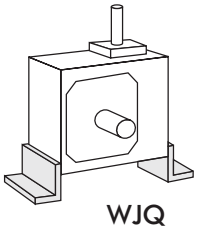

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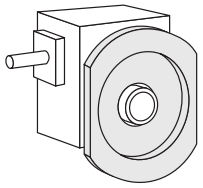

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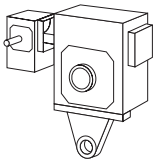

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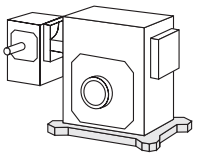

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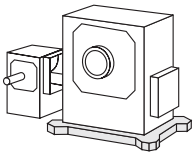

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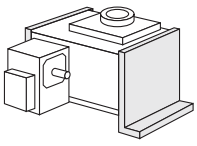

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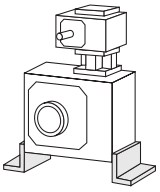

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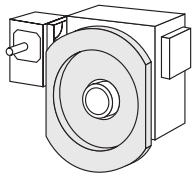

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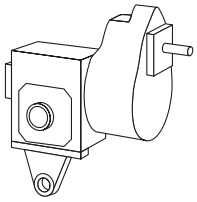

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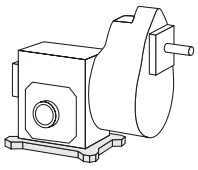

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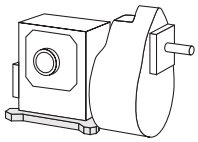

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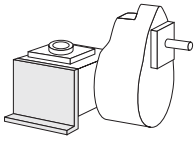

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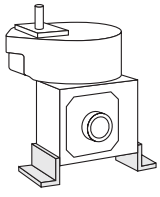

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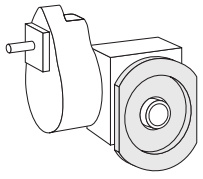

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WOHQ


WUHQ


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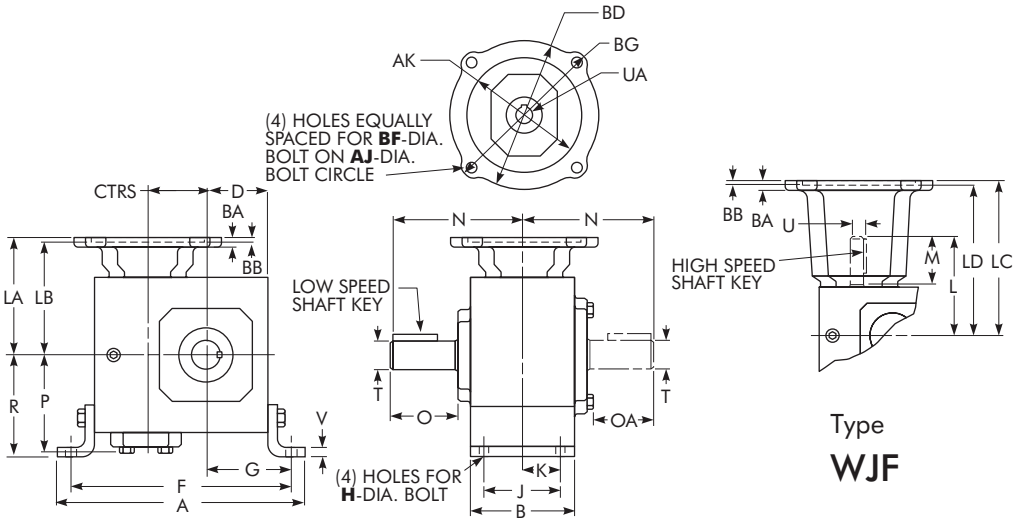

WJHQ


WLHQ

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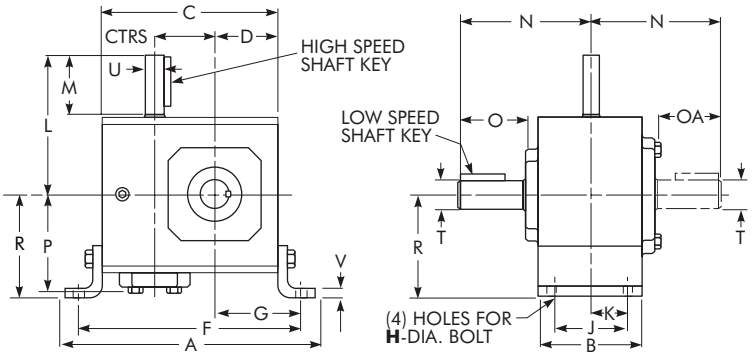
Single Reduction/Vertical Input

Type
WJM



Type
WJF

Type
WJ



SEE PAGE 47 FOR MOTOR MOUNTING DIMENSIONS.

(Continued on next page)

DRIVE SIZE ★	CTRS	A	B	C	D	F	G	H	J	K	L	M •	N	O ♦	OA ♦	P	R
1133	1.33	7.42	2.75	4.66	1.72	6.42	2.60	.38	2.00	1.00	3.82	1.76	4.00	2.16	1.94	2.61	2.94
1154	1.54	8.14	3.50	5.38	1.91	7.08	2.76	.44	2.75	1.38	4.35	1.76	4.31	2.11	1.90	3.14	3.50
1175	1.75	8.51	3.50	5.75	2.06	7.45	2.91	.44	2.75	1.38	4.45	1.76	4.31	2.05	1.84	3.24	3.50
1206	2.06	9.76	4.00	6.38	2.28	8.62	3.40	.50	2.75	1.38	4.82	1.76	4.68	2.29	2.08	3.61	4.01
1238	2.38	10.31	4.00	6.94	2.50	9.19	3.63	.50	2.88	1.44	5.51	2.38	5.14	2.66	2.44	3.77	4.06
1262	2.63	11.62	5.00	8.00	2.94	10.38	4.13	.56	3.38	1.69	6.07	2.38	5.63	2.73	2.52	4.34	5.00
1300	3.00	12.64	6.00	8.88	3.25	11.38	4.50	.56	3.88	1.94	6.57	2.38	6.75	3.60	3.36	4.84	5.62
1325	3.25	13.14	6.00	9.38	3.50	11.88	4.75	.56	3.88	1.94	6.76	2.38	7.06	3.66	3.42	5.02	5.63
1425	4.25	16.38	7.00	11.38	4.44	14.88	6.19	.69	5.00	2.50	9.57	3.47	8.12	4.50	4.21	6.10	6.50
1525	5.25	19.00	7.00	14.00	5.12	17.50	6.87	.69	5.81	2.91	10.88	3.38	9.06	4.78	4.53	7.50	7.75

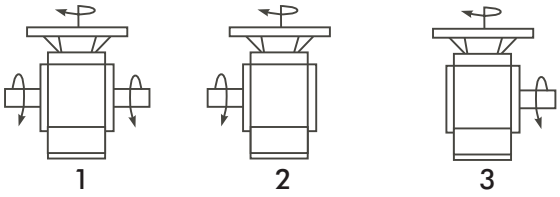
(See Page 5 for footnotes.)

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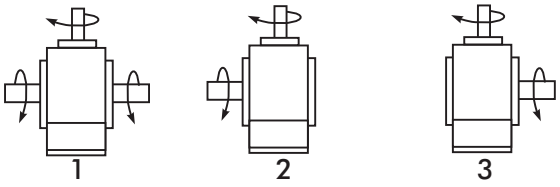
Assemblies ✷

Reverse all arrows for opposite rotation of high speed shaft. Refer to assembly A or B for low speed shaft rotation relative to high speed shaft position.

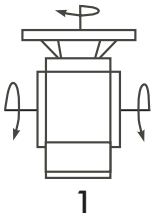
WJM & WJF



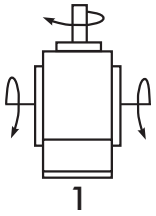
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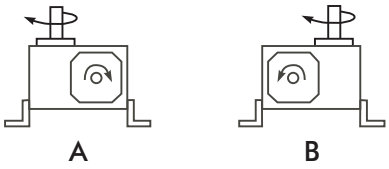


WJQM & WJQF



WJQ





(See Page 5 for footnotes.)

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NOMENCLATURE



S-2000

S E P2B - S2 - 207 - R E

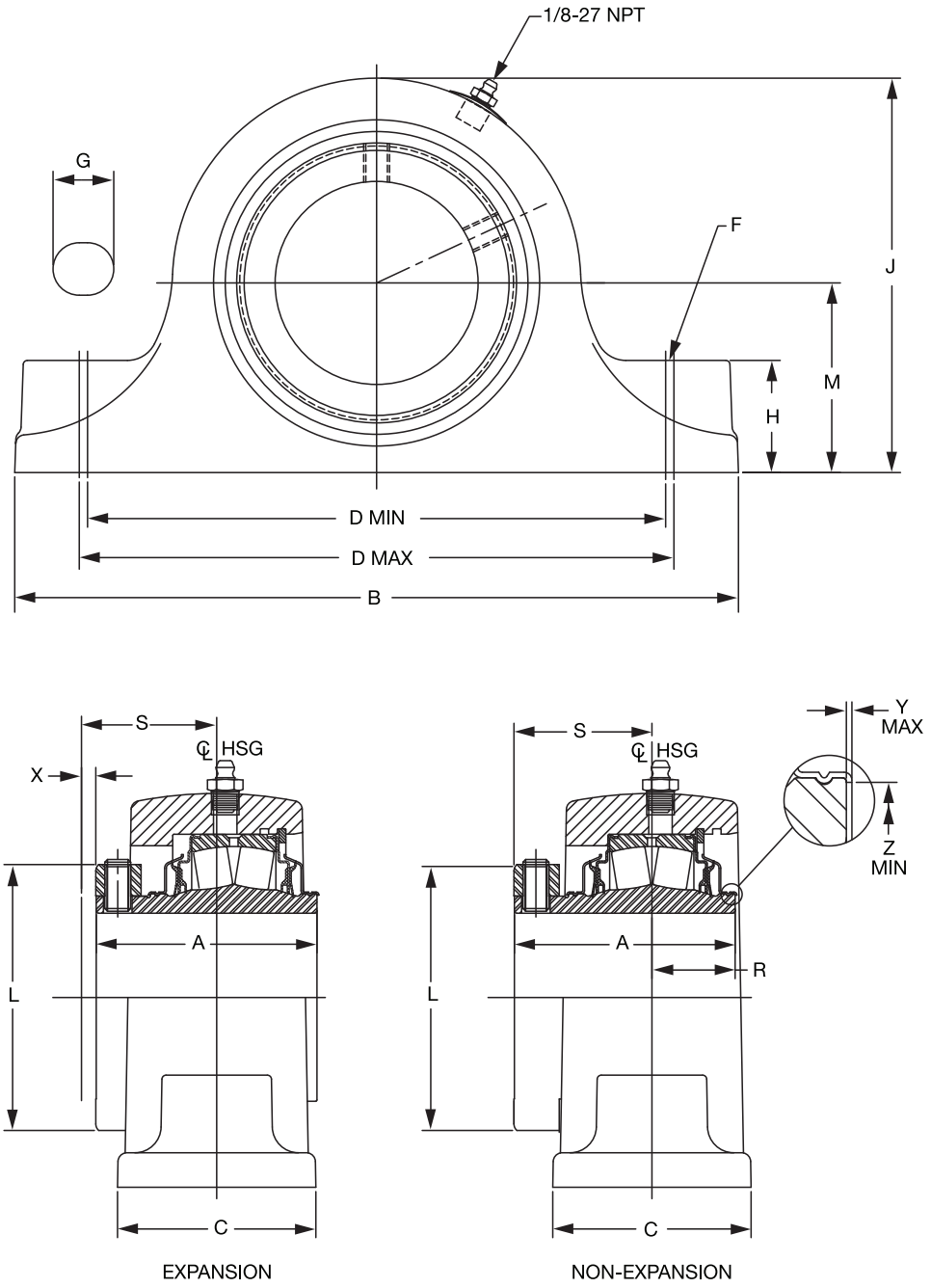
	HOUSING STYLE	BEARING TYPE	SIZE	SEAL	OTHER DATA
"E" prefix denotes Type E dimensioned housing with S2000 spherical roller bearing insert *	P2B = Pillow Block 2-Bolt Base, Cast Iron	S2 = S-2000	Inches and 16th 2 = 2" 07 = 7/16" 207 = 2-7/16"	R = TRIDENT Triple Lip Rubbing Seal	E = Expansion Type Bearing - If "E" Does Not Appear, Bearing Is Non Expansion Type
"S" prefix denotes cast steel housing	P4B = Pillow Block 4-Bolt Base, Cast Iron			L = Labyrinth Metallic Seal	
	F3R = Flange Bearing 3-Bolt, Cast Iron, Round				
	F4S = Flange Bearing 4-Bolt, Cast Iron, Square				
	F4R = Flange Bearing 4-Bolt, Cast Iron, Round				
	FC = Piloted Flanged (Flanged Cartridge)				
	WSTU = Wide Slot Take-Up Bearing For Use In Center-Pull Frames				
	TPHU = TPHU Take-up Bearing For Use In TPHU Or Top Angle Take-Up Frames				

* Available in two or four bolt pillow blocks, four bolt square flanges and piloted flanges

FEATURES/BENEFITS PAGE B12-2	SPECIFICATION PAGE B12-4	SELECTION PAGE B12-7	DIMENSIONS PAGE B12-14

DIMENSIONS

S-2000 Pillow Block with Type E Dimensions
2-BOLT



FEATURES/BENEFITS PAGE B12-2	SPECIFICATION PAGE B12-4	HOW TO ORDER/NOMENCLATURE PAGE B12-4	SELECTIONS PAGE B12-7

DODGE®



DIMENSIONS

S-2000 Pillow Block with Type E Dimensions
2-BOLT

Bearing Series	Shaft Size*	TRIDENT Seal				Labyrinth Seal			
		Non Expansion		Expansion		Non Expansion		Expansion	
		Part No.	Part Name	Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
22208	1-3/8	**071389**	EP2B-S2-106R	**071400**	EP2B-S2-106RE	**071411**	EP2B-S2-106L	**071422**	EP2B-S2-106LE
	1-7/16	**071390**	EP2B-S2-107R	**071401**	EP2B-S2-107RE	**071412**	EP2B-S2-107L	**071423**	EP2B-S2-107LE
22209	1-11/16	**071391**	EP2B-S2-111R	**071402**	EP2B-S2-111RE	**071413**	EP2B-S2-111L	**071424**	EP2B-S2-111LE
22210	1-15/16	**071392**	EP2B-S2-115R	**071403**	EP2B-S2-115RE	**071414**	EP2B-S2-115L	**071425**	EP2B-S2-115LE
	2	**071393**	EP2B-S2-200R	**071404**	EP2B-S2-200RE	**071415**	EP2B-S2-200L	**071426**	EP2B-S2-200LE
22211	2-3/16	**071394**	EP2B-S2-203R	**071405**	EP2B-S2-203RE	**071416**	EP2B-S2-203L	**071427**	EP2B-S2-203LE
22213	2-7/16	**071395**	EP2B-S2-207R	**071406**	EP2B-S2-207RE	**071417**	EP2B-S2-207L	**071428**	EP2B-S2-207LE
22215	2-11/16	**071396**	EP2B-S2-211R	**071407**	EP2B-S2-211RE	**071418**	EP2B-S2-211L	**071429**	EP2B-S2-211LE
	2-15/16	**071397**	EP2B-S2-215R	**071408**	EP2B-S2-215RE	**071419**	EP2B-S2-215L	**071430**	EP2B-S2-215LE
	3	**071398**	EP2B-S2-300R	**071409**	EP2B-S2-300RE	**071420**	EP2B-S2-300L	**071431**	EP2B-S2-300LE
22218	3-7/16	**071399**	EP2B-S2-307R	**071410**	EP2B-S2-307RE	**071421**	EP2B-S2-307L	**071432**	EP2B-S2-307LE

*Consult Dodge For Sizes Not Listed

Shaft Size	A	B#	C#	D		F Bolt Dia.	G#	H#	J#	L	M	R	S	X Total Exp.	Y	Z	Set Screw Size	S/S Torque In/Lbs
				Min	Max													
1-3/8 1-7/16	2.53	7.37	2.12	5.63	5.88	1/2	0.75	1.13	3.85	2.55	1.88	1.03	1.50	5/32	0.020	1.80	5/16-18	165
1-11/16	2.67	7.88	2.38	6.13	6.38	1/2	0.75	1.25	4.25	3.01	2.13	0.98	1.69	3/16	0.020	2.08	5/16-18	165
1-15/16 2	2.84	8.87	2.49	6.88	7.12	5/8	0.88	1.31	4.47	3.44	2.25	1.08	1.76	7/32	0.020	2.30	3/8-16	290
2-3/16	2.94	9.62	2.56	7.63	7.88	5/8	0.88	1.50	5.00	3.50	2.50	1.06	1.88	1/4	0.025	2.60	3/8-16	290
2-7/16	3.20	10.50	2.87	8.38	8.62	5/8	0.88	1.63	5.71	4.06	2.75	1.20	2.00	1/4	0.025	2.95	3/8-16	290
2-11/16 2-15/16 3	3.59	12.00	2.99	9.31	9.69	3/4	1.07	1.88	6.32	4.61	3.13	1.34	2.25	1/4	0.025	3.47	1/2-13	620
3-7/16	4.01	14.00	3.49	10.81	11.19	7/8	1.19	2.25	7.69	5.50	3.75	1.51	2.50	1/4	0.025	4.05	1/2-13	620

Notes: "A" And "R" Dimensions Do Not Include "Y" Dimension

Reference Dimension Only

FEATURES/BENEFITS PAGE B12-2	SPECIFICATION PAGE B12-4	HOW TO ORDER/NOMENCLATURE PAGE B12-4	SELECTIONS PAGE B12-7

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Product Detail



GEAR SPUR 20 DEG STEEL
TS420

UPC: 697950263724

Martin Stock Spur Gears are available in five different styles. Steel Gears are furnished in plain style and plain style with hub. Cast gears are furnished, plain with hub, web with lightening holes, and spoke. Cast gears are machined on all operating surfaces. Martin cast gears are cast with a larger hub to provide extra strength and to allow for larger bores. Spur gears are stocked in both 14 ½ and 20 degree pressure angles.

Product Specifications | Misc Info

Material	Steel	Bore Type	Reborable
Diametral Pitch	4	Min Bore Size	1.125 in.
Pressure Angle	20.000 deg.	Max Bore Size	2.750 in.
Number of Teeth	20	Hub Outside Diameter	4.266 in.
Pitch Diameter	5.000 in.	Hub Projection	0.875 in.
Outside Diameter	5.500 in.	Length thru Bore	4.375 in.

INDUCTIVE SENSOR
QUICK SELECTION GUIDE

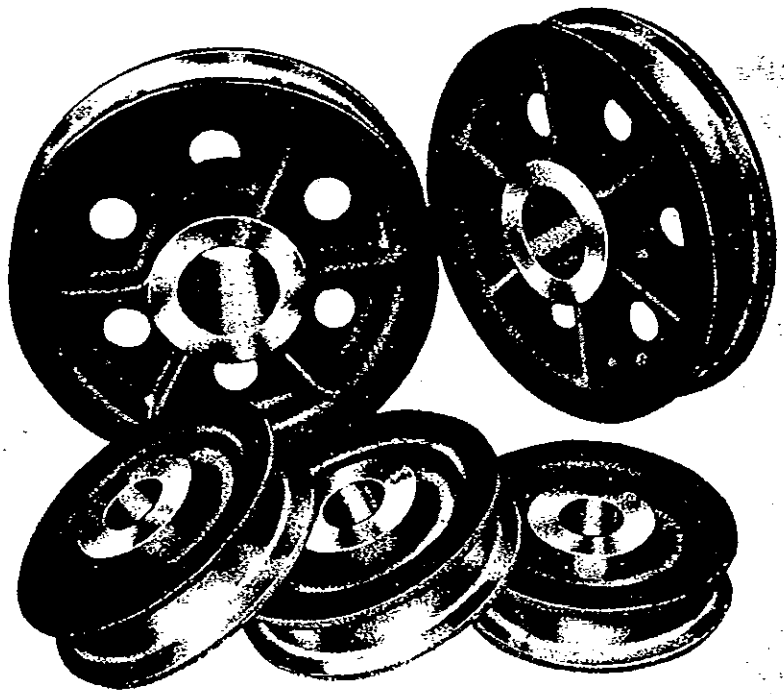
	Product Family	Product Features	Housing Diameter/ Dimensions (mm)	Sensing Range Shielded (mm)	Sensing Range Unshielded (mm)	Enclosure Ratings	2-wire DC	3-wire DC	4-wire DC	2-wire AC	2-wire AC/DC
General Purpose	**872C WorldProx™** 	• Nickel-plated brass barrel with plastic face • Standard length and short barrel versions (3-wire DC versions) • Extended range versions available (3-wire DC and 2-wire AC) • Wide variety of cable and connector options	6.5	2 & 3	3	IP67	✔	✔	✔	✔	✔
			8	2 & 3	3, 4, 6						
			12	3, 4, 6	4, 8, 10						
			18	5, 8, 12	8, 12, 20						
			30	10, 15, 22	15, 20, 40						
	872C/871C Plastic Housing 	• Plastic barrel and sensing face • Cable and QD models (AC units only available with cable) • AC units available in 871C product family	12	3	4	IP67		✔		✔	
			18	5	8						
			30	10	15						
Harsh Duty	**871TM** 	• Rugged stainless steel 304 barrel and sensing face • Extended Range units available (3-wire DC versions) • Wide variety of sensing types available (standard inductive, submersible units, low energy AC/DC units, and intrinsically safe versions)	8	3	6	All units IP67 & 1200 psi wash down rated (Selected units meet IP69K)	✔	✔		✔	✔
			12	2 & 6	4 & 10						
			18	5 & 10	8 & 20						
			30	10 & 20	15 & 40						
	871T Ferrous 	• Rugged stainless steel 304 barrel and sensing face • Ferrous versions only sense ferrous materials	18	5	NA	All units IP67				✔	
Food & Beverage	**871TS** 	• Stainless steel 316L barrel and FDA approved PPS plastic sensing face • ECOLAB certified • Extended temperature ratings (-40˚ to 100 ˚C) • Extended range units available • Laser engraved part numbers • Threaded or smooth barrel	12	2 & 4	4 & 8	IP67, IP68 & IP69K					
			18	5 & 8	8 & 12			✔			
	871T 	• Stainless steel 304 barrel with plastic sensing face • AC housing and sensing face constructed of stainless steel 304 • Extended low end temperature ratings (-40˚ to 70 ˚C)	12	2	4	IP67		✔		✔	
			18	5	8						
	871C Extended Temperature 	• Nickel-plated brass barrel and plastic sensing face • Operating temperature from -40˚ to 100 ˚C • PUR cable and QD connector options	12	2	4	IP67		✔			
			18	5	8						
			30	10	15						
Hazardous Locations	**871C NAMUR** 	• Conform to NAMUR specifications (DIN 19 234) • Sensors are appropriate for intrinsically safe applications when used with NAMUR style isolators/amplifiers	8	1	2	IP67	✔				
			12	2	4						
			18	5	8						
			30	10	15						

Specialty Solutions

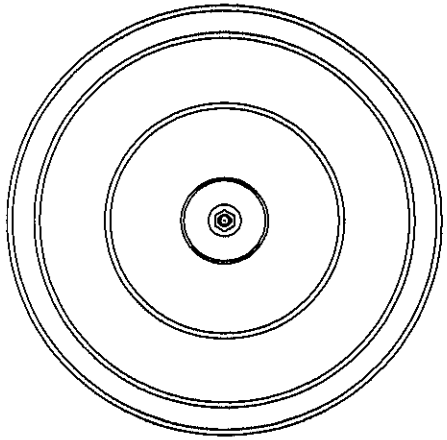
871D WorldClamp™ 	• Designed for use in power clamp and gripper applications to indicate open and closed position • Weld Field Immune • 2 different sensor head styles • 3-wire DC and 2-wire AC/DC versions	**871D Cylinder Position Indicator** 	• Designed to detect the extended or retracted position of a hydraulic or pneumatic cylinder • Weld Field Immune • Multiple probe lengths to accommodate different size cylinders • 3-wire DC and 2-wire AC/DC versions

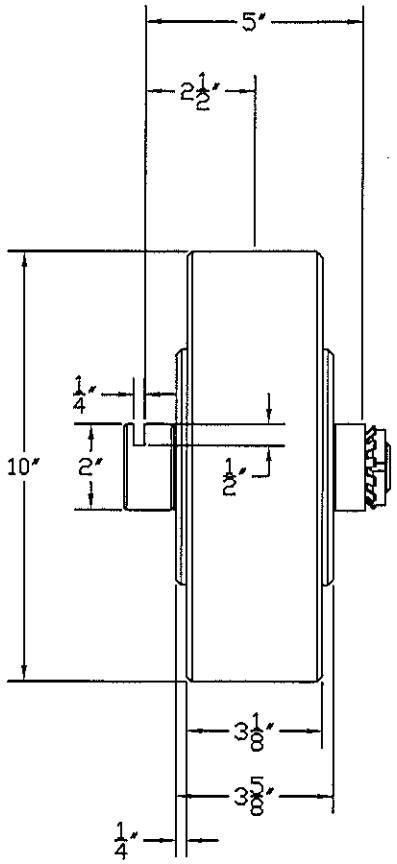
[illegible] CRANE & HOIST CO. [illegible]
[illegible] STREET · LOS ANGELES CALIFORNIA, U.S. [illegible]

CRANE WHEELS AND WHEEL ASSEMBLIES



TELEPHONE (213) 589-6061 FAX (213) 589-6066





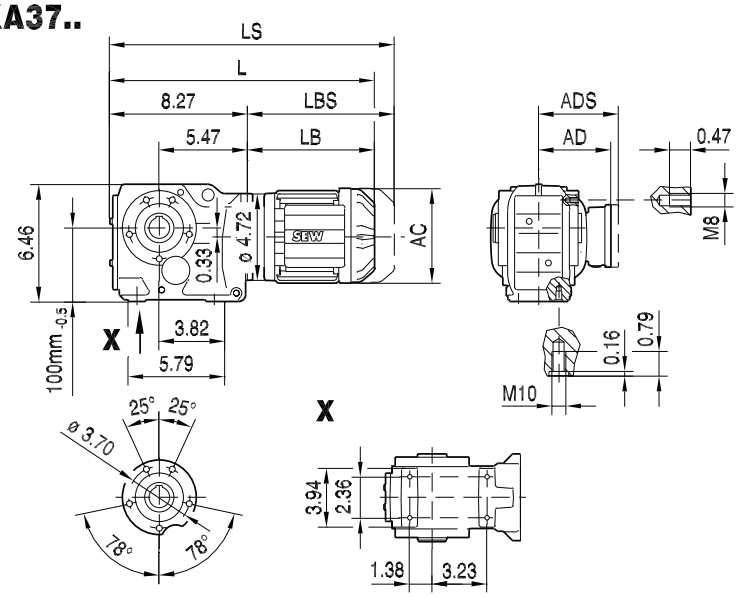
PART NO.	NO. REQD	BILL OF MATERIAL	SHEET NO.	65 WEIGHT
		DOWNS PIN & KEEPER TIMKEN Ø10" FLAT TREAD		
		DOWNS EQUIPMENT DESIGN • MANUFACTURERS CRANE & HOIST COMPANY LOS ANGELES, CALIFORNIA		
DES FOR STOCK		S.O. —	W.O. —	
DRN. BY RCV	DATE 4/9/07	CH. BY	SCALE HALF	
SHEET NO. 1 OF 1		A-4-TIM DROP	412574	

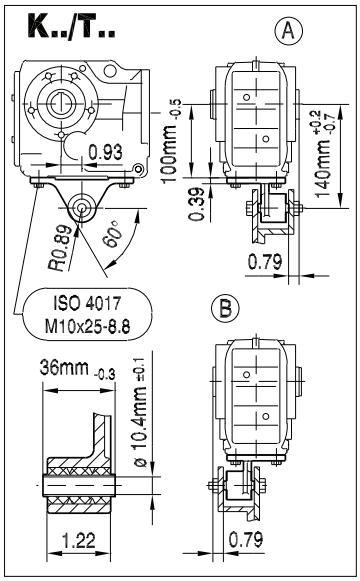
REVISIONS	BY	DATE
FILE NAME		

M3-PN147005 4.53 - Shutter Bogie

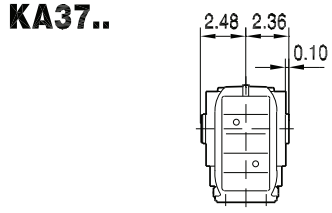
33 047 00 09

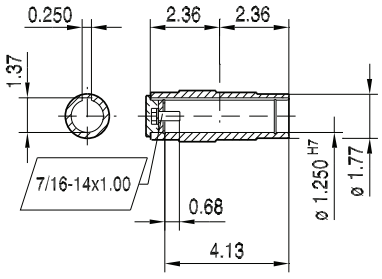
KA37..



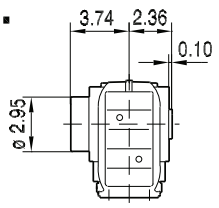


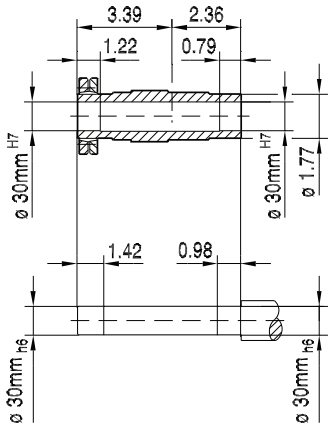
KA37..



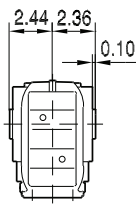


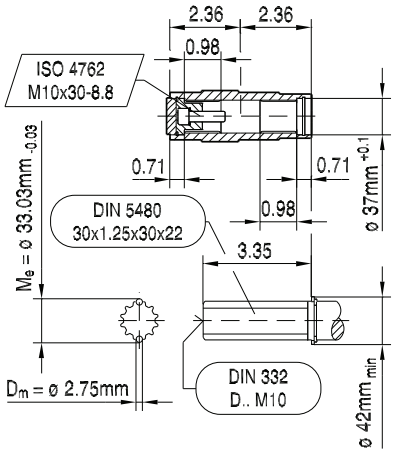
KH37..





KV37..





(→ 125)	DR63..	DR71S	DR71M	DR80S	DR80M	DR90M	DR90L	DR100M	DR100L/LC
AC	5.20	5.47	5.47	6.14	6.14	7.05	7.05	7.76	7.76
AD	4.13	4.69	4.69	5.04	5.04	5.51	5.51	6.18	6.18
ADS	4.13	5.08	5.08	5.47	5.47	5.91	5.91	6.22	6.22
L	15.79	16.26	17.24	17.60	18.82	18.98	19.76	20.94	22.13
LS	17.95	18.94	19.92	20.79	22.01	22.64	23.43	24.61	25.79
LB	7.52	7.99	8.98	9.33	10.55	10.71	11.50	12.68	13.86
LBS	9.69	10.67	11.65	12.52	13.74	14.37	15.16	16.34	17.52

SEW-EURODRIVE

PT Pilot® Quotation

Date 06/19/2014 **Quotation # 20140619-000132**

From	SEW-Western Region (CA) SEW-Eurodrive, Inc. 30599 San Antonio Street Hayward CA, 94544	**Phone** (510) 487-3560 **Fax** (510) 487-6433	**To**	M3 Engineering 2051 W Sunset Road Tucson AZ, 85704	**Phone** (520) 293-1488 **Fax** (520) 293-8349
Email	cshayward@seweurodrive.com		**Attn**	John Reid	

Purchase Order	N/A	**Tag/Ref**	**SO#**

Model	KA37TDRE90L4BE2/AS7Y/TF/V/C			**Base Price**	$1,677 List
Gear Ratio	3.98				
Prim/Sec Stages	3 / 0	**Shaft Location**	--	**Cable Entry Loc**	Unsure
Output Speed	437 RPM	**Output Shaft Dia**	30 mm	**Overhung Load**	700 lbs
Motor HP	2 HP	**Output Shaft Style**	Hollow Shaft	**Output Torque**	290 lb-in
Motor Voltage	460 VAC	**Input Shaft Dia**	--	**Torque Capacity**	1,110 lb-in
Frequency	60 Hz	**Flange Diameter**	--	**Nameplate S.F.**	3.80
Brake Voltage	460V	**Flange Location**	--	**Load S.F.**	--
Mtg. Position	M1	**Conduit Box Loc**	270	**Weight** (includes oil)	69 lbs

GEAR OPTIONS (List)

30 mm Bore [$0], 5001 Green/Blue Paint [$0], Shell Omala S2 G 220 mineral oil (standard) [$0], T - Torque Arm w/Bolts (Do Not Mount) [$103]

MOTOR AND BRAKE OPTIONS (List)

115V Space Heater [$188], IP54 Enclosure [$0], 5001 Green Blue Paint [$0], AS7Y - Spreadshaft SSI Encoder [$1655], TF - PTC Thermistors (x3) Class H [$195], C - Protective Canopy on Motor [$62], V - Constant Fan (220V-1Ph, 230-575V/3Ph) [$423], Inverter/Vector Duty Nameplate [$0], Standard Aluminum Conduit Box - NPT holes [$0], Class H Insulation [$195], 15m Encoder Cable w/Wire Leads + (2) 15-pin Plugs (P/N 1360 2640-15) [$400], No Brake Release [$0], BE2 with 177 lb-in Brake Torque [$430], BMH Rectifier [$135]

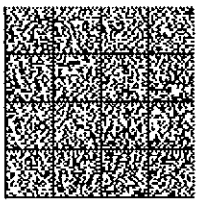
ELECTRONIC OPTIONS / MECHANICAL VARIABLE SPEED (List)

MCV40A0015-5A3-4-00 [$1463], Output Filter HF015-503 [$531], Resistor BW268 [$419], USB11A [$190], Universal Communication Cable for USB11A P/N 08143447-01 [$104], Line Filter NF009-503 [$367], DFE33B + UOH11B - Ethernet/IP Gateway [$720]

COMMENTS / SPECIAL INSTRUCTIONS

Ambient = 25C (77F) or lower.

OFFICE USE ONLY



DELIVERY

Need by N/A
Ship Via N/A
FOB SEW Eurodrive, Inc.

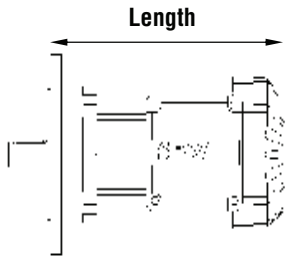
Qty	1	**List Ea**	$9,257	**Disc**	0.556	**Net Adders Ea**	$0	**Net Ea**	$5,146.89	**TOTAL**	$5,146.89

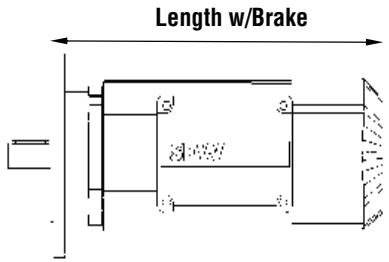
Quotation is valid for 30 days and subject to SEW-Eurodrive terms and conditions of sale.
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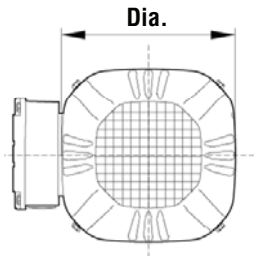
Dimension Comparison – DR & DT/DV Motors

DT/DV Series Motor	DRS Series Standard Efficiency	DRE Series High Efficiency	DRP Series PREMIUM Efficiency	Power [Hp]	Power [kW]	DT/DV/DR			DRS			DRE			DRP			New Standard vs. DT/DV		
						Length	w/BMG	Diameter	Length	w/BE	Dia.	Length	w/BE	Dia.	Length	w/BE	Dia.	Length	w/Brake	Dia.
DT56M4	-	-	-	0.13	0.09	136	172	109	-	-	-	-	-	-	-	-	-	-	-	-
DR63S4	-	-	-	0.15	0.12	187	242	132	-	-	-	-	-	-	-	-	-	-	-	-
DT56L4	-	-	-	0.2	0.15	136	172	109	-	-	-	-	-	-	-	-	-	-	-	-
DR63M4	DRS71S4	-	-	0.25	0.18	187	242	132	198	266	139	-	-	-	-	-	-	+11	+24	+7
DT71K4						202	266	145				-	-	-	-	-	-	-4	0	-6
DR63L4	DRS71S4	-	-	0.33	0.25	187	242	132	198	266	139	-	-	-	-	-	-	+11	+24	+7
DT71C4						202	266	145				-	-	-	-	-	-	-4	0	-6
DT71D4	DRS71S4	-	-	0.5	0.37	202	266	145	198	266	139	-	-	-	-	-	-	-4	0	-6
DT80K4	DRS71M4	-	-	0.75	0.55	252	316	145	223	291	139	-	-	-	-	-	-	-29	-25	-6
DT80N4	DRS80S4	DRE80M4	DRP90M4	1.0	0.75	252	316	145	241	322	156	272	353	156	266	359	179	+20	+37	+11
DT90S4	DRS80M4	DRE90M4	DRP90L4	1.5	1.1	257	342	197	272	353	156	266	359	179	286	379	179	+9	+17	-18
DT90L4	DRS90M4	DRE90L4	DRP90L4	2.0	1.5	257	342	197	266	359	179	286	379	179	286	379	179	+29	+37	-18
DT100LS4	DRS90L4	DRE100L4	DRP112M4	3.0	2.2	311	396	197	286	379	179	346	439	197	352	464	221	+41	+43	0
DV100M4	DRS90L4	DRE100L4	DRP112M4	3.0	2.2	341	426	197	316	409	197	346	439	197	387	499	221	+5	+13	0
DT100L4	DRS100M4	DRE100LC4	DRP132S4	5.0	3.7	341	426	197	316	409	197	346	439	197	387	499	221	+5	+13	0
DV100L4																				
DV112M4	DRS100L4	DRE132S4	-	5.4	4.0	349	429	221	346	439	197	387	499	221	-	-	-	+38	+70	0
DV132S4	DRS132S4	DRE132M4	DRP160S4	7.5	5.5	394	474	221	387	499	221	437	549	221	460	597	272	+43	+75	0
DV132M4	DRS132M4	DRE132MC4	DRP160S4	10	7.5	407	519	275	437	549	221	437	549	221	460	597	272	+30	+30	-54
DV132ML4	DRS132MC4	DRE160M4	DRP160M4	12.5	9.2	462	574	275	437	549	221	460	597	272	460	597	272	-2	+23	-3
DV160M4	DRS160M4	DRE160MC4	DRP160MC4	15	11	462	574	275	460	597	272	460	597	272	460	597	272	-2	+23	-3
DV160L4	DRS160MC4	DRE180M4	DRP180M4	20	15	509	665	331	460	597	272	540	739	317	540	739	317	+31	+74	-14
DV180M4	DRS180M4	DRE180L4	DRP180L4	25	18.5	581	737	331	540	739	317	600	799	317	583	772	317	+19	+62	-14
DV180L4	DRS180L4	DRE180LC4	DRP180LC4	30	22	581	737	331	600	799	317	600	799	316	600	799	316	+19	+62	-15
DV200L4	DRS180LC4	DRE200L4	DRP225S4	40	30	616	772	394	600	799	317	649	869	394	649	869	394	+33	+97	0
DV225S4	DRS225S4	DRE225S4	DRP225M4	50	37	690	846	394	649	869	394	649	869	394	699	919	394	-41	+23	0
DV225M4	DRS225M4	DRE225M4	-	60	45	690	846	394	699	919	394	699	919	394	-	-	-	+9	+73	0
DV250M4	DRS225MC4	DVE250M4	-	75	55	772	957	510	699	919	394	772	957	510	-	-	-	0	0	0
DV280S4	-	DVE280S4	-	100	75	772	957	510	-	-	-	772	957	510	-	-	-	0	0	0
DV280M4	-	DVE280M4	-	125	90	-	-	-	-	-	-	772	957	510	-	-	-	-	-	-
-	-	DRE315K4	-	150	110	-	-	-	-	-	-	941	1192	624	-	-	-	-	-	-
-	-	DRE315S4	-	200	150	-	-	-	-	-	-	941	1192	624	-	-	-	-	-	-
-	-	DRE315M4	-	250	185	-	-	-	-	-	-	1071	1322	624	-	-	-	-	-	-
-	-	DRE315L4	-	275	200	-	-	-	-	-	-	1071	1322	624	-	-	-	-	-	-
-	-	DRE315L4	-	300	225	-	-	-	-	-	-	1071	1322	624	-	-	-	-	-	-

NOTES:
1. BLUE denotes USA standard motor
2. Copper rotor always selected for non-standard motor
3. All dimension units are metric [mm]
4. Dia. (diameter) dimension does not include conduit box
5. Longest flange selected for Length, w/BMG, and /BE dimensions
6. **New Standard vs. DT/DV** useful when replacing motors
7. RED = larger new dimension Δ, GREEN = smaller Δ







SEW EURODRIVE

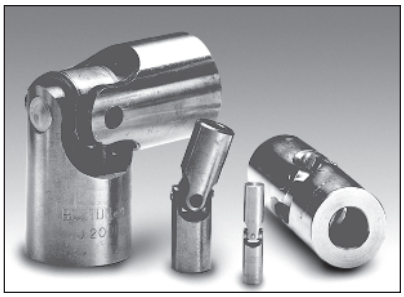
Technical Note

M-111-02

Universal Joints

J/JS Series

Pin and Block Type; Steel and Stainless Steel



Boston Gear precision machined J and JS Series Universal Joints are designed for connecting shafts at angles up to 30 degrees and speeds up to 2000 RPM. All sizes are stocked with both solid and bored hubs.

Joints J100 and J100B and larger are equipped with self-closing, ball valve oilers, creating an oil reservoir to provide enclosed lubrication.

The self-locking assembly ring on joints with 7/8" and larger hub diameter, fits into recess provided in center bearing block and snaps around groove in small bearing pin — assuring locking of entire assembly allowing for quick and easy disassembly and reassembly.

Joints with 3/4" and smaller hub diameters are locked by riveting the small bearing pin. Joint covers (boots) keep dirt and moisture out and lubricants in.

Selection

Torque ratings may be calculated from data in tables. The tables indicate the Rated Static Torque (Lb. Ins.) of alloy and stainless steel joints and Speed-Angle factors suggested for various operating conditions.

The approximate service torque rating of a particular joint is obtained by dividing the Rated Static Torque by the appropriate Speed-Angle factor.

Selecting a universal to satisfy a specified torque requirement is also made convenient with the data provided.

The designated torque load should be multiplied by the appropriate Speed-Angle factor to obtain an equivalent static torque load.

A universal with a rated static torque equal to or greater than the calculated torque load would then be selected.

Example:

A pair of universal joints are desired to transmit 1/2 HP from one shaft running at 500 RPM to another located at an angle of 10 degrees (from a straight line).

The joints will be connected by an intermediate shaft and arranged to operate at equal angles of 5 degrees.
A Speed-Angle factor of 9 is indicated in the table for an operating angle of 5 degrees and a speed of 500 RPM.

$$\text{Torque Load} = \frac{63025 \times HP}{RPM} = \frac{63025 \times 1/2}{500} = 63 \text{ Lb. Ins.}$$

J100 size alloy steel or JS175 size stainless steel universals would be suggested for this application.

SPEED-ANGLE FACTORS

Speed In RPM	Operating Angle – Degrees (Deviation From Straight Line)														
	0	1/2	1	2	3	4	5	6	8	10	12	15	20	25	30
2000	21	22	23.2	25.2	27.4	29.4	31.6	–	–	–	–	–	–	–	–
1800	19	20	21.0	22.8	24.8	26.6	28.6	30.4	–	–	–	–	–	–	–
1600	17	17.8	18.8	20.4	22.2	23.8	25.6	27.2	–	–	–	–	–	–	–
1400	15	15.8	16.6	18.0	19.6	21.0	22.6	24.0	27	–	–	–	–	–	–
1200	13	13.6	14.4	15.6	17.0	18.2	19.6	20.8	23.4	–	–	–	–	–	–
1000	11	11.6	12.2	13.2	14.4	15.4	16.6	17.6	19.8	22	–	–	–	–	–
900	10	10.6	11.0	12.0	13.0	14.0	15.0	16.0	18.0	20	22	–	–	–	–
800	9.0	9.4	10.0	10.8	11.8	12.6	13.6	14.4	16.2	18	19.8	–	–	–	–
700	8.0	8.4	8.8	9.6	10.4	11.2	12.0	12.8	14.4	16	17.6	20	–	–	–
600	7.0	7.4	7.8	8.4	9.2	9.8	10.6	11.2	12.6	14	15.4	17.6	–	–	–
500	6.0	6.4	6.6	7.2	7.8	8.4	9.0	9.6	10.8	12	13.2	15.0	18	–	–
400	5.0	5.2	5.6	6.0	6.6	7.0	7.6	8.0	9.0	10	11.0	12.6	15	17.6	–
300	4.0	4.2	4.4	4.8	5.2	5.6	6.0	6.4	7.2	8.0	8.8	10.0	12	14.0	16
200	3.0	3.2	3.4	3.6	4.0	4.2	4.6	4.8	5.4	6.0	6.6	7.6	9.0	10.6	12
100	2.0	2.2	2.2	2.4	2.6	2.8	3.0	3.2	3.6	4.0	4.4	5.0	6.0	7.0	8.0
50	1.5	1.6	1.7	1.8	2.0	2.2	2.2	2.4	2.8	3.0	3.4	3.8	4.6	5.2	6.0
25	1.3	1.3	1.4	1.5	1.6	1.8	1.9	2.0	2.2	2.6	2.8	3.2	3.8	4.4	5.0
10	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.8	2.0	2.2	2.4	2.8	3.4	3.8	4.4
0	1.0	1.1	1.1	1.2	1.3	1.4	1.5	1.6	1.8	2.0	2.2	2.6	3.0	3.6	4.0

RATED STATIC TORQUE (LB. INS.) **STRAIGHT LINE**

ALLOY STEEL UNIVERSAL JOINTS

Catalog Number	J37	J50	J62	J75	J87	J100	J112	J125	J150	J175	J200	J250	J300	J400
Torque – Lb. Ins.	20	80	166	320	370	600	670	1040	1680	2500	4400	7000	11,000	26,400

STAINLESS STEEL UNIVERSAL JOINTS

Catalog Number	JS37	JS50	JS62	JS75	JS87	JS100	JS112	JS125	JS150	JS175	JS200	JS250	JS300	JS400
Torque – Lb. Ins.	6	24	50	96	110	180	200	310	500	750	1320	1900	3100	7360

E

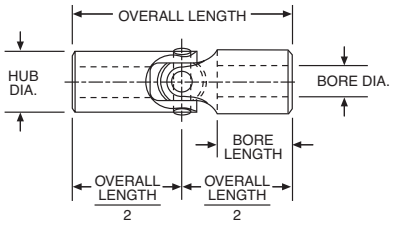
Universal Joints

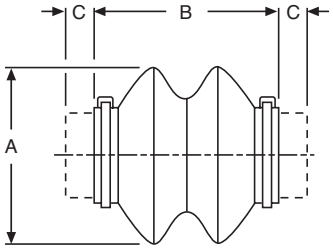
J/JS Series Bored and Solid Hubs

Pin and Block Type; Steel and Stainless Steel

STANDARD TOLERANCES

DIMENSIONS		TOLERANCE	
		Steel	Stainless
Bore	All	± .001	±.001
Hub Dia.	All	+.000 –.003	±.020
Bore Length	All	±1/16	±1/64
Overall Length	1-3/4 - 4-1/4	±1/64	±1/64
	5 -10-5/8	±1/32	±1/32





Reference Pages

Lubrication—312
Mounting—312

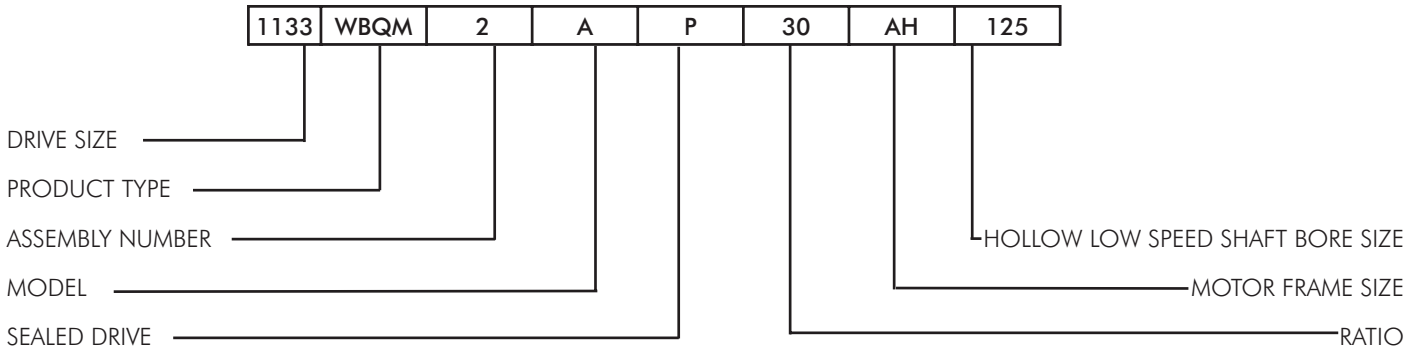
ALL DIMENSIONS IN INCHES
ORDER BY CATALOG NUMBER OR ITEM CODE

Steel		Stainless Steel		Universal Joints							Boot Kits†				
Catalog Number	Item Code	Catalog Number	Item Code	Bore**	Bore Length*	Hub Dia.	Overall Length	Keyway	Setscrew	Approx. Weight Lbs.	A	B	C	Catalog† Number	Item Code
J37A-3/16	72467	-	-	3/16	11/16	3/8	1-3/4	-	2-56NC	.04					
J37B	08426	JS37B	08472	3/16	11/16	3/8	1-3/4	-	-	.04	1-1/32	1-1/32	9/32	UB37	47602
J37	08400	JS37	08452	-	-	3/8	1-3/4	-	-	.05					
J50A-1/4	72468	-	-	1/4	3/4	1/2	2	-	4-40NC	.08					
J50B	08428	JS50B	08474	1/4	3/4	1/2	2	-	-	.08	1-1/4	1-5/16	11/32	UB50	47603
J50	08402	JS50	08454	-	-	1/2	2	-	-	.10					
J62A-5/16	72469	-	-	5/16	13/16	5/8	2-1/4	3/32x3/64	10-32NF	.14					
J62B	08430	JS62B	08476	5/16	13/16	5/8	2-1/4	-	-	.14	1-1/2	1-7/16	13/16	UB62	47604
J62	08404	JS62	08456	-	-	5/8	2-1/4	-	-	.18					
J75A-3/8	72470	-	-	3/8	31/32	3/4	2-11/16	3/32x3/64	10-32NF	.24					
J75B	08432	JS75B	08478	3/8	31/32	3/4	2-11/16	-	-	.24	1-3/4	1-9/16	9/16	UB75	47605
J75	08406	JS75	08458	-	-	3/4	2-11/16	-	-	.30					
J87A-7/16	72471	--		7/16	1-1/32	7/8	3	3/32x3/64	10-32NF	.31					
J87B	08434	JS87B	08480	7/16	1-1/32	7/8	3	-	-	.31	2	1-13/16	19/32	UB87	47606
J87	08408	JS87	08460	-	-	7/8	3	-	-	.45					
J100A-1/2	72472	-	-	1/2	1-3/16	1	3-3/8	1/8x1/16	1/4-20NC	.50					
J100B	08436	JS100B	08482	1/2	1-3/16	1	3-3/8	-	-	.50	2-1/4	2-1/8	5/8	UB100	47607
J100	08410	JS100	08462	-	-	1	3-3/8	-	-	.66					
J112A-9/16	72473	-	-	9/16	1-7/32	1-1/8	3-1/2	1/8x1/16	1/4-20NC	.69					
J112B	72474	JS112B	72483	9/16	1-7/32	1-1/8	3-1/2	-	-	.69	2-9/16	2-7/16	17/32	UB112	72491
J112	72475	JS112	72484	-	-	1-1/8	3-1/2	-	-	.88					
J125A-5/8	72476	--		5/8	1-1/4	1-1/4	3-3/4	3/16x3/32	5/16-18NC	.88					
J125B	08438	JS125B	08484	5/8	1-1/4	1-1/4	3-3/4	-	-	.88	2-7/8	2-3/4	1/2	UB125	47608
J125	08412	JS125	08464	-	-	1-1/4	3-3/4	-	-	1.15					
J150A-3/4	72477	-	-	3/4	1-11/32	1-1/2	4-1/4	3/16x3/32	5/16-18NC	1.44					
J150B	08440	JS150B	08486	3/4	1-11/32	1-1/2	4-1/4	-	-	1.44	3-1/4	3-1/4	1/2	UB150	47609
J150	08414	JS150	08466	-	-	1-1/2	4-1/4	-	-	1.81					
J175A-7/8	72478	-	-	7/8	1-9/16	1-3/4	5	3/16x3/32	5/16-18NC	2.31					
J175B	08442	JS175B	08488	7/8	1-9/16	1-3/4	5	-	-	2.31	3-5/8	3-3/4	5/8	UB175	47610
J175	08416	JS175	08468	-	-	1-3/4	5	-	-	2.86					
J200A-1	72479	-	-	1	1-5/8	2	5-7/16	1/4x1/8	3/8-16NC	3.31					
J200B	08444	JS200B	08490	1	1-5/8	2	5-7/16	-	-	3.31	4-1/2	4-3/16	5/8	UB200	47611
J200	08418	JS200	08470	-	-	2	5-7/16	-	-	4.06					
J250A-1-1/4	72480	-	-	1-1/4	2-3/32	2-1/2	7	1/4x1/8	3/8-16NC	6.81					
J250B	08446	JS250B	72485	1-1/4	2-3/32	2-1/2	7	-	-	6.81	5-1/2	4-7/8	1-1/16	UB250	47612
J250	08420	JS250	72486	-	-	2-1/2	7	-	-	8.25					
J300A-1/1/2	72481	-	-	1-1/2	2-27/32	3	9	3/8x3/16	1/2-13NC	12.5					
J300B	08448	JS300B	72487	1-1/2	2-27/32	3	9	-	-	12.5	6	5-5/8	1-11/16	UB300	47613
J300	08422	JS300	72488	-	-	3	9	-	-	15.25					
J400A-2	72482	-	-	2	3-1/8	4	10-5/8	1/2x1/4	1/2-13NC	25.8					
J400B	08450	JS400B	72489	2	3-1/8	4	10-5/8	-	-	25.8	6-7/8	6-5/8	2	UB400	47614
J400	08424	JS400	72490	-	-	4	10-5/8	-	-	31.3					

*Approximate Hub Projection
†Each Kit contains (2) Boots and (4) Ties together with complete instructions for installation and lubrication.
**Style A includes bore, keyway and setscrew. Style B includes bore only. Units without an A & B letter have a solid bore.

E

Drive Nomenclature



Drive Size (Shaft Centers)

1133 = 1.33	1262 = 2.62	1525 = 5.25
1154 = 1.54	1300 = 3.00	1600 = 6.00
1175 = 1.75	1325 = 3.25	1700 = 7.00
1206 = 2.06	1326 = 3.26	1800 = 8.00
1238 = 2.38	1425 = 4.25	11000 = 10.00

Product Type ✷

Expressed 2 to 5 letters, including Primary Type, Output Shaft, and Motor Flange, as required.
WB — Basic drive without Feet (Single Reduction)
WU — Worm Under (Horizontal LSS)
WO — Worm Over (Horizontal LSS)
WX — Vertical Low Speed Shaft
WJ — Vertical High Speed Shaft (Horizontal LSS)
WL — Flange Mounted drive
WR — Extended Output Shaft

Primary/Type

H — Helical drives (Double Reduction)
W — Worm drives (Double Reduction)

Output Shaft

Q — Hollow Low Speed Shaft

Motor Flange

F — Flange Mounted Electric Motor with Coupling
M — Flange Mounted Electric Motor without Coupling (Hollow Input Shaft)

Assembly Number

See Individual Dimension Pages

Model

A, B, C, etc.
S — Modified or Special

Sealed Drive

P — Sealed Drive with Pressure Compensation System & Synthetic Lube.
- — Standard Drive (Not Sealed)

Ratio

Nominal Ratio Expressed 1 to 4 digits, as required

Motor Frame Size

NEMA Frame Sizes
AH— 48C
AA— 56C
AB— 140TC
AC— 180TC
AD— 210TC
AE — 250TC

IEC Frame Sizes
GA — 63D
GB — 71D
GD — 80D
GF — 90D
GH — 100LD
GK — 112D
GM— 132D

Hollow Low Speed Shaft Bore Size

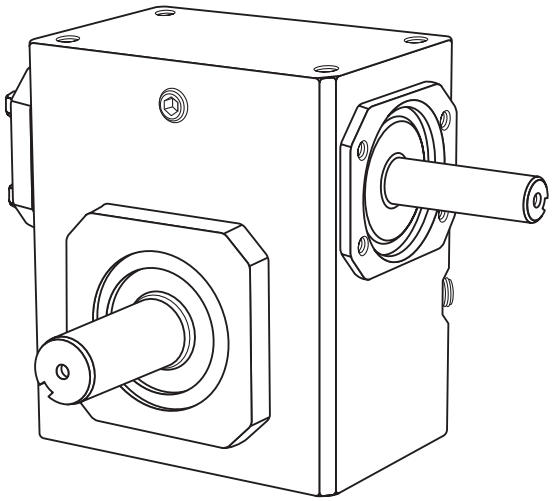
For Sizes 1133-1525, Output Shaft= "Q" Drives Only (Decimal Omitted)

(See Page 5 for footnotes.)

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Selection Guide *

Drivers with Solid Input Shaft and Solid Output Shaft

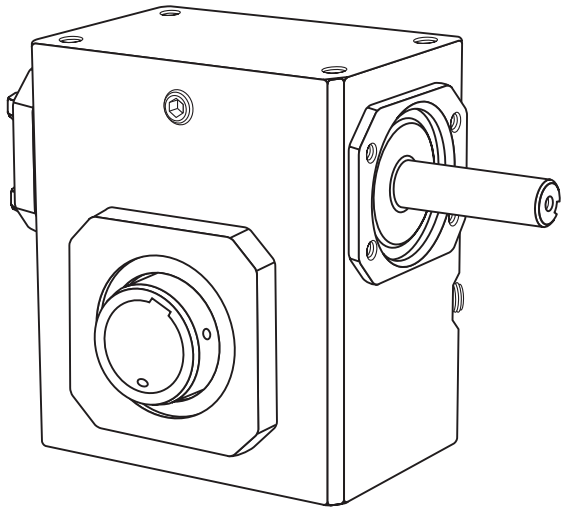


Single Reduction
Selections — Pages 22 through 27
Dimensions — Pages 28 through 51

Double Reduction Worm-Worm
Selections — Pages 52 through 57
Dimensions — Pages 58 through 81

Double Reduction Helical-Worm
Selections — Pages 82 through 85
Dimensions — Pages 86 through 117

Drivers with Solid Input Shaft and Hollow Output Shaft



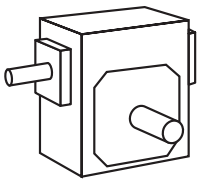
Single Reduction
Selections — Pages 22 through 27
Dimensions — Pages 28 through 51

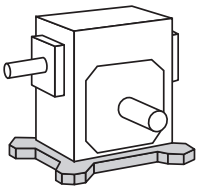
Double Reduction Worm-Worm
Selections — Pages 52 through 57
Dimensions — Pages 58 through 81

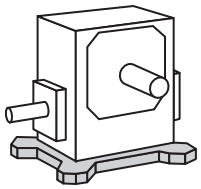
Double Reduction Helical-Worm
Selections — Pages 82 through 85
Dimensions — Pages 86 through 117

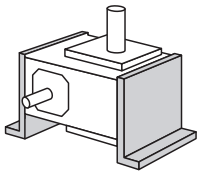
(See Page 5 for footnotes.)

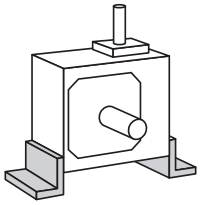
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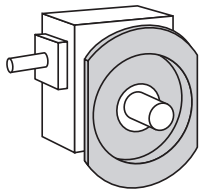

WB

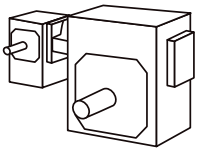

WO

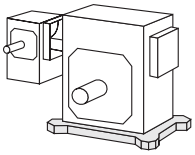

WU

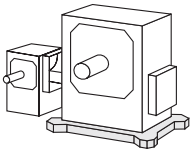

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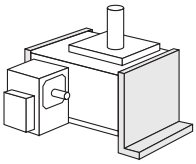

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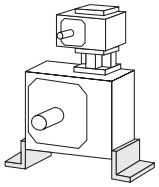

WL

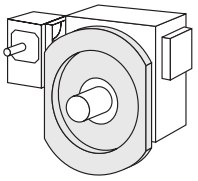

WBW

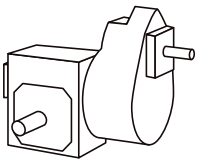

WOW

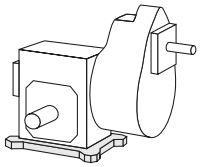

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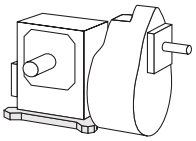

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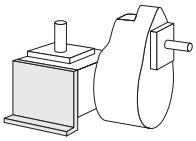

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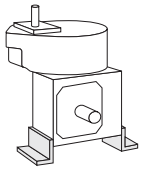

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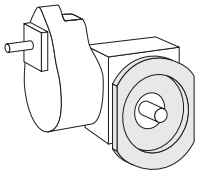

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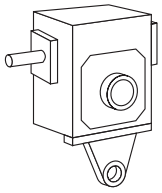

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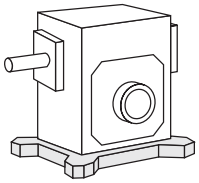

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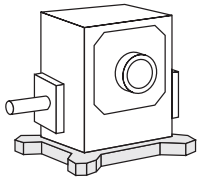

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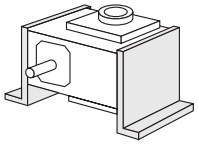

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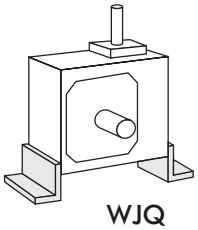

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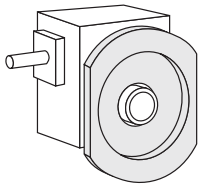

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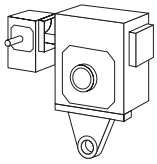

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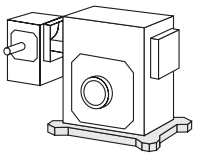

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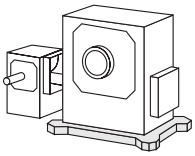

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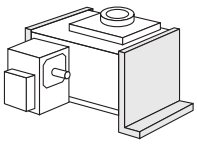

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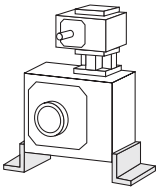

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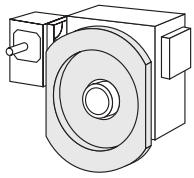

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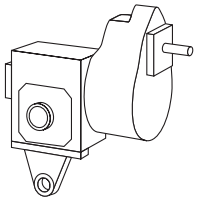

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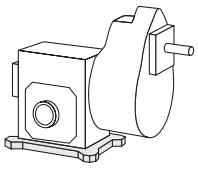

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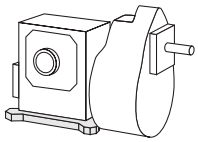

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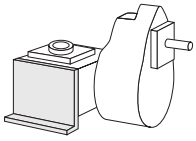

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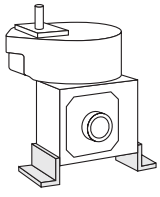

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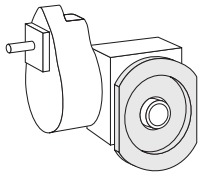

WBHQ


WOHQ


WUHQ

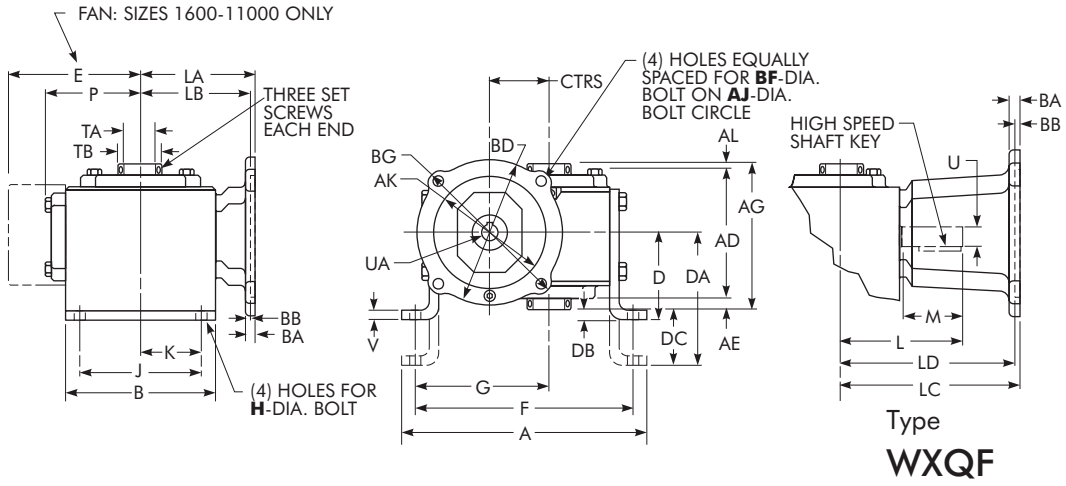

WXHQ


WJHQ


WLHQ

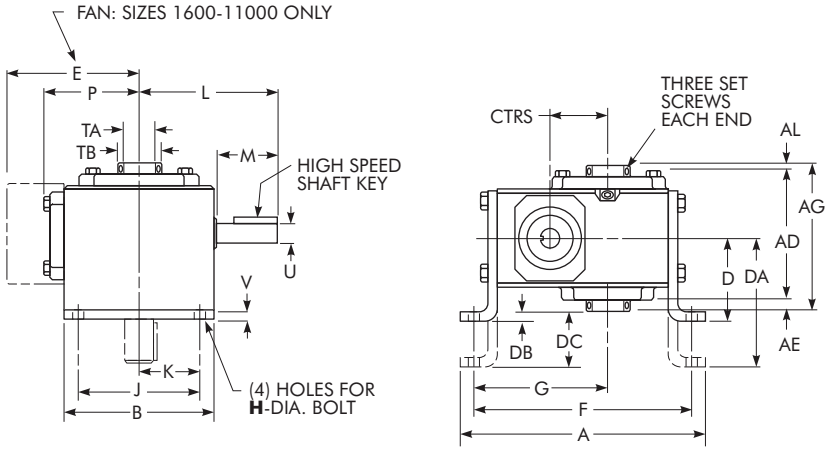
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Type
WXQM



Type
WXQF

Type
WXQ



SEE PAGE 43 FOR MOTOR MOUNTING DIMENSIONS.

(Continued from preceding page)

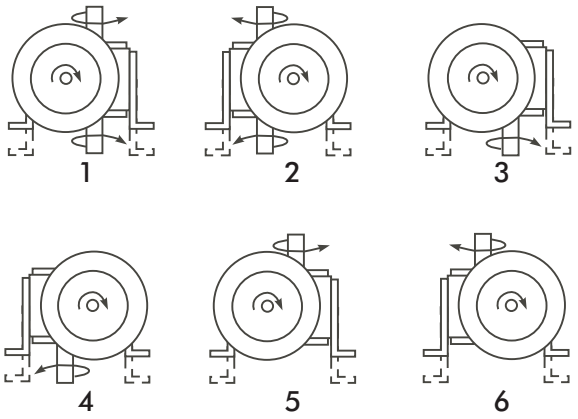
DRIVE SIZE ★	Hollow Low Speed Shaft			High Speed Shaft		V	AD	AE	AG	AL	DA	DB	DC	Approx. Wt – lb					
	TA Max ■ +.002 −.000	TB	Key	U −.0005 −.0015	Key									WXM	WXF	WX	WXQM	WXQF	WXQ
1133	.625	1.00	.188 x .188 x 1.25	.5000	.125 x .125 x 1.44	.25	3.90	.53	4.75	.32	3.56	.25	1.19	20	25	18	20	25	18
1154	.625	1.00	.188 x .188 x 1.25	.6250	.188 x .188 x 1.50	.25	4.61	.51	5.42	.30	4.38	.29	1.87	26	31	24	26	31	24
1175	1.000	1.44	.250 x .250 x 2.50	.6250	.188 x .188 x 1.50	.25	4.73	.49	5.50	.28	4.38	.25	1.63	27	33	26	27	33	26
1206	1.438	1.94	.375 x .375 x 3.00	.6250	.188 x .188 x 1.50	.38	4.99	.61	6.00	.40	4.88	.13	1.88	48	42	35	48	42	35
1238	1.438	1.94	.375 x .375 x 3.00	.7500	.188 x .188 x 1.75	.38	5.18	.51	6.00	.31	5.25	.38	2.25	54	55	46	54	55	46
1262	1.438	1.94	.375 x .375 x 3.00	.7500	.188 x .188 x 1.75	.38	6.01	.60	7.00	.39	5.56	.13	2.06	70	71	62	70	71	62
1300	1.938	2.51	.500 x .500 x 3.00	.8750	.188 x .188 x 1.75	.38	6.53	.60	7.50	.36	5.88	.19	2.13	94	105	90	94	105	90
1325	1.938	2.51	.500 x .500 x 3.00	.8750	.188 x .188 x 1.75	.38	7.04	.54	7.88	.29	6.25	.75	2.31	97	108	93	97	108	93
1425	2.188	2.75	.500 x .500 x 3.00	1.2500	.250 x .250 x 2.88	.50	7.53	.63	8.50	.34	7.50	.75	3.25	174	182	164	174	182	164
1525	3.438	4.26	.875 x .875 x 4.00	1.2500	.250 x .250 x 3.00	.50	8.85	.97	10.50	.68	9.16	–.09	3.91	282	289	267	282	289	267
1600	3.438	4.18	.875 x .875 x 4.00	1.5000	.375 x .375 x 3.00	.50	10.52	.52	11.50	.52	9.63	1.56	3.88	371	378	348	371	378	348
1700	3.938	4.92	1.000 x 1.000 x 7.00	1.6250	.375 x .375 x 2.87	.75	11.36	1.09	13.50	1.09	. . .	.25	. . .	. . .	500	470	. . .	500	470
1800	4.438	5.55	1.000 x 1.000 x 7.00	1.8750	.500 x .500 x 2.81	.75	12.48	1.03	14.50	1.03	. . .	.75	. . .	. . .	690	660	. . .	690	660
11000	5.438	6.67	1.250 x 1.250 x 12.00	2.2500	.500 x .500 x 3.69	1.00	15.78	1.39	18.50	1.39	. . .	–.25	. . .	. . .	. . .	1060	. . .	. . .	1060

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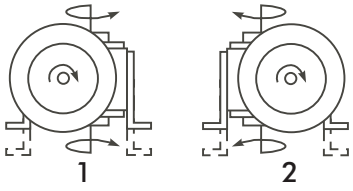
Assemblies ✷

Reverse all arrows for opposite rotation of high speed shaft.

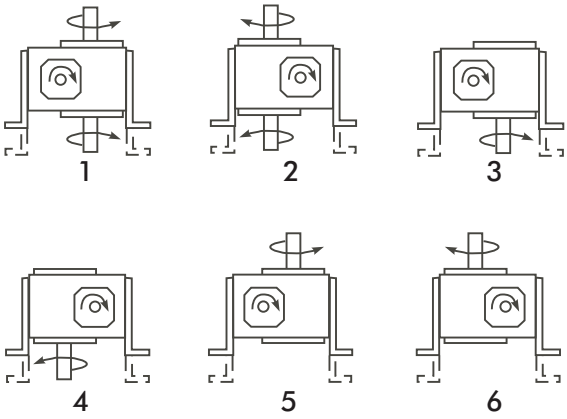
WXM & WXF



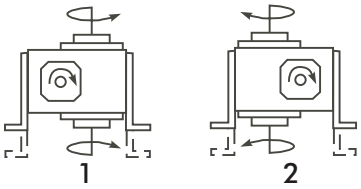
WXQM & WXQF



WX



WXQ



(See Page 5 for footnotes.)

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Lifelign® Gear Coupling Nomenclature

Type GC (Pages 16 thru 18 & 37 thru 41)

1010 — SIZE
GC — PRODUCT CLASSIFICATION
02 — TYPE

Gear — Continuous Sleeve

GC02 = Double Engagement
GC05 = Single Engagement/Floating Shaft

Type G (Pages 19 thru 41)

1010 — SIZE
G — PRODUCT CLASSIFICATION
20 — TYPE (Shrouded and Exposed Bolts)

Gear — Standard Flanged Sleeve

G10/20 = Double Engagement (Shrouded/Exposed)
G51/52 = Single Engagement/Floating Shaft (Shrouded/Exposed)
GV10/20 = Vertical Double Engagement (Shrouded/Exposed)
GV51/52 = Vert. Single Engage./Floating Shaft (Shrouded/Exposed)
G62 = Brakewheel Double Engagement (Exposed)
G63 = Disc Brake Double Engagement (Exposed)
G66 = Brakewheel Single Engagement (Exposed)
GL20 = Slide Double Engagement (Exposed)
GL52 = Slide Single Engagement/Floating Shaft (Exposed)
G70 = Disconnect Inching Drives
G72 = Disconnect (Exposed)
G31/32 = Spacer (Shrouded/Exposed)
GP20 = Insulated Double Engagement (Exposed)
GP52 = Insulated Single Engagement/Floating Shaft (Exposed)
GP82 = Insulated Rigid (Exposed)
G81/82 = Rigid (Shrouded/Exposed)
GV82 = Vertical Rigid (Exposed)
GR20 = Shear Pin (Exposed)

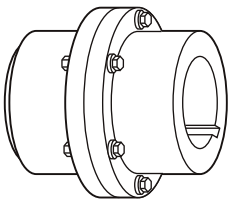
Type G (Pages 42 thru 56)

1080 — SIZE
G — PRODUCT CLASSIFICATION
20 — TYPE (Exposed Bolts Only)

Gear — Large Flanged Sleeve

Type G20 = Double Engagement
Type G52 = Single Engagement/Floating Shaft
Type GV20 = Vertical Double Engagement
Type GV52 = Vertical Single Engagement//Floating Shaft
Type GL20 = Slide Double Engagement
Type G70 = Disconnect/Inching Drives
Type G32 = Spacer
Type G82 = Rigid
Type GV82 = Vertical Rigid
Type GR20 = Shear Pin

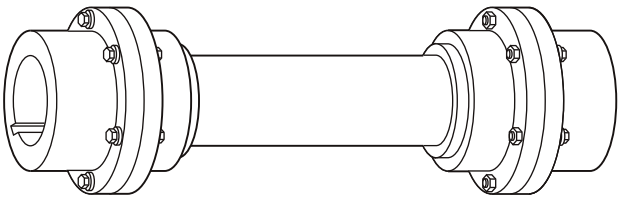
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Types G52, GV52

The Type G52 single engagement design is used with floating shafts or three bearing drive trains. It has one flex half and one rigid half and only accepts angular misalignment. (See Pages 21 and 43.)

The GV52 vertical single engagement gear coupling is a standard horizontal single engagement gear coupling modified to accommodate the sleeve centering assembly. It recommended for inclinations over 10°. Downward thrust capacity for Sizes 1010 thru 1030GV52 is 10,000 lbs.; Sizes 1035 thru 1070GV52 is 30,000 lbs. and Sizes 1080GV52 and larger is 87,000 lbs. (See Pages 25 & 46.)

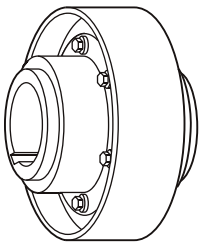


Types G52, GV52

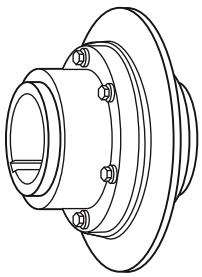
Floating shaft assemblies are used when distance between equipment is too great for spacer couplings. A standard floating shaft assembly consists of two standard single engagement couplings, two gap discs and a connecting shaft. A floating shaft can eliminate the need for additional bearing supports along spanning shafts because the shaft is supported by connected equipment through the single engagement couplings. (See Pages 22, 23, and 44.) When used with a vertical floating shaft on inclinations over 10°, the Type GV52 coupling is used as the lower coupling to support the shaft. (See Pages 25 and 46.)

Flex Hubs on Floating Shaft (RFFR) — Assembly of the flex hubs on the floating shaft allows for easier replacement and allows the rigid hubs with greater bore capacity to be used on the connected equipment shafts. This frequently means a smaller coupling size can be utilized.

Rigid Hubs on Floating Shaft (FRRF) — When the rigid hubs are on the floating shaft, shorter shaft spans can be accommodated, since no cover drawback is required.

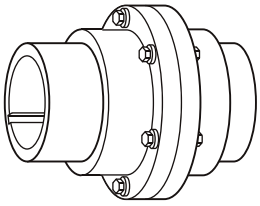


Types G62 & 66



Type G63

Double or single engagement brakewheel and disc brake couplings are used for applications, such as cranes, hoists and conveyors. Brakewheel and disc brake couplings accommodate misalignment between connected equipment and eliminate the need for double shaft extensions on motors and gear drives for applications requiring brakes. (See Pages 26 and 27.)

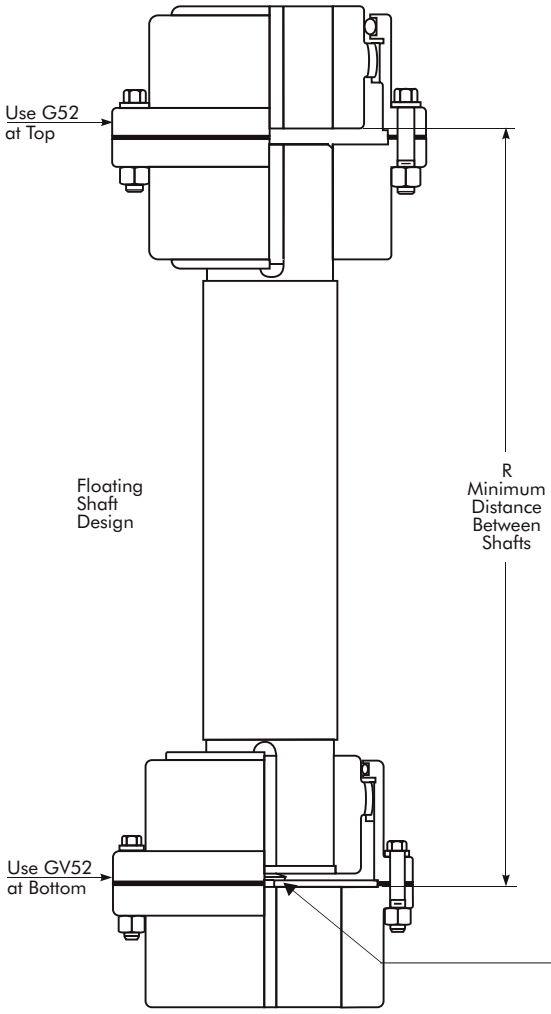


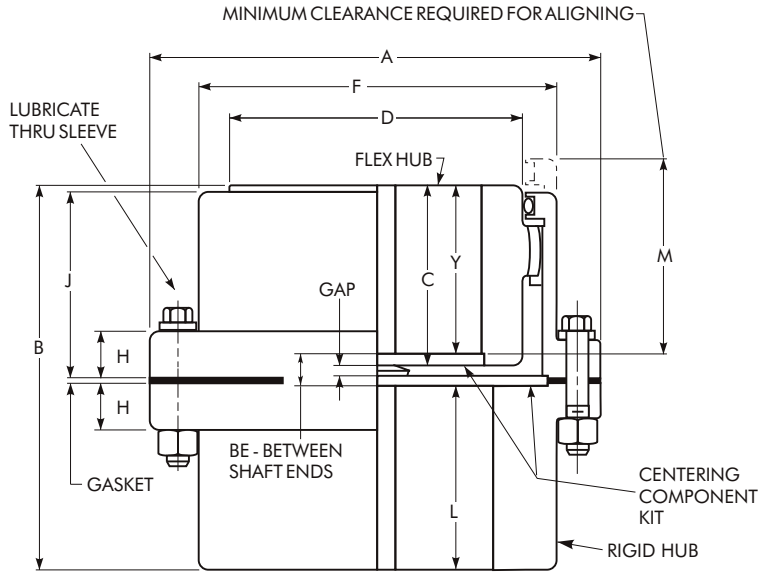
Types GL20 & GL52

Double and single engagement Slide couplings are used for applications requiring axial movement to accommodate thermal shaft expansion or adjustment. (See Pages 28, 29, and 47.)

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Type GV52 Standard Flanged Sleeve
Vertical Single Engagement/Dimensions — Inches





For Sizes 1010GV thru 1055GV, Type GV51 Shrouded Bolts furnished only when specified on order.



Downward Thrust Capacity of Support Button
Sizes 1010-1030GV = 10,000 lb
Sizes 1035-1070GV = 30,000 lb

SIZE ★	Torque Rating (lb-in) ♦†	Allow Speed rpm ✱	Max Bore ●		Min Bore ■	Cplg Wt With No Bore-lb		Lube Wt lb	A	B	C	D	F	H	J	L	M	R	Y	BE	Gap	SIZE ★
			Flex Hub	Rigid Hub		GV51	GV52															
1010GV	10,080	7,000	1.875	2.375	.50	9	10	.08	4.56	3.42	1.53	2.70	3.30	.55	1.53	1.56	1.80	5.18	1.28	.580	.140	**1010GV**
1015GV	20,790	5,500	2.375	2.938	.75	18	20	.12	6.00	3.92	1.77	3.40	4.14	.75	1.88	1.82	2.20	6.00	1.52	.580	.140	**1015GV**
1020GV	37,800	4,600	2.875	3.625	1.00	32	35	.20	7.00	4.90	2.27	4.14	4.98	.75	2.34	2.30	2.80	7.20	2.02	.580	.140	**1020GV**
1025GV	66,150	4,000	3.625	4.375	1.25	55	60	.40	8.38	6.11	2.82	5.14	6.10	.86	2.82	2.90	3.40	8.57	2.57	.640	.200	**1025GV**
1030GV	107,100	3,600	4.125	5.125	1.50	85	95	.60	9.44	7.24	3.39	6.00	7.10	.86	3.30	3.46	4.00	9.75	3.14	.640	.200	**1030GV**
1035GV	163,800	3,100	4.875	5.875	2.00	135	150	1.00	11.00	8.43	3.95	7.00	8.32	1.12	3.84	4.02	4.90	11.73	3.70	.710	.260	**1035GV**
1040GV	270,900	2,800	5.750	7.250	2.50	205	225	1.50	12.50	9.58	4.42	8.25	9.66	1.12	4.38	4.54	5.50	13.40	4.17	.865	.300	**1040GV**
1045GV	371,700	2,600	6.750	8.125	3.00	285	305	2.00	13.62	10.77	4.95	9.25	10.79	1.12	4.84	5.14	6.20	15.28	4.58	1.050	.360	**1045GV**
1050GV	500,900	2,400	7.375	9.000	3.50	405	435	3.00	15.31	12.19	5.67	10.00	12.04	1.50	5.54	5.80	6.90	16.68	5.30	1.090	.315	**1050GV**
1055GV	655,200	2,200	8.250	10.000	4.00	560	585	3.70	16.75	13.78	6.26	11.00	13.16	1.50	6.22	6.80	7.70	18.28	5.89	1.090	.315	**1055GV**
1060GV	800,100	2,100	9.125	11.000	4.50	. . .	860	5.00	18.00	15.18	7.00	12.00	14.41	1.00	6.66	7.34	8.70	20.56	6.62	1.215	.315	**1060GV**
1070GV	1,197,000	1,800	10.875	13.000	5.00	. . .	1140	7.20	20.75	17.88	8.18	14.00	16.73	1.12	7.70	8.67	10.00	24.22	7.67	1.540	.380	**1070GV**

★ See page 15 for General Information and other Reference Notes.
♦ Torque Rating is for coupling only, refer to Page 22 for floating shaft selection and ratings.
✱ Allowable speed listed is for GV52 coupling only, refer to Page 22 for floating shaft selection and running speed.

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PU-R Series
industrial/outdoor applications

PU-E Series
industrial/indoor applications

MADE IN THE USA

PU-E Series Hall-Effect Pick-up

The PU Series pick-up is an economical and reliable way to **monitor motor speed.** Its unique design provides ease of installation in otherwise difficult to reach areas. The PU pick-up operates at a 5 to 24 volt level producing a sharp square wave output, which may be fed into Dart's field programmable tachometer, closed-loop control, counter, or any other digital device.

The PU pick-up series also includes a quadrature model to monitor both motor speed and direction by providing two square wave output signals 81° out-of-phase.

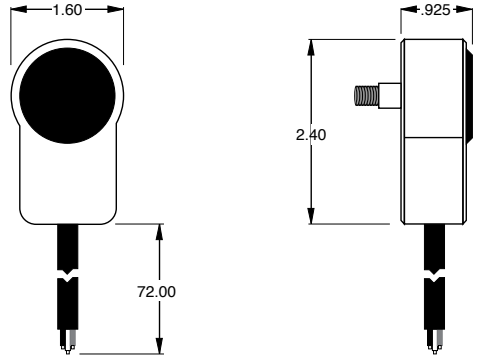
STANDARD FEATURES

- PU Series pick-up mounts directly on shaft being monitored using a single 10-32 screw.
- Maximum speed: 5,000 RPM or 50,000 pulses per minute.
- Supply voltage +4.5 VDC to +24 VDC.
- NPN open collector output signal with built-in pull-up resistor. Square wave output,signal voltage equals supply voltage. +5 VDC to 24 VDC supply voltage. Current sink: 50mA absolute maximum.
- Operating temperature: -40° C. to +100° C.
- Stainless steel ball bearing.
- Compact housing of molded "Santoprene" plastic rubber.
- Output cable-6' rubber jacketed, 3-wire 18AWG conductors;
  red wire: +VDC supply input
  black wire: Common
  white wire: Signal A
  brown wire: Signal B (model PU-20EQUAD only)

PU SERIES SELECTION GUIDE

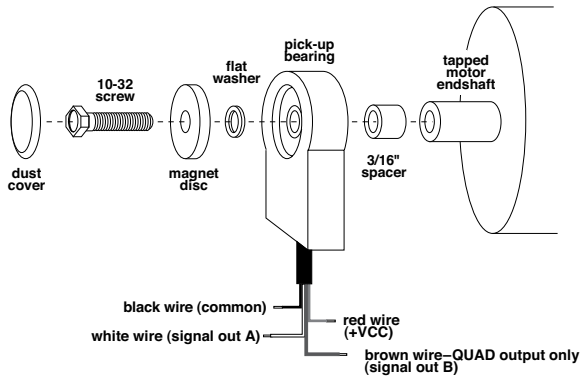
MODEL		PULSES/REVOLUTION
PU-2E industrial/indoor app.	PU-2R industrial/outdoor app.	1
PU-4E	PU-4R	2
PU-20E	PU-20R	10
PU-40E	PU-40R	20
PU-20EQUAD	PU-20RQUAD	10 (and direction)

DIMENSIONAL SPECIFICATIONS



No other mounting brackets or screws are necessary, as the cord will keep the unit from rotating. The PU gives a high signal when the south pole of the magnetic disc crosses the Hall-Effect transistor. The signal is switched low when the north pole crosses this same transistor.

INSTALLATION AND WIRING



CAUTION: DO NOT OVER TIGHTEN MOUNTING SCREW !!!

CAUTION: The PU cord should not be grouped with any other wires or cords. For applications with PU wires over 6 feet long, or particularly noisy environments, a **SHIELDED CABLE** is recommended. Connect the shield to the **COMMON** terminal of the control device, leaving the shield at the pick-up end floating.

Non-Adjustable Series Hydraulic Shock Absorbers
ECO Series

Overview



RoHS COMPLIANT

ITT Enidine's **New ECO Series** non-adjustable hydraulic shock absorbers can accommodate varying energy conditions. This family of tamperproof shock absorbers provides consistent performance, cycle after cycle. Non-adjustable models are designed to absorb maximum energy within a compact envelope size.

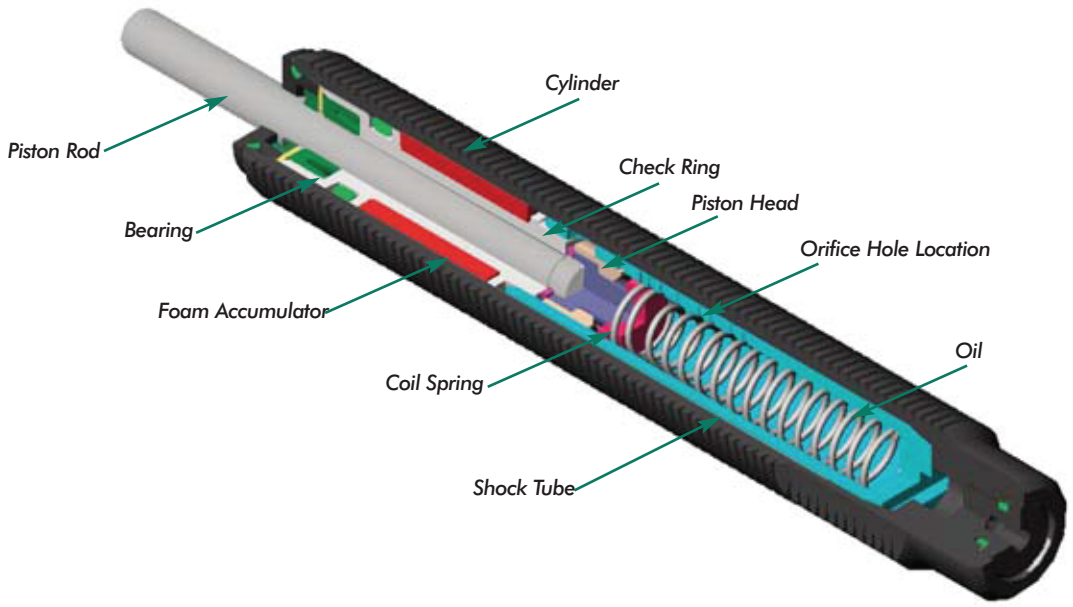
The **ECO Series** was designed using materials and fluids that are safe for our environment. Models can accommodate a wide range of operating conditions with varying masses or propelling forces. The **ECO Series** offers a flexible design to accomodate a wide variety of application parameters. Whether your application has a low velocity/high drive force or high velocity/low drive force condition, the **New ECO Series** will deliver the performance that you have come to expect.

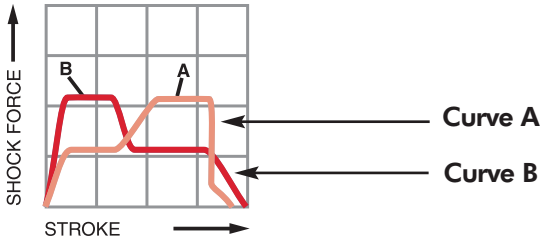
Features and Benefits

- **Extensive non-adjustable product line** offers flexibility in both size and energy absorption capacity to fulfill a wide range of application requirements.
- **Environmentally friendly materials:**
  - RoHS Compliant materials
  - Bio-degradable hydraulic oil
  - Copper-Free design
  - Recyclable packaging materials
- **Introducing our new Enicote II surface finish:**
  - RoHS Compliant
  - Rated at 350 hours salt spray corrosion protection
- **Jam Nut included** with every shock absorber.
- **ISO quality standards** result in reliable, long-life operation.
- **Tamperproof design** ensures repeatable performance.
- **Threaded cylinders provide mounting flexibility** and increase surface area for improved heat dissipation.
- **Wrench flats** promote ease of mounting
- **Capability to mount into pressure chambers**
- **Integrated positive stopping capabilities** up to 100 psi (7 bar).
- **Special materials and finishes** can be designed to meet specific customer requirements
  - Optional fluids and seal packages can expand the standard operating temperature range from (15°F to 180°F) to (–30°F to 210°F)
  - Food grade options available
- **Custom orificed (CBECO)** can be engineered to meet specific application requirements or emergency impact only requirements.

Non-Adjustable Series Hydraulic Shock Absorbers
ECO Series

ITT Enidine Non-Adjustable Multiple Orifice Shock Absorbers





Self-compensating damping maintains acceptable deceleration with conventional type damping characteristics. Self-compensating shock absorbers operate over a wide range of weights and velocities. These shock absorbers are well suited for high drive force, low velocity applications, and where energy conditions may change. **Curve A** shows the *shock force vs. stroke* curve of a self-compensating shock absorber impacted with a low velocity and high drive force. **Curve B** shows the *shock force vs. stroke* curve of a self-compensating shock absorber impacted with a high velocity and low drive force.

The design of a multi-orifice shock absorber features a double cylinder arrangement with space between the concentric shock tube and cylinder, and a series of orifice holes drilled down the length of the shock tube wall.

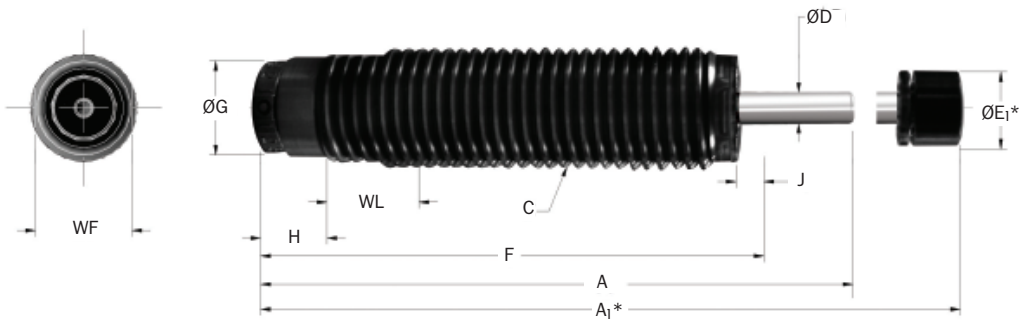
During piston movement, the check ring is seated and oil is forced through the orifices in the shock tube wall, into the closed cellular foam accumulator and behind the piston head.

As the piston head moves it closes off orifice holes, thus reducing the available orifice area in proportion to the velocity. After the load is removed the coil spring pushes the piston rod outward. This unseats the check ring and permits the oil to flow from the accumulator and across the piston head, back into the shock tube. This allows quick repositioning for the next impact.

Low Pressure multiple orifice shock absorbers can provide progressive or self-compensating damping, depending on the impact conditions.

Standard

ECO 8 → ECO 100 Series



*Note: A_1 and E_1 apply to button models and urethane striker cap accessory. One Hex Jam Nut included with every shock absorber.

Catalog No./ Model	(S) Stroke in. (mm)	(E_T) Max. in.-lbs./cycle (Nm/cycle)	(E_TE) Emergency Max. in.-lbs./cycle (Nm/cycle)	(E_TC) Max. in.-lbs./hour (Nm/h)	(F_P) Max. Reaction Force lbs. (N)	Nominal Coil Spring Force		(F_D) Max. Propelling Force lbs. (N)	Model Weight oz. (g)
						Extended lbs. (N)	Compressed lbs. (N)		
ECO 8 (B)	0.25 (6,4)	35 (4,0)	– –	55,000 (6 215)	200 (890)	0.6 (2,7)	1.2 (5,6)	45 (200)	.5 (16)
ECO 10 (B)	0.28 (7,0)	62 (7,0)	– –	120,700 (13 640)	360 (1 600)	0.5 (2,2)	1.0 (4,5)	80 (350)	1.0 (28)
ECO 15 (B)	0.41 (10,4)	106 (12,0)	220 (25)	275,000 (31 020)	450 (2 000)	0.7 (3,0)	1.6 (7,0)	50 (220)	2.0 (56)
ECO S 25 (B)	0.50 (12,7)	212 (24,0)	390 (44)	331,000 (37 400)	625 (2 800)	1.0 (4,5)	2.5 (11,0)	200 (890)	2.4 (68)
ECO 25 (B)	0.63 (16,0)	265 (30,0)	500 (56)	389,000 (44 000)	625 (2 800)	1.0 (4,5)	2.5 (11,0)	200 (890)	2.4 (68)
ECO S 50 (B)	0.50 (12,7)	285 (32,0)	560 (63)	440,000 (49 720)	850 (3 750)	1.5 (6,0)	3.5 (15,0)	360 (1 600)	4.0 (123)
ECO 50 (B)	0.88 (22,0)	550 (62,0)	975 (110)	523,000 (59 070)	850 (3 750)	2.0 (8,9)	6.8 (30,0)	360 (1 600)	4.8 (136)
ECO 100 (B)	1.00 (25,0)	930 (105,0)	2210 (250)	681,500 (77 000)	1,250 (5 500)	3.0 (13,0)	6.0 (27,0)	500 (2 200)	10.5 (297)

*Notes: Maximum energy rating for emergency use only. Estimated cycle life of 1-5 cycles if used at maximum emergency rating.

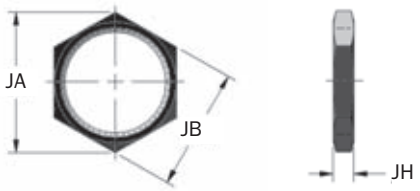
Catalog No./ Model	Damping Constant	A in. (mm)	A_1 in. (mm)	C in. (mm)	D in. (mm)	E_1 in. (mm)	F in. (mm)	G in. (mm)	H in. (mm)	J in. (mm)	WF in. (mm)	WL in. (mm)
ECO 8 IF (B)	-1,-2,-3	1.86 (47,0)	2.25 (57,0)	3/8 - 32 UNEF	.10 (2,5)	0.27 (6,8)	1.61 (40,9)	.26 (6,6)	.18 (4,6)	.10 (2,5)	–	–
ECO 8 MF (B)	-1,-2,-3			M8 x 0,75							–	–
ECO 8 MC (B)	-1,-2,-3			M8 x 1,0								
ECO 10 IF (B)	-1,-2,-3	2.12 (54,0)	2.51 (64,0)	7/16 - 28 UNEF	.12 (3,0)	0.34 (8,6)	1.83 (46,5)	.34 (8,6)	.18 (4,6)	.13 (3,3)	–	–
ECO 10 MF (B)	-1,-2,-3			M10 x 1,0							–	–
ECO 15 IF (B)	-1,-2,-3,-4	2.45 (62,2)	2.85 (72,4)	7/16 - 28 UNEF	.12 (3,0)	.40 (10,2)	2.10 (52,1)	.39 (9,9)	.27 (6,9)	.10 (2,5)	.39 (11,0)	.38 (9,5)
ECO 15 MF(B)	-1,-2,-3,-4			M12 x 1,0								
ECO 15 IC (B)	-1,-2,-3,-4			1/2 - 20 UNEF								
ECO S 25 MF (B)	-1,-2,-3	3.25 (82,7)	3.63 (92,2)	M14 x 1,0	.16 (4,0)	0.44 (11,2)	2.74 (69,5)	.43 (10,9)	.20 (5,1)	.04 (1,0)	(12,0)	.50 (12,7)
ECO S 25 IC (B)	-1,-2,-3			9/16 - 18 UNF							.50	
ECO S 25 MC (B)	-1,-2,-3			M14 x 1,5								(12,0)
ECO 25 IF (B)	-1,-2,-3,-4	3.84 (97,5)	4.22 (107,2)	1/2 - 20 UNF	.16 (4,0)	.44 (11,2)	3.20 (81,3)	.43 (10,9)	.30 (7,6)	.04 (1,0)	(12,0)	.44
ECO 25 MF (B)	-1,-2,-3,-4			M14 x 1,0								.50 (12,7)
ECO 25 IC (B)	-1,-2,-3,-4			9/16 - 18 UNF							.50	
ECO 25 MC (B)	-1,-2,-3,-4			M14 x 1,5								(12,0)
ECO S 50 IF (B)	-1,-2,-3	3.46 (87,9)	3.93 (99,9)	3/4 - 16 UNF	.19 (4,8)	0.50 (12,7)	2.93 (74,4)	.64 (16,3)	.30 (7,6)	.04 (1,0)	.68 (18,0)	.50 (12,7)
ECO S 50 MC (B)	-1,-2,-3			M20 x 1,5								
ECO 50 IF (B)	-1,-2,-3,-4	4.66 (118,4)	5.13 (130,3)	3/4 - 16 UNF	.19 (4,8)	0.50 (12,7)	3.76 (95,5)	.64 (16,3)	.30 (7,6)	.04 (1,0)	.68 (18,0)	.50 (12,7)
ECO 50 MC (B)	-1,-2,-3,-4			M20 x 1,5								
ECO 100 IF (B)	-1,-2,-3,-4	5.07 (128,8)	5.57 (141,5)	1-12 UNF	.25 (6,4)	0.62 (15,7)	4.04 (102,6)	.87 (22,0)	.50 (12,7)	.18 (4,6)	.88 (23,0)	.50 (12,7)
ECO 100 MF (B)	-1,-2,-3,-4			M25 x 1,5								
ECO 100 MC (B)	-1,-2,-3,-4			M27 x 3,0								

Notes: 1. See page 54 for constant damping curves.

ECO 8 → ECO 100 Series

Jam Nut (JN)

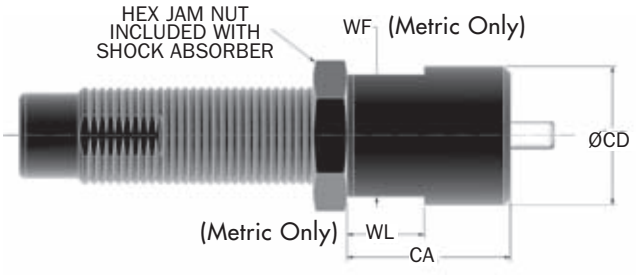
*Note: One Hex Jam Nut included with every shock absorber.



Catalog No./ Model	ECO Series Part Number	Model (Ref)	JA in. (mm)	JB in. (mm)	JH in. (mm)	Weight (mass) oz. (g)
JN 3/8 - 32	J123839034	ECO 8 (B)	0.58	0.50	.09	0.1
JN M8 x 0,75	J223839185	ECO 8 MF (B)	(14,0)	(12,0)	(4,0)	(2)
JN M8 x 1	J223839035	ECO 8 MC (B)	(14,0)	(12,0)	(4,0)	(2)
JN 7/16 - 28	J123840034	ECO 10 IF (B)/ECO 15 (B)	0.65	0.56	.16	0.1
JN M10 x 1	J223840167	ECO 10 MF (B)	(17,3)	(15,0)	(4,0)	(2)
JN M12 x 1	J223841035	ECO 15 M (B)	(15,0)	(13,0)	(3,2)	(2)
JN 1/2 - 20	J123842166	ECO 25 IF (B)	0.72	0.63	.12	0.1
JN M14 x 1	J223842035	ECO S/ECO 25 MF (B)	(19,7)	(17,0)	(4,0)	(3)
JN 9/16 - 18	J123842034	ECO S/ECO 25 IC (B)	1.01	0.88	.31	0.6
JN M14 x 1,5	J223842165	ECO S/ECO 25 MC (B)	(19,7)	(17,0)	(4,0)	(3)
JN 3/4 - 16	J123844034	ECO S/ECO 50 IC (B)	1.08	0.94	.18	0.3
JN M20 x 1,5	J223844035	ECO S/ECO 50 MC (B)	(27,7)	(24,0)	(4,6)	(9)
JN 1-12	J123846034	ECO 100 (B)	1.30	1.13	.18	0.5
JN M25 x 1,5	J223846035	ECO 100 MF (B)	(37,0)	(32,0)	(4,6)	(15)

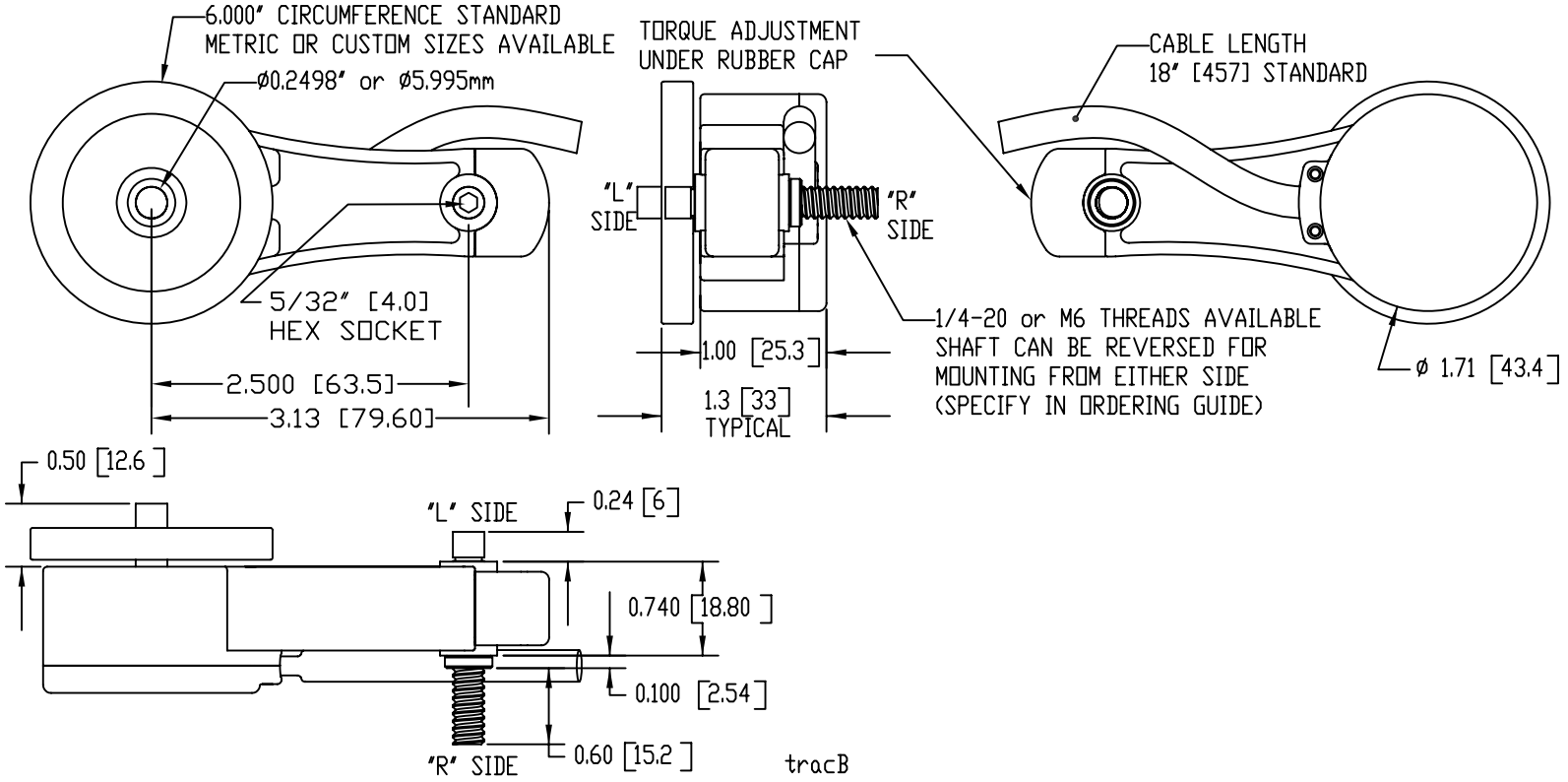
Stop Collar (SC)

ECO8 → ECO100

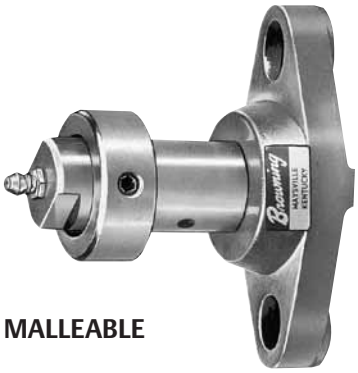


Catalog No./ Model	ECO Series Part Number	Model (Ref)	CA in. (mm)	CB in. (mm)	CD in. (mm)	WF in. (mm)	WL in. (mm)	Weight (mass) oz. (g)
SC 3/8 - 32	M923839057	ECO 8 (B)	0.75	.50	0.58	–	–	.5
SC M8 x 0,75	M923839175	ECO 8 MF (B)	(19,0)	(12,0)	(14,0)	–	–	(23)
SC M8 x 1	M923839058	ECO 8 MC (B)	(19,0)	(12,0)	(14,0)	–	–	(23)
SC 7/16 - 28	M923841057	ECO 10 IF (B)	0.75	–	0.63	–	–	.5
SC M10 x 1	M923840171	ECO 10 MF (B)	(19,0)	–	(14,3)	–	–	(11)
SC 7/16 - 28	M923841057	ECO 15 (B)	0.75	–	0.63	–	–	.5
SC M12 x 1	M923841058	ECO 15 M (B)	(19,0)	–	(16,0)	(14,0)	(9,0)	(14)
SC 1/2 - 20	M923842057	ECO 25 IF (B)	1.00	–	0.75	–	–	1.0
SC M14 x 1,5	M923842171	ECO S/ECO 25 MF (B)	(25,4)	–	(21,0)	(19,0)	(12,0)	(38)
SC 9/16 - 18	M923842199	ECO S/ECO 25 IC (B)	1.00	–	0.69	–	–	1.0
SC M14 x 1	M923842058	ECO S/ECO 25 MF (B)	(25,4)	–	(18,0)	(17,0)	(12,0)	(20)
SC 3/4 - 16	M923844057	ECO S/ECO 50 (B)	1.50	–	1.00	–	–	2.0
SC M20 x 1,5	M924057058	ECO S/ECO 50 M (B)	(38,0)	–	(25,0)	(22,0)	(12,0)	(63)
SC 1-12 x 1	M923846057	ECO 100 (B)	1.75	–	1.50	–	–	8.0
SC M25 x 1,5	M923846171	ECO 100 MF (B)	(44,5)	–	(38,0)	(32,0)	(15,0)	(215)

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
--	INITIAL RELEASE		
A	CHANGED SOME DIMENSION LOCATIONS		
B	CHANGED PIVOT ARM BOLT HEAD		



THIRD ANGLE PROJECTION		ENCODER PRODUCTS COMPANY	
DIMENSIONS ARE IN INCHES		APPROVALS	DATE
ISSUE DATE: xx/xx/xx	TOLERANCES	DRAWN: J.Meschko	10/25/04
NEXT ASSEM. XXX	DECIMAL ± .005	CHECKED	
PREV. ASSEM. XXX	DECIMAL ± .01	RESP ENG	
PART NUMBER ◇	ANGULAR ± 1	MFG ENG	
		QUAL ENG	
NAME AND TITLE: Model TR1			
DWG. NO. trac-01		REV. B	
SCALE: NONE	DWG. SIZE: B	SHEET 1 OF 1	



MALLEABLE

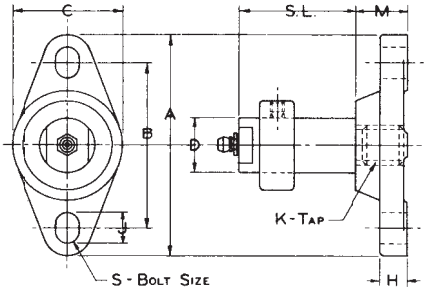


Table No. 1

Fixed Flange Tighteners

Part No.	Shaft	DIMENSIONS										Wt. Lbs.
		A	B▲	C	D	H	J▲	K	M	S.L.	S▲	
FFTN1	N1①	2 3/8"	1 3/4"	1 1/8"	.500"	1/4"	9/32"	3/8 — 16	1/2"	1 1/2"	1/4"	.3
FFTH	None②	4	3	2	—	1/2	9/16	1/2 — 13	15/16	—	3/8	.9
FFTP	None②	4	3	2	—	1/2	9/16	5/8 — 11	15/16	—	3/8	.9
FFTQ	None②	4	3	2	—	1/2	9/16	3/4 — 10	15/16	—	3/8	.8
FFTQ	N2③	4	3	2	1.000	1/2	9/16	3/4 — 10	15/16	2 1/8	3/8	1.6
FFTQ	N3③	4	3	2	1.000	1/2	9/16	3/4 — 10	15/16	3 1/8	3/8	1.8
FFTQ	N4③	4	3	2	1.000	1/2	9/16	3/4 — 10	15/16	4 1/8	3/8	2.1
FFTQ-1	None②	7 1/2	6	3 1/2	—	3/4	15/16	1 — 8	1 7/16	—	5/8	4.8
FFTQ-1	N5③	7 1/2	6	3 1/2	1.500	3/4	15/16	1 — 8	1 7/16	4	5/8	7.3
FFTQ-1	N6③	7 1/2	6	3 1/2	1.500	3/4	15/16	1 — 8	1 7/16	6	5/8	8.5

▲Slots are cast, some variations may be expected.
①Shaft is included.
②No shaft is required when used with Idler Bushings shown on page J-8.
③SHAFT MUST BE ORDERED SEPARATELY.

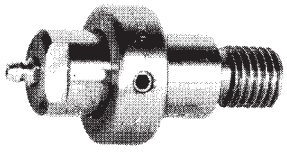
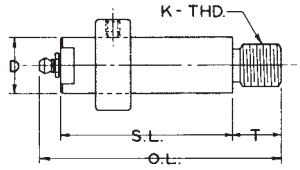


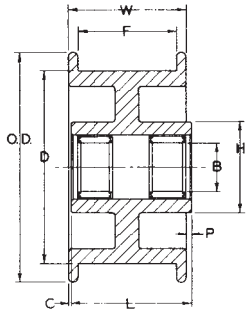
Table No. 2

Tightener Shafts

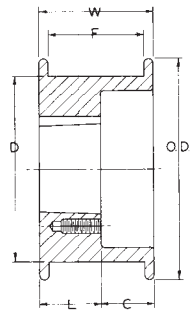
Part No.	DIMENSIONS					Wt. Lbs.
	O.L.	D	K	T	S.L.	
N1	2 5/16"	.500"	3/8 — 16	7/16"	1 1/2"	.13
N2	3 3/8	1.000	3/4 — 10	7/8	2 1/8	.6
N3	4 3/8	1.000	3/4 — 10	7/8	3 1/8	.9
N4	5 3/8	1.000	3/4 — 10	7/8	4 1/8	1.0
N5	5 11/16	1.500	1 — 8	1 5/16	4	2.8
N6	7 11/16	1.500	1 — 8	1 5/16	6	3.8







Type 1



Type 2

Table No. 3

Flat Face Idlers

Part No.	Type	Shaft Length	DIMENSIONS									Wt. Lbs.	Radial Load Capacity in Pounds Based on 2500 Hours Average Life at RPM Shown ■							
			O.D.	D	B	H	W	F	L	P	C		100	500	1000	1500	2000	2500	3000	3500
N1D05F	1	1 1/2" *	1 3/4"	1 3/8"	1/2"	1 1/4"	3/4"	9/16"	3/4"	1/8"	1/8"	.3	665	406	331	294	269	250	237	226
N4D1F	1	2 1/8*	4 3/8	4	1	1 7/8	1 7/16	1 1/16	1 1/4	1/8	5/16	3.0	2927	1787	1458	1295	1185	1104	1047	997
N4D2F	1	3 1/8*	4 3/8	4	1	1 7/8	2 7/16	2 1/16	2 1/2	1/8	1/16	5.0	4348	2654	2166	1922	1760	1640	1544	1482
N4D3F	1	4 1/8*	4 3/8	4	1	1 7/8	3 7/16	3 1/16	3 1/2	1/8	1/16	7.8	5854	3574	2916	2590	2370	2208	2094	1994
N6D4F	1	6*	7	6	1 1/2	2 5/8	5	4 1/2	4	1/8	1 1/8	22.5	5884	3592	2930	2602	2380	2218	2102	2004
N6D6F	1	6*	7	6	1 1/2	2 5/8	6 3/4	6 1/4	5	1/8	1 7/8	29.5	5884	3592	2930	2602	2380	2218	2102	2004
4D1FH	2	H1▲	4 3/8	4	▲	—	1 7/16	1 1/16	7/8	—	9/16	3.4	1518	1016	854	772	718	678	648	624
4D2FP	2	P1▲	4 3/8	4	▲	—	2 7/16	2 1/16	1 5/16	—	1 1/8	4.6	1518	1016	854	772	718	678	648	624
4D3FP	2	P1▲	4 3/8	4	▲	—	3 7/16	3 1/16	1 5/16	—	2 1/8	5.6	1518	1016	854	772	718	678	648	624

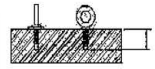
*For use with Drive Tighteners shown on pages J-2 and J-3 and above with shaft lengths indicated.
▲ For use with H-1 1/2 or P1-5/8 IDLER BUSHINGS shown on page J-8.
■See page J-8 for factors to use for Average Life of more or less than 2500 hours.
All Browning Stock Idlers furnished with needle bearings have retainers that insure minimum internal friction and wear by separating the needle rollers. These bearings are inset approximately 1/8" on either end of the Idler hubs to form a grease cavity.

Rigging Information

Crosby RIGGING HARDWARE 3

Crosby SHOULDER EYEBOLTS

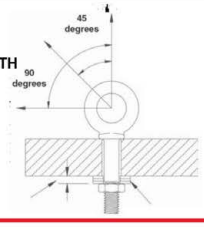




SHANK DIMENSIONS	WLL IN - LINE PULL	WLL 0° < β ≤ 45°	WLL 45° < β ≤ 90°
MM	t	t	t
M6 X 13	0.20	0.06	0.05
M8 X 13	0.40	0.12	0.10
M10 X 17	0.64	0.19	0.16
M12 X 20.5	1.00	0.30	0.25
M16 X 27	1.80	0.54	0.45
M20 X 30	2.50	0.75	0.62
M24 X 36	4.00	1.20	1.00
M30 X 45	6.00	1.80	1.50
M36 X 54	8.50	2.55	2.12

EYE BOLTS WITH UNC THREADING ARE AVAILABLE

- NEVER EXCEED WORKING LOAD LIMITS
- ONLY USE EYE BOLTS IN NON AGEABLE STEEL IN ACCORDANCE WITH THE MACHINERY DIRECTIVE FOR LIFTING APPLICATIONS.
- ALWAYS USE SHOULDER NUT EYEBOLTS FOR ANGULAR LIFTS
- FOR ANGULAR LIFTS ADJUST WORKING LOAD AS SHOWN ABOVE
- ALWAYS TIGHTEN NUTS SECURELY AGAINST THE LOAD
- ALWAYS APPLY LOAD TO EYE BOLT IN THE PLANE OF THE EYE



Crosby SWIVEL HOIST RING



THREAD SHANK SIZE & EFF. THREAD PROJ.		WLL D.F. 5/1	WLL D.F. 4/1	TORQUE
MM	MM	t	t	Nm
M8 X 40	16.9	0.40	0.50	10
M10 X 40	16.9	0.45	0.55	16
M12 X 50	17.2	1.05	1.30	38
M16 X 60	27.2	1.90	2.40	81
M20 X 65	31.2	2.15	2.70	136
M20 X 75	28.1	3.00	3.75	136
M24 X 80	33.1	4.20	5.25	312
M30 X 120	65.1	7.00	8.75	637
M36 X 150	60.6	11.00	13.75	1005
M42 X 160	70.6	12.50	15.60	1005
M48 X 160	70.6	13.50	16.90	1350

- THE SWIVEL HOIST RING MAINTAINS 100% OF ITS WLL AT ANGULAR LOADING. IT IS SUBJECTED TO THE SAME LOAD AS THE SLING.
- APPLY PROPER TORQUE DURING INSTALLATION.
- NEVER USE SPACERS BETWEEN BUSHING FLANGE AND MOUNTING SURFACE.
- ALWAYS ENSURE FREE MOVEMENT OF BAIL. THERE SHOULD BE NO INTERFERENCE BETWEEN LOAD AND HOIST RING BAIL.



REFER TO THE Crosby GROUP WARNINGS FOR ADDITIONAL INFORMATION

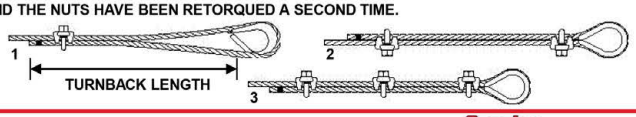
Crosby RIGGING HARDWARE 4

Crosby WIRE ROPE CLIPS

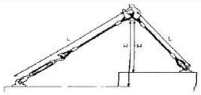


SIZE INCH	SIZE MM	EFFICIENCY	NUMBER OF CLIPS	TURNBACK LENGTH MM	TORQUE Nm
1/8	3 - 4	80%	2	85	6.1
3/16	5	80%	2	95	10.2
1/4	6 - 7	80%	2	120	20.3
5/16	8	80%	2	133	40.7
3/8	9 - 10	80%	2	165	61
7/16	11	80%	2	178	88
1/2	12 - 13	80%	3	292	88
9/16	14 - 15	80%	3	305	129
5/8	16	80%	3	305	129
3/4	18 - 20	80%	4	460	176
7/8	22	80%	4	480	305
1	24 - 26	90%	5	660	305

- APPLY U-BOLT OVER DEAD END OF THE WIRE ROPE, LIVE END OF THE ROPE RESTS IN THE SADDLE; NEVER SADDLE A DEAD HORSE!
- USE THE RECOMMENDED NUMBER OF CLIPS AND APPLY THE RECOMMENDED TORQUE AS SPECIFIED IN THE TABLE.
- A TERMINATION IS ONLY FINISHED WHEN IT HAS BEEN LOADED AT THE REQUIRED WLL AND THE NUTS HAVE BEEN RETORQUED A SECOND TIME.

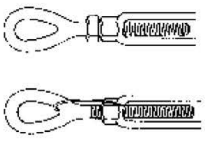


Crosby TURNBUCKLES



SIZE INCH	SIZE MM	WLL (t) JAW AND EYE D.F. 5/1	WLL (t) HOOK END FITTING D.F. 5/1
1/4	6.3	230	180
5/16	8	360	320
3/8	9.5	540	450
1/2	13	1.000	680
5/8	16	1.590	1.020
3/4	19	2.360	1.360
7/8	22	3.270	1.810
1	25	4.540	2.270
1-1/4	32	6.890	-
1-1/2	38	9.710	-
1-3/4	45	12.700	-
2	51	16.780	-

THE USE OF LOCKNUTS OR MOUSING IS AN EFFECTIVE METHOD OF PREVENTING TURNBUCKLES FROM ROTATING.

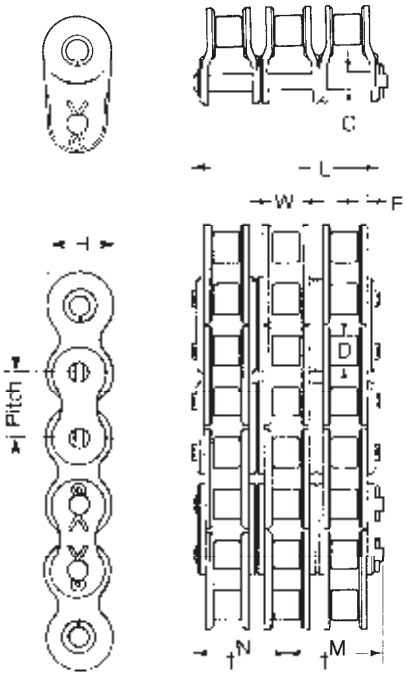


REFER TO THE Crosby CATALOG FOR ADDITIONAL INFORMATION

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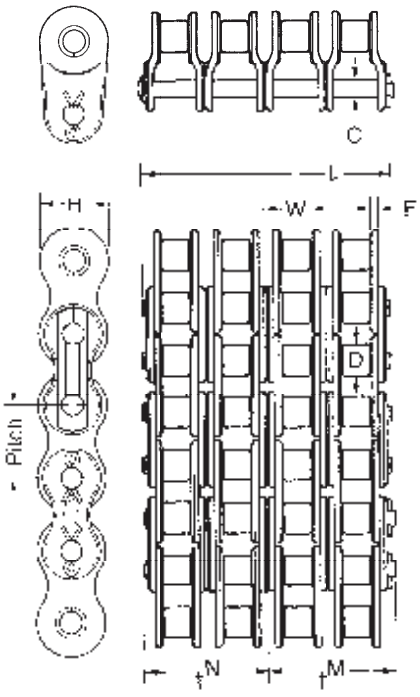
Morse PERFORMANCE CHAIN®

ANSI ROLLER CHAIN
TRIPLE and QUADRUPLE STRAND



Standard series-triple strand

Catalog No.	Dimensions (Inches)									Average Tensile Strength	Weight Per Foot
	Pitch	W-Roller Width	D-Roller Dia.	C-Pin Dia.	F-Plate Thick-ness	L-Width Over Pins	H-Inside Plate Height	†N	†M		
35-3*	3/8	3/16	.200	.141	.050	1.265	.350	.632	.703	6,300	.66
40-3	1/2	5/16	.312	.156	.060	1.780	.466	.880	.968	11,100	1.23
50-3	5/8	3/8	.400	.200	.080	2.220	.584	1.110	1.203	18,300	2.02
60-3	3/4	1/2	.468	.234	.094	2.790	.700	1.395	1.500	25,500	2.96
80-3	1	5/8	.625	.312	.125	3.585	.934	1.792	1.905	43,500	5.09
100-3	1 1/4	3/4	.750	.375	.156	4.371	1.166	2.186	2.329	72,000	7.61
120-3	1 1/2	1	.875	.437	.187	5.538	1.400	2.769	2.938	102,000	11.43
140-3	1 3/4	1	1.000	.500	.219	5.965	1.634	2.982	3.156	138,000	14.63
160-3	2	1 1/4	1.125	.562	.250	7.132	1.866	3.566	3.782	174,000	19.58
200-3	2 1/2	1 1/2	1.562	.781	.312	8.754	2.250	4.377	4.704	285,000	32.04
Heavy series-triple strand											
60-3H	3/4	1/2	.468	.234	.125	3.176	.700	1.588	1.680	25,500	3.60
80-3H	1	5/8	.625	.312	.156	3.971	.934	1.985	2.090	43,500	6.00
100-3H	1 1/4	3/4	.750	.375	.187	4.767	1.166	2.383	2.528	72,000	8.60
120-3H	1 1/2	1	.875	.437	.219	5.943	1.400	2.971	3.141	102,000	12.60
140-3H	1 3/4	1	1.000	.500	.250	6.356	1.634	3.178	3.334	138,000	16.10
160-3H	2	1 1/4	1.125	.562	.281	7.253	1.866	3.761	3.952	174,000	21.20
200-3H	2 1/2	1 1/2	1.562	.781	.375	9.545	2.334	4.772	4.990	285,000	36.20



Standard series-quadruple strand

Catalog No.	Dimensions (Inches)									Average Tensile Strength	Weight Per Foot
	Pitch	W-Roller Width	D-Roller Dia.	C-Pin Dia.	F-Plate Thick-ness	L-Width Over Pins	H-Inside Plate Height	†N	†M		
*35-4	3/8	3/16	.200	.141	.050	1.664	.350	.832	.906	8,400	.88
40-4	1/2	5/16	.312	.156	.060	2.345	.466	1.162	1.250	14,800	1.64
50-4	5/8	3/8	.400	.200	.080	2.933	.584	1.466	1.547	24,400	2.76
60-4	3/4	1/2	.468	.234	.094	3.688	.700	1.844	1.938	34,000	3.94
80-4	1	5/8	.625	.312	.125	4.738	.934	2.369	2.469	58,000	6.77
100-4	1 1/4	3/4	.750	.375	.156	5.779	1.166	2.889	3.031	96,000	10.12
120-4	1 1/2	1	.875	.437	.187	7.327	1.400	3.663	3.828	136,000	15.20
140-4	1 3/4	1	1.000	.500	.219	7.889	1.634	3.945	4.125	184,000	19.48
160-4	2	1 1/4	1.125	.562	.250	9.437	1.866	4.718	4.938	232,000	26.07
200-4	2 1/2	1 1/2	1.562	.781	.312	11.571	2.334	5.785	6.109	380,000	42.59
Heavy series-quadruple strand											
60-4H	3/4	1/2	.468	.234	.125	4.204	.700	2.102	2.194	34,000	4.80
80-4H	1	5/8	.625	.312	.156	5.524	.934	2.627	2.731	58,000	7.90
100-4H	1 1/4	3/4	.750	.375	.187	6.306	1.166	3.153	3.297	96,000	11.50
120-4H	1 1/2	1	.875	.437	.219	7.867	1.400	3.933	4.103	136,000	16.80
140-4H	1 3/4	1	1.000	.500	.250	8.411	1.634	4.205	4.362	184,000	21.50
160-4H	2	1 1/4	1.125	.562	.281	9.959	1.866	4.979	5.170	232,000	28.30
200-4H	2 1/2	1 1/2	1.562	.781	.375	12.628	2.334	6.314	6.531	380,000	48.20

* Rollerless

All sizes available in Riveted construction. Sizes 60 and above available in Cottered construction. Please specify desired construction when ordering.

Standard multiple-strand chains are supplied with loose-fit center plates. Morse press-lit center plates are available on special order.

Chains on this page should not be used for Hoisting applications. Consult Morse for Hoist application recommendations.

† For cotter chain and connector link clearance.

Lifelign® Gear Coupling Nomenclature

Type GC (Pages 16 thru 18 & 37 thru 41)

1010	GC	02
SIZE	PRODUCT CLASSIFICATION	TYPE

Gear — Continuous Sleeve

GC02 = Double Engagement
GC05 = Single Engagement/Floating Shaft

Type G (Pages 19 thru 41)

1010	G	20
SIZE	PRODUCT CLASSIFICATION	TYPE (Shrouded and Exposed Bolts)

Gear — Standard Flanged Sleeve

G10/20 = Double Engagement (Shrouded/Exposed)
G51/52 = Single Engagement/Floating Shaft (Shrouded/Exposed)
GV10/20 = Vertical Double Engagement (Shrouded/Exposed)
GV51/52 = Vert. Single Engage./Floating Shaft (Shrouded/Exposed)
G62 = Brakewheel Double Engagement (Exposed)
G63 = Disc Brake Double Engagement (Exposed)
G66 = Brakewheel Single Engagement (Exposed)
GL20 = Slide Double Engagement (Exposed)
GL52 = Slide Single Engagement/Floating Shaft (Exposed)
G70 = Disconnect Inching Drives
G72 = Disconnect (Exposed)
G31/32 = Spacer (Shrouded/Exposed)
GP20 = Insulated Double Engagement (Exposed)
GP52 = Insulated Single Engagement/Floating Shaft (Exposed)
GP82 = Insulated Rigid (Exposed)
G81/82 = Rigid (Shrouded/Exposed)
GV82 = Vertical Rigid (Exposed)
GR20 = Shear Pin (Exposed)

Type G (Pages 42 thru 56)

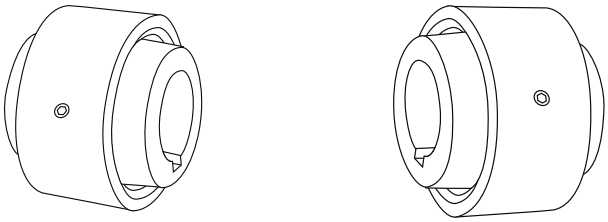
1080	G	20
SIZE	PRODUCT CLASSIFICATION	TYPE (Exposed Bolts Only)

Gear — Large Flanged Sleeve

Type G20 = Double Engagement
Type G52 = Single Engagement/Floating Shaft
Type GV20 = Vertical Double Engagement
Type GV52 = Vertical Single Engagement//Floating Shaft
Type GL20 = Slide Double Engagement
Type G70 = Disconnect/Inching Drives
Type G32 = Spacer
Type G82 = Rigid
Type GV82 = Vertical Rigid
Type GR20 = Shear Pin

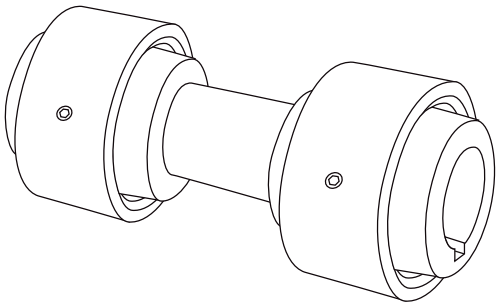
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Lifelign Gear Coupling Types



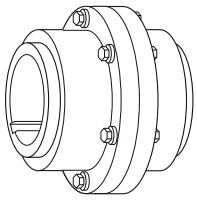
Type GC02 & GC05

With two hubs and one sleeve, the simplicity of this continuous sleeve coupling allows it to be easily adapted to a wide variety of applications. It's very compact, low in rotating mass, and has a lower initial cost than flanged types. (See Pages 16 & 17.)

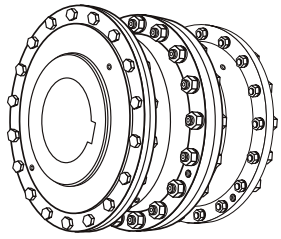


Type GC05 Floating Shaft

Floating shaft assemblies are used when distance between equipment is too great for spacer couplings. A standard floating shaft assembly consists of two standard single engagement couplings and a connecting shaft. A floating shaft can eliminate the need for additional bearing supports along spanning shafts because the shaft is supported by connected equipment through the single engagement couplings. (See Page 18.)



Types G20, GV20

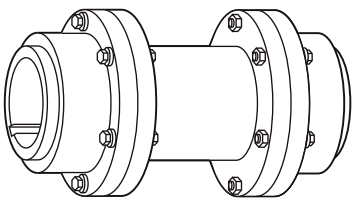


Type G Large Gear Coupling

The Type G20 double engagement, close coupled type has two flex halves to accommodate both offset and angular misalignment or a combination of the two, as well as end float. It is ideal for all horizontal, close coupled applications including fans, overhead cranes, conveyors, steel and paper mill equipment. It is adaptable with limited end float kits for use on electric motors, generators or any machines fitted with sleeve or straight roller bearings. (See Page 19.)

Type GV20 vertical double engagement coupling is a standard horizontal double engagement gear coupling modified to accommodate the sleeve centering assembly. Recommended for inclinations over 10°. (See Pages 24 and 45.)

The Type G Large Gear Coupling is available in all types for capacities up to 72,450,00 lb-in., 8,185,000 Nm. (See Page 42.)

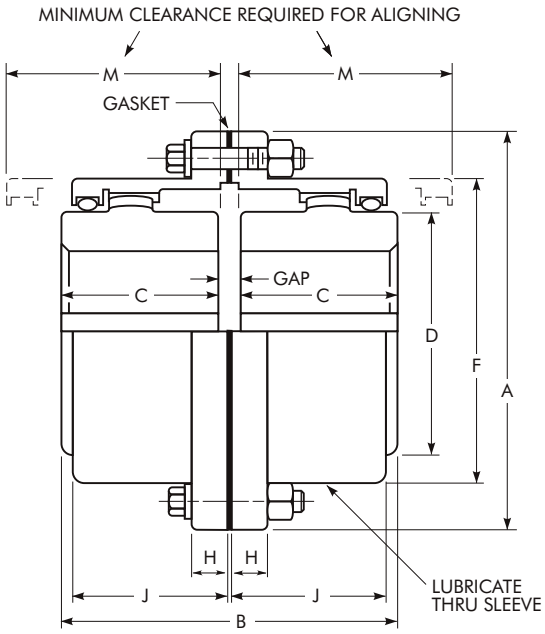


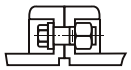
Types G32

Spacer couplings for pump and compressor applications simplify servicing connected equipment. Spacer couplings use a standard double engagement coupling with a spacer tube and an additional set of fasteners. Stock spacer lengths for quick delivery are available in the popular sizes. Special lengths are also available. (See Page 20.)

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Type G20 Standard Flanged Sleeve
Double Engagement/Dimensions — Inches





For Sizes 1010G thru 1055G, Type G10 Shrouded Bolts furnished only when specified on order.

SIZE ★	Torque Rating (lb–in) †	Allow Speed rpm ‡	Max Bore ●	Min Bore ■	Cplg Wt With No Bore-lb G10	Cplg Wt With No Bore-lb G20	Lube Wt lb	A	B	C	D	F	H	J	M	Gap	SIZE ★
1010G	10,080	8,000	1.875	.50	9	10	.09	4.56	3.50	1.69	2.70	3.30	.55	1.53	2.00	.125	**1010G**
1015G	20,790	6,500	2.375	.75	17	20	.16	6.00	4.00	1.94	3.40	4.14	.75	1.88	2.40	.125	**1015G**
1020G	37,800	5,600	2.875	1.00	30	35	.25	7.00	5.00	2.44	4.14	4.98	.75	2.34	3.00	.125	**1020G**
1025G	66,150	5,000	3.625	1.25	55	65	.50	8.38	6.25	3.03	5.14	6.10	.86	2.82	3.60	.188	**1025G**
1030G	107,100	4,400	4.125	1.50	85	95	.80	9.44	7.37	3.59	6.00	7.10	.86	3.30	4.20	.188	**1030G**
1035G	163,800	3,900	4.875	2.00	135	150	1.20	11.00	8.63	4.19	7.00	8.32	1.12	3.84	5.10	.250	**1035G**
1040G	270,900	3,600	5.750	2.50	195	215	2.00	12.50	9.75	4.75	8.25	9.66	1.12	4.38	5.70	.250	**1040G**
1045G	371,700	3,200	6.750	3.00	280	300	2.30	13.62	10.93	5.31	9.25	10.79	1.12	4.84	6.50	.312	**1045G**
1050G	500,900	2,900	7.375	3.50	390	420	3.90	15.31	12.37	6.03	10.00	12.04	1.50	5.54	7.20	.312	**1050G**
1055G	655,200	2,650	8.250	4.00	525	550	4.90	16.75	13.56	6.62	11.00	13.16	1.50	6.22	8.00	.312	**1055G**
1060G	800,100	2,450	9.125	4.50	. . .	675	7.00	18.00	15.13	7.41	12.00	14.41	1.00	6.66	9.00	.312	**1060G**
1070G	1,197,000	2,150	10.875	5.00	. . .	1070	9.60	20.75	17.75	8.69	14.00	16.73	1.12	7.70	10.50	.375	**1070G**

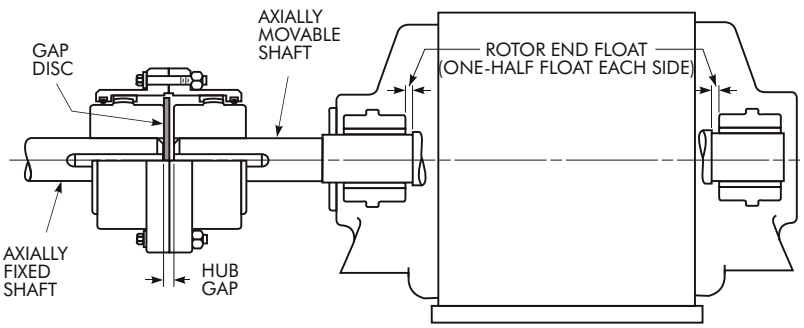
★ See page 15 for General Information and other Reference Notes.

TABLE 7— Limited End Float & Standard Gap Disc Dimensions – Inches

SIZE	B	End Float ♦	Gap Disc ✱ Thickness	Gap Disc ✱ Dia	Gap
1010G	3.58	.094	.156	2.95	.203
1015G	4.08	.094	.156	3.70	.203
1020G	5.11	.094	.188	4.50	.234
1025G	6.39	.094	.281	5.55	.328
1030G	7.54	.094	.312	6.50	.359
1035G	8.79	.188	.312	7.55	.406
1040G	9.91	.188	.312	8.95	.406
1045G	11.15	.188	.438	9.95	.531
1050G	12.59	.188	.438	10.95	.531
1055G	13.80	.188	.469	12.00	.563
1060G	15.45	.188	.532	13.12	.625
1070G	18.10	.188	.625	15.10	.718

♦ If these values exceed one-half rotor end float or equivalent manufacturer's specification, refer to Falk.

✱ Gap disc material: Neoprene, 70 durometer.



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Product Detail



SPK ROLLER DOUBLE MST (Q2
D80Q14H

UPC: 697950217970

Martin Split taper sprocket is another style of bushed sprocket. The split taper bushing, when installed, offers a wide range of bore sizes.

Product Specifications | Misc Info

Material	Steel	Hub Outside Diameter	4.250 in.
Chain Number	80	Hub Recessed For Chain Clearance	Yes
Chain Pitch	1.000 in.	Construction Detail	Solid With Recess Groove
Number of Chain Rows	2	Bore Type	Bushed MST
Number of Teeth	14	Key Way Size	.500 WIDE in.
Outside Diameter	4.981 in.	Bushing Part Number	Q2
Pitch Diameter	4.494 in.	Bushing Min Bore Size	1.000 in.
Single Strand Tooth Thickness	0.557 in.	Bushing Max Bore Size	2.625 in.
Hardened Teeth	Yes		

Product Detail



MST BUSHING
Q2 2 1/2

UPC: 697950129235

MST Bushings are easy to install and remove. They are split through the barrel and have a taper to provide a true clamp on the shaft. They are keyed to both the shaft and the hub to help during “blind” installations.

Product Specifications | Misc Info

Material	Ductile Iron	Flange Diameter	4.125 in.
Bore Type	Standard	Length Thru Bore	3.500 in.
Finished Bore Size	2.500 in.	Cap Screw Bolt Circle	3.375 in.
Key Way Size	5/8 X 5/16 in.	Number of Mounting Cap Screws	3
Min Bore Size	2.500 in.	Cap Screw Size	3/8 X 1 1/4 in.
Max Bore Size	2.063 in.	Bushing Construction	Type 1

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Product Detail



MST BUSHING
Q2 2 3/8

UPC: 697950129303

MST Bushings are easy to install and remove. They are split through the barrel and have a taper to provide a true clamp on the shaft. They are keyed to both the shaft and the hub to help during “blind” installations.

Product Specifications | Misc Info

Material	Ductile Iron	Flange Diameter	4.125 in.
Bore Type	Standard	Length Thru Bore	3.500 in.
Finished Bore Size	2.375 in.	Cap Screw Bolt Circle	3.375 in.
Key Way Size	5/8 X 5/16 in.	Number of Mounting Cap Screws	3
Min Bore Size	2.375 in.	Cap Screw Size	3/8 X 1 1/4 in.
Max Bore Size	2.625 in.	Bushing Construction	Type 2

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Product Detail



MST BUSHING
R1 2 1/2

UPC: 697950129907

MST Bushings are easy to install and remove. They are split through the barrel and have a taper to provide a true clamp on the shaft. They are keyed to both the shaft and the hub to help during “blind” installations.

Product Specifications | Misc Info

Material	Ductile Iron	Flange Diameter	5.375 in.
Bore Type	Standard	Length Thru Bore	2.875 in.
Finished Bore Size	2.500 in.	Cap Screw Bolt Circle	4.625 in.
Key Way Size	5/8 X 5/16 in.	Number of Mounting Cap Screws	3
Set Screw Size	5/16-18 X 5/16 in.	Cap Screw Size	3/8 X 1 3/4 in.
Min Bore Size	2.500 in.	Bushing Construction	Type 1
Max Bore Size	2.813 in.		

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Product Detail



SPK ROLLER TRIPLE MST (Q2
E80Q15H

UPC: 697950218953

Martin Split taper sprocket is another style of bushed sprocket. The split taper bushing, when installed, offers a wide range of bore sizes.

Product Specifications | Misc Info

Material	Steel	Hub Outside Diameter	4.250 in.
Chain Number	80	Hub Recessed For Chain Clearance	Yes
Chain Pitch	1.000 in.	Construction Detail	Solid
Number of Chain Rows	3	Bore Type	Bushed MST
Number of Teeth	15	Key Way Size	.500 WIDE in.
Outside Diameter	5.305 in.	Bushing Part Number	Q2
Pitch Diameter	4.810 in.	Bushing Min Bore Size	1.000 in.
Single Strand Tooth Thickness	0.557 in.	Bushing Max Bore Size	2.625 in.
Hardened Teeth	Yes		

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Product Detail



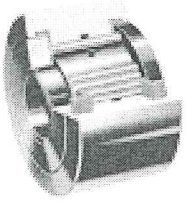
SPK ROLLER TRIPLE MST (R1
E80R20H

UPC: 697950219004

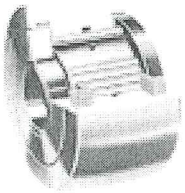
Martin Split taper sprocket is another style of bushed sprocket. The split taper bushing, when installed, offers a wide range of bore sizes.

Product Specifications | Misc Info

Material	Steel	Hardened Teeth	Yes
Chain Number	80	Hub Recessed For Chain Clearance	No
Chain Pitch	1.000 in.	Construction Detail	Solid
Number of Chain Rows	3	Bore Type	Bushed MST
Number of Teeth	20	Key Way Size	.750 WIDE in.
Outside Diameter	6.914 in.	Bushing Part Number	R1
Pitch Diameter	6.393 in.	Bushing Min Bore Size	1.125 in.
Single Strand Tooth Thickness	0.557 in.	Bushing Max Bore Size	3.750 in.

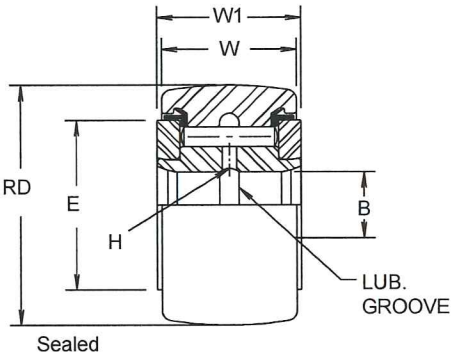


With LUBRI-DISC® seals
add letter "S"
Ex. CYR-1¾-S



Crowned O.D.
add letter "C"
Ex. CCYR-1¾-S

See page 14 for crown details.



CYR, CYR-S & CCYR-S series

Cam followers without studs for shaft mounting, with and without LUBRI-DISC® seals

UNSEALED BRG. NO.	SEALED BRG. NO.	SEALED BRG. NO.	ROLLER DIA. (RD) +.000 -.001	ROLLER WIDTH (W) +.000 -.005	BORE (B)		WIDTH OVER END PLATES (W1) +.005 -.010	DIA. OF END PLATES (E)	OIL HOLE (H) DIA.	MIN. BOSS DIA.	SHAFT DIA.						MAX. STATIC CAPACITY LBS.	BASIC DYN. RATING LBS.
											PUSH FIT		DRIVE FIT		PRESS FIT			
					NOM.	TOL.					NOM.	TOL.	NOM.	TOL.	NOM.	TOL.		
CYR-3/4	CYR-3/4-S	CCYR-3/4-S	.750	.500	.250		.5625	39/64		1/2	.2495		.2501		.2503		4130	1660
CYR-7/8	CYR-7/8-S	CCYR-7/8-S	.875	.500	.250		.5625	39/64		1/2	.2495		.2501		.2503		4130	1660
CYR-1	CYR-1-S	CCYR-1-S	1.000	.625	.3125		.6875	25/32		41/64	.3120		.3126		.3128		6120	2225
CYR-1 1/8	CYR-1 1/8-S	CCYR-1 1/8-S	1.125	.625	.3125		.6875	25/32		41/64	.3120		.3126		.3128		6120	2225
CYR-1 1/4	CYR-1 1/4-S	CCYR-1 1/4-S	1.250	.750	.375		.8125	63/64		49/64	.3745		.3751		.3753		8500	3930
CYR-1 3/8	CYR-1 3/8-S	CCYR-1 3/8-S	1.375	.750	.375		.8125	63/64		49/64	.3745		.3751		.3753		8500	3930
CYR-1 1/2	CYR-1 1/2-S	CCYR-1 1/2-S	1.500	.875	.4375	+.0002 -.0004	.9375	1 3/32	3/32	57/64	.4370	±.0002	.4376	±.0002	.4378	±.0002	11280	4840
CYR-1 5/8	CYR-1 5/8-S	CCYR-1 5/8-S	1.625	.875	.4375		.9375	1 3/32		57/64	.4370		.4376		.4378		11280	4840
CYR-1 3/4	CYR-1 3/4-S	CCYR-1 3/4-S	1.750	1.000	.500		1.0625	1 1/4		1 3/64	.4995		.5001		.5005		15840	6385
CYR-1 7/8	CYR-1 7/8-S	CCYR-1 7/8-S	1.875	1.000	.500		1.0625	1 1/4		1 3/64	.4995		.5001		.5005		15840	6385
CYR-2	CYR-2-S	CCYR-2-S	2.000	1.250	.625		1.3125	1 13/32		1 13/64	.6245		.6251		.6255		21140	8090
CYR-2 1/4	CYR-2 1/4-S	CCYR-2 1/4-S	2.250	1.250	.625		1.3125	1 13/32		1 13/64	.6245		.6251		.6255		21140	8090
CYR-2 1/2	CYR-2 1/2-S	CCYR-2 1/2-S	2.500	1.500	.750		1.5625	1 11/16		1 5/16	.7495		.7501		.7505		32900	11720
CYR-2 3/4	CYR-2 3/4-S	CCYR-2 3/4-S	2.750	1.500	.750		1.5625	1 11/16		1 5/16	.7495		.7501		.7505		32900	11720
CYR-3	CYR-3-S	CCYR-3-S	3.000	1.750	1.000		1.8125	2 1/8	1/8	1 3/4	.9994		1.0002		1.0006		49820	15720
CYR-3 1/4	CYR-3 1/4-S	CCYR-3 1/4-S	3.250	1.750	1.000		1.8125	2 1/8		1 3/4	.9994		1.0002		1.0006		49820	15720
CYR-3 1/2	CYR-3 1/2-S	CCYR-3 1/2-S	3.500	2.000	1.125		2.0625	2 7/16		1 59/64	1.1244		1.1252		1.1256		63250	22800
CYR-4	CYR-4-S	CCYR-4-S	4.000	2.250	1.250	+.0001 -.0005	2.3125	2 51/64		2 9/32	1.2494	+.0002 -.0003	1.2502	+.0002 -.0003	1.2506	+.0002 -.0003	89540	29985
	CYR-5-S	†CCYR-5-S	5.000	2.750	1.750		2.8750	3 9/16		2 7/8	1.7494		1.7502		1.7506		135900	46575
	CYR-6-S	†CCYR-6-S	6.000	3.250	2.250		3.3750	4 15/32	3/16	3 3/8	2.2494		2.2502		2.2506		160900	60000
	CYR-7-S	†CCYR-7-S	7.000	3.750	2.750		3.8750	5 3/16		3 7/8	2.7494		2.7502		2.7506		213860	75380
	†CYR-8-S◆	†CCYR-8-S◆	8.000	4.250	3.255		4.500	4 3/8	1/4	4 3/8	3.2545		3.2560		3.2565		288200	92200
	†CYR-9-S◆	†CCYR-9-S◆	9.000	4.750	3.755	+.001 -.000	5.000	5 1/16	5/16	5 1/16	3.7545	±.0005	3.7560	±.0005	3.7565	±.0005	366850	113260
	†CYR-10-S◆	†CCYR-10-S◆	10.000	5.250	4.255		5.500	5 15/32	3/8	5 15/32	4.2545		4.2560		4.2565		431130	131545

† Not available from stock. Consult McGill Customer Service for availability.
◆ Standard tolerances do not apply. Consult McGill Customer Service.
NOTE: Consult McGill Customer Service for limiting speeds.

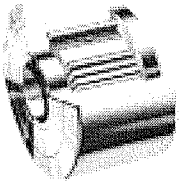
CYR series cam yoke roller

Cam follower type bearings without studs for shaft mounting — sealed (with or without crowned O.D.), and unsealed.

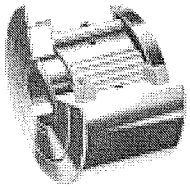
Illustrated are the options available in cam yoke roller bearings. These may be combined to best serve any application and combinations regularly stocked are shown in the following table. Others would be special and should be discussed with the McGill Engineering Department.

CYR, CYR-S & CCYR-S series

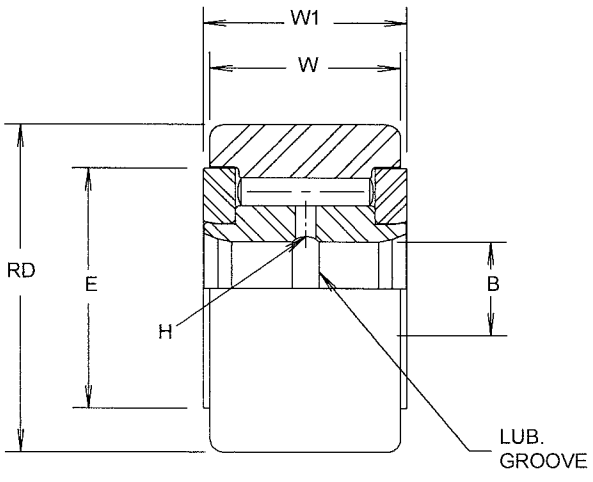
Cam followers without studs for shaft mounting, with and without LUBRI-DISC® seals

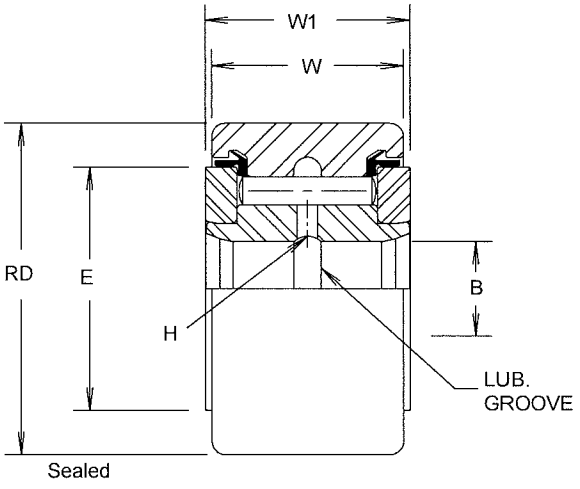


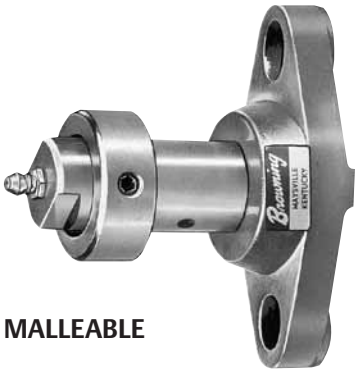
Unsealed



With LUBRI-DISC seals







MALLEABLE

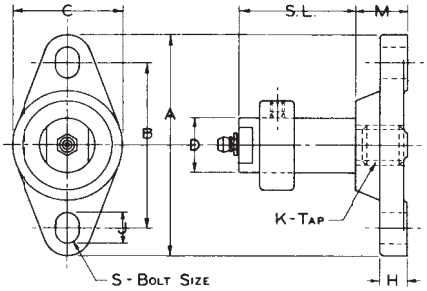


Table No. 1

Fixed Flange Tighteners

Part No.	Shaft	DIMENSIONS										Wt. Lbs.
		A	B▲	C	D	H	J▲	K	M	S.L.	S▲	
FFTN1	N1①	2 3/8"	1 3/4"	1 1/8"	.500"	1/4"	9/32"	3/8 — 16	1/2"	1 1/2"	1/4"	.3
FFTH	None②	4	3	2	—	1/2	9/16	1/2 — 13	15/16	—	3/8	.9
FFTP	None②	4	3	2	—	1/2	9/16	5/8 — 11	15/16	—	3/8	.9
FFTQ	None②	4	3	2	—	1/2	9/16	3/4 — 10	15/16	—	3/8	.8
FFTQ	N2③	4	3	2	1.000	1/2	9/16	3/4 — 10	15/16	2 1/8	3/8	1.6
FFTQ	N3③	4	3	2	1.000	1/2	9/16	3/4 — 10	15/16	3 1/8	3/8	1.8
FFTQ	N4③	4	3	2	1.000	1/2	9/16	3/4 — 10	15/16	4 1/8	3/8	2.1
FFTQ-1	None②	7 1/2	6	3 1/2	—	3/4	15/16	1 — 8	1 7/16	—	5/8	4.8
FFTQ-1	N5③	7 1/2	6	3 1/2	1.500	3/4	15/16	1 — 8	1 7/16	4	5/8	7.3
FFTQ-1	N6③	7 1/2	6	3 1/2	1.500	3/4	15/16	1 — 8	1 7/16	6	5/8	8.5

▲Slots are cast, some variations may be expected.
①Shaft is included.
②No shaft is required when used with Idler Bushings shown on page J-8.
③SHAFT MUST BE ORDERED SEPARATELY.

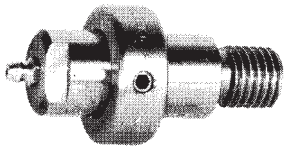
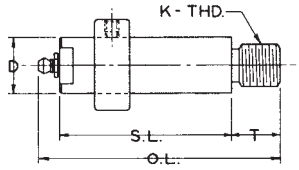


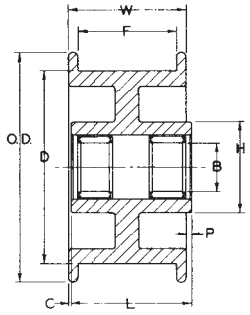
Table No. 2

Tightener Shafts

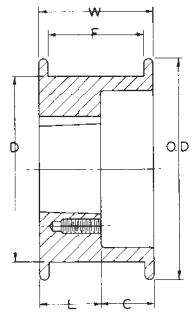
Part No.	DIMENSIONS					Wt. Lbs.
	O.L.	D	K	T	S.L.	
N1	2 5/16"	.500"	3/8 — 16	7/16"	1 1/2"	.13
N2	3 3/8	1.000	3/4 — 10	7/8	2 1/8	.6
N3	4 3/8	1.000	3/4 — 10	7/8	3 1/8	.9
N4	5 3/8	1.000	3/4 — 10	7/8	4 1/8	1.0
N5	5 11/16	1.500	1 — 8	1 5/16	4	2.8
N6	7 11/16	1.500	1 — 8	1 5/16	6	3.8







Type 1



Type 2

Table No. 3

Flat Face Idlers

Part No.	Type	Shaft Length	DIMENSIONS									Wt. Lbs.	Radial Load Capacity in Pounds Based on 2500 Hours Average Life at RPM Shown ■							
			O.D.	D	B	H	W	F	L	P	C		100	500	1000	1500	2000	2500	3000	3500
N1D05F	1	1 1/2" *	1 3/4"	1 3/8"	1/2"	1 1/4"	3/4"	9/16"	3/4"	1/8"	1/8"	.3	665	406	331	294	269	250	237	226
N4D1F	1	2 1/8*	4 3/8	4	1	1 7/8	1 7/16	1 1/16	1 1/4	1/8	5/16	3.0	2927	1787	1458	1295	1185	1104	1047	997
N4D2F	1	3 1/8*	4 3/8	4	1	1 7/8	2 7/16	2 1/16	2 1/2	1/8	1/16	5.0	4348	2654	2166	1922	1760	1640	1544	1482
N4D3F	1	4 1/8*	4 3/8	4	1	1 7/8	3 7/16	3 1/16	3 1/2	1/8	1/16	7.8	5854	3574	2916	2590	2370	2208	2094	1994
N6D4F	1	6*	7	6	1 1/2	2 5/8	5	4 1/2	4	1/8	1 1/8	22.5	5884	3592	2930	2602	2380	2218	2102	2004
N6D6F	1	6*	7	6	1 1/2	2 5/8	6 3/4	6 1/4	5	1/8	1 7/8	29.5	5884	3592	2930	2602	2380	2218	2102	2004
4D1FH	2	H1▲	4 3/8	4	▲	—	1 7/16	1 1/16	7/8	—	9/16	3.4	1518	1016	854	772	718	678	648	624
4D2FP	2	P1▲	4 3/8	4	▲	—	2 7/16	2 1/16	1 5/16	—	1 1/8	4.6	1518	1016	854	772	718	678	648	624
4D3FP	2	P1▲	4 3/8	4	▲	—	3 7/16	3 1/16	1 5/16	—	2 1/8	5.6	1518	1016	854	772	718	678	648	624

*For use with Drive Tighteners shown on pages J-2 and J-3 and above with shaft lengths indicated.
▲ For use with H-1 1/2 or P1-5/8 IDLER BUSHINGS shown on page J-8.
■See page J-8 for factors to use for Average Life of more or less than 2500 hours.
All Browning Stock Idlers furnished with needle bearings have retainers that insure minimum internal friction and wear by separating the needle rollers. These bearings are inset approximately 1/8" on either end of the Idler hubs to form a grease cavity.

NOMENCLATURE



S-2000

S E P2B - S2 - 207 - R E

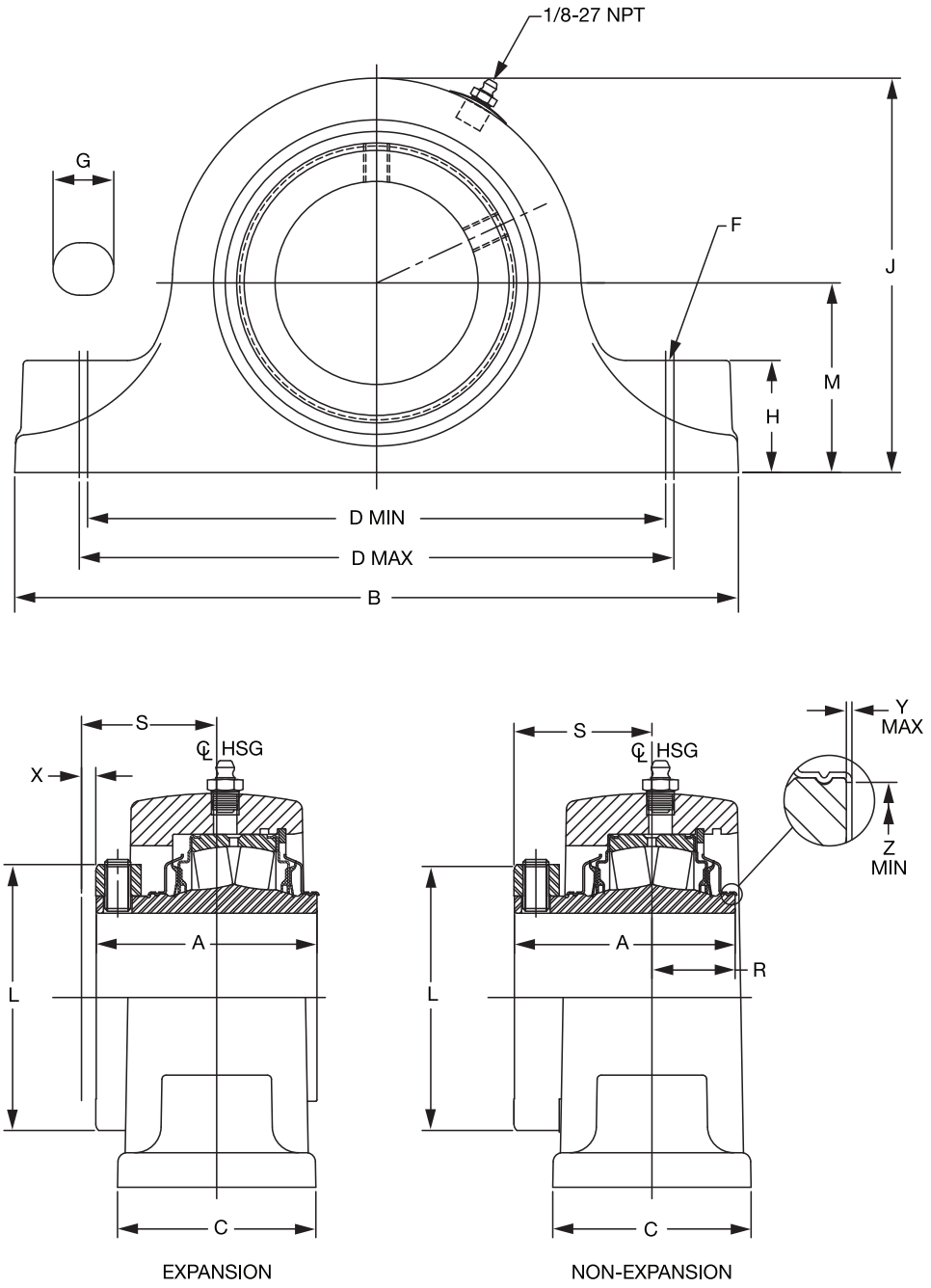
	HOUSING STYLE	BEARING TYPE	SIZE	SEAL	OTHER DATA
"E" prefix denotes Type E dimensioned housing with S2000 spherical roller bearing insert *	P2B = Pillow Block 2-Bolt Base, Cast Iron	S2 = S-2000	Inches and 16th 2 = 2" 07 = 7/16" 207 = 2-7/16"	R = TRIDENT Triple Lip Rubbing Seal	E = Expansion Type Bearing - If "E" Does Not Appear, Bearing Is Non Expansion Type
"S" prefix denotes cast steel housing	P4B = Pillow Block 4-Bolt Base, Cast Iron			L = Labyrinth Metallic Seal	
	F3R = Flange Bearing 3-Bolt, Cast Iron, Round				
	F4S = Flange Bearing 4-Bolt, Cast Iron, Square				
	F4R = Flange Bearing 4-Bolt, Cast Iron, Round				
	FC = Piloted Flanged (Flanged Cartridge)				
	WSTU = Wide Slot Take-Up Bearing For Use In Center-Pull Frames				
	TPHU = TPHU Take-up Bearing For Use In TPHU Or Top Angle Take-Up Frames				

* Available in two or four bolt pillow blocks, four bolt square flanges and piloted flanges

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DIMENSIONS

S-2000 Pillow Block with Type E Dimensions
2-BOLT



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DIMENSIONS



S-2000 Pillow Block with Type E Dimensions
2-BOLT

Bearing Series	Shaft Size*	TRIDENT Seal				Labyrinth Seal			
		Non Expansion		Expansion		Non Expansion		Expansion	
		Part No.	Part Name	Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
22208	1-3/8	**071389**	EP2B-S2-106R	**071400**	EP2B-S2-106RE	**071411**	EP2B-S2-106L	**071422**	EP2B-S2-106LE
	1-7/16	**071390**	EP2B-S2-107R	**071401**	EP2B-S2-107RE	**071412**	EP2B-S2-107L	**071423**	EP2B-S2-107LE
22209	1-11/16	**071391**	EP2B-S2-111R	**071402**	EP2B-S2-111RE	**071413**	EP2B-S2-111L	**071424**	EP2B-S2-111LE
22210	1-15/16	**071392**	EP2B-S2-115R	**071403**	EP2B-S2-115RE	**071414**	EP2B-S2-115L	**071425**	EP2B-S2-115LE
	2	**071393**	EP2B-S2-200R	**071404**	EP2B-S2-200RE	**071415**	EP2B-S2-200L	**071426**	EP2B-S2-200LE
22211	2-3/16	**071394**	EP2B-S2-203R	**071405**	EP2B-S2-203RE	**071416**	EP2B-S2-203L	**071427**	EP2B-S2-203LE
22213	2-7/16	**071395**	EP2B-S2-207R	**071406**	EP2B-S2-207RE	**071417**	EP2B-S2-207L	**071428**	EP2B-S2-207LE
22215	2-11/16	**071396**	EP2B-S2-211R	**071407**	EP2B-S2-211RE	**071418**	EP2B-S2-211L	**071429**	EP2B-S2-211LE
	2-15/16	**071397**	EP2B-S2-215R	**071408**	EP2B-S2-215RE	**071419**	EP2B-S2-215L	**071430**	EP2B-S2-215LE
	3	**071398**	EP2B-S2-300R	**071409**	EP2B-S2-300RE	**071420**	EP2B-S2-300L	**071431**	EP2B-S2-300LE
22218	3-7/16	**071399**	EP2B-S2-307R	**071410**	EP2B-S2-307RE	**071421**	EP2B-S2-307L	**071432**	EP2B-S2-307LE

*Consult Dodge For Sizes Not Listed

Shaft Size	A	B#	C#	D		F Bolt Dia.	G#	H#	J#	L	M	R	S	X Total Exp.	Y	Z	Set Screw Size	S/S Torque In/Lbs
				Min	Max													
1-3/8 1-7/16	2.53	7.37	2.12	5.63	5.88	1/2	0.75	1.13	3.85	2.55	1.88	1.03	1.50	5/32	0.020	1.80	5/16-18	165
1-11/16	2.67	7.88	2.38	6.13	6.38	1/2	0.75	1.25	4.25	3.01	2.13	0.98	1.69	3/16	0.020	2.08	5/16-18	165
1-15/16 2	2.84	8.87	2.49	6.88	7.12	5/8	0.88	1.31	4.47	3.44	2.25	1.08	1.76	7/32	0.020	2.30	3/8-16	290
2-3/16	2.94	9.62	2.56	7.63	7.88	5/8	0.88	1.50	5.00	3.50	2.50	1.06	1.88	1/4	0.025	2.60	3/8-16	290
2-7/16	3.20	10.50	2.87	8.38	8.62	5/8	0.88	1.63	5.71	4.06	2.75	1.20	2.00	1/4	0.025	2.95	3/8-16	290
2-11/16 2-15/16 3	3.59	12.00	2.99	9.31	9.69	3/4	1.07	1.88	6.32	4.61	3.13	1.34	2.25	1/4	0.025	3.47	1/2-13	620
3-7/16	4.01	14.00	3.49	10.81	11.19	7/8	1.19	2.25	7.69	5.50	3.75	1.51	2.50	1/4	0.025	4.05	1/2-13	620

Notes: "A" And "R" Dimensions Do Not Include "Y" Dimension

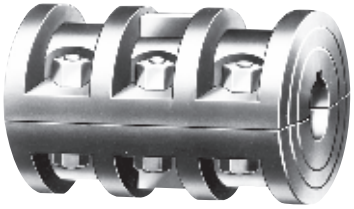
Reference Dimension Only

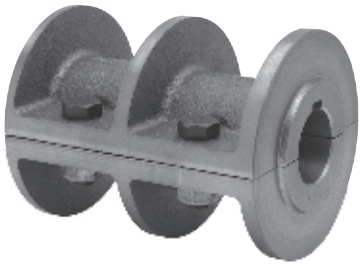
FEATURES/BENEFITS PAGE B12-2	SPECIFICATION PAGE B12-4	HOW TO ORDER/NOMENCLATURE PAGE B12-4	SELECTIONS PAGE B12-7

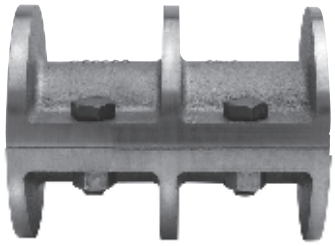
DODGE®

SELECTION/DIMENSIONS

Ribbed Rigid







For Nominal Shaft of:	Style Cplg. Figure no.	Part Number	Max RPM	Torque (In-Lb)	Weight	Coupling Dia x Length	Keyway Size	Key Furnished	Bolts	
									No.	Dia.
1	1	**009001**	5360	1200	6.0	3-5/8 x 5-1/4	1/4 x 1/8	1/4 x 1/4 x 5-1/4	4	3/8
1-3/16	1	**009002**	5360	2000	5.5					
1-1/4	1	**009003**	5360	2300	5.2					
1-3/8	1	**009004**	4130	3100	11.0	4-5/8 x 6-3/16	5/16 x 5/32	5/16 x 5/16 x 6-3/16	4	1/2
1-7/16	1	**009005**	4130	3500	10.5	4-5/8 x 6-3/16	3/8 x 3/16	3/8 x 3/8 x 6-3/16	4	1/2
1-1/2	1	**009006**	4130	4000	10.2					
1-11/16	1	**009007**	3965	5700	13.7	4-13/16 x 7-1/16	3/8 x 3/16	3/8 x 3/8 x 7-1/16	4	1/2
1-3/4	1	**009008**	3965	6300	13.3					
1-7/8	★	**009009**	3635	7800	19.4	5-1/4 x 7-15/16	1/2 x 1/4	1/2 x 1/2 x 7-15/16	4	1/2
1-15/16		**009010**	3635	8600	20.6					
2		**009011**	3635	9400	20.0					
2-3/16	★	**009013**	3180	12400	29.1	6 x 8-5/8	1/2 x 1/4	1/2 x 1/2 x 8-5/8	4	5/8
2-1/4		**009012**	3180	13400	29.0					
2-7/16	2	**009015**	2965	17100	37.3	6-7/16 x 9-11/16	5/8 x 5/16	5/8 x 5/8 x 9-11/16	6	5/8
2-1/2	2	**009016**	2965	18400	36.6					
2-11/16	2	**009017**	2830	22900	43.4	6-3/4 x 10-9/16	5/8 x 5/16	5/8 x 5/8 x 10-9/16	6	5/8
2-3/4	2	**009014**	2830	24500	43.0					
2-15/16	2	**009019**	2545	29900	58.7	7-1/2 x 11-3/8	3/4 x 3/8	3/4 x 3/4 x 11-3/8	6	3/4
3	2	**009020** ✻	2545	31800	56.2					
3-3/16	2	**009022**	2315	38200	80.5	8-1/4 x 12-1/4	3/4 x 3/8	3/4 x 3/4 x 12-1/4	6	7/8
3-1/4	2	**009021** ✻	2315	40500	80.0	8-1/4 x 12-1/4	3/4 x 3/8	3/4 x 3/4 x 12-1/4	6	7/8
3-7/16	2	**009023**	2165	47900	94.6	8-13/16 x 13-3/16	7/8 x 7/16	7/8 x 7/8 x 13-3/16	6	7/8
3-1/2	2	**009024** ✻	2165	50500	94.0	8-13/16 x 13-3/16	7/8 x 7/16	7/8 x 7/8 x 13-3/16	6	7/8
3-15/16	2	**009025**	1900	72000	146.6	10-1/16 x 15-1/4	1 x 1/2	1 x 1 x 15-1/4	6	1
4	2	**009027** ✻	1900	75400	146.0	10-1/16 x 15-1/4	1 x 1/2	1 x 1 x 15-1/4	6	1
4-7/16	3	**009026**	1775	103000	215.0	10-3/4 x 18-3/16	1 x 1/2	1 x 1 x 18-3/16	6	1-1/8
4-1/2	3	**009031** ✻	1775	107400	214.4	10-3/4 x 18-3/16	1 x 1/2	1 x 1 x 18-3/16	6	1-1/8
4-15/16	3	**009028**	1625	142000	276.3	11-3/4 x 19-5/8	1-1/4 x 5/8	1-1/4 x 1-1/4 x 19-5/8	6	1-1/8
5	3	**009043** ✻	1625	147500	275.6	11-3/4 x 19-5/8	1-1/4 x 5/8	1-1/4 x 1-1/4 x 19-5/8	6	1-1/8
5-7/16	4	**009029**	1390	190000	426.2	13-3/4 x 20-3/8	1-1/4 x 5/8	1-1/4 x 1-1/4 x 20-3/8	8	1-1/8
5-1/2	4	**009050** ✻	1390	196000	425.4	13-3/4 x 20-3/8	1-1/4 x 5/8	1-1/4 x 1-1/4 x 20-3/8	8	1-1/8
5-15/16	3	**009042** ✻	1365	247000	426.0	14 x 20-3/4	1-1/2 x 3/4	1-1/2 x 1-1/2 x 20-3/4	6	1-1/4
6	3	**009054** ✻	1365	255000	425.3	14 x 20-3/4	1-1/2 x 3/4	1-1/2 x 1-1/2 x 20-3/4	6	1-1/4
7	4	**009044** ✻	1230	404000	560.8	15-1/2 x 21-15/16	1-3/4 x 3/4	1-3/4 x 1-1/2 x	8	1-1/4

★ Same as Fig. 1 except with a rib parallel to the bore between each pair of flanges

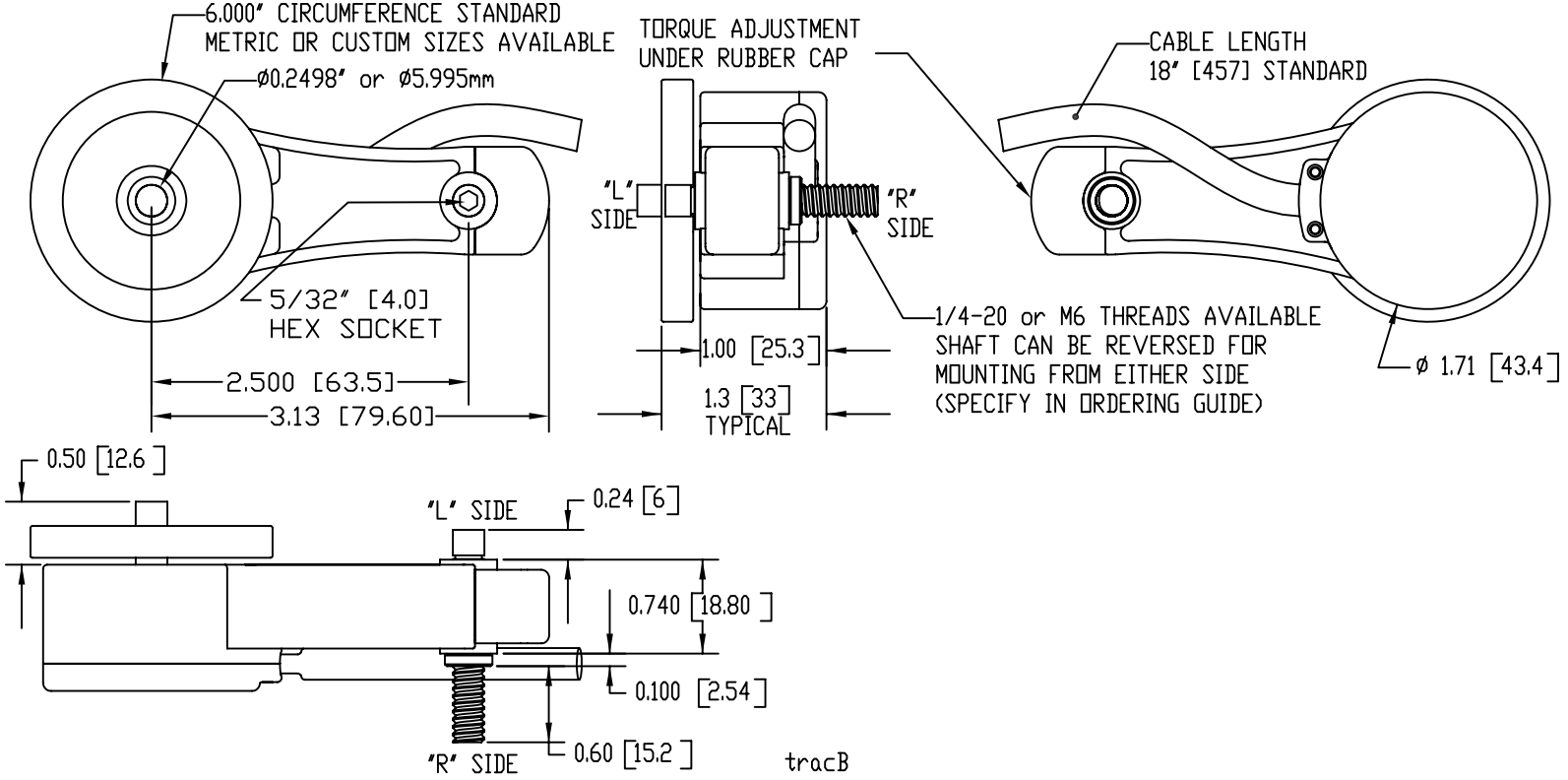
✻ Standard non-stock size. Consult DODGE for delivery

Note: Coupled shafts must be the same diameters

NOTE: Instruction manuals for Ribbed Rigid Couplings available on www.dodge-pt.com

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REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
--	INITIAL RELEASE		
A	CHANGED SOME DIMENSION LOCATIONS		
B	CHANGED PIVOT ARM BOLT HEAD		



THIRD ANGLE PROJECTION		ENCODER PRODUCTS COMPANY	
DIMENSIONS ARE IN INCHES		APPROVALS	DATE
ISSUE DATE: xx/xx/xx	TOLERANCES	DRAWN: J.Meschko	10/25/04
NEXT ASSEM. XXX	DECIMAL ± .005	CHECKED	
PREV. ASSEM. XXX	DECIMAL ± .01	RESP ENG	
PART NUMBER ◇	ANGULAR ± 1	MFG ENG	
		QUAL ENG	
NAME AND TITLE: Model TR1			
DWG. NO. trac-01		REV. B	
SCALE: NONE	DWG. SIZE: B	SHEET 1 OF 1	

Model TR1 - Tru-Trac™



Features

- **Encoder And Measuring Wheel Solution Integrated Into One Compact Unit**
- **Spring Loaded Torsion Arm Makes Wheel Pressure Adjustments A Snap**
- **Easily Installed In A Vertical, Horizontal, or Upside-Down Orientation**
- **Operates Over A Variety Of Surfaces At Speeds Up To 3000 Feet Per Minute**
- **Integrated Module Simplifies Your System Design, Reducing Cost**

FINALLY! An integrated encoder and spring loaded measuring wheel assembly available in one, easy-to-use, compact unit. The NEW Tru-Trac™ by Encoder Products Company is a versatile solution for tracking velocity, position, or distance over a wide variety of surfaces in almost any application. It's spring-loaded torsion arm provides a simple-to-adjust torsion load, allowing the Tru-Trac™ to be mounted in almost any orientation, even upside-down. The threaded shaft on the pivot axis is field reversible providing mounting access from either side. The Tru-Trac™ housing is a durable, conductive composite material that will eliminate static build up. With operating speeds up to 3000 feet per minute and a wide variety of configuration options, it's easy to see the Tru-Trac™ is the ideal solution for countless applications.

Common Applications

Web Tension Control, Paper Monitoring, Glue Dispensing, Linear Material Monitoring, Conveyor Systems, Printing, Labeling, Document Handling

Model TR1 - Tru-Trac™ Ordering Guide

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Mechanical | **Electrical** | **Optional Features** (Leave Blank For Standard Options)

TR1	–	U1	R4	–	0500	N	V1	A	OC	–	F00	–	[ ]	[ ]	[ ]	[ ]
														-20° to +85°C Std	IP50 Std	None Std

MODEL
TR1 Tru-Trac™

WHEEL TYPE & CIRCUMFERENCE
- U1 Urethane 6" cir
- U2 Urethane 200 mm cir
- K1 Knurled 6" cir
- K2 Knurled 200 mm cir
- 19 No Wheel - 1/4" shaft
- 20 No Wheel - 6 mm shaft

PIVOT SHAFT MOUNTING[1]
- R4 Right side 1/4-20 thread
- L4 Left side 1/4-20 thread
- R6 Right side M6 thread
- L6 Left side M6 thread

CYCLES PER REVOLUTION
See *CPR Options* below
Price adder >1999

COMMUTATION
- N None

INPUT VOLTAGE
- V1 5 to 28 VDC

NUMBER OF CHANNELS[2]
- A Channel A

Channel A Leads B
- Q Quadrature A & B
- R Quadrature A & B with Index

Channel B Leads A[8]
- K Reverse Quadrature A & B
- D Reverse Quadrature A & B with Index

OUTPUT TYPE
- OC Open Collector
- PP Push-Pull
- HV Line Driver
- PU Pull-Up Resistor[7]
- OD Open Collector with Differential Outputs

CONNECTOR TYPE
- F00 18" Cable[3] (Std)
- F01 12" Cable
- F02 24" Cable
- F03 36" Cable
- M00 2M Cable[4]
- J00 18" Cable with 5-pin M12[6]
- K00 18" Cable with 8-pin M12[6]

MAXIMUM FREQUENCY
Standard
F3 Extended
See Specifications

OPERATING TEMPERATURE
-20° to +85° C (Std)
- T1 -40° to +85° C
- T2 -20° to +100° C

SEALING
IP50 (Std)
- S2 IP65

CERTIFICATION
None (Std)
- CE CE Marked[5]



Accessory Angle Mounting Bracket for TR1 Tru-Trac™ can be ordered separately as part # 140104
Dimensional drawing available at www.encoder.com.

Model TR1 - Tru-Trac™ CPR Options

0001 thru 0189*		0198	0200	0250
0256	0300	0315	0360	0400
0500	0512	0580	0600	0750
0800	1000	1024	1125	1200
1250	1500	1800	2000	2048
2500	2540	3000	3600	4000
4096	5000	6000	7200	8192
10,000				

*Contact Customer Service For Availability

New CPR values are periodically added to those listed. Contact Customer Service to determine all currently available values. Special disk resolutions are available upon request and may be subject to a one-time NRE fee.

For specification assistance call Customer Service at 1-800-366-5412

NOTES:
1. See mechanical drawing. Shaft is reversible in the field.
2. Contact Customer Service for non-standard index gating or phase relationship options.
3. For non-standard English cable lengths enter 'F' plus cable length expressed in feet. Example: F06 = 6 feet of cable. Frequency above 300 kHz standard cable lengths only.
4. For non-standard metric cable lengths enter 'M' plus cable length expressed in meters. Example: M06 = 6 meters of cable.
5. Please refer to **Technical Bulletin TB100: *When to Choose the CE Option*** at www.encoder.com.
6. 5-pin not available with Line Driver (HV) output. Additional cable lengths available. Please consult Customer Service.
7. With Input Voltage above 16 VDC, operating temperature is limited to 85° C.
8. Reverse Quadrature not available with PU output type.

ENCODER PRODUCTS COMPANY

Model TR1 - Tru-Trac™

Model TR1 - Tru-Trac™ Specifications

Electrical

Input Voltage	4.75 to 28 VDC max for temperatures up to 85° C 4.75 to 24 VDC for temperatures between 85° C to 100° C
Input Current	100 mA max (65 mA typical) with no output load
Output Format	Incremental- Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the wheel side. See *Waveform Diagrams* below.
Output Types	Open Collector- 20 mA max per channel Push-Pull- 20 mA max per channel Pull-Up- Open collector with 2.2K ohm Pull-Up 20mA max per channel Line Driver- 20 mA max per channel (Meets RS 422 at 5 VDC supply)
Index	Once per revolution. 0190 to 10,000 CPR: Gated to output A 0001 to 0189 CPR: Ungated See *Waveform Diagrams* below.
Max. Frequency	Standard Frequency Response is 200 kHz for CPR 1 to 2540 500 kHz for CPR 2541 to 5000 1 MHz for CPR 5001 to 10,000 Extended Frequency Response (optional) is 300 kHz for CPR 2000, 2048, 2500, and 2540
Noise Immunity	Tested to BS EN61000-6-2; BS EN50081-2; BS EN61000-4-2; BS EN61000-4-3; BS EN61000-4-6, BS EN500811
Symmetry	180° (±18°) electrical
Quad. Phasing	90° (±22.5°) electrical
Min. Edge Sep	67.5° electrical
Accuracy	Within 0.017° mechanical or 1 arc-minute from true position. (for CPR>189)

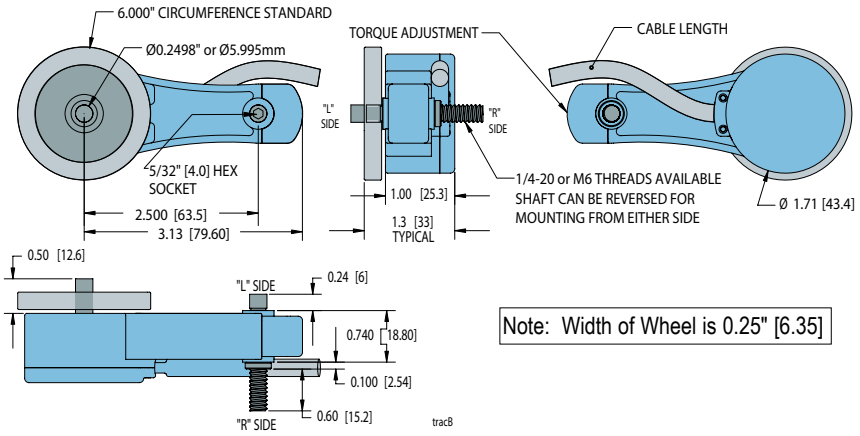
Mechanical

Max Shaft Speed	6000 RPM. Higher speeds may be achievable, contact Customer Service.
Shaft Material	Stainless Steel
Shaft Tolerance	+0.0000/-0.0004" [+0.000/-0.010 mm]
Radial Shaft Load	5 lb max. Rated load of 2 to 3 lb for bearing life of 1.2 x 10^{10} revolutions
Axial Shaft Load	5 lb max. Rated load of 2 to 3 lb for bearing life of 1.2 x 10^{10} revolutions
Starting Torque	IP50 0.05 oz-in IP65- 0.4 oz-in
Electrical Conn	18" cable (foil and braid shield, 24 AWG conductors), 5- or 8-pin M12 (12 mm) in-line connector with 18" cable (braid shield)
Mounting	Pivot shaft can be mounted from either side of the Tru-Trac™ housing, and is reversible in the field. Specify 1/4-20 or M6 threads
Housing	Stainless steel fibers in a high temperature nylon composite
Wheel Width	0.25"
Weight	5 oz typical

Environmental

Operating Temp	-20° to +85° C for standard models -40° to +85° C for low temperature option -20° to +100° C for high temperature option
Storage Temp	-25° to +85° C
Humidity	98% RH non-condensing
Vibration	10 g @ 58 to 500 Hz
Shock	80 g @ 11 ms duration
Sealing	IP50 standard; IP65 available

Model TR1 - Tru-Trac™



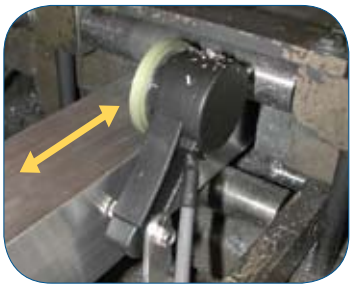
Note: Width of Wheel is 0.25" [6.35]

All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified
Metric dimensions are given in brackets [mm]

Model TR1 - Tru-Trac™ Applications



For **Linear Applications** the Tru-Trac™ can be mounted above or below the moving object, and the tension on the wheel adjusted for a wide range of applications such as packaging, conveyors, mail sorting, cut to length, labeling, gantries etc.

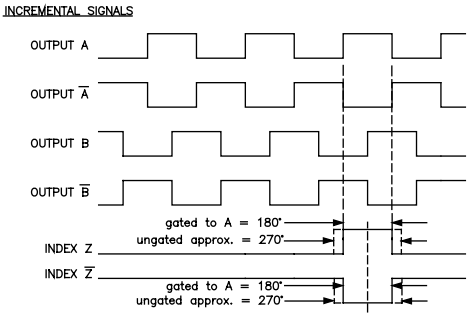




For **Rotational Applications** the Tru-Trac™ can be mounted in any orientation to monitor the position or velocity of many types of otating equipment such as web tension control drums, rotary tables, printing, spooling, etc.



Waveform Diagram



Waveform shown with optional complementary signals A, B, Z for HV and OD outputs only.

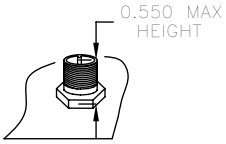
Wiring Table

Function	Cable Wire Color	5-pin M12**	8-pin M12**
Com	Black	3	7
+VDC	White	1	2
A	Brown	4	1
A'	Yellow	--	3
B	Red	2	4
B'	Green	--	5
Z	Orange	5	6
Z'	Blue	--	8
Shield	Bare *	--	--

* CE Option: Cable shield (bare wire) is connected to internal case.
** Non-CE Option: Cable shield is connected to M12 connector body.
CE Option: Cable shield is connected to M12 connector body, and internal case.







Linear Encoders

SPRING HANGERS

Fig. 98, C-98

Double Spring

Fig. 98 Type A

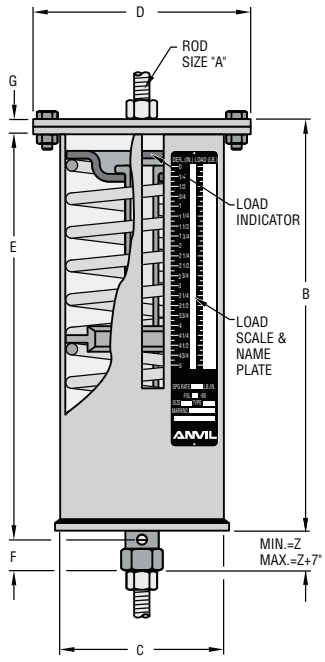


Fig. 98 Type B

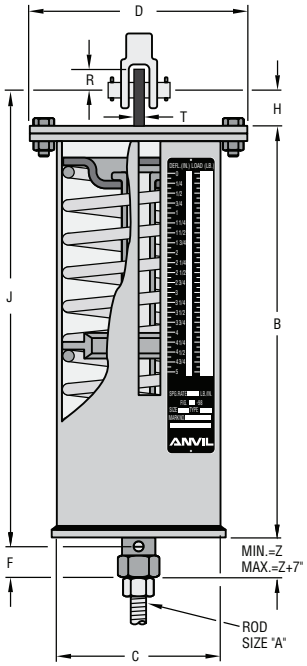


Fig. 98 Type C

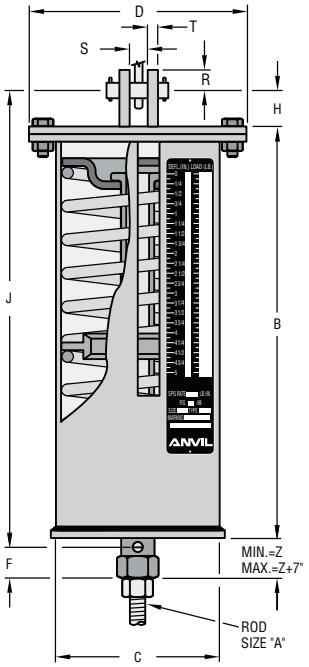


Fig. 98 Type D

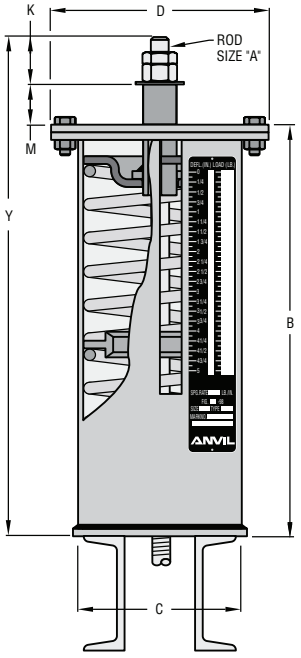


Fig. 98 Type E

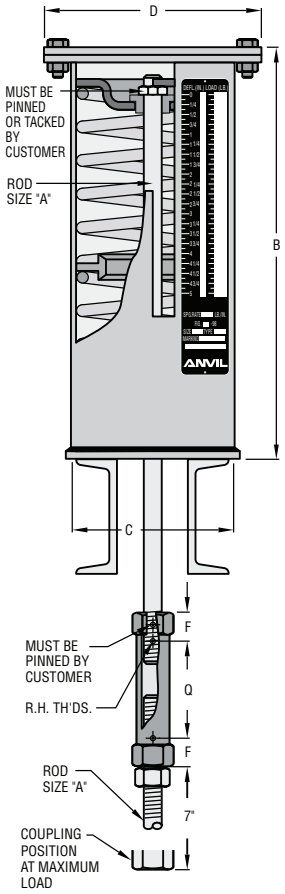


Fig. 98 Type F

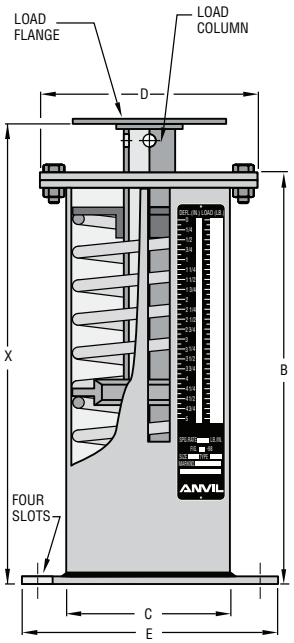
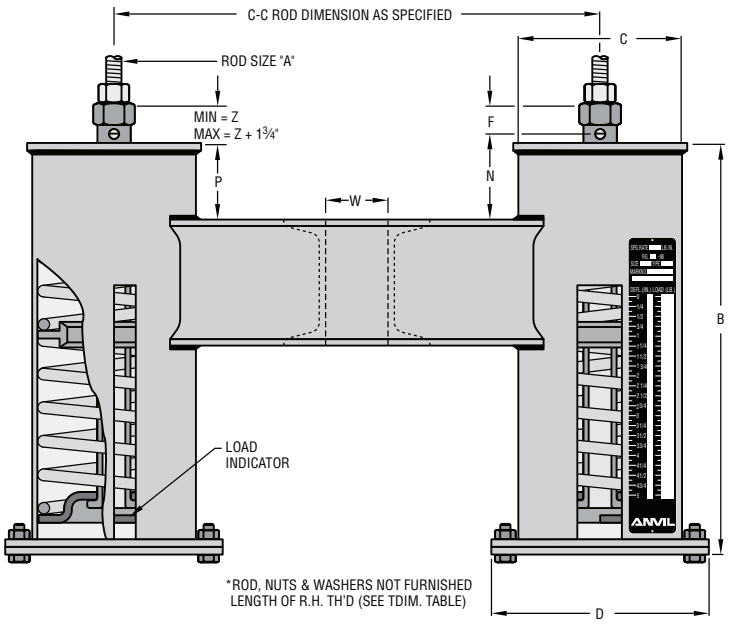


Fig. 98 Type G



The Anvil Variable Double Spring Hanger, Fig. 98, embodies all of the Fig. B-268 features and is designed to the same exacting specifications. Each basic unit consists of two springs arranged in series within a single casing. A centering guide is provided to assure the permanent alignment of the spring assembly. This hanger is offered in the seven basic types as shown here.

The load table and instructions for sizing and ordering this hanger may be found on page 142 through 145.

SPRING HANGERS

FIG. 98, C-98 DOUBLE SPRING: WEIGHT (LBS) • DIMENSIONS (IN)

Hanger Size	Rod Size A	R.H. Thread Length	Casing		Flange Dia. D	Min. Thread Engage F	Z	Rod Take Out By Type				Type A	Types B, C					Type D		
			Length B	Dia. C				A / E	B, C / J	E / Q	G / N	Thread Depth G	Lug Hole Size	Pin Hgt H	R	Clevis Opening S	Thk. T	Rod Length Y	Nut Allow. K	Height Spacer M
0	½	9	12 5/8	4	5 1/8	15/16	15/16	12 3/16	14 1/8	9	1 1/2	7/16	1 1/16	1 1/2	1 1/4	7/8	1/4	19 3/8	1 1/4	5 1/2
1			14 3/8				15/16	13 15/16	15 7/8		1 1/2							21 1/8		
2			15 7/8				1 1/16	15 3/16	17 1/8		1 1/4							22 1/2		
3	½	9	14	5 9/16	6 15/16	15/16	1 3/16	13 7/16	15 3/8	9	1 7/8	7/16	1 1/16	1 1/2	1 1/4	7/8	1/4	20 3/4	1 1/4	5 1/2
4			15 1/4				1 3/16	15 3/16	17 1/8		2 3/8							22		
5			16 5/8				1 1/16	15 15/16	17 7/8		1 3/4							23 3/8		
6	5/8	9	16 11/16	6 5/8	8 3/8	15/16	1 3/16	15 15/16	18 1/16	9	1 7/8	5/8	13/16	1 1/2	1 1/4	1 1/16	1/4	23 11/16	1 1/2	5 1/2
7			18 5/8				1 1/8	18 3/16	20 5/16		2 3/16							25 5/8		
8			19 9/16				1 1/16	18 11/16	20 13/16		1 3/4							26 9/16		
9	¾	9	20 3/16	8 5/8	10 3/4	1 1/4	15/16	18 7/8	21 3/8	9	2 11/16	1	15/16	1 1/2	1 1/4	1 1/4	3/8	27 7/16	1 3/4	5 1/2
10			22 5/8				1	21 3/8	23 7/8		2 3/4							29 7/8		
11		10	18 1/4				7/8	16 7/8	19 3/8	12	2 5/8							25 1/2		
12	1	10	19 1/2	8 5/8	10 3/4	1 1/4	5/8	17 7/8	20 7/8	12	3 3/8	1	1 1/4	2	1 1/2	1 5/8	1/2	27 1/4	2 1/4	5 1/2
13			24 3/4				3/4	23 1/4	26 1/4		3 1/2							32 3/8		
14	1 1/4		24 7/8				1/2	23 1/8	27 1/8		3 1/4		1 1/2	3	2	2	5/8	33 3/8	3	
15	1 1/4	10	24 7/8	8 5/8	10 3/4	1 15/16	1/2	23 1/8	27 1/8	12	3 1/4	1	1 1/2	3	2	2	5/8	33 3/4	3	5 1/2
16	1 1/2	11	29 7/8		11 3/8		2	28 9/16	32 15/16	7	4 1/16	1 3/8	1 3/4		2 1/2	2 3/8		38 7/8	3 1/2	
17	1 3/4	12	34				2 1/8	32 13/16	37 3/16		4 3/16		2			2 5/8	3/4	43 1/2	4	
18	2	12	33 1/4	12 3/4	15 7/8	2 3/4	2 11/16	31 1/8	37 3/16	7	4 1/8	2 1/4	2 3/8	4	3	2 7/8	3/4	43 3/16	4 9/16	5 1/2
19	2 1/4	13	37 3/4				2 9/16	35 1/2	42 1/8		4		2 5/8	4 1/2		3 1/8		48 1/8	5	
20	2 1/2	14	44 1/4				2 11/16	42 1/8	48 3/4		4 1/8		2 7/8		4	3 3/8	1	55 3/16	5 9/16	
21	2 3/4	14	49 7/8	12 3/4	16 7/8	3 5/8	2 11/16	45 7/16	52 11/16	7	3 5/16	2 3/4	3 1/8	4 1/2	4	3 5/8	1	60 5/8	6 1/4	5 1/2
22	3	15	62				3 1/2	58 1/8	66 1/8		4 1/8	3	3 3/8	5		3 7/8		73 1/8	6 5/8	

Hanger Size	Type F									Type G				Weight			
	E' Bottom Flange			Bottom Flange		Load Col. Dia.	Load Flange		Length X ■		Channel Size (lbs/ft)	Max C-C	Space Between Channels - W	P	Type			
	Size Sq.	Bolt Circle Min	Bolt Circle Max	Bolts	Thick		Dia.	Thick	Min	Max					A,B,C	D,E	F	G*
0	7½	7	8¾	5/8	1/4	1.90	3 7/8	3/16	14 3/16	16 3/16	C3 x 4.1	24	5/8	1½	12	12	20	37
1									15 15/16	17 15/16					14	14	21	41
2									17 7/16	19 7/16					16	16	23	45
3	7½	7	8¾	¾	1/4	2.88	5¾	3/16	15 5/8	17 5/8	C3 x 4.1	30	¾	2	22	21	35	55
4									16 7/8	18 7/8					25	24	39	61
5									18 1/4	20 1/4					27	26	41	65
6	9	8	10 7/8	¾	3/8	3.50	6 3/8	1/4	18 3/8	20 3/8	C3 x 4.1	36	1	2	41	40	62	93
7									20 5/16	22 5/16					49	48	72	109
8									21 1/4	23 1/4					61	52	75	133
9	13¼	10 9/16	16½	¾	½	4.50	8 3/8	½	21 7/8	23 7/8	C4 x 5.4	36	1¼	3	97	94	136	207
10									24 5/16	26 5/16					114	108	150	241
11									19 15/16	21 15/16					96	95	134	209
12	13¼	10 9/16	16½	¾	½	4.50	8 3/8	½	21 3/16	23 3/16	C5 x 6.7	36	1½	4	108	104	144	223
13									26 7/16	28 7/16					144	139	181	305
14									26 9/16	28 9/16		33			153	147	188	323
15	13¼	10 9/16	16½	¾	½	4.50	8 3/8	½	26 9/16	28 9/16	C6 x 10.5	36	1½	4	172	163	201	368
16						2.00			31 7/8	33 7/8	C8 x 11.5		2 1/8		218	202	241	462
17									36	38					273	247	287	572
18	17¼	15¾	22	¾	5/8	2.50	12½	½	35 5/16	37 5/16	C12 x 20.7	42	2 3/8	4	512	477	550	1,056
19									39 13/16	41 13/16					600	548	624	1,231
20									46 5/16	48 5/16		40			802	723	807	1,633
21	17¼	15¾	22	¾	5/8	3.00	12½	½	51 7/8	53 7/8	C15 x 33.9	48	3 1/8	4	940	845	872	1,965
22									64	66			3 3/8		1,240	1,140	1,184	2,566

■ Hanger take-out or installed height. With pipe movement up, cold to hot, installed height should be the mid point between the minimum and maximum "X" dimension, plus thickness of load flange. With pipe movement down, cold to hot installed height should be mid-point between the minimum and maximum "X" dimension, plus the amount of vertical movement and load flange thickness. (Type F only).

* Weight based on 24" center-to-center dimension. See page 150 for Type F roller and guided load column information.

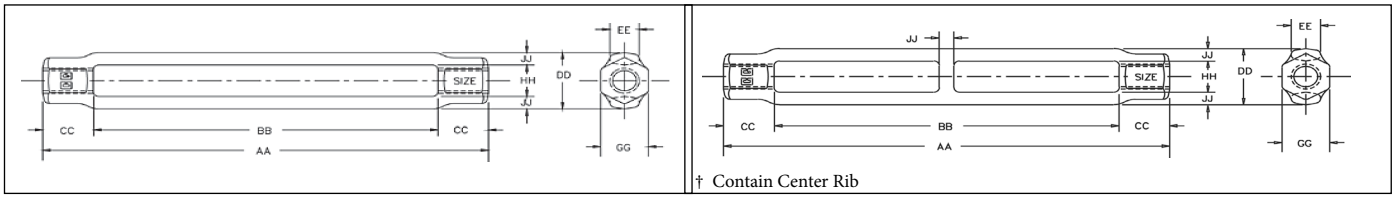
Attachment rods and nuts not furnished.

Turnbuckle- Body Only

"QT" QUENCHED & TEMPERED — Fatigue Rated®

HG-2510 BODY

- Heat treat by normalizing.
- Hot Dip galvanized.
- UNC threads
- Fatigue Rated.
- Meets the performance requirements of Federal Specifications FF-T-791b,Type 1, Form 1 - Class 2, except for those provisions required by the contractor.



Shank Dia. & Take Up (in.)	HG-2510 Stock No.	Working Load Limit (lbs)	Weight Each (lbs.)	Dimensions (in)							
				AA	BB	CC	DD	EE	GG	HH	JJ
* 1/4 x 4	1033893	500	.15	4.87	4.07	.40	.72	.34	.50	.38	.17
* 5/16 x 4-1/2	1033919	800	.22	5.59	4.58	.51	.82	.38	.56	.44	.19
* 3/8 x 6	1033937	1200	.29	7.29	6.10	.60	.88	.38	.63	.50	.19
1/2 x 6	1033955	2200	.70	7.70	6.03	.84	1.19	.68	.81	.63	.28
† 1/2 x 9	1033973	2200	1.03	11.03	9.36	.84	1.19	.68	.81	.63	.28
† 1/2 x 12	1033991	2200	1.27	14.03	12.36	.84	1.19	.68	.81	.63	.28
5/8 x 6	1034017	3500	1.11	8.02	6.03	1.00	1.43	.83	1.00	.75	.34
† 5/8 x 9	1034035	3500	1.59	11.38	9.39	1.00	1.43	.83	1.00	.75	.34
† 5/8 x 12	1034053	3500	1.96	14.38	12.39	1.00	1.43	.83	1.00	.75	.34
3/4 x 6	1034071	5200	1.50	8.26	6.13	1.07	1.74	.94	1.13	.94	.40
† 3/4 x 9	1034099	5200	2.17	11.72	9.59	1.07	1.74	.94	1.13	.94	.40
† 3/4 x 12	1034115	5200	2.66	14.72	12.59	1.07	1.74	.94	1.13	.94	.40
† 3/4 x 18	1034133	5200	3.63	20.66	18.53	1.07	1.74	.94	1.13	.94	.40
7/8 x 12	1034179	7200	3.61	14.62	12.16	1.23	2.00	1.13	1.31	1.06	.47
† 7/8 x 18	1034197	7200	5.27	21.09	18.63	1.23	2.00	1.13	1.31	1.06	.47
1 x 6	1034213	10000	3.32	9.00	6.18	1.41	2.45	1.25	1.50	1.25	.60
1 x 12	1034231	10000	5.34	15.00	12.18	1.41	2.45	1.25	1.50	1.25	.60
1 x 18	1034259	10000	7.35	21.00	18.18	1.41	2.45	1.25	1.50	1.25	.60
† 1 x 24	1034277	10000	9.85	27.66	24.84	1.41	2.45	1.25	1.50	1.25	.60
1-1/4 x 12	1034339	15200	5.72	15.40	12.06	1.67	2.62	1.25	1.88	1.50	.56
1-1/4 x 18	1034357	15200	7.58	21.40	18.06	1.67	2.62	1.25	1.88	1.50	.56
† 1-1/4 x 24	1034375	15200	9.45	27.96	24.62	1.67	2.62	1.25	1.88	1.50	.56
1-1/2 x 12	1034437	21400	8.01	15.82	12.32	1.75	2.99	1.50	2.25	1.75	.62
1-1/2 x 18	1034455	21400	10.4	21.82	18.32	1.75	2.99	1.50	2.25	1.75	.62
† 1-1/2 x 24	1034473	21400	12.9	28.45	24.94	1.75	2.99	1.50	2.25	1.75	.62
1-3/4 x 18	1034552	28000	15.7	22.44	18.37	2.04	3.62	1.75	2.62	2.12	.75
1-3/4 x 24	1034570	28000	19.2	28.44	24.37	2.04	3.62	1.75	2.62	2.12	.75
2 x 24	1034632	37000	25.8	29.13	24.48	2.33	4.14	2.00	3.00	2.38	.88
2-1/2 x 24	1034678	60000	55.9	31.66	24.60	3.53	5.62	2.75	3.88	3.12	1.25
2-3/4 x 24	1034696	75000	54.0	31.66	24.65	3.51	5.62	2.75	3.88	4.48	1.25

* Mechanical Galvanized
† Contains Center Rib for additional body support.

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Crosby® Turnbuckles



HG-223
Hook & Hook

Meets the performance requirements of Federal Specifications FF-T-79lb, Type 1, Form 1 - Class 5, and ASTM F-1145, except for those provisions required of the contractor.



HG-225
Hook & Eye

Meets the performance requirements of Federal Specifications FF-T-79lb, Type 1, Form 1 - Class 6, and ASTM F-1145, except for those provisions required of the contractor.



HG-226
Eye & Eye

Meets the performance requirements of Federal Specifications FF-T-79lb, Type 1, Form 1 - Class 4, and ASTM F-1145, except for those provisions required of the contractor.



HG-227
Jaw & Eye

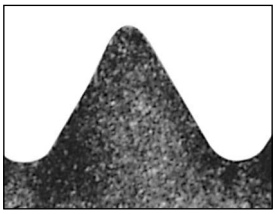
Meets the performance requirements of Federal Specifications FF-T-79lb, Type 1, Form 1 - Class 8, and ASTM F-1145, except for those provisions required of the contractor.



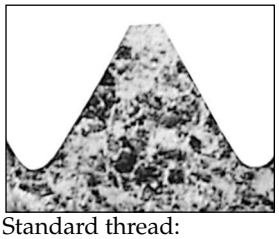
HG-228
Jaw & Jaw

Meets the performance requirements of Federal Specifications FF-T-79lb, Type 1, Form 1 - Class 7, and ASTM F-1145, except for those provisions required of the contractor.

- Turnbuckle assembly combinations include: Eye and Eye, Hook and Hook, Hook and Eye, Jaw and Jaw & Jaw and Eye.
- End fittings are Quenched and Tempered or Normalized, bodies heat treated by normalizing.
- Crosby's Quenched and Tempered end fittings and normalized bodies have enhanced impact properties for greater toughness at all temperatures.
- Hot Dip galvanized.
- Hooks are forged with a greater cross sectional area that results in a stronger hook with better fatigue properties.
- Modified UNJ thread on end fittings for improved fatigue properties. Body has UNC threads.
- Turnbuckle eyes are forged elongated, by design, to maximize easy attachment in system and minimize stress in the eye. For turnbuckle size 1/4" through 2-1/2" a shackle one size smaller can be reeved through eye.
- Forged jaw ends are fitted with bolts and nuts on size 1/4" - 5/8", and pins and cotter on sizes 3/4" through 2-3/4".
- TURNBUCKLES RECOMMENDED FOR STRAIGHT OR IN-LINE PULL ONLY.
- Lock Nuts available for all sizes.
- Typical hardness levels, Tensile Strengths and Ductility Properties are available for all sizes.
- Turnbuckles can be furnished proof tested or magnaflux inspected with certificates if requested at time of order.
- Meets or exceeds all the requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements. Importantly, these turnbuckles meet other critical performance requirements including fatigue life, impact properties and material traceability, not addressed by ASME B30.26.



Modified thread:
Note stress relieving radii in this unretouched photo enlargement of the supabuckle.

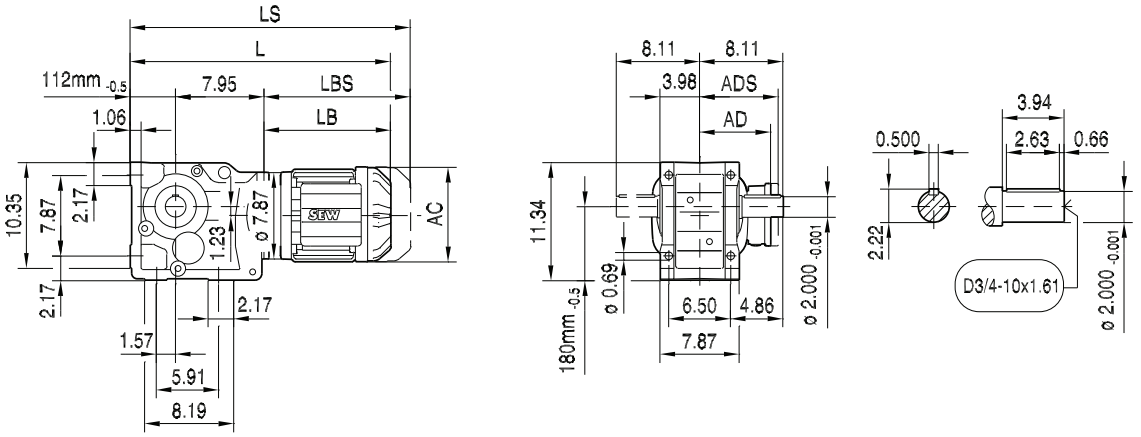


Standard thread:
Note stress building sharp "V" in this untouched photo enlargement.

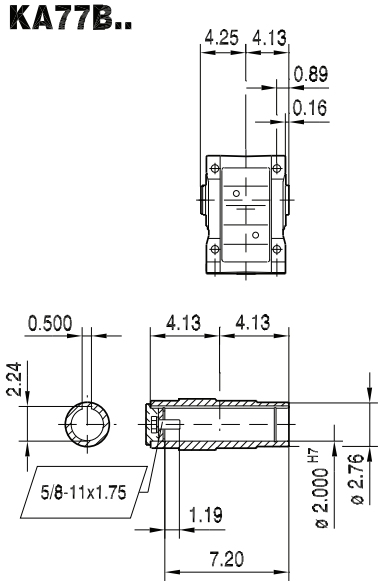
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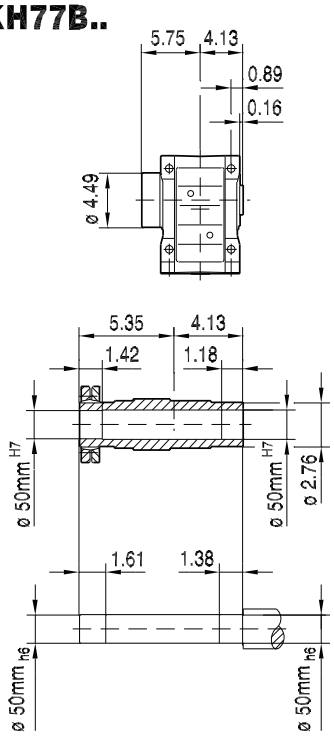
K77..



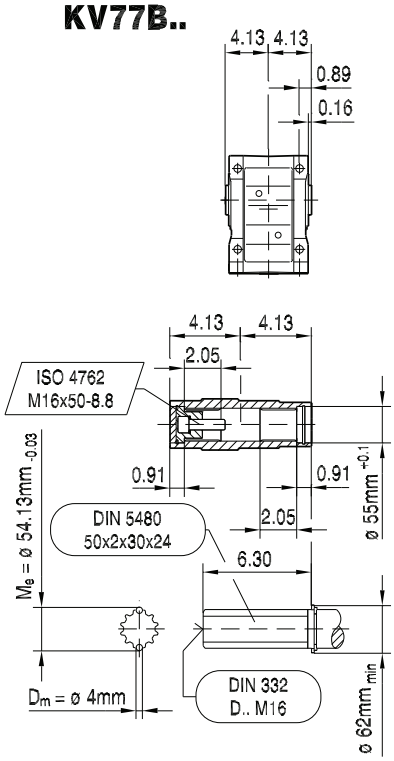
KA77B..



KH77B..



KV77B..



(→ 125)	DR71M	DR80S	DR80M	DR90M	DR90L	DR100M	DR100L/LC	DR132S	DR132M/MC	DR160..
AC	5.47	6.14	6.14	7.05	7.05	7.76	7.76	8.70	8.70	10.63
AD	4.69	5.04	5.04	5.51	5.51	6.18	6.18	6.69	6.69	8.98
ADS	5.08	5.47	5.47	5.91	5.91	6.22	6.22	6.77	6.77	8.98
L	20.79	21.14	22.36	22.44	23.23	24.41	25.59	27.28	29.25	30.87
LS	23.46	24.33	25.55	26.10	26.89	28.07	29.25	31.69	33.66	36.26
LB	8.43	8.78	10.00	10.08	10.87	12.05	13.23	14.92	16.89	18.50
LBS	11.10	11.97	13.19	13.74	14.53	15.71	16.89	19.33	21.30	23.90

SEW-EURODRIVE

PT Pilot® Quotation

Date 09/24/2014 **Quotation # 20140924-00076**

From	SEW-Western Region (CA) SEW-Eurodrive, Inc. 30599 San Antonio Street Hayward CA, 94544	**Phone** (510) 487-3560 **Fax** (510) 487-6433	**To**	M3 Engineering 2051 W Sunset Road Tucson AZ, 85704	**Phone** (520) 293-1488 **Fax** (520) 293-8349
Email	cshayward@seweurodrive.com		**Attn**	John Reid	

Purchase Order	N/A	**Tag/Ref**	**SO#**

Model	K77DRE100L4BE5/AS7Y/TH			**Base Price**	$2,527 List
Gear Ratio	97.05				
Prim/Sec Stages	3 / 0	**Shaft Location**	A (ex: MxA)	**Cable Entry Loc**	Unsure
Output Speed	18 RPM	**Output Shaft Dia**	50 mm	**Overhung Load**	3,950 lbs
Motor Power	3 HP	**Output Shaft Style**	Solid Shaft	**Output Torque**	10,300 lb-in
Motor Voltage	460 VAC	**Input Shaft Dia**	--	**Torque Capacity**	13,720 lb-in
Frequency	60 Hz	**Flange Diameter**	--	**Nameplate S.F.**	1.30
Brake Voltage	460V	**Flange Location**	--	**Load S.F.**	--
Mtg. Position	M4	**Conduit Box Loc**	90	**Weight** (includes oil)	194 lbs

GEAR OPTIONS (List)

50 mm Shaft [$0], Shaft A [$0], 5001 Green/Blue Paint [$0], Shell Omala S2 G 220 mineral oil (standard) [$0]

MOTOR AND BRAKE OPTIONS (List)

115V Space Heater [$188], IP54 Enclosure [$0], 5001 Green Blue Paint [$0], AS7Y - Spreadshaft SSI Encoder [$1655], TH - Thermostat switches (x3) Class F [$153], Inverter/Vector Duty Nameplate [$0], Class F Insulation on Nameplate [$0], Standard Aluminum Conduit Box - NPT holes [$0], 15m Encoder Cable w/Wire Leads + (2) 15-pin Plugs (P/N 1360 2640-15) [$400], No Brake Release [$0], BGE Rectifier (std) [$0], BE5 with 354 lb-in Brake Torque [$500]

ELECTRONIC OPTIONS / MECHANICAL VARIABLE SPEED (List)

MCF41A0022-5A3-4-00 [$1478], Output Filter HF022-503 [$632], USB11A [$190], Line Filter NF009-503 [$367]

COMMENTS / SPECIAL INSTRUCTIONS

Ambient = 25C (77F) or lower.

OFFICE USE ONLY



DELIVERY

Need by N/A
Ship Via N/A
FOB SEW Eurodrive, Inc.

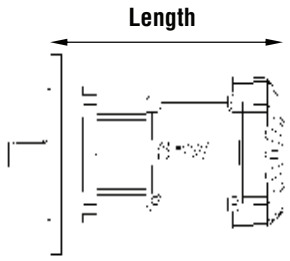
Qty 1	**List Ea** $8,090	**Disc** 0.556	**Net Adders Ea** $0	**Net Ea** $4,498.04	**TOTAL** $4,498.04

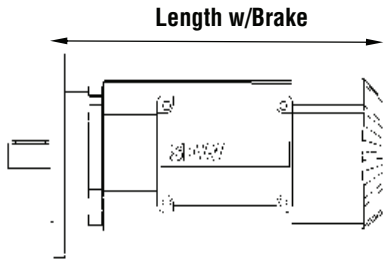
Quotation is valid for 30 days and subject to SEW-Eurodrive terms and conditions of sale.
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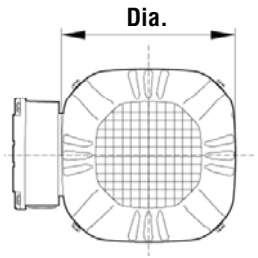
Dimension Comparison – DR & DT/DV Motors

DT/DV Series Motor	DRS Series Standard Efficiency	DRE Series High Efficiency	DRP Series PREMIUM Efficiency	Power [Hp]	Power [kW]	DT/DV/DR			DRS			DRE			DRP			New Standard vs. DT/DV		
						Length	w/BMG	Diameter	Length	w/BE	Dia.	Length	w/BE	Dia.	Length	w/BE	Dia.	Length	w/Brake	Dia.
DT56M4	-	-	-	0.13	0.09	136	172	109	-	-	-	-	-	-	-	-	-	-	-	-
DR63S4	-	-	-	0.15	0.12	187	242	132	-	-	-	-	-	-	-	-	-	-	-	-
DT56L4	-	-	-	0.2	0.15	136	172	109	-	-	-	-	-	-	-	-	-	-	-	-
DR63M4	DRS71S4	-	-	0.25	0.18	187	242	132	198	266	139	-	-	-	-	-	-	+11	+24	+7
DT71K4						202	266	145				-	-	-	-	-	-	-4	0	-6
DR63L4	DRS71S4	-	-	0.33	0.25	187	242	132	198	266	139	-	-	-	-	-	-	+11	+24	+7
DT71C4						202	266	145				-	-	-	-	-	-	-4	0	-6
DT71D4	DRS71S4	-	-	0.5	0.37	202	266	145	198	266	139	-	-	-	-	-	-	-4	0	-6
DT80K4	DRS71M4	-	-	0.75	0.55	252	316	145	223	291	139	-	-	-	-	-	-	-29	-25	-6
DT80N4	DRS80S4	DRE80M4	DRP90M4	1.0	0.75	252	316	145	241	322	156	272	353	156	266	359	179	+20	+37	+11
DT90S4	DRS80M4	DRE90M4	DRP90L4	1.5	1.1	257	342	197	272	353	156	266	359	179	286	379	179	+9	+17	-18
DT90L4	DRS90M4	DRE90L4	DRP90L4	2.0	1.5	257	342	197	266	359	179	286	379	179	286	379	179	+29	+37	-18
DT100LS4	DRS90L4	DRE100L4	DRP112M4	3.0	2.2	311	396	197	286	379	179	346	439	197	352	464	221	+41	+43	0
DV100M4	DRS90L4	DRE100L4	DRP112M4	3.0	2.2	341	426	197	316	409	197	346	439	197	387	499	221	+5	+13	0
DT100L4	DRS100M4	DRE100LC4	DRP132S4	5.0	3.7	341	426	197	316	409	197	346	439	197	387	499	221	+5	+13	0
DV100L4																				
DV112M4	DRS100L4	DRE132S4	-	5.4	4.0	349	429	221	346	439	197	387	499	221	-	-	-	+38	+70	0
DV132S4	DRS132S4	DRE132M4	DRP160S4	7.5	5.5	394	474	221	387	499	221	437	549	221	460	597	272	+43	+75	0
DV132M4	DRS132M4	DRE132MC4	DRP160S4	10	7.5	407	519	275	437	549	221	437	549	221	460	597	272	+30	+30	-54
DV132ML4	DRS132MC4	DRE160M4	DRP160M4	12.5	9.2	462	574	275	437	549	221	460	597	272	460	597	272	-2	+23	-3
DV160M4	DRS160M4	DRE160MC4	DRP160MC4	15	11	462	574	275	460	597	272	460	597	272	460	597	272	-2	+23	-3
DV160L4	DRS160MC4	DRE180M4	DRP180M4	20	15	509	665	331	460	597	272	540	739	317	540	739	317	+31	+74	-14
DV180M4	DRS180M4	DRE180L4	DRP180L4	25	18.5	581	737	331	540	739	317	600	799	317	583	772	317	+19	+62	-14
DV180L4	DRS180L4	DRE180LC4	DRP180LC4	30	22	581	737	331	600	799	317	600	799	316	600	799	316	+19	+62	-15
DV200L4	DRS180LC4	DRE200L4	DRP225S4	40	30	616	772	394	600	799	317	649	869	394	649	869	394	+33	+97	0
DV225S4	DRS225S4	DRE225S4	DRP225M4	50	37	690	846	394	649	869	394	649	869	394	699	919	394	-41	+23	0
DV225M4	DRS225M4	DRE225M4	-	60	45	690	846	394	699	919	394	699	919	394	-	-	-	+9	+73	0
DV250M4	DRS225MC4	DVE250M4	-	75	55	772	957	510	699	919	394	772	957	510	-	-	-	0	0	0
DV280S4	-	DVE280S4	-	100	75	772	957	510	-	-	-	772	957	510	-	-	-	0	0	0
DV280M4	-	DVE280M4	-	125	90	-	-	-	-	-	-	772	957	510	-	-	-	-	-	-
-	-	DRE315K4	-	150	110	-	-	-	-	-	-	941	1192	624	-	-	-	-	-	-
-	-	DRE315S4	-	200	150	-	-	-	-	-	-	941	1192	624	-	-	-	-	-	-
-	-	DRE315M4	-	250	185	-	-	-	-	-	-	1071	1322	624	-	-	-	-	-	-
-	-	DRE315L4	-	275	200	-	-	-	-	-	-	1071	1322	624	-	-	-	-	-	-
-	-	DRE315L4	-	300	225	-	-	-	-	-	-	1071	1322	624	-	-	-	-	-	-

NOTES:
1. BLUE denotes USA standard motor
2. Copper rotor always selected for non-standard motor
3. All dimension units are metric [mm]
4. Dia. (diameter) dimension does not include conduit box
5. Longest flange selected for Length, w/BMG, and /BE dimensions
6. **New Standard vs. DT/DV** useful when replacing motors
7. RED = larger new dimension Δ, GREEN = smaller Δ







SEW EURODRIVE

Technical Note

M-111-02

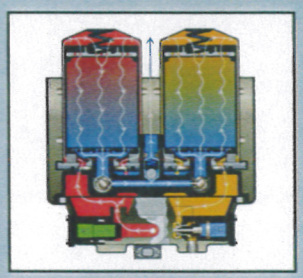
MODEL 15 - 30 HP

Sullivan Palatek®

" The Ultimate Performance Rotary Screw Air Compressor"



ENCLOSED CDD
MODEL SHOWN



EXTENDED LIFE
Mounted desiccant dryer to eliminate moisture and contaminants, -40° F Dew Point.

- Rotary screw compressor, cool, clean air.
- Compact design.
- 100 percent duty cycle.
- 5-year air end warranty.

Complete package with starter, air cooled oil cooler/aftercooler and protective devices for high temperature and low oil shutdown. In line filter.

COMPRESSOR & DESICCANT DRYER PACKAGE

Sullivan Palatek®

Air Compressor & Desiccant Air Dryer Package.

STANDARD FEATURES

ELECTRIC MOTOR:	Nema T-Frame, C-Frame, double shaft, open drip proof squirrel cage, induction type. Contact factory for voltage availability. Direct coupling to motor for positive alignment.
MOTOR STARTER:	Full voltage magnetic starter with 120 volt controls, Nema 1 enclosure, circuit breaker, transformer and three phase overload protector.
AIR INTAKE FILTER:	Multi-stage dry type with replaceable element.
CONTROLS:	Full modulation, electronically controlled for smooth operation and lowest possible no load power. Auto dual control, timed stop or constant run.
INSTRUMENTATION:	Line pressure gauge, fluid reservoir gauge, hour meter, discharge temperature gauge, oil filter and separator element differential gauges.
PROTECTIVE DEVICES:	Class 20 overload relay, high temperature and overpressure shut down.
COOLING SYSTEM:	Air cooled with air cooler/aftercooler and factory filled with Palasyn 45 synthetic lubricoolant. Equipped with microfiber full flow oil filter.
AIR DRYER:	Desiccant air dryer and coalescing air filter for moisture removal, spin on replaceable cartridges and built for -40°F dew point.
MOUNTING:	Base mounted, no special foundation required. Optional tank, platform and accoustical enclosure available. Consult factory for dimensions and weights for optional equipment.

GENERAL SPECIFICATIONS

MODEL	BASE PACKAGE	ENCLOSED PACKAGE
Lubricant Reservoir Capacity	3 Gal.	3 Gal.
Length	58"	77"
Height	35"	43"
Width	34"	38"
Weight (lbs.)	1,050	1,650
Discharge Connection	1"N.P.T.	1"N.P.T.

Sold and Serviced By:

CDD 15-30 HP

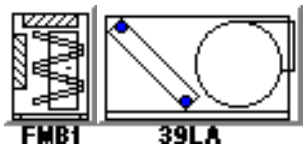


TANK MOUNTED OPEN CDD MODEL SHOWN.

Sullivan Palatek®

3501 West Dunes Highway TEL: 219-874-2497 FAX: 219-872-5043 www.palatek.com
Michigan City, IN 46360 TEL: 800-438-6203 FAX: 800-725-6203 Email: info@palatek.com

Job Name	SPMT Telescope
Mark for	FC06
Date	June 22, 2014



Unit Parameters

Unit Size: 12
Insulation: 1" 1.5# Tuf-Skin II Single Wall
Hand: Right
Export Crate Unit
Suspension Package
Controls: No Product Integrated Controls

FMB1 Combo Filter Mixing Box Sect. (Top & Rear Inlet)

2in Pleated MERV13 Filters - kit
(6) 16in. x 20in.

LA Horizontal Cooling (LFA) Coil/Fan Section

Fan RPM: 1008
Drive
Motor HP: 5
Voltage: 230/460 3 Phase 60Hz
Efficiency: Premium
Enclosure: ODP
RPM: 1800
Manufacturer - Generic
Frame Size - 184T
Motor Shaft Diameter (in.) - 1.125
Full Load Amps - 13/6.5
MCA - 16.2/8.1
MOCP - 25/10
Efficiency - 89.5%
Discharge: Top Horiz. Front
CW 11.2 sq.ft. 6 Rows 11 FPI Double Circuit
0.016 in. Tube Wall Thickness

Weights and Dimensions

(LxWxH in ft in) 7' 0" x 5' 5" x 2' 8" **
Dry 1069 LB ** Wet 1133 LB **

Job Name	SPMT Telescope
Mark for	FC06
Date	June 22, 2014

Weights and Dimensions are approximate. Weights include base unit weight, coils (wet & dry), fans and fan motors, and other components, but does not include filters, drives and skids. Approximate dimensions are provided primarily for shipping purposes. Shipping skids are not included.
All filter media efficiency ratings are for the filter media only.

Chilled Water Coil Performance Summary

Project: SPMT Telescope
Tag: FC06

Cooling Application's Balance Criteria: Fluid Flow

Coil Model	**Carrier 28NA**	
Row / FPI / Circ	**6 / 11 / DB**	
Face Area Type	**Large**	
Coil Face Area	**11.20**	sqft
Face Velocity	**560.0**	fpm
Tube Material	**Al / Cu**	
Tube Diameter	**0.5**	in
Tube spacing: Stf x Str	**1.25 x 0.781**	in
Tube Wall Thickness	**0.016**	in
Actual Airflow	**6272**	CFM
Site Altitude	**9285**	ft
Total Cooling Capacity	**117.21**	MBH
Sensible Cooling Capacity	**113.25**	MBH
Fluid Flow Rate	**23.4**	gpm
Fluid Pressure Drop	**0.8**	ft wg
Fluid Velocity	**1.1**	ft/s
Entering Fluid Temperature	**45.00**	F
Leaving Fluid Temperature	**55.00**	F
Fluid Temperature Rise	**10.0**	F
Entering Air Dry Bulb	**76.50**	F
Entering Air Wet Bulb	**60.00**	F
Entering Air Enthalpy	**31.39**	BTU/lb
Leaving Air Dry Bulb	**53.14**	F
Leaving Air Wet Bulb	**52.52**	F
Leaving Air Enthalpy	**25.5**	BTU/lb
Air Friction	**0.45**	in wg
Brine	**FW**	
Brine Concentration	**0**	%
Fouling Factor	**0.0**	(hr-sqft-F)/BTU

AHRI CERTIFIED® www.ahridirectory.org Air-Cooling and Air-Heating Coils AHRI Standard 410

NOTE: Certified in accordance with the AHRI Forced-Circulation Air-Cooling and Air-Heating Coils Certification Program which is based on AHRI Standard 410 within the Range of Standard Rating Conditions listed in Table 1 of the Standard. Certified units may be found in the AHRI Directory (www.ahridirectory.org).

Resulting Face Velocity May Cause Water Carryover

Supply Fan Performance Summary

Project: SPMT Telescope
Tag: FC06

Fan Model		**39L**
Unit Size		**12**
Fan Type	**LA**	**(For LFA Clg. Coils)**
Inlet Guide Vanes		**No**
Actual Airflow, CFM		**6272**
Site Altitude, ft		**9285**
Upstream Ext. Static, in wg		**0.00**
Downstream Ext. Static, in wg		**0.50**
Cooling Coil Static, in wg		**0.45**
Heating Coil Static, in wg		**0.00**
Other Losses, in wg		**0.00**
Total Accessory Static, in wg		**0.22**
Total Static Pressure, in wg		**1.17**
Fan RPM		**984**
Fan BHP		**2.6**

Acoustic Data:

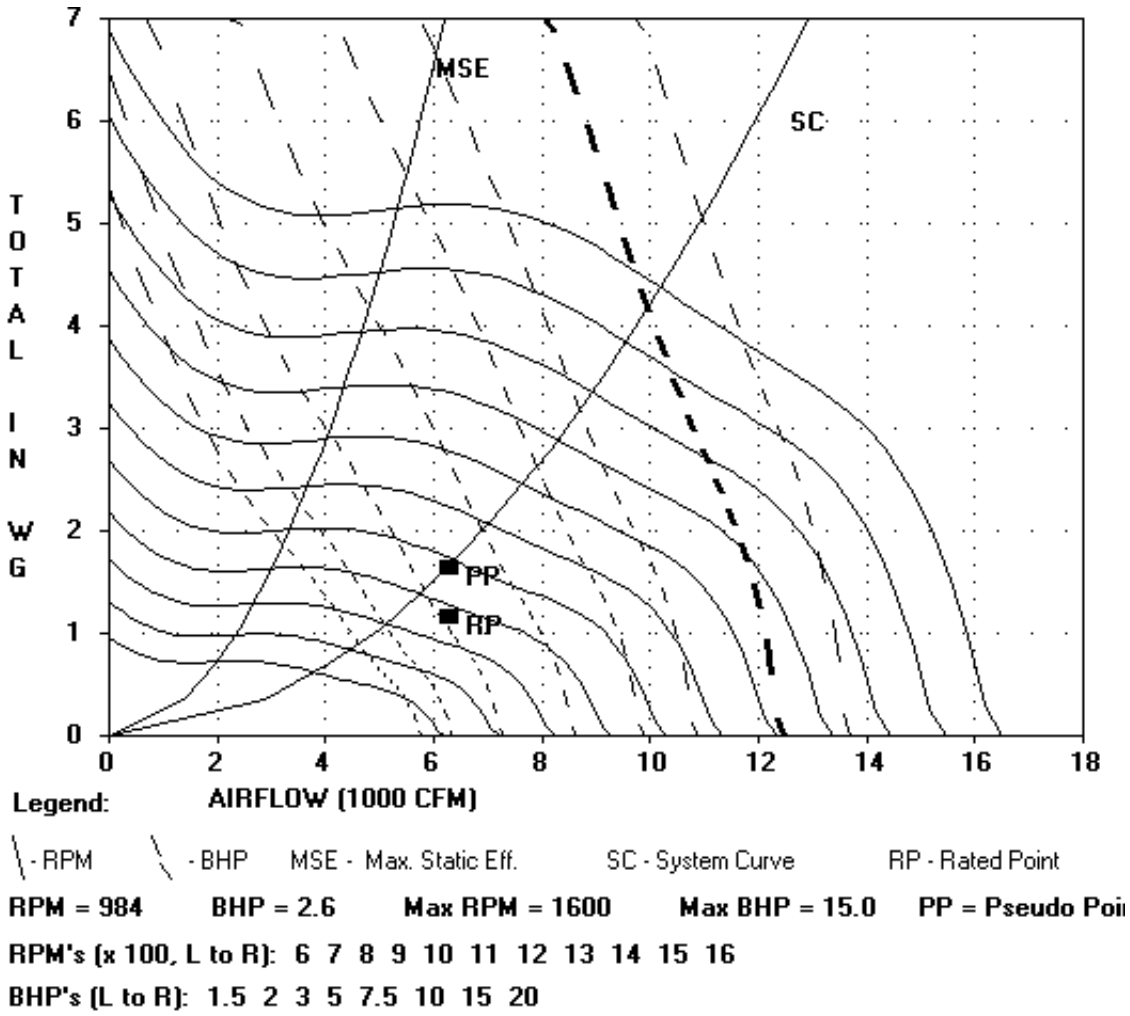
	Discharge	Inlet	Casing
63 Hz	**88**	**80**	**82**
125 Hz	**89**	**71**	**77**
250 Hz	**84**	**65**	**67**
500 Hz	**83**	**63**	**63**
1000 Hz	**80**	**63**	**64**
2000 Hz	**73**	**62**	**60**
4000 Hz	**68**	**55**	**55**
8000 Hz	**62**	**46**	**52**

AHRI CERTIFIED® www.ahridirectory.org Central Station Air-Handlers AHRI Standard 430

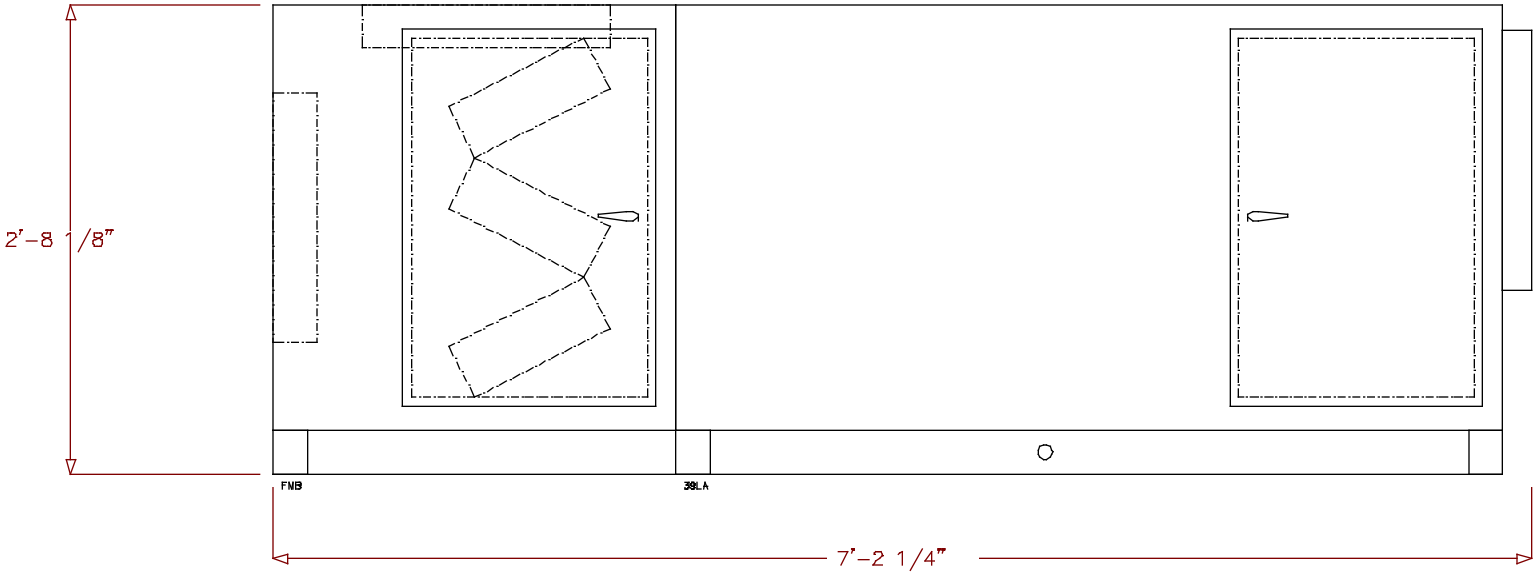
Accessories:

(1) Filter/Mixing Box Synthetic 2 inch MERV 13 [0.22]

NOTE: RP - indicates actual total static pressure and horsepower.
PP - indicates actual RPM. Graph is at sea level conditions.



Mark for: FC06
Job name: SPMT Telescope



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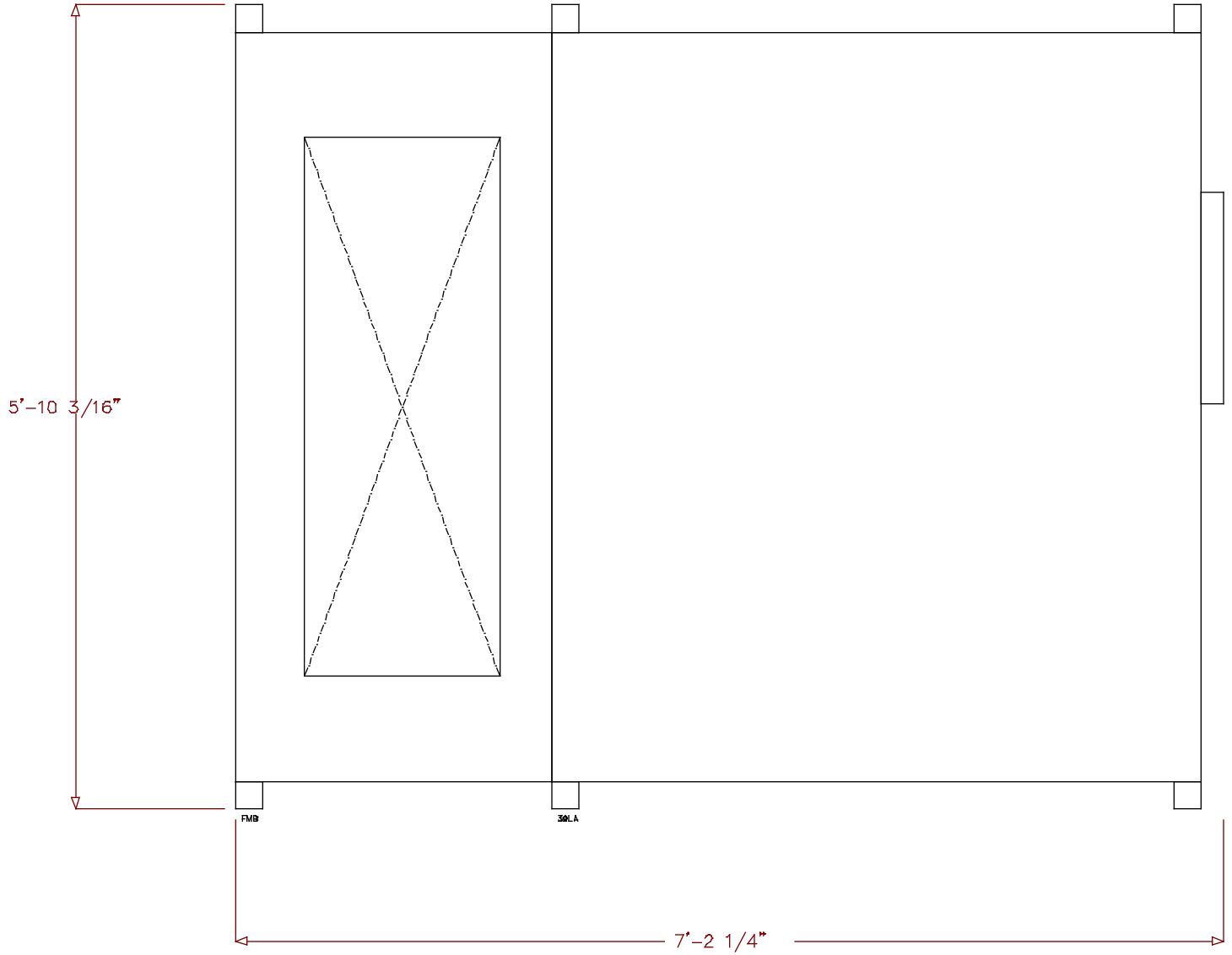
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39L

Date:	AHU Builder Version:	39L Central Station Air Handler
06/22/14	v6.34 02/11/14 SDM Version: 6.30	39LA12KA-AS-AKP-09, Size 12, RH Unit, (Side View) , Insulation: 1in, 1.5# Tuff-Skin II

Mark for: FC06
Job name: SPMT Telescope



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Syracuse, NY 13221

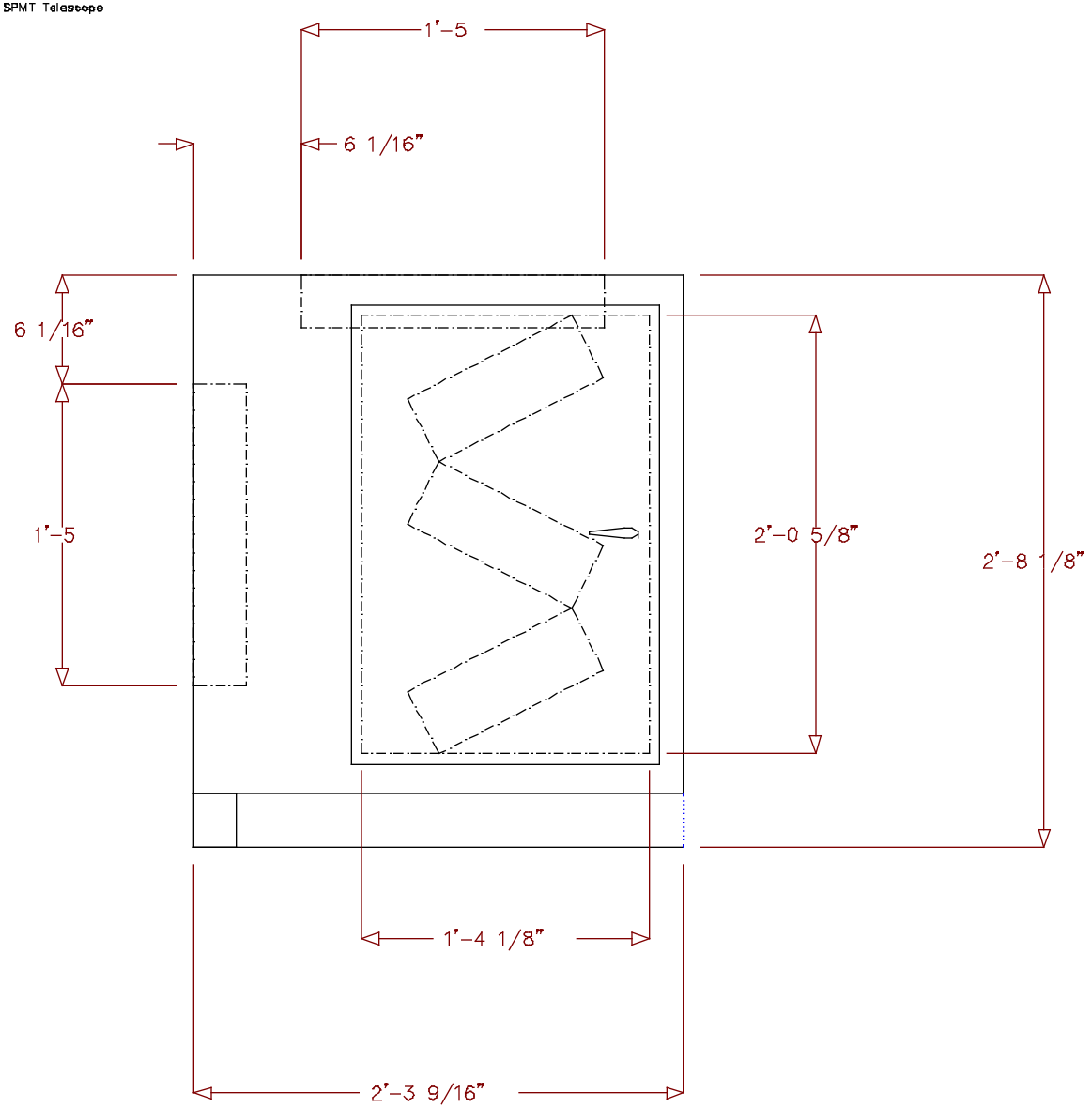
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39L

Date:	AHU Builder Version:	39L Central Station Air Handler
06/22/14	v6.34 02/11/14	39LA12KA-AS-AKP-09, Size 12, RH Unit, (Top View)
	SDM Version:	, Insulation: 1in, 1.5# Tuff-Skin II
	6.30	

Mark for: FCD6
Job name: SPMT Telescope



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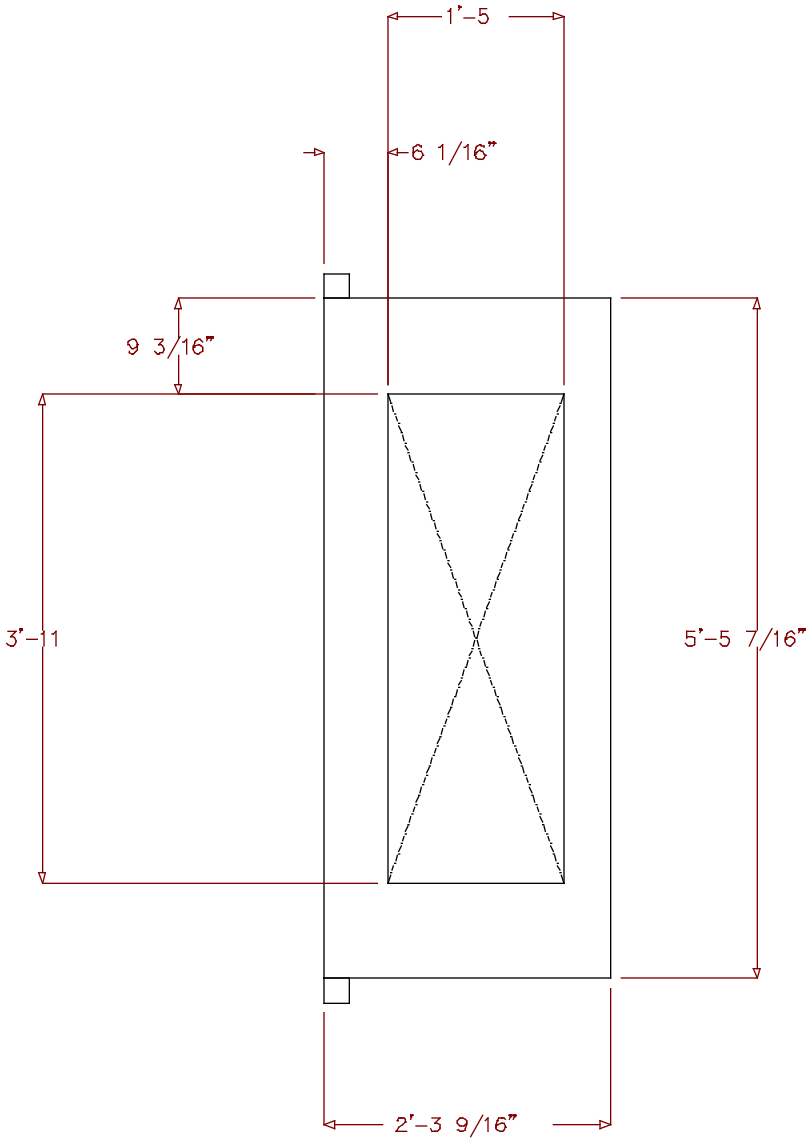
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39L

Date:	AHU Builder Version:	39L Central Station Air Handler
06/22/14	v6.34 02/11/14	Filter/Mixing Box, Size 12, RH Unit, (Side View)
	SDM Version:	Insulation: 1in., 1.5# Tuff-Skin II
	6.30	

Mark for: FC06
Job name: SPMT Telescope



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Carrier Parkway
Syracuse, NY 13221

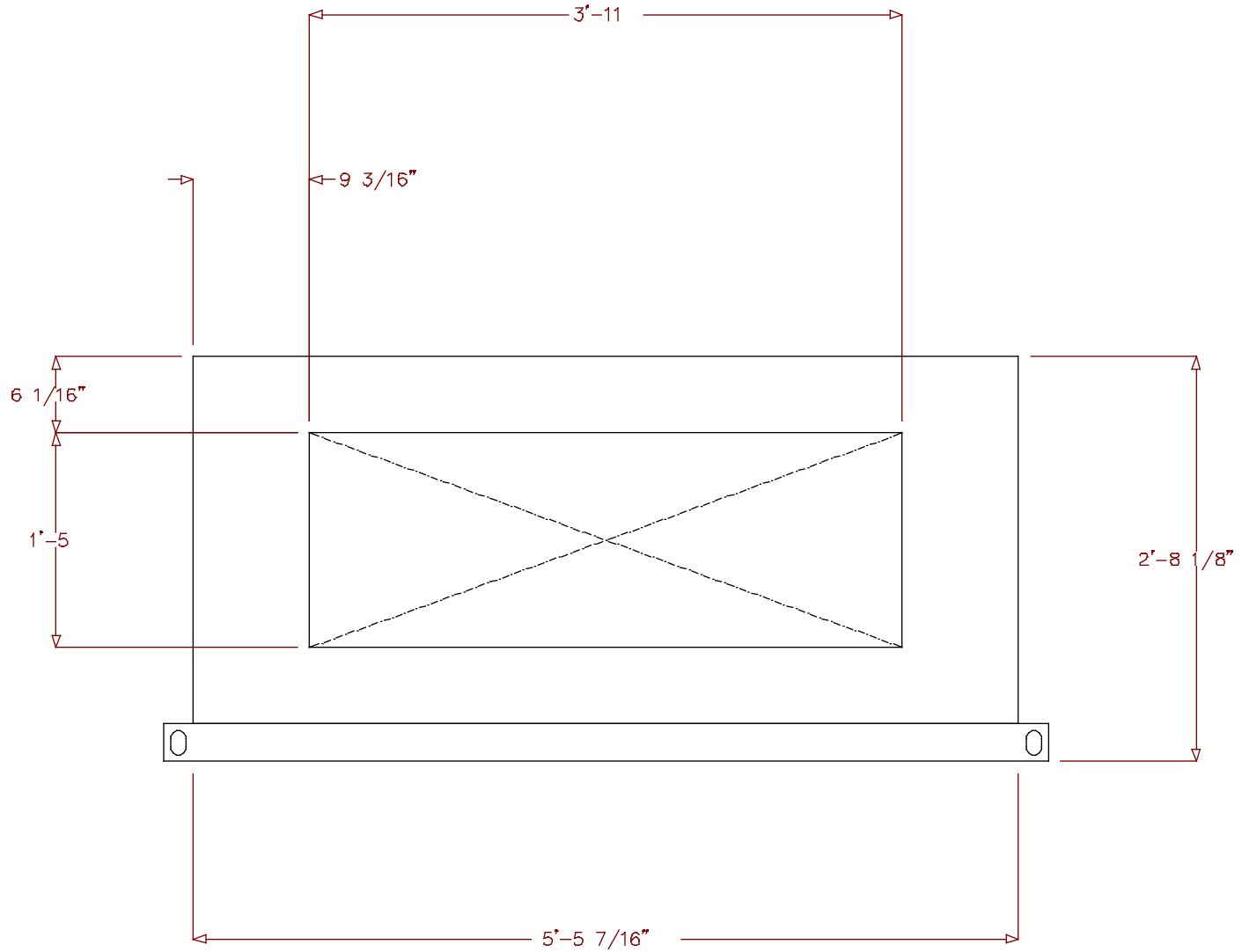
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39L

Date:	AHU Builder Version:	39L Central Station Air Handler
06/22/14	v6.34 02/11/14 SDM Version: 6.30	Filter/Mixing Box, Size 12, RH Unit, (Top View) Insulation: 1in., 1.5# Tuff-Skin II

Mark for: FC06
Job name: SPMT Telescope



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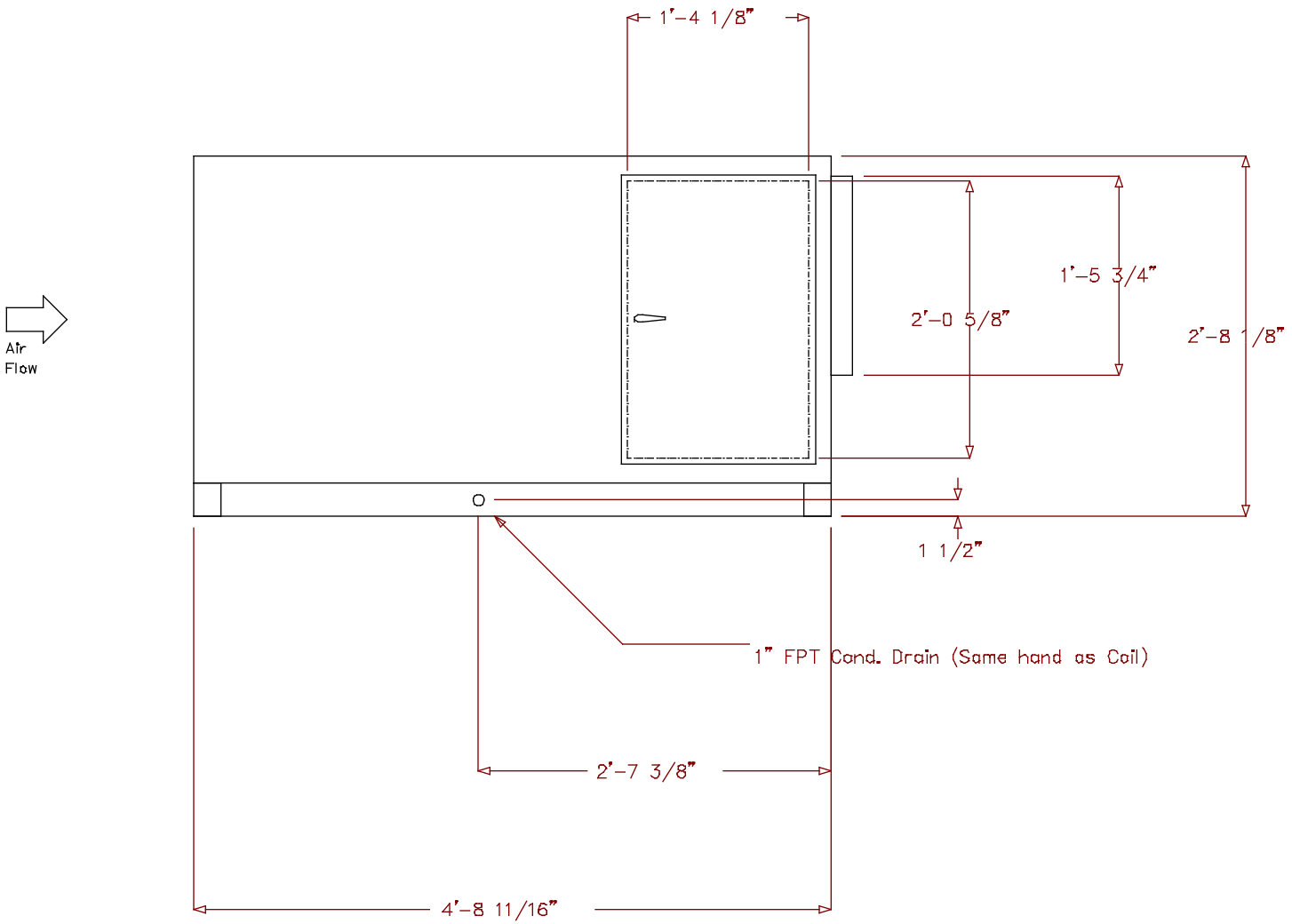
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39L

Date:	AHU Builder Version:	39L Central Station Air Handler
06/22/14	v6.34 02/11/14	Filter/Mixing Box, Size 12, RH Unit, (End View)
	SDM Version:	Insulation: 1in., 1.5# Tuff-Skin II
	6.30	

Mark for: FC06
Job name: SPMT Telescope



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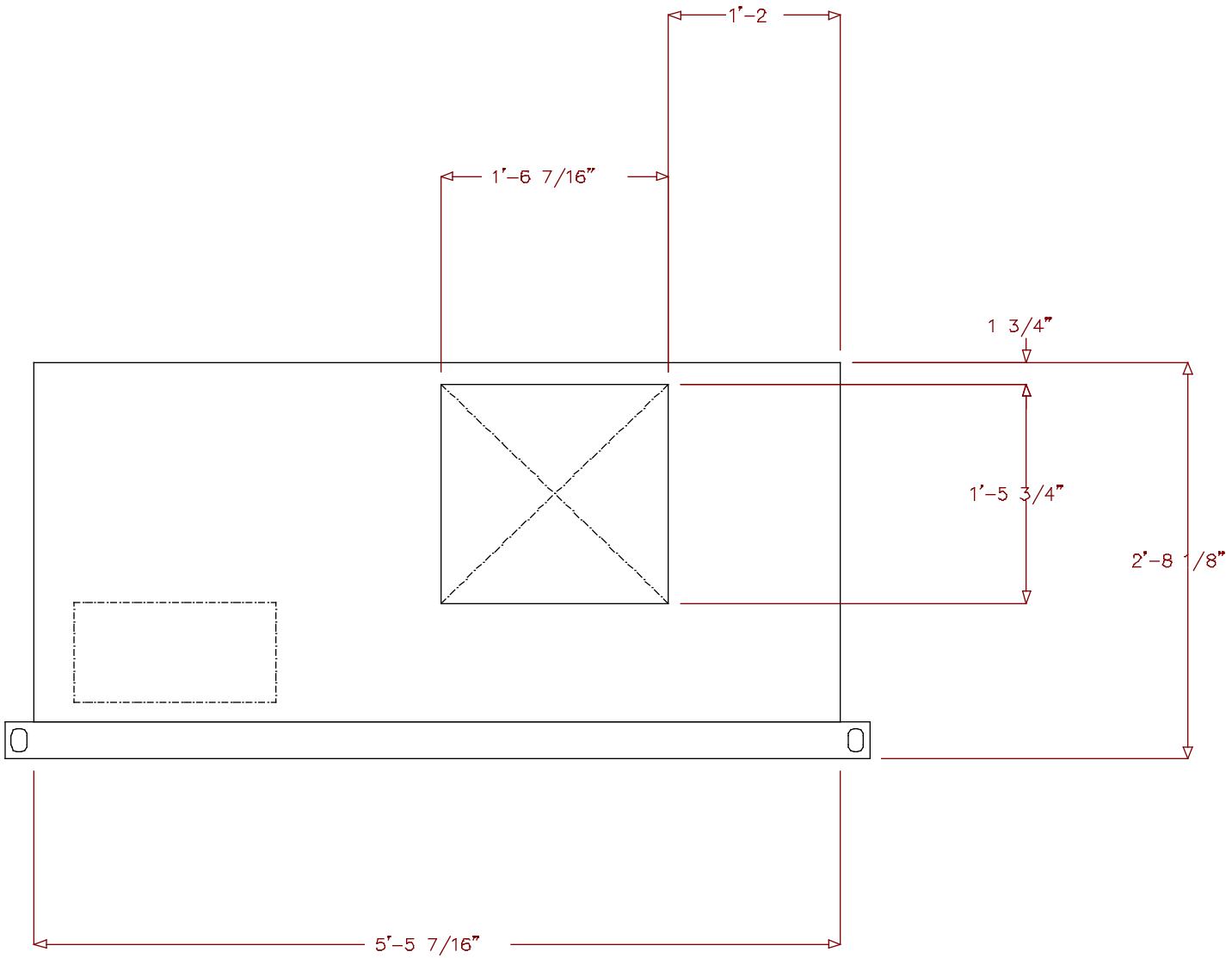
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39L

Date:	AHU Builder Version:	39L Central Station Air Handler
06/22/14	v6.34 02/11/14 SDM Version: 6.30	39LA, Size 12, RH Unit, (Side View) , Insulation: 1in, 1.5# Tuff-Skin II

Mark for: FC06
Job name: SPMT Telescope



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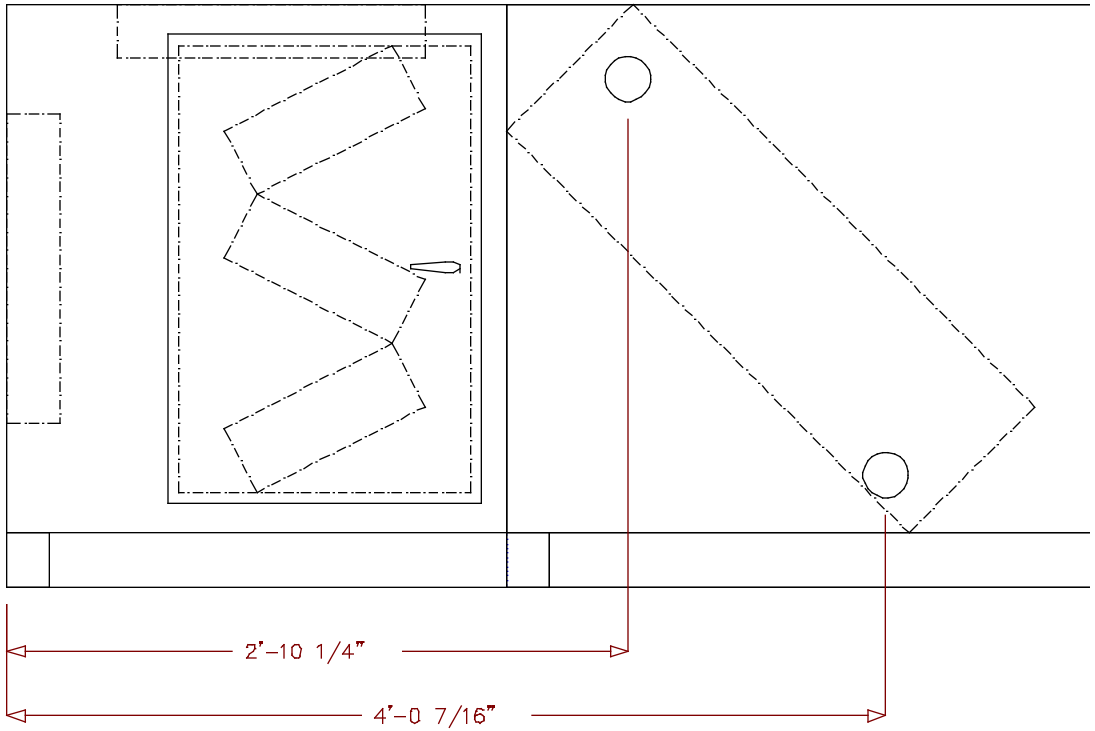
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39L

Date:	AHU Builder Version:	39L Central Station Air Handler
06/22/14	v6.34 02/11/14	39LA, Size 12, RH Unit, (End View)
	SDM Version:	, Insulation: 1in, 1.5# Tuff-Skin II
	6.30	

Mark for: FCD6
Job name: SPMT Telescope



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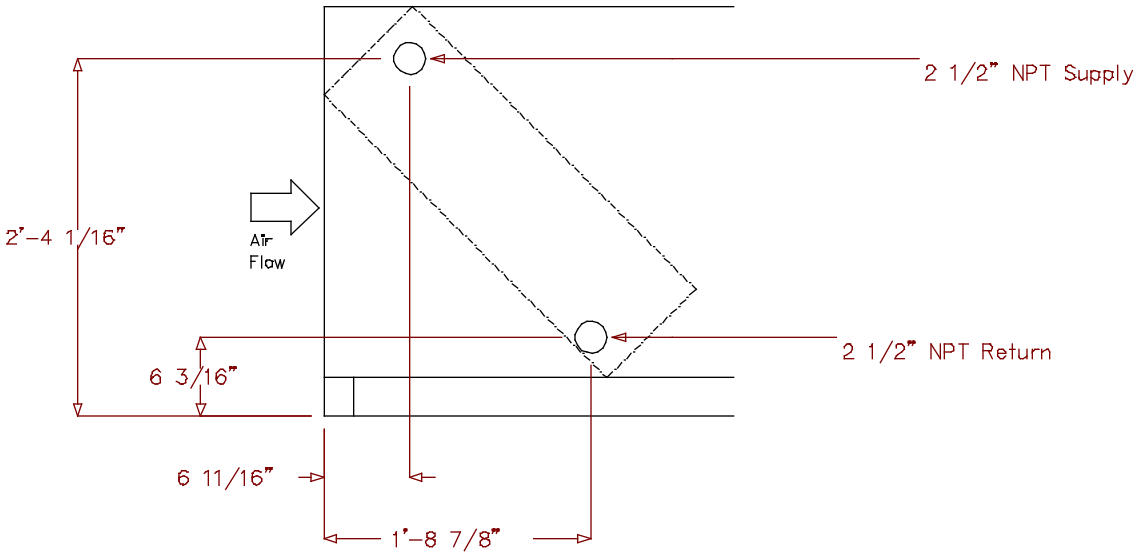
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39L

Date:	AHU Builder Version:	39L Central Station Air Handler
06/22/14	v6.34 02/11/14	39LA12KA-AS-AKP-09, Size 12, RH Unit, (Side View)
	SDM Version:	, Insulation: 1in, 1.5# Tuff-Skin II
	6.30	

Mark for: FC06
Job name: SPMT Telescope



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39L

Date:	AHU Builder Version:	39L Central Station Air Handler	
06/22/14	v6.34 02/11/14 SDM Version: 6.30	39LA Base Unit, Size 12, RH Unit Chilled Water Coil, 6 Row, Double Circuit	

SUBMITTAL

Project

SPMT Telescope

Date

Friday, June 20, 2014

Rebecca T. Callimanis
Sigler Commercial Tucson
3672 South Wall Street
Tucson AZ 85713

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Prepared By: Rebecca T. Callimanis 02:15PM

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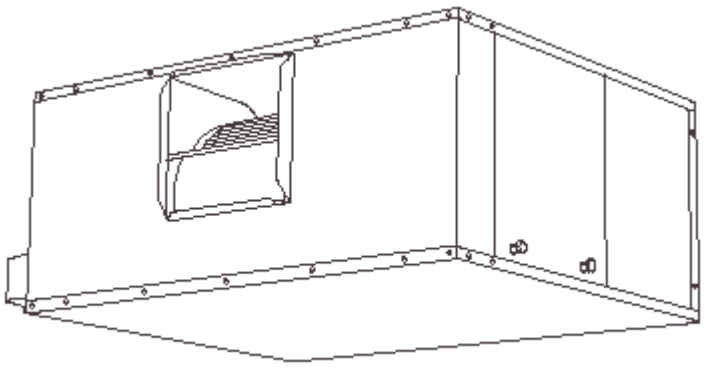
FC01

Tag Cover Sheet
Unit Report
Certified Drawing
Performance Report

Unit Report For FC01

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



Unit Parameters

Tag Name: **FC01**
Quantity: **1**
Unit Model: **42BHE30BG4L63010FE**
Unit Type: **42BH Horizontal Belt Drive**
Unit Size: **3000 CFM**
Shipping Options: **Standard**

Dimensions

Unit Length: **1022.35** mm
Unit Width: **1219.20** mm
Unit Height: **819.15** mm
Operating Weight: **182** kg

Coil Parameters

System Type: **2-Pipe Cooling w/ Total Electric Heat**
Cooling Coil: **Cold Fluid Cooling**
Cooling Coil Rows: **4 Rows**
Coil Hand: **Left Hand**

Electrical

Motor Voltage: **460-3-60** V-Ph-Hz
Heater Voltage: **480-3-60, 2-Stage** V-Ph-Hz
Heater kW: **9.9 kW**

Fan and Drive Data

RPM: **929**
BHP: **.86** kW
Turns: **2.5**
Drive Code: **FQ7**

Warranty Information

First Year - Parts Only (Standard)

Ordering Information

Part Number	Description	Quantity
Base Unit		
	42BHE30BG4L63010FE	1
	42BHE30:Horizontal Belt-Drive Fan Coil 3000 CFM Cooling 460-3-60	
	1 1/2 HP Motor	
	Disconnect Switch (up to 40 Amps)	
	9.9 kW	
	2-Stage	
	Field Supplied/Installed Thermostat	

Certified Drawing for FC01

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

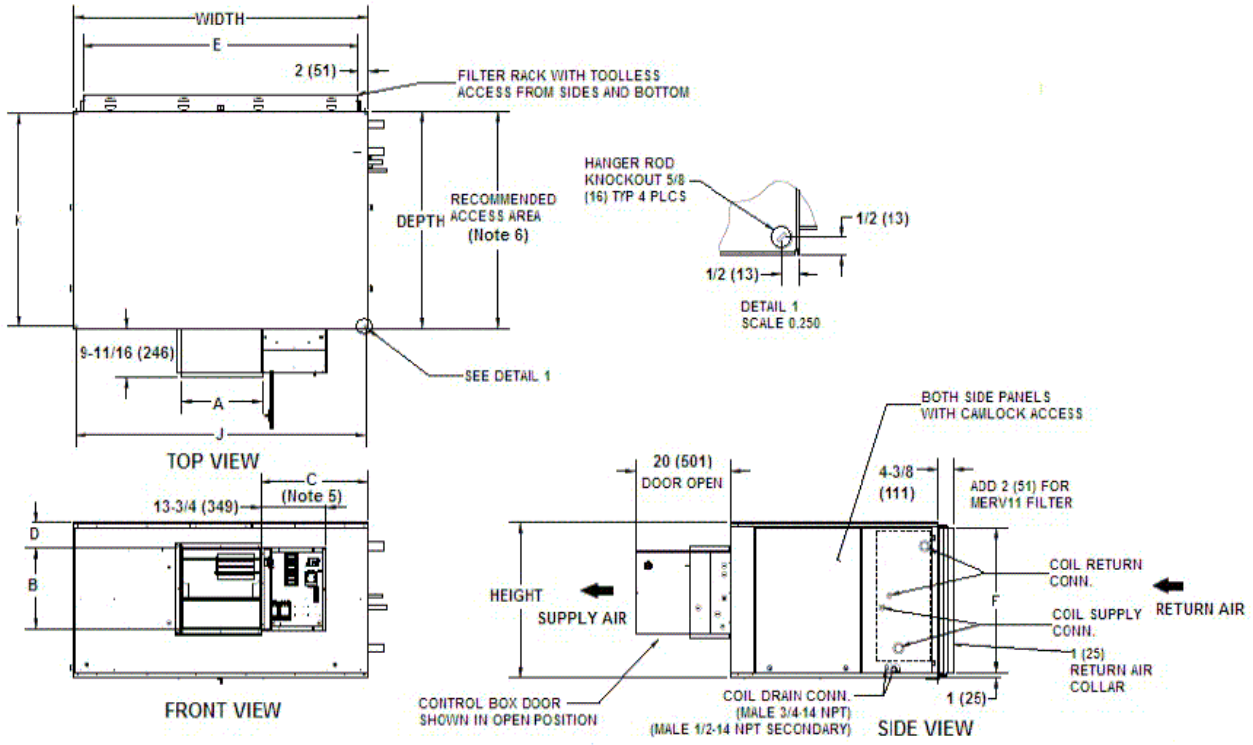
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HORIZONTAL BELT DRIVE UNIT (ELECTRIC HEAT)

42BHE



NOTE:
1. R.H. shown, L.H. opposite.
2. All dimensions ±1/4".
3. Coil connections shown are for 4-pipe system. Heating coil is in re-heat position as standard.
4. For 4-pipe, DX/Hot water combination, hot water coil is always in pre-heat position as standard.
5. "C" dimension is measured from coil side of the unit.
6. Allow adequate spacing or maneuverability of unit to allow service through recommended access area.
7. Dimensions in parenthesis are in mm.

Unit Size	Dimensions											
	Fan Size	Depth	Width	Height	Supply Duct				Return Duct		Mounting Holes	
					A	B	C	D	E	F	J	K
06	9 x 4	36	28	19-3/4	8-7/8	10-1/2	14-1/2	2-1/4	24	16-1/2	27-1/4	35-1/4
08	9 x 6	36	28	19-3/4	8-7/8	10-1/2	13-7/8	2-1/4	24	16-1/2	27-1/4	35-1/4
10	10 x 4	37-1/2	37	21-1/2	10-3/8	11-9/16	15-1/4	2-1/4	33	18-1/4	36-1/4	37
12	10 x 7	37-1/2	37	21-1/2	10-3/8	11-9/16	13-7/8	2-1/4	33	18-1/4	36-1/4	37
16	11 x 10	37-3/4	47	21-1/2	13-7/8	12-3/4	16-3/4	2-1/4	43	18-1/4	46-1/4	37
20	12 x 9	40-1/4	48	24	13	13-3/4	17-3/4	2-1/4	44	20-3/4	47-1/4	39-1/2
30	12 x 12	40-1/4	48	32-1/4	16-1/4	13-3/4	16	7-1/4	44	29	47-1/4	39-1/2
40	15 x 12	43-1/2	62	32-1/4	16-3/4	16-1/16	22-3/4	6-1/4	58	29	61-3/4	42-1/2

JOB NAME

JOB NUMBER

DATE
01/14/2011

Carrier

DRAWING NUMBER
42BH-202-3

REVISION
G

SHEET
1 OF 1

Certified Drawing for FC01

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

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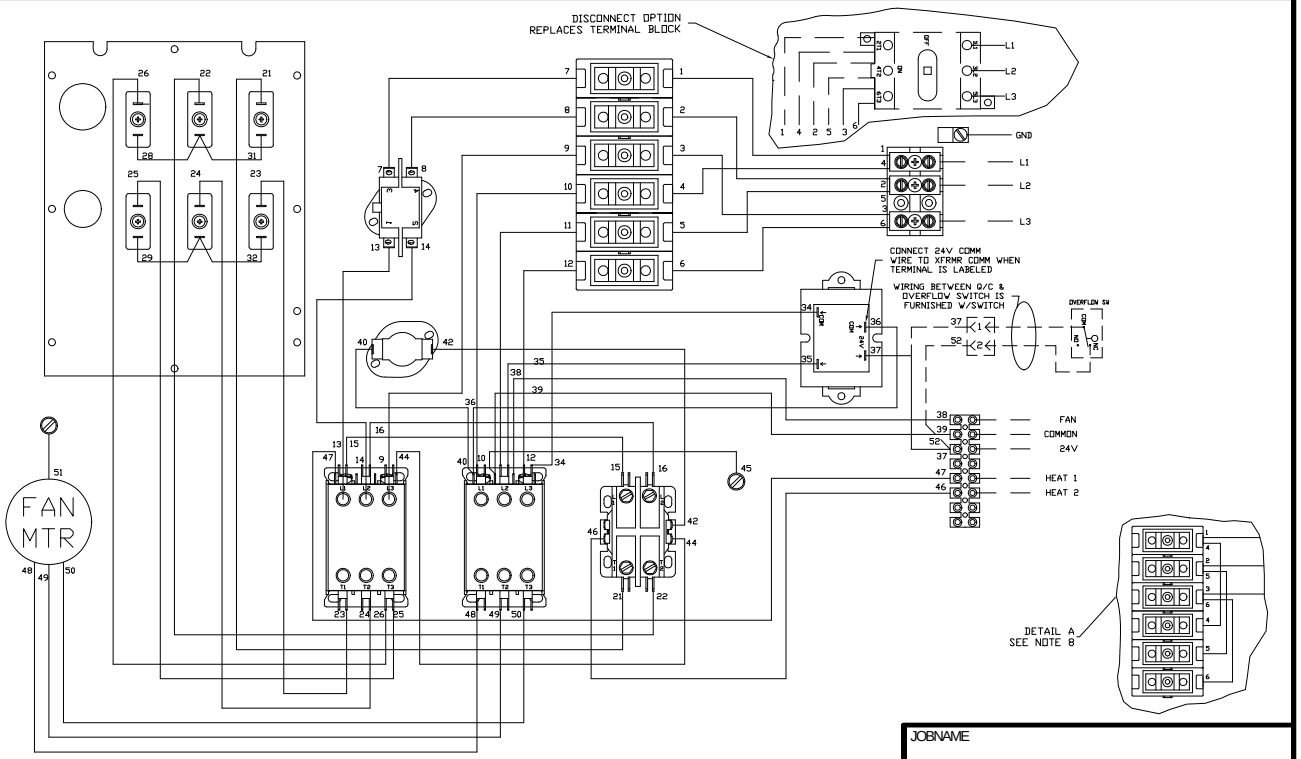
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ELECTRIC HEAT 3-PHASE 2-STAGE

42B

Wire	Gage	Color
1	8 AWG	Black
2	8 AWG	Red
3	8 AWG	Blue
4	12 AWG	Black
5	12 AWG	Red
6	12 AWG	Blue
7	8 AWG	Black
8	8 AWG	Red
9	8 AWG	Blue
10	12 AWG	Black
11	12 AWG	Red
12	12 AWG	Blue
13	8 AWG	Black
14	8 AWG	Red
15	10 AWG	Black
16	10 AWG	Red
21	12 AWG	Black
22	12 AWG	Red
23	12 AWG	Black
24	12 AWG	Red
25, 26	12 AWG	Blue
28, 29	12 AWG	Black
31, 32	12 AWG	Black
34	18 AWG	Blue
35	18 AWG	Red
36	18 AWG	Yellow
37	18 AWG	Orange
38	18 AWG	Gray
39, 40	18 AWG	Yellow
41, 42	18 AWG	Yellow
44, 45	18 AWG	Yellow
46	18 AWG	Purple
47	18 AWG	Brown
48	14 AWG	Black
49	14 AWG	Red
50	14 AWG	Blue
51	14 AWG	Green
52	18 AWG	Orange**

** Only Used With Overflow Switch.



NOTES:

1. This is a point to point electrical diagram.
2. Caution: Disconnect power before servicing.
3. See nameplate for correct voltage, use 75°C min. copper conductors only.
4. Blower motor(s) thermally protected.
5. All contractor wiring must conform to electrical codes, national and local.
6. Wires 9, 13 and 14 will terminate inside contactor lug.
7. Wires 4, 5 and 6 to be installed as shown in Detail A when using P/N E035-50011401 disconnect switch. All other disconnects switches to be wired as shown in main diagram.

JOB NAME	
JOB NUMBER	
DATE	02/10/2012
DRAWING NUMBER	42B-204-9
REVISION	
SHEET	1 OF 1

Carrier®

Performance Summary For FC01

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

Unit Parameters

Tag Name:	**FC01**
Quantity:	**1**
Unit Model:	**42BHE30BG4L63010FE**
Unit Type:	**42BH Horizontal Belt Drive**
Unit Size:	**3000 CFM**
System Type:	**2-Pipe Cooling w/ Total Electric Heat**
Cooling Coil:	**Cold Fluid Cooling**
Cooling Coil Rows:	**4 Rows**
Heating Coil:	**Electric Heat**
Coil Hand:	**Left Hand**
Shipping Options:	**Standard**

Unit Performance

Actual Airflow:	**1,410.2**	L/s
Altitude:	**2,590**	m
External Static Pressure:	**.13**	kPa
Total Static Pressure:	**.25**	kPa
Voltage:	**460-3-60**	V-Ph-Hz

Cooling Data

Coil Type:	**Cold Fluid Cooling**	
Coil Rows:	**4 Rows**	
Fluid Type:	**Propylene Glycol**	
Brine Concentration:	**40**	
Total Capacity:	**10,097**	W
Sensible Capacity:	**10,097**	W
Entering Air Dry Bulb Temperature:	**24.0**	C
Entering Air Wet Bulb Temperature:	**12.3**	C
Leaving Air Dry Bulb Temperature:	**15.9**	C
Leaving Air Wet Bulb Temperature:	**8.8**	C
Fluid Flow Rate:	**.4**	L/s
Fluid Pressure Drop:	**2.39**	kPa
Fluid Entering Temperature:	**7.2**	C
Fluid Leaving Temperature:	**12.8**	C

Electric Heating Data

Coil Type:	**Electric Heat**	
Voltage:	**480-3-60, 2-Stage**	V-Ph-Hz
Sensible Capacity:	**9,900**	W
Entering Air Temperature:	**19.2**	C
Leaving Air Temperature:	**25.0**	C
kW:	**9.9 kW**	

Electrical Data

Motor Voltage:	**460-3-60**	V-Ph-Hz
Motor FLA (per motor):	**1.1**	
Unit MCA:	**16.26**	
MFS:	**17.5**	

Fan and Drive Data

Fan RPM:	**929**	
BHP:	**.86**	kW
Motor Nominal HP:	**1 1/2**	
Number of Turns:	**2.5**	
Drive Package Code:	**FQ7**	

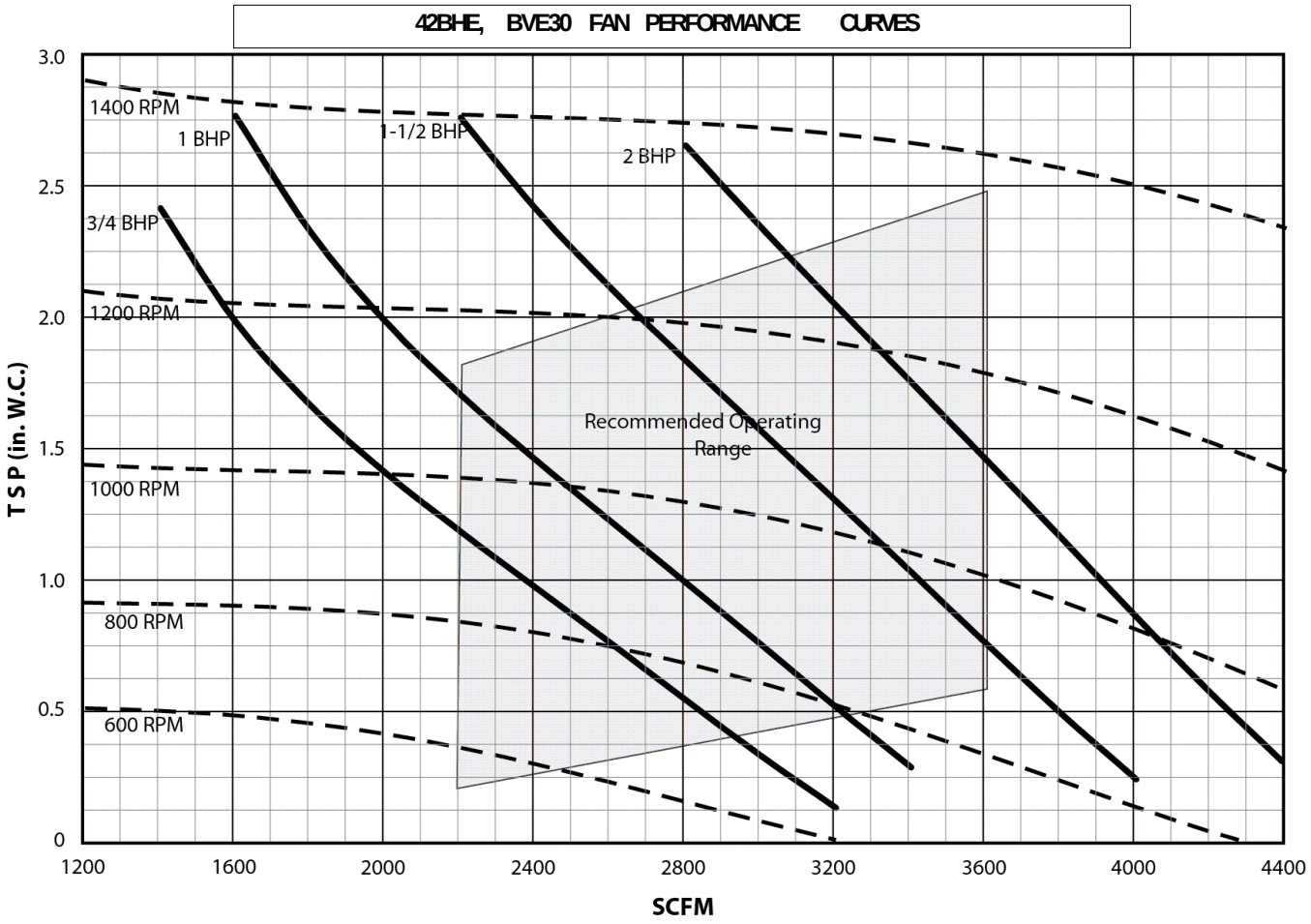
Factory-Installed Options

Unit Arrangement:	**Rear Return / Front Supply**
Filters:	**2 in. MERV 8 Pleated Filter**
Motor HP:	**1 1/2 HP**
AAV / Drains:	**Manual Air Vents only**
Coil Hand:	**Left Hand**
Thermostats:	**Field Supplied/Installed Thermostat**
Unit Controls:	**Disconnect Switch (up to 40 Amps)**
Insulation:	**Std. 1 in. Tufskin**
Packaging:	**Units shipped on treated wood pallet**

Performance Summary For FC01

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



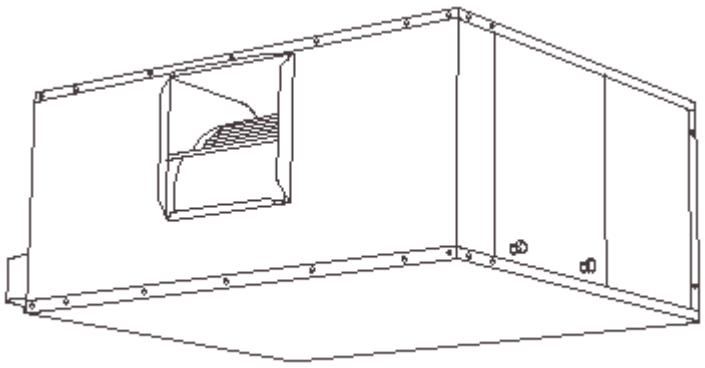
FC02

Tag Cover Sheet
Unit Report
Certified Drawing
Performance Report

Unit Report For FC02

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



Unit Parameters

Tag Name:	**FC02**
Quantity:	**1**
Unit Model:	**42BHE08RG4L60709CE**
Unit Type:	**42BH Horizontal Belt Drive**
Unit Size:	**800 CFM**
Shipping Options:	**Standard**

Dimensions

Unit Length:	**914.40**	mm
Unit Width:	**711.20**	mm
Unit Height:	**501.65**	mm
Operating Weight:	**108**	kg

Coil Parameters

System Type:	**2-Pipe Cooling Only**
Cooling Coil:	**Cold Fluid Cooling**
Cooling Coil Rows:	**8 Rows**
Coil Hand:	**Left Hand**

Electrical

Motor Voltage:	**460-3-60**	V-Ph-Hz

Fan and Drive Data

RPM:	**1,040**	
BHP:	**.36**	kW
Turns:	**1.5**	
Drive Code:	**CD4**	

Warranty Information

First Year - Parts Only (Standard)

Ordering Information

Part Number	Description	Quantity
Base Unit		
	42BHE08RG4L60709CE	1
	42BHE08:Horizontal Belt-Drive Fan Coil 800 CFM Cooling 460-3-60	
	1/2 HP Motor	
	Motor Control with interlocking disc	
	High Capacity 8-Row in lieu of standard 4-Row - For 2-pipe system	
	Field Supplied/Installed Thermostat	

Certified Drawing for FC02

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

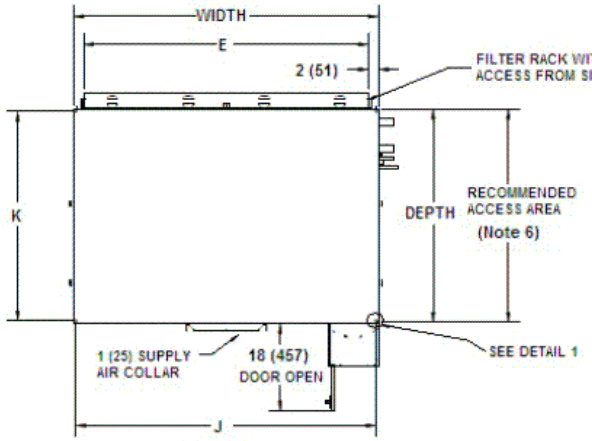
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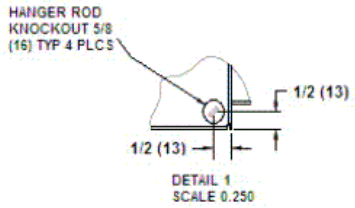
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HORIZONTAL BELT DRIVE UNIT (MOTOR CONTROLS)

42BHE

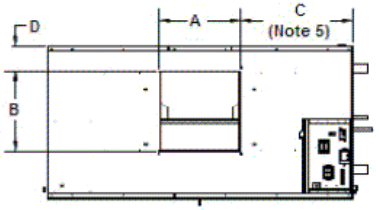


TOP VIEW

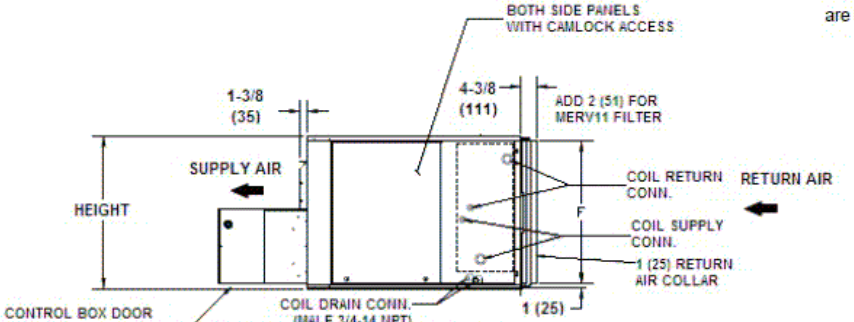


DETAIL 1
SCALE 0.250

NOTE:
1. R.H. shown, L.H. opposite.
2. All dimensions ±1/4".
3. Coil connections shown are for 4-pipe system. Heating coil is in re-heat position as standard.
4. For 4-pipe, DX/Hot water combination, hot water coil is always in pre-heat position as standard.
5. "C" dimension is measured from coil side of the unit.
6. Allow adequate spacing or maneuverability of unit to allow service through recommended access area.
7. Dimensions in parenthesis are in mm.



FRONT VIEW



SIDE VIEW

Unit Size	Dimensions											
	Fan Size	Depth	Width	Height	Supply Duct				Return Duct		Mounting Holes	
					A	B	C	D	E	F	J	K
06	9 x 4	36	28	19-3/4	7-1/8	10-1/2	14-1/2	2-1/4	24	16-1/2	27-1/4	35-1/4
08	9 x 6	36	28	19-3/4	8-1/2	10-1/2	13-7/8	2-1/4	24	16-1/2	27-1/4	35-1/4
10	10 x 4	37-1/2	37	21-1/2	7-1/8	11-9/16	15-1/4	2-1/4	33	18-1/4	36-1/4	37
12	10 x 7	37-1/2	37	21-1/2	9-15/16	11-9/16	13-7/8	2-1/4	33	18-1/4	36-1/4	37
16	11 x 10	37-3/4	47	21-1/2	13-3/8	12-3/4	16-3/4	2-1/4	43	18-1/4	46-1/4	37
20	12 x 9	40-1/4	48	24	12-1/2	13-3/4	17-3/4	2-1/4	44	20-3/4	47-1/4	39-1/2
30	12 x 12	40-1/4	48	32-1/4	15-7/8	13-3/4	16	7-1/4	44	29	47-1/4	39-1/2
40	15 x 12	43-1/2	62	32-1/4	16-7/16	16-1/16	22-3/4	6-1/4	58	29	61-3/4	42-1/2

JOB NAME

JOB NUMBER

DATE
01/14/2011

Carrier

DRAWING NUMBER	REVISION	SHEET
42BH-202-2	G	1 OF 1

Certified Drawing for FC02

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

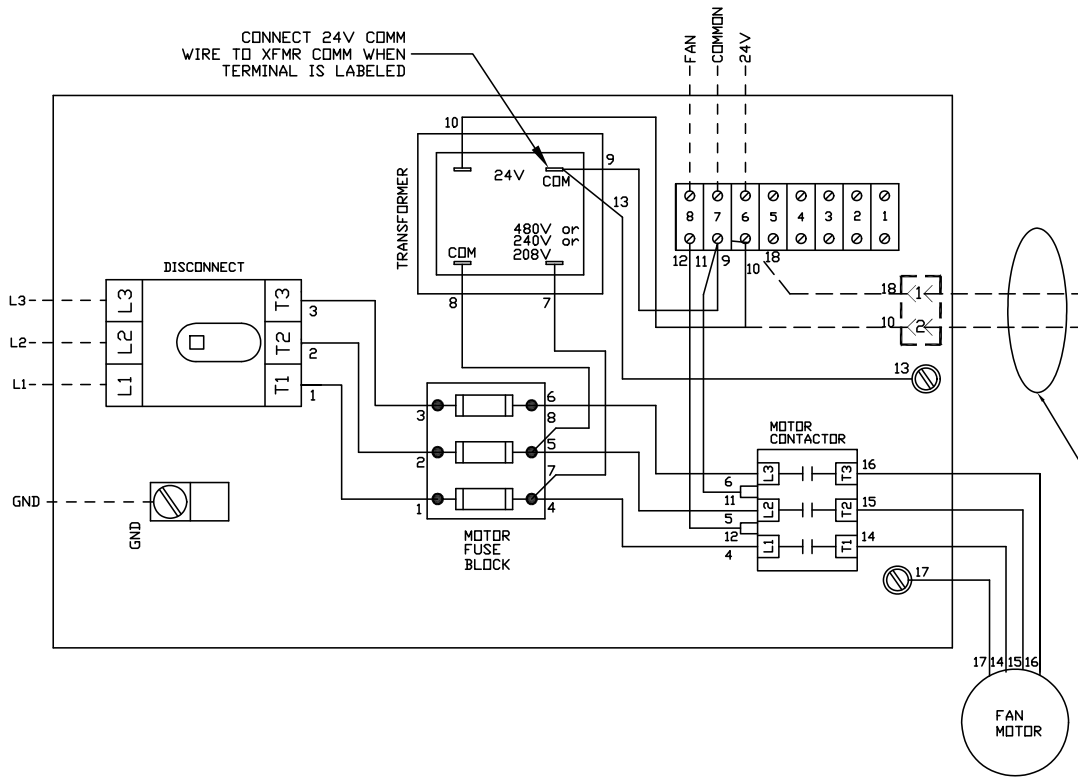
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MOTOR CONTROLS WITH INTERLOCKING DISCONNECT, 3-PHASE

42B



Wire	Gage	Color
1	1-12 AWG	Black
2	1-12 AWG	Red
3	1-12 AWG	Blue
4	1-12 AWG	Black
5	1-12 AWG	Red
6	1-12 AWG	Blue
7	1-18 AWG	Black
8	1-18 AWG	Red
9	1-18 AWG	Yellow
10	1-18 AWG	Orange
11	1-18 AWG	Yellow
12	1-18 AWG	Gray
13	1-18 AWG	Yellow
14	1-14 AWG	Black
15	1-14 AWG	Red
16	1-14 AWG	Blue
17	1-14 AWG	Green
18	1-18 AWG	Orange**

** Only Used With Overflow Switch.

LEGEND
AWG - American Wire Gage
GND - Ground
NC - Normally Closed
NO - Normally Open
Q/C - Quick Connect
XFMR - Transformer

WIRE CONNECTION
WIRE TAPED
FACTORY WIRING
FIELD WIRING
OPTIONAL COMPONENTS/WIRING

NOTES:
1. This is a point to point electrical diagram.
2. Caution: Disconnect power before servicing.
3. See nameplate for correct voltage, use 75°C min, copper conductors only. Unit terminals are not designed to accept any other wiring.
4. Blower motor(s) thermally protected.
5. All contractor wiring must conform to electrical codes, national and local.

JOB NAME		
JOB NUMBER		Carrier®
DATE: 02/10/2012		
DRAWING NUMBER: 42B-204-6	REVISION	SHEET: 1 OF 1

Performance Summary For FC02

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

Unit Parameters

Tag Name:	**FC02**
Quantity:	**1**
Unit Model:	**42BHE08RG4L60709CE**
Unit Type:	**42BH Horizontal Belt Drive**
Unit Size:	**800 CFM**
System Type:	**2-Pipe Cooling Only**
Cooling Coil:	**Cold Fluid Cooling**
Cooling Coil Rows:	**8 Rows**
Coil Hand:	**Left Hand**
Shipping Options:	**Standard**

Unit Performance

Actual Airflow:	**335.1**	L/s
Altitude:	**2,591**	m
External Static Pressure:	**.13**	kPa
Total Static Pressure:	**.22**	kPa
Voltage:	**460-3-60**	V-Ph-Hz

Cooling Data

Coil Type:	**Cold Fluid Cooling**	
Coil Rows:	**8 Rows**	
Fluid Type:	**Propylene Glycol**	
Brine Concentration:	**40**	
Total Capacity:	**3,830**	W
Sensible Capacity:	**3,830**	W
Entering Air Dry Bulb Temperature:	**24.3**	C
Entering Air Wet Bulb Temperature:	**12.1**	C
Leaving Air Dry Bulb Temperature:	**11.4**	C
Leaving Air Wet Bulb Temperature:	**6.2**	C
Fluid Flow Rate:	**.2**	L/s
Fluid Pressure Drop:	**4.71**	kPa
Fluid Entering Temperature:	**7.2**	C
Fluid Leaving Temperature:	**12.8**	C

Electrical Data

Motor Voltage:	**460-3-60**	V-Ph-Hz
Motor FLA (per motor):	**1.1**	

Fan and Drive Data

Fan RPM:	**1,040**
Motor Nominal HP:	**1/2**
Number of Turns:	**1.5**
Drive Package Code:	**CD4**

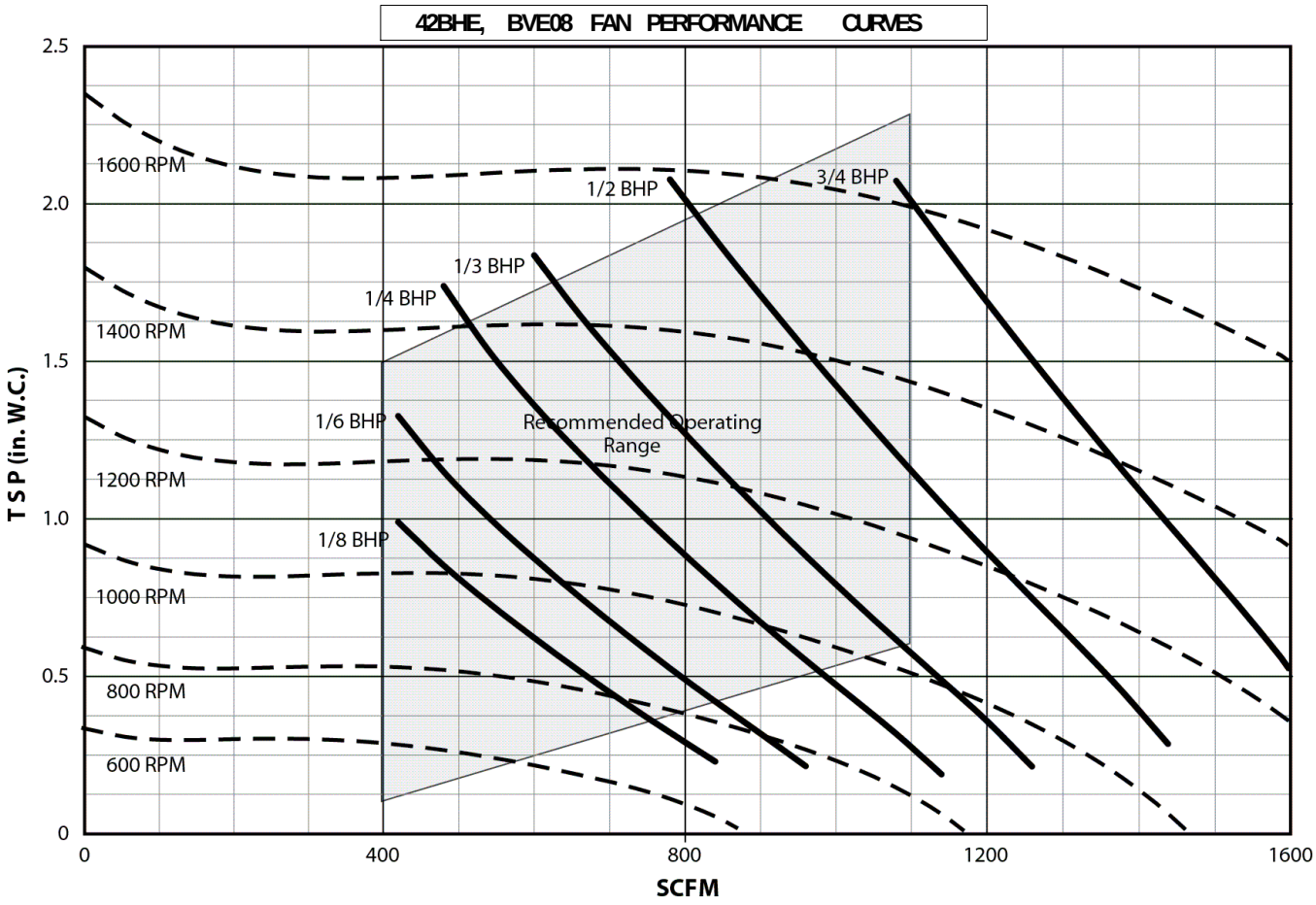
Factory-Installed Options

Unit Arrangement:	**Rear Return / Front Supply**
Filters:	**2 in. MERV 8 Pleated Filter**
Motor HP:	**1/2 HP**
AAV / Drains:	**Manual Air Vents only**
Coil Hand:	**Left Hand**
Thermostats:	**Field Supplied/Installed Thermostat**
Unit Controls:	**Motor Control with interlocking disc**
Insulation:	**Std. 1 in. Tufskin**
Packaging:	**Units shipped on treated wood pallet**

Performance Summary For FC02

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



FC03

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

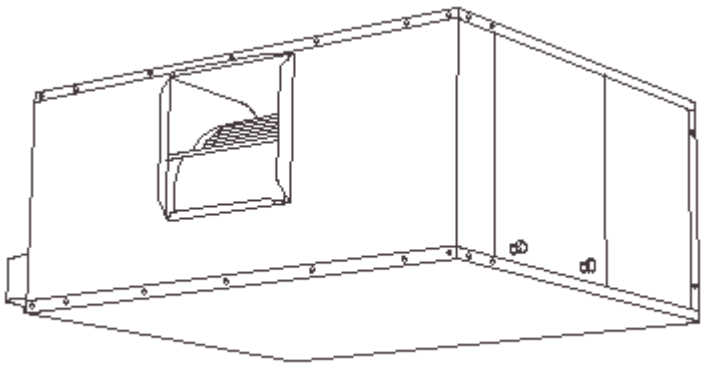
FC03

Tag Cover Sheet
Unit Report
Certified Drawing
Performance Report
Guide Specification

Unit Report For FC03

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



Unit Parameters

Tag Name:	**FC03**
Quantity:	**1**
Unit Model:	**42BHE12RG4L61211CE**
Unit Type:	**42BH Horizontal Belt Drive**
Unit Size:	**1200 CFM**
Shipping Options:	**Standard**

Dimensions

Unit Length:	**952.50**	mm
Unit Width:	**939.80**	mm
Unit Height:	**546.10**	mm
Operating Weight:	**131**	kg

Coil Parameters

System Type:	**2-Pipe Cooling w/ Total Electric Heat**
Cooling Coil:	**Cold Fluid Cooling**
Cooling Coil Rows:	**8 Rows**
Coil Hand:	**Left Hand**

Electrical

Motor Voltage:	**460-3-60**	V-Ph-Hz
Heater Voltage:	**480-3-60, 1-Stage**	V-Ph-Hz
Heater kW:	**3.5 kW**	

Fan and Drive Data

RPM:	**1,012**	
BHP:	**.36**	kW
Turns:	**1.5**	
Drive Code:	**CD6**	

Warranty Information

First Year - Parts Only (Standard)

Ordering Information

Part Number	Description	Quantity
Base Unit		
	42BHE12RG4L61211CE	1
	42BHE12:Horizontal Belt-Drive Fan Coil 1200 CFM Cooling 460-3-60	
	1/2 HP Motor	
	Disconnect Switch (up to 40 Amps)	
	High Capacity 8-Row in lieu of standard 4-Row - For 2-pipe system	
	3.5 kW	
	Field Supplied/Installed Thermostat	

Certified Drawing for FC03

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

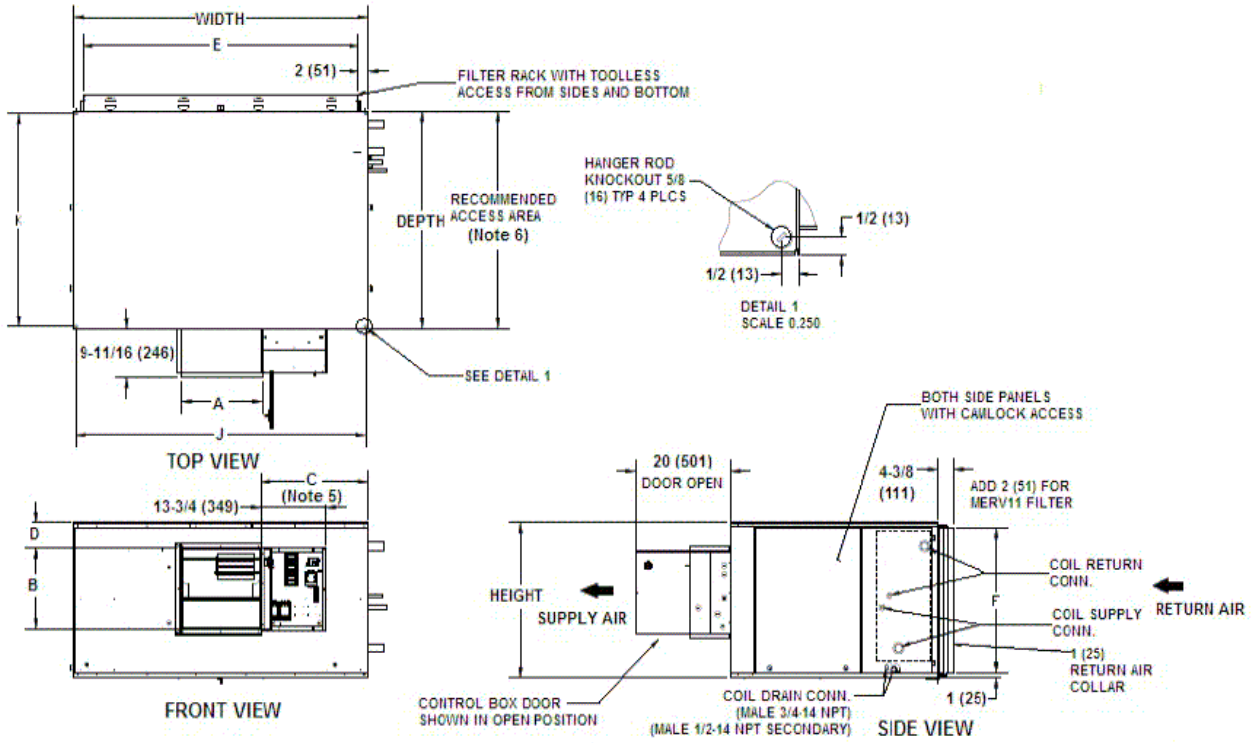
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HORIZONTAL BELT DRIVE UNIT (ELECTRIC HEAT)

42BHE



NOTE:
1. R.H. shown, L.H. opposite.
2. All dimensions ±1/4".
3. Coil connections shown are for 4-pipe system. Heating coil is in re-heat position as standard.
4. For 4-pipe, DX/Hot water combination, hot water coil is always in pre-heat position as standard.
5. "C" dimension is measured from coil side of the unit.
6. Allow adequate spacing or maneuverability of unit to allow service through recommended access area.
7. Dimensions in parenthesis are in mm.

Unit Size	Dimensions											
	Fan Size	Depth	Width	Height	Supply Duct				Return Duct		Mounting Holes	
					A	B	C	D	E	F	J	K
06	9 x 4	36	28	19-3/4	8-7/8	10-1/2	14-1/2	2-1/4	24	16-1/2	27-1/4	35-1/4
08	9 x 6	36	28	19-3/4	8-7/8	10-1/2	13-7/8	2-1/4	24	16-1/2	27-1/4	35-1/4
10	10 x 4	37-1/2	37	21-1/2	10-3/8	11-9/16	15-1/4	2-1/4	33	18-1/4	36-1/4	37
12	10 x 7	37-1/2	37	21-1/2	10-3/8	11-9/16	13-7/8	2-1/4	33	18-1/4	36-1/4	37
16	11 x 10	37-3/4	47	21-1/2	13-7/8	12-3/4	16-3/4	2-1/4	43	18-1/4	46-1/4	37
20	12 x 9	40-1/4	48	24	13	13-3/4	17-3/4	2-1/4	44	20-3/4	47-1/4	39-1/2
30	12 x 12	40-1/4	48	32-1/4	16-1/4	13-3/4	16	7-1/4	44	29	47-1/4	39-1/2
40	15 x 12	43-1/2	62	32-1/4	16-3/4	16-1/16	22-3/4	6-1/4	58	29	61-3/4	42-1/2

JOB NAME

JOB NUMBER

DATE
01/14/2011

Carrier

DRAWING NUMBER
42BH-202-3

REVISION
G

SHEET
1 OF 1

Certified Drawing for FC03

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

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Climate | Controls | Security

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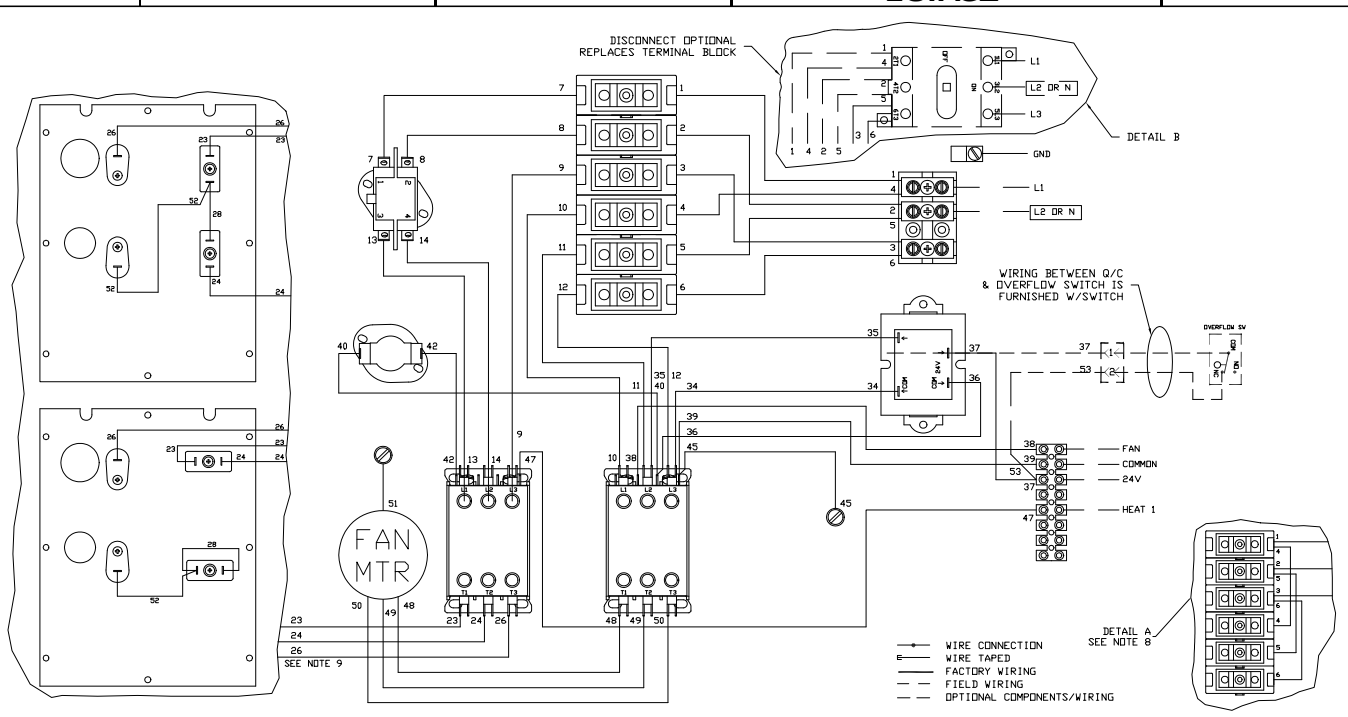
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ELECTRIC HEAT 3-PHASE 1-STAGE

42B

Wire	Gage	Color
1	8 AWG	Black
2	8 AWG	Red
3	8 AWG	Blue
4	12 AWG	Black
5	12 AWG	Red
6	12 AWG	Blue
7	8 AWG	Black
8	8 AWG	Red
9	8 AWG	Blue
10	12 AWG	Black
11	12 AWG	Red
12	12 AWG	Blue
13	8 AWG	Black
14	8 AWG	Red
23	12 AWG	Black
24	12 AWG	Red
26	12 AWG	Blue
28	12 AWG	Black
34	18 AWG	Blue
35	18 AWG	Red
36	18 AWG	Yellow
37	18 AWG	Orange
38	18 AWG	Gray
39	18 AWG	Yellow
40	18 AWG	Yellow
42	18 AWG	Yellow
45	18 AWG	Yellow
47	18 AWG	Brown
48	14 AWG	Black
49	14 AWG	Red
50	14 AWG	Blue
51	14 AWG	Green
52	12 AWG	Black
53	18 AWG	Orange**

** Only Used With Overflow Switch.



NOTES:

1. This is a point to point electrical diagram.
2. Caution: Disconnect power before servicing.
3. See nameplate for correct voltage, use 75°C min. copper conductors only.
4. Blower motor(s) thermally protected.
5. All contractor wiring must conform to electrical codes, national and local.
6. Wires 9, 13 and 14 will terminate inside contactor lug.
7. Wires 4, 5 and 6 to be installed as shown in Detail A when using P/N E035-50011401-1 if the disconnect is field provided then use main wiring diagram.
8. Use applicable heater configuration shown for proper connections.

JOB NAME	
JOB NUMBER	
DATE	02/10/2012
DRAWING NUMBER	42B-204-8
REVISION	
SHEET	1 OF 1

Carrier®

Performance Summary For FC03

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

Unit Parameters

Tag Name:	**FC03**
Quantity:	**1**
Unit Model:	**42BHE12RG4L61211CE**
Unit Type:	**42BH Horizontal Belt Drive**
Unit Size:	**1200 CFM**
System Type:	**2-Pipe Cooling w/ Total Electric Heat**
Cooling Coil:	**Cold Fluid Cooling**
Cooling Coil Rows:	**8 Rows**
Heating Coil:	**Electric Heat**
Coil Hand:	**Left Hand**
Shipping Options:	**Standard**

Cooling Data

Coil Type:	**Cold Fluid Cooling**	
Coil Rows:	**8 Rows**	
Fluid Type:	**Propylene Glycol**	
Brine Concentration:	**40**	
Total Capacity:	**6,564**	W
Sensible Capacity:	**6,564**	W
Entering Air Dry Bulb Temperature:	**24.5**	C
Entering Air Wet Bulb Temperature:	**13.9**	C
Leaving Air Dry Bulb Temperature:	**11.5**	C
Leaving Air Wet Bulb Temperature:	**8.3**	C
Fluid Flow Rate:	**.3**	L/s
Fluid Pressure Drop:	**18.08**	kPa
Fluid Entering Temperature:	**7.2**	C
Fluid Leaving Temperature:	**12.8**	C

Electric Heating Data

Coil Type:	**Electric Heat**	
Voltage:	**480-3-60, 1-Stage**	V-Ph-Hz
Sensible Capacity:	**3,500**	W
Entering Air Temperature:	**18.3**	C
Leaving Air Temperature:	**23.4**	C
kW:	**3.5 kW**	

Electrical Data

Motor Voltage:	**460-3-60**	V-Ph-Hz
Motor FLA (per motor):	**2.8**	
Unit MCA:	**8.76**	
MFS:	**12.0**	

Fan and Drive Data

Fan RPM:	**1,012**
Motor Nominal HP:	**1/2**
Number of Turns:	**1.5**
Drive Package Code:	**CD6**

Unit Performance

Actual Airflow:	**570.1**	L/s
Altitude:	**2,590**	m
External Static Pressure:	**.13**	kPa
Total Static Pressure:	**.27**	kPa
Voltage:	**460-3-60**	V-Ph-Hz

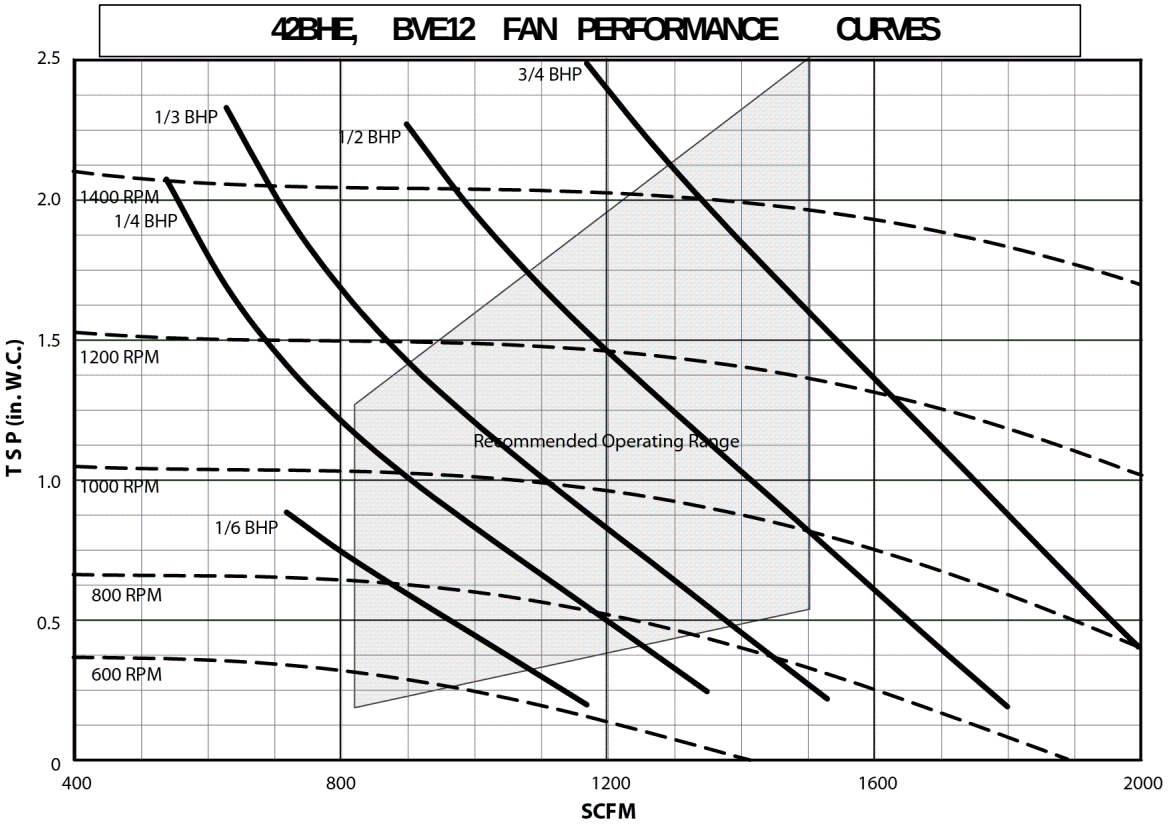
Factory-Installed Options

Unit Arrangement:	**Rear Return / Front Supply**
Filters:	**2 in. MERV 8 Pleated Filter**
Motor HP:	**1/2 HP**
AAV / Drains:	**Manual Air Vents only**
Coil Hand:	**Left Hand**
Thermostats:	**Field Supplied/Installed Thermostat**
Unit Controls:	**Disconnect Switch (up to 40 Amps)**
Insulation:	**Std. 1 in. Tufskin**
Packaging:	**Units shipped on treated wood pallet**

Performance Summary For FC03

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



Guide Specification for FC03

Project: SPMT Telescope 06/22/2014
Prepared By: Rebecca T. Callimanis 02:15PM

HVAC Guide Specifications
System Fan Coil Unit

Size Range:
600 to 4000 Nominal Cfm

Carrier Model Numbers:
42BHE (Horizontal Fan Coil Unit)
42BVE (Vertical Fan Coil Unit)

Part 1 — General

1.01 SYSTEM DESCRIPTION

Horizontal and vertical, 2-pipe or 4-pipe, belt-driven, galvanized casing model fan coil unit for ducted installation above the ceiling or within floor-mounted cabinet, with full access to internal components.

1.02 QUALITY ASSURANCE

A. Unit shall be constructed in accordance with ETL and ETL, Canada standards. Units comply with the minimum requirements of the US and Canadian national product safety standard, UL 1995/CSA C22.2 No. 236. Factory-installed motors and electric heaters shall be UL approved. Insulation and adhesive shall meet NFPA-90A requirements for flame spread and smoke generation.
B. Coils shall be tested in accordance with AHRI standard 410, latest edition. Each coil shall be factory tested for leakage at 300-psig air pressure with coil submerged in water.

1.03 DELIVERY, STORAGE AND HANDLING

Unit shall be handled and stored in accordance with the manufacturer's instructions.

Part 2 — Products

2.01 EQUIPMENT

A. General:
Factory-assembled, horizontal and vertical, draw-thru type fan coil unit for ducted installation above the ceiling or floor mounting. Unit shall be complete with water coils, fan(s), motor, belt drive, drain pan, and filter.
B. Casing:
Construction shall be heavy-gage galvanized steel, lined with one-in. thick fiberglass Tuf-Skin™ II thermal/acoustical insulation. Knockouts shall be provided for hanging the horizontal unit, that will accept 3/8-in. threaded rod at the top and bottom of all unit corners. Supply and return duct connections shall be 1 in. long. Removable side panels shall be provided for access to the fan/motor assembly. Access panels shall be easily removable with hex key tool on vertical unit, and without tools on horizontal unit. A double-sloped drain pan shall be constructed of stainless steel, extending under the full length and width of the coil(s) with a 3/4-in. male nominal pipe thread stainless steel drain connection and 1/2-in. male NPT stainless secondary drain connection (cap when not required). The outside surface of the drain pan shall be insulated with 1/8-in. closed cell insulation. Drain pan is removable from cabinet from same end as coil connections for ease of cleaning.
C. Fans:
Belt-driven, double-width fan wheels shall have forward- curved blades and be statically and dynamically balanced. Fan drive shall consist of variable-pitch motor pulley, fixed-diameter blower sheave with keyed shaft, and V-belt. Fan drive shall be designed for 120% of rated fan horsepower. Fans and scrolls shall be of galvanized steel. Bearings are ball bearings, permanently lubricated and sealed for life. Bearings are isolated from the blower housing by rubber mounts set into heavy gage metal support system. The blower housing shall be isolated from the cabinet and motor.
D. Coils:
Standard unit shall be equipped with a 4-row coil for installation in a 2-pipe system and additional rows of coil shall be provided as an option for installation in a 4-pipe system. Coils shall have 1/2-in. copper tubes, aluminum fins bonded to the tubes by mechanical expansion and have a working pressure of 250 psig at 200 F. Each coil shall have a manual air vent and sweat connections for copper tubes.
E. Operating Characteristics:
A single-circuit coil unit installed in a 2-pipe system shall be capable of providing heating or cooling as determined by the operating mode of the central water supply system. A double-circuit coil unit installed in a 4-

pipe system shall be capable of providing sequenced heating and cooling.

F. Motor(s):
   1. Fan motors shall be open, drip-proof, single-speed, 60 Hz, 1750 rpm single or 3 phase, suitable for continuous duty at 104 F (40 C). Single-phase motors are capacitor start, include automatic reset thermal overload protection and are available in 115, 208, 230, or 277 volts (60 Hz) or 220 volts (50 Hz). Three-phase motors are available in 208, 230, or 460 volts (60 Hz) or 380 volts (50 Hz).
   2. Motors are Class B, continuous duty rated. Motors are resilient mounted (1/4 to 2 HP), rigid base mounted (3 and 5 HP), NEMA frame motors. Motors are factory wired to unit junction or control box. Motor bearings are permanently lubricated. Motors are mounted on an adjustable base for belt tensioning and alignment. The motor and drive are installed on the same end as the coil connection for ease of service.

G. Special Features:
   1. Coils:
      a. Unit coil(s) shall be equipped with automatic air vent(s).
      b. Unit shall be equipped with a high-capacity 6-row or 8-row coil for installation in a 2-pipe system.
      c. For installation in a 4-pipe system, unit shall be equipped with either a 4-row cooling/1-row hot water heating split-circuit coil, or a 4/2, 6/1, or 6/2 split-circuit coil as required.
      d. Unit shall be equipped with either a 4-row DX (direct expansion) cooling coil or a 6-row DX cooling coil as required.
      e. Unit coil(s) shall be copper fin, copper tube with stainless steel end sheets and baffles.
   2. Filters:
      a. A two-in. pleated filter shall be installed in the unit (standard).
      b. One-in. pleated, two 1-in. throwaway or 2-in. pleated MERV 11 filters with 2-in. prefilter shall be installed as indicated on the equipment schedule.
   3. Insulation:
      a. Units shall be equipped with 1-in. thick Tuf-Skin™ II insulation (standard).
      b. Units are available with 1-in. closed cell, 1-in. anti-microbial fiberglass, or 1-in. foil-faced insulation.
   4. Controls:
      a. Unit shall be equipped with 24-v transformer, motor contactor and terminal strip for connection to field or factory provided controller.
      b. Unit shall be equipped with interlocking door-disconnect switch with lock-out tag-out compatibility, touch-type fusing, 24-v transformer, motor contactor and terminal strip for connection to field provided controller.
      c. Unit shall be equipped with interlocking door-disconnect switch with lock-out tag-out compatibility, separate motor and electric heater touch-type fusing, 24-v transformer, motor contactor and terminal strip for connection to field-provided or factory-provided controller.
      d. Fuses comply with NFPA 70E/IP20.
   5. Electric Heat:
      a. Electric heaters shall be constructed of high-grade resistance wire supported by ceramic insulators on plated steel brackets. The heat elements shall be suspended in front of the outlet, after the blower and coil. An auto and manual thermal limit switch shall protect the heat elements in the event of an air failure.
      b. Single-phase heaters shall be available in 115, 208, 230, or 277 volts (60 Hz) or 220 volts (50 Hz). Three-phase electric heat shall be available in 208, 230, or 460 volts (60 Hz) or 380 volts (50 Hz).
      c. Electric heaters can be controlled in single, 2, or 3 stages of operation.
   6. Mixing Boxes:
      a. Mixing boxes shall be preassembled at the factory and shipped separately with base rails.
      b. Mixing boxes shall include a linkage kit, which consists of two crankarms, 2 swivels and a rod, 25 in. long (for unit sizes 06-16) or 84 in. long (for unit sizes 20-40), for the field installation of the actuator.
   7. Cabinet:
      a. Optional double wall construction with choice of 1-in. fiberglass or 1-in. closed cell insulation with solid or perforated inner liners. An antimicrobial coating can also be added.
      b. Optional seismic structural upgrade to meet IBC-2009 and OSHPD seismic certification in accordance with ICC-ES-AS-156.

FC04

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

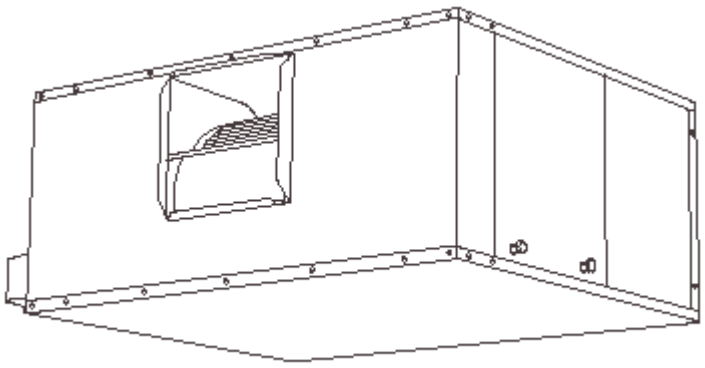
FC04

Tag Cover Sheet
Unit Report
Certified Drawing
Performance Report

Unit Report For FC04

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



Unit Parameters

Tag Name: **FC04**
Quantity: **1**
Unit Model: **42BHE16BG4L61609CE**
Unit Type: **42BH Horizontal Belt Drive**
Unit Size: **1600 CFM**
Shipping Options: **Standard**

Dimensions

Unit Length: **958.85** mm
Unit Width: **1193.80** mm
Unit Height: **546.10** mm
Operating Weight: **140** kg

Coil Parameters

System Type: **2-Pipe Cooling w/ Total Electric Heat**
Cooling Coil: **Cold Fluid Cooling**
Cooling Coil Rows: **4 Rows**
Coil Hand: **Left Hand**

Electrical

Motor Voltage: **460-3-60** V-Ph-Hz
Heater Voltage: **480-3-60, 2-Stage** V-Ph-Hz
Heater kW: **7.0 kW**

Fan and Drive Data

RPM: **902**
BHP: **.36** kW
Turns: **3.5**
Drive Code: **CW6**

Warranty Information

First Year - Parts Only (Standard)

Ordering Information

Part Number	Description	Quantity
Base Unit		
	42BHE16BG4L61609CE	1
	42BHE16:Horizontal Belt-Drive Fan Coil 1600 CFM Cooling 460-3-60	
	1/2 HP Motor	
	Disconnect Switch (up to 40 Amps)	
	7.0 kW	
	2-Stage	
	Field Supplied/Installed Thermostat	

Certified Drawing for FC04

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
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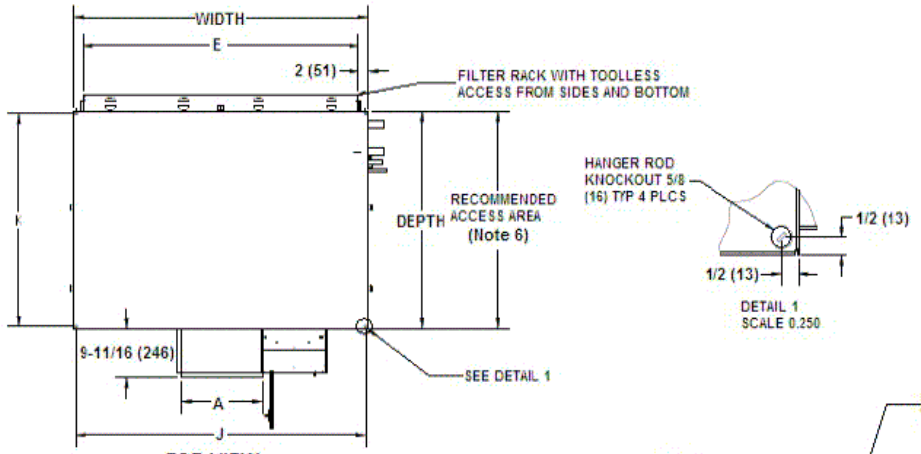
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HORIZONTAL BELT DRIVE UNIT (ELECTRIC HEAT)

42BHE



NOTE:
1. R.H. shown, L.H. opposite.
2. All dimensions ±1/4".
3. Coil connections shown are for 4-pipe system. Heating coil is in re-heat position as standard.
4. For 4-pipe, DX/Hot water combination, hot water coil is always in pre-heat position as standard.
5. "C" dimension is measured from coil side of the unit.
6. Allow adequate spacing or maneuverability of unit to allow service through recommended access area.
7. Dimensions in parenthesis are in mm.

Unit Size	Dimensions											
	Fan Size	Depth	Width	Height	Supply Duct				Return Duct		Mounting Holes	
					A	B	C	D	E	F	J	K
06	9 x 4	36	28	19-3/4	8-7/8	10-1/2	14-1/2	2-1/4	24	16-1/2	27-1/4	35-1/4
08	9 x 6	36	28	19-3/4	8-7/8	10-1/2	13-7/8	2-1/4	24	16-1/2	27-1/4	35-1/4
10	10 x 4	37-1/2	37	21-1/2	10-3/8	11-9/16	15-1/4	2-1/4	33	18-1/4	36-1/4	37
12	10 x 7	37-1/2	37	21-1/2	10-3/8	11-9/16	13-7/8	2-1/4	33	18-1/4	36-1/4	37
16	11 x 10	37-3/4	47	21-1/2	13-7/8	12-3/4	16-3/4	2-1/4	43	18-1/4	46-1/4	37
20	12 x 9	40-1/4	48	24	13	13-3/4	17-3/4	2-1/4	44	20-3/4	47-1/4	39-1/2
30	12 x 12	40-1/4	48	32-1/4	16-1/4	13-3/4	16	7-1/4	44	29	47-1/4	39-1/2
40	15 x 12	43-1/2	62	32-1/4	16-3/4	16-1/16	22-3/4	6-1/4	58	29	61-3/4	42-1/2

JOB NAME

JOB NUMBER

DATE
01/14/2011

Carrier

DRAWING NUMBER
42BH-202-3

REVISION
G

SHEET
1 OF 1

Certified Drawing for FC04

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

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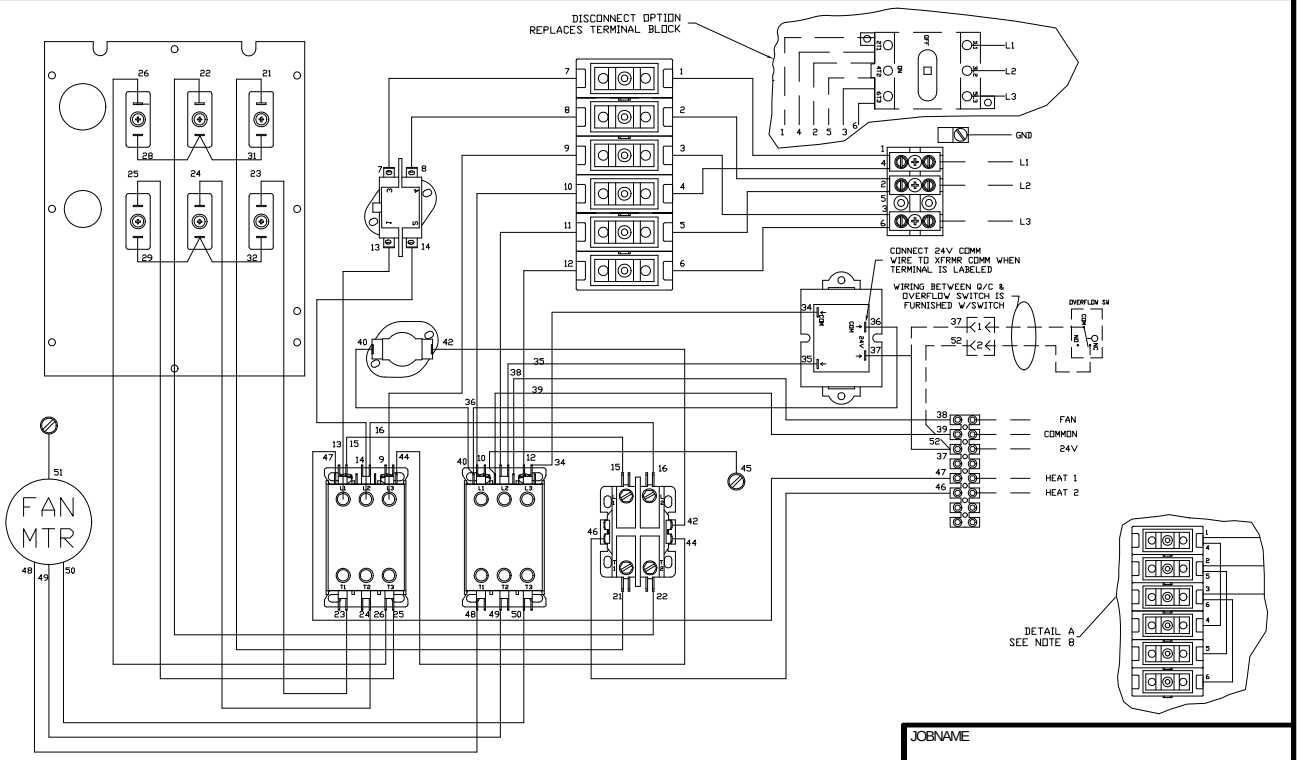
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ELECTRIC HEAT 3-PHASE 2-STAGE

42B

Wire	Gage	Color
1	8 AWG	Black
2	8 AWG	Red
3	8 AWG	Blue
4	12 AWG	Black
5	12 AWG	Red
6	12 AWG	Blue
7	8 AWG	Black
8	8 AWG	Red
9	8 AWG	Blue
10	12 AWG	Black
11	12 AWG	Red
12	12 AWG	Blue
13	8 AWG	Black
14	8 AWG	Red
15	10 AWG	Black
16	10 AWG	Red
21	12 AWG	Black
22	12 AWG	Red
23	12 AWG	Black
24	12 AWG	Red
25, 26	12 AWG	Blue
28, 29	12 AWG	Black
31, 32	12 AWG	Black
34	18 AWG	Blue
35	18 AWG	Red
36	18 AWG	Yellow
37	18 AWG	Orange
38	18 AWG	Gray
39, 40	18 AWG	Yellow
41, 42	18 AWG	Yellow
44, 45	18 AWG	Yellow
46	18 AWG	Purple
47	18 AWG	Brown
48	14 AWG	Black
49	14 AWG	Red
50	14 AWG	Blue
51	14 AWG	Green
52	18 AWG	Orange**

** Only Used With Overflow Switch.



NOTES:

1. This is a point to point electrical diagram.
2. Caution: Disconnect power before servicing.
3. See nameplate for correct voltage, use 75°C min. copper conductors only.
4. Blower motor(s) thermally protected.
5. All contractor wiring must conform to electrical codes, national and local.
6. Wires 9, 13 and 14 will terminate inside contactor lug.
7. Wires 4, 5 and 6 to be installed as shown in Detail A when using P/N E035-50011401 disconnect switch. All other disconnect switches to be wired as shown in main diagram.

JOB NAME	
JOB NUMBER	
DATE	02/10/2012
DRAWING NUMBER	42B-204-9
REVISION	
SHEET	1 OF 1

Carrier®

Performance Summary For FC04

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

Unit Parameters

Tag Name:	**FC04**
Quantity:	**1**
Unit Model:	**42BHE16BG4L61609CE**
Unit Type:	**42BH Horizontal Belt Drive**
Unit Size:	**1600 CFM**
System Type:	**2-Pipe Cooling w/ Total Electric Heat**
Cooling Coil:	**Cold Fluid Cooling**
Cooling Coil Rows:	**4 Rows**
Heating Coil:	**Electric Heat**
Coil Hand:	**Left Hand**
Shipping Options:	**Standard**

Unit Performance

Actual Airflow:	**774.9**	L/s
Altitude:	**2,590**	m
External Static Pressure:	**.13**	kPa
Total Static Pressure:	**.23**	kPa
Voltage:	**460-3-60**	V-Ph-Hz

Cooling Data

Coil Type:	**Cold Fluid Cooling**	
Coil Rows:	**4 Rows**	
Fluid Type:	**Propylene Glycol**	
Brine Concentration:	**40**	
Total Capacity:	**5,548**	W
Sensible Capacity:	**5,548**	W
Entering Air Dry Bulb Temperature:	**24.2**	C
Entering Air Wet Bulb Temperature:	**13.1**	C
Leaving Air Dry Bulb Temperature:	**16.1**	C
Leaving Air Wet Bulb Temperature:	**9.7**	C
Fluid Flow Rate:	**.2**	L/s
Fluid Pressure Drop:	**2.36**	kPa
Fluid Entering Temperature:	**7.2**	C
Fluid Leaving Temperature:	**12.8**	C

Electric Heating Data

Coil Type:	**Electric Heat**	
Voltage:	**480-3-60, 2-Stage**	V-Ph-Hz
Sensible Capacity:	**7,000**	W
Entering Air Temperature:	**17.3**	C
Leaving Air Temperature:	**24.8**	C
kW:	**7.0 kW**	

Electrical Data

Motor Voltage:	**460-3-60**	V-Ph-Hz
Motor FLA (per motor):	**1.1**	
Unit MCA:	**11.90**	
MFS:	**12.0**	

Fan and Drive Data

Fan RPM:	**902**
Motor Nominal HP:	**1/2**
Number of Turns:	**3.5**
Drive Package Code:	**CW6**

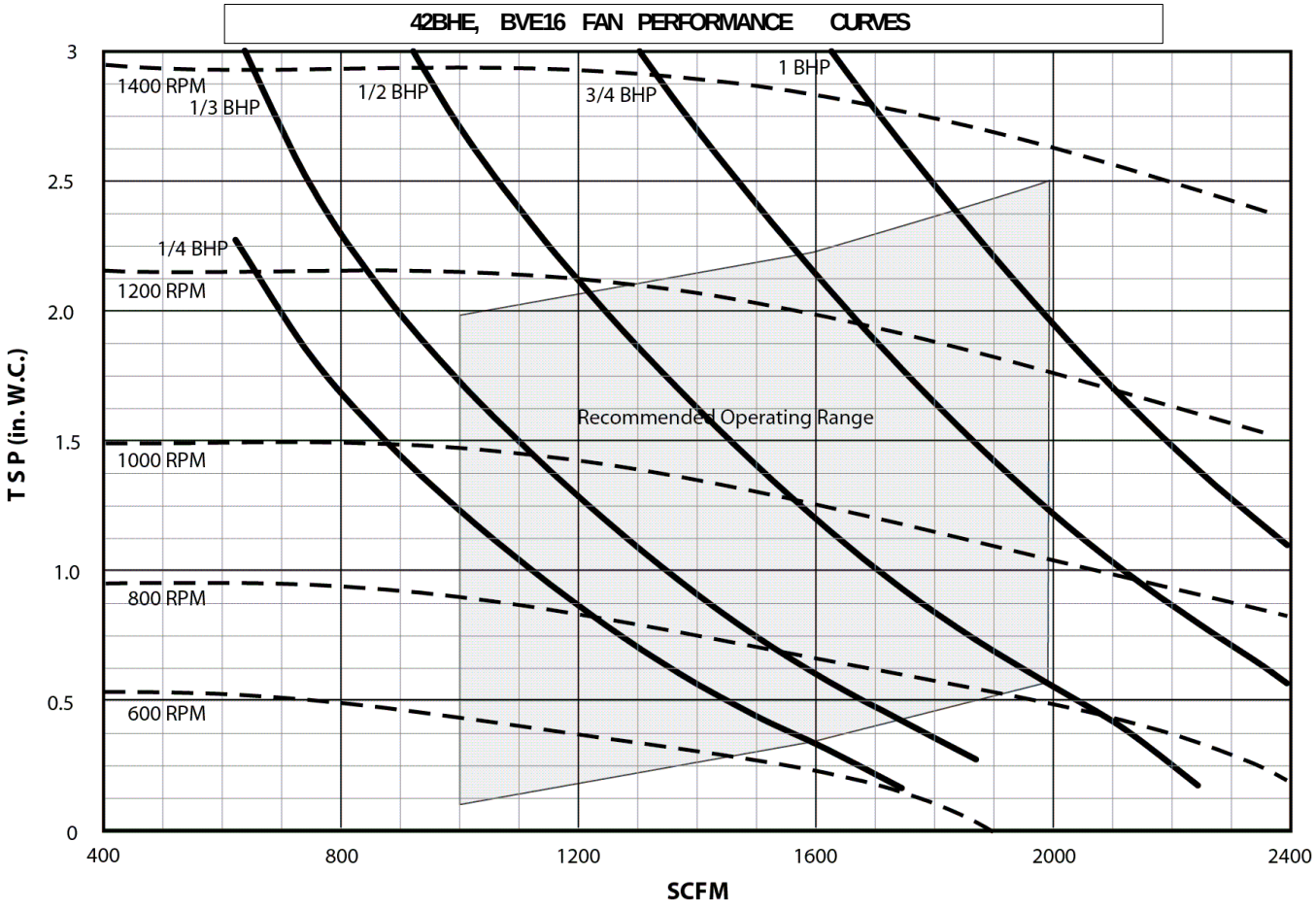
Factory-Installed Options

Unit Arrangement:	**Rear Return / Front Supply**
Filters:	**2 in. MERV 8 Pleated Filter**
Motor HP:	**1/2 HP**
AAV / Drains:	**Manual Air Vents only**
Coil Hand:	**Left Hand**
Thermostats:	**Field Supplied/Installed Thermostat**
Unit Controls:	**Disconnect Switch (up to 40 Amps)**
Insulation:	**Std. 1 in. Tufskin**
Packaging:	**Units shipped on treated wood pallet**

Performance Summary For FC04

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



FC05

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

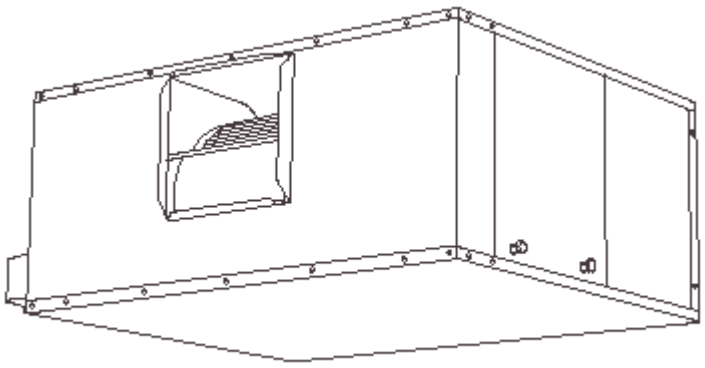
FC05

Tag Cover Sheet
Unit Report
Certified Drawing
Performance Report

Unit Report For FC05

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



Unit Parameters

Tag Name:	**FC05**
Quantity:	**1**
Unit Model:	**42BHE12RG4L61211CE**
Unit Type:	**42BH Horizontal Belt Drive**
Unit Size:	**1200 CFM**
Shipping Options:	**Standard**

Dimensions

Unit Length:	**952.50**	mm
Unit Width:	**939.80**	mm
Unit Height:	**546.10**	mm
Operating Weight:	**116**	kg

Coil Parameters

System Type:	**2-Pipe Cooling Only**
Cooling Coil:	**Cold Fluid Cooling**
Cooling Coil Rows:	**8 Rows**
Coil Hand:	**Left Hand**

Electrical

Motor Voltage:	**460-3-60**	V-Ph-Hz

Fan and Drive Data

RPM:	**1,002**	
BHP:	**.36**	kW
Turns:	**2.0**	
Drive Code:	**CD6**	

Warranty Information

First Year - Parts Only (Standard)

Ordering Information

Part Number	Description	Quantity
Base Unit		
	42BHE12RG4L61211CE	1
	42BHE12:Horizontal Belt-Drive Fan Coil 1200 CFM Cooling 460-3-60	
	1/2 HP Motor	
	Motor Control with interlocking disc	
	High Capacity 8-Row in lieu of standard 4-Row - For 2-pipe system	
	Field Supplied/Installed Thermostat	

Certified Drawing for FC05

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

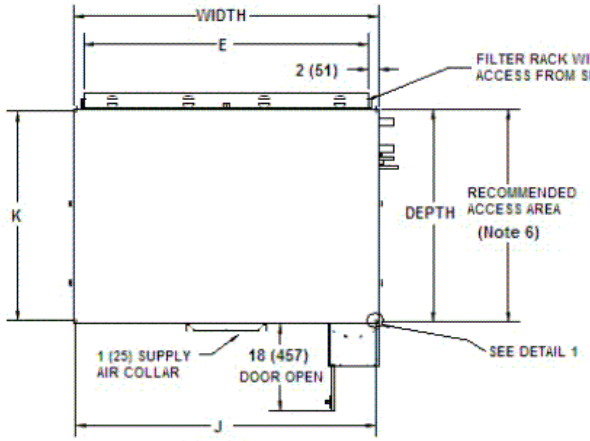
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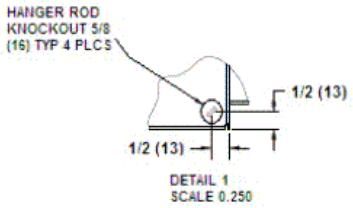
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HORIZONTAL BELT DRIVE UNIT (MOTOR CONTROLS)

42BHE

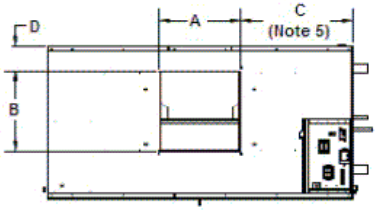


TOP VIEW

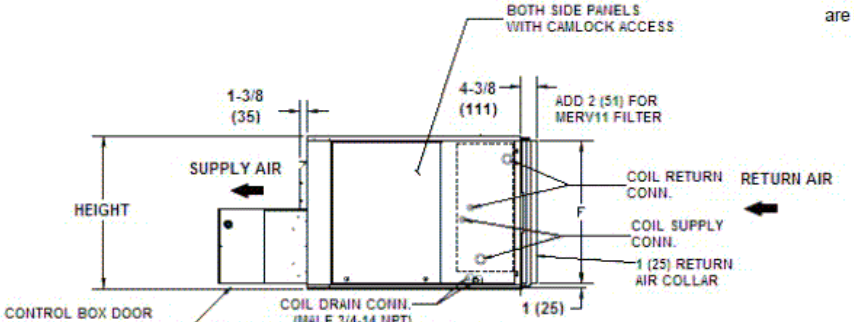


DETAIL 1
SCALE 0.250

NOTE:
1. R.H. shown, L.H. opposite.
2. All dimensions ±1/4".
3. Coil connections shown are for 4-pipe system. Heating coil is in re-heat position as standard.
4. For 4-pipe, DX/Hot water combination, hot water coil is always in pre-heat position as standard.
5. "C" dimension is measured from coil side of the unit.
6. Allow adequate spacing or maneuverability of unit to allow service through recommended access area.
7. Dimensions in parenthesis are in mm.



FRONT VIEW



SIDE VIEW

Unit Size	Dimensions											
	Fan Size	Depth	Width	Height	Supply Duct				Return Duct		Mounting Holes	
					A	B	C	D	E	F	J	K
06	9 x 4	36	28	19-3/4	7-1/8	10-1/2	14-1/2	2-1/4	24	16-1/2	27-1/4	35-1/4
08	9 x 6	36	28	19-3/4	8-1/2	10-1/2	13-7/8	2-1/4	24	16-1/2	27-1/4	35-1/4
10	10 x 4	37-1/2	37	21-1/2	7-1/8	11-9/16	15-1/4	2-1/4	33	18-1/4	36-1/4	37
12	10 x 7	37-1/2	37	21-1/2	9-15/16	11-9/16	13-7/8	2-1/4	33	18-1/4	36-1/4	37
16	11 x 10	37-3/4	47	21-1/2	13-3/8	12-3/4	16-3/4	2-1/4	43	18-1/4	46-1/4	37
20	12 x 9	40-1/4	48	24	12-1/2	13-3/4	17-3/4	2-1/4	44	20-3/4	47-1/4	39-1/2
30	12 x 12	40-1/4	48	32-1/4	15-7/8	13-3/4	16	7-1/4	44	29	47-1/4	39-1/2
40	15 x 12	43-1/2	62	32-1/4	16-7/16	16-1/16	22-3/4	6-1/4	58	29	61-3/4	42-1/2

JOB NAME

JOB NUMBER

DATE
01/14/2011

Carrier

DRAWING NUMBER	REVISION	SHEET
42BH-202-2	G	1 OF 1

Certified Drawing for FC05

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

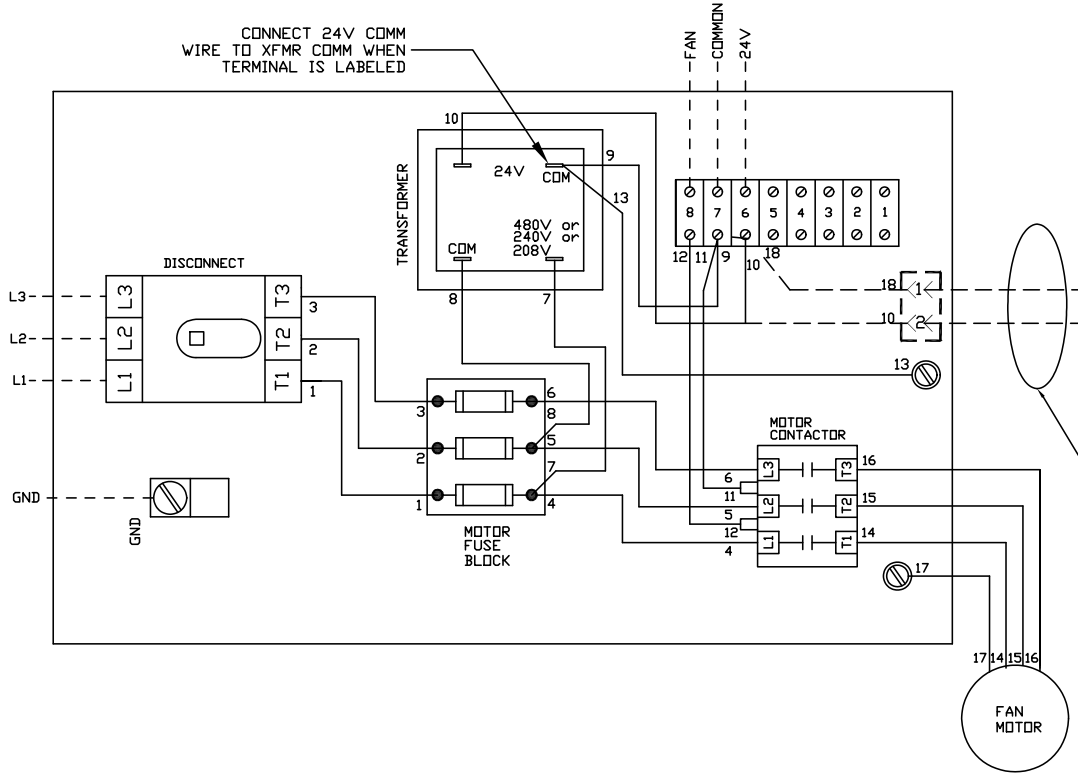
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MOTOR CONTROLS WITH INTERLOCKING DISCONNECT, 3-PHASE

42B



Wire	Gage	Color
1	1-12 AWG	Black
2	1-12 AWG	Red
3	1-12 AWG	Blue
4	1-12 AWG	Black
5	1-12 AWG	Red
6	1-12 AWG	Blue
7	1-18 AWG	Black
8	1-18 AWG	Red
9	1-18 AWG	Yellow
10	1-18 AWG	Orange
11	1-18 AWG	Yellow
12	1-18 AWG	Gray
13	1-18 AWG	Yellow
14	1-14 AWG	Black
15	1-14 AWG	Red
16	1-14 AWG	Blue
17	1-14 AWG	Green
18	1-18 AWG	Orange**

** Only Used With Overflow Switch.

LEGEND

AWG - American Wire Gage
GND - Ground
NC - Normally Closed
NO - Normally Open
Q/C - Quick Connect
XFMR - Transformer

WIRE CONNECTION
WIRE TAPED
FACTORY WIRING
FIELD WIRING
OPTIONAL COMPONENTS/WIRING

NOTES:

1. This is a point to point electrical diagram.
2. Caution: Disconnect power before servicing.
3. See nameplate for correct voltage, use 75°C min, copper conductors only. Unit terminals are not designed to accept any other wiring.
4. Blower motor(s) thermally protected.
5. All contractor wiring must conform to electrical codes, national and local.

JOB NAME		
JOB NUMBER		Carrier®
DATE: 02/10/2012		
DRAWING NUMBER: 42B-204-6	REVISION	SHEET: 1 OF 1

Performance Summary For FC05

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

Unit Parameters

Tag Name:	**FC05**
Quantity:	**1**
Unit Model:	**42BHE12RG4L61211CE**
Unit Type:	**42BH Horizontal Belt Drive**
Unit Size:	**1200 CFM**
System Type:	**2-Pipe Cooling Only**
Cooling Coil:	**Cold Fluid Cooling**
Cooling Coil Rows:	**8 Rows**
Coil Hand:	**Left Hand**
Shipping Options:	**Standard**

Unit Performance

Actual Airflow:	**560.2**	L/s
Altitude:	**2,590**	m
External Static Pressure:	**.13**	kPa
Total Static Pressure:	**.26**	kPa
Voltage:	**460-3-60**	V-Ph-Hz

Cooling Data

Coil Type:	**Cold Fluid Cooling**	
Coil Rows:	**8 Rows**	
Fluid Type:	**Propylene Glycol**	
Brine Concentration:	**40**	
Total Capacity:	**6,478**	W
Sensible Capacity:	**6,478**	W
Entering Air Dry Bulb Temperature:	**24.5**	C
Entering Air Wet Bulb Temperature:	**12.2**	C
Leaving Air Dry Bulb Temperature:	**11.4**	C
Leaving Air Wet Bulb Temperature:	**6.2**	C
Fluid Flow Rate:	**.3**	L/s
Fluid Pressure Drop:	**17.63**	kPa
Fluid Entering Temperature:	**7.2**	C
Fluid Leaving Temperature:	**12.8**	C

Electrical Data

Motor Voltage:	**460-3-60**	V-Ph-Hz
Motor FLA (per motor):	**1.1**	

Fan and Drive Data

Fan RPM:	**1,002**
Motor Nominal HP:	**1/2**
Number of Turns:	**2.0**
Drive Package Code:	**CD6**

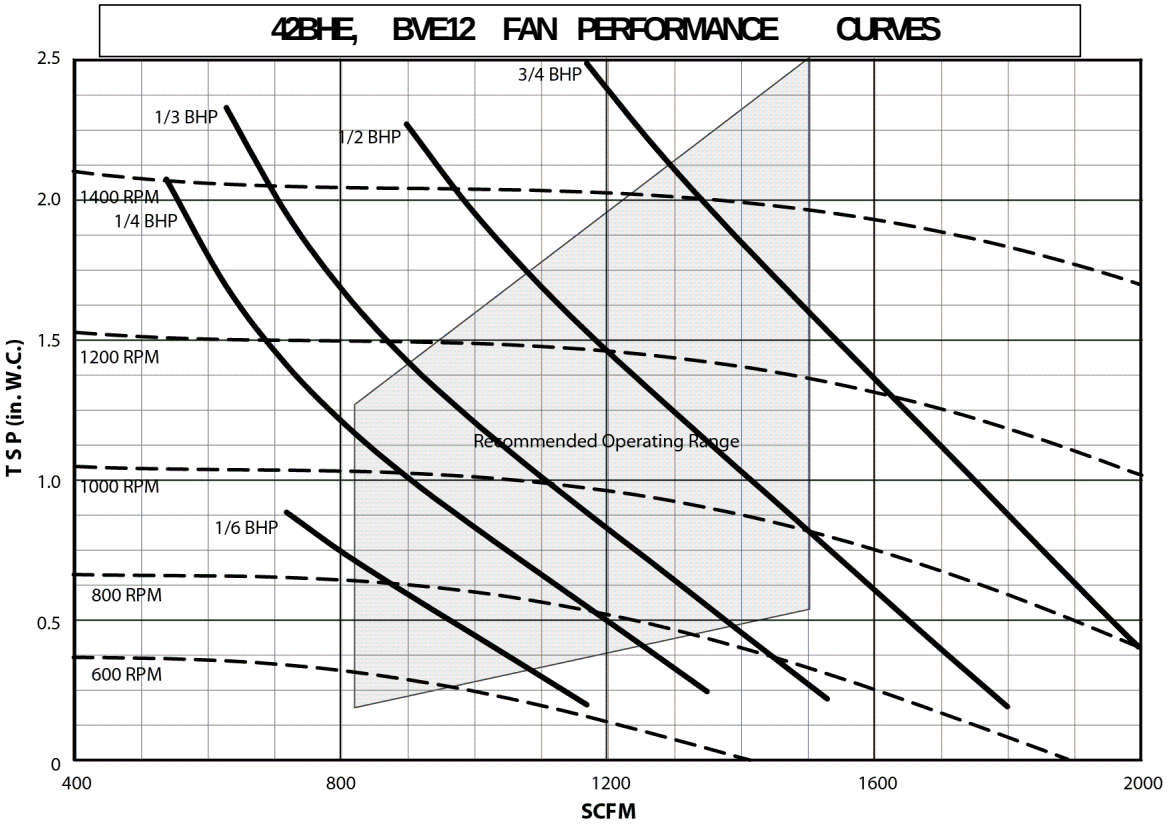
Factory-Installed Options

Unit Arrangement:	**Rear Return / Front Supply**
Filters:	**2 in. MERV 8 Pleated Filter**
Motor HP:	**1/2 HP**
AAV / Drains:	**Manual Air Vents only**
Coil Hand:	**Left Hand**
Thermostats:	**Field Supplied/Installed Thermostat**
Unit Controls:	**Motor Control with interlocking disc**
Insulation:	**Std. 1 in. Tufskin**
Packaging:	**Units shipped on treated wood pallet**

Performance Summary For FC05

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



FC07

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

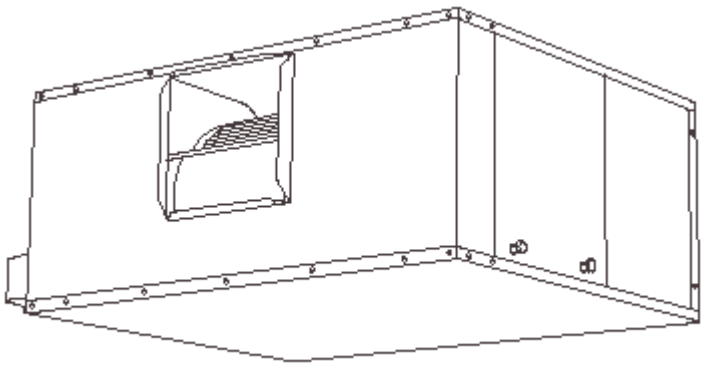
FC07

Tag Cover Sheet
Unit Report
Certified Drawing
Performance Report

Unit Report For FC07

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



Unit Parameters

Tag Name:	**FC07**
Quantity:	**1**
Unit Model:	**42BHE12RG4L61110CE**
Unit Type:	**42BH Horizontal Belt Drive**
Unit Size:	**1200 CFM**
Shipping Options:	**Standard**

Dimensions

Unit Length:	**952.50**	mm
Unit Width:	**939.80**	mm
Unit Height:	**546.10**	mm
Operating Weight:	**131**	kg

Coil Parameters

System Type:	**2-Pipe Cooling w/ Total Electric Heat**
Cooling Coil:	**Cold Fluid Cooling**
Cooling Coil Rows:	**8 Rows**
Coil Hand:	**Left Hand**

Electrical

Motor Voltage:	**460-3-60**	V-Ph-Hz
Heater Voltage:	**480-3-60, 1-Stage**	V-Ph-Hz
Heater kW:	**4.5 kW**	

Fan and Drive Data

RPM:	**983**	
BHP:	**.36**	kW
Turns:	**2.0**	
Drive Code:	**CD6**	

Warranty Information

First Year - Parts Only (Standard)

Ordering Information

Part Number	Description	Quantity
Base Unit		
	42BHE12RG4L61110CE	1
	42BHE12:Horizontal Belt-Drive Fan Coil 1200 CFM Cooling 460-3-60	
	1/2 HP Motor	
	Disconnect Switch (up to 40 Amps)	
	High Capacity 8-Row in lieu of standard 4-Row - For 2-pipe system	
	4.5 kW	
	Field Supplied/Installed Thermostat	

Certified Drawing for FC07

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

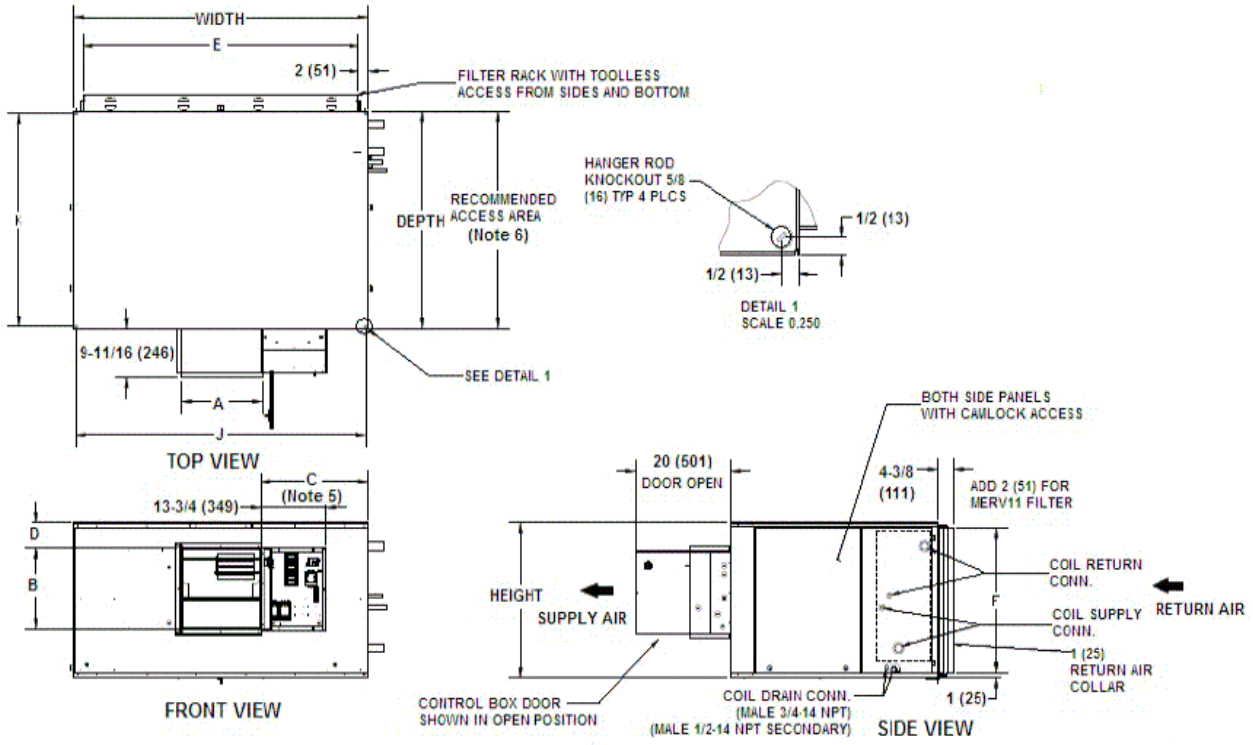
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HORIZONTAL BELT DRIVE UNIT (ELECTRIC HEAT)

42BHE



NOTE:
1. R.H. shown, L.H. opposite.
2. All dimensions ±1/4".
3. Coil connections shown are for 4-pipe system. Heating coil is in re-heat position as standard.
4. For 4-pipe, DX/Hot water combination, hot water coil is always in pre-heat position as standard.
5. "C" dimension is measured from coil side of the unit.
6. Allow adequate spacing or maneuverability of unit to allow service through recommended access area.
7. Dimensions in parenthesis are in mm.

Unit Size	Dimensions											
	Fan Size	Depth	Width	Height	Supply Duct				Return Duct		Mounting Holes	
					A	B	C	D	E	F	J	K
06	9 x 4	36	28	19-3/4	8-7/8	10-1/2	14-1/2	2-1/4	24	16-1/2	27-1/4	35-1/4
08	9 x 6	36	28	19-3/4	8-7/8	10-1/2	13-7/8	2-1/4	24	16-1/2	27-1/4	35-1/4
10	10 x 4	37-1/2	37	21-1/2	10-3/8	11-9/16	15-1/4	2-1/4	33	18-1/4	36-1/4	37
12	10 x 7	37-1/2	37	21-1/2	10-3/8	11-9/16	13-7/8	2-1/4	33	18-1/4	36-1/4	37
16	11 x 10	37-3/4	47	21-1/2	13-7/8	12-3/4	16-3/4	2-1/4	43	18-1/4	46-1/4	37
20	12 x 9	40-1/4	48	24	13	13-3/4	17-3/4	2-1/4	44	20-3/4	47-1/4	39-1/2
30	12 x 12	40-1/4	48	32-1/4	16-1/4	13-3/4	16	7-1/4	44	29	47-1/4	39-1/2
40	15 x 12	43-1/2	62	32-1/4	16-3/4	16-1/16	22-3/4	6-1/4	58	29	61-3/4	42-1/2

JOB NAME

JOB NUMBER

DATE 01/14/2011

Carrier

DRAWING NUMBER 42BH-202-3 | REVISION G | SHEET 1 OF 1

Certified Drawing for FC07

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

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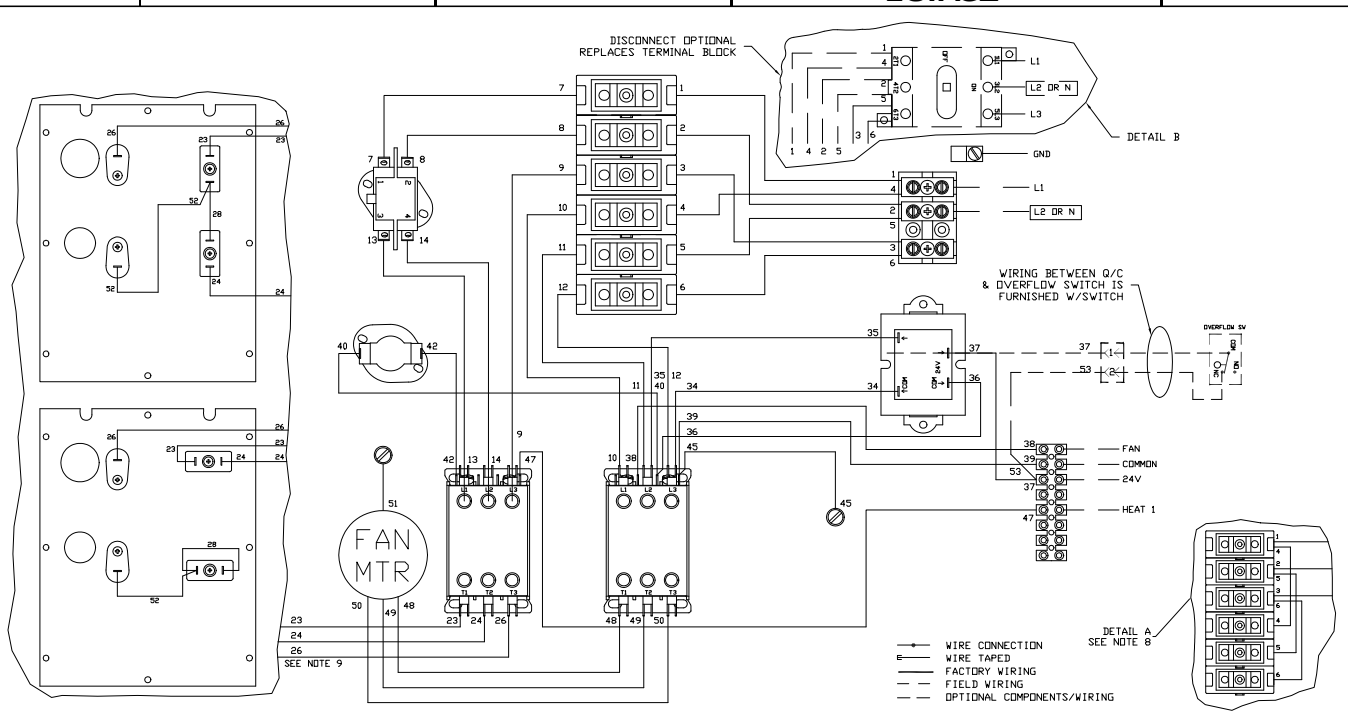
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ELECTRIC HEAT 3-PHASE 1-STAGE

42B

Wire	Gage	Color
1	8 AWG	Black
2	8 AWG	Red
3	8 AWG	Blue
4	12 AWG	Black
5	12 AWG	Red
6	12 AWG	Blue
7	8 AWG	Black
8	8 AWG	Red
9	8 AWG	Blue
10	12 AWG	Black
11	12 AWG	Red
12	12 AWG	Blue
13	8 AWG	Black
14	8 AWG	Red
23	12 AWG	Black
24	12 AWG	Red
26	12 AWG	Blue
28	12 AWG	Black
34	18 AWG	Blue
35	18 AWG	Red
36	18 AWG	Yellow
37	18 AWG	Orange
38	18 AWG	Gray
39	18 AWG	Yellow
40	18 AWG	Yellow
42	18 AWG	Yellow
45	18 AWG	Yellow
47	18 AWG	Brown
48	14 AWG	Black
49	14 AWG	Red
50	14 AWG	Blue
51	14 AWG	Green
52	12 AWG	Black
53	18 AWG	Orange**

** Only Used With Overflow Switch.



NOTES:

1. This is a point to point electrical diagram.
2. Caution: Disconnect power before servicing.
3. See nameplate for correct voltage, use 75°C min. copper conductors only.
4. Blower motor(s) thermally protected.
5. All contractor wiring must conform to electrical codes, national and local.
6. Wires 9, 13 and 14 will terminate inside contactor lug.
7. Wires 4, 5 and 6 to be installed as shown in Detail A when using P/N E035-50011401-1 if the disconnect is field provided then use main wiring diagram.
8. Use applicable heater configuration shown for proper connections.

JOB NAME	
JOB NUMBER	
DATE	02/10/2012
DRAWING NUMBER	42B-204-8
REVISION	
SHEET	1 OF 1

Carrier®

Performance Summary For FC07

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

Unit Parameters

Tag Name:	**FC07**
Quantity:	**1**
Unit Model:	**42BHE12RG4L61110CE**
Unit Type:	**42BH Horizontal Belt Drive**
Unit Size:	**1200 CFM**
System Type:	**2-Pipe Cooling w/ Total Electric Heat**
Cooling Coil:	**Cold Fluid Cooling**
Cooling Coil Rows:	**8 Rows**
Heating Coil:	**Electric Heat**
Coil Hand:	**Left Hand**
Shipping Options:	**Standard**

Unit Performance

Actual Airflow:	**539.9**	L/s
Altitude:	**2,590**	m
External Static Pressure:	**.13**	kPa
Total Static Pressure:	**.25**	kPa
Voltage:	**460-3-60**	V-Ph-Hz

Cooling Data

Coil Type:	**Cold Fluid Cooling**	
Coil Rows:	**8 Rows**	
Fluid Type:	**Propylene Glycol**	
Brine Concentration:	**40**	
Total Capacity:	**6,291**	W
Sensible Capacity:	**6,291**	W
Entering Air Dry Bulb Temperature:	**24.5**	C
Entering Air Wet Bulb Temperature:	**14.3**	C
Leaving Air Dry Bulb Temperature:	**11.3**	C
Leaving Air Wet Bulb Temperature:	**8.8**	C
Fluid Flow Rate:	**.3**	L/s
Fluid Pressure Drop:	**16.61**	kPa
Fluid Entering Temperature:	**7.2**	C
Fluid Leaving Temperature:	**12.8**	C

Electric Heating Data

Coil Type:	**Electric Heat**	
Voltage:	**480-3-60, 1-Stage**	V-Ph-Hz
Sensible Capacity:	**4,500**	W
Entering Air Temperature:	**15.6**	C
Leaving Air Temperature:	**22.5**	C
kW:	**4.5 kW**	

Electrical Data

Motor Voltage:	**460-3-60**	V-Ph-Hz
Motor FLA (per motor):	**1.1**	
Unit MCA:	**8.14**	
MFS:	**9.0**	

Fan and Drive Data

Fan RPM:	**983**
Motor Nominal HP:	**1/2**
Number of Turns:	**2.0**
Drive Package Code:	**CD6**

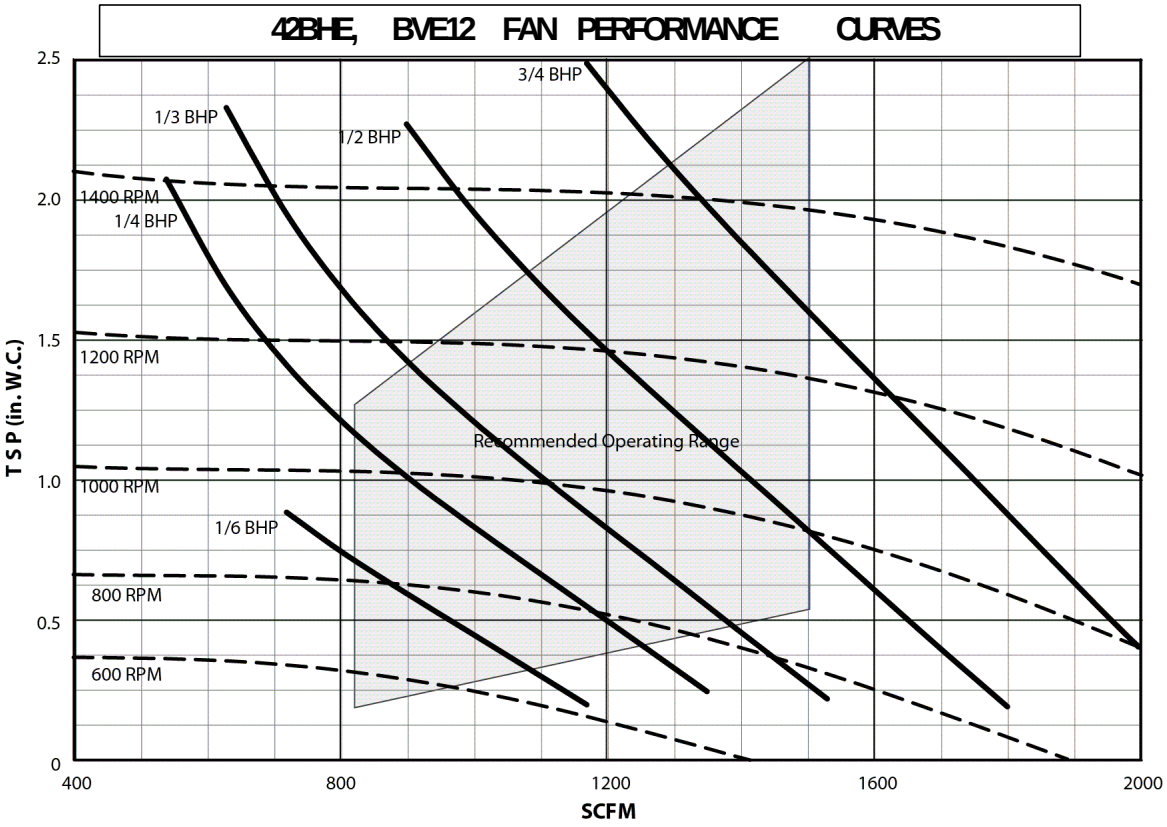
Factory-Installed Options

Unit Arrangement:	**Rear Return / Front Supply**
Filters:	**2 in. MERV 8 Pleated Filter**
Motor HP:	**1/2 HP**
AAV / Drains:	**Manual Air Vents only**
Coil Hand:	**Left Hand**
Thermostats:	**Field Supplied/Installed Thermostat**
Unit Controls:	**Disconnect Switch (up to 40 Amps)**
Insulation:	**Std. 1 in. Tufskin**
Packaging:	**Units shipped on treated wood pallet**

Performance Summary For FC07

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



FC08,09,10,11

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

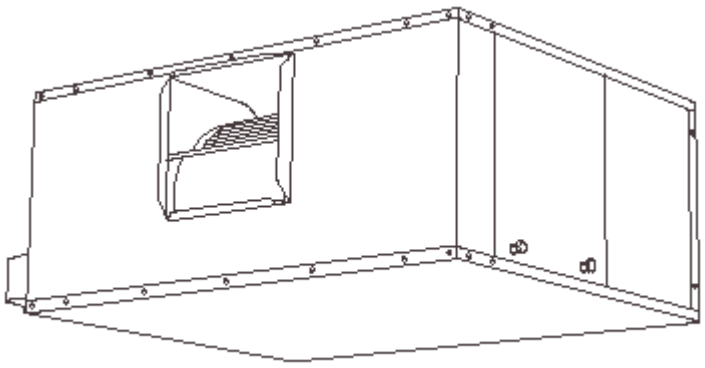
FC08,09,10,11

Tag Cover Sheet
Unit Report
Certified Drawing
Performance Report

Unit Report For FC08,09,10,11

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



Unit Parameters

Tag Name:	**FC08,09,10,11**
Quantity:	**4**
Unit Model:	**42BHE20RG4L61810DE**
Unit Type:	**42BH Horizontal Belt Drive**
Unit Size:	**2000 CFM**
Shipping Options:	**Standard**

Dimensions

Unit Length:	**1022.35**	mm
Unit Width:	**1219.20**	mm
Unit Height:	**609.60**	mm
Operating Weight:	**157**	kg

Coil Parameters

System Type:	**2-Pipe Cooling Only**
Cooling Coil:	**Cold Fluid Cooling**
Cooling Coil Rows:	**8 Rows**
Coil Hand:	**Left Hand**

Electrical

Motor Voltage:	**460-3-60**	V-Ph-Hz

Fan and Drive Data

RPM:	**866**	
BHP:	**.41**	kW
Turns:	**1.5**	
Drive Code:	**DQ4**	

Warranty Information

First Year - Parts Only (Standard)

Ordering Information

Part Number	Description	Quantity
Base Unit		
	42BHE20RG4L61810DE	4
	42BHE20:Horizontal Belt-Drive Fan Coil 2000 CFM Cooling 460-3-60	
	3/4 HP Motor	
	Motor Control with interlocking disc	
	High Capacity 8-Row in lieu of standard 4-Row - For 2-pipe system	
	Field Supplied/Installed Thermostat	

Certified Drawing for FC08,09,10,11

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

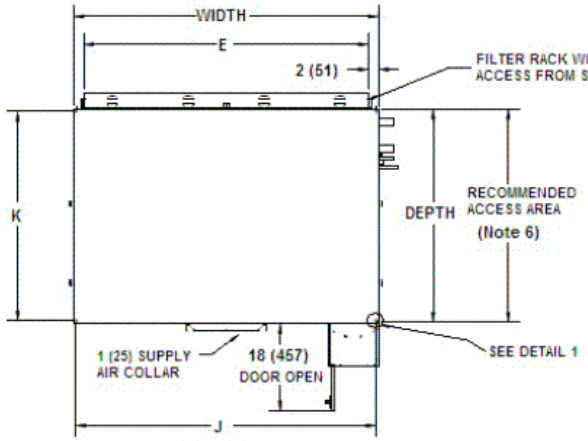
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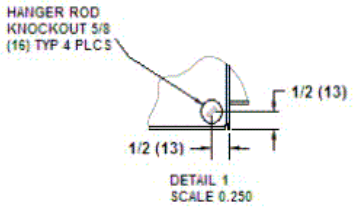
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HORIZONTAL BELT DRIVE UNIT (MOTOR CONTROLS)

42BHE

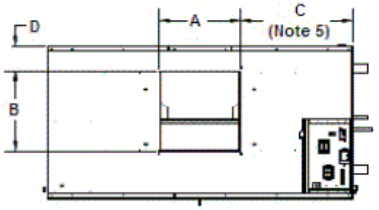


TOP VIEW

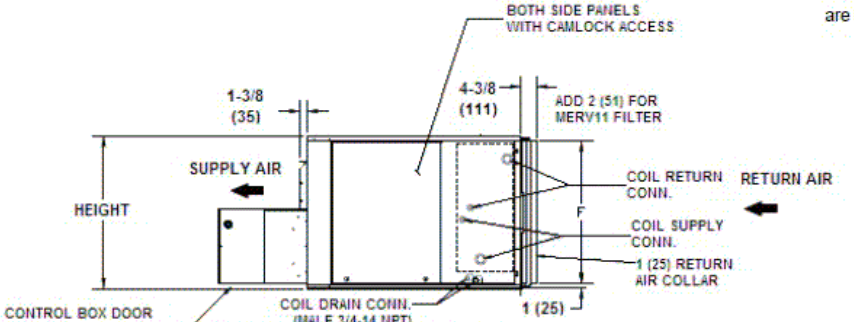


DETAIL 1
SCALE 0.250

NOTE:
1. R.H. shown, L.H. opposite.
2. All dimensions ±1/4".
3. Coil connections shown are for 4-pipe system. Heating coil is in re-heat position as standard.
4. For 4-pipe, DX/Hot water combination, hot water coil is always in pre-heat position as standard.
5. "C" dimension is measured from coil side of the unit.
6. Allow adequate spacing or maneuverability of unit to allow service through recommended access area.
7. Dimensions in parenthesis are in mm.



FRONT VIEW



SIDE VIEW

Unit Size	Dimensions											
	Fan Size	Depth	Width	Height	Supply Duct				Return Duct		Mounting Holes	
					A	B	C	D	E	F	J	K
06	9 x 4	36	28	19-3/4	7-1/8	10-1/2	14-1/2	2-1/4	24	16-1/2	27-1/4	35-1/4
08	9 x 6	36	28	19-3/4	8-1/2	10-1/2	13-7/8	2-1/4	24	16-1/2	27-1/4	35-1/4
10	10 x 4	37-1/2	37	21-1/2	7-1/8	11-9/16	15-1/4	2-1/4	33	18-1/4	36-1/4	37
12	10 x 7	37-1/2	37	21-1/2	9-15/16	11-9/16	13-7/8	2-1/4	33	18-1/4	36-1/4	37
16	11 x 10	37-3/4	47	21-1/2	13-3/8	12-3/4	16-3/4	2-1/4	43	18-1/4	46-1/4	37
20	12 x 9	40-1/4	48	24	12-1/2	13-3/4	17-3/4	2-1/4	44	20-3/4	47-1/4	39-1/2
30	12 x 12	40-1/4	48	32-1/4	15-7/8	13-3/4	16	7-1/4	44	29	47-1/4	39-1/2
40	15 x 12	43-1/2	62	32-1/4	16-7/16	16-1/16	22-3/4	6-1/4	58	29	61-3/4	42-1/2

JOB NAME

JOB NUMBER

DATE
01/14/2011

Carrier

DRAWING NUMBER	REVISION	SHEET
42BH-202-2	G	1 OF 1

Certified Drawing for FC08,09,10,11

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

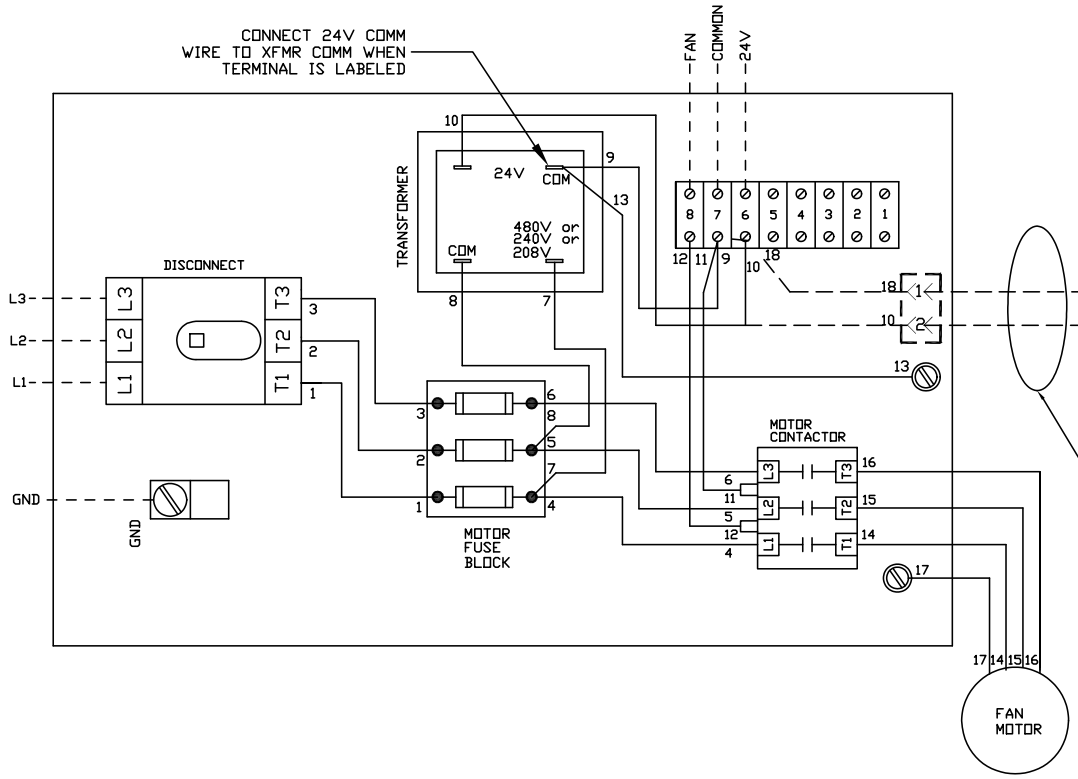
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MOTOR CONTROLS WITH INTERLOCKING DISCONNECT, 3-PHASE

42B



Wire	Gage	Color
1	1-12 AWG	Black
2	1-12 AWG	Red
3	1-12 AWG	Blue
4	1-12 AWG	Black
5	1-12 AWG	Red
6	1-12 AWG	Blue
7	1-18 AWG	Black
8	1-18 AWG	Red
9	1-18 AWG	Yellow
10	1-18 AWG	Orange
11	1-18 AWG	Yellow
12	1-18 AWG	Gray
13	1-18 AWG	Yellow
14	1-14 AWG	Black
15	1-14 AWG	Red
16	1-14 AWG	Blue
17	1-14 AWG	Green
18	1-18 AWG	Orange**

** Only Used With Overflow Switch.

LEGEND

AWG	- American Wire Gage
GND	- Ground
NC	- Normally Closed
NO	- Normally Open
Q/C	- Quick Connect
XFMR	- Transformer

WIRE CONNECTION
WIRE TAPED
FACTORY WIRING
FIELD WIRING
OPTIONAL COMPONENTS/WIRING

NOTES:

1. This is a point to point electrical diagram.
2. Caution: Disconnect power before servicing.
3. See nameplate for correct voltage, use 75°C min, copper conductors only. Unit terminals are not designed to accept any other wiring.
4. Blower motor(s) thermally protected.
5. All contractor wiring must conform to electrical codes, national and local.

JOB NAME		
JOB NUMBER		Carrier®
DATE: 02/10/2012		
DRAWING NUMBER: 42B-204-6	REVISION	SHEET: 1 OF 1

Performance Summary For FC08,09,10,11

Project: SPMT Telescope 06/22/2014
Prepared By: Rebecca T. Callimanis 02:15PM

Unit Parameters

Tag Name:	**FC08,09,10,11**
Quantity:	**4**
Unit Model:	**42BHE20RG4L61810DE**
Unit Type:	**42BH Horizontal Belt Drive**
Unit Size:	**2000 CFM**
System Type:	**2-Pipe Cooling Only**
Cooling Coil:	**Cold Fluid Cooling**
Cooling Coil Rows:	**8 Rows**
Coil Hand:	**Left Hand**
Shipping Options:	**Standard**

Unit Performance

Actual Airflow:	**859.9**	L/s
Altitude:	**2,590**	m
External Static Pressure:	**.13**	kPa
Total Static Pressure:	**.26**	kPa
Voltage:	**460-3-60**	V-Ph-Hz

Cooling Data

Coil Type:	**Cold Fluid Cooling**	
Coil Rows:	**8 Rows**	
Fluid Type:	**Propylene Glycol**	
Brine Concentration:	**40**	
Total Capacity:	**10,174**	W
Sensible Capacity:	**9,028**	W
Entering Air Dry Bulb Temperature:	**15.6**	C
Entering Air Wet Bulb Temperature:	**10.2**	C
Leaving Air Dry Bulb Temperature:	**3.8**	C
Leaving Air Wet Bulb Temperature:	**3.7**	C
Fluid Flow Rate:	**.4**	L/s
Fluid Pressure Drop:	**13.33**	kPa
Fluid Entering Temperature:	**-1.1**	C
Fluid Leaving Temperature:	**4.4**	C

Electrical Data

Motor Voltage:	**460-3-60**	V-Ph-Hz
Motor FLA (per motor):	**1.5**	

Fan and Drive Data

Fan RPM:	**866**	
BHP:	**.41**	kW
Motor Nominal HP:	**3/4**	
Number of Turns:	**1.5**	
Drive Package Code:	**DQ4**	

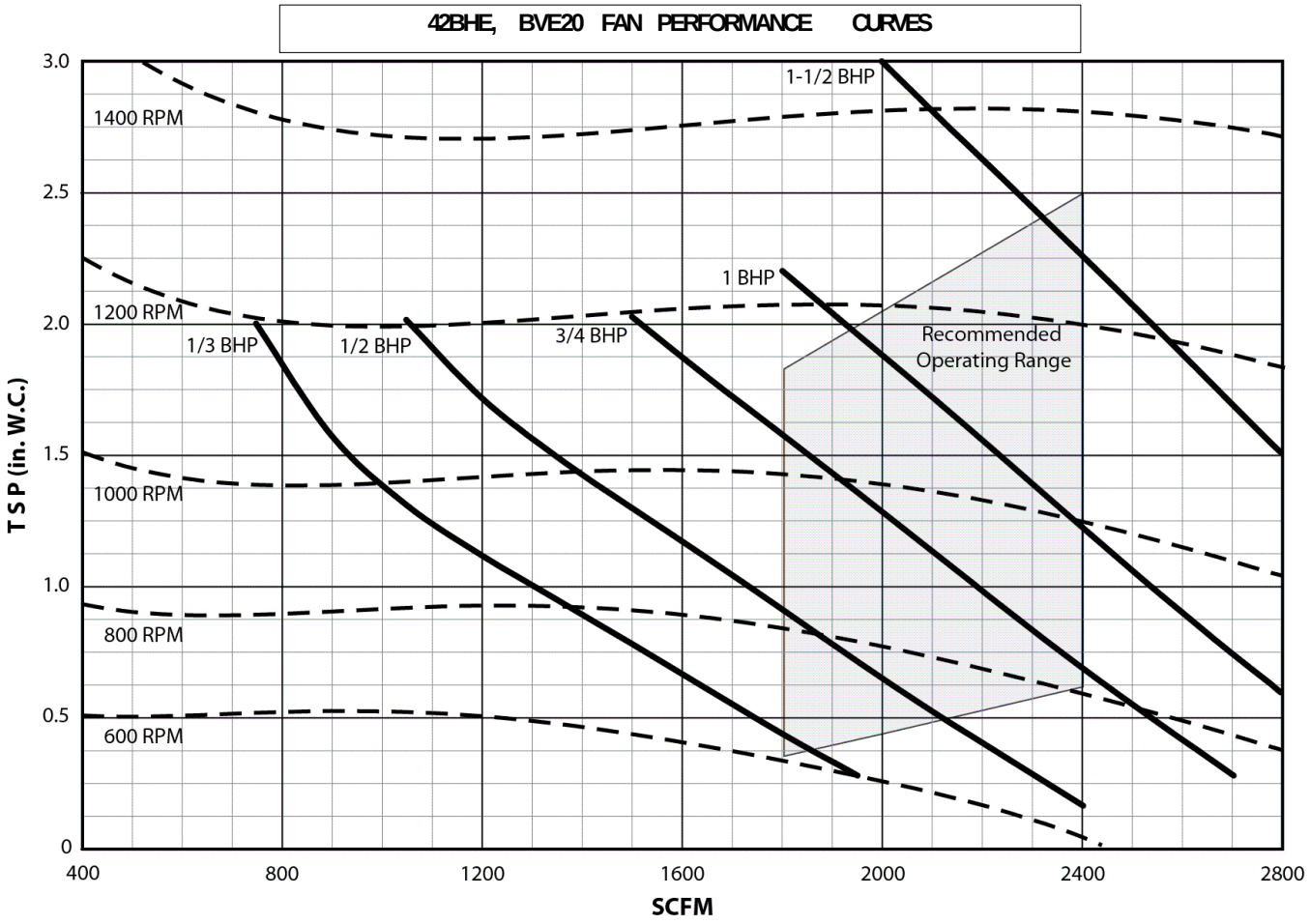
Factory-Installed Options

Unit Arrangement:	**Rear Return / Front Supply**
Filters:	**2 in. MERV 8 Pleated Filter**
Motor HP:	**3/4 HP**
AAV / Drains:	**Manual Air Vents only**
Coil Hand:	**Left Hand**
Thermostats:	**Field Supplied/Installed Thermostat**
Unit Controls:	**Motor Control with interlocking disc**
Insulation:	**Std. 1 in. Tufskin**
Packaging:	**Units shipped on treated wood pallet**

Performance Summary For FC08,09,10,11

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



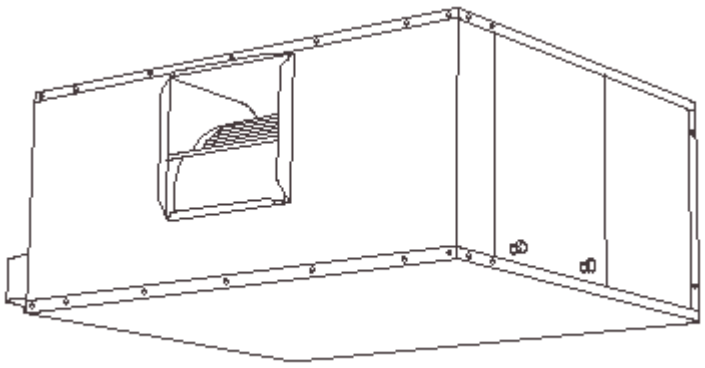
FC12

Tag Cover Sheet
Unit Report
Certified Drawing
Performance Report

Unit Report For FC12

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



Unit Parameters

Tag Name: **FC12**
Quantity: **1**
Unit Model: **42BHE20BG4L62110DE**
Unit Type: **42BH Horizontal Belt Drive**
Unit Size: **2000 CFM**
Shipping Options: **Standard**

Dimensions

Unit Length: **1022.35** mm
Unit Width: **1219.20** mm
Unit Height: **609.60** mm
Operating Weight: **152** kg

Coil Parameters

System Type: **2-Pipe Cooling w/ Total Electric Heat**
Cooling Coil: **Cold Fluid Cooling**
Cooling Coil Rows: **4 Rows**
Coil Hand: **Left Hand**

Electrical

Motor Voltage: **460-3-60** V-Ph-Hz
Heater Voltage: **480-3-60, 2-Stage** V-Ph-Hz
Heater kW: **9.9 kW**

Fan and Drive Data

RPM: **891**
BHP: **.52** kW
Turns: **3.5**
Drive Code: **DO6**

Warranty Information

First Year - Parts Only (Standard)

Ordering Information

Part Number	Description	Quantity
Base Unit		
	42BHE20BG4L62110DE	1
	42BHE20:Horizontal Belt-Drive Fan Coil 2000 CFM Cooling 460-3-60	
	3/4 HP Motor	
	Disconnect Switch (up to 40 Amps)	
	9.9 kW	
	2-Stage	
	Field Supplied/Installed Thermostat	

Certified Drawing for FC12

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

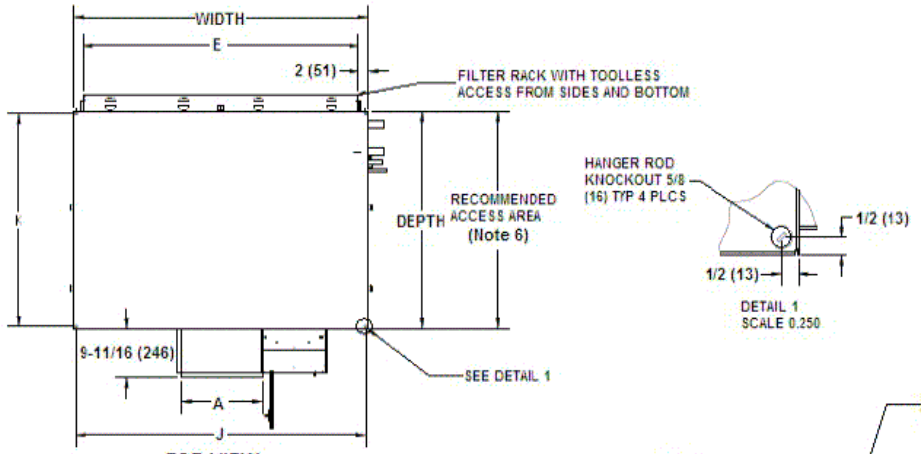
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HORIZONTAL BELT DRIVE UNIT (ELECTRIC HEAT)

42BHE



NOTE:
1. R.H. shown, L.H. opposite.
2. All dimensions ±1/4".
3. Coil connections shown are for 4-pipe system. Heating coil is in re-heat position as standard.
4. For 4-pipe, DX/Hot water combination, hot water coil is always in pre-heat position as standard.
5. "C" dimension is measured from coil side of the unit.
6. Allow adequate spacing or maneuverability of unit to allow service through recommended access area.
7. Dimensions in parenthesis are in mm.

Unit Size	Dimensions											
	Fan Size	Depth	Width	Height	Supply Duct				Return Duct		Mounting Holes	
					A	B	C	D	E	F	J	K
06	9 x 4	36	28	19-3/4	8-7/8	10-1/2	14-1/2	2-1/4	24	16-1/2	27-1/4	35-1/4
08	9 x 6	36	28	19-3/4	8-7/8	10-1/2	13-7/8	2-1/4	24	16-1/2	27-1/4	35-1/4
10	10 x 4	37-1/2	37	21-1/2	10-3/8	11-9/16	15-1/4	2-1/4	33	18-1/4	36-1/4	37
12	10 x 7	37-1/2	37	21-1/2	10-3/8	11-9/16	13-7/8	2-1/4	33	18-1/4	36-1/4	37
16	11 x 10	37-3/4	47	21-1/2	13-7/8	12-3/4	16-3/4	2-1/4	43	18-1/4	46-1/4	37
20	12 x 9	40-1/4	48	24	13	13-3/4	17-3/4	2-1/4	44	20-3/4	47-1/4	39-1/2
30	12 x 12	40-1/4	48	32-1/4	16-1/4	13-3/4	16	7-1/4	44	29	47-1/4	39-1/2
40	15 x 12	43-1/2	62	32-1/4	16-3/4	16-1/16	22-3/4	6-1/4	58	29	61-3/4	42-1/2

JOB NAME

JOB NUMBER

DATE 01/14/2011

Carrier

DRAWING NUMBER 42BH-202-3 | REVISION G | SHEET 1 OF 1

Certified Drawing for FC12

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

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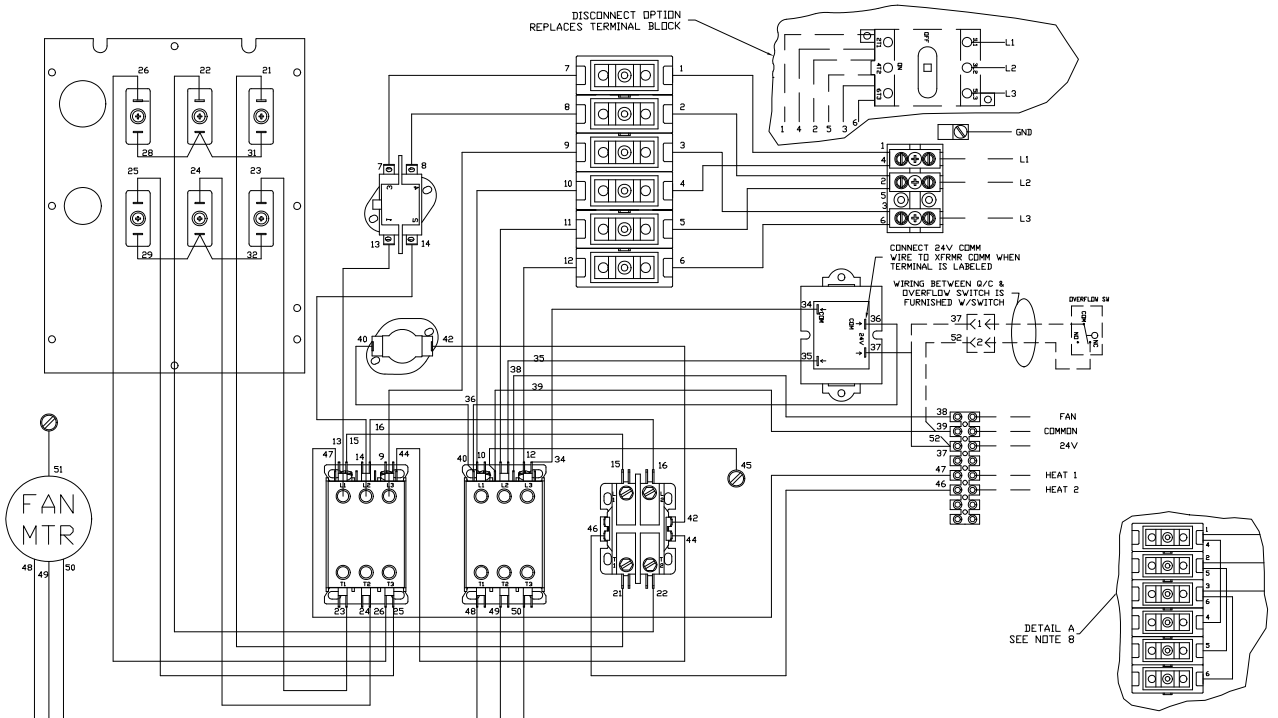
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ELECTRIC HEAT 3-PHASE 2-STAGE

42B

Wire	Gage	Color
1	8 AWG	Black
2	8 AWG	Red
3	8 AWG	Blue
4	12 AWG	Black
5	12 AWG	Red
6	12 AWG	Blue
7	8 AWG	Black
8	8 AWG	Red
9	8 AWG	Blue
10	12 AWG	Black
11	12 AWG	Red
12	12 AWG	Blue
13	8 AWG	Black
14	8 AWG	Red
15	10 AWG	Black
16	10 AWG	Red
21	12 AWG	Black
22	12 AWG	Red
23	12 AWG	Black
24	12 AWG	Red
25, 26	12 AWG	Blue
28, 29	12 AWG	Black
31, 32	12 AWG	Black
34	18 AWG	Blue
35	18 AWG	Red
36	18 AWG	Yellow
37	18 AWG	Orange
38	18 AWG	Gray
39, 40	18 AWG	Yellow
41, 42	18 AWG	Yellow
44, 45	18 AWG	Yellow
46	18 AWG	Purple
47	18 AWG	Brown
48	14 AWG	Black
49	14 AWG	Red
50	14 AWG	Blue
51	14 AWG	Green
52	18 AWG	Orange**

** Only Used With Overflow Switch.



NOTES:

1. This is a point to point electrical diagram.
2. Caution: Disconnect power before servicing.
3. See nameplate for correct voltage, use 75°C min. copper conductors only.
4. Blower motor(s) thermally protected.
5. All contractor wiring must conform to electrical codes, national and local.
6. Wires 9, 13 and 14 will terminate inside contactor lug.
7. Wires 4, 5 and 6 to be installed as shown in Detail A when using P/N E035-50011401 disconnect switch. All other disconnects switches to be wired as shown in main diagram.

JOB NAME	
JOB NUMBER	
DATE	02/10/2012
DRAWING NUMBER	42B-204-9
REVISION	
SHEET	1 OF 1

Carrier®

Performance Summary For FC12

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

Unit Parameters

Tag Name:	**FC12**
Quantity:	**1**
Unit Model:	**42BHE20BG4L62110DE**
Unit Type:	**42BH Horizontal Belt Drive**
Unit Size:	**2000 CFM**
System Type:	**2-Pipe Cooling w/ Total Electric Heat**
Cooling Coil:	**Cold Fluid Cooling**
Cooling Coil Rows:	**4 Rows**
Heating Coil:	**Electric Heat**
Coil Hand:	**Left Hand**
Shipping Options:	**Standard**

Cooling Data

Coil Type:	**Cold Fluid Cooling**	
Coil Rows:	**4 Rows**	
Fluid Type:	**Propylene Glycol**	
Brine Concentration:	**40**	
Total Capacity:	**6,920**	W
Sensible Capacity:	**6,920**	W
Entering Air Dry Bulb Temperature:	**24.2**	C
Entering Air Wet Bulb Temperature:	**12.4**	C
Leaving Air Dry Bulb Temperature:	**16.3**	C
Leaving Air Wet Bulb Temperature:	**8.9**	C
Fluid Flow Rate:	**.3**	L/s
Fluid Pressure Drop:	**2.77**	kPa
Fluid Entering Temperature:	**7.2**	C
Fluid Leaving Temperature:	**12.8**	C

Electric Heating Data

Coil Type:	**Electric Heat**	
Voltage:	**480-3-60, 2-Stage**	V-Ph-Hz
Sensible Capacity:	**9,900**	W
Entering Air Temperature:	**15.6**	C
Leaving Air Temperature:	**23.8**	C
kW:	**9.9 kW**	

Electrical Data

Motor Voltage:	**460-3-60**	V-Ph-Hz
Motor FLA (per motor):	**1.5**	
Unit MCA:	**16.76**	
MFS:	**17.5**	

Fan and Drive Data

Fan RPM:	**891**	
BHP:	**.52**	kW
Motor Nominal HP:	**3/4**	
Number of Turns:	**3.5**	
Drive Package Code:	**DO6**	

Unit Performance

Actual Airflow:	**990.1**	L/s
Altitude:	**2,590**	m
External Static Pressure:	**.13**	kPa
Total Static Pressure:	**.25**	kPa
Voltage:	**460-3-60**	V-Ph-Hz

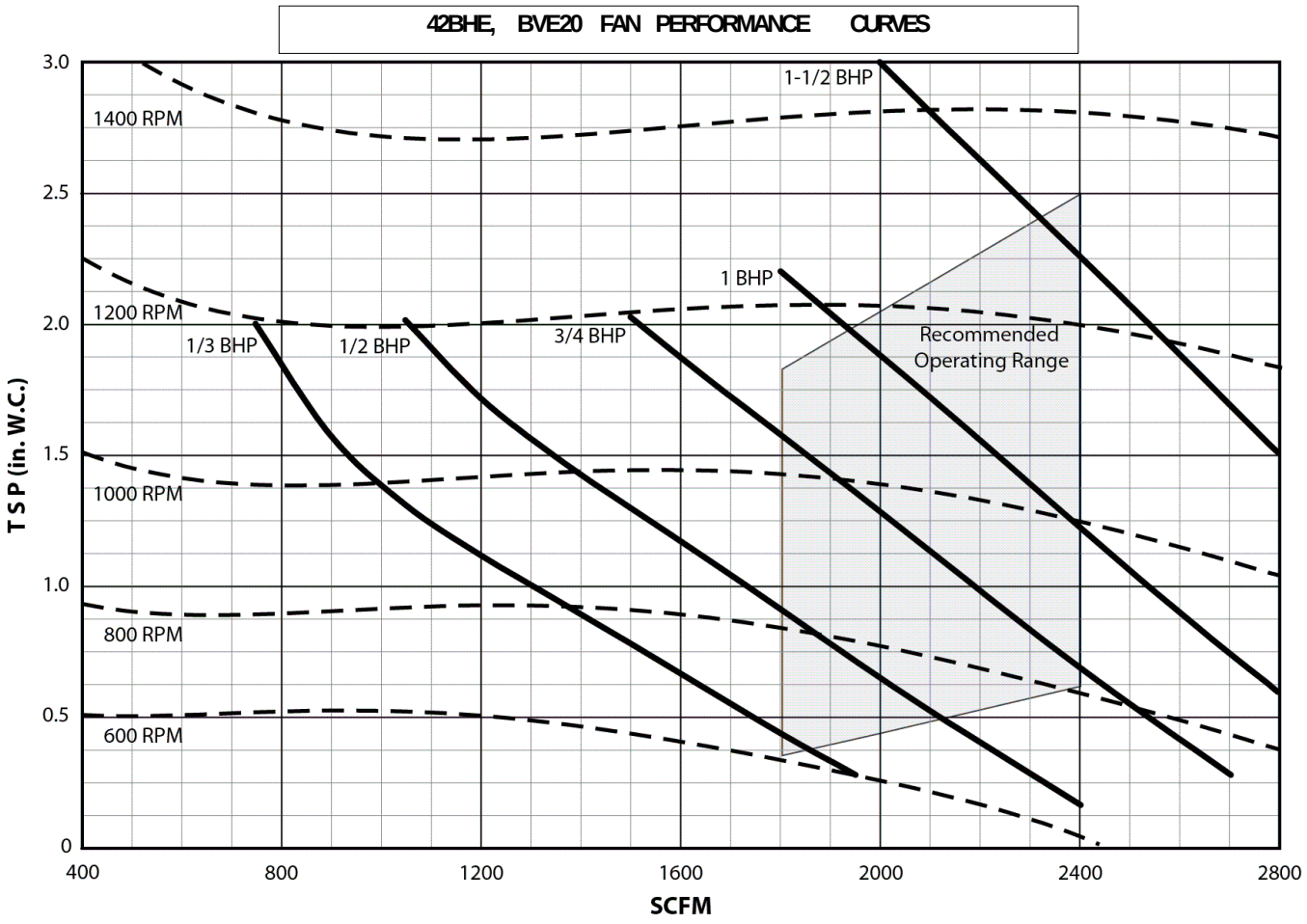
Factory-Installed Options

Unit Arrangement:	**Rear Return / Front Supply**
Filters:	**2 in. MERV 8 Pleated Filter**
Motor HP:	**3/4 HP**
AAV / Drains:	**Manual Air Vents only**
Coil Hand:	**Left Hand**
Thermostats:	**Field Supplied/Installed Thermostat**
Unit Controls:	**Disconnect Switch (up to 40 Amps)**
Insulation:	**Std. 1 in. Tufskin**
Packaging:	**Units shipped on treated wood pallet**

Performance Summary For FC12

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



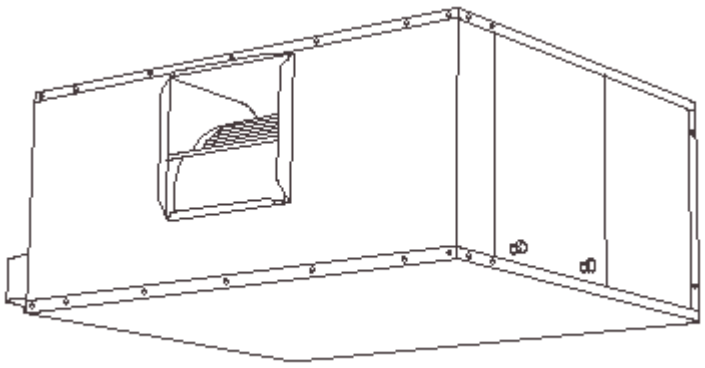
FC13

Tag Cover Sheet
Unit Report
Certified Drawing
Performance Report

Unit Report For FC13

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



Unit Parameters

Tag Name:	**FC13**
Quantity:	**1**
Unit Model:	**42BHE30RG4L62610EE**
Unit Type:	**42BH Horizontal Belt Drive**
Unit Size:	**3000 CFM**
Shipping Options:	**Standard**

Dimensions

Unit Length:	**1022.35**	mm
Unit Width:	**1219.20**	mm
Unit Height:	**819.15**	mm
Operating Weight:	**199**	kg

Coil Parameters

System Type:	**2-Pipe Cooling Only**
Cooling Coil:	**Cold Fluid Cooling**
Cooling Coil Rows:	**8 Rows**
Coil Hand:	**Left Hand**

Electrical

Motor Voltage:	**460-3-60**	V-Ph-Hz

Fan and Drive Data

RPM:	**860**	
BHP:	**.63**	kW
Turns:	**1.5**	
Drive Code:	**EQ7**	

Warranty Information

First Year - Parts Only (Standard)

Ordering Information

Part Number	Description	Quantity
Base Unit		
	42BHE30RG4L62610EE	1
	42BHE30:Horizontal Belt-Drive Fan Coil 3000 CFM Cooling 460-3-60	
	1 HP Motor	
	Motor Control with interlocking disc	
	High Capacity 8-Row in lieu of standard 4-Row - For 2-pipe system	
	Field Supplied/Installed Thermostat	

Certified Drawing for FC13

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

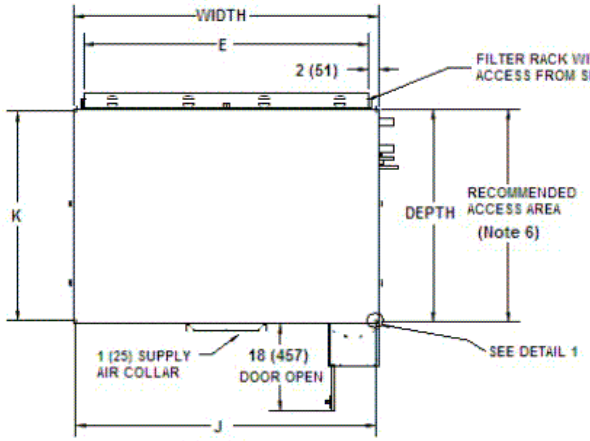
Carrier
A United Technologies Company

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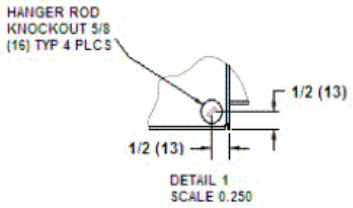
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HORIZONTAL BELT DRIVE UNIT (MOTOR CONTROLS)

42BHE

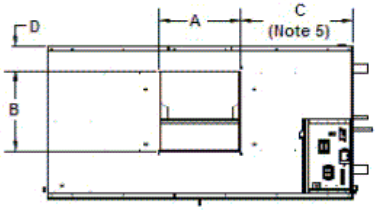


TOP VIEW

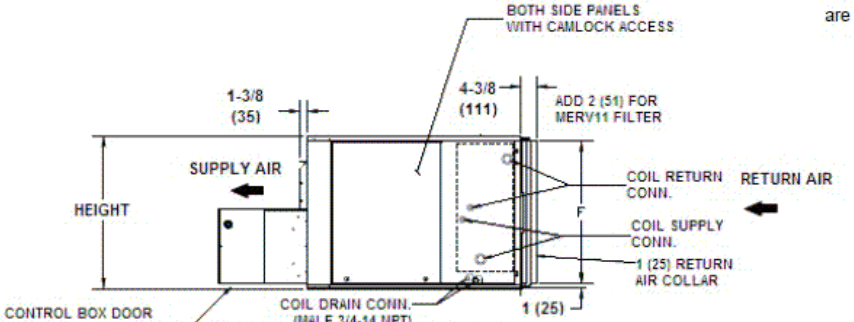


DETAIL 1
SCALE 0.250

NOTE:
1. R.H. shown, L.H. opposite.
2. All dimensions ±1/4".
3. Coil connections shown are for 4-pipe system. Heating coil is in re-heat position as standard.
4. For 4-pipe, DX/Hot water combination, hot water coil is always in pre-heat position as standard.
5. "C" dimension is measured from coil side of the unit.
6. Allow adequate spacing or maneuverability of unit to allow service through recommended access area.
7. Dimensions in parenthesis are in mm.



FRONT VIEW



SIDE VIEW

Unit Size	Dimensions											
	Fan Size	Depth	Width	Height	Supply Duct				Return Duct		Mounting Holes	
					A	B	C	D	E	F	J	K
06	9 x 4	36	28	19-3/4	7-1/8	10-1/2	14-1/2	2-1/4	24	16-1/2	27-1/4	35-1/4
08	9 x 6	36	28	19-3/4	8-1/2	10-1/2	13-7/8	2-1/4	24	16-1/2	27-1/4	35-1/4
10	10 x 4	37-1/2	37	21-1/2	7-1/8	11-9/16	15-1/4	2-1/4	33	18-1/4	36-1/4	37
12	10 x 7	37-1/2	37	21-1/2	9-15/16	11-9/16	13-7/8	2-1/4	33	18-1/4	36-1/4	37
16	11 x 10	37-3/4	47	21-1/2	13-3/8	12-3/4	16-3/4	2-1/4	43	18-1/4	46-1/4	37
20	12 x 9	40-1/4	48	24	12-1/2	13-3/4	17-3/4	2-1/4	44	20-3/4	47-1/4	39-1/2
30	12 x 12	40-1/4	48	32-1/4	15-7/8	13-3/4	16	7-1/4	44	29	47-1/4	39-1/2
40	15 x 12	43-1/2	62	32-1/4	16-7/16	16-1/16	22-3/4	6-1/4	58	29	61-3/4	42-1/2

JOB NAME

JOB NUMBER

DATE
01/14/2011

Carrier

DRAWING NUMBER	REVISION	SHEET
42BH-202-2	G	1 OF 1

Certified Drawing for FC13

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

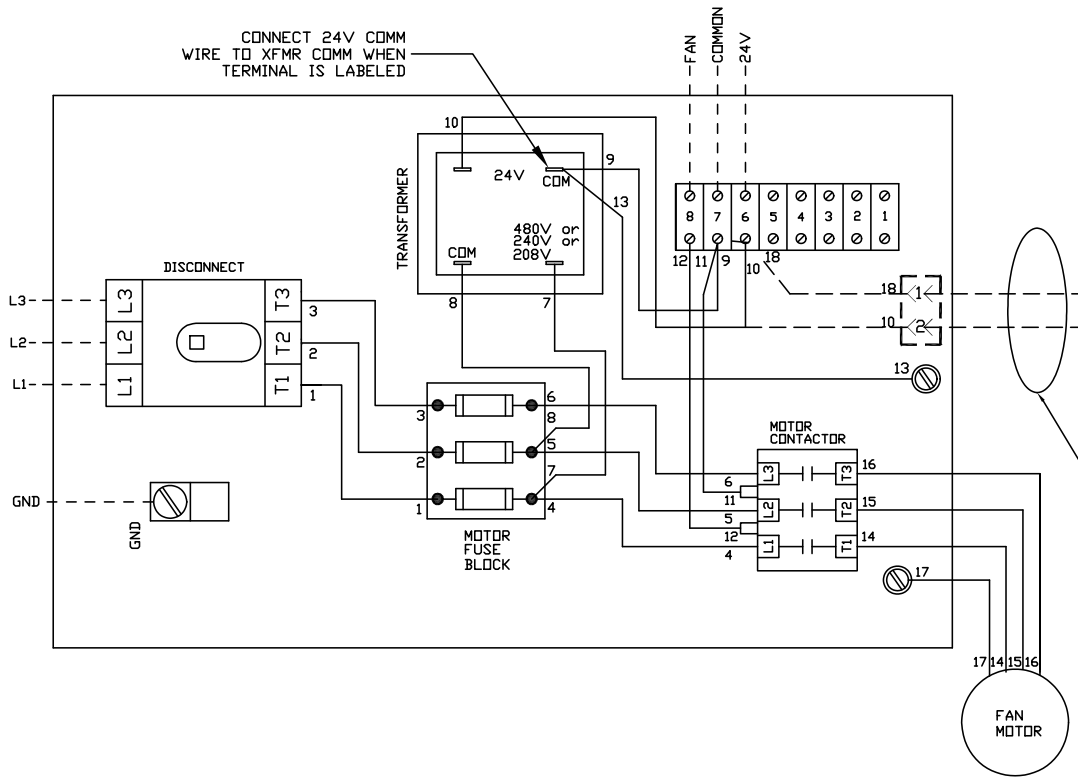
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MOTOR CONTROLS WITH INTERLOCKING DISCONNECT, 3-PHASE

42B



Wire	Gage	Color
1	1-12 AWG	Black
2	1-12 AWG	Red
3	1-12 AWG	Blue
4	1-12 AWG	Black
5	1-12 AWG	Red
6	1-12 AWG	Blue
7	1-18 AWG	Black
8	1-18 AWG	Red
9	1-18 AWG	Yellow
10	1-18 AWG	Orange
11	1-18 AWG	Yellow
12	1-18 AWG	Gray
13	1-18 AWG	Yellow
14	1-14 AWG	Black
15	1-14 AWG	Red
16	1-14 AWG	Blue
17	1-14 AWG	Green
18	1-18 AWG	Orange**

** Only Used With Overflow Switch.

LEGEND

AWG - American Wire Gage
GND - Ground
NC - Normally Closed
NO - Normally Open
Q/C - Quick Connect
XFMR - Transformer

WIRE CONNECTION
WIRE TAPED
FACTORY WIRING
FIELD WIRING
OPTIONAL COMPONENTS/WIRING

NOTES:

1. This is a point to point electrical diagram.
2. Caution: Disconnect power before servicing.
3. See nameplate for correct voltage, use 75°C min, copper conductors only. Unit terminals are not designed to accept any other wiring.
4. Blower motor(s) thermally protected.
5. All contractor wiring must conform to electrical codes, national and local.

JOB NAME		
JOB NUMBER		Carrier®
DATE: 02/10/2012		
DRAWING NUMBER: 42B-204-6	REVISION	SHEET: 1 OF 1

Performance Summary For FC13

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

Unit Parameters

Tag Name:	**FC13**
Quantity:	**1**
Unit Model:	**42BHE30RG4L62610EE**
Unit Type:	**42BH Horizontal Belt Drive**
Unit Size:	**3000 CFM**
System Type:	**2-Pipe Cooling Only**
Cooling Coil:	**Cold Fluid Cooling**
Cooling Coil Rows:	**8 Rows**
Coil Hand:	**Left Hand**
Shipping Options:	**Standard**

Unit Performance

Actual Airflow:	**1,245.0**	L/s
Altitude:	**2,590**	m
External Static Pressure:	**.13**	kPa
Total Static Pressure:	**.25**	kPa
Voltage:	**460-3-60**	V-Ph-Hz

Cooling Data

Coil Type:	**Cold Fluid Cooling**	
Coil Rows:	**8 Rows**	
Fluid Type:	**Propylene Glycol**	
Brine Concentration:	**40**	
Total Capacity:	**14,585**	W
Sensible Capacity:	**14,585**	W
Entering Air Dry Bulb Temperature:	**24.4**	C
Entering Air Wet Bulb Temperature:	**12.2**	C
Leaving Air Dry Bulb Temperature:	**11.2**	C
Leaving Air Wet Bulb Temperature:	**6.2**	C
Fluid Flow Rate:	**.6**	L/s
Fluid Pressure Drop:	**10.08**	kPa
Fluid Entering Temperature:	**7.2**	C
Fluid Leaving Temperature:	**12.8**	C

Electrical Data

Motor Voltage:	**460-3-60**	V-Ph-Hz
Motor FLA (per motor):	**1.9**	

Fan and Drive Data

Fan RPM:	**860**	
BHP:	**.63**	kW
Motor Nominal HP:	**1**	
Number of Turns:	**1.5**	
Drive Package Code:	**EQ7**	

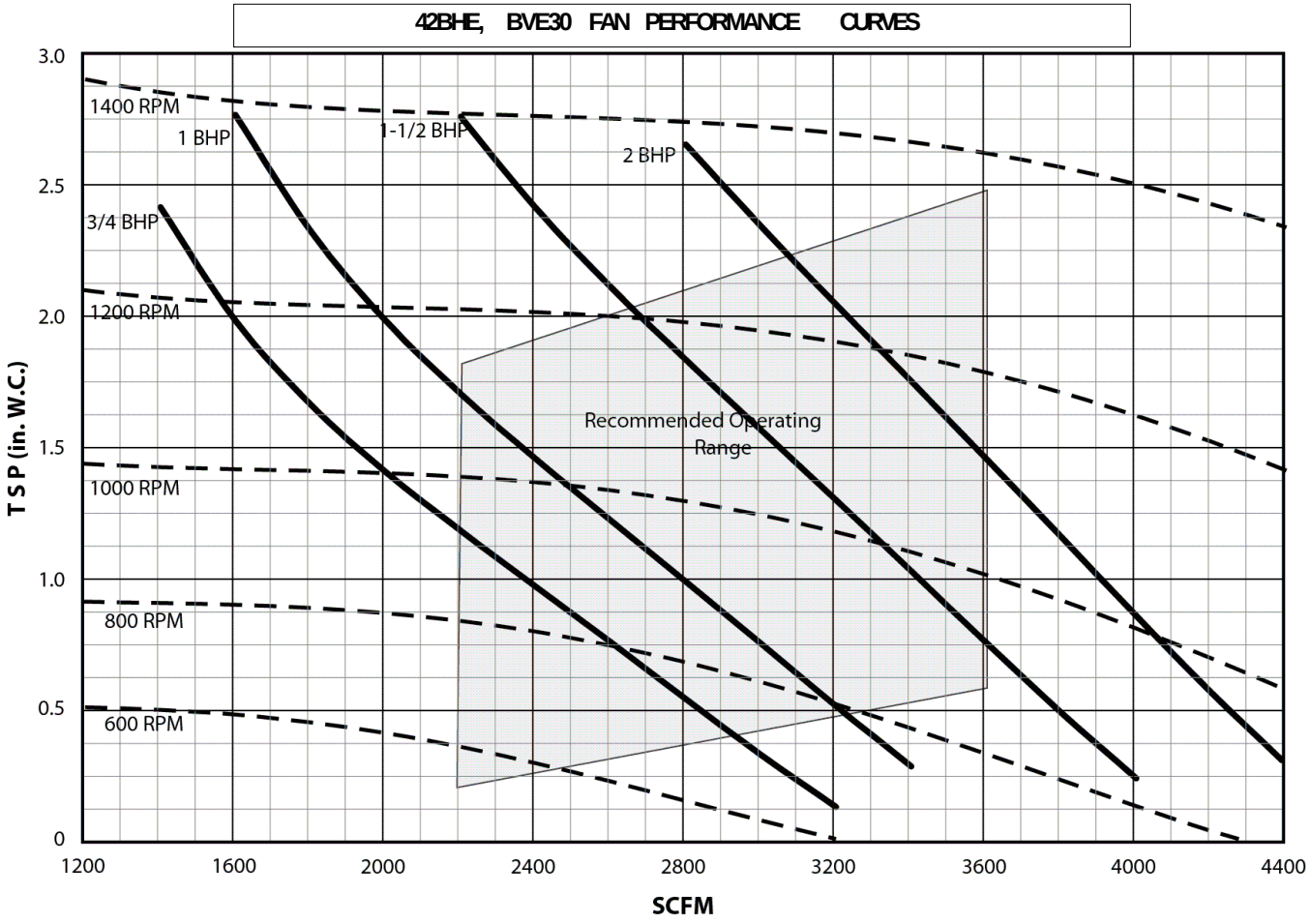
Factory-Installed Options

Unit Arrangement:	**Rear Return / Front Supply**
Filters:	**2 in. MERV 8 Pleated Filter**
Motor HP:	**1 HP**
AAV / Drains:	**Manual Air Vents only**
Coil Hand:	**Left Hand**
Thermostats:	**Field Supplied/Installed Thermostat**
Unit Controls:	**Motor Control with interlocking disc**
Insulation:	**Std. 1 in. Tufskin**
Packaging:	**Units shipped on treated wood pallet**

Performance Summary For FC13

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



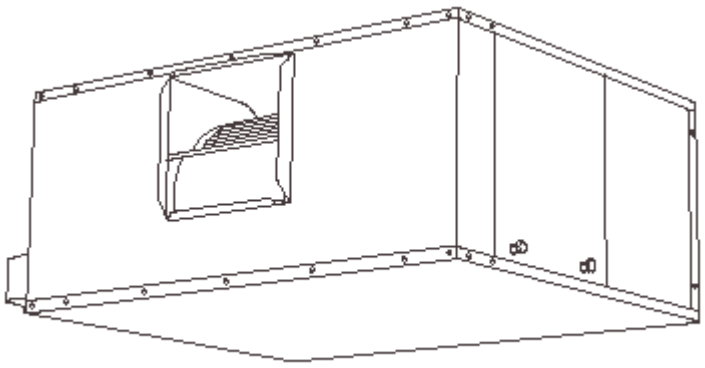
FC14

Tag Cover Sheet
Unit Report
Certified Drawing
Performance Report

Unit Report For FC14

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



Unit Parameters

Tag Name:	**FC14**
Quantity:	**1**
Unit Model:	**42BHE30RG4L62711EE**
Unit Type:	**42BH Horizontal Belt Drive**
Unit Size:	**3000 CFM**
Shipping Options:	**Standard**

Dimensions

Unit Length:	**1022.35**	mm
Unit Width:	**1219.20**	mm
Unit Height:	**819.15**	mm
Operating Weight:	**199**	kg

Coil Parameters

System Type:	**2-Pipe Cooling Only**
Cooling Coil:	**Cold Fluid Cooling**
Cooling Coil Rows:	**8 Rows**
Coil Hand:	**Left Hand**

Electrical

Motor Voltage:	**460-3-60**	V-Ph-Hz

Fan and Drive Data

RPM:	**893**	
BHP:	**.69**	kW
Turns:	**3.5**	
Drive Code:	**EP0**	

Warranty Information

First Year - Parts Only (Standard)

Ordering Information

Part Number	Description	Quantity
Base Unit		
	42BHE30RG4L62711EE	1
	42BHE30:Horizontal Belt-Drive Fan Coil 3000 CFM Cooling 460-3-60	
	1 HP Motor	
	Motor Control with interlocking disc	
	High Capacity 8-Row in lieu of standard 4-Row - For 2-pipe system	
	Field Supplied/Installed Thermostat	

Certified Drawing for FC14

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

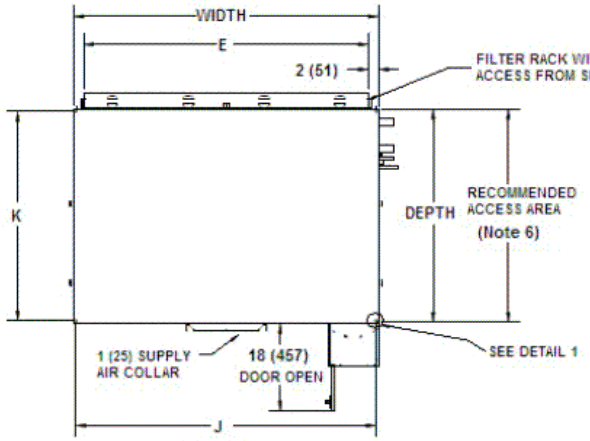
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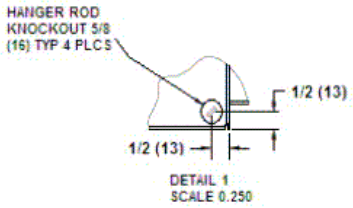
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HORIZONTAL BELT DRIVE UNIT (MOTOR CONTROLS)

42BHE

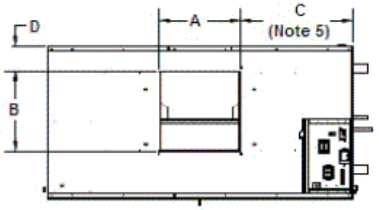


TOP VIEW

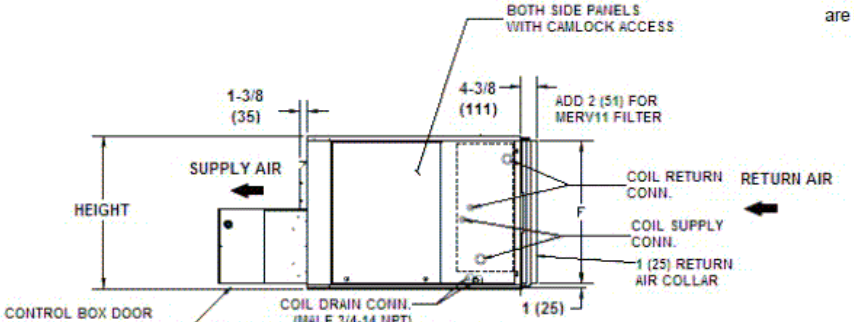


DETAIL 1
SCALE 0.250

NOTE:
1. R.H. shown, L.H. opposite.
2. All dimensions ±1/4".
3. Coil connections shown are for 4-pipe system. Heating coil is in re-heat position as standard.
4. For 4-pipe, DX/Hot water combination, hot water coil is always in pre-heat position as standard.
5. "C" dimension is measured from coil side of the unit.
6. Allow adequate spacing or maneuverability of unit to allow service through recommended access area.
7. Dimensions in parenthesis are in mm.



FRONT VIEW



SIDE VIEW

Unit Size	Dimensions											
	Fan Size	Depth	Width	Height	Supply Duct				Return Duct		Mounting Holes	
					A	B	C	D	E	F	J	K
06	9 x 4	36	28	19-3/4	7-1/8	10-1/2	14-1/2	2-1/4	24	16-1/2	27-1/4	35-1/4
08	9 x 6	36	28	19-3/4	8-1/2	10-1/2	13-7/8	2-1/4	24	16-1/2	27-1/4	35-1/4
10	10 x 4	37-1/2	37	21-1/2	7-1/8	11-9/16	15-1/4	2-1/4	33	18-1/4	36-1/4	37
12	10 x 7	37-1/2	37	21-1/2	9-15/16	11-9/16	13-7/8	2-1/4	33	18-1/4	36-1/4	37
16	11 x 10	37-3/4	47	21-1/2	13-3/8	12-3/4	16-3/4	2-1/4	43	18-1/4	46-1/4	37
20	12 x 9	40-1/4	48	24	12-1/2	13-3/4	17-3/4	2-1/4	44	20-3/4	47-1/4	39-1/2
30	12 x 12	40-1/4	48	32-1/4	15-7/8	13-3/4	16	7-1/4	44	29	47-1/4	39-1/2
40	15 x 12	43-1/2	62	32-1/4	16-7/16	16-1/16	22-3/4	6-1/4	58	29	61-3/4	42-1/2

JOB NAME

JOB NUMBER

DATE
01/14/2011

Carrier

DRAWING NUMBER	REVISION	SHEET
42BH-202-2	G	1 OF 1

Certified Drawing for FC14

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

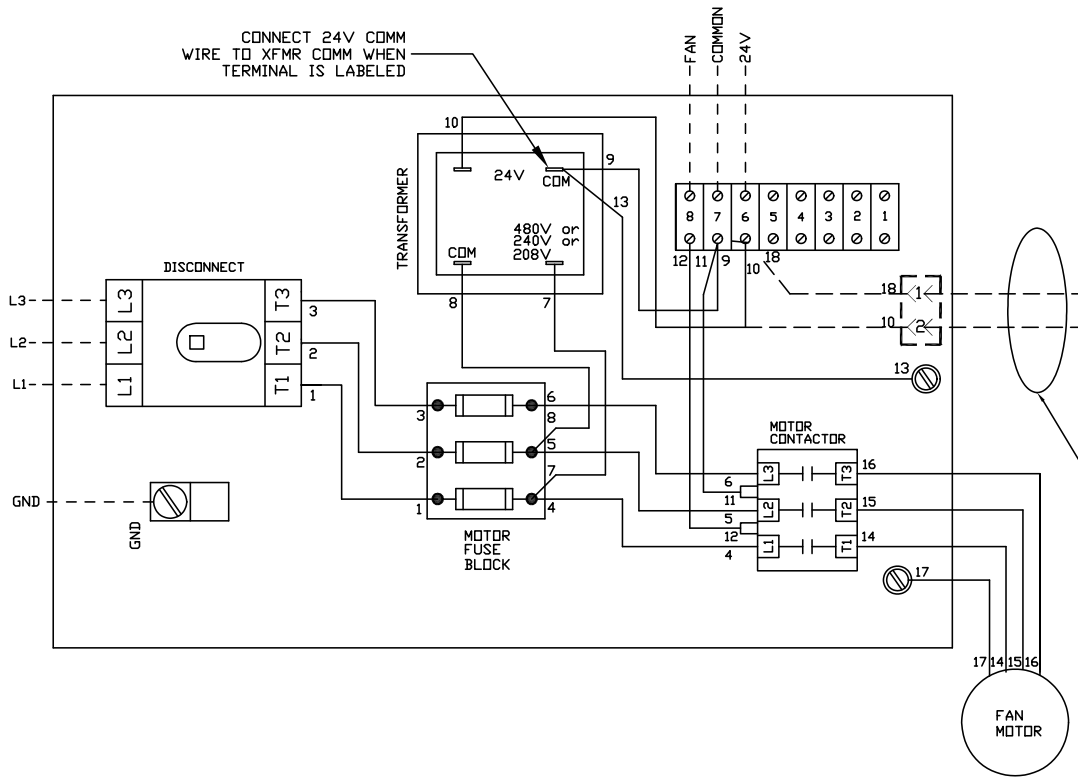
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MOTOR CONTROLS WITH INTERLOCKING DISCONNECT, 3-PHASE

42B



Wire	Gage	Color
1	1-12 AWG	Black
2	1-12 AWG	Red
3	1-12 AWG	Blue
4	1-12 AWG	Black
5	1-12 AWG	Red
6	1-12 AWG	Blue
7	1-18 AWG	Black
8	1-18 AWG	Red
9	1-18 AWG	Yellow
10	1-18 AWG	Orange
11	1-18 AWG	Yellow
12	1-18 AWG	Gray
13	1-18 AWG	Yellow
14	1-14 AWG	Black
15	1-14 AWG	Red
16	1-14 AWG	Blue
17	1-14 AWG	Green
18	1-18 AWG	Orange**

** Only Used With Overflow Switch.

LEGEND
AWG - American Wire Gage
GND - Ground
NC - Normally Closed
NO - Normally Open
Q/C - Quick Connect
XFMR - Transformer

WIRE CONNECTION
WIRE TAPED
FACTORY WIRING
FIELD WIRING
OPTIONAL COMPONENTS/WIRING

NOTES:
1. This is a point to point electrical diagram.
2. Caution: Disconnect power before servicing.
3. See nameplate for correct voltage, use 75°C min, copper conductors only. Unit terminals are not designed to accept any other wiring.
4. Blower motor(s) thermally protected.
5. All contractor wiring must conform to electrical codes, national and local.

JOB NAME		
JOB NUMBER		Carrier®
DATE: 02/10/2012		
DRAWING NUMBER: 42B-204-6	REVISION	SHEET: 1 OF 1

Performance Summary For FC14

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

Unit Parameters

Tag Name:	**FC14**
Quantity:	**1**
Unit Model:	**42BHE30RG4L62711EE**
Unit Type:	**42BH Horizontal Belt Drive**
Unit Size:	**3000 CFM**
System Type:	**2-Pipe Cooling Only**
Cooling Coil:	**Cold Fluid Cooling**
Cooling Coil Rows:	**8 Rows**
Coil Hand:	**Left Hand**
Shipping Options:	**Standard**

Unit Performance

Actual Airflow:	**1,275.2**	L/s
Altitude:	**2,590**	m
External Static Pressure:	**.13**	kPa
Total Static Pressure:	**.26**	kPa
Voltage:	**460-3-60**	V-Ph-Hz

Cooling Data

Coil Type:	**Cold Fluid Cooling**	
Coil Rows:	**8 Rows**	
Fluid Type:	**Propylene Glycol**	
Brine Concentration:	**40**	
Total Capacity:	**14,768**	W
Sensible Capacity:	**14,768**	W
Entering Air Dry Bulb Temperature:	**24.3**	C
Entering Air Wet Bulb Temperature:	**12.1**	C
Leaving Air Dry Bulb Temperature:	**11.2**	C
Leaving Air Wet Bulb Temperature:	**6.1**	C
Fluid Flow Rate:	**.6**	L/s
Fluid Pressure Drop:	**10.32**	kPa
Fluid Entering Temperature:	**7.2**	C
Fluid Leaving Temperature:	**12.8**	C

Electrical Data

Motor Voltage:	**460-3-60**	V-Ph-Hz
Motor FLA (per motor):	**1.9**	

Fan and Drive Data

Fan RPM:	**893**	
BHP:	**.69**	kW
Motor Nominal HP:	**1**	
Number of Turns:	**3.5**	
Drive Package Code:	**EP0**	

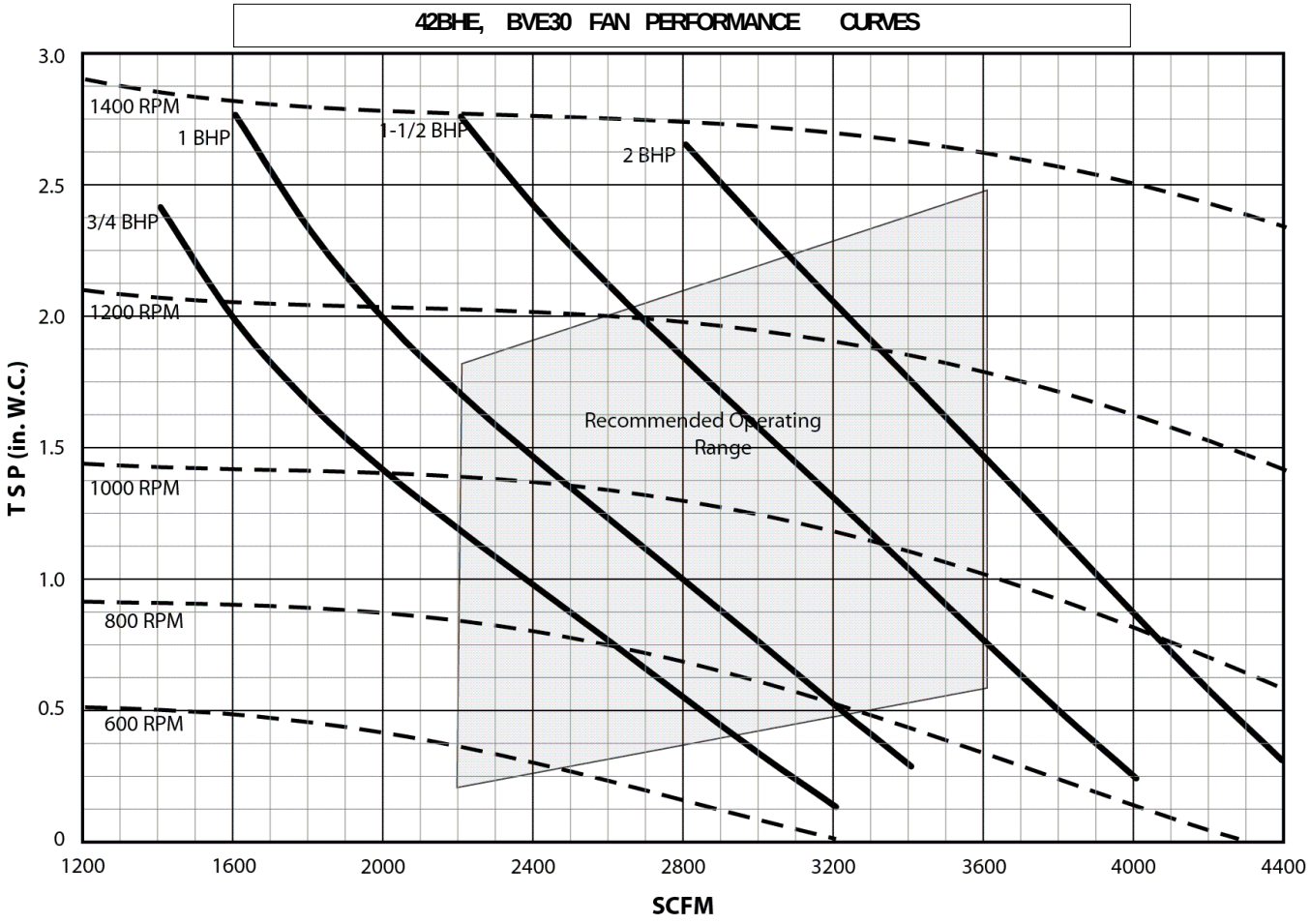
Factory-Installed Options

Unit Arrangement:	**Rear Return / Front Supply**
Filters:	**2 in. MERV 8 Pleated Filter**
Motor HP:	**1 HP**
AAV / Drains:	**Manual Air Vents only**
Coil Hand:	**Left Hand**
Thermostats:	**Field Supplied/Installed Thermostat**
Unit Controls:	**Motor Control with interlocking disc**
Insulation:	**Std. 1 in. Tufskin**
Packaging:	**Units shipped on treated wood pallet**

Performance Summary For FC14

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



FC15

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

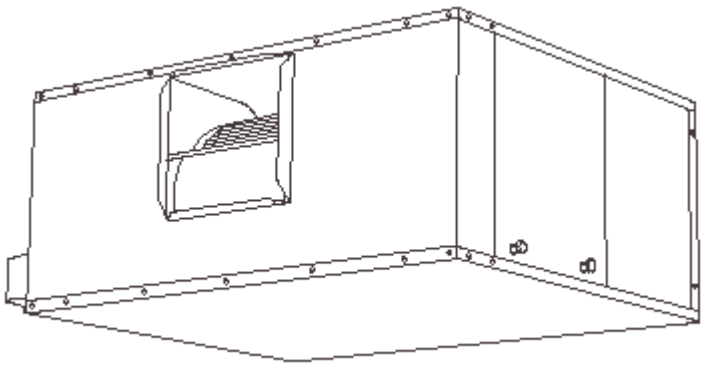
FC15

Tag Cover Sheet
Unit Report
Certified Drawing
Performance Report
Guide Specification

Unit Report For FC15

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



Unit Parameters

Tag Name:	**FC15**
Quantity:	**1**
Unit Model:	**42BHE20RG4L61911DE**
Unit Type:	**42BH Horizontal Belt Drive**
Unit Size:	**2000 CFM**
Shipping Options:	**Standard**

Dimensions

Unit Length:	**1022.35**	mm
Unit Width:	**1219.20**	mm
Unit Height:	**609.60**	mm
Operating Weight:	**157**	kg

Coil Parameters

System Type:	**2-Pipe Cooling Only**
Cooling Coil:	**Cold Fluid Cooling**
Cooling Coil Rows:	**8 Rows**
Coil Hand:	**Left Hand**

Electrical

Motor Voltage:	**460-3-60**	V-Ph-Hz

Fan and Drive Data

RPM:	**868**	
BHP:	**.44**	kW
Turns:	**1.5**	
Drive Code:	**DQ4**	

Warranty Information

First Year - Parts Only (Standard)

Ordering Information

Part Number	Description	Quantity
Base Unit		
	42BHE20RG4L61911DE	1
	42BHE20:Horizontal Belt-Drive Fan Coil 2000 CFM Cooling 460-3-60	
	3/4 HP Motor	
	Motor Control with interlocking disc	
	High Capacity 8-Row in lieu of standard 4-Row - For 2-pipe system	
	Field Supplied/Installed Thermostat	

Certified Drawing for FC15

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

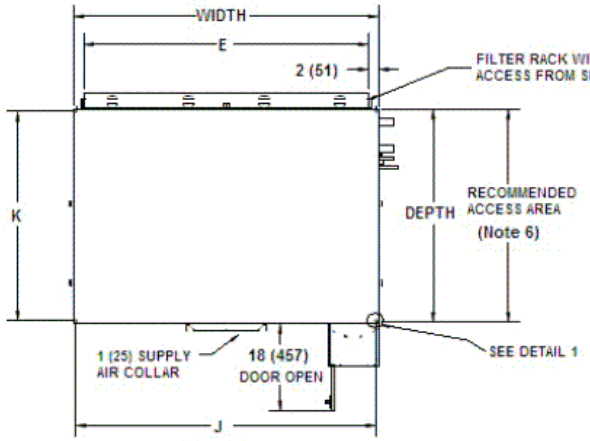
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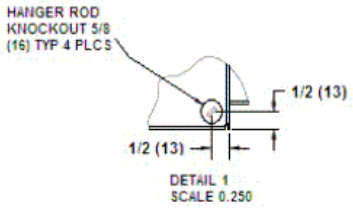
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HORIZONTAL BELT DRIVE UNIT (MOTOR CONTROLS)

42BHE

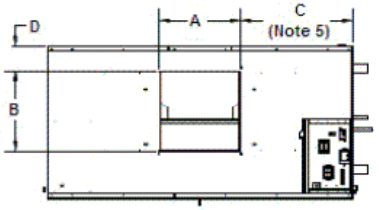


TOP VIEW

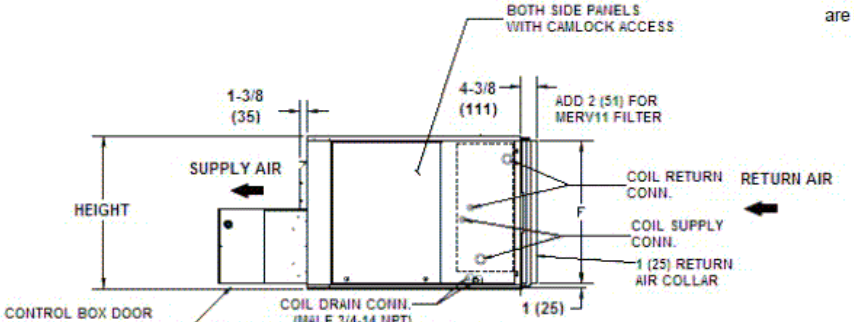


DETAIL 1
SCALE 0.250

NOTE:
1. R.H. shown, L.H. opposite.
2. All dimensions ±1/4".
3. Coil connections shown are for 4-pipe system. Heating coil is in re-heat position as standard.
4. For 4-pipe, DX/Hot water combination, hot water coil is always in pre-heat position as standard.
5. "C" dimension is measured from coil side of the unit.
6. Allow adequate spacing or maneuverability of unit to allow service through recommended access area.
7. Dimensions in parenthesis are in mm.



FRONT VIEW



SIDE VIEW

Unit Size	Dimensions											
	Fan Size	Depth	Width	Height	Supply Duct				Return Duct		Mounting Holes	
					A	B	C	D	E	F	J	K
06	9 x 4	36	28	19-3/4	7-1/8	10-1/2	14-1/2	2-1/4	24	16-1/2	27-1/4	35-1/4
08	9 x 6	36	28	19-3/4	8-1/2	10-1/2	13-7/8	2-1/4	24	16-1/2	27-1/4	35-1/4
10	10 x 4	37-1/2	37	21-1/2	7-1/8	11-9/16	15-1/4	2-1/4	33	18-1/4	36-1/4	37
12	10 x 7	37-1/2	37	21-1/2	9-15/16	11-9/16	13-7/8	2-1/4	33	18-1/4	36-1/4	37
16	11 x 10	37-3/4	47	21-1/2	13-3/8	12-3/4	16-3/4	2-1/4	43	18-1/4	46-1/4	37
20	12 x 9	40-1/4	48	24	12-1/2	13-3/4	17-3/4	2-1/4	44	20-3/4	47-1/4	39-1/2
30	12 x 12	40-1/4	48	32-1/4	15-7/8	13-3/4	16	7-1/4	44	29	47-1/4	39-1/2
40	15 x 12	43-1/2	62	32-1/4	16-7/16	16-1/16	22-3/4	6-1/4	58	29	61-3/4	42-1/2

JOB NAME

JOB NUMBER

DATE
01/14/2011

Carrier

DRAWING NUMBER	REVISION	SHEET
42BH-202-2	G	1 OF 1

Certified Drawing for FC15

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

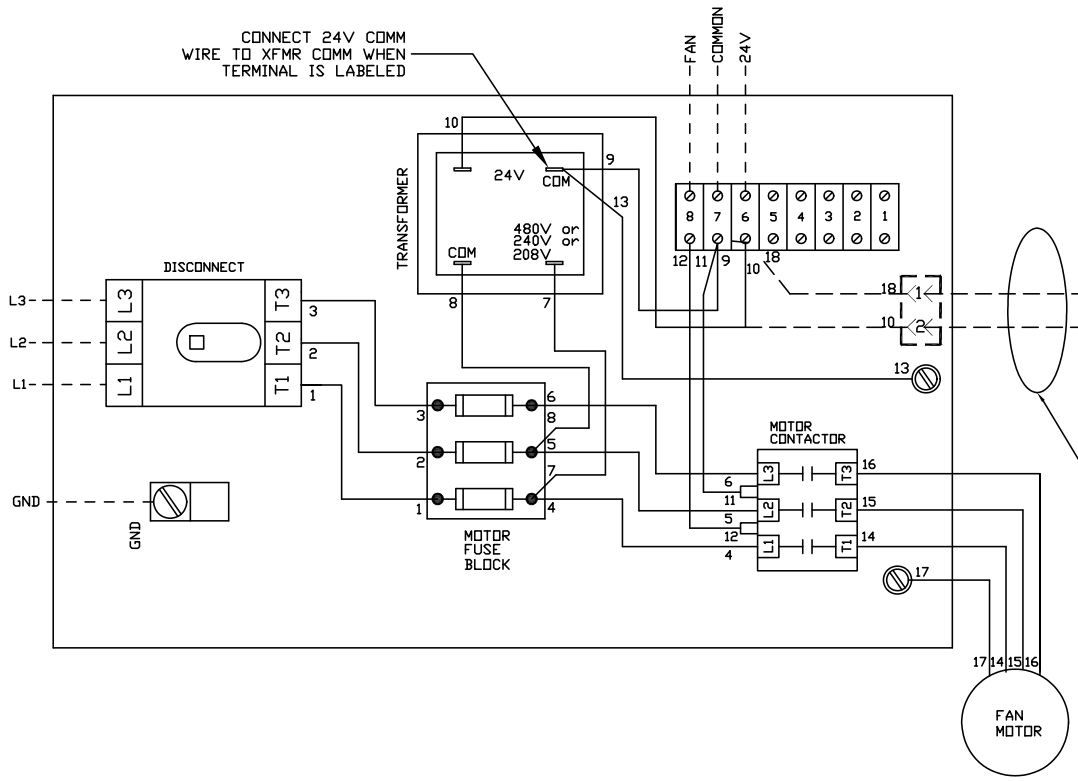
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MOTOR CONTROLS WITH INTERLOCKING DISCONNECT, 3-PHASE

42B



Wire	Gage	Color
1	1-12 AWG	Black
2	1-12 AWG	Red
3	1-12 AWG	Blue
4	1-12 AWG	Black
5	1-12 AWG	Red
6	1-12 AWG	Blue
7	1-18 AWG	Black
8	1-18 AWG	Red
9	1-18 AWG	Yellow
10	1-18 AWG	Orange
11	1-18 AWG	Yellow
12	1-18 AWG	Gray
13	1-18 AWG	Yellow
14	1-14 AWG	Black
15	1-14 AWG	Red
16	1-14 AWG	Blue
17	1-14 AWG	Green
18	1-18 AWG	Orange**

** Only Used With Overflow Switch.

LEGEND

AWG - American Wire Gage
GND - Ground
NC - Normally Closed
NO - Normally Open
Q/C - Quick Connect
XFMR - Transformer

WIRE CONNECTION
WIRE TAPED
FACTORY WIRING
FIELD WIRING
OPTIONAL COMPONENTS/WIRING

NOTES:

1. This is a point to point electrical diagram.
2. Caution: Disconnect power before servicing.
3. See nameplate for correct voltage, use 75°C min, copper conductors only. Unit terminals are not designed to accept any other wiring.
4. Blower motor(s) thermally protected.
5. All contractor wiring must conform to electrical codes, national and local.

JOB NAME		
JOB NUMBER		Carrier®
DATE: 02/10/2012		
DRAWING NUMBER: 42B-204-6	REVISION	SHEET: 1 OF 1

Performance Summary For FC15

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM

Unit Parameters

Tag Name:	**FC15**
Quantity:	**1**
Unit Model:	**42BHE20RG4L61911DE**
Unit Type:	**42BH Horizontal Belt Drive**
Unit Size:	**2000 CFM**
System Type:	**2-Pipe Cooling Only**
Cooling Coil:	**Cold Fluid Cooling**
Cooling Coil Rows:	**8 Rows**
Coil Hand:	**Left Hand**
Shipping Options:	**Standard**

Unit Performance

Actual Airflow:	**900.0**	L/s
Altitude:	**2,590**	m
External Static Pressure:	**.13**	kPa
Total Static Pressure:	**.27**	kPa
Voltage:	**460-3-60**	V-Ph-Hz

Cooling Data

Coil Type:	**Cold Fluid Cooling**	
Coil Rows:	**8 Rows**	
Fluid Type:	**Propylene Glycol**	
Brine Concentration:	**40**	
Total Capacity:	**10,493**	W
Sensible Capacity:	**10,493**	W
Entering Air Dry Bulb Temperature:	**24.7**	C
Entering Air Wet Bulb Temperature:	**13.5**	C
Leaving Air Dry Bulb Temperature:	**11.6**	C
Leaving Air Wet Bulb Temperature:	**7.8**	C
Fluid Flow Rate:	**.5**	L/s
Fluid Pressure Drop:	**12.89**	kPa
Fluid Entering Temperature:	**7.2**	C
Fluid Leaving Temperature:	**12.8**	C

Electrical Data

Motor Voltage:	**460-3-60**	V-Ph-Hz
Motor FLA (per motor):	**1.5**	

Fan and Drive Data

Fan RPM:	**868**	
BHP:	**.44**	kW
Motor Nominal HP:	**3/4**	
Number of Turns:	**1.5**	
Drive Package Code:	**DQ4**	

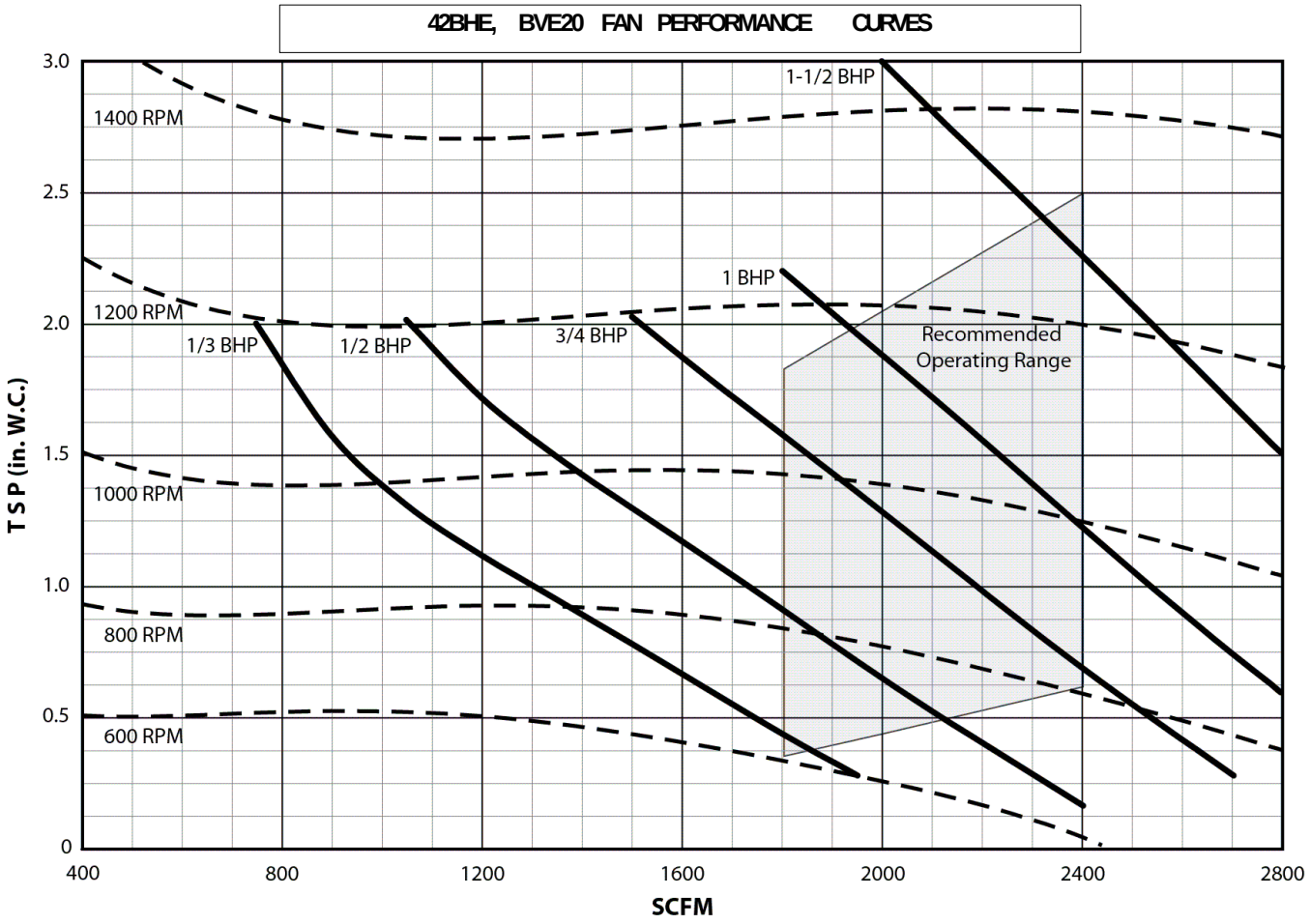
Factory-Installed Options

Unit Arrangement:	**Rear Return / Front Supply**
Filters:	**2 in. MERV 8 Pleated Filter**
Motor HP:	**3/4 HP**
AAV / Drains:	**Manual Air Vents only**
Coil Hand:	**Left Hand**
Thermostats:	**Field Supplied/Installed Thermostat**
Unit Controls:	**Motor Control with interlocking disc**
Insulation:	**Std. 1 in. Tufskin**
Packaging:	**Units shipped on treated wood pallet**

Performance Summary For FC15

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/22/2014
02:15PM



Guide Specification for FC15

Project: SPMT Telescope 06/22/2014
Prepared By: Rebecca T. Callimanis 02:15PM

HVAC Guide Specifications
System Fan Coil Unit

Size Range:
600 to 4000 Nominal Cfm

Carrier Model Numbers:
42BHE (Horizontal Fan Coil Unit)
42BVE (Vertical Fan Coil Unit)

Part 1 — General

1.01 SYSTEM DESCRIPTION

Horizontal and vertical, 2-pipe or 4-pipe, belt-driven, galvanized casing model fan coil unit for ducted installation above the ceiling or within floor-mounted cabinet, with full access to internal components.

1.02 QUALITY ASSURANCE

A. Unit shall be constructed in accordance with ETL and ETL, Canada standards. Units comply with the minimum requirements of the US and Canadian national product safety standard, UL 1995/CSA C22.2 No. 236. Factory-installed motors and electric heaters shall be UL approved. Insulation and adhesive shall meet NFPA-90A requirements for flame spread and smoke generation.
B. Coils shall be tested in accordance with AHRI standard 410, latest edition. Each coil shall be factory tested for leakage at 300-psig air pressure with coil submerged in water.

1.03 DELIVERY, STORAGE AND HANDLING

Unit shall be handled and stored in accordance with the manufacturer's instructions.

Part 2 — Products

2.01 EQUIPMENT

A. General:
Factory-assembled, horizontal and vertical, draw-thru type fan coil unit for ducted installation above the ceiling or floor mounting. Unit shall be complete with water coils, fan(s), motor, belt drive, drain pan, and filter.
B. Casing:
Construction shall be heavy-gage galvanized steel, lined with one-in. thick fiberglass Tuf-Skin™ II thermal/acoustical insulation. Knockouts shall be provided for hanging the horizontal unit, that will accept 3/8-in. threaded rod at the top and bottom of all unit corners. Supply and return duct connections shall be 1 in. long. Removable side panels shall be provided for access to the fan/motor assembly. Access panels shall be easily removable with hex key tool on vertical unit, and without tools on horizontal unit. A double-sloped drain pan shall be constructed of stainless steel, extending under the full length and width of the coil(s) with a 3/4-in. male nominal pipe thread stainless steel drain connection and 1/2-in. male NPT stainless secondary drain connection (cap when not required). The outside surface of the drain pan shall be insulated with 1/8-in. closed cell insulation. Drain pan is removable from cabinet from same end as coil connections for ease of cleaning.
C. Fans:
Belt-driven, double-width fan wheels shall have forward- curved blades and be statically and dynamically balanced. Fan drive shall consist of variable-pitch motor pulley, fixed-diameter blower sheave with keyed shaft, and V-belt. Fan drive shall be designed for 120% of rated fan horsepower. Fans and scrolls shall be of galvanized steel. Bearings are ball bearings, permanently lubricated and sealed for life. Bearings are isolated from the blower housing by rubber mounts set into heavy gage metal support system. The blower housing shall be isolated from the cabinet and motor.
D. Coils:
Standard unit shall be equipped with a 4-row coil for installation in a 2-pipe system and additional rows of coil shall be provided as an option for installation in a 4-pipe system. Coils shall have 1/2-in. copper tubes, aluminum fins bonded to the tubes by mechanical expansion and have a working pressure of 250 psig at 200 F. Each coil shall have a manual air vent and sweat connections for copper tubes.
E. Operating Characteristics:
A single-circuit coil unit installed in a 2-pipe system shall be capable of providing heating or cooling as determined by the operating mode of the central water supply system. A double-circuit coil unit installed in a 4-

pipe system shall be capable of providing sequenced heating and cooling.

F. Motor(s):
   1. Fan motors shall be open, drip-proof, single-speed, 60 Hz, 1750 rpm single or 3 phase, suitable for continuous duty at 104 F (40 C). Single-phase motors are capacitor start, include automatic reset thermal overload protection and are available in 115, 208, 230, or 277 volts (60 Hz) or 220 volts (50 Hz). Three-phase motors are available in 208, 230, or 460 volts (60 Hz) or 380 volts (50 Hz).
   2. Motors are Class B, continuous duty rated. Motors are resilient mounted (1/4 to 2 HP), rigid base mounted (3 and 5 HP), NEMA frame motors. Motors are factory wired to unit junction or control box. Motor bearings are permanently lubricated. Motors are mounted on an adjustable base for belt tensioning and alignment. The motor and drive are installed on the same end as the coil connection for ease of service.

G. Special Features:
   1. Coils:
      a. Unit coil(s) shall be equipped with automatic air vent(s).
      b. Unit shall be equipped with a high-capacity 6-row or 8-row coil for installation in a 2-pipe system.
      c. For installation in a 4-pipe system, unit shall be equipped with either a 4-row cooling/1-row hot water heating split-circuit coil, or a 4/2, 6/1, or 6/2 split-circuit coil as required.
      d. Unit shall be equipped with either a 4-row DX (direct expansion) cooling coil or a 6-row DX cooling coil as required.
      e. Unit coil(s) shall be copper fin, copper tube with stainless steel end sheets and baffles.
   2. Filters:
      a. A two-in. pleated filter shall be installed in the unit (standard).
      b. One-in. pleated, two 1-in. throwaway or 2-in. pleated MERV 11 filters with 2-in. prefilter shall be installed as indicated on the equipment schedule.
   3. Insulation:
      a. Units shall be equipped with 1-in. thick Tuf-Skin™ II insulation (standard).
      b. Units are available with 1-in. closed cell, 1-in. anti-microbial fiberglass, or 1-in. foil-faced insulation.
   4. Controls:
      a. Unit shall be equipped with 24-v transformer, motor contactor and terminal strip for connection to field or factory provided controller.
      b. Unit shall be equipped with interlocking door-disconnect switch with lock-out tag-out compatibility, touch-type fusing, 24-v transformer, motor contactor and terminal strip for connection to field provided controller.
      c. Unit shall be equipped with interlocking door-disconnect switch with lock-out tag-out compatibility, separate motor and electric heater touch-type fusing, 24-v transformer, motor contactor and terminal strip for connection to field-provided or factory-provided controller.
      d. Fuses comply with NFPA 70E/IP20.
   5. Electric Heat:
      a. Electric heaters shall be constructed of high-grade resistance wire supported by ceramic insulators on plated steel brackets. The heat elements shall be suspended in front of the outlet, after the blower and coil. An auto and manual thermal limit switch shall protect the heat elements in the event of an air failure.
      b. Single-phase heaters shall be available in 115, 208, 230, or 277 volts (60 Hz) or 220 volts (50 Hz). Three-phase electric heat shall be available in 208, 230, or 460 volts (60 Hz) or 380 volts (50 Hz).
      c. Electric heaters can be controlled in single, 2, or 3 stages of operation.
   6. Mixing Boxes:
      a. Mixing boxes shall be preassembled at the factory and shipped separately with base rails.
      b. Mixing boxes shall include a linkage kit, which consists of two crankarms, 2 swivels and a rod, 25 in. long (for unit sizes 06-16) or 84 in. long (for unit sizes 20-40), for the field installation of the actuator.
   7. Cabinet:
      a. Optional double wall construction with choice of 1-in. fiberglass or 1-in. closed cell insulation with solid or perforated inner liners. An antimicrobial coating can also be added.
      b. Optional seismic structural upgrade to meet IBC-2009 and OSHPD seismic certification in accordance with ICC-ES-AS-156.

NH-EL

The evolution of the industry's most trusted electrode steam humidifier



NH
SERIES

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The all new Nortec NH-EL

The NH-EL is the newest electrode steam humidifier from Nortec. With forty years experience and a leader in commercial humidification, Nortec has developed an all new touch screen controller that is easy to navigate and contains more information than ever before.

The NH-EL features:

- Intuitive touch screen control
- Standard building automation support with integrated BACnet
- Internet connectivity for remote factory diagnosis
- USB port for performance downloads
- SIM card storage of all operational information and user changes
- New cabinet design and smaller footprint than previous NH models
- Zero unit side clearance

For many years, electrode steam has been the number one selling commercial humidifier. Today it is one of the best humidification solutions for high performance in green buildings with a thermal efficiency of 98%, excellent water management and longest lifecycle.



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Canada 2740 Fenton Road, Ottawa, Ontario K1T 3T7
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humidity.com

13-651

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3900 Dr. Greaves Rd. • Kansas City, MO 64030 • (816) 761-7476 • FAX (816) 765-8955

EME6625D WIND-DRIVEN RAIN RESISTANT STATIONARY LOUVER

MIAMI-DADE APPROVED **FLORIDA PRODUCT APPROVAL # FL3268.1**

MIAMI-DADE COUNTY, FLORIDA NOTICE OF ACCEPTANCE NUMBER: 12-0628.06 (1/28/17)

STANDARD CONSTRUCTION

LOUVER FRAME
6" (152) deep, 6063T5 extruded aluminum with .125" (3.2) nominal wall thickness.

LOUVER BLADES
6063T5 extruded aluminum .081" (2.1) nominal wall thickness. Blades are mounted vertically.

BIRD SCREEN
1/2" x .063" (13 x 1.6) square mesh aluminum bird screen in removable frame. Screen adds approximately 1/2" (13) to louver depth.

FINISH
Mill.

MINIMUM SIZE
12"w x 12"h (305 x 305).

APPROXIMATE SHIPPING WEIGHT
12 lbs. per sq. ft. (58.6 kg/m²)

MAXIMUM SHIPPING SECTION SIZE
48"w x 96"h (1219 x 2438).

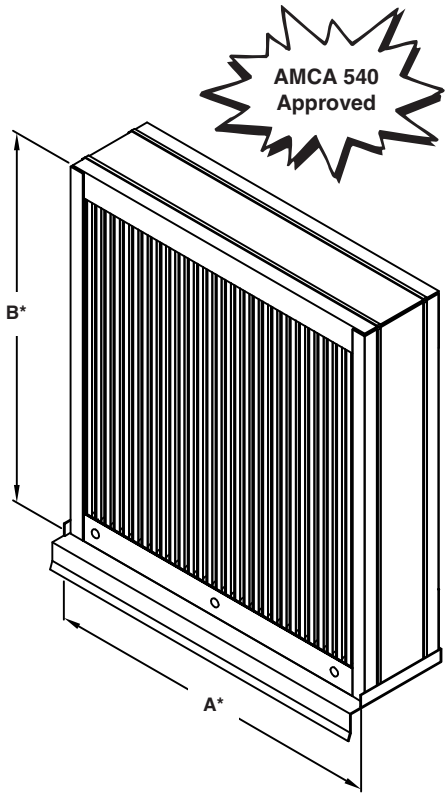
MAXIMUM OVERALL ASSEMBLY SIZE
Unlimited width x 96"h (2438) with or without damper. Overall assembly consists of individual sections combined in the field (combination of sections in the field not by Ruskin).

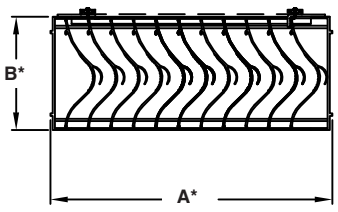
INSTALLATION
The EME6625D must be installed per the appropriate Installation Detail. Reference the appropriate separate Installation Instruction Sheets.

Consult Ruskin for additional information.

EME6625D meets the requirements for the following:
- Miami-Dade NOA Approval 12-0628.06
- * AMCA 540 and AMCA 550 approved
- Florida Product Approved FL3286.1
- AMCA 500-L Tested

Please reference our website www.ruskin.com for up to date LEED® information





Front
(Plan View)

FEATURES

- Large missile impact resistant per Miami-Dade PA-201 test protocol.
- The EME6625D Louver is approved for use in open structures with provisions to manage weather infiltration (wet rooms).
- The EME6625D Louver/CD50 Control Damper combination is approved for use in closed structures without provisions to manage weather infiltration (dry rooms) over 33' (10m) in elevation. Approved for closed structures with weather management provisions (wet rooms) above 33' (10m) in elevation.
- Maximum windload with and without damper +160 PSF (7.66 KPa), -140 PSF (-6.70 KPa).
- 42% Free Area.
- Published free area and pressure drop

Performance ratings based on testing in accordance with AMCA Publication 500-L.

VARIATIONS

- Filter racks.
- A variety of bird and insect screens.

Consult Ruskin for other special requirements
- Selection of finishes: prime coat, 50% PVDF (modified fluoropolymer), epoxy, Pearledize, 70% PVDF, clear and color anodize. (Some variation in anodize color consistency is possible).
- On EME6625D/CD50 Combination Units, the CD50 Damper and sleeve are shipped separately and must be combined with the EME6625D in the field (combination of louver/ damper not by Ruskin).

*Please provide Rough Opening Dimensions for "A" and "B" dimensions. Unless ordered as actual size, the louver will be provided 1/2" (12) smaller than the "A" and "B" dimensions provided.

Dimensions in inches, parenthesis ( ) indicate millimeters.

TAG	QTY.	SIZE		INST. CHANNEL DEPTH	VARIATIONS
		A*-WIDE	B*-HIGH		

PROJECT **LOCATION**
ARCH./ENGR. **CONTRACTOR**
REPRESENTATIVE **DATE**

 ALL STATED SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE OR OBLIGATION. © Ruskin May 2013

SUGGESTED SPECIFICATION

Furnish and install louvers as hereinafter specified where shown on plans or as described in schedules. Louvers shall possess stationary vertical blades designed to prevent the penetration of wind driven rain. Louver blades shall be contained within a 6" (152) frame. Extended sill shall be provided to capture and drain water to exterior of building. Louver components (heads, jambs, sill and blades) shall be factory assembled by the louver manufacturer. Louver sizes too large for shipping shall be built up by the contractor from factory assembled louver sections to provide overall sizes required. Louver design shall incorporate visible mullions on units larger than 48” x 96” (1219 x 2438).

Louvers shall be Ruskin Model EME6625D extruded 6063T6 aluminum alloy construction as follows:

MATERIAL

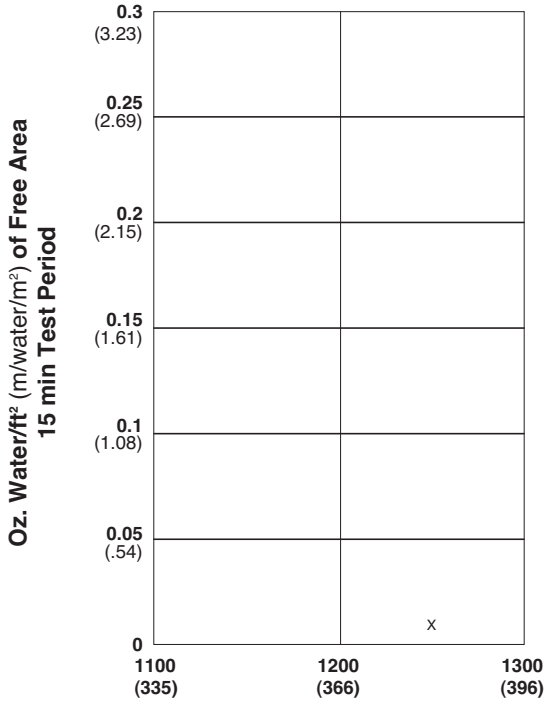
Frame:	.125" (3.2) wall thickness, caulking surfaces provided.
Blades:	081" (2.1) nominal wall thickness. Blades are mounted vertically.
Extended Sill:	. 063” (2.1) wall thickness with upturned side panels to prevent water leakage.
Screen:	1/2" x .040" (13 x 1.6) aluminum bird screen in removable frame.
Finish:	Select finish specification from Ruskin Finishes Brochure.

STRUCTURAL DESIGN

Integral structural supports shall be designed and furnished by the louver manufacturer to carry a wind load of not less than +160 PSF (7.66 KPa), -140 PSF (-6.70 KPa).

WATER PENETRATION GRAPH

Test size 48" x 48" (1219 x 1219)
Beginning point of water penetration at .01 oz./sq. ft. is above 1250 fpm (381 m/min.)



WIND-DRIVEN RAIN PERFORMANCE - AMCA 500-L WIND-DRIVEN RAIN TEST

Test size is 1m x 1m (39" x 39") core area, 1.05m x 1.08m (41 1/4" x 42 5/16") nominal. Free Area of test louver is 4.86 ft² (.45m²).

Wind Velocity mph (kph)	Rain Fall Rate In./hr. (mm/hr.)	Core Velocity[1] fpm (m/s)	Airflow cfm (m³/min)	Free Area Velocity[2] fpm (m/sec.)	Effectiveness Ratio	Class[3, 4]
29 (46.4)	3 (76)	970 (5)	10,444 (295)	2,149 (10.9)	100%	A
50 (80.5)	8 (203)	982 (5)	10,570 (298)	2,175 (11.0)	99.8%	A

NOTES

1. Core area is the open area of the louver face (face area less louver frames). Core Velocity is the airflow velocity through the Core Area of the louver (1m x 1m). 5m/s is the maximum core velocity utilized in this test.
2. Free Area of test size is calculated per AMCA standard 500-L.
3. Wind Driven Rain Penetration Classes:

Class	Effectiveness	Class	Effectiveness
A	1 to .99	C	0.949 to 0.80
B	0.989 to 0.95	D	Below 0.8

4. The EME6625D provides Class A performance at all velocities up to and including 5 m/s core velocity.

FREE AREA GUIDE

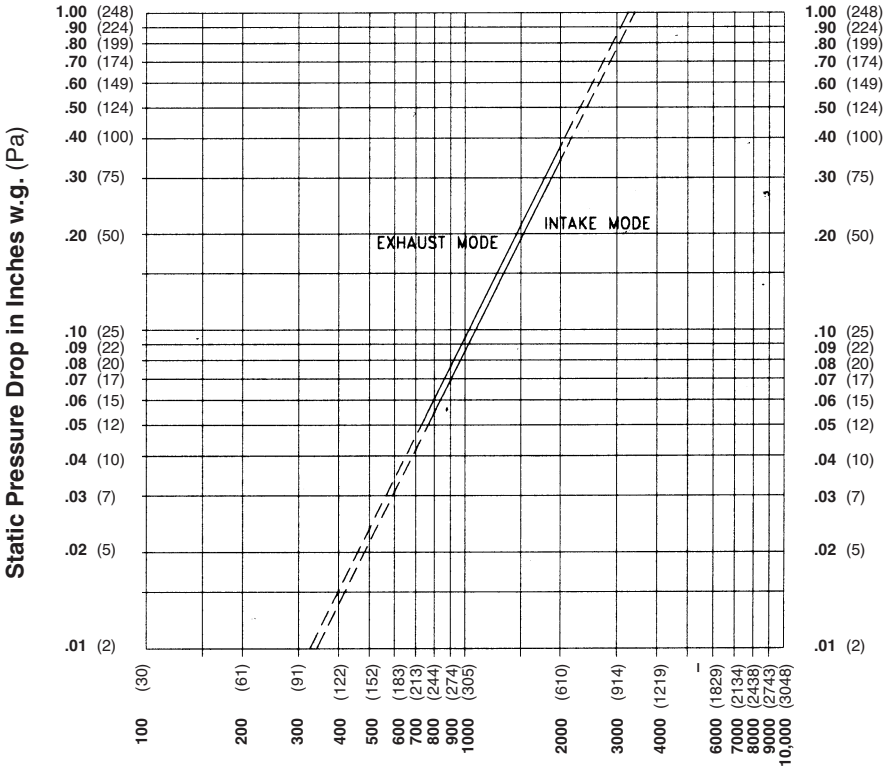
Free Area Guide shows free area in ft² and m² **for various sizes of EME6625D.**

Width – Inches and Meters

Height – Inches and Meters

	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120
	0.30	0.46	0.61	0.76	0.91	1.07	1.22	1.37	1.52	1.68	1.83	1.98	2.13	2.29	2.44	2.59	2.74	2.90	3.05
12	**0.11**	**0.18**	**0.25**	**0.32**	**0.39**	**0.45**	**0.52**	**0.59**	**0.66**	**0.73**	**0.80**	**0.87**	**0.94**	**1.01**	**1.07**	**1.14**	**1.21**	**1.28**	**1.35**
0.30	0.01	0.02	0.02	0.03	0.04	0.04	0.05	0.06	0.06	0.07	0.07	0.08	0.09	0.09	0.10	0.11	0.11	0.12	0.13
18	**0.33**	**0.54**	**0.74**	**0.95**	**1.16**	**1.36**	**1.57**	**1.78**	**1.98**	**2.19**	**2.40**	**2.60**	**2.81**	**3.02**	**3.22**	**3.43**	**3.64**	**3.84**	**4.05**
0.46	0.03	0.05	0.07	0.09	0.11	0.13	0.15	0.17	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.32	0.34	0.36	0.38
24	**0.55**	**0.89**	**1.24**	**1.58**	**1.93**	**2.27**	**2.62**	**2.96**	**3.31**	**3.65**	**4.00**	**4.34**	**4.68**	**5.03**	**5.37**	**5.72**	**6.06**	**6.41**	**6.75**
0.61	0.05	0.08	0.12	0.15	0.18	0.21	0.24	0.28	0.31	0.34	0.37	0.40	0.44	0.47	0.50	0.53	0.56	0.60	0.63
30	**0.77**	**1.25**	**1.73**	**2.22**	**2.70**	**3.18**	**3.66**	**4.15**	**4.63**	**5.11**	**5.59**	**6.08**	**6.56**	**7.04**	**7.52**	**8.01**	**8.49**	**8.97**	**9.45**
0.76	0.07	0.12	0.16	0.21	0.25	0.30	0.34	0.39	0.43	0.48	0.52	0.57	0.61	0.65	0.70	0.74	0.79	0.83	0.88
36	**0.99**	**1.61**	**2.23**	**2.85**	**3.47**	**4.09**	**4.71**	**5.33**	**5.95**	**6.57**	**7.19**	**7.81**	**8.43**	**9.05**	**9.67**	**10.29**	**10.91**	**11.53**	**12.15**
0.91	0.09	0.15	0.21	0.27	0.32	0.38	0.44	0.50	0.55	0.61	0.67	0.73	0.78	0.84	0.90	0.96	1.01	1.07	1.13
42	**1.21**	**1.97**	**2.73**	**3.48**	**4.24**	**5.00**	**5.76**	**6.52**	**7.27**	**8.03**	**8.79**	**9.55**	**10.31**	**11.06**	**11.82**	**12.58**	**13.34**	**14.10**	**14.85**
1.07	0.11	0.18	0.25	0.32	0.39	0.46	0.54	0.61	0.68	0.75	0.82	0.89	0.96	1.03	1.10	1.17	1.24	1.31	1.38
48	**1.43**	**2.32**	**3.22**	**4.12**	**5.01**	**5.91**	**6.80**	**7.70**	**8.60**	**9.49**	**10.39**	**11.28**	**12.18**	**13.08**	**13.97**	**14.87**	**15.76**	**16.66**	**17.56**
1.22	0.13	0.22	0.30	0.38	0.47	0.55	0.63	0.72	0.80	0.88	0.97	1.05	1.13	1.22	1.30	1.38	1.47	1.55	1.63
54	**1.65**	**2.68**	**3.72**	**4.75**	**5.78**	**6.82**	**7.85**	**8.88**	**9.92**	**10.95**	**11.99**	**13.02**	**14.05**	**15.09**	**16.12**	**17.15**	**18.19**	**19.22**	**20.26**
1.37	0.15	0.25	0.35	0.44	0.54	0.63	0.73	0.83	0.92	1.02	1.11	1.21	1.31	1.40	1.50	1.60	1.69	1.79	1.88
60	**1.87**	**3.04**	**4.21**	**5.38**	**6.55**	**7.73**	**8.90**	**10.07**	**11.24**	**12.41**	**13.58**	**14.76**	**15.93**	**17.10**	**18.27**	**19.44**	**20.61**	**21.79**	**22.96**
1.52	0.17	0.28	0.39	0.50	0.61	0.72	0.83	0.94	1.05	1.15	1.26	1.37	1.48	1.59	1.70	1.81	1.92	2.03	2.13
66	**2.09**	**3.40**	**4.71**	**6.02**	**7.33**	**8.64**	**9.94**	**11.25**	**12.56**	**13.87**	**15.18**	**16.49**	**17.80**	**19.11**	**20.42**	**21.73**	**23.04**	**24.35**	**25.66**
1.68	0.19	0.32	0.44	0.56	0.68	0.80	0.92	1.05	1.17	1.29	1.41	1.53	1.66	1.78	1.90	2.02	2.14	2.26	2.39
72	**2.31**	**3.76**	**5.20**	**6.65**	**8.10**	**9.54**	**10.99**	**12.44**	**13.89**	**15.33**	**16.78**	**18.23**	**19.67**	**21.12**	**22.57**	**24.02**	**25.46**	**26.91**	**28.36**
1.83	0.21	0.35	0.48	0.62	0.75	0.89	1.02	1.16	1.29	1.43	1.56	1.70	1.83	1.96	2.10	2.23	2.37	2.50	2.64
78	**2.53**	**4.11**	**5.70**	**7.28**	**8.87**	**10.45**	**12.04**	**13.62**	**15.21**	**16.79**	**18.38**	**19.96**	**21.55**	**23.13**	**24.72**	**26.30**	**27.89**	**29.47**	**31.06**
1.98	0.24	0.38	0.53	0.68	0.82	0.97	1.12	1.27	1.41	1.56	1.71	1.86	2.00	2.15	2.30	2.45	2.59	2.74	2.89
84	**2.75**	**4.47**	**6.19**	**7.92**	**9.64**	**11.36**	**13.08**	**14.81**	**16.53**	**18.25**	**19.98**	**21.70**	**23.42**	**25.15**	**26.87**	**28.59**	**30.31**	**32.04**	**33.76**
2.13	0.26	0.42	0.58	0.74	0.90	1.06	1.22	1.38	1.54	1.70	1.86	2.02	2.18	2.34	2.50	2.66	2.82	2.98	3.14
90	**2.97**	**4.83**	**6.69**	**8.55**	**10.41**	**12.27**	**14.13**	**15.99**	**17.85**	**19.71**	**21.57**	**23.44**	**25.30**	**27.16**	**29.02**	**30.88**	**32.74**	**34.60**	**36.46**
2.29	0.28	0.45	0.62	0.80	0.97	1.14	1.31	1.49	1.66	1.83	2.01	2.18	2.35	2.53	2.70	2.87	3.04	3.22	3.39

PRESSURE DROP

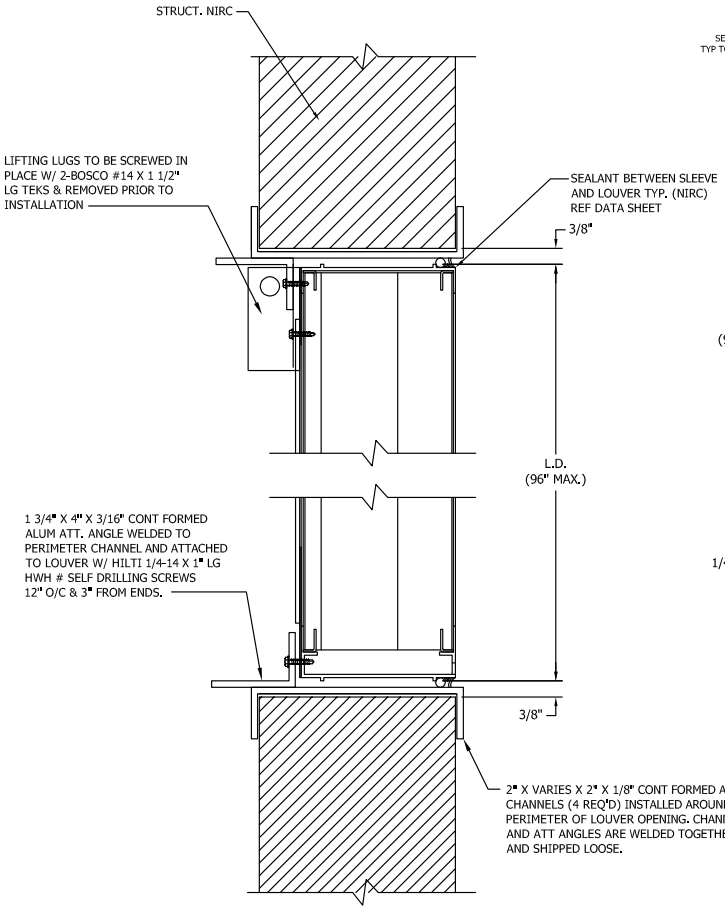


Air Velocity in feet and (meters) **per minute through Free Area**

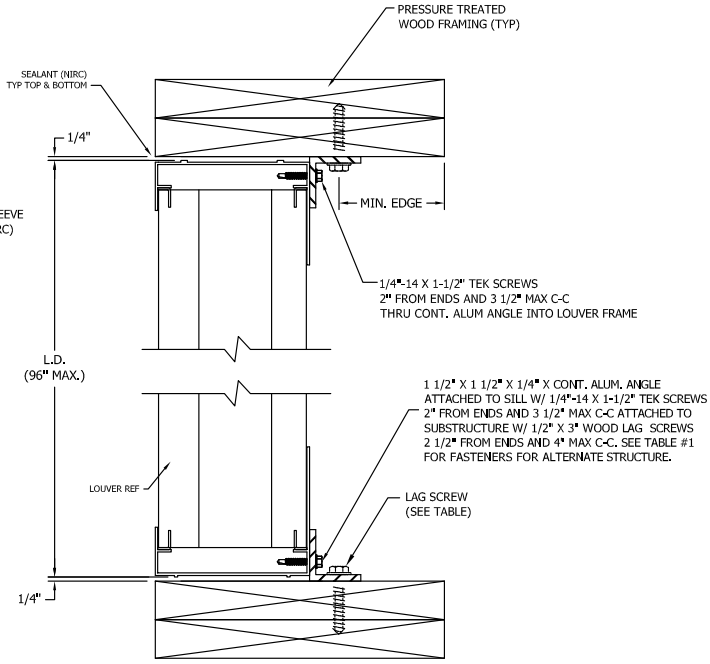
(Data corrected to standard air density and AMCA figure tested to 5.5)

Ratings do not include the effect of a bird screen.

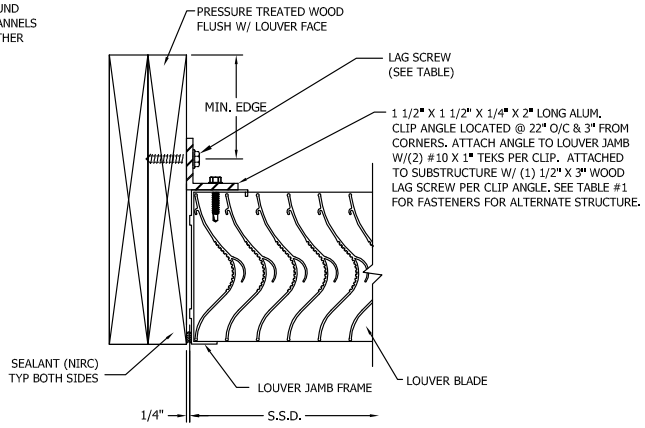
EME6625D CONSTRUCTION INFORMATION



1 - HEAD AND SILL DETAIL-INSTALLATION CHANNEL (JAMB SIMILAR)
N.T.S



2 - HEAD AND SILL DETAIL WOOD SUBSTRATE
N.T.S



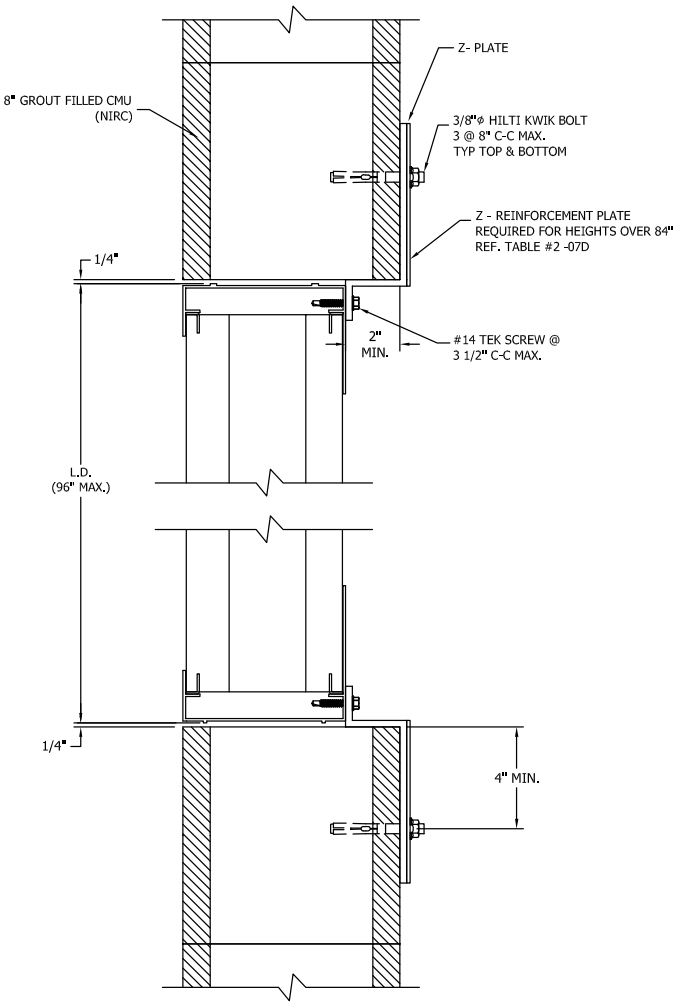
3 - JAMB DETAIL WOOD SUBSTRATE
N.T.S

TABLE #1: APPROVED ATTACHMENTS

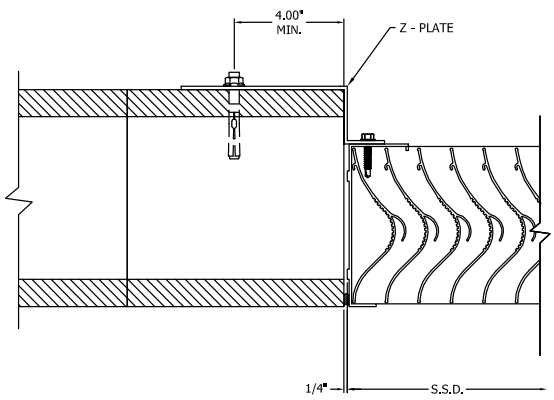
MIN. SUPPORT MAT'L	TYPE CONNECTION	ANGLE SLOT WIDTH	MAX SPACING	MIN EMBEDMENT	MIN EDGE
(12 GA MIN) STEEL	5/16"ϕ A307 OR SDS	3/8"	3 1/2" C-C MAX.	N/A	2 1/2"
(4" MIN) CONCRETE	3/8"ϕ KB TZ	7/16"	6" C-C MAX.	2"	3"
(8" CMU) GROUT FILLED MASONRY	3/8"ϕ KBIII	7/16"	8" C-C MAX.	2 1/2"	4"
(2 - 2 X 10) WOOD	1/2"ϕ X 3 LAG SCREW	9/16"	4" C-C MAX.	3"	2 1/2"

NOTE: ALL FASTENERS MUST BE INSTALLED PER THE MANUFACTURER'S FLORIDA/DADE COUNTY APPROVED INSTALLATION INSTRUCTIONS

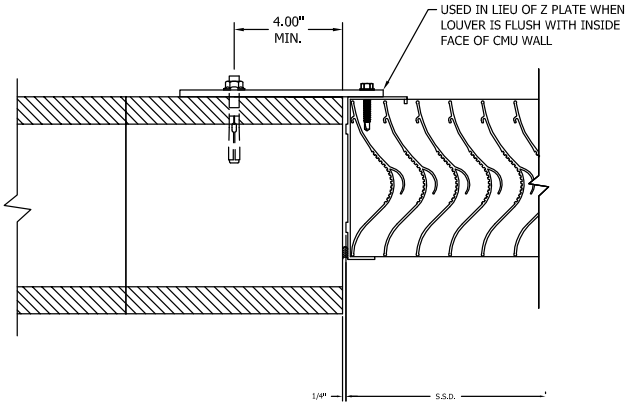
EME6625D CONSTRUCTION INFORMATION



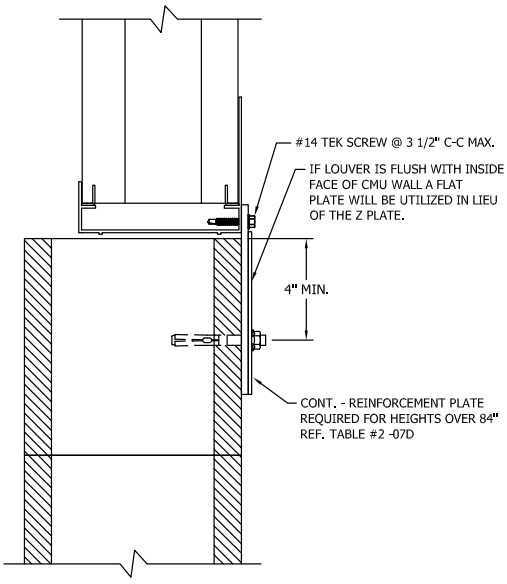
4 - HEAD AND SILL DETAIL GROUT FILLED CMU (FRONT FLUSH)
N.T.S



5 - JAMB DETAIL: GROUT FILLED CMU (FRONT FLUSH)
N.T.S

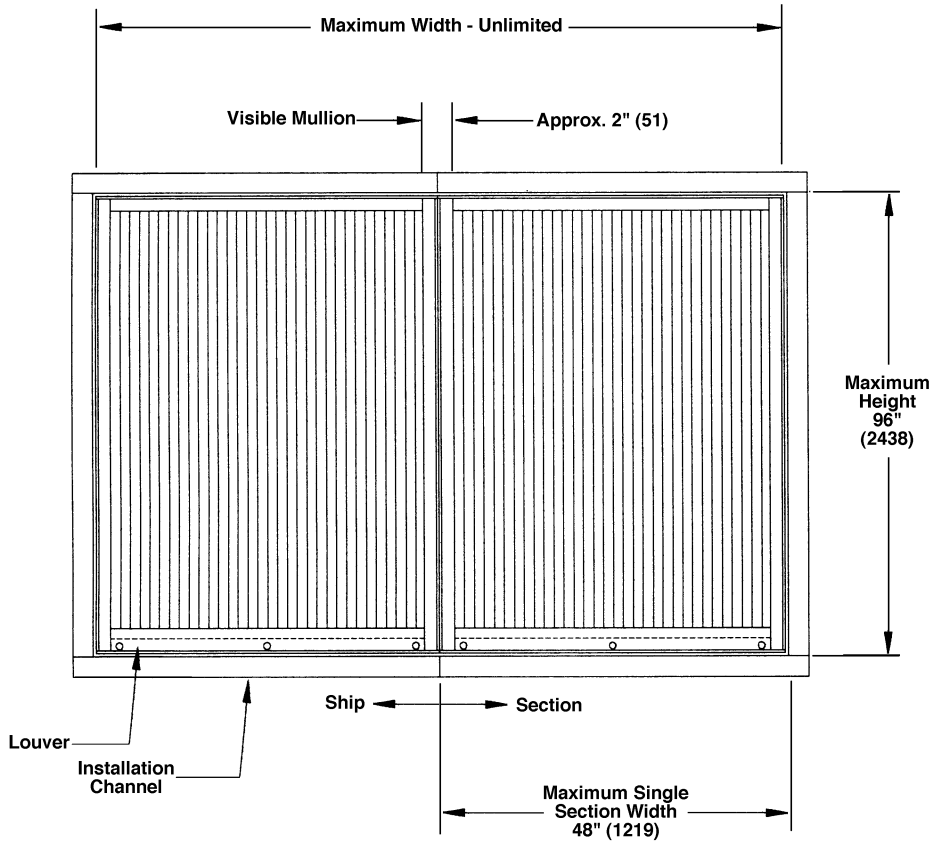


6 - JAMB DETAIL GROUT FILLED CMU (REAR FLUSH)
N.T.S



7 - SILL DETAIL GROUT FILLED CMU (REAR FLUSH) (HEAD SIMILAR)
N.T.S

EME6625D CONSTRUCTION INFORMATION



General Notes:

1. Reference separate Installation Instruction sheets (with and without optional damper) for installation details. The installation methods indicated must be complied with for Miami-Dade Approval. It is the responsibility of the installing contractor to properly install the louvers per the appropriate detail.
2. On special orders, Ruskin may provide submittal and/or shop drawings. Reference these drawings for additional installation information.
3. Louvers wider than the maximum single section width will be shipped in multiple sections and will require field assembly. Field assembly is not by Ruskin.
4. Installation channels are shipped loose.

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Fiberglass Underground Wastewater Tanks



Xerxes Fiberglass Wastewater Tanks

Fiberglass Tanks for Long-Term Storage of Wastewater

As communities, businesses and industries become increasingly accountable to meet environmental requirements for liquids that require safe, design-proven storage, Xerxes is in the forefront with innovative answers. When considering the options in customized systems to process and store wastewater, facility designers and owners look for a long-term, structurally strong, watertight and cost-effective option. That is exactly what the Xerxes fiberglass tank is.

For decades, Xerxes has been well-known as a major tank supplier to the petroleum industry, with more than 150,000 tanks installed. Many of the world's largest oil companies rely on Xerxes to supply environmentally safe underground tanks for storage of gasoline at their retail service stations. Throughout the neighborhoods and communities of America, Xerxes underground tanks are in place, simultaneously storing products and protecting the environment.

Today Xerxes is taking its place in those same neighborhoods and communities as a major supplier of storage tanks for wastewater applications — including septic, recirculation, dosing and holding tanks — as well as other liquids, such as leachate, chemicals, potable water, fire-protection water, irrigation water, gray water, rain water, stormwater and emergency-supply water. Each time a Xerxes fiberglass underground tank is delivered to a customer, the same performance standard has been met — a vessel for safe underground storage of liquid and careful protection of the environment.

Tanks Designed & Manufactured by a Long-Time Industry Leader

Xerxes is a leader in the design and manufacture of high-quality, cost-effective products that help protect the fragile relationship between humans and their environment. Each Xerxes wastewater tank represents decades of innovation and proven experience developing and fabricating fiberglass storage tanks for underground storage of liquids.

At Xerxes, excellence in service is as highly valued as excellence in product design and manufacturing. Xerxes' four strategically located manufacturing facilities in the United States provide customers with prompt, economical delivery and quality service. That gives Xerxes tanks one more advantage — they are readily available to customers throughout the country.



Watertight Tanks Featuring the Many Benefits of Fiberglass

A fiberglass wastewater tank, by virtue of its materials and design, is inherently the superior choice for safe, long-term storage and treatment of wastewater for a wide range of applications. The best storage system for wastewater is structurally strong, corrosion-resistant, watertight, easily installed and cost-effective. All these elements come together in the design and manufacture of a Xerxes fiberglass wastewater tank.

Xerxes uses only high-quality resin and glass in the manufacture of its fiberglass tanks. For added structural strength, Xerxes tanks are designed with integral ribs. Because the integral ribs and tank are made of the same materials and are manufactured simultaneously, the Xerxes tank is a very robust tank. It is designed to accommodate heavy traffic loads and high water-table conditions when properly installed. Fiberglass tanks available from smaller fabricators may also utilize ribs, but they may not be designed for traffic environments and do not have the same robust design features of a Xerxes tank. While concrete tanks are widely viewed as structurally strong, many are not designed for the heavy loading conditions that vehicle traffic and groundwater can present.

Since water by nature can create a corrosive environment, rust can be a major weakness in some underground wastewater storage systems. The materials used to construct Xerxes fiberglass tanks are inherently rustproof and corrosion-resistant. Concrete tanks, whether precast or poured-in-place, are susceptible to rust if the steel reinforcement is exposed through cracks in the concrete. Exposure to hydrogen sulfide gases, present in wastewater tanks, can also cause corrosion damage to a concrete tank and steel reinforcement, thereby limiting the tank's useful life. Since wastewater tanks can be exposed to highly corrosive conditions, selecting a Xerxes wastewater tank gives system owners and designers the assurance that rust or corrosion will not cause a leak or structural failure.

Aside from being rustproof and corrosion-resistant, a Xerxes tank is also designed to be watertight. Easily equipped for on-site pressure testing before or after installation, Xerxes wastewater tanks give owners the confidence that the tank is watertight from the day it is installed. This feature is of growing importance with today's stringent regulations, many requiring watertight systems. For more than 28 years Xerxes has been manufacturing thousands of underground tanks for use in the petroleum industry, where a zero leak rate is the accepted industry standard. These fuel tanks must be leak-free, not only upon installation, but for decades, verified by periodic, precision-testing practices that are routine for gasoline tanks.

Leaking concrete tanks are one of the reasons that Xerxes tanks have become such a popular choice for wastewater applications. Concrete, by its nature, is vulnerable to cracking. In most cases, precast concrete tanks rely on sealants or adhesives to seal the seams designed into the tank. When the ground around the tank shifts or settles, or when the tank is improperly installed, these seams are susceptible to leaking, causing either groundwater contamination or groundwater infiltrating into the tank, requiring the system to processes groundwater along with septage. A structurally strong, watertight fiberglass tank eliminates both of these problems.



Quality manufacturing is key to producing a strong, watertight tank. When it comes to the environment, Xerxes knows that too much is at stake to manufacture anything less than a superior underground storage tank. Xerxes maintains high standards of quality in the manufacture of each tank. The quality control steps are applied in a tightly controlled manufacturing environment. On the other hand, the same level of quality control may not be maintained in situations where tanks are assembled, in part or in whole, in the field and where weather conditions may not allow careful quality control procedures.

Features of Xerxes Wastewater Tanks

- Constructed of rustproof, long-lasting fiberglass
- Manufactured to meet customers' functional requirements
- Designed with integral ribs for added strength
- Designed for H-20 load conditions
- Easy to ship and install
- Can be purchased with accessories that allow for both pre-installation or post-installation pressure testing
- Manufactured to applicable requirements of Underwriters Laboratories (UL) 1316 and ANSI/AWWA D120
- Able to be reinstalled after recertification by Xerxes
- Available in single-wall, double-wall and triple-wall models
- Available in sizes from 600 gallons to sizes in excess of 60,000 gallons

The Design of Xerxes Wastewater Tanks Offers Many Advantages



Many advantages of a Xerxes wastewater tank come from the geometry of the tank itself. The Xerxes tank has a cylindrical shape and is domed at both ends, which offers major benefits in terms of both operation and maintenance. The shape of a Xerxes tank maximizes the natural flow of liquids through a vessel, allowing for the smooth flow of liquids through the tank and maximum use of the tank's interior.

A domed, cylindrical tank minimizes pockets or "dead" spots in which scum or sludge can accumulate. The smooth, rounded surfaces of the tank's interior provide a significant advantage when pumping out scum and sludge. Tanks designed with squared corners and sharp angles can have pockets and "dead" spots, creating two major disadvantages — diminished volume and spaces in which scum and sludge settle.

When a Xerxes wastewater tank is delivered to an installation site, all it needs to be ready for operation is connection of the piping and installation of the risers, which allow for easy access to the tank for maintenance and cleaning from above grade. Septic systems manufactured of other materials may be delivered in multiple pieces and require field assembly. That not only makes installation more difficult and time-consuming, it also increases the possibility of leakage once the system is in operation. The installation and proper curing of cast-in-place tanks can be very time-consuming, taking days or weeks, as opposed to the one-day installation typical for a Xerxes fiberglass tank.

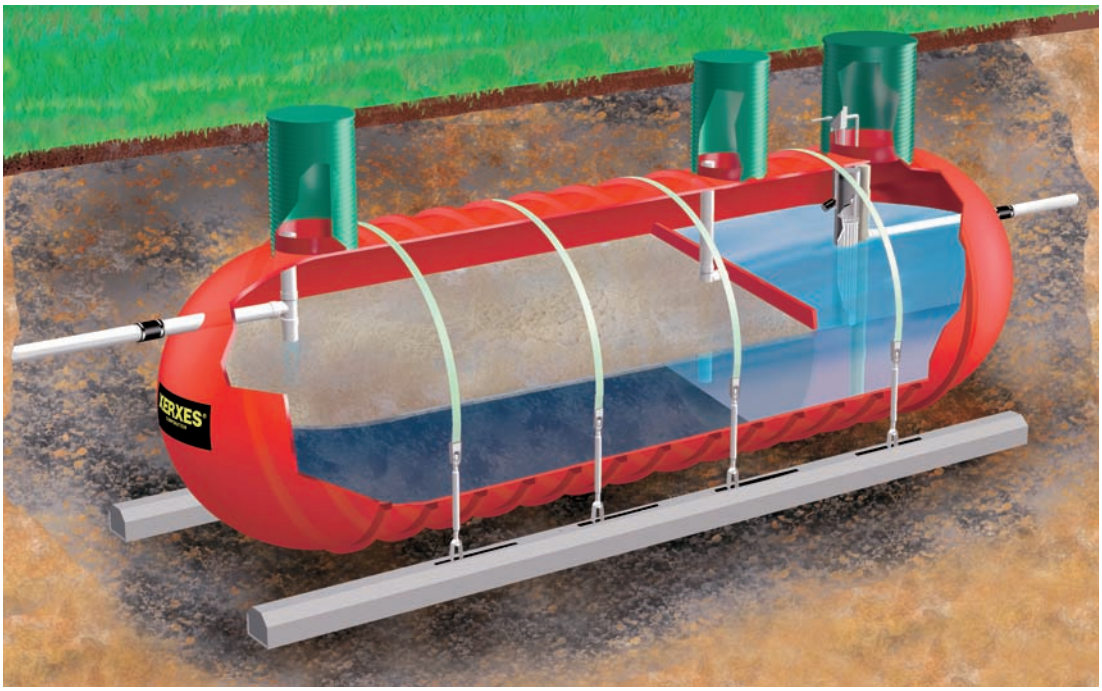
Xerxes tanks fit a variety of wastewater applications. They can be used as septic tanks, recirculation tanks, dosing tanks, pump tanks, holding tanks and tanks using prepackaged treatment systems. (Some typical applications are shown in these pages.) Xerxes tanks can be manufactured in sizes from 600 gallons to in excess of 60,000 gallons, with multiple compartments, and in single-wall, double-wall and triple-wall models. Whatever the application and whatever the size, each Xerxes fiberglass wastewater tank offers the same benefits: It is watertight, rustproof, corrosion-resistant and lightweight. A Xerxes tank is easy to install, easy to operate and easy to maintain.

All in all, from delivery to operation, Xerxes offers customers a superior option for all their wastewater tank needs.

Typical Wastewater Applications

- Housing developments
- Municipalities
- Public parks
- Rural developments
- Sanitary stations
- Rest areas and truck stops
- Private RV parks
- Resorts
- Schools and recreation centers
- Business parks

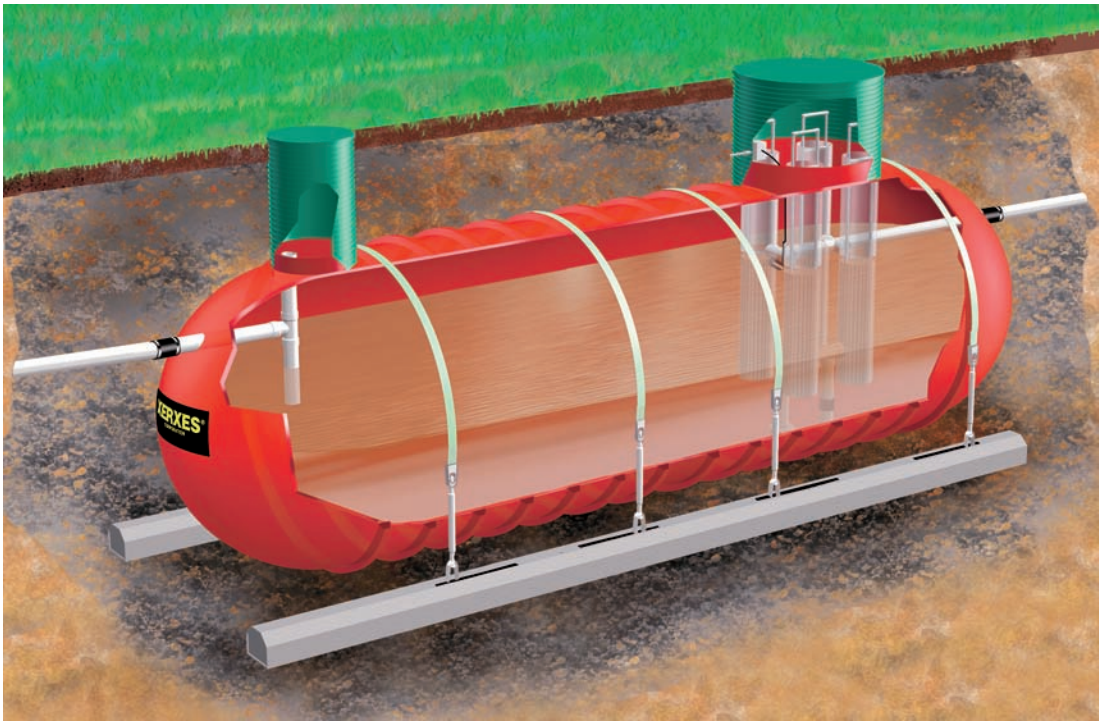
Dual-Compartment Septic Tank Applications



When an application calls for more than one compartment in a primary treatment system, Xerxes offers a dual-compartment fiberglass tank, which has two compartments with a baffle between them to control the waste stream. Xerxes also offers wastewater tanks with more than two compartments.

When an application requires more than one compartment, other systems may use a number of separate tanks, which increases the possibility of failed connections. This is an example of a definite advantage that customers have with Xerxes dual-compartment septic tanks. Compartment sizes can be configured in a variety of arrangements to meet design requirements. Recent Xerxes installations of dual-compartment septic tanks are residential septic systems in the desert, and septic systems in small business parks and schools.

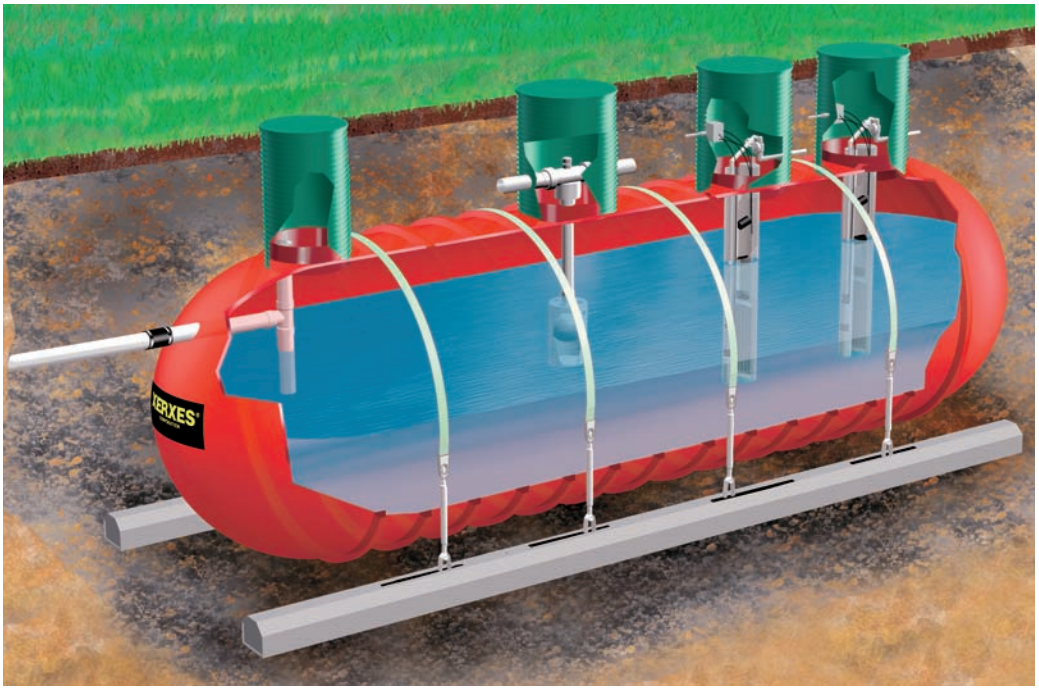
Large Commercial Septic Tank Applications



When a customer needs a large commercial septic system, a Xerxes tank can serve as the sole tank in a septic system or as the second tank in a two-tank septic system. This Xerxes tank has a major advantage over build-in-place or multiple-tank systems, which typically require several smaller tanks to create a large system. Xerxes access-opening designs can also accommodate multiple pump chambers that are often necessary in large commercial-size tanks.

The Xerxes large commercial septic tank is a good fit for hotels and resorts where open green space is limited. Since Xerxes tanks are designed for H-20 load conditions, they can be installed under parking space. Recent installations of this type of Xerxes tank include a 150,000-gallon/day treatment system for a resort community in the mountains and a 40,000-gallon/day treatment system for a conference center in the Midwest.

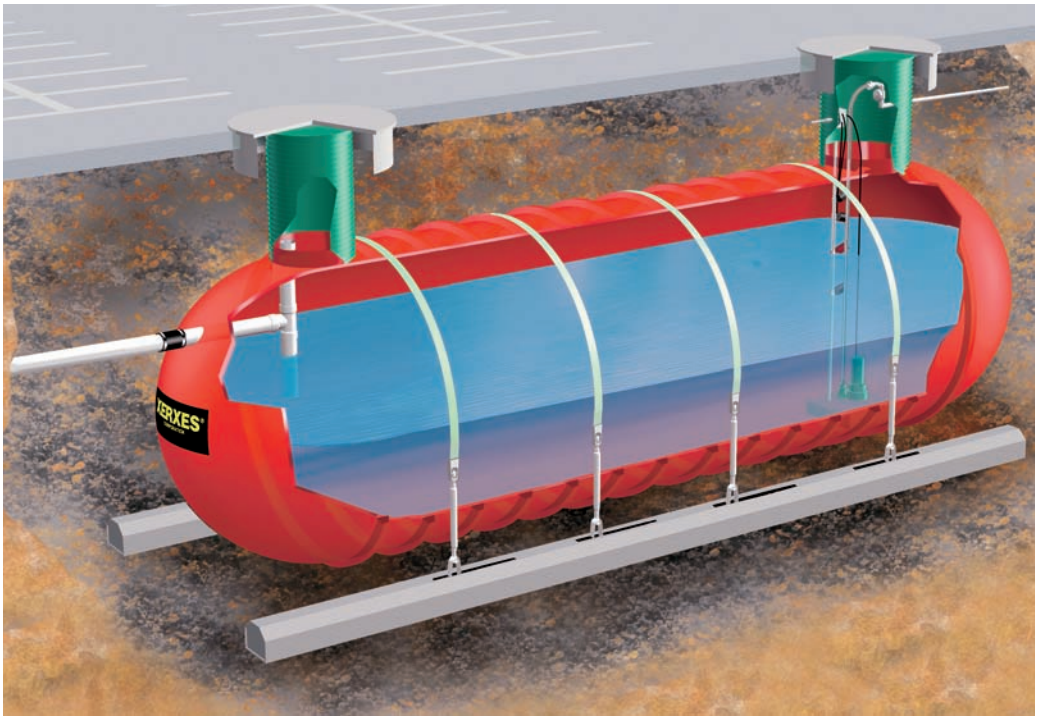
Recirculation Tank Applications



One way of treating the waste stream is by recirculating the effluent through a filter (gravel, sand or peat, for instance). The common denominator in such secondary treatment systems is a recirculation tank. A Xerxes wastewater tank can be used in any system that requires recirculation of the waste stream.

Whether a wastewater customer is installing a new system or is retrofitting an existing system, a Xerxes recirculation tank, in which all waste liquids can be stored in one tank, is a superior option. Installing a Xerxes recirculation tank can eliminate the need to install a whole new septic system. Recirculation tanks can be designed and manufactured to fit specific requirements for splitter valves and pumping equipment. Whether the system has a hanging pump chamber or a submerged pump mounted on a pump platform, Xerxes can provide a recirculation tank and accessories to fit a customer's specific requirements. If an application requires use of the entire tank capacity, Xerxes also manufactures bottom sumps to meet this requirement. A typical example of a Xerxes recirculation tank application is a recently installed 10-foot-diameter, 30,000-gallon recirculation tank at a trailer park that previously had a concrete septic system that needed upgrading because of new regulations pertaining to existing secondary treatment systems.

Dosing Tank Applications

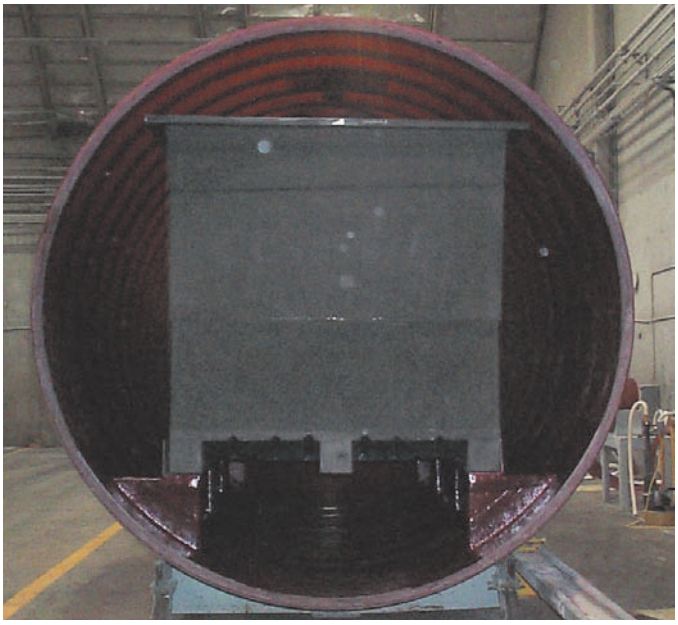


Certain wastewater systems require a dosing tank. A Xerxes dosing tank is designed to receive the wastewater from a septic tank at two points in the process — after primary treatment and/or after secondary treatment — and then dispense of the effluent for final dispersal and/or disinfection.

A Xerxes fiberglass dosing tank allows for the storage of surge capacity in the system and periodic dispersal of doses of effluent into the drain field in one of two ways — either electrically with a pump or mechanically with a siphon. Each Xerxes tank is manufactured with the same structural integrity designed to handle the pressures of continuous filling and emptying of the tank at specified burial depths. A watertight, corrosion-resistant Xerxes fiberglass tank is an excellent choice as a dosing tank in a wastewater system.

Prepackaged Treatment System Applications

Many wastewater projects today are designed with an engineered prepackaged treatment system. These systems have a variety of designs, but all require a watertight, structurally strong, corrosion-resistant storage vessel. Xerxes offers all the options in tank design needed to accommodate most treatment systems. Whether the engineered system is a sequenced batch reactor (SBR), aerobic treatment unit (ATU), membrane bio-reactor (MBR) or other technology, Xerxes offers a range of advantages and flexible design options. One of these advantages is providing the customer with a product assembled in the plant and shipped to the project site as a complete system.



Xerxes installation of treatment components in the plant reduces or eliminates the requirement for tank entry in the field, thereby saving considerable installation time and expense. A confined space entry can be a costly step for the installer of the system. Also, because Xerxes assembles these components in a factory-controlled environment, the customer can receive a higher-quality finished product than with the many variables created by field assembly and installation. Additionally, the use of Xerxes tanks for collection and disposal along with Xerxes tanks for treatment provides the designer and/or owner with an entire system that is watertight and corrosion-resistant. In recent years, Xerxes has worked closely with many system suppliers to provide unique tank solutions for engineered prepackaged systems going to national park sites, housing developments, manufacturing facilities and schools.

Other Wastewater Tank Applications



Lightweight, watertight and corrosion-resistant fiberglass tanks are ideally suited to a variety of wastewater projects, whether they are in a rural community, a remote location or the middle of a city. Each Xerxes wastewater tank is designed and manufactured to meet a customer's specific requirements. Today, many Xerxes tanks are finding their way into neighborhoods as septic tanks for single-family homes. (See photo above.)

Additional examples of recent Xerxes wastewater tank installations are: 1) a wastewater holding system for an amphitheater in Washington state; 2) a recirculating, sand-filter wastewater treatment system for a Minnesota housing development; 3) surge tanks, settling tanks and lift station/pump tanks for a city sewer system in Missouri; and 4) 62,000-gallon tanks for a wastewater treatment system for a desert housing development in Arizona.

Optional Tank Accessories to Fit a Variety of Wastewater Applications

One of the ways Xerxes continues to meet the changing needs of the marketplace is to meet the functional requirements of system designers and owners. When it comes to the wastewater market, Xerxes has developed a line of accessories to complement the full range of its wastewater tanks. Shown here are just a few of these accessories, including access openings, piping connections, baffles/partition walls, sumps, risers and deadmen.

Access Openings



Xerxes offers a variety of fiberglass access openings for wastewater tanks. The access openings serve a variety of purposes, including as inspection openings and as openings for effluent filters (vaults). They are available in a range of sizes, from 24 inches to 48 inches in diameter and can include internal flanges to support pump vaults.

Internal Baffles/Partition Walls

Xerxes' internal baffles and partition walls can improve treatment performance in wastewater tanks by maximizing the retention time of waste. These fiberglass accessories are designed and manufactured with the appropriate penetrations to fit the needs of specific applications.



Piping Connections



Depending on the application, wastewater tanks require a variety of accessories for piping connections. Xerxes offers, in either PVC or FRP, inlet and outlet piping, and influent or effluent sanitary tees. These connections are manufactured to the size required for each application.

Other wastewater tank accessories

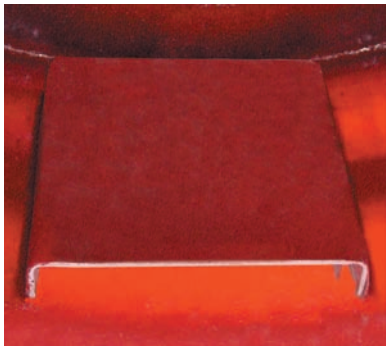
To fit a variety of wastewater applications, Xerxes provides a wide range of accessories. These include access risers (photo to right), large-diameter bottom sumps (photo below), reinforced-concrete deadmen, fiberglass hold-down straps and fiberglass or aluminum ladders.





Pump Platforms

Depending on the type of system design, a Xerxes wastewater tank may require a submerged pump. Among the accessories Xerxes offers are pump platforms designed to support submerged pumps located in the bottom of the tank.



Single-Wall Tank Data

Nominal Capacity (gallons)	Actual Capacity (gallons)	Nominal Tank Length	Nominal Shipping Weight (pounds)	Number of Hold-Down Straps Required
4-Foot-Diameter Tanks				
600	602	6′-11 7/8″	500	2
1,000	1,009	11′-3 7/8″	700	2
1,500	1,449	16′-0″	1,000	2
6-Foot-Diameter Tanks				
1,500	1,779	10′-7 1/4″	800	2
2,000	2,376	13′-5 3/4″	1,000	2
3,000	2,973	16′-4 1/4″	1,200	2
4,000	4,131	21′-11 1/8″	1,600	2
5,000	5,064	26′-5″	1,900	4
6,000	5,960	30′-8 3/4″	2,200	4
8-Foot-Diameter Tanks				
2,000	2,189	9′-1/2″	900	2
3,000	3,271	12′-3″	1,200	2
4,000	4,218	15′-1/2″	1,400	2
5,000	5,165	17′-8 1/2″	1,700	2
6,000	6,084	20′-6 1/2″	2,000	2
7,000	6,946	23′-1″	2,200	4
8,000	7,950	26′-1/2″	2,500	4
9,000	8,869	28′-9″	2,700	4
10,000	9,816	31′-6 1/2″	3,000	4
11,000	10,763	34′-4″	3,200	4
12,000	11,682	37′-1/2″	3,500	4
13,000	13,081	41′-2″	4,000	6
14,000	14,028	43′-11 1/2″	4,200	6
15,000	14,975	46′-9″	4,500	6
10-Foot-Diameter Tanks				
10,000	10,563	21′-5 1/4″	3,200	4
11,000	11,364	22′-9 3/4″	3,400	4
12,000	12,068	24′-1/4″	3,600	4
13,000	12,966	25′-6 3/4″	3,800	4
14,000	13,767	26′-11 1/4″	4,000	4
15,000	15,248	29′-5 3/4″	4,500	4
20,000	20,055	37′-8 3/4″	5,700	6
22,000	22,580	42′-3/4″	6,600	8
25,000	25,783	47′-6 3/4″	7,900	8
30,000	30,590	55′-9 3/4″	9,400	10
35,000	35,397	64′-3/4″	10,500	12
40,000	41,004	73′-8 1/4″	12,100	14
12-Foot-Diameter Tanks				
20,000	20,781	29′-4″	9,200	6
25,000	25,541	35′-7″	10,600	8
30,000	31,253	43′-1″	12,500	10
35,000	36,013	49′-4″	13,900	12
40,000	39,821	54′-4″	15,000	12
48,000	48,389	65′-7″	17,700	18
50,000	50,293	68′-1″	18,300	18

Guide Specifications – Single-Wall FRP Tanks for Septic Use

Short Form:

The contractor shall provide a single-wall fiberglass reinforced plastic (FRP) underground storage tank as shown on the drawings. Sizes and fittings shall be as shown. The tank shall be a fiberglass tank as manufactured by Xerxes Corporation.

Tank shall be tested and installed according to the Xerxes Installation Manual and Operating Guidelines in effect at time of installation.

Long Form:

Part I: General

1.01 Quality Assurance

A. Acceptable Manufacturer: Xerxes Corporation

B. Governing Standards, as applicable:

1. Tank manufacturer shall be in the business of manufacturing tanks to Underwriters Laboratories, Inc. (UL) Standard 1316.
2. Tank manufacturer shall be in the business of manufacturing tanks conforming to the requirements of ANSI/AWWA D120 Thermosetting Fiberglass-Reinforced Plastic Tanks.

Part II: Products

2.01 Single-Wall Fiberglass Reinforced Plastic (FRP) Underground Storage Tanks:

A. Loading Conditions — Standard tank design shall meet the following criteria:

1. Internal Load — Tank shall be designed to withstand a 5-psig air-pressure test (3 psig for a 12'-diameter tank) with a 5:1 safety factor. When tank is designed for on-site testing, contractor shall individually test tank for leakage prior to installation. Maximum test pressure is 5 psig (3 psig for a 12'-diameter tank).
2. Surface Loads — Tank shall withstand surface H-20 axle loads when properly installed according to tank manufacturer's current Installation Manual and Operating Guidelines.
3. External Hydrostatic Pressure — Tank shall be capable of being buried in ground with 7' of overburden over the top of the tank, the hole fully flooded and a safety factor of 5:1 against general buckling.
4. Tank shall support accessory equipment — such as inlet and outlet piping, effluent filter chamber, ladders and baffles — when installed according to tank manufacturer's current Installation Manual and Operating Guidelines.

B. Product Storage:

1. Tank shall be capable of storing wastewater products limited to the collection and storage of human solid or liquid organic sewage.
2. Tank shall be vented to atmospheric pressure.
3. Tank shall be capable of storing products identified in the manufacturer's current standard limited warranty.

C. Materials:

1. Tank shall be manufactured with 100% resin and glass-fiber reinforcement. No sand fillers.
2. Resin used in tank and accessories shall be premium isophthalic polyester.

D. Tank Dimensions (Refer to Xerxes literature on gallonage.):

1. Tank shall have nominal capacity of _____ gallons.
2. Tank shall have nominal outside diameter of _____ feet.

2.02 Accessories

A. Piping:

1. Schedule 40 PVC or FRP pipe shall be used for inlet and outlet piping.
2. When a PVC pipe is affixed to the tank, a fiberglass lay-up is used.
3. All piping shall be factory-sealed to enable field tightness testing with at least one pipe opening provided with a threaded fitting for connecting a pressure-test manifold.

B. Access Openings:

1. All access openings 24 inches in diameter or larger shall be manufactured of FRP.
2. Location(s) shall be as shown on tank drawings.
3. Optional riser extensions shall be FRP or PVC.
4. With tanks designed for on-site tightness testing, all access openings shall be factory-sealed to enable field tightness testing.

C. Optional Anchor Straps:

1. Straps shall be FRP anchor straps as supplied by tank manufacturer.
2. Number and location of straps shall be specified in current literature by tank manufacturer.

D. Optional Ladders:

1. Ladders shall be the standard ladder as supplied by tank manufacturer.

E. Optional Fittings:

1. All threaded fittings shall be constructed of carbon steel or FRP.
2. All standard threaded fittings shall be half-couplings and shall be 2", 4" or 6" in diameter. Reducers are to be used for smaller sizes where shown and provided by contractor.
3. All FRP and PVC nozzles shall be flat-faced and flanged, and shall conform to ANSI B16.5 150# bolting pattern.

F. Optional Internal Pump Platforms:

1. Pump platforms shall be FRP.
2. Contact tank manufacturer with pump details, such as dimensions and weight

Part III: Testing and Installation

3.01 Testing

A. Testing—Tank shall be tested according to the Xerxes Installation Manual and Operating Guidelines in effect at time of installation.

B. Optional Testing—Prior to installation, a tank-tightness test consisting of a 5 psig air pressure/soap test shall be performed (3 psig for 12-foot-diameter tanks) per the tank testing procedures outlined in the Xerxes

Guide Specifications – Single-Wall FRP Tanks for Septic Use

Installation Manual and Operating Guidelines in effect at time of installation.

3.02 Installation

A. Contractor shall be trained in proper installation procedures by the tank manufacturer, the state or other approved agency.

B. Tank shall be installed according to the Xerxes Installation Manual and Operating Guidelines in effect at time of installation.

Part IV: Warranty

4.01 Warranty

A. Warranty shall be manufacturer's standard limited warranty for underground septic tanks in effect at time of purchase.

Limited Warranty

Underground Septic Tanks

Xerxes Corporation ("Xerxes") warrants to ("Owner") that our underground septic tanks, and all Xerxes manufactured septic tank accessories, if installed, used and maintained in the United States in accordance with Xerxes' published specifications, installation instructions and operating guidelines, all applicable laws and regulations, and the limited septic applications defined herein, will be free from material defects in materials and workmanship for a period of one (1) year from date of original delivery by Xerxes. Septic applications for purposes of this warranty are limited to the collection and storage of solid or liquid organic sewage and wastewater at temperatures not to exceed 140° F.

If any tank is to be removed from an installation, moved to Owner's new location and is intended for active service at the new location, the tank must be recertified by Xerxes in order to maintain the warranty as originally extended. The foregoing warranty does not extend to tanks or accessories (collectively "Goods") damaged due to acts of God, war, terrorism, or failure of Goods caused, in whole or in part, by misuse, improper installation, storage, servicing, maintenance, or operation in excess of their rated capacity, contrary to their recommended use, or contrary to the septic applications defined above, whether intentional or otherwise, or any other cause or damage of any kind not the fault of Xerxes. Xerxes only warrants repairs or alterations performed by Xerxes or its authorized contractors. Xerxes does not warrant any product, components or parts manufactured by others.

XERXES' OBLIGATIONS UNDER THIS LIMITED WARRANTY ARE NULL AND VOID IF A TANK HAS BEEN USED FOR PRODUCTS CONTAINING A "HAZARDOUS SUBSTANCE" AS DEFINED BY THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT OF 1980 (CERCLA OR "SUPERFUND") WHICH DESIGNATES CERTAIN CHEMICALS AS "HAZARDOUS SUBSTANCES." SEE 42 UNITED STATES CODE, SECTION § 9601 (14).

Owner's sole and exclusive remedy for breach of warranty is limited at Xerxes' option to: (a) repair of the defective tank or accessory, (b) delivery of replacement tank or accessory to the point of original delivery, or (c) refund of the original purchase price. A claimant must give Xerxes the opportunity to observe and inspect the tank and/or accessory prior to removal from the ground or the claim will be forever barred. All claims must be made in writing within one (1) year after tank and/or accessory failure or be forever barred. THE FOREGOING LIMITED WARRANTY CONSTITUTES XERXES' EXCLUSIVE OBLIGATION AND XERXES MAKES NO OTHER WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, WITH RESPECT TO THE TANK OR ANY SERVICE, ADVICE, OR CONSULTATION, IF ANY, FURNISHED TO OWNER BY XERXES OR ITS REPRESENTATIVES, WHETHER AS TO MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE. THE SELLER (XERXES) UNDERTAKES NO RESPONSIBILITY FOR THE QUALITY OF THE GOODS, EXCEPT AS OTHERWISE PROVIDED IN THIS CONTRACT. THE SELLER (XERXES) ASSUMES NO RESPONSIBILITY THAT THE GOODS WILL BE FIT FOR ANY PARTICULAR PURPOSE FOR WHICH YOU (OWNER) MAY BE BUYING THESE GOODS, EXCEPT AS OTHERWISE PROVIDED IN THE CONTRACT. THE REMEDIES SET FORTH IN THE ABOVE LIMITED WARRANTY ARE THE ONLY REMEDIES AVAILABLE TO ANY PERSON OR ENTITY FOR BREACH OF WARRANTY OR FOR BREACH OF ANY OTHER COVENANT, DUTY, OR OBLIGATION ON THE PART OF XERXES. XERXES SHALL HAVE NO LIABILITY OR OBLIGATION TO ANY PERSON OR ENTITY FOR BREACH OF ANY OTHER COVENANT, DUTY, OR OBLIGATION UNDER THIS LIMITED WARRANTY EXCEPT AS EXPRESSLY SET FORTH HEREIN. IT IS EXPRESSLY AGREED THAT THIS LIMITED WARRANTY DOES NOT FAIL OF ITS ESSENTIAL PURPOSE. XERXES SHALL HAVE NO LIABILITY FOR COSTS OF INSTALLATION OR REMOVAL OF GOODS, ENVIRONMENTAL CONTAMINATION, FIRES, EXPLOSIONS, OR ANY OTHER CONSEQUENCES ALLEGEDLY ATTRIBUTABLE TO A BREACH OF WARRANTY, OR INCIDENTAL, CONSEQUENTIAL, PUNITIVE OR OTHER DAMAGES OF ANY DESCRIPTION, WHETHER ANY SUCH CLAIM OR DAMAGES BE BASED UPON WARRANTY, CONTRACT, NEGLIGENCE, STRICT LIABILITY OR OTHER TORT, OR OTHERWISE. IN NO EVENT SHALL XERXES' TOTAL LIABILITY HEREUNDER EXCEED THE ORIGINAL PURCHASE PRICE OF THE GOODS WHICH GAVE RISE TO SUCH LIABILITY.

Consumer Notice: This Limited Warranty gives you (Owner) specific legal rights. You (Owner) may also have other rights which vary from state to state.

Effective: 1/1/07



Xerxes Manufacturing Facilities

Anaheim, CA
Phone 714.630.0012
Fax 714.632.7133

Hagerstown, MD
Phone 301.223.6933
Fax 301.223.6836

Sequin, TX
Phone 830.372.0090
Fax 830.372.0321

Tipton, IA
Phone 563.886.6172
Fax 563.886.2042

ZCL Manufacturing Facilities

Edmonton, AB
Phone 800.661.8265
Fax 780.466.6126

Drummondville, QC
Phone 800.661.8265
Fax 780.466.6126

Waverley, NS
Phone 800.661.8265
Fax 780.466.6126



Hagerstown, MD

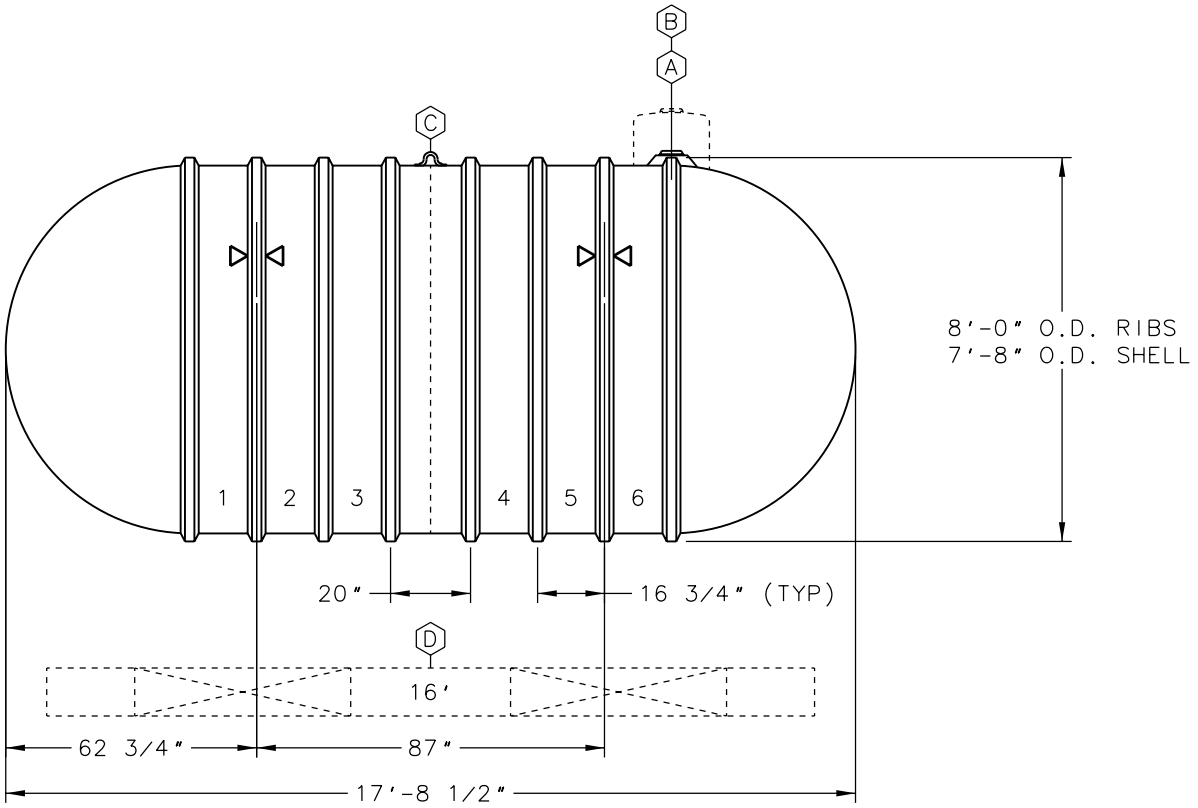
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CORPORATION
a subsidiary of ZCL Composites Inc.

7901 Xerxes Avenue South
| Minneapolis | MN | 55431-1288
Ph: 952.887.1890 Fax: 952.887.1882

www.xerxescorp.com

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XWW10/08pp



ITEM	QTY	DESCRIPTION
A	1	4" NPT MONITOR FITTING
B	1	OPTIONAL 18" DIA. HYDROSTATIC MONITORING RESERVOIR WITH 4" NPT FITTING
C	1	LIFTING LUG
D	2	OPTIONAL 16' PREFABRICATED CONCRETE DEADMAN
⋈	2	HOLD DOWN STRAP LOCATION

XERXES®
a ZCL company

TITLE 8' DIA. DOUBLE-WALL
CAP. 5,000 GALLONS
MADE-TO-ORDER

DATE 3-14 DR. NO. S11-735.00

CH01_30RBGS

Tag Cover Sheet
Certified Drawing
Wiring Diagram
Detailed Performance Report

Certified Drawing for CH01_30RBGS

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

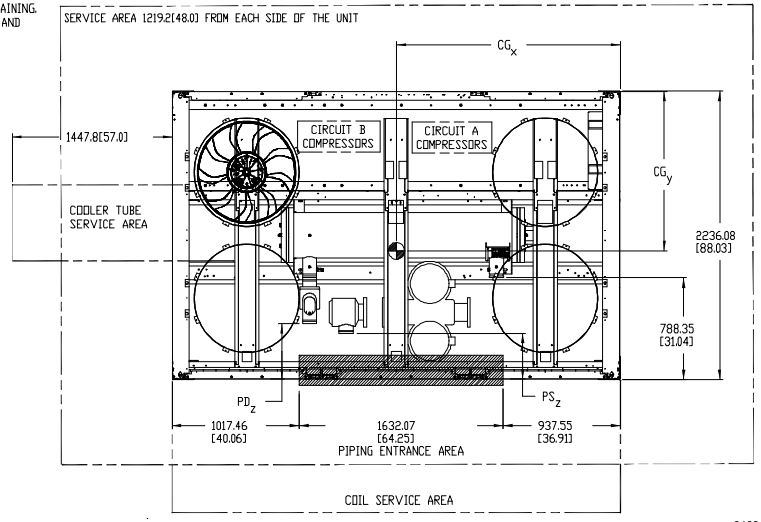
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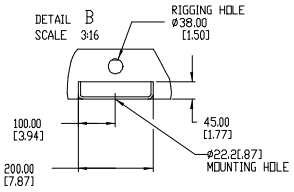
NOTES: 1. UNIT MUST HAVE CLEARANCES AS FOLLOWS:
TOP- DO NOT RESTRICT
SIDES AND END- 6' FROM SOLID SURFACE FOR AIRFLOW
SIDE- 8' REQUIRED FOR COIL SERVICE AREA.
2. ALL PUMPS HAVE DRAINS LOCATED AT THE BOTTOM OF VOLUTE FOR DRAINING.
3. TEMPERATURE RELIEF DEVICES LOCATED ON SUCTION LINE, LIQUID LINE AND FILTER DRIER OF EACH CIRCUIT AND HAVE 1/4" FLARE CONNECTION.
4. NO PUMP PACKAGE LEAVING WATER CONNECTION IS SAME SIZE AND HAS SAME Y AND Z DIMENSIONS AS ENTERING WATER. ALSO HAS SAME PDx DIMENSION AS PUMP PACKAGE.

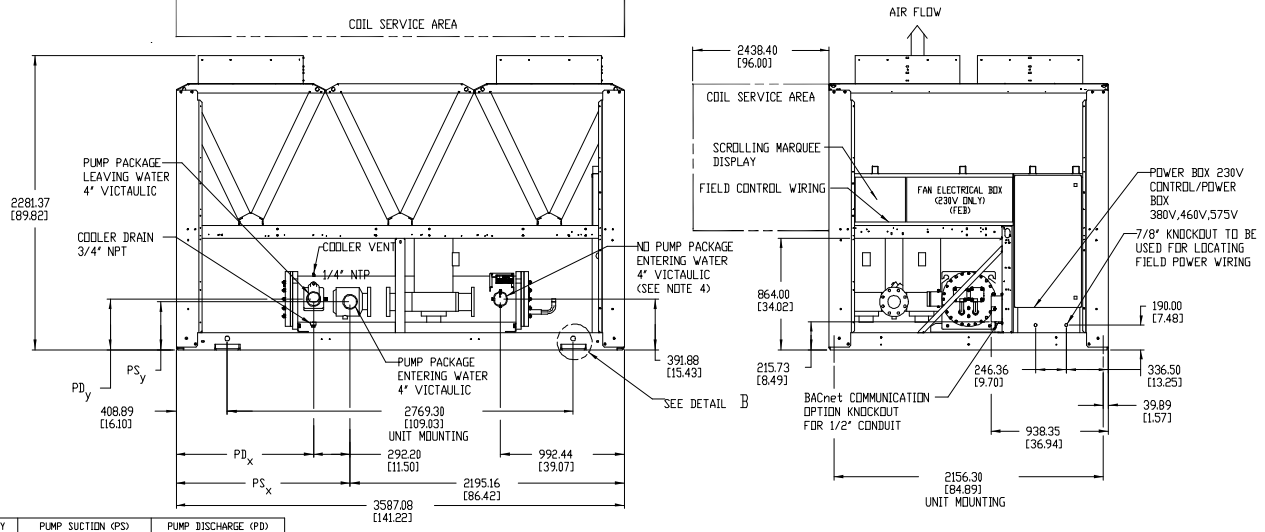
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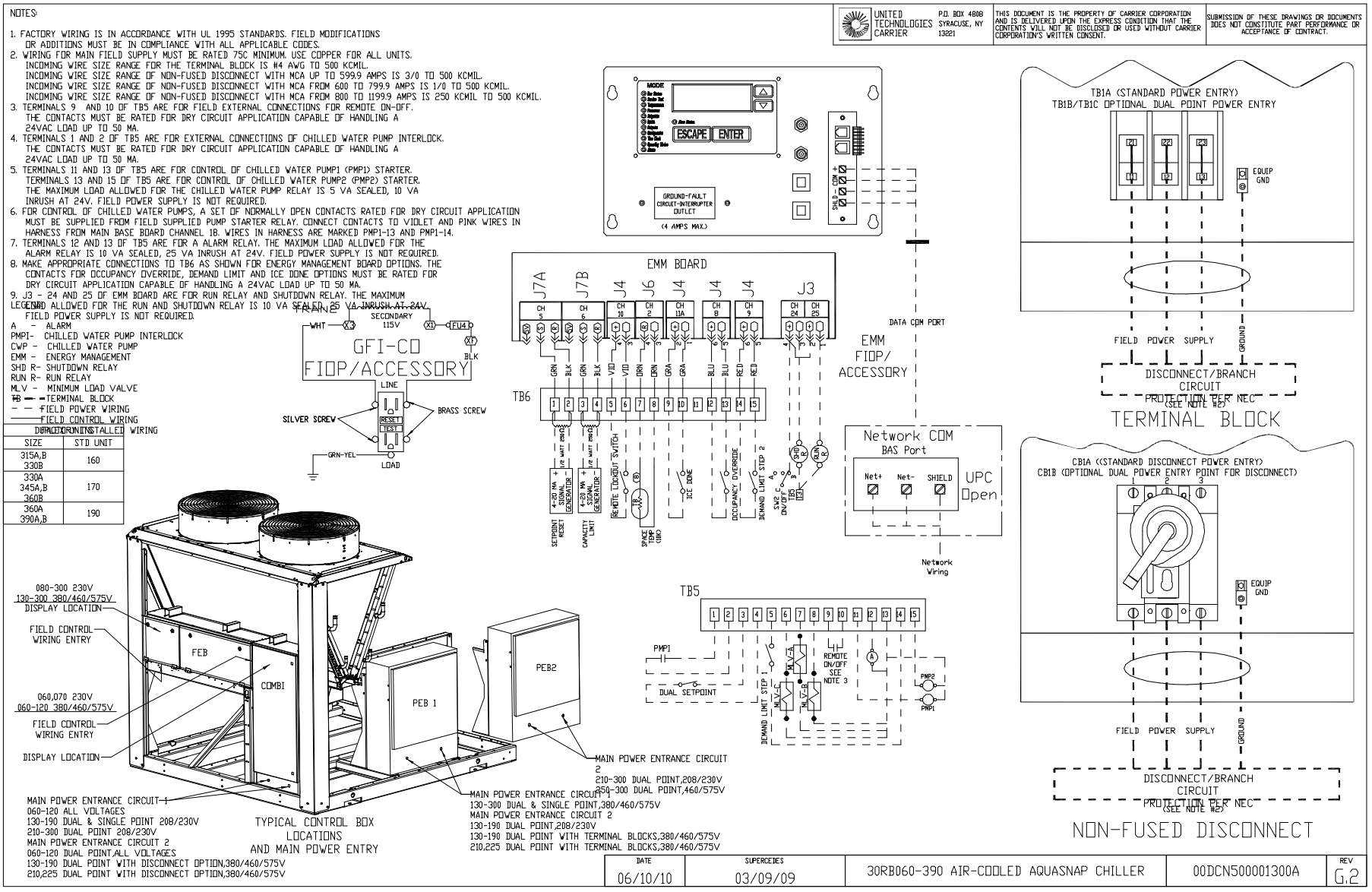
	WEIGHT CU/AL lb/kg	MAX WEIGHT CU/AL PUMP lb/kg	WEIGHT CU/CU lb/kg	MAX WEIGHT CU/CU PUMP lb/kg	WEIGHT MCHX lb/kg	MAX WEIGHT MCHX PUMP lb/kg	CENTER OF GRAVITY CGx MM [INCH]	CGy MM [INCH]	PUMP SUCTION (PS) X ±.25	Y ±.25	Z ±.25	PUMP DISCHARGE (PD) X ±.25	Y ±.25	Z ±.25
30RB-090	5932 2697	6855 3116	6656 3026	7579 3445	5449 2472	6372 2890	1625 [64.0]	1017 [40.0]	1389.4 [54.7]	309.9 [12.2]	353.1 [13.9]	1097.3 [43.2]	497.8 [19.6]	170.2 [6.7]
30RB-100	6155 2798	7078 3217	6879 3127	7802 3547	5663 2569	6586 2987	1614 [63.5]	999 [39.3]	1389.4 [54.7]	309.9 [12.2]	353.1 [13.9]	1097.3 [43.2]	497.8 [19.6]	170.2 [6.7]

DATE	SUPERCEDES			REV
06/10/10	04/20/10	30RB-090,100 AIR COOLED CHILLER	00DCN500000300A	H.4

Field Wiring Diagram for CH01_30RBGS

Project: SPMT Telescope
Prepared By: Rebecca T. Callimanis

06/25/2014
02:03PM



Detailed Performance Summary For CH01_30RBGS

Project: SPMT Telescope 06/25/2014
Prepared By: Rebecca T. Callimanis 02:03PM

Unit Information

Tag Name:	**CH01_30RBGS**	
Model Number:	**30RB090**	
Condenser Type:	**Air Cooled**	
Compressor Type:	**Scroll**	
Nameplate Voltage:	**460-3-60**	V-Ph-Hz
Quantity:	**1**	
Manufacturing Source:	**Charlotte, NC USA**	
Refrigerant:	**R410A**	
Capacity Control Steps:	**4**	
Minimum Capacity:	**22.0**	%
Shipping Weight:	**5184**	lb
Operating Weight:	**5449**	lb
Unit Length:	**142**	in
Unit Width:	**89**	in
Unit Height:	**90**	in
Minimum Outdoor Operating Temp:	**32**	°F
Chiller Pressure Drop:	**14.0**	ft wg

Performance Information

Cooling Capacity:	**84.1**	Tons
Total Compressor Power:	**70.2**	kW
Total Fan Motor Power:	**10.9**	kW
Total Unit Power (without pump):	**81.1**	kW
Efficiency (without pump):	**12.43**	EER

Acoustics Information

A-Weighted Sound Power Level:	**100**	dbA

Evaporator Information

Fluid Type:	**Propylene Glycol**	
Brine Concentration:	**40.0**	%
Fouling Factor:	**0.00010**	(hr-sqft-F)/BTU
Leaving Temperature:	**44.0**	°F
Entering Temperature:	**54.0**	°F
Fluid Flow:	**218.1**	gpm

Condenser Information

Altitude:	**9285**	ft
Number of Fans:	**6**	
Total Condenser Fan Air Flow:	**74400**	CFM
Entering Air Temperature:	**75.0**	°F

Integrated Pump Information

No Pump Selected

Accessories and Installed Options

Freeze Protection
Non-Fused Disconnect
Energy Management Module
Micro Channel
Single Point
BACnet Communications
Coil Trim Panels, Grilles, Upper Hail Guards
High-Efficiency Variable Condenser Fans

Electrical Information

Unit Voltage:	**460-3-60**	V-Ph-Hz
Connection Type:	**Single Point**	
Minimum Voltage:	**414**	Volts
Maximum Voltage:	**506**	Volts

Amps	Electrical Circuit 1	Electrical Circuit 2
MCA	191.4	
MOCP	225.0	
ICF	399.4	
Rec Fuse Size	225.0	

Detailed Performance Summary For CH01_30RBGS

Project: SPMT Telescope 06/25/2014
Prepared By: Rebecca T. Callimanis 02:03PM

Integrated Part Load Value (ARI)

IPLV:..... **16.04** EER

Unit Performance				
Percent of Full Load Capacity, %	100	75	50	25
Percent of Full Load Power, %	100.0	58.8	29.0	12.9
Unloading Sequence	B	B	B	B
Cooling Capacity, Tons	86.6	65.0	43.3	21.7
Total Unit Power, kW	100.7	59.2	29.2	13.0
Efficiency, EER	10.32	13.16	17.81	19.95
Evaporator Data				
Fluid Entering Temperature, °F	54.0	51.5	49.0	46.5
Fluid Leaving Temperature, °F	44.0	44.0	44.0	44.0
Fluid Flow Rate, gpm	207.8	207.8	207.8	207.8
Fouling Factor, (hr-sqft-F)/BTU	0.0001	0.0001	0.0001	0.0001
Condenser Data				
Entering Air Temperature, °F	95.0	80.0	65.0	55.0

An uncoated Novation condenser coil was selected for this product. This is based on an installed location that must be analyzed and guidance provided by applications engineering and a non-corrosive localized environment.
Evaporator contains a glycol or other secondary coolants for freeze protection with a leaving chilled fluid temperature above 32°F and is certified in accordance with the AHRI Air-Cooled Water Chilling Packages Using Vapor Compression Cycle Certification Program, which is based on AHRI Standard 550/590 (I-P) when tested with water at Standard Rating Conditions. Certified units may be found in the AHRI Directory at www.ahridirectory.org.
Sound power measured in accordance with ANSI/AHRI 370-2001.



KOOLANT KOOLERS
TO THE Nth DEGREE

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www.koolantkoolers.com
rev May 2014

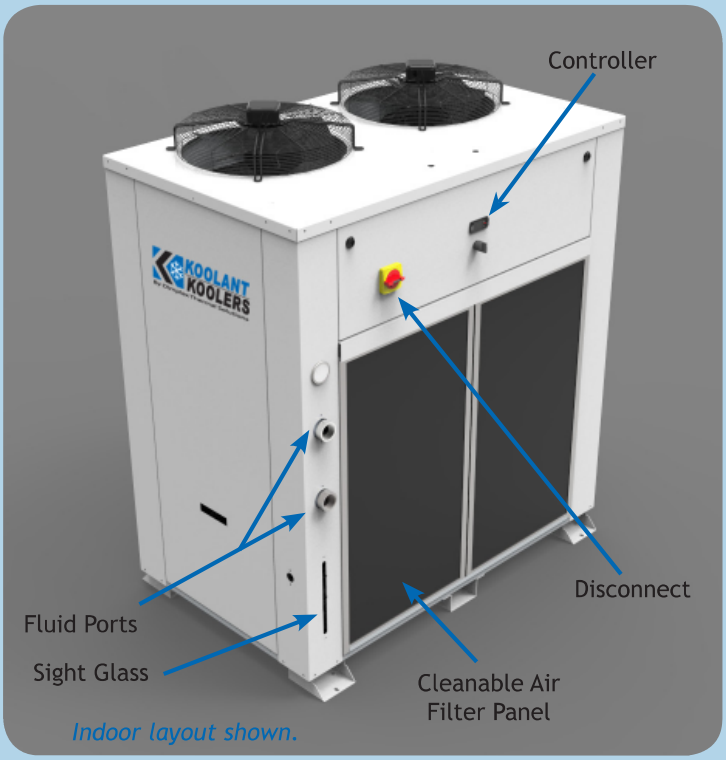
7.5 and 10 Ton S Series

Self-Contained Reliable Cooling

This durable chiller offers an indoor or outdoor design and provides the utmost in reliable operation and precise temperature control. A standard product offering with a wide range of options, this chiller can provide cooling in most applications and is available from 3 - 20 tons of cooling capacity.

Features Included:

- Air-cooled, closed loop
- Indoor or outdoor styles available
- Digital temperature controller
- Hermetic compressor
- Brazed plate evaporator
- Hot gas regulator
- Fused disconnect
- Verticle air discharge
- Cleanable air filters
- Manual bypass
- Fluid level sight glass
- Seamless plastic tank



Indoor layout shown.

UL 1995 certification | 18 month parts & labor warranty | 24/7 service & support

Indoor Style:

- Ambient 50˚F - 95˚F
- Water or water/glycol (70/30)
- Carel EZ digital controller
- RAL 7035 powdercoated cabinet

Outdoor Style:

- Outdoor Ambient -20˚F to 95˚F
- Water/glycol (70/30)
- Ranco ETC digital controller
- Galvanized sheet metal cabinet

High-Flow Package:

- Auto water fill
- Inlet water filter
- High flow pump

Options:

- Auto makeup
- Inlet water filter
- Remotely located controller
- Service/maintenance packages

7.5 and 10 Ton S Series SPECIFICATIONS

Self-Contained Reliable Cooling

S Series	7.5 TON		10 TON		
	460/3/60 @40psi	460/3/60 @80psi	460/3/60 @40psi	460/3/60 @80psi	
Cooling					
Refrigerant:	407C				
Compressor type:	Scroll compressor				
Condenser type:	Fin and tube				
Climatic Data					
Site of installation:	**Indoor** and **Outdoor** Models Available				-
Ambient conditions:	**Indoor:** 50 to 95 I **Outdoor**: -20 to 95				°F
Noise level:	78-80				dB(A)
Fluid Circuit					
Cooling capacity (60Hz):	90,000		120,000		Btu
Fluid temperature (outlet):	65 *				°F
Temperature stability:	3				°F
Cooling medium:	**Indoor:** water or water/glycol (70/30) I **Outdoor:** water/glycol (70/30)				
Flow rate:	25	25	30	30	gpm
Pump pressure:	40	80	40	80	psi
Tank:					
Capacity:	60				gal
Material construction:	Low density polyethylene				
Type:	Open to atmosphere				
Fluid Connections (FNPT):	2				in
Wetted component material:	Non-Ferrous				
Evaporator:	Stainless steel copper brazed plate				
Gauge:	Pressure				
Electrical Data					
Voltage:	460				V
Phases:	3				~
Frequency:	60				Hz
Control:					
Voltage:	115				V
Phases:	1				~
Frequency:	60				Hz
Certifications/Standards:	UL1995				
Full loaded amps:	25.5		30.4		amps
Controller type:	**Indoor:** Carel EZ / **Outdoor:** Ranco ETC				
Additional Data					
Chiller dimensions (WxDxH):	57 x 37 x 68				in
Finish:	**Indoor:** RAL 7035 powdercoat / **Outdoor:** Galvanized				
Crated weight:	1350				Lbs

* This is the rated temperature. Temps can vary but will affect capacity - contact factory.

SMARTSERIES® by QMARK

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High Output Digital Wall Heater



- **READY, SET, GO PROGRAMMING**
  – SMARTSERIES® DIGITAL THERMOSTAT
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- **SAVE TIME AND MONEY ON INSTALLATION**
  – 'OUT OF THE BOX' SET-UP
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  – RESTAURANTS
  – HOTELS
  – CONFERENCE ROOMS
  – ATRIUM
  ... AND MUCH MORE



ETL LISTED INTERTEK C US

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SMART™ ENERGY SAVER

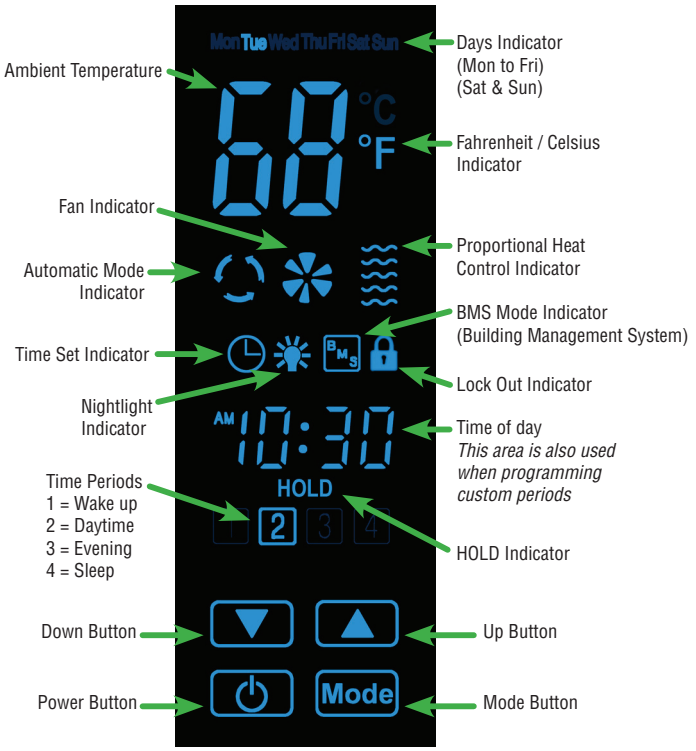
OUTSMART THE COMPETITION

SELECTION CHART

CATALOG NUMBER	UPC	VOLTS	WATTS	AMPS	BTUHR
SSHO4008	6 85360 15669 9	208	1800 - 4000	8.7 - 19.2	13,650
SSHO4004	6 85360 15671 2	240	1800 - 4000	7.5 - 16.7	13,650
SSHO4007	6 85360 15673 6	277	1800 - 4000	6.5 - 14.4	13,650
SURFACE MOUNTING FRAMES					
HTWHSM	6 85360 15545 6	Surface Mounting Frame 16-1/4" W x 19-3/8" H x 3-7/8" D			
HTWHS1	6 85360 15548 7	1" Semi-Recess Mounting Frame 16-1/4" W x 19-3/8" H x 1" D			
HTWHS2	6 85360 15551 7	2" Semi-Recess Mounting Frame 16-1/4" W x 19-3/8" H x 2" D			

Note: Standard grille color is Northern White, Add NV (Navajo White) or SB (Stat Bronze) suffix to catalog number. Example: SSHO4008NV
Allow two weeks delivery for models with special color. See Color Selection Chart for custom colors.

THERMOSTAT DISPLAY



FEATURES

- Heat where you are, not where you aren't . Instant response when you want it. Save energy by heating only the areas you occupy.
- Precise heat within 1.5 degree of set temperature (as compared to five degrees with conventional bi-metal thermostats.)
- 5 day / 2 day programmability (5 weekdays and 2 day weekend, 4 program periods per day).
- SmartSeries provides only the amount of heat needed at any given moment by continually calculating heat output and fan speed of the proportional difference between room temperature and the set temperature.
- Hold mode maintains constant set temperature which can be used for freeze protection or vacation setting for when you are not there.
- BMS compatible – Connects to Building Management Systems for optimum control.
- Lockout Feature – Securely maintain comfort levels.
- Remote control to make adjustments anywhere in the room – Catch a chill? Raise the temperature from the comfort of your bed or easy chair.
- Quick set up – 'right out of the box' - 3 piece construction – Includes back box, Element/Fan Deck and Grille.
- Fits recessed between standard studs walls or use with optional surface mounting frame (ideal for block or plaster walls).
- No ducting or plumbing needed means no heat loss before the heat enters the room.

AVAILABLE COLOR OPTIONS

Grilles are available in three colors:


Navajo White

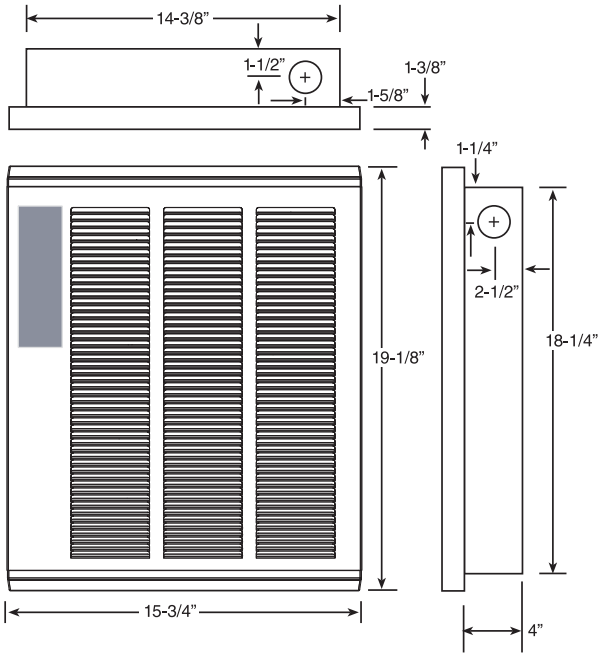

Statuary Bronze


Northern White

MOUNTING LIMITATIONS

Do not install heater closer than 12" to the floor, 12" to an adjacent wall, 36" to the ceiling. Do not install heater behind towel rack or door, upside down or sideways, in the floor, in the ceiling, or in closets.

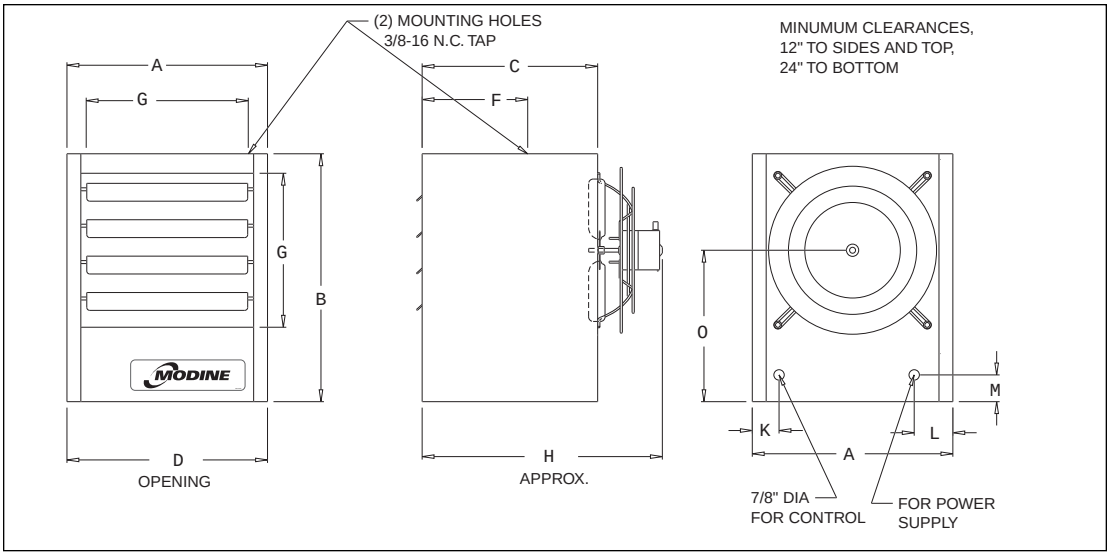
DIMENSIONS



2-420.12

September, 2002

SUBMITTAL DATA
horizontal electric unit heaters
models HER50 thru HER250



Outline Dimensions (inches)

Dim.	Electrical Unit Heater Models						
	HER50	HER75	HER100	HER125	HER150	HER200	HER250
A	16-7/8	16-7/8	16-7/8	16-7/8	16-7/8	18-7/8	18-7/8
B	20-7/8	20-7/8	20-7/8	20-7/8	20-7/8	24	24
C	14-3/4	14-3/4	14-3/4	14-3/4	14-3/4	20	20
D	14-1/2	14-1/2	14-1/2	14-1/2	14-1/2	16-1/2	16-1/2
E	13	13	13	13	13	16	16
F	8-7/8	8-7/8	9-5/8	9-5/8	9-5/8	12-5/8	12-5/8
G	13-1/2	13-1/2	13-1/2	13-1/2	13-1/2	15-1/2	15-1/2
H	20-1/4	20-1/4	21-1/4	21-1/4	21-1/4	26-1/2	26-1/2
K	2-1/4	2-1/4	2-1/4	2-1/4	2-1/4	3-1/4	3-1/4
L	3-1/4	3-1/4	3-1/4	3-1/4	3-1/4	4-1/4	4-1/4
M	2-1/4	2-1/4	2-1/4	2-1/4	2-1/4	2-1/2	2-1/2
O	12-3/4	12-3/4	12-3/4	12-3/4	12-3/4	14-1/2	14-1/2
Fan Dia.	12	12	12	12	12	14	14
Wt.* Lbs.	52	52	67	65	74	97	98

* Approx. Shipping Weight…Add 7 lbs. for 480 Volt Models.

Motor Specifications

Model	HP	Voltage	Phase	Amp.	Hertz	RPM	Motor Type W/Tol	Shaft Dia. (In.)	Bearing Type
HER50 HER75	1/40	208-230	1	0.50	60	1550	Totally Enclosed Shaded Pole	5/16	Sleeve
HER100 HER125 HER150 HER200 HER250	1/15	208-230	1	1.28	60	1050	Totally Enclosed Shaded Pole	1/2	Sleeve

Wiring Data

Model No.	Power Supply	Total* Amps (Approx.)	Min. Wire Size (Awg)	Min. Conduit Size
HER 50	208/1	24.5	8	3/4
	240/1	21.3	10	1/2
	208/3	14.4	12	1/2
	240/3	12.6	12	1/2
	480/3	6.6	14	1/2
HER 75	208/1	36.5	6	1
	240/1	31.8	8	3/4
	208/3	21.3	10	1/2
	240/3	18.5	10	1/2
	480/3	9.6	14	1/2
HER 100	208/1	49.1	4	1
	240/1	42.7	6	1
	208/3	28.8	8	3/4
	240/3	25.1	8	3/4
	480/3	13.2	12	1/2
HER 125	208/3	35.8	6	1
	240/3	31.2	8	3/4
	480/3	16.1	10	1/2
HER 150	208/3	42.7	6	1
	240/3	37.2	6	1
	480/3	19.2	10	1/2
HER 200	208/3	56.6	3	1-1/4
	240/3	49.2	4	1
	480/3	25.2	8	3/4
HER 250	208/3	70.5	2	1-1/4
	240/3	61.2	3	1-1/4
	480/3	31.2	8	3/4

* NEC fuse requirements are 125 percent of total amperes. Check with local code.

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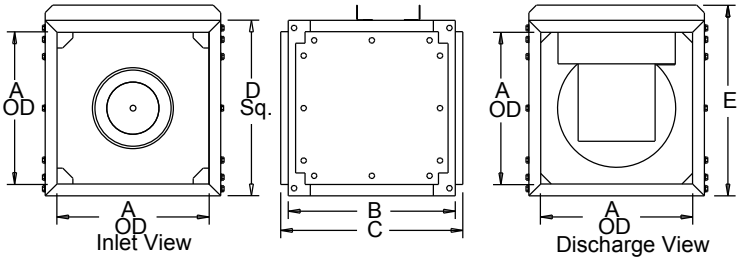
MARK: FN01	
PROJECT: SPMT MEXICO	
DATE: 6/18/2014	

SQN-D

Centrifugal Square Inline
Direct Drive

STANDARD CONSTRUCTION FEATURES:

All aluminum wheel - Galvanized steel housing - Three removable access doors - Closed cell neoprene gasketing - Inlet and discharge duct collars - Universal mounting feet - Permanently lubricated motor - Transit tested packaging.



Performance

Qty	Catalog Number	Flow (CFM)	SP (inwc)	Fan RPM	Input Watts
1	90SQN10D	200	.200	1133	60

Altitude (ft): 9285 Temperature (F): 60

Motor Information

HP	RPM	Volts/Ph/Hz	Enclosure	TOL
1/6	1075	115/1/60	TENV -SE	Yes

Dimensions (inches)

A	12
B	15
C	17
D Sq.	14
E	15-9/16

NOTE: Accessories may affect dimensions shown.

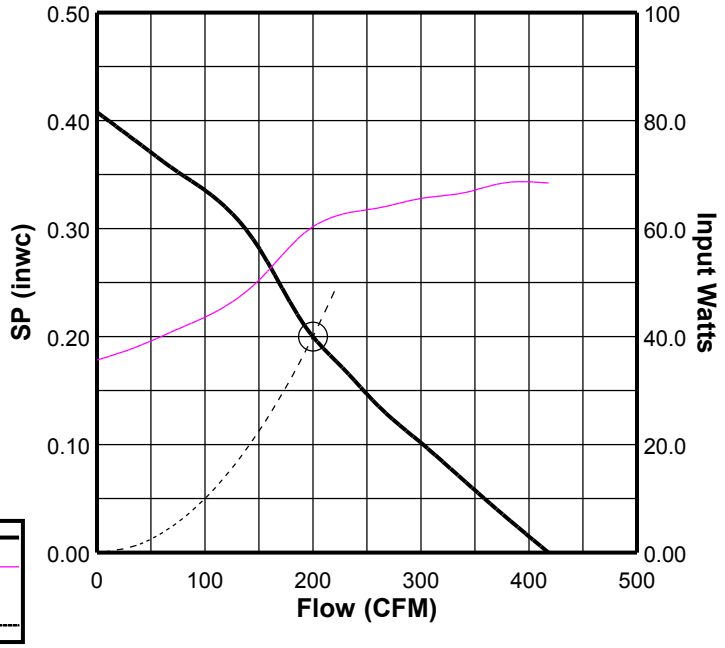
Shipping Weight(lbs)* **	95

***Includes fan, motor & accessories.

Accessories:

STD DISCONNECT PREWIRED
FAN SPEED CONTROLLER 5 AMP 120 VOLT
RC-75 SET(4) - ISOLATORS

Fan Curve



Fan Curve Legend

CFM vs SP	———
CFM vs Watts	———
Point of Operation	◯
System Curve	- - - - -

COOK

MARK: FN01
PROJECT: SPMT MEXICO
DATE: 6/18/2014

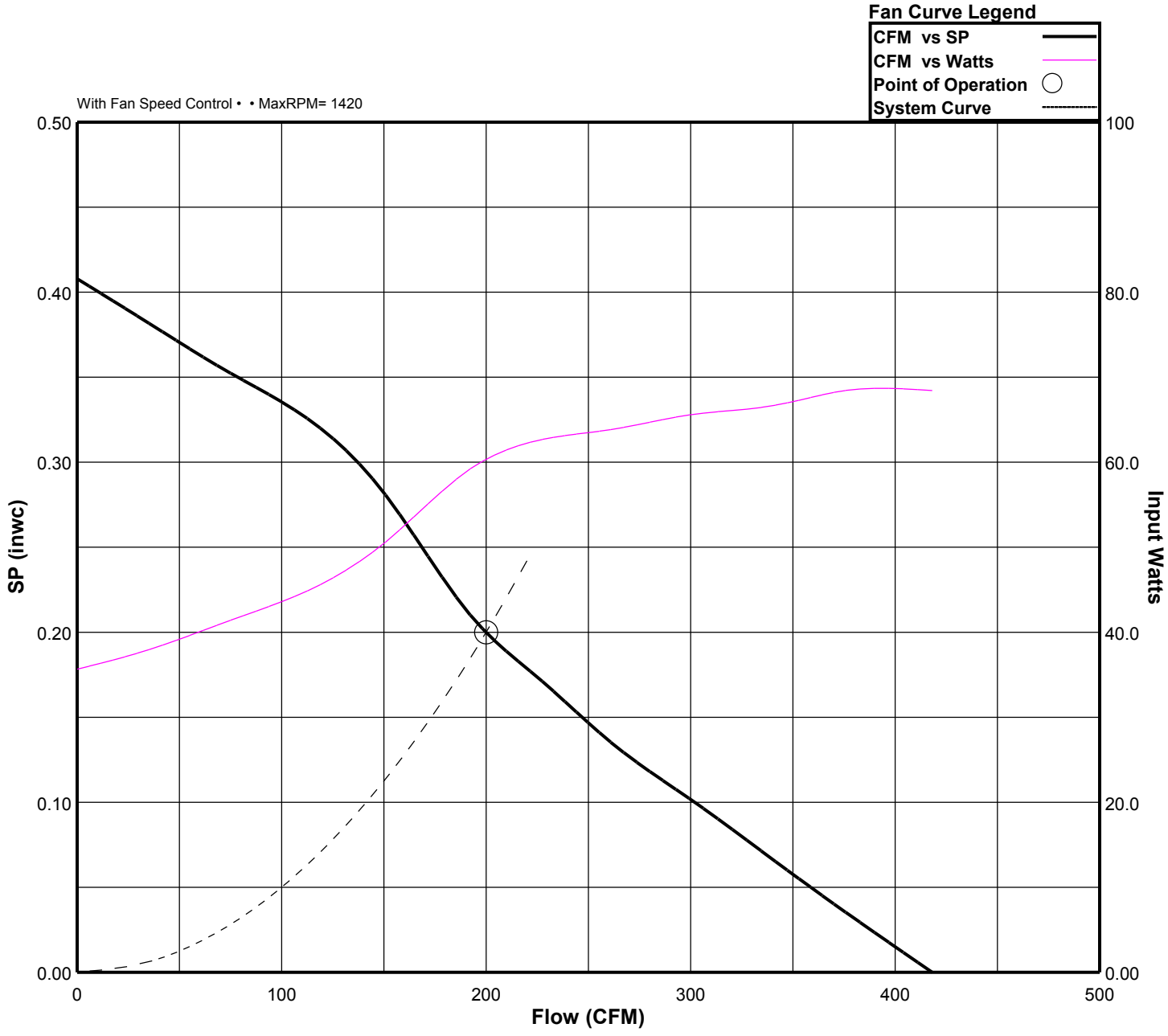
SQN-D

Performance

Catalog Number	Flow (CFM)	SP (inwc)	Fan RPM	Input Watts	OVEL (fpm)	TSPD (fpm)	TEMP (°F)	ALT (ft)
90SQN10D	200	.200	1133	60	200	2669	60	9285

Sound Data Inlet Sound Power by Octave Band

1	2	3	4	5	6	7	8	LwA	dBA	Sones
58	61	60	55	52	47	42	38	58	46	4.1



COOK

PROJECT: SPMT MEXICO
DATE: 6/18/2014

FSC

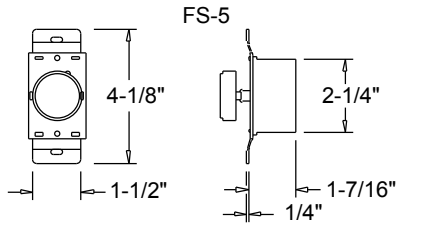
Fan Speed Controls

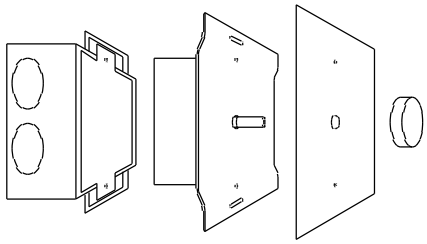
STANDARD CONSTRUCTION FEATURES:

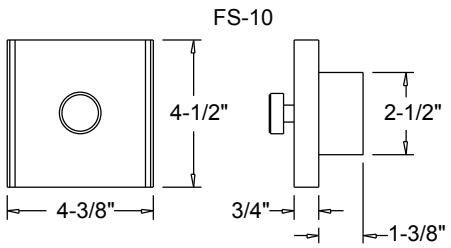
PRODUCT DESCRIPTION - Through the "Quadrac" integrated semi-conductor device it is now possible to offer this system with many advantages. Fewer semi-conductor parts mean greater reliability and the passivation process used in the manufacture of the semi-conductor insures long life. Printed circuit construction eliminates wiring difficulties and guarantees workmanship. All of these factors serve to offer the most important of all features - quality. SPEED CONTROL - Positive Off/On action in the control dial. Speed range set to the customer's requirements. CONTROL RATING - 120 volts, 60 cycles, 1 phase. Maximum ambient temperature - 120 degree F (5 AMP, 10 AMP, 15 AMP). 220/240 volt, 50/60 cycles, 1 phase. Maximum ambient temperature - 120 degree F (5 AMP, 10 AMP). 220/240 volt model not UL listed. Fan cannot have UL listing if furnished with prewired 220/240 volt FSC. 277 volt, 60 cycles, 1 phase. Maximum ambient temperature - 120 degree F (5 AMP). WARNING - Power must be turned off before installing this unit. STANDARD INSTALLATION - Fits any standard single gang box. Turn off power and connect the two wires on the control to the two switch wires in the usual manner. The connection box is not supplied. SPECIAL FEATURES - Complete range control, solid state "Quadrac" integrated circuitry, solid state construction for long reliable operating life, saves on electric bills.

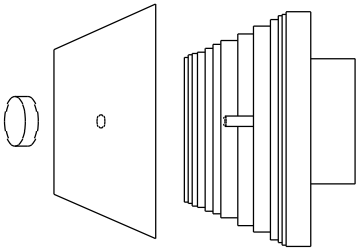
Dimensions (inches)

Mark	Qty	Description
FN01	1	FSC 5 AMP 120 VOLT

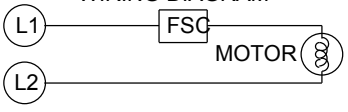








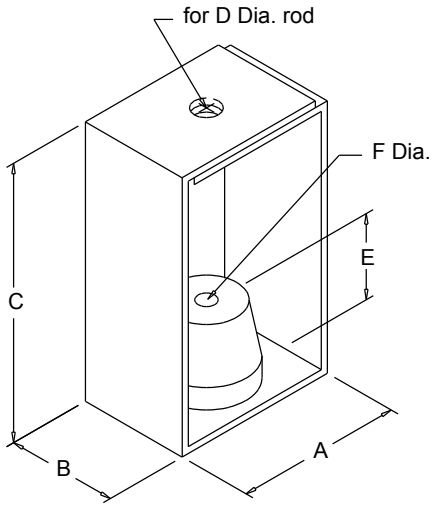
WIRING DIAGRAM



PROJECT: SPMT MEXICO
DATE: 6/18/2014

RIS CEILING

Rubber-In-Shear Isolator Ceiling Mounted



NOTE:
Dimensions are for informational purposes only - Not for construction.

Dimensions (inches)

Mark	Qty	Description	A	B	C	D	E	F
FN01	1	RC-75 SET(4)	2-5/32	1-1/2	2-23/32	11/16	15/32	3/8

Blower Standard Construction Features

* Heavy duty relubricatable, self-aligning bearings rated for 200,000 hours average life.
* Precision turned ground & polished solid steel shafts sized for critical speed of 125% max cataloged conditions.
* All steel components Lorenized with an electrostatically applied baked polyester powder coating.
* Integral adjustable motor mounting plate on arrangements 9 and 10.
* Dynamically balanced wheels.
* Static resistant belts.
* Pre-punched mounting holes.
* Lifting lugs on all sizes.
* Corrosion resistant fasteners.

PRODUCT SPECIFIC FEATURES:

CIC - Inline Centrifugal Blower

UL 705 Listed * AMCA Air and Sound certified performance * Flanged outlet * Inlet collar for slip-fit duct connection * Fully welded straightening vanes * Lube lines extended to exterior of unit * Continuously welded, high efficiency airfoil wheel * Heavy gauge spun aluminum inlet cone * Continuously welded heavy gauge housing.

CA – Airfoil Centrifugal Blower

UL 705 Listed * AMCA Air and Sound certified performance * Flanged outlet * Inlet collar for slip-fit duct connection on arrangements 1, 2, 9 and 10 * Continuously welded, high efficiency airfoil wheel * Heavy gauge spun aluminum inlet cone * Continuously welded heavy gauge housing.

CF – Backward Inlet Centrifugal Blower

UL 705 Listed * AMCA Air certified performance * Flanged outlet * Inlet collar for slip-fit duct connection on arrangements 1, 2, 9 and 10 * Continuously welded, heavy duty flat blade wheel * Heavy gauge spun aluminum inlet cone * Continuously welded heavy gauge housing.

CPS/CPA – Arr. 10 Vent Set

UL 705 Listed * AMCA Air certified performance * Field rotatable housings * AMCA 'A' all aluminum airstream construction on CPA * Flanged outlet * Inlet collar for slip-fit duct connection * Continuously welded, heavy duty flat blade wheel * Heavy gauge spun aluminum inlet cone * Continuously welded housing.

CPS-A/CPA-A – Arr. 10 Vent Set

Field rotatable housings * AMCA 'A' all aluminum airstream construction on CPA-A * Flanged outlet * Inlet collar for slip-fit duct connection * Continuously welded, high efficiency airfoil wheel * Heavy gauge spun aluminum inlet cone * Continuously welded housing.

CPV – Arr. 10 Vent Set

UL 705 Listed * AMCA Air and Sound certified performance * Field rotatable housings * Flanged outlet * Inlet collar for slip-fit duct connection * All aluminum flat blade wheel * Heavy gauge spun aluminum inlet cone * Continuously welded housing.

CPFB/CPFD – Vent Set

UL 705 Listed * AMCA Air and Sound certified performance * Field rotatable housings * Flanged outlet on CPFB, slip-fit outlet on CPFD * Inlet Collar for slip-fit inlet duct connection * Forward curved wheel * Heavy gauge spun aluminum inlet cone in CPFB, steel inlet on CPFD * Continuously welded housing on CPFB.

CCP – Plug Fan

UL 705 Listed * AMCA Air and Sound certified performance * Heavy gauge mounting panel with welded corners * Continuously welded, airfoil and flat blade wheel available * Heavy gauge spun aluminum inlet cone.

PLC – Plenum Fan

UL 705 Listed * AMCA Air and Sound certified performance * Heavy duty structural steel frame with heavy gauge inlet panel welded at all connections * Continuously welded airfoil wheel * Heavy gauge spun aluminum inlet cone.

CFS – Centrifugal Filtered Supply Fan

UL 705 Listed * Continuously welded, high efficiency airfoil wheel * Extruded aluminum tiers with continuously welded and mitered corners * Removable aluminum top cap with welded corners*Permanent removable washable filters * Continuously welded heavy gauge blower housing.

IMH – Industrial Material Handler

AMCA Air certified performance * Field rotatable housing * Inlet collar for slip-fit duct connection * Continuously welded, heavy duty radial tip wheel * Continuously welded housing * Heavy duty structural steel housing supports.

MH - Radial blades in an open wheel
MHR - Rim reinforced, radial blades in an open wheel
MHB - Radial, buttressed blades in a backplate wheel
MHA - Backward inclined blades in a backplate wheel with a conical shroud

COOK

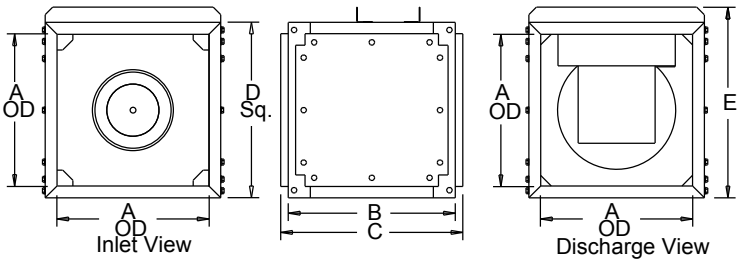
MARK: FN02	
PROJECT: SPMT MEXICO	
DATE: 6/18/2014	

SQN-D

Centrifugal Square Inline
Direct Drive

STANDARD CONSTRUCTION FEATURES:

All aluminum wheel - Galvanized steel housing - Three removable access doors - Closed cell neoprene gasketing - Inlet and discharge duct collars - Universal mounting feet - Permanently lubricated motor - Transit tested packaging.



Performance

Qty	Catalog Number	Flow (CFM)	SP (inwc)	Fan RPM	Input Watts
1	90SQN10D	295	.250	1420	77

Altitude (ft): 9285 Temperature (F): 70

Motor Information

HP	RPM	Volts/Ph/Hz	Enclosure	TOL
1/6	1075	115/1/60	TENV -SE	Yes

Dimensions (inches)

A	12
B	15
C	17
D Sq.	14
E	15-9/16

NOTE: Accessories may affect dimensions shown.

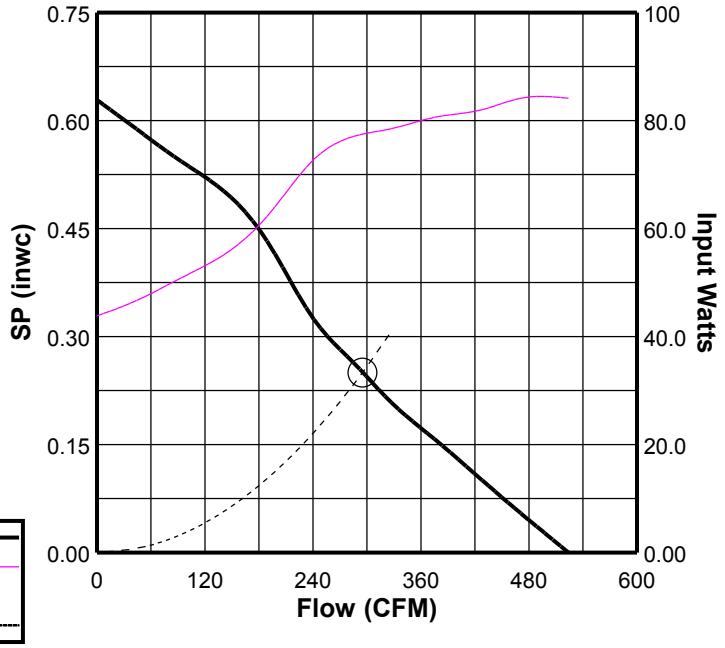
Shipping Weight(lbs)***	93

***Includes fan, motor & accessories.

Accessories:

STD DISCONNECT PREWIRED
FAN SPEED CONTROLLER 5 AMP 120 VOLT

Fan Curve



Fan Curve Legend

CFM vs SP	———
CFM vs Watts	———
Point of Operation	◯
System Curve	- - - - - -

COOK

MARK: FN02
PROJECT: SPMT MEXICO
DATE: 6/18/2014

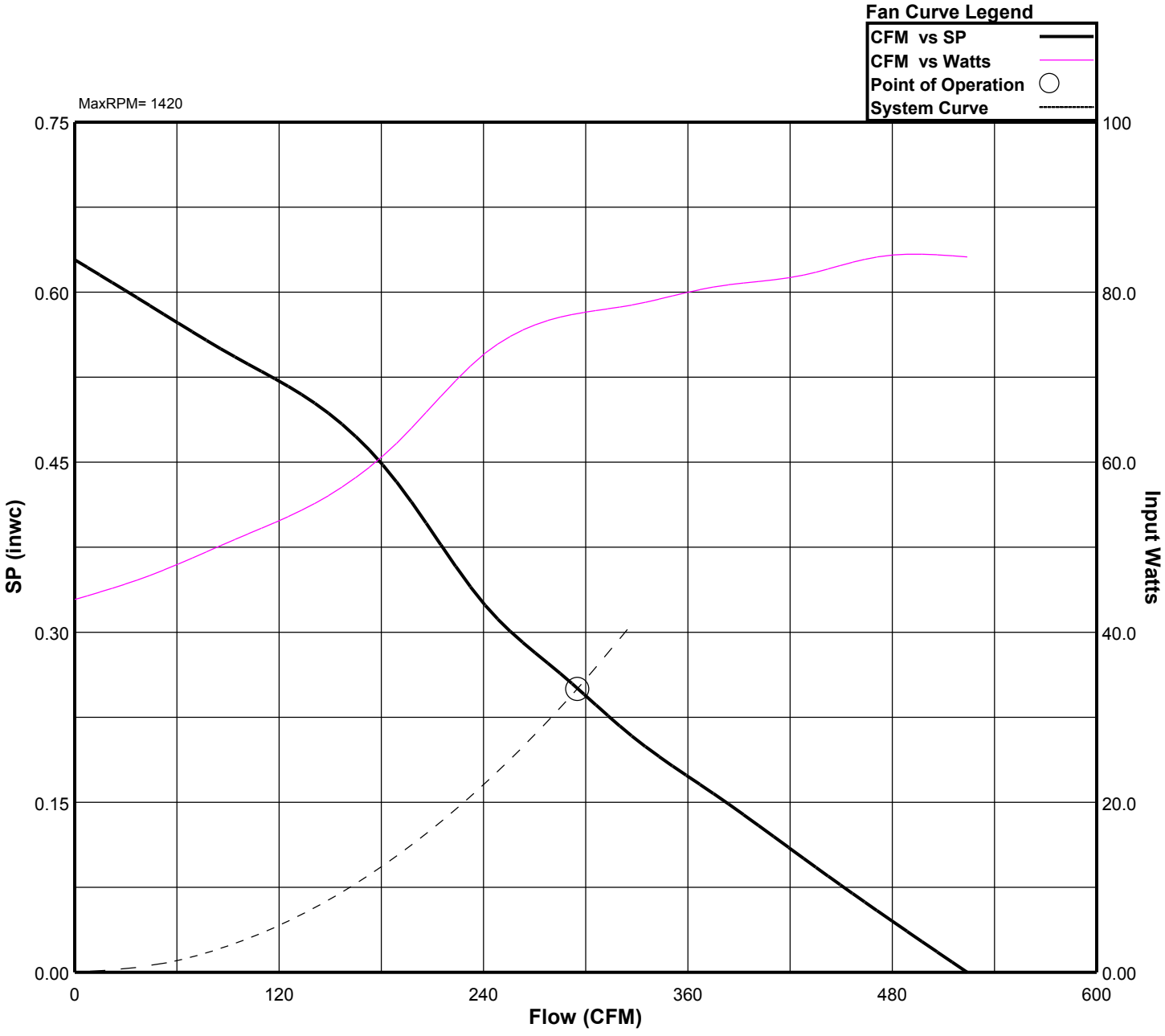
SQN-D

Performance

Catalog Number	Flow (CFM)	SP (inwc)	Fan RPM	Input Watts	OVEL (fpm)	TSPD (fpm)	TEMP (°F)	ALT (ft)
90SQN10D	295	.250	1420	77	295	3345	70	9285

Sound Data Inlet Sound Power by Octave Band

1	2	3	4	5	6	7	8	LwA	dBA	Sones
64	68	66	62	59	53	48	44	64	53	6.2



PROJECT: SPMT MEXICO
DATE: 6/18/2014

FSC

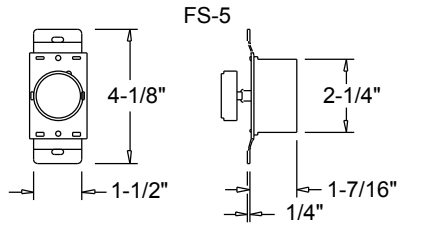
Fan Speed Controls

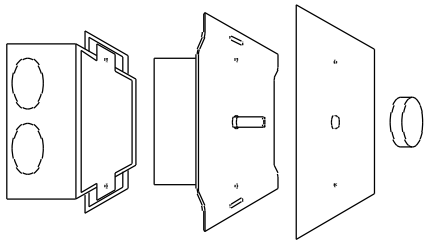
STANDARD CONSTRUCTION FEATURES:

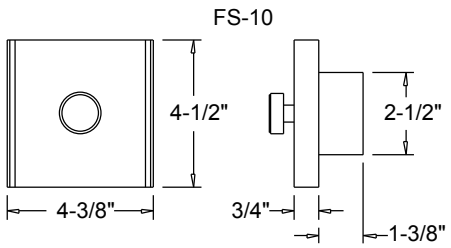
PRODUCT DESCRIPTION - Through the "Quadrac" integrated semi-conductor device it is now possible to offer this system with many advantages. Fewer semi-conductor parts mean greater reliability and the passivation process used in the manufacture of the semi-conductor insures long life. Printed circuit construction eliminates wiring difficulties and guarantees workmanship. All of these factors serve to offer the most important of all features - quality. SPEED CONTROL - Positive Off/On action in the control dial. Speed range set to the customer's requirements. CONTROL RATING - 120 volts, 60 cycles, 1 phase. Maximum ambient temperature - 120 degree F (5 AMP, 10 AMP, 15 AMP). 220/240 volt, 50/60 cycles, 1 phase. Maximum ambient temperature - 120 degree F (5 AMP, 10 AMP). 220/240 volt model not UL listed. Fan cannot have UL listing if furnished with prewired 220/240 volt FSC. 277 volt, 60 cycles, 1 phase. Maximum ambient temperature - 120 degree F (5 AMP). WARNING - Power must be turned off before installing this unit. STANDARD INSTALLATION - Fits any standard single gang box. Turn off power and connect the two wires on the control to the two switch wires in the usual manner. The connection box is not supplied. SPECIAL FEATURES - Complete range control, solid state "Quadrac" integrated circuitry, solid state construction for long reliable operating life, saves on electric bills.

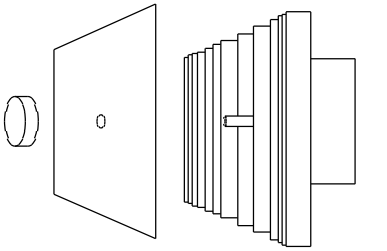
Dimensions (inches)

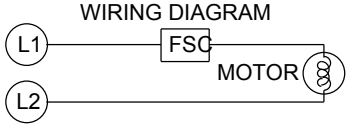
Mark	Qty	Description
FN02	1	FSC 5 AMP 120 VOLT











Blower Standard Construction Features

* Heavy duty relubricatable, self-aligning bearings rated for 200,000 hours average life.
* Precision turned ground & polished solid steel shafts sized for critical speed of 125% max cataloged conditions.
* All steel components Lorenized with an electrostatically applied baked polyester powder coating.
* Integral adjustable motor mounting plate on arrangements 9 and 10.
* Dynamically balanced wheels.
* Static resistant belts.
* Pre-punched mounting holes.
* Lifting lugs on all sizes.
* Corrosion resistant fasteners.

PRODUCT SPECIFIC FEATURES:

CIC - Inline Centrifugal Blower

UL 705 Listed * AMCA Air and Sound certified performance * Flanged outlet * Inlet collar for slip-fit duct connection * Fully welded straightening vanes * Lube lines extended to exterior of unit * Continuously welded, high efficiency airfoil wheel * Heavy gauge spun aluminum inlet cone * Continuously welded heavy gauge housing.

CA – Airfoil Centrifugal Blower

UL 705 Listed * AMCA Air and Sound certified performance * Flanged outlet * Inlet collar for slip-fit duct connection on arrangements 1, 2, 9 and 10 * Continuously welded, high efficiency airfoil wheel * Heavy gauge spun aluminum inlet cone * Continuously welded heavy gauge housing.

CF – Backward Inlet Centrifugal Blower

UL 705 Listed * AMCA Air certified performance * Flanged outlet * Inlet collar for slip-fit duct connection on arrangements 1, 2, 9 and 10 * Continuously welded, heavy duty flat blade wheel * Heavy gauge spun aluminum inlet cone * Continuously welded heavy gauge housing.

CPS/CPA – Arr. 10 Vent Set

UL 705 Listed * AMCA Air certified performance * Field rotatable housings * AMCA 'A' all aluminum airstream construction on CPA * Flanged outlet * Inlet collar for slip-fit duct connection * Continuously welded, heavy duty flat blade wheel * Heavy gauge spun aluminum inlet cone * Continuously welded housing.

CPS-A/CPA-A – Arr. 10 Vent Set

Field rotatable housings * AMCA 'A' all aluminum airstream construction on CPA-A * Flanged outlet * Inlet collar for slip-fit duct connection * Continuously welded, high efficiency airfoil wheel * Heavy gauge spun aluminum inlet cone * Continuously welded housing.

CPV – Arr. 10 Vent Set

UL 705 Listed * AMCA Air and Sound certified performance * Field rotatable housings * Flanged outlet * Inlet collar for slip-fit duct connection * All aluminum flat blade wheel * Heavy gauge spun aluminum inlet cone * Continuously welded housing.

CPFB/CPFD – Vent Set

UL 705 Listed * AMCA Air and Sound certified performance * Field rotatable housings * Flanged outlet on CPFB, slip-fit outlet on CPFD * Inlet Collar for slip-fit inlet duct connection * Forward curved wheel * Heavy gauge spun aluminum inlet cone in CPFB, steel inlet on CPFD * Continuously welded housing on CPFB.

CCP – Plug Fan

UL 705 Listed * AMCA Air and Sound certified performance * Heavy gauge mounting panel with welded corners * Continuously welded, airfoil and flat blade wheel available * Heavy gauge spun aluminum inlet cone.

PLC – Plenum Fan

UL 705 Listed * AMCA Air and Sound certified performance * Heavy duty structural steel frame with heavy gauge inlet panel welded at all connections * Continuously welded airfoil wheel * Heavy gauge spun aluminum inlet cone.

CFS – Centrifugal Filtered Supply Fan

UL 705 Listed * Continuously welded, high efficiency airfoil wheel * Extruded aluminum tiers with continuously welded and mitered corners * Removable aluminum top cap with welded corners*Permanent removable washable filters * Continuously welded heavy gauge blower housing.

IMH – Industrial Material Handler

AMCA Air certified performance * Field rotatable housing * Inlet collar for slip-fit duct connection * Continuously welded, heavy duty radial tip wheel * Continuously welded housing * Heavy duty structural steel housing supports.

MH - Radial blades in an open wheel
MHR - Rim reinforced, radial blades in an open wheel
MHB - Radial, buttressed blades in a backplate wheel
MHA - Backward inclined blades in a backplate wheel with a conical shroud

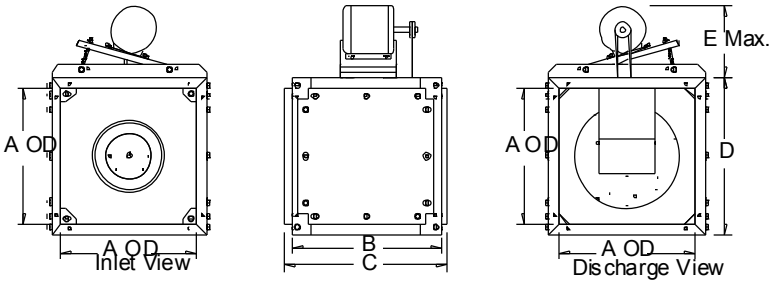
MARK: PIER EXHAUST
PROJECT: SPMT MEXICO
DATE: 9/25/2014

SQN-HP

Centrifugal Square Inline
High Pressure
Belt Drive

STANDARD CONSTRUCTION FEATURES:

All aluminum wheel - Galvanized steel housing - Three removable access doors - Closed cell neoprene gasketing - Inlet and discharge duct collars - Universal mounting feet - Regreasable bearings in a cast housing rated at 200,000 hours average life - Permanently lubricated ball bearing motor - Adjustable pitch drives through 5 HP - All fans factory adjusted to specified fan RPM - Transit tested packaging.



Performance (*Bhp includes 10% drive loss)

Qty	Catalog Number	Flow (CFM)	SP (inwc)	Fan RPM	Power* (HP)
1	210SQN-HP	4500	2.00	1702	2.87

Altitude (ft): 9000 Temperature (F): 70

Motor Information

HP	RPM	Volts/Ph/Hz	Enclosure	Mounted
3	1725	460/3/60	ODP -PE	Yes

NEMA Premium® efficiency motor per MG-1 (2006) Table 12-12

Dimensions (inches)

A	28
B	32
C	35
D	31-1/4
E	15
MaxMtrFrm	182T

NOTE: Accessories may affect dimensions shown.

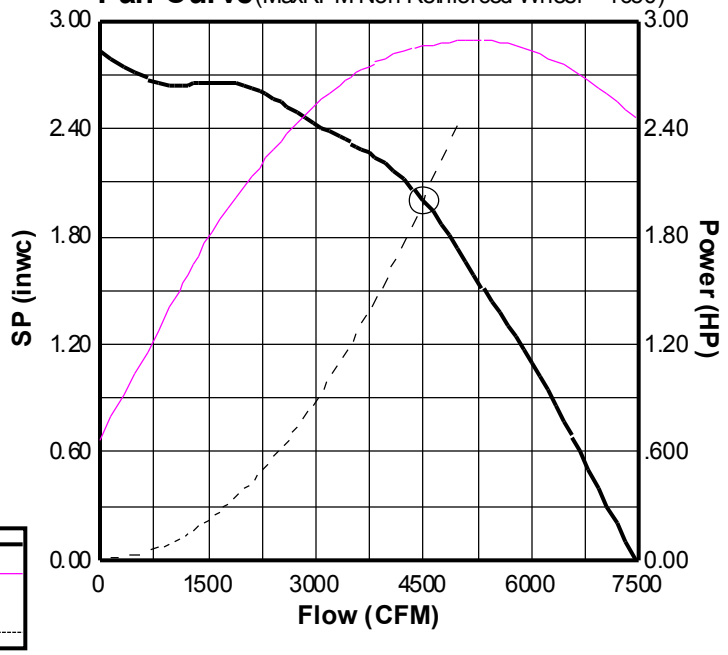
Shipping Weight(lbs)***	346

*** Includes fan, motor & accessories.

Accessories:

Premium Efficiency Motor (Min. 89.5%)
OSHA GUARD/MTR COVER
RC-125 SET(4) - ISOLATORS

Fan Curve (MaxRPM Non-Reinforced Wheel = 1650)



Fan Curve Legend

CFM vs SP
CFM vs HP
Point of Operation
System Curve

COOK

MARK: PIER EXHAUST
PROJECT: SPMT MEXICO
DATE: 9/25/2014

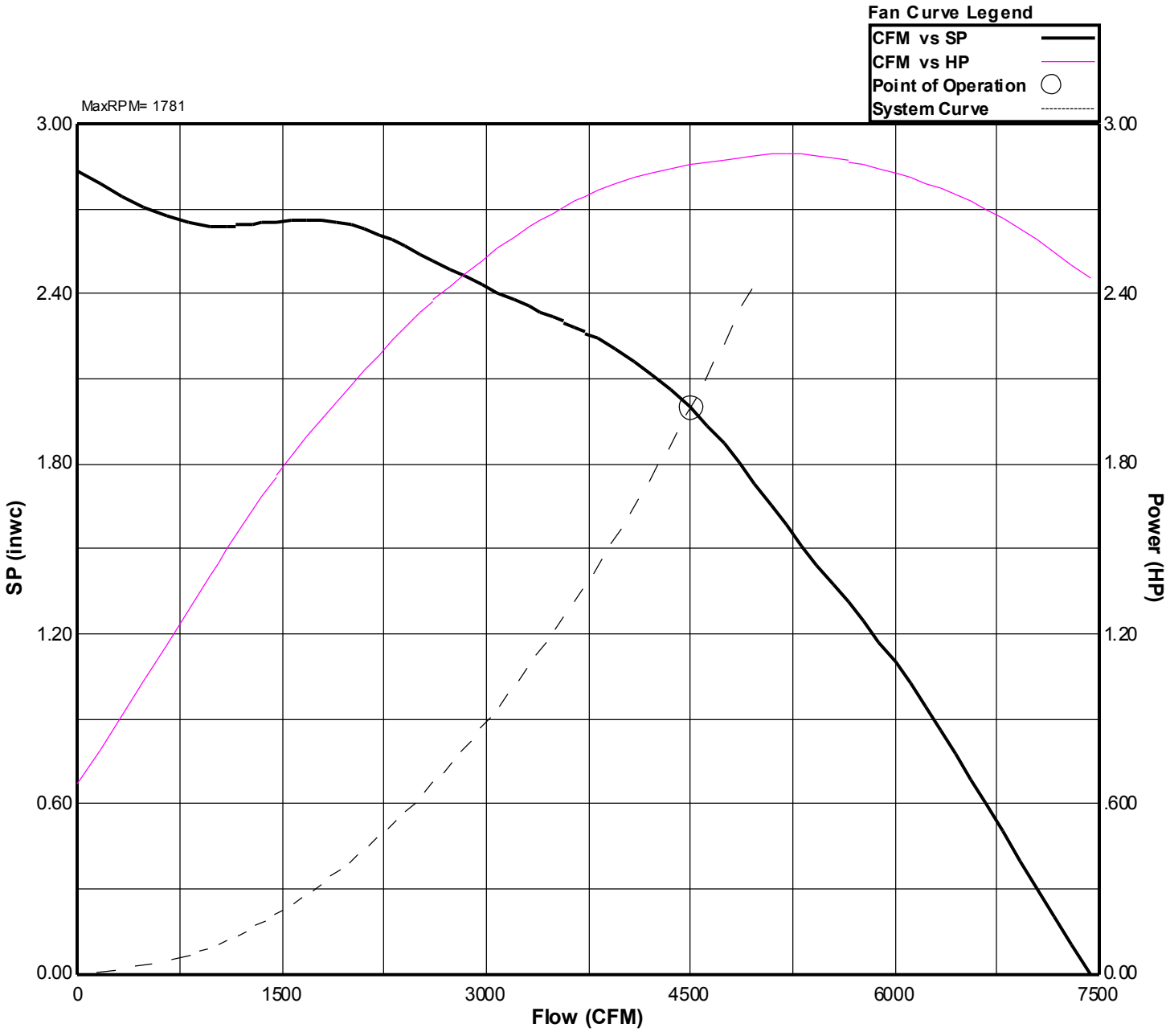
SQN-HP

Performance (*Bhp includes 10% drive loss)

Catalog Number	Flow (CFM)	SP (inwc)	Fan RPM	Power* (HP)	OVEL (fpm)	TSPD (fpm)	TEMP (°F)	ALT (ft)
210SQN-HP	4500	2.00	1702	2.87	827	9357	70	9000

Sound Data Inlet Sound Power by Octave Band

1	2	3	4	5	6	7	8	LwA	dBA	Sones
90	96	98	91	87	81	81	76	94	82	39



v9.2.34.0

PROJECT: SPMT MEXICO
DATE: 9/25/2014

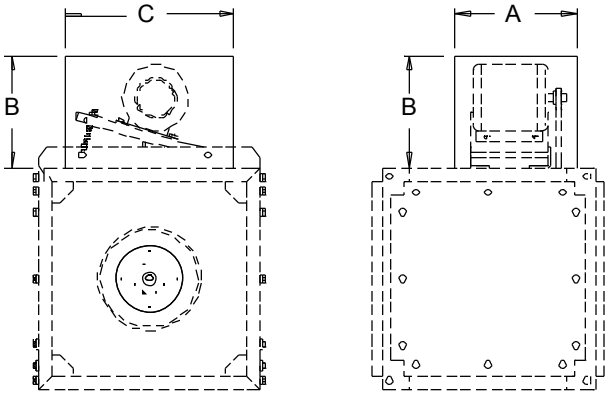
MOTOR COVER

STANDARD CONSTRUCTION FEATURES:

18 ga. Galvanized steel - Meets OSHA requirements.

Options:

Lorenized coating.



Dimensions (inches)

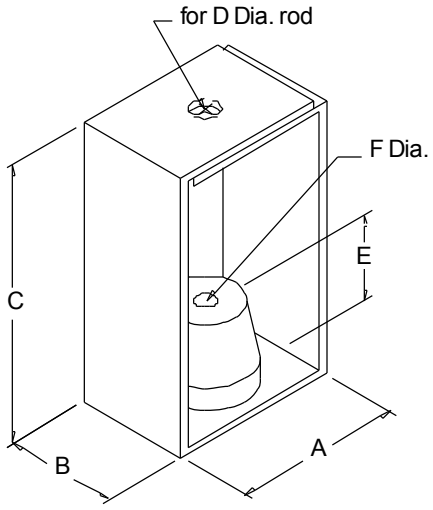
Mark	Qty	Description	A	B	C
PIER EXHAUST	1	OSHA GUARD/MTR COVER	25	18	20

PROJECT: SPMT MEXICO
DATE: 9/25/2014

RIS CEILING

Rubber-In-Shear Isolator Ceiling Mounted

NOTE:
Dimensions are for informational purposes only - Not for construction.



Dimensions (inches)

Mark	Qty	Description	A	B	C	D	E	F
PIER EXHAUST	1	RC-125 SET(4)	2-5/32	1-1/2	2-23/32	11/16	15/32	3/8

Blower Standard Construction Features

* Heavy duty relubricatable, self-aligning bearings rated for 200,000 hours average life.
* Precision turned ground & polished solid steel shafts sized for critical speed of 125% max cataloged conditions.
* All steel components Lorenized with an electrostatically applied baked polyester powder coating.
* Integral adjustable motor mounting plate on arrangements 9 and 10.
* Dynamically balanced wheels.
* Static resistant belts.
* Pre-punched mounting holes.
* Lifting lugs on all sizes.
* Corrosion resistant fasteners.

PRODUCT SPECIFIC FEATURES:

CIC - Inline Centrifugal Blower

UL 705 Listed * AMCA Air and Sound certified performance * Flanged outlet * Inlet collar for slip-fit duct connection * Fully welded straightening vanes * Lube lines extended to exterior of unit * Continuously welded, high efficiency airfoil wheel * Heavy gauge spun aluminum inlet cone * Continuously welded heavy gauge housing.

CA – Airfoil Centrifugal Blower

UL 705 Listed * AMCA Air and Sound certified performance * Flanged outlet * Inlet collar for slip-fit duct connection on arrangements 1, 2, 9 and 10 * Continuously welded, high efficiency airfoil wheel * Heavy gauge spun aluminum inlet cone * Continuously welded heavy gauge housing.

CF – Backward Inlet Centrifugal Blower

UL 705 Listed * AMCA Air certified performance * Flanged outlet * Inlet collar for slip-fit duct connection on arrangements 1, 2, 9 and 10 * Continuously welded, heavy duty flat blade wheel * Heavy gauge spun aluminum inlet cone * Continuously welded heavy gauge housing.

CPS/CPA – Arr. 10 Vent Set

UL 705 Listed * AMCA Air certified performance * Field rotatable housings * AMCA 'A' all aluminum airstream construction on CPA * Flanged outlet * Inlet collar for slip-fit duct connection * Continuously welded, heavy duty flat blade wheel * Heavy gauge spun aluminum inlet cone * Continuously welded housing.

CPS-A/CPA-A – Arr. 10 Vent Set

Field rotatable housings * AMCA 'A' all aluminum airstream construction on CPA-A * Flanged outlet * Inlet collar for slip-fit duct connection * Continuously welded, high efficiency airfoil wheel * Heavy gauge spun aluminum inlet cone * Continuously welded housing.

CPV – Arr. 10 Vent Set

UL 705 Listed * AMCA Air and Sound certified performance * Field rotatable housings * Flanged outlet * Inlet collar for slip-fit duct connection * All aluminum flat blade wheel * Heavy gauge spun aluminum inlet cone * Continuously welded housing.

CPFB/CPFD – Vent Set

UL 705 Listed * AMCA Air and Sound certified performance * Field rotatable housings * Flanged outlet on CPFB, slip-fit outlet on CPFD * Inlet Collar for slip-fit inlet duct connection * Forward curved wheel * Heavy gauge spun aluminum inlet cone in CPFB, steel inlet on CPFD * Continuously welded housing on CPFB.

CCP – Plug Fan

UL 705 Listed * AMCA Air and Sound certified performance * Heavy gauge mounting panel with welded corners * Continuously welded, airfoil and flat blade wheel available * Heavy gauge spun aluminum inlet cone.

PLC – Plenum Fan

UL 705 Listed * AMCA Air and Sound certified performance * Heavy duty structural steel frame with heavy gauge inlet panel welded at all connections * Continuously welded airfoil wheel * Heavy gauge spun aluminum inlet cone.

CFS – Centrifugal Filtered Supply Fan

UL 705 Listed * Continuously welded, high efficiency airfoil wheel * Extruded aluminum tiers with continuously welded and mitered corners * Removable aluminum top cap with welded corners*Permanent removable washable filters * Continuously welded heavy gauge blower housing.

IMH – Industrial Material Handler

AMCA Air certified performance * Field rotatable housing * Inlet collar for slip-fit duct connection * Continuously welded, heavy duty radial tip wheel * Continuously welded housing * Heavy duty structural steel housing supports.

MH - Radial blades in an open wheel
MHR - Rim reinforced, radial blades in an open wheel
MHB - Radial, buttressed blades in a backplate wheel
MHA - Backward inclined blades in a backplate wheel with a conical shroud



INERGEN Fire Suppression Systems

Multiple levels of protection
- Fire detection and suppression
- Won't damage valuable assets
- Wide range of applications

Safe for people
- Nontoxic
- Composed of gases people breathe
- No fog to obscure escape routes

Safe for the environment
- No ozone layer depletion
- No global warming potential
- Warranted to comply with future legislative standards

You expect a top-performing product from a world leader in fire detection and suppression. INERGEN clean agent delivers. Reliable and field proven, the INERGEN system safeguards lives and property to protect your business.

High Performance Results

Upon discharge, INERGEN agent floods the room and remains suspended, suppressing the fire quickly and effectively. How quickly? In performance testing, INERGEN agent easily exceeded the NFPA Standard 2001 allowance of one-minute discharge, suppressing a Class A fire in 22 seconds and a Class B fire in 17 seconds.

Safe for Your Property

As destructive as fire can be, conventional agents also can damage sensitive equipment, including your data storage, information processing and system operation electronics — equipment that keeps your business running.

INERGEN is a clean, non-conductive and natural fire suppression agent that won't damage valuable assets. Many archival organizations use INERGEN agent to protect irreplaceable items such as artwork, historic documents and antiquities.

Safe for People

INERGEN agent is nontoxic and doesn't produce corrosive decomposition products. Halocarbon (chemical) alternatives can create dangerous levels of hydrogen fluoride in the presence of fire. INERGEN agent is safe for people in a number of other ways. When discharged, INERGEN agent will not produce a fog, so escape routes remain visible. Also, INERGEN agent suppresses the fire but doesn't deplete the amount of oxygen people require to remain safe and healthy. This is vital in cases where immediate evacuation may not be possible. In fact, people exposed to INERGEN agent in extinguishing concentrations receive the same amount of oxygen to the brain as they do in an ordinary atmosphere.

Safe for the Environment

INERGEN agent is non-synthetic and composed of gases people breathe: nitrogen, argon and carbon dioxide. Once discharged, it simply returns to the atmosphere in its natural state.

The production of Halon 1301 was banned in 1993 due to its negative effects on the ozone layer. INERGEN agent poses no ozone depletion or global warming potential and is warranted to comply with future environmental standards.



APPLICATIONS FOR INERGEN SYSTEMS

- Automated tape storage libraries
- Clean/specialty manufacturing
- Computer and data processing facilities
- Control rooms
- Cultural and historical sites
- Data centers
- Hospital and major medical facilities
- Libraries/archives/rare book storage
- Marine/offshore/naval
- Mining
- Museums and art galleries
- Power generation facilities
- Telecommunication facilities

State-of-the-Art Detection and Suppression

Even before a fire reaches the flame stage, INERGEN systems can detect and suppress it. This state-of-the-art detection and control system combines exclusive AUTOPULSE microprocessor control panels with highly sensitive smoke, heat and flame detectors and specialized agent distribution components.

In case of fire, AUTOPULSE control panels also will sound alarms, close doors and shut down equipment. The system provides automatic detection day and night in conjunction with manual pull stations.

The Ultimate Fire Suppression Solution

No other fire suppression brand promises the full range of solutions or the quality of ANSUL — from automatic detection and suppression systems to a full range of wheeled and portable extinguishers and more. ANSUL products are backed by a worldwide network of factory-trained distributors — the largest and best-qualified in the industry.

A Passion for Protection

Dedicated customer support. Extensive product portfolio. Engineering excellence. Trusted, proven brands. Tyco Fire Protection Products offers all of these attributes, plus a passion for protection. It's what drives us to create solutions to help safeguard what matters most — your valued people, property and business.

tyco Fire Protection Products

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M6

Plate Heat Exchanger



M6-FG

Applications
General heating and cooling duties. Heating by means of steam.

Standard design
The plate heat exchanger consists of a pack of corrugated metal plates with portholes for the passage of the two fluids between which heat transfer will take place.

The plate pack is assembled between a fix frame plate and a movable pressure plate and compressed by tightening bolts. The plates are fitted with a gasket which seals the interplate channel and directs the fluids into alternate channels. The number of plates is determined by the flow rate, physical properties of the fluids, pressure drop and temperature program. The plate corrugations promote fluid turbulence and support the plates against differential pressure.

The frame plate and the pressure plate are suspended from an upper carrying bar and located by a lower guiding bar, both of which are fixed to a support column.

Connections are located in the frame plate or, if either or both fluids make more than a single pass within the unit, in the frame and pressure plates.

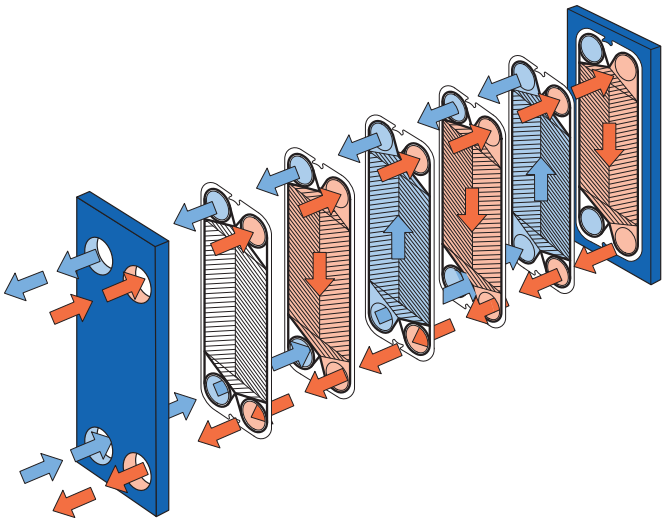
Typical capacities
Liquid flow rate
Up to 16 kg/s (250 gpm), depending on media, permitted pressue drop and temperature program.

Water heating by steam
300 to 800 kW

Plate types
M6, M6-M and M6-MD

Frame types
FM, FG and FD

Working principle
Channels are formed between the plates and the corner ports are arranged so that the two media flow through alternate channels. The heat is transferred through the plate between the channels, and complete counter-current flow is created for highest possible efficiency. The corrugation of the plates provides the passage between the plates, supports each plate against the adjacent one and enhances the turbulence, resulting in efficient heat transfer.



Flow principle of a plate heat exchanger

STANDARD MATERIALS

Frame plate
Mild steel, Epoxy painted

Nozzles
Carbon steel
Metal lined: Stainless steel, Titanium, Alloy 254 SMO, Alloy C276
Rubber lined: Nitrile, EPDM

Plates
Stainless steel: Alloy 316, Alloy 304. Alloy 254 SMO, Alloy C276, Titanium

Gaskets
Nitrile, EPDM, Viton®
Other grades and material available on request.

TECHNICAL DATA

Pressure vessel codes, PED, ASME, pvcALS™

Mechanical design pressure (g) / temperature

FM	pvcALS™	1.0 MPa / 180°C
FG	PED	1.6 MPa / 180°C
FG	ASME	162 psig / 482°F
FG	pvcALS™	1.6 MPa / 180°C
FD	PED, pvcALS™	2.5 MPa / 180°C
FD	ASME	351 psig / 482°F

Connections

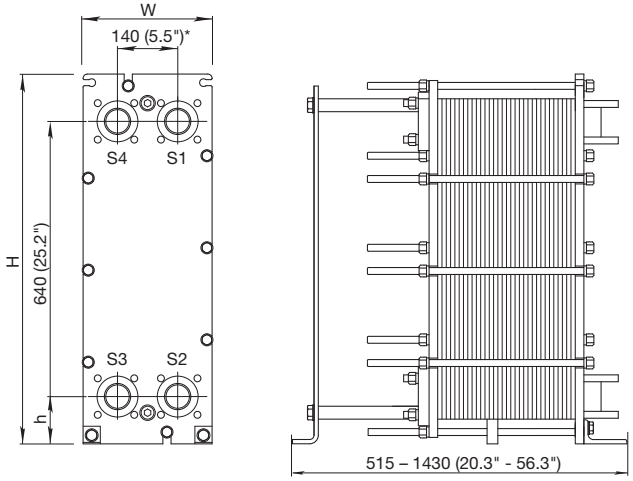
Pipe connections (not for frame type FD)

	Size:	
Straight threaded	50 mm	ISO G2"
Tapered threaded	50 mm	ISO R2", NPT2"
Straight weld	50 mm	
Threaded inlet port	50 mm	ISO G2"

Flange connections

		Size:	
FM	pvcALS™	50 mm	DIN/GB/GOST PN10, ASME Cl. 150, JIS 10K
FG	PED	50 mm	DIN PN16, ASME Cl. 150
FG	ASME	2"	ASME Cl. 150
FG	pvcALS™	50 mm	DIN/GB/GOST PN16, ASME Cl. 150, JIS 16K
FD	PED	50 mm	DIN PN25, ASME Cl. 300
FD	ASME	2"	ASME Cl. 300
FD	ALS	50 mm	DIN, GB, GOST PN25, JIS 20K

Dimensions



* Displacement of some connection types occur.

Measurements mm (inch)

Type	H	W	h
M6-FM	920 (36.2")	320 (12.6")	140 (5.5")
M6-FG	920 (36.2")	320 (12.6")	140 (5.5")
M6-FD	940 (37.0")	330 (13.0")	150 (5.9")

The number of tightening bolts may vary depending on pressure rating.

Maximum heat transfer surface
38 m² (400 sq. ft)

Particulars required for quotation
- Flow rates or heat load
- Temperature program
- Physical properties of liquids in question (if not water)
- Desired working pressure
- Maximum permitted pressure drop
- Available steam pressure

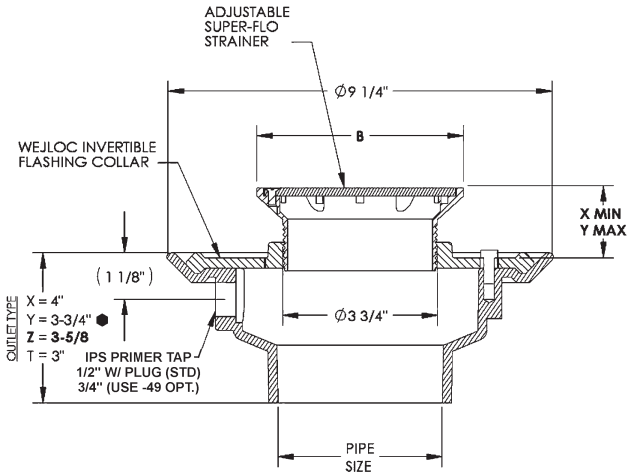
Alfa Laval reserves the right to change specifications without prior notification.

How to contact Alfa Laval
Up-to-date AlfaLaval contact details for all countries are always available on our website on www.alfalaval.com

FLOOR DRAINS • Body/Strainer Combinations

30000-A SERIES

Body with Round SUPER-FLO® Strainer

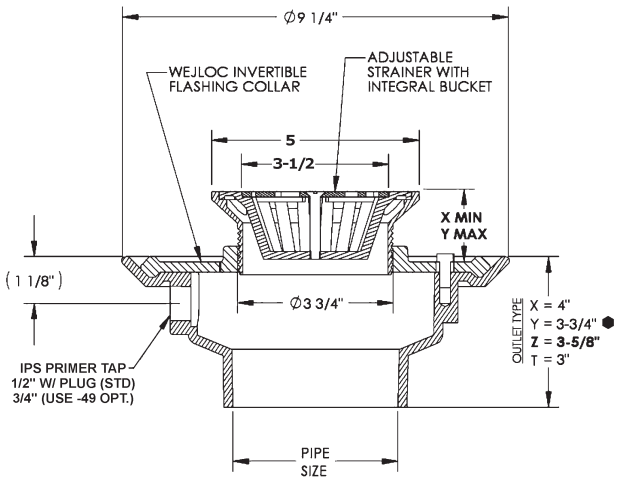


⬢ CONFORMS WITH ASTM-C564.

TYPE NO.	PIPE SIZE	ADJUSTABLE STRAINER TYPE NO.	B	ADJUSTMENT X	ADJUSTMENT Y	FREE AREA	LBS.†
30002	2	5A	5	3/4	2-1/8	7.8	14
30003	3	6A	6	1-1/4	2-3/8	11.0	15
30004	4	7A	7	1-1/8	2-7/8	13.2	16
† STRAINER W/BODY		8A	8	1-5/8	2-5/8	16.2	17

30000-C SERIES

Body with Non-Clog Strainer & Bucket

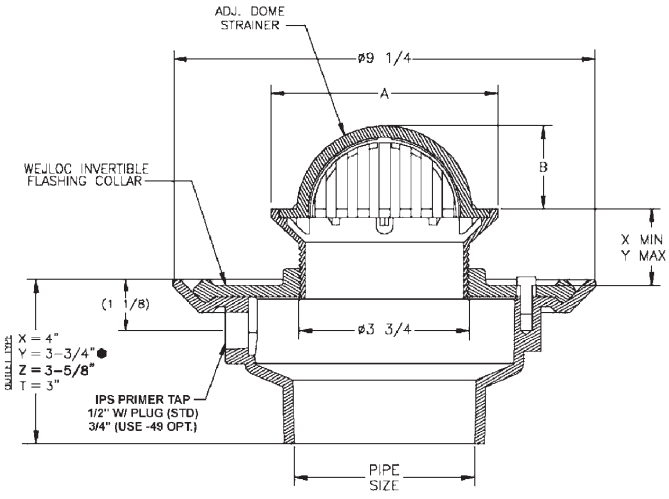


⬢ CONFORMS WITH ASTM-C564.

TYPE NO.	PIPE SIZE	ADJUSTABLE STRAINER TYPE NO.	ADJUSTMENT X	ADJUSTMENT Y	FREE AREA	LBS.†
30002	2	5C	3/4	1-7/8	4.5	15
30003	3					
30004	4					
† STRAINER W/BODY						

30000-D SERIES

Body with Dome Strainer

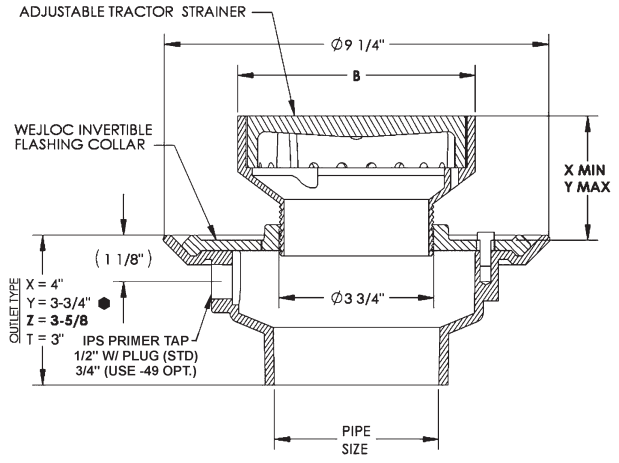


⬢ CONFORMS WITH ASTM-C564.

TYPE NO.	PIPE SIZE	ADJUSTABLE STRAINER TYPE NO.	A	B	ADJUSTMENT X	ADJUSTMENT Y	FREE AREA	LBS.†
30002	2	5D	5	1-7/8	3/4	2-1/8	8.1	15
30003	3	6D	6	1-3/4	1-1/4	2-3/8	8.1	16
30004	4							
† STRAINER W/BODY								

30000-E SERIES

Body with Tractor Strainer



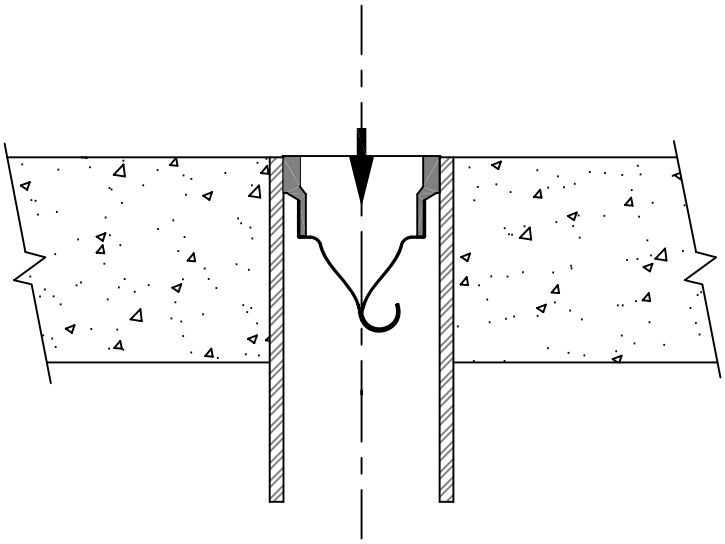
⬢ CONFORMS WITH ASTM-C564.

TYPE NO.	PIPE SIZE	ADJUSTABLE STRAINER TYPE NO.	B	ADJUSTMENT X	ADJUSTMENT Y	FREE AREA	LBS.†
30002	2	6E	6	2-1/4	3-1/2	6.7	17
30003	3	7E	7	1-7/8	3-1/8	12.0	18
30004	4	9E	9	2-1/4	3-3/8	21.2	23
† STRAINER W/BODY							

TRAP GUARD DRAIN INSERT PROTECTION

CAN BE USED ABOVE OR BELOW GROUND FLOOR

TRAP GUARD INSERT FITTING FITS
INSIDE OF CAST IRON OR PLASTIC PIPE



- ☐ PART NO. TG22IP 2" INSERT FITS INSIDE 2" CAST IRON PIPE
- ☐ PART NO. TG22P 2" INSERT FITS INSIDE 2" PVC OR ABS PIPE
- ☐ PART NO. SG22P 2" SUDS GUARD FITS INSIDE 2" PVC OR ABS PIPE
- ☐ PART NO. TG33IP 3" INSERT FITS INSIDE 3" PVC, ABS OR CAST IRON PIPE
- ☐ PART NO. TG33-WADE 3" INSERT FITS INSIDE 3" WADE DRAIN TAILPIECE.

FOR TRAP GUARDS INSERTING INTO GASKET CONNECTED DRAINS, SEE DRAWING TG-23-G

IMPORTANT NOTES :

1. This insert can be installed into any open ended pipe to prevent sewer gas emission.
2. They can be inserted into an open end pipe that connects larger top floor drains.
3. They can be inserted into open ended pipe that connects floor sinks or hub drains,
4. To make a watertight seal, use an adhesive type caulk under the top flange or if the pipe opening is PVC, a small amount of solvent cement can be used under the flange.

If the trap guard device should get damaged or impaired in any way, the device can be easily removed by using a sharp screw driver under the flange.

Note: Care should be taken not to touch the elastomeric flexible material with the primer.

MAINTENANCE INSTRUCTIONS:

The Trap Guard device should be inspected periodically for build up of any type debris. The device should then be flushed out thoughly with clear warm water.

NO FIRE RATINGS ARE REQUIRED FOR UNDERGROUND PIPING OR OPENINGS

PROSET® SYSTEMS
FIRESTOP PENETRATOR™

DATE : 9-02-03

DRG . NO . TG-23-IPD

SANITARY FLOOR SINKS

49300 SERIES — SUPER-FLO® 8" SQUARE TOP, 6" DEEP

APPLICATION

For use in non-traffic areas where ultimate sanitation is desired, such as kitchens, hospitals and food processing plants. The 7-1/4" square grate and medium sump accept moderate flow and the dome strainer intercepts debris which could block the drain line. Double drainage flange serves as an anchor in the sub-floor and redirects secondary moisture to the waste line. It may also be used with a clamp device to assure a bond between the drain and the flashing or waterproof membrane.

SPECIFICATION

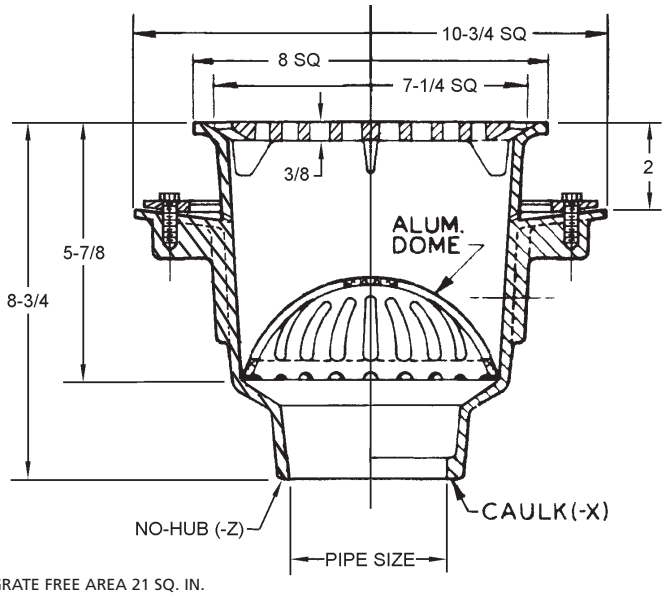
JOSAM 49300 Series square cast iron 5-7/8" deep SUPER-FLO-SEPTOR® Floor Sink with acid-resisting interior, double drainage flange with weepholes, bottom outlet, aluminum internal dome strainer and cast iron, non-traffic, acid-resisting, anti-tilting, SUPER-FLO® Grate.

For Options, See Below

OPTIONS N/A: -VP, -8, -20, -24

TYPE NO.	PIPE SIZE	LBS
49302	2	24
49303	3	24
49304	4	24

SLOT WIDTH 7/16"



GRATE FREE AREA 21 SQ. IN.

FOR OUTLET TYPE, SPECIFY -X or -Z.

49300-LF SERIES — Less Flange

APPLICATION

For use in non-traffic areas where ultimate sanitation is desired, such as kitchens, hospitals and food processing plants. The 7-1/4" square grate and medium sump accept moderate flow and the dome strainer intercepts debris which could block the drain line.

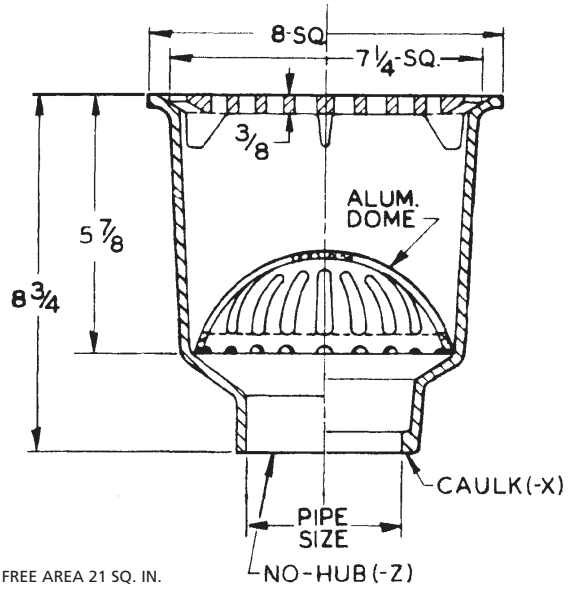
SPECIFICATION

JOSAM 49300-LF Series square cast iron 5-7/8" deep SUPER-FLO-SEPTOR® Floor Sink with acid-resisting interior, bottom outlet, aluminum internal dome strainer and cast iron, non-traffic, acid-resisting, anti-tilting, SUPER-FLO® Grate.

OPTIONS N/A: -VP, -8, -20, -24, -C

TYPE NO.	PIPE SIZE	LBS
49302-LF	2	20
49303-LF	3	20
49304-LF	4	21

SLOT WIDTH 7/16"



GRATE FREE AREA 21 SQ. IN.

OPTIONS

▼	-LF	Less Flange
▼	-NB	Nickel Bronze Traffic Top
	-LG	Less Grate
	-3	1/2 Grate
	-4	3/4 Grate
	-7	Full Grate with 2-1/2" Center Opening
	-8	Stainless Steel Depressed Grate, NB
	-VP	Secured Grate, Vandal-Proof Screws, NB
	-16	Grate with 4" Round Funnel
	-17	Grate with 6" Round Funnel
	-18	Grate with 9" x 3-1/2" Oval Funnel
	-20	Solid Nikaloy Cover, NB
	-24	Chained Grate, NB
	-31	Sediment Bucket (Aluminum)
	-33	Sediment Bucket (A.R. Finish)
▽	-35	Stainless Steel Mesh Bucket Liner
	-43	Internal Dome Strainer (A.R. Finish)
	-45	Less Internal Dome Strainer
	-55	1/2" Primer Adapter, 88450 Provided
	-C	Clamp Device, 49300, 49300-NB

OUTLETS

-X	Inside Caulk Outlet
-Z	No-Hub Outlet

▽ Specify -31 or -33 Bucket

▼ Product Illustration follows.

49300-NB SERIES — with -NB Nikaloy Traffic Top

APPLICATION

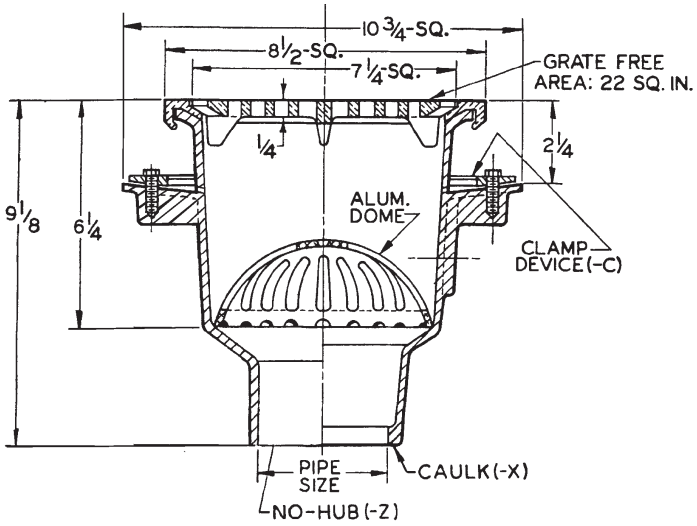
For use in areas where pedestrian and medium weight wheel loads are anticipated and ultimate sanitation is desired, such as kitchens, hospitals and food processing plants. The 7-1/4" square grate and medium sump accept moderate flow and the dome strainer intercepts debris which could block the drain line. Double drainage flange serves as an anchor in the sub-floor and redirects secondary moisture to the waste line. It may also be used with a clamp device to assure a bond between the drain and the flashing or waterproof membrane.

SPECIFICATION

JOSAM 49300-NB Series square cast iron 6-1/4" deep SUPER-FLO-SEPTOR® Floor Sink with acid-resisting interior, double drainage flange with weepholes, bottom outlet, aluminum internal dome strainer, Nikaloy sanitary sloped rim and Nikaloy light-duty, anti-tilting, SUPER-FLO® Grate.

TYPE NO.	PIPE SIZE	LBS.
49302-NB	2	27
49303-NB	3	27
49304-NB	4	27

SLOT WIDTH 1/2"



GRATE FREE AREA 22 SQ. IN.

FOR OUTLET TYPE, SPECIFY -X or -Z.

49300-LF-NB SERIES — Less Flange, with -NB Nikaloy Traffic Top

APPLICATION

For use in areas where pedestrian and medium weight wheel loads are anticipated and ultimate sanitation is desired, such as kitchens, hospitals and food processing plants. The 7-1/4" square grate and medium sump accept moderate flow and the dome strainer intercepts debris which could block the drain line.

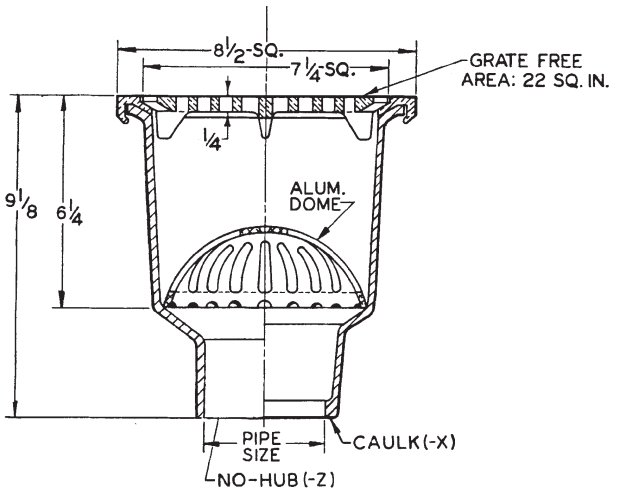
SPECIFICATION

JOSAM 49300-LF-NB Series square cast iron 6-1/4" deep SUPER-FLO-SEPTOR® Floor Sink with acid-resisting interior, aluminum internal dome strainer, Nikaloy sanitary sloped rim and Nikaloy light-duty, anti-tilting, SUPER-FLO® Grate.

OPTION N/A: -C

TYPE NO.	PIPE SIZE	LBS.
49302-LF-NB	2	24
49303-LF-NB	3	24
49304-LF-NB	4	25

SLOT WIDTH 1/2"



GRATE FREE AREA 22 SQ. IN.

FOR OUTLET TYPE, SPECIFY -X or -Z.

American Standard
Style That Works Better

SELECTRONIC™
ELECTRONIC PROXIMITY LAVATORY FAUCET
CAST BRASS SPOUT



GENERAL DESCRIPTION:

Electronic faucet with proximity operation. Vandal-resistant solid brass construction with single post mounting. Operates on DC (battery) or AC permanent power. Water pressure range from 20 to 125 psi. Single inlet 15" flexible stainless steel hose with 3/8" compression fitting for spout connection.

PRODUCT FEATURES:

Power Options:

- **Battery -** Includes CR-P2 lithium battery. Battery Life-Approximately 200,000 cycles (4 years @ 4,000 cycles per month).
- **Plug-In AC -** Includes universal low voltage plug-inpower supply with 6 foot long cord. Inlet Voltage: 80 - 250 VAC, 50 - 60 Hz. Outlet Voltage: 6 VDC. One power supply can run up to 15 faucets and/or flush valves at one time.
- **Hard-Wired AC -** Includes universal low voltage hard-wired transformer. Inlet Voltage: 80 - 250 VAC, 50 - 60 Hz. Outlet Voltage: 6 VDC. One transformer can run up to 15 faucets and/or flush valves at one time.

Easy & Flexible Installation: Single post mounting with optional 4" & 8" deck plate. Water resistant solenoid enclosure mounts to wall.

Durable Vandal-Resistant Brass Body: Ideal for high-use commercial applications.

Easy to Service Integrated Strainer: Patented integrated strainer protects solenoid from debris. Strainer is enclosed in removable debris cup for easy service.

Optional Purge Feature: Faucet can be programmed to open at a pre-determined time after the last use to purge the faucet and water lines.

Safety Timer: Helps prevent vandalism by turning off the faucet if the sensor is covered for more than 1 minute.

Low Lead: Faucet contains ≤ 0.25% total lead content by weighted average.

MODEL NUMBER:

DC POWERED; single inlet

- ❑ **6055.105** with cast spout, 0.5 GPM pressure compensating, vandal-resistant non-aerated spray. Battery included.
- ❑ **6055.102** with cast spout, 1.5 GPM pressure compensating, vandal-resistant aerator. Battery included.

PLUG-IN AC POWERED; single inlet

- ❑ **6056.105** with cast spout, 0.5 GPM pressure compensating, vandal-resistant non-aerated spray. Includes Plug-In AC power supply.
- ❑ **6056.102** with cast spout, 1.5 GPM pressure compensating, vandal-resistant aerator. Includes Plug-In AC power supply.

HARD-WIRED AC POWERED; single inlet

- ❑ **6059.105** with cast spout. 0.5 GPM pressure compensating, vandal-resistant, non-aerated spray. Includes UL-approved Hard-Wired AC transformer (electrical box by others).
- ❑ **6059.102** with cast spout. 1.5 GPM pressure compensating, vandal-resistant aerator. Includes UL-approved Hard-Wired AC transformer (electrical box by others).

MULTI AC POWERED; single inlet

- ❑ **6057.105** with cast spout. 0.5 GPM pressure compensating, vandal-resistant non-aerated spray. One power supply or transformer (sold separately) can operate up to 15 faucets and/or flush valves. 10' extension cable included.
- ❑ **6057.102** with cast spout. 1.5 GPM pressure compensating, vandal-resistant aerator. One power supply or transformer (sold separately) can operate up to 15 faucets and/or flush valves. 10' extension cable included.

OPTIONAL 4" or 8" Deck plates

- ❑ 605P.400 4" brass deck plate with 1/4" fixation studs and quick spin nuts. (6-1/8"x 2-1/8"x 1/2")

  605P.800 8" brass deck plate with 1/4" fixation studs and quick spin nuts. (10-1/8"x 2-3/8"x1/2")

OPTIONAL Mixing Valve

- ❑ 605XTMV or 605XTMV1070 Thermostatic mixing valve, flex hoses 3/8" compression 20" hose length.

RECOMMENDED SPECIFICATION

Electronic Proximity Lavatory shall feature vandal resistant all brass body with single inlet, and in-line strainer. Shall also feature a low energy use electronically operated solenoid valve and microprocessor controlled proximity sensors. Shall meet ANSI A112.18.1 and ANSI 117.1 codes. Fitting shall be American Standard Model # 6055.____, 6056____, 6057____6059___.

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American Standard
Style That Works Better

SELECTRONIC™
ELECTRONIC PROXIMITY LAVATORY FAUCET
CAST BRASS SPOUT

CODES AND STANDARDS

These products meet or exceed the following codes and standards:

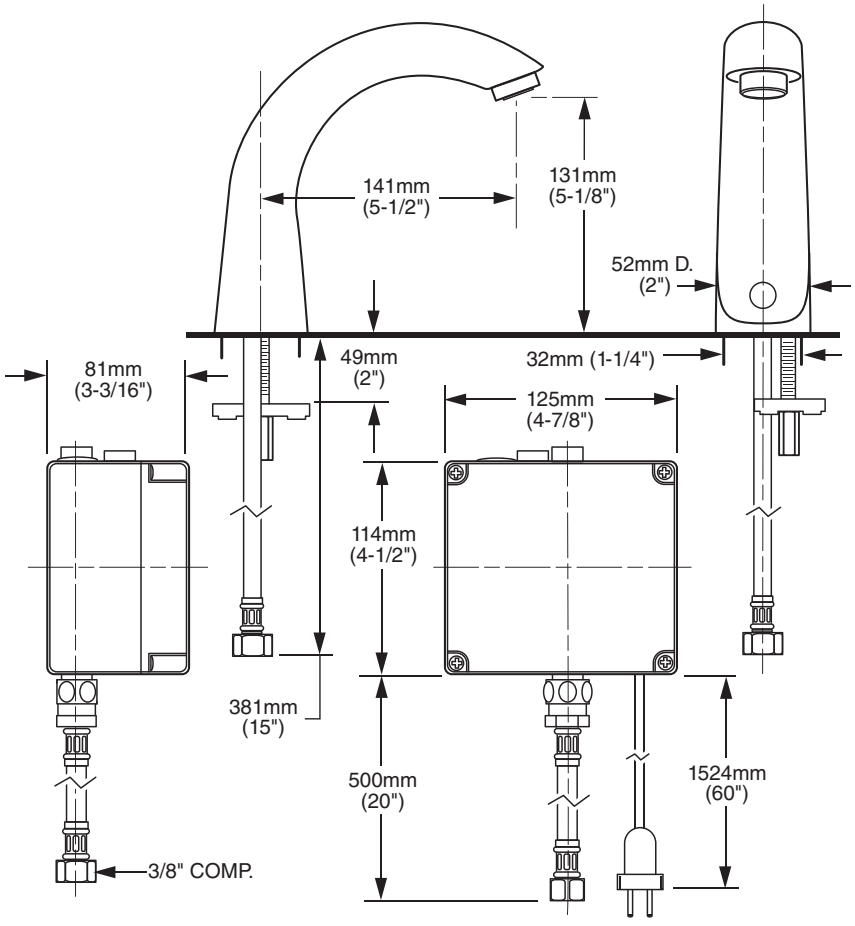
ANSI A117.1
ASME A112.18.1
CSA B 125
NSF 61/Section 9, Annex G

MEETS THE AMERICANS WITH DISABILITIES ACT GUIDELINES AND ANSI A117.1 REQUIREMENTS FOR ACCESSIBLE AND USABLE BUILDING FACILITIES-CHECK LOCAL CODES

Other Aerators Available:

Part Suffix	Description
A15LV	Anti-Microbial 1.5 gpm (5.7 Lpm) Vandal-Resistant Non-Aerated Laminar Flow Outlet
LV15	1.5 gpm (5.7 Lpm) PCA Vandal-Resistant Non-Aerated Laminar Flow Outlet
LV10	1.0 gpm (3.8 Lpm) PCA Vandal-Resistant Non-Aerated Laminar Flow Outlet
V10	1.0 gpm (3.8 Lpm) PCA Vandal-Resistant Aerator
V035**	0.35 gpm (1.3 Lpm) PCA Vandal-Resistant Non-Aerated Spray

*PCA - Pressure Compensating
**Meets Cal Green Code



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For Residential, Commercial and Institutional Applications

Job Name _____ Contractor _____

Job Location _____ Approval _____

Engineer _____ Contractor's P.O. No. _____

Approval _____ Representative _____

Series MMV
Thermostatic Mixing Valves

Triple Listed!
ASSE 1017,
ASSE 1069 & ASSE 1070

Sizes: ½" – 1" (15 – 25mm)

Series MMV Thermostatic Mixing Valves maintain and limit mixed hot water to a desired, selectable temperature. The MMV series can be set to any temperature between 80°F and 120°F with flow rates as low as 0.5 gpm and as high as 12 gpm (refer to capacity chart on back). This mixing valve series is listed under ASSE 1017 for valves used in hot water source applications, ASSE 1069 for single-pipe, tempered water applications and ASSE 1070 for valves used in individual or multiple fixture applications and also listed IAPMO cUPC.

The MMV-M1 uses a double throttling design to control both the hot and cold water supply to the mixed outlet. The superior flow characteristics of this valve provide accurate temperature control (±3°F) with low pressure drop across the rated flow range. As an added feature, the MMV-M1 series incorporates integral inlet filter washers and check valves in both the hot and cold water inlets to protect against cross flow.

The MMV-M1 is available with either union thread (-U1), union solder (-US), CPVC, (-QC) Quick-Connect or PEX end connectors.



MMV-US-M1



MMV-QC-M1

Features

- Bronze body construction
- Solid wax hydraulic principle thermostat assures dependable mixing of hot and cold water
- Thermostat controls both hot and cold water
- Solder, threaded, PEX or CPVC, Quick-Connect end connection models available
- Adjustment cap with locking feature
- ASSE 1017 listed
- ASSE 1069 listed
- ASSE 1070 listed
- IAPMO cUPC listed
- Integral filter washers and check valves

Specifications

A Thermostatic Mixing Valve shall be installed on the hot water supply to fixture. The valve shall be ASSE 1017, ASSE 1069, ASSE Standard 1070 and IAPMO cUPC listed and control the temperature of the hot water. It shall have a bronze body and shall include integral filter washers and check valves and an adjustment cap with locking feature. The valve shall be provided with solder (-US), threaded (-U1), CPVC, (-QC) Quick Connect or PEX union connections. The valve shall be a Watts Regulator Company Series MMV.

Applications

The MMV-M1 Thermostatic Mixing Valves are ideal for supplying sinks, baths, showers or lavatories with tempered water. The MMV-M1 valves can be used in residential, commercial and institutional environments. These thermostatically modulated mixing valves can be used anywhere preset water temperature is required for point-of-use installations such as in homes, schools, restaurants, hospitals, beauty salons, and public restrooms. The MMV-M1 is provided with an adjustment cap that includes a locking feature.

The MMV-M1 valves should be used prior to the fixture to reduce the hot water supply to a safe temperature.

WARNING!

When used in an ASSE 1017 application at the hot water source, the Watts Thermostatic Mixing Valve Series MMV cannot be used by itself to control final temperature at fixtures where ASSE Standard 1016-96 or ASSE Standard 1070 listed devices are required. Such use may result in severe bodily injury (i.e. scalding or chilling) and/or death. Additional ASSE Standard 1016-96, ASSE 1069 or ASSE Standard 1070 listed devices, such as Watts Series L111, USG or MMV, should be used at fixtures to prevent possible injury.

Recirculation systems should recirculate water at temperatures over 140°F to reduce the risk of bacterial growth in the piping. This valve should not be used to achieve these elevated temperatures. This valve can be used at fixtures in conjunction with recirculation systems to reduce the system's hot water to a safe temperature at the point of use.

IMPORTANT!

Water temperatures in excess 110°F (43°C) are dangerous and may cause scalding, severe injury or death! This valve can be adjusted to deliver water at temperatures exceeding 110°F (43°C). Consequently, when used in an ASSE 1016-96, ASSE 1069 or ASSE 1070 application, the installer must check the mixed water outlet temperature at the point of use and adjust the Watts Thermostatic Mixing Valve Series MMV to ensure delivery of water at a safe temperature not exceeding 110°F (43°C). Mechanical valves are not fail-safe. Due to the effects of various water conditions, periodic verification of outlet water temperature is required.

Watts product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Watts Technical Service. Watts reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Watts products previously or subsequently sold.

WATTS®

Materials

Body:	Bronze
Disc:	Stainless steel
Thermostat Assembly:	Copper
O-rings:	Buna-N; EPDM
Pistons:	Udel-P1700
Springs:	Stainless Steel

Pressure — Temperature — Flow Rate

Minimum Supply Pressure Static: 30psi (207 kPa)

Inlet Temperatures: hot inlet, 120°F – 180°F (49°C – 82°C), cold inlet, 39°F – 85°F (4°C – 29°C)

Hot Water Inlet to Outlet Differential Temperature: 5°F (3°C) above set point

Temperature Out: Field range: 80°F – 120°F (27°C – 49°C), adjustable. Accurate within ±3°F (1.7°C)

Maximum Temperature: 200°F (93°C)

Maximum Pressure: 150psi (10.3 bar)

Minimum Flow: 0.5 gpm (1.9 lpm) @ 0.8psi (0.55 kPa)†

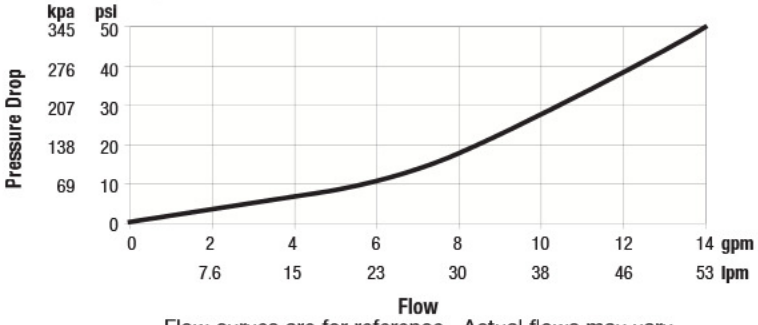
Maximum Flow: 20 gpm (76 lpm) @ 125psi (862 kPa)†

Max. Pressure Differential between Hot & Cold Water Supplies: 25%

Listing: ASSE 1017, ASSE 1069, ASSE 1070 and IAPMO cUPC

† When tested in accordance with ASSE 1017, ASSE 1069 & ASSE 1070.

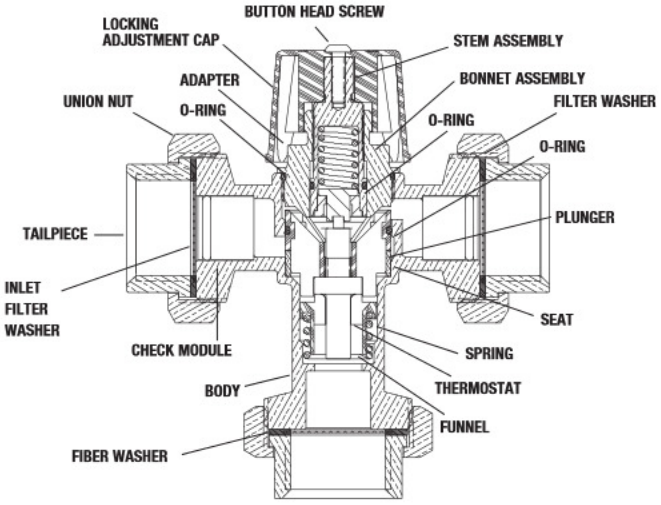
Capacity*



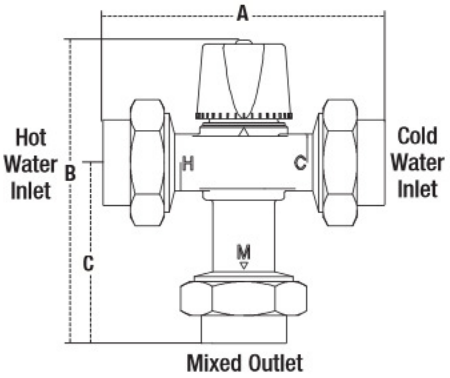
Flow curves are for reference. Actual flows may vary depending on system temperatures and/or pressures.

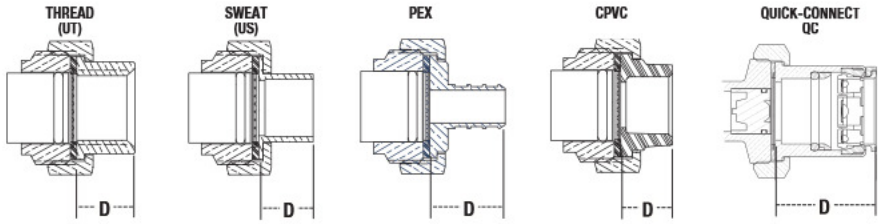
**Flow curve with integral inlet filters and check valves*

Basic Construction



Dimensions — Weights





SIZE (DN)		MODEL	DIMENSIONS								WEIGHT	
			A		B		C		D			
in.	mm		in.	mm	in.	mm.	in.	mm	in.	mm	lbs.	kg.
½	15	MMV-UT-M1	4⅛	124	5 7/16	137	3 3/16	80	½	13	1.5	.68
¾	20		4⅛	124	5 7/16	137	3 3/16	80	9/16	14	1.6	.73
1	25		5 5/16	135	5⅝	143	3⅜	86	11/16	17	1.6	.73
½	15	MMV-US-M1	4 13/16	123	5⅜	137	3⅛	80	½	13	1.5	.68
¾	20		5 5/16	135	5⅝	143	3⅜	86	¾	19	1.6	.73
1	25		5 13/16	148	5⅞	149	3⅝	92	15/16	23	1.6	.73
½	15	MMV-PEX-M1	5¼	133	5 9/16	142	3 5/16	85	⅝	1	1.5	.68
¾	20		5½	140	5 11/16	145	3 7/16	88	¾	19	1.6	.73
1	25		5⅞	149	5⅞	150	3⅝	93	13/16	2	1.6	.73
½	15	MMV-CPVC-M1	4¾	121	5 5/16	136	3 1/16	79	½	13	1.5	.68
¾	20		5¼	133	5 9/16	142	3 5/16	85	¾	19	1.6	.73
1	25		5 11/16	144	5 13/16	147	3 9/16	90	15/16	23	1.6	.73
½	15	MMV-QC-M1	6⅝	168	6¼	159	4	102	1½	38	2.17	.98
¾	20		6 15/16	177	6 7/16	163	4 3/16	106	1 11/16	42	2.88	1.31
1	25		7⅛	181	6½	165	4¼	108	1¾	44	3.65	1.66

WATTS®

A Watts Water Technologies Company

ISO 9001-2000 CERTIFIED

USA: 815 Chestnut St., No. Andover, MA 01845-6098; www.watts.com
Canada: 5435 North Service Rd., Burlington, ONT. L7L 5H7; www.wattscanada.ca

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American Standard
Style That Works Better

BARRIER FREE

LUCERNE™ WALL-HUNG LAVATORY
VITREOUS CHINA

LUCERNE™ WALL-HUNG LAVATORY

- Wall-hung sink
- Vitreous china
- Front overflow
- D-shaped bowl
- Self-draining deck area with contoured back and side splash shields
- Faucet ledge

Faucet holes on 203mm (8") centers (Illus.):

❑ **0356.028** For exposed bracket support
Shown with 4801.862 Amarilis Heritage faucet with Triune Cross handles (not included)
❑ **0356.015** For wall hanger (included) or concealed arms support
❑ **0356.037** For wall hanger (included) or concealed arms support
• Extra right-hand hole
❑ **0356.073** For wall hanger (included) or concealed arms support
• Extra left-hand hole

Faucet holes on 102mm (4") centers:

❑ **0355.027** For exposed bracket support
❑ **0355.012** For wall hanger (included) or concealed arms support
❑ **0355.034** For wall hanger (included) or concealed arms support
• Extra right-hand hole
❑ **0355.041** For wall hung sink thru bolt support on backsplash for wall anchors
❑ **0355.056** For wall hanger (included) or concealed arms support
• Extra left-hand hole

Single center faucet hole (Illus.):

❑ **0356.041** For exposed bracket support
Shown with 1340.000 metering faucet (not included)
❑ **0356.421** For wall hanger (included) or concealed arms support
❑ **0356.137** For wall hanger (included) or concealed arms support
• Extra right-hand hole
❑ **0356.115** For wall hanger (included) or concealed arms support
• Extra left-hand hole

Nominal Dimensions:
521 x 464mm
(20-1/2" x 18-1/4")

Bowl sizes:
381mm (15") wide
254mm (10") front to back
165mm (6-1/2") deep

Compliance Certifications - Meets or Exceeds the Following Specifications:
• ASME A112.19.2 for Vitreous China Fixtures



0356.028



0356.041

SEE REVERSE FOR ROUGHING-IN DIMENSIONS

To Be Specified:
❑ Color: ❑ White ❑ Bone ❑ Silver ❑ Black ❑ Linen
❑ Faucet*:
❑ Faucet Finish:
❑ Supplies:
❑ 1-1/4" Trap:
❑ Nipple:
❑ Bracket Support (by others):
❑ Concealed Arms Support (by others):

* See faucet section for additional models available

MEETS THE AMERICANS WITH DISABILITIES ACT GUIDELINES AND ANSI A117.1 ACCESSIBLE AND USABLE BUILDINGS AND FACILITIES - CHECK LOCAL CODES.
Top of front rim mounted 864mm (34") from finished floor.

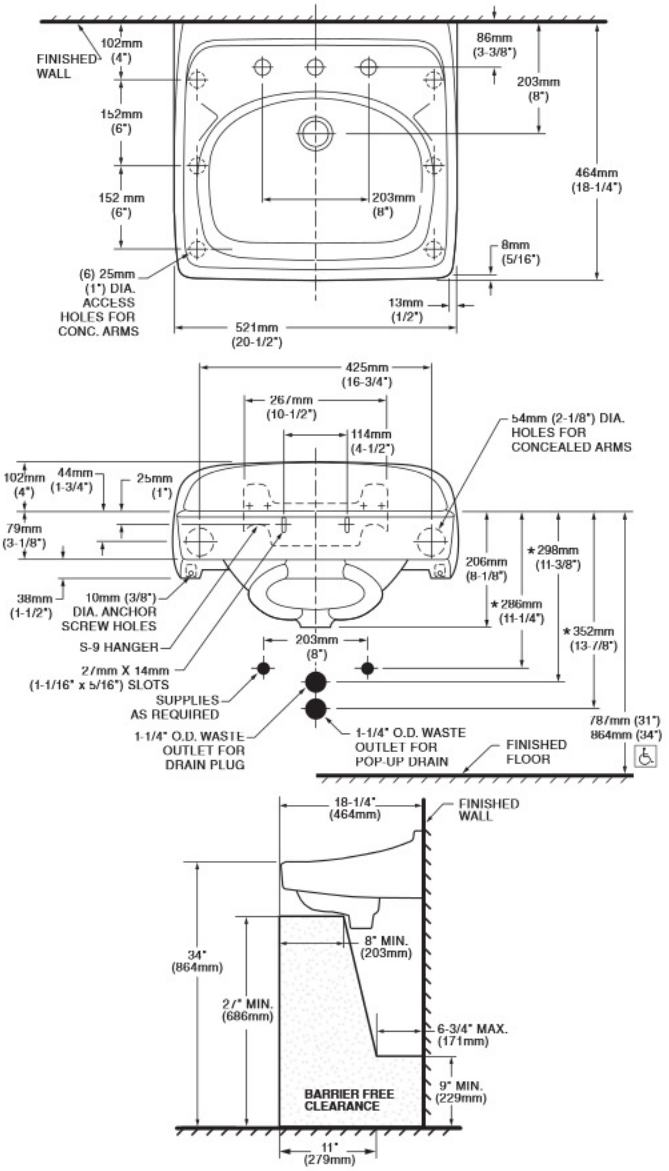
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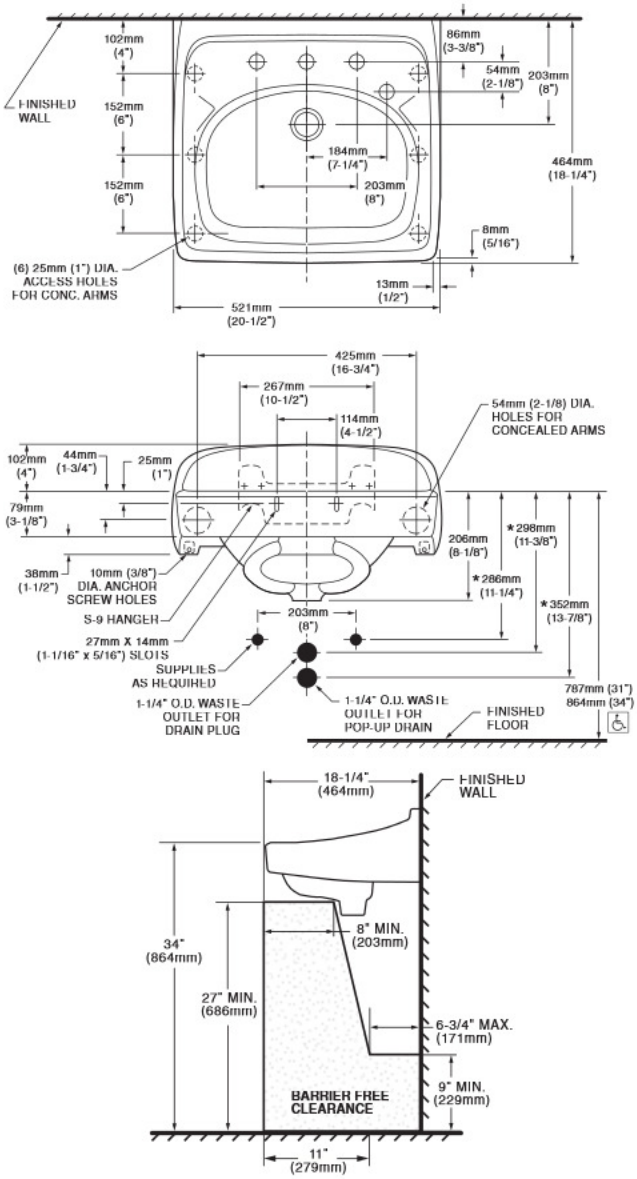
BARRIER FREE

LUCERNE™
WALL-HUNG LAVATORY
VITREOUS CHINA

0356.015 8" CTRS FOR WALL HANGER OR CONCEALED ARMS



0356.037 8" CTRS FOR WALL HANGER OR CONCEALED ARMS EXTRA RIGHT HAND HOLE



NOTES:
* DIMENSIONS SHOWN FOR LOCATION OF SUPPLIES AND "P" TRAP ARE SUGGESTED.
PROVIDE SUITABLE REINFORCEMENT FOR ALL WALL SUPPORTS.
FITTINGS NOT INCLUDED AND MUST BE ORDERED SEPARATELY.
CONCEALED ARM SUPPORT AS REQUIRED TO BE FURNISHED BY OTHERS.

IMPORTANT: Dimensions of fixtures are nominal and may vary within the range of tolerances established by ANSI Standard A112.19.2. These measurements are subject to change or cancellation. No responsibility is assumed for use of superseded or voided pages.

LAVATORY DESIGNED TO MEET ADA HANDICAPPED GUIDELINES WITH MOUNTING HEIGHT SET AT 864MM (34") ABOVE FINISHED FLOOR.

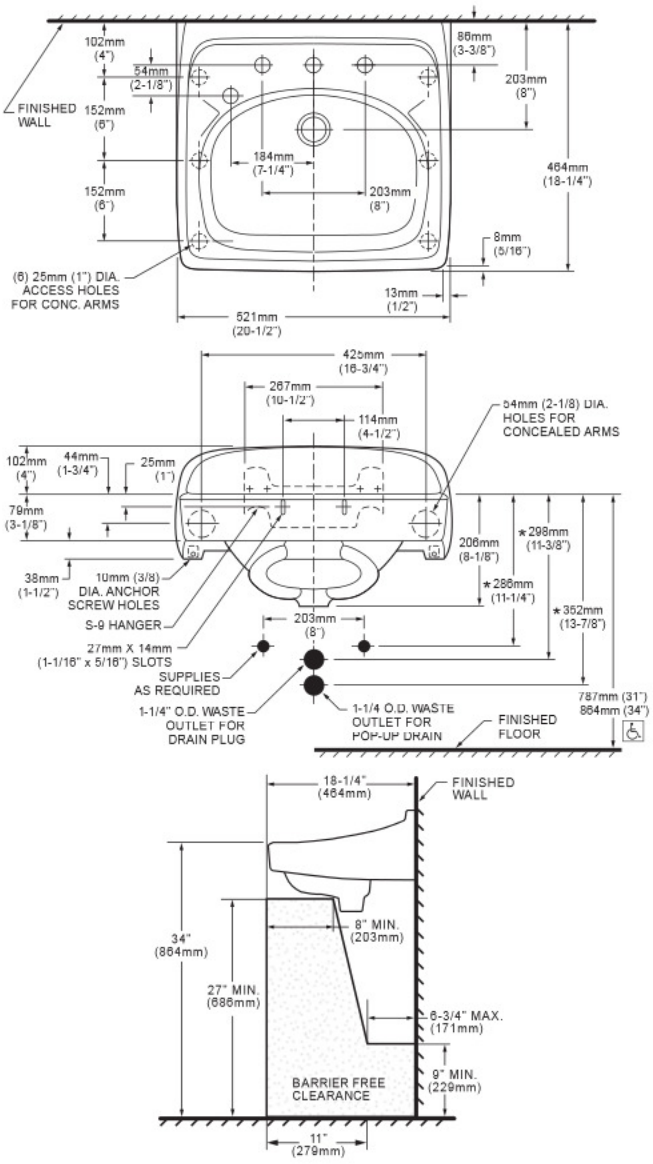
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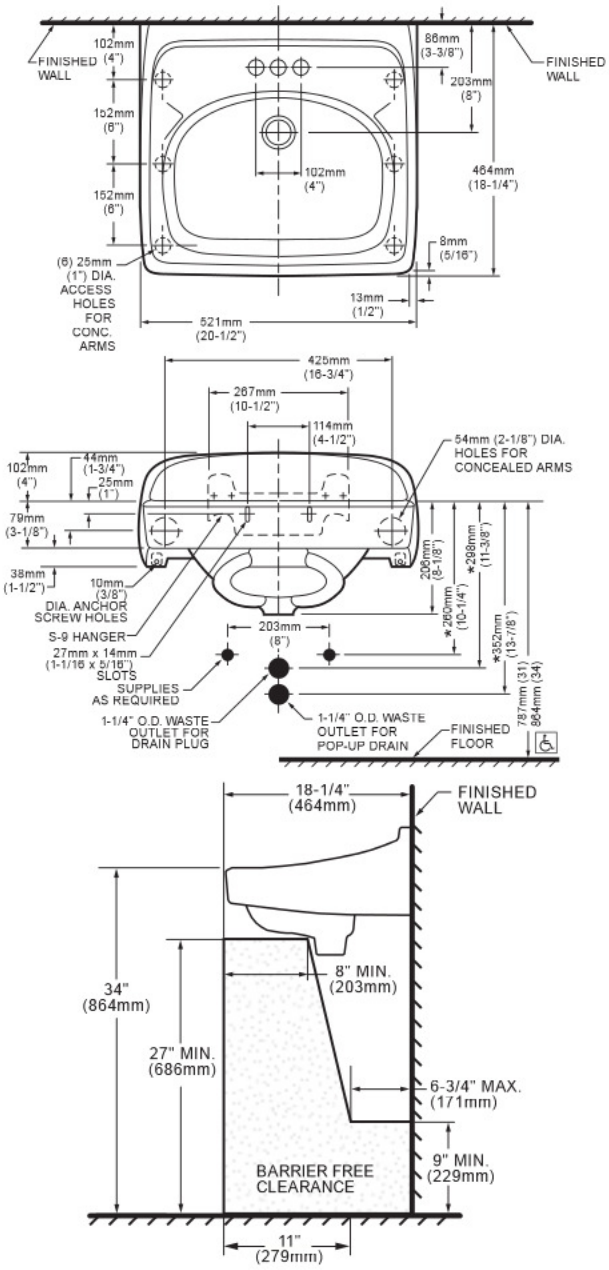
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LUCERNE™ WALL-HUNG LAVATORY
VITREOUS CHINA

0356.073 8" CTRS FOR WALL HANGER OR CONCEALED ARMS EXTRA LEFT HAND HOLE



0355.012 4" CTRS FOR WALL HANGER OR CONCEALED ARMS



NOTES:
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PROVIDE SUITABLE REINFORCEMENT FOR ALL WALL SUPPORTS.
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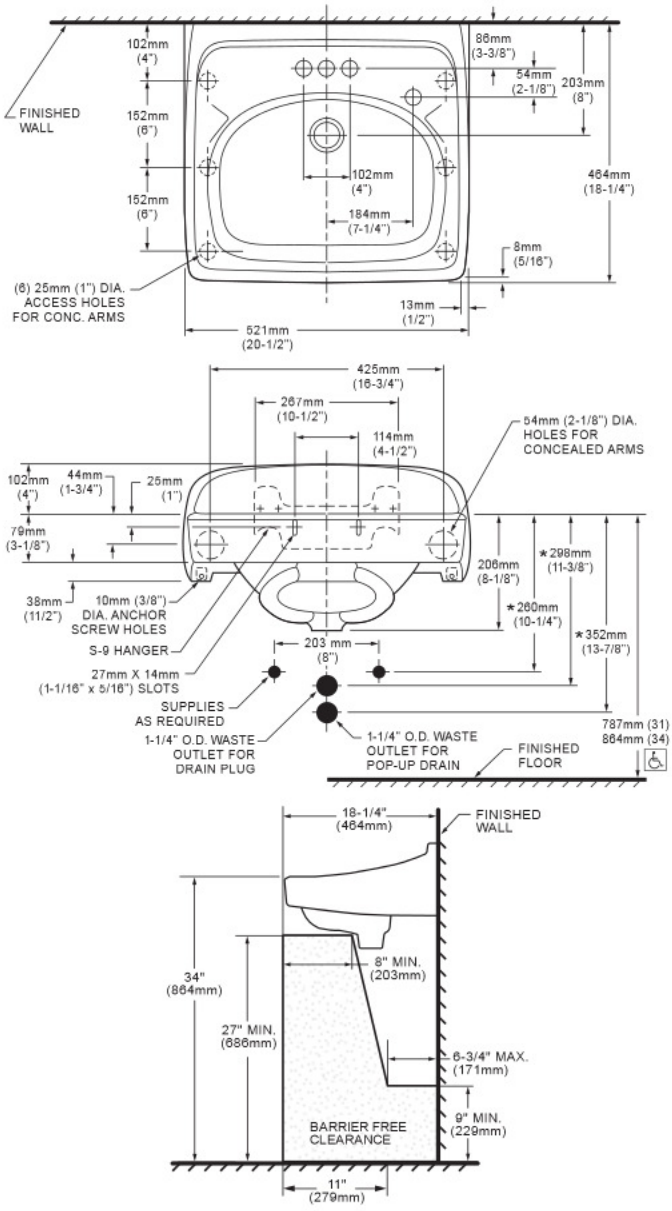
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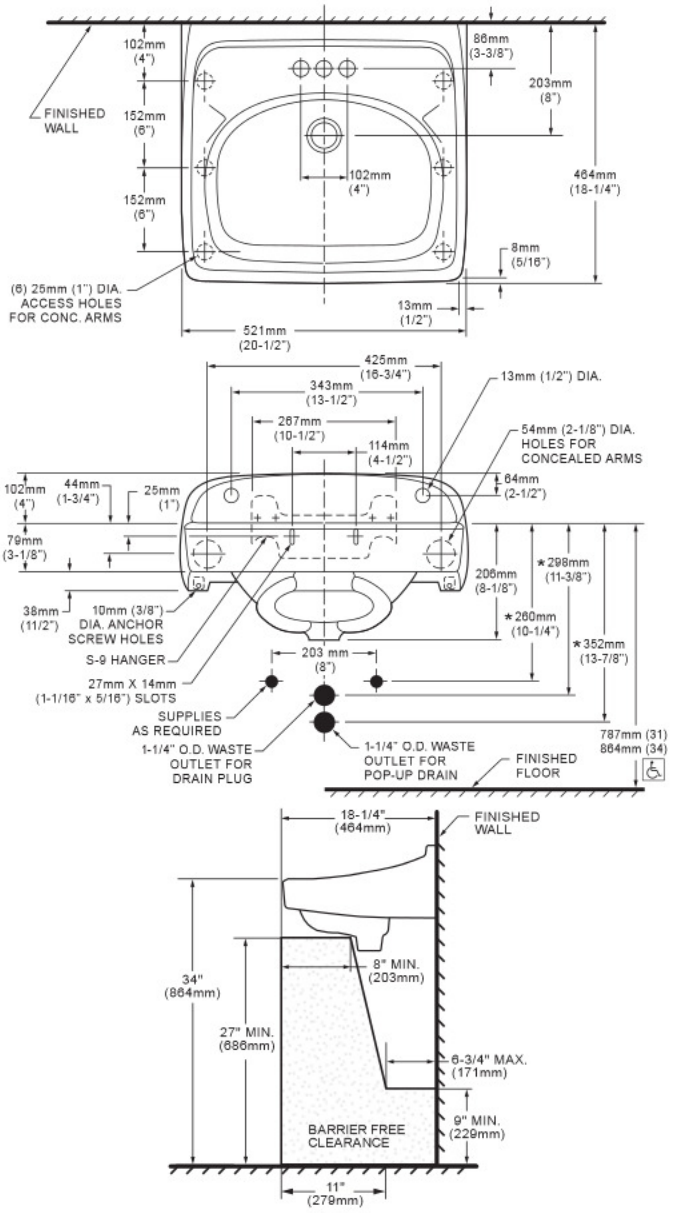
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LUCERNE™ WALL-HUNG LAVATORY
VITREOUS CHINA

0355.034 4" CTRS FOR WALL HANGER OR CONCEALED ARMS EXTRA RIGHT HAND HOLE



0355.041 WALL HUNG SINK THRU BOLT SUPPORT ON BACKSPLASH FOR WALL ANCHORS



NOTES:
* DIMENSIONS SHOWN FOR LOCATION OF SUPPLIES AND "P" TRAP ARE SUGGESTED.
PROVIDE SUITABLE REINFORCEMENT FOR ALL WALL SUPPORTS.
FITTINGS NOT INCLUDED AND MUST BE ORDERED SEPARATELY.
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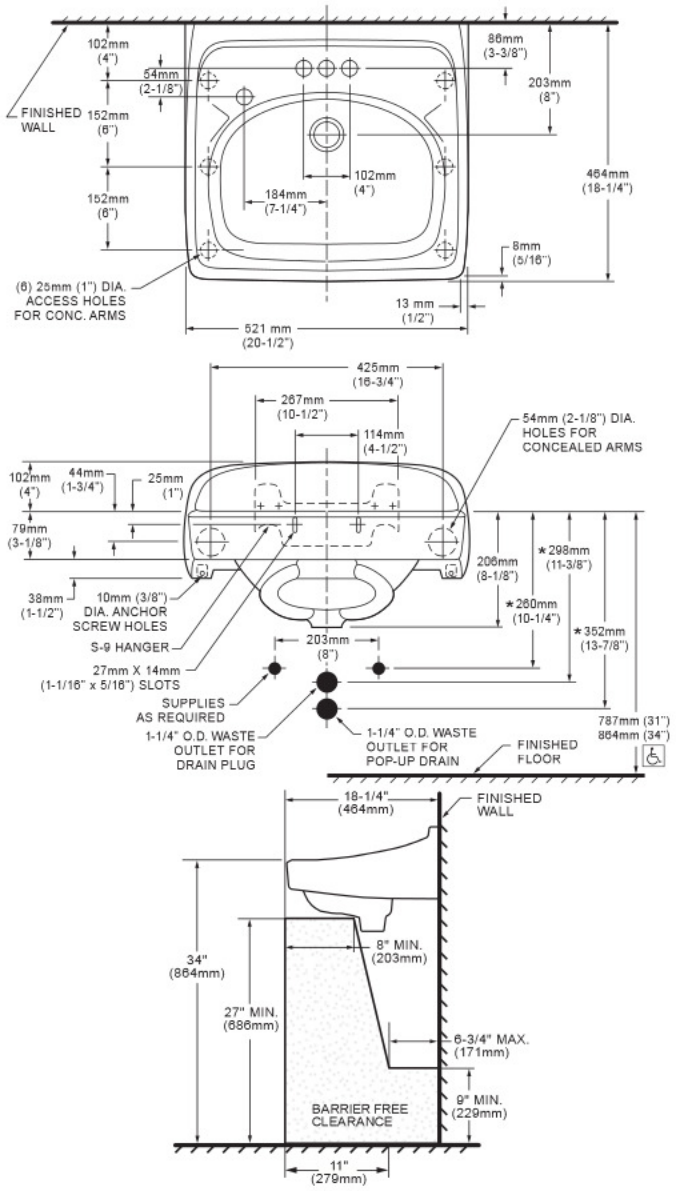
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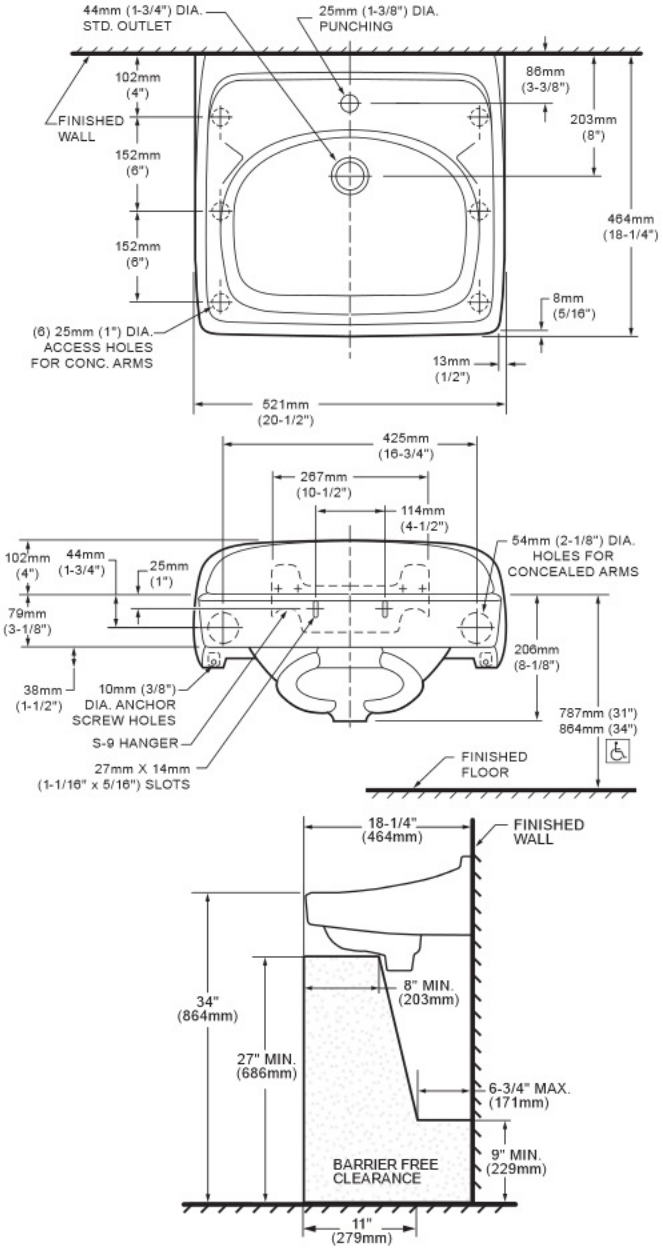
LUCERNE™ WALL-HUNG LAVATORY
VITREOUS CHINA

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0355.056 4" CTRS FOR WALL HANGER OR CONCEALED ARMS EXTRA LEFT HAND HOLE



0356.421 SINGLE CENTER HOLE FOR WALL HANGER OR CONCEALED ARMS



NOTES:
* DIMENSIONS SHOWN FOR LOCATION OF SUPPLIES AND "P" TRAP ARE SUGGESTED.
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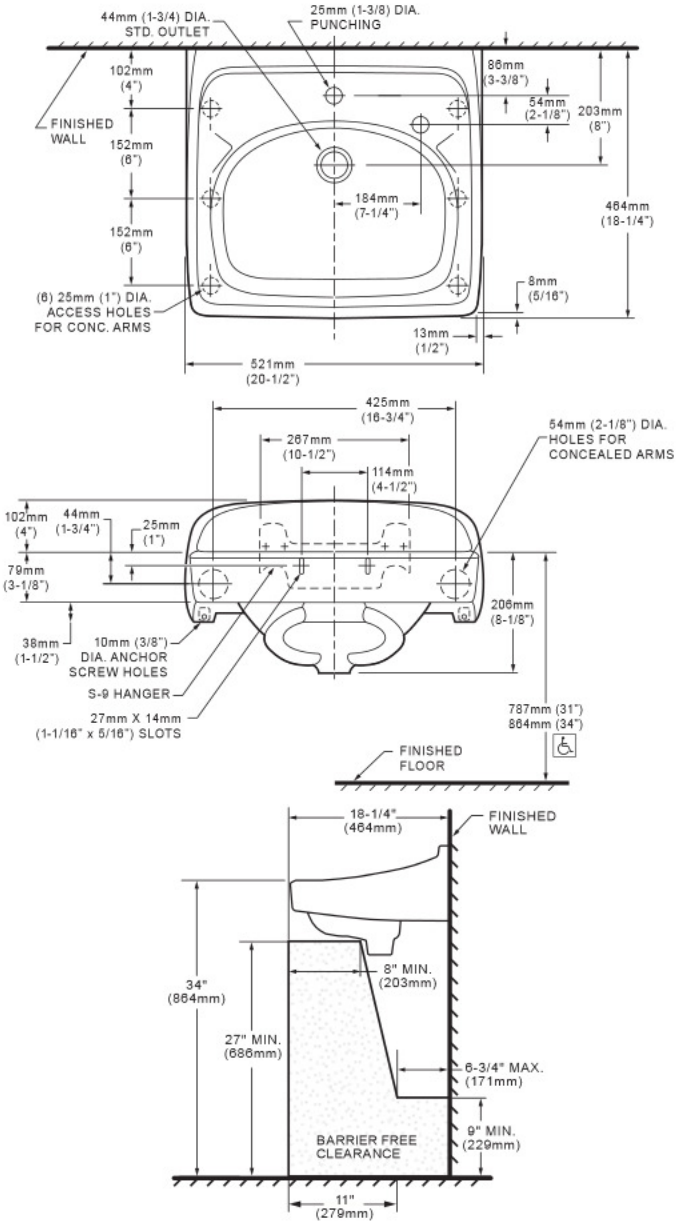
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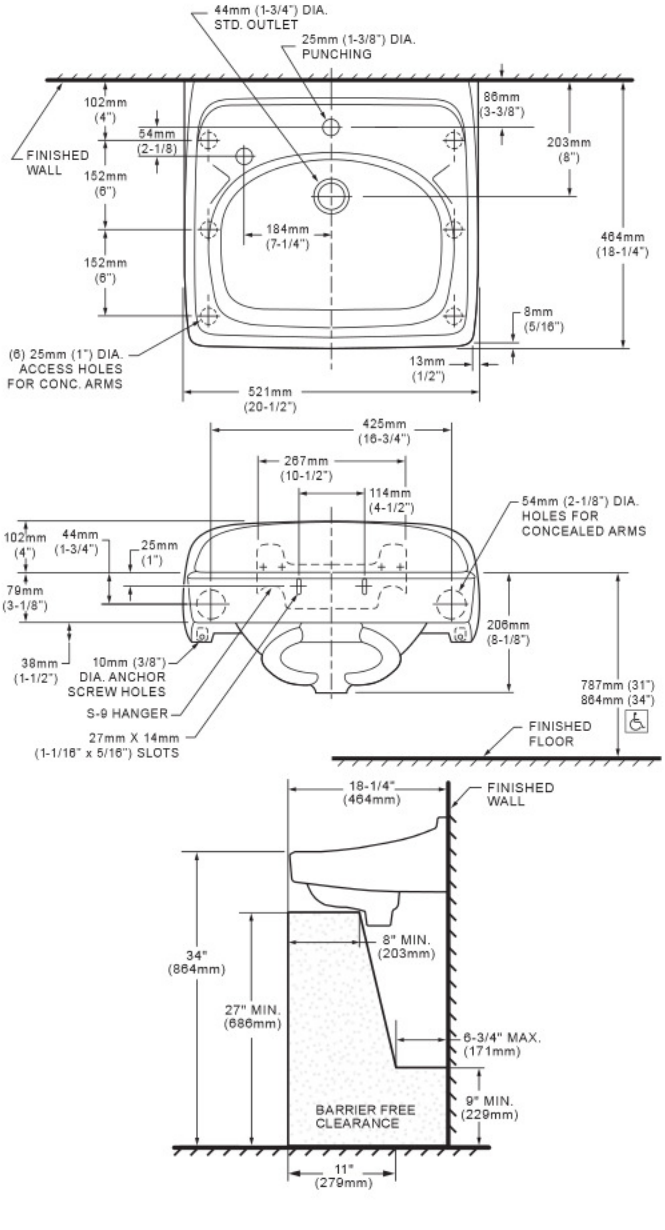
BARRIER FREE

LUCERNE™ WALL-HUNG LAVATORY
VITREOUS CHINA

0356.137 SINGLE CENTER HOLE FOR WALL HANGER OR CONCEALED ARMS WITH EXTRA RIGHT HAND HOLE



0356.115 SINGLE CENTER HOLE FOR WALL HANGER OR CONCEALED ARMS WITH EXTRA LEFT HAND HOLE



NOTES:
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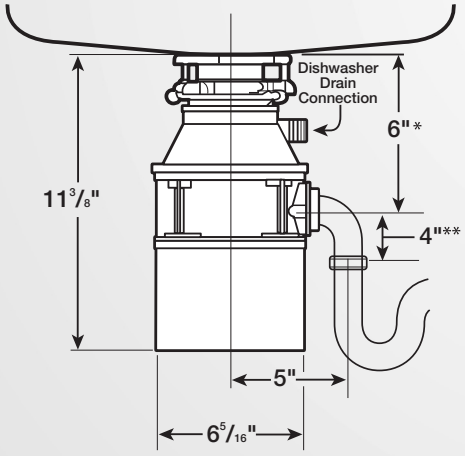
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Food Waste Disposers

insinkerator badger 1



Dimensions



* Distance from bottom of sink to center line of disposer outlet. Add 1/2" when stainless steel sinks are used.
** Length of tailpipe from center line of disposer outlet to end of tailpipe. NOTE: Plumb waste line to prevent standing water in disposer motor housing.

Job Specifications

Submittal Sheet

This model offers the following features and benefits:

- 1/3 Horsepower Heavy Duty Motor (Quiet Dura-Drive® Induction Motor)
- *We Come To You*® 1-Year In-Home Limited Warranty
- Rugged Galvanized Steel Construction (For Disposer Durability)
- Space-Saving Compact Design

Sample Specification

Food Waste Disposer(s) shall be InSinkErator Badger® 1, continuous feed, with 1/3 H.P. motor, galvanized steel grinding elements with two stainless steel 360° swivel lugs. Exclusive self-service wrench.

Warranty:
1-Year parts and in-home service.

* The complete InSinkErator warranty is included in the Care & Use Booklet packed with each unit.

Specifications

Type of Feed	Continuous
On/Off Control	Wall Switch
Motor	Single Phase
HP	1/3
Volts	120
HZ	60
RPM	1725
Amp. (Avg. Load)	5.6
Time Rating	Intermittent
Lubrication	Permanently Lubricated Upper & Lower Bearings
Shipping Weight (Approx.)	12 lbs. 7oz.
Unit Finish	Waterborne Grey Enamel
Overall Height	11-3/8"
Grind Chamber Capacity	26 oz.
Motor Protection	Manual Reset Overload
Average Water Usage	Approx. 1 Gallon per Person Per Day
Average Electrical Usage	3-4 KWh per Year
Drain Connection	1-1/2" Cushioned Slip Joint
Dishwasher Drain Connection	Yes

Food waste disposers can provide an environmentally responsible alternative to transporting food waste to landfills. And they can help reduce greenhouse gas emissions. At capable wastewater treatment plants, food waste can be recycled to produce renewable energy. Additionally, capable wastewater treatment plants can process food waste into fertilizer. (Check the plant in your area.)

c UL us IAPMO LISTED ASSE 1008

EMERSON™
Commercial & Residential Solutions

The Emerson logo is a trademark and service mark of Emerson Electric Co. The mounting collar configuration is a trademark of Emerson Electric Co.

InSinkErator may make improvements and/or changes in the specifications at any time, in its sole discretion, without notice or obligation and further reserves the right to change or discontinue models.

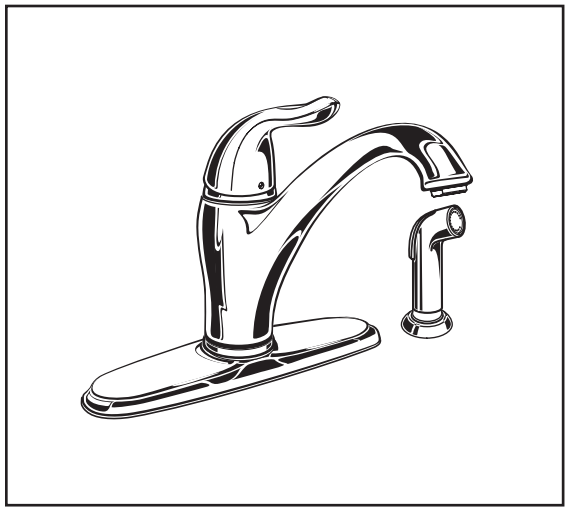
1-800-558-5700
www.insinkerator.com

Printed in U.S.A.

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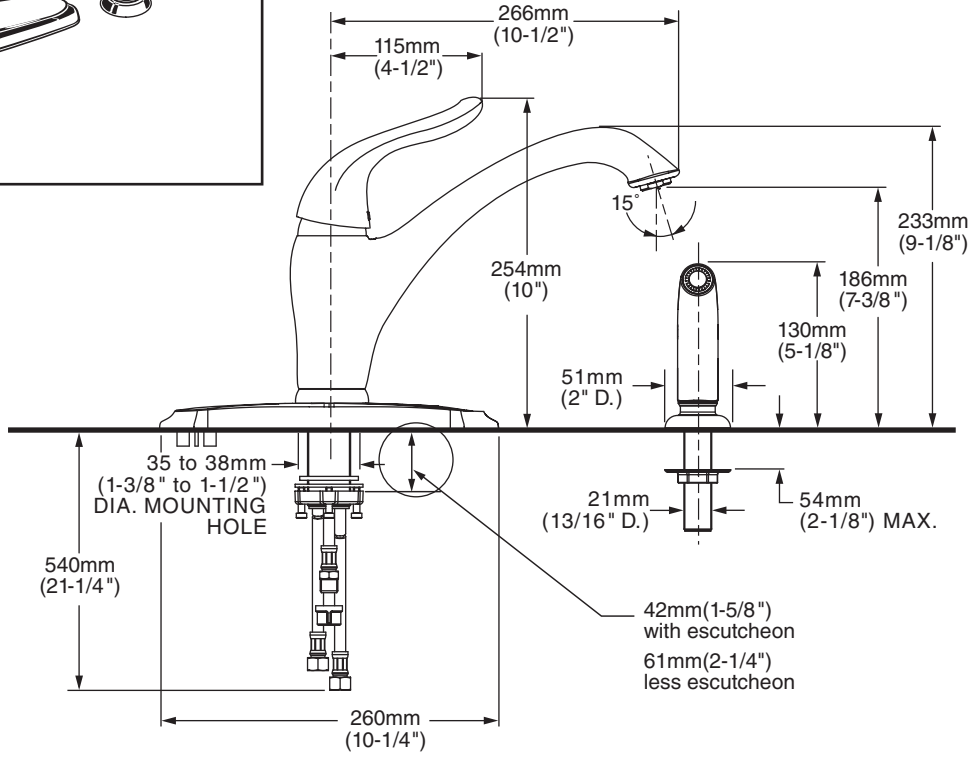
American Standard
Style That Works Better

LAKELAND™
SINGLE CONTROL KITCHEN FAUCET
WITH CAST BRASS SPOUT



MODEL NUMBER:

❑ **4114.001 Kitchen Faucet**
Color matched handspray. Escutcheon plate (installation is optional).



GENERAL DESCRIPTION:

Cast brass body and swivel spout. Metal escutcheon plate and metal lever handle. Washerless 40mm ceramic disc valve cartridge. Braided flexible supply hoses with 3/8" compression connections. 2.2 gpm/8.3L/min. maximum flow rate. Brass mounting shank with brass fixation ring. Can be mounted with or without supplied escutcheon plate (escutcheon size 10-1/4"L x 2-1/2"W). Color-matched hand spray. Cap provided for less spray applications

PRODUCT FEATURES:

Ceramic Disc Valve Cartridge: Assures smooth, precise valve control and a lifetime of drip-free, maintenance-free performance.

Cast Brass Spout: Highest quality materials for durability and long life.

Memory Position Valving: Allows user to turn valve on and off at preferred temperature setting without readjusting handle position each time.

Lead Free: Faucet contains ≤ 0.25% total lead content by weighted average.

Choice of Finishes: Choice of Polished Chrome, Stainless Steel (PVD), or Oil Rubbed Bronze.

SUGGESTED SPECIFICATION:

Single control kitchen faucet shall feature a cast brass body and cast brass swivel spout. Metal escutcheon plate, and metal lever handle. Shall also feature washerless ceramic disc valve cartridge, and flexible hose supplies. Fitting shall be American Standard Model # 4114.001.___ .

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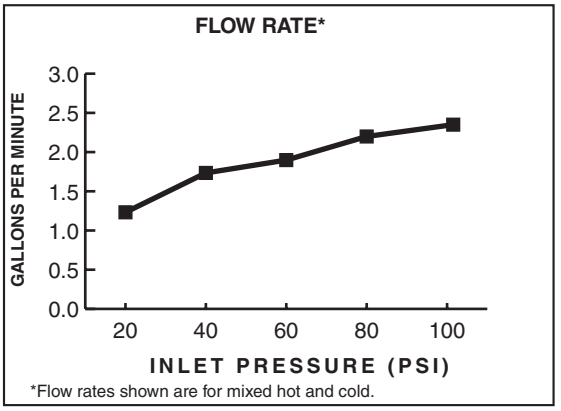
American Standard
Style That Works Better

LAKELAND™
SINGLE CONTROL KITCHEN FAUCET
WITH CAST BRASS SPOUT

CODES AND STANDARDS

These products meet or exceed the following codes and standards:

ANSI A117.1
ASME A112.18.1
CSA B 125
NSF 61/Section 9 & Annex G



*Flow rates shown are for mixed hot and cold.

Product Number	Description	Finish Options		
		Polished Chrome	PVD Stainless Steel	Oil Rubbed Bronze
		002	075	224
4114.001	Single Control Kitchen Faucet with Side Spray			

Meets the American Disabilities Act Guidelines and **ANSI A117.1** Requirements for the physically challenged.

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ELKAY®

SPECIFICATIONS

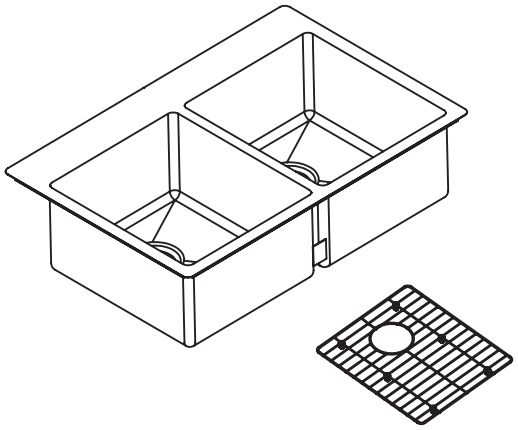
Crosstown™ Universal Mount Sink with Slim Rim and Bottom Grid Model ECTSR33229BG

GENERAL
Highest quality sink fabricated of #18 (1.2mm) gauge, type 304 (18-8) nickel bearing stainless steel. Top mount or undermount.

DESIGN FEATURES
Bowl Depth: 9" (228mm).
Coved Corners: Approximately 5/8" (15mm).
Rim Height: 3/64" (1mm).
Slim Rim: Ultra-thin edge virtually eliminates the barrier between the sink and countertop.
Finish: Exposed surfaces have a Polished Satin finish.
Underside: Fully protected by heavy duty Sound Guard® under-coating to reduce condensation and dampen sound.

OTHER
Drain Opening: 3-1/2" (89mm).
Sink complies with ASME A112.19.3/ CSA B45.4

Sinks are listed by IAPMO® as meeting the applicable requirements of the Uniform Plumbing Code®, International Plumbing Code®, and National Plumbing Code of Canada.



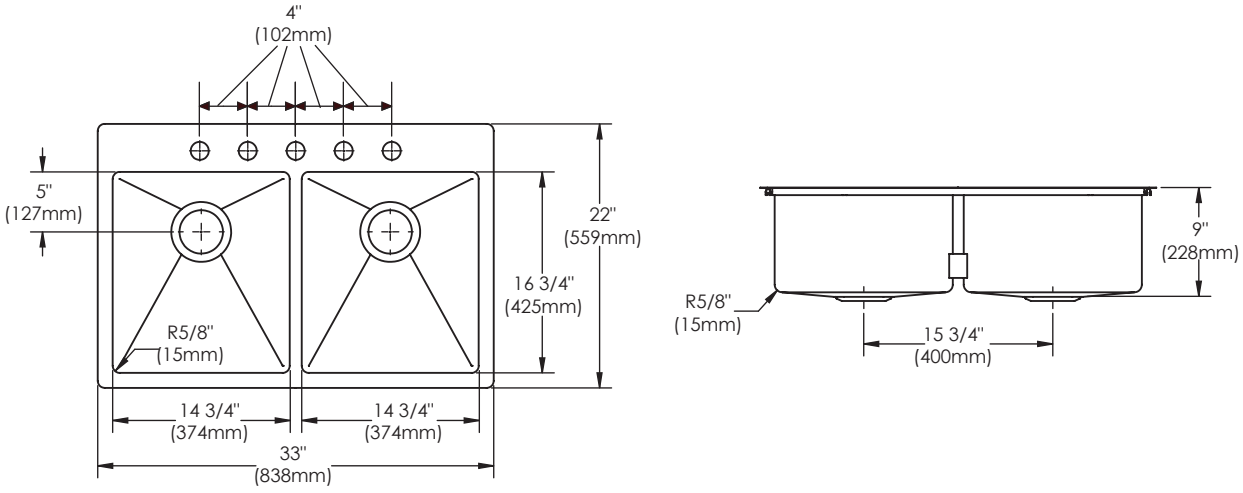
Included Accesories:
Bottom Grid: CTOBG1315SS

OPTIONAL ACCESSORIES
Undermount Hardware: LKUMSK36, LKUCLIP8
Drain: LK99

SINK DIMENSIONS*

Model Number	Overall		Inside Left Bowl			Inside Right Bowl			Cutout in Countertop ¼ (6mm) Radius Corners Top Mount Installation Only	No. of 1-1/2" (38mm) Dia. Faucet Holes 4" (102mm) Center	Minimum Cabinet Size
	L	W	L	W	D	L	W	D			
ECTSR33229BG	33 (838mm)	22 (559mm)	14 3/4 (374mm)	16 3/4 (425mm)	9 (228mm)	14 3/4 (374mm)	16 3/4 (425mm)	9 (228mm)	32 ⅜ x 21 ⅜ (822mm x 543mm)	1, 2, 3, 4, 5 MR2 or FR2	36 (914mm)

* Length is left to right. Width is front to back.
** For undermount installation, template 0000001180 is packed with every sink.



Model ECTSR33229BG5 Illustrated

In keeping with our policy of continuing product improvement, Elkay reserves the right to change product specifications without notice. Please visit elkay .com for most current version of Elkay product specification sheets.

This specification describes an Elkay product with design, quality and functional benefits to the user. When making a comparison of other producers' offerings, be certain these features are not overlooked.

Elkay
elkay.com
2222 Camden Court
Oak Brook, IL 60523

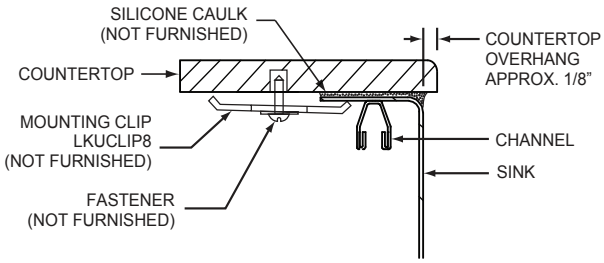
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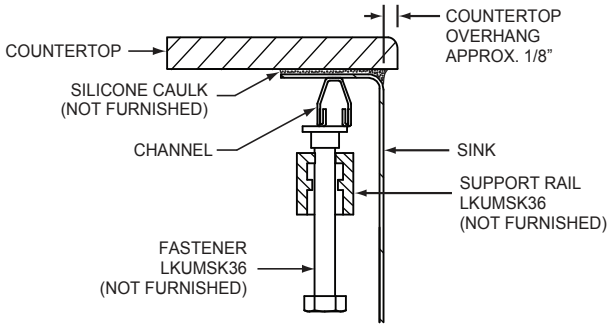
SPECIFICATIONS

Crosstown™ Universal Mount Sink with Slim Rim and Bottom Grid Model ECTSR33229BG

UNDERMOUNT INSTALLATION

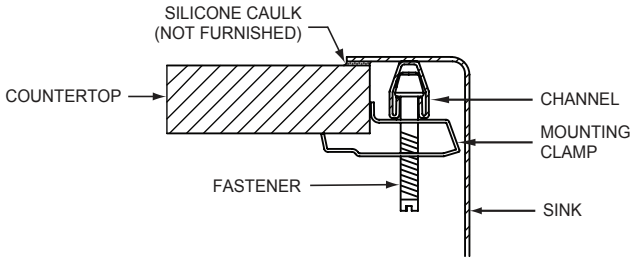


SIDES



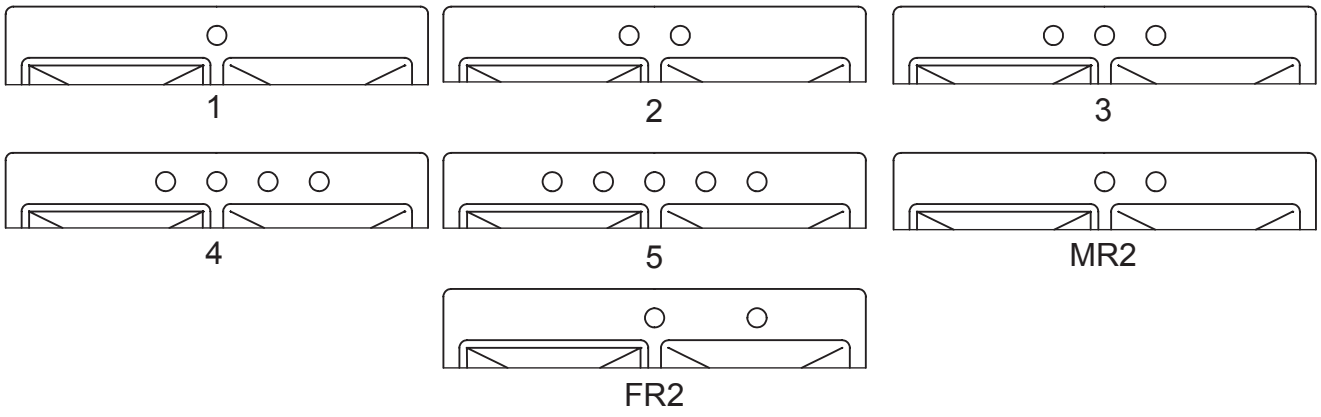
FRONT & BACK

TOP MOUNT INSTALLATION



HOLE DRILLING CONFIGURATIONS

1-1/2" (38mm) Diameter Faucet Holes on 4" (102mm) Centers



In keeping with our policy of continuing product improvement, Elkay reserves the right to change product specifications without notice. Please visit elkay.com for most current version of Elkay product specification sheets.

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Style That Works Better

FLORWELL™ SERVICE SINK
ENAMELED CAST IRON

FLORWELL™ SERVICE SINK

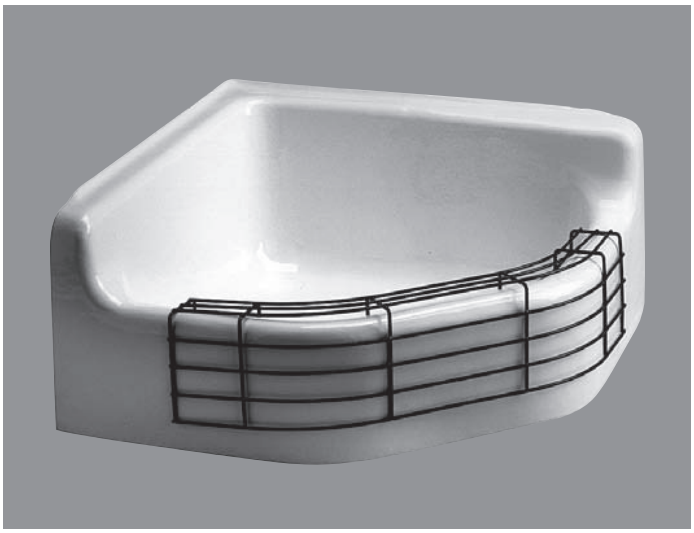
- Enameled cast iron
- 3" outlet
- Corner model

❑ **7741.000** Fixture only - Less rim guard

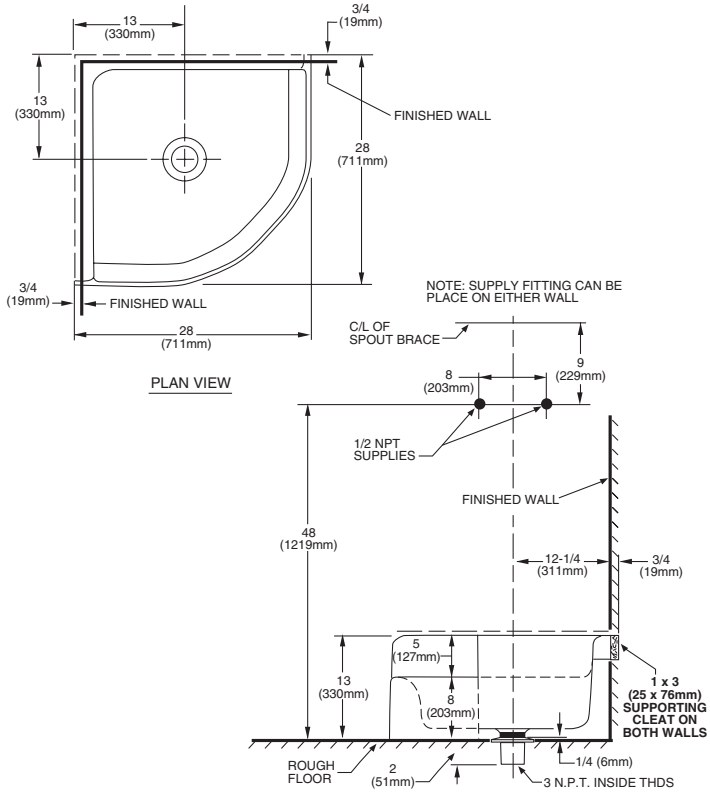
❑ **7745.811** Removable vinyl rim guard

Nominal Dimensions:
711 x 711 x 330mm
(28" x 28" x 13")

Compliance Certifications -
Meets or Exceeds the Following Specifications:
• ASME A112.19.1 for Cast Iron Plumbing Fixtures



To Be Specified:
❑ Faucet: 8344.112 faucet with top brace, stops, and vacuum breaker
❑ Alternative Faucet:
❑ Drain: 7721.038 flat grid drain
❑ Removable vinyl-coated rim guard: 7745.811 (black)



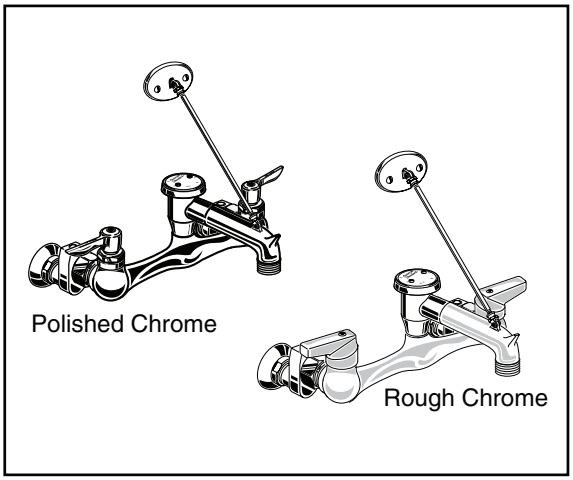
NOTES:
PROVIDE SUITABLE REINFORCEMENT FOR ALL WALL SUPPORTS.
FITTINGS NOT INCLUDED AND MUST BE ORDERED SEPARATELY.

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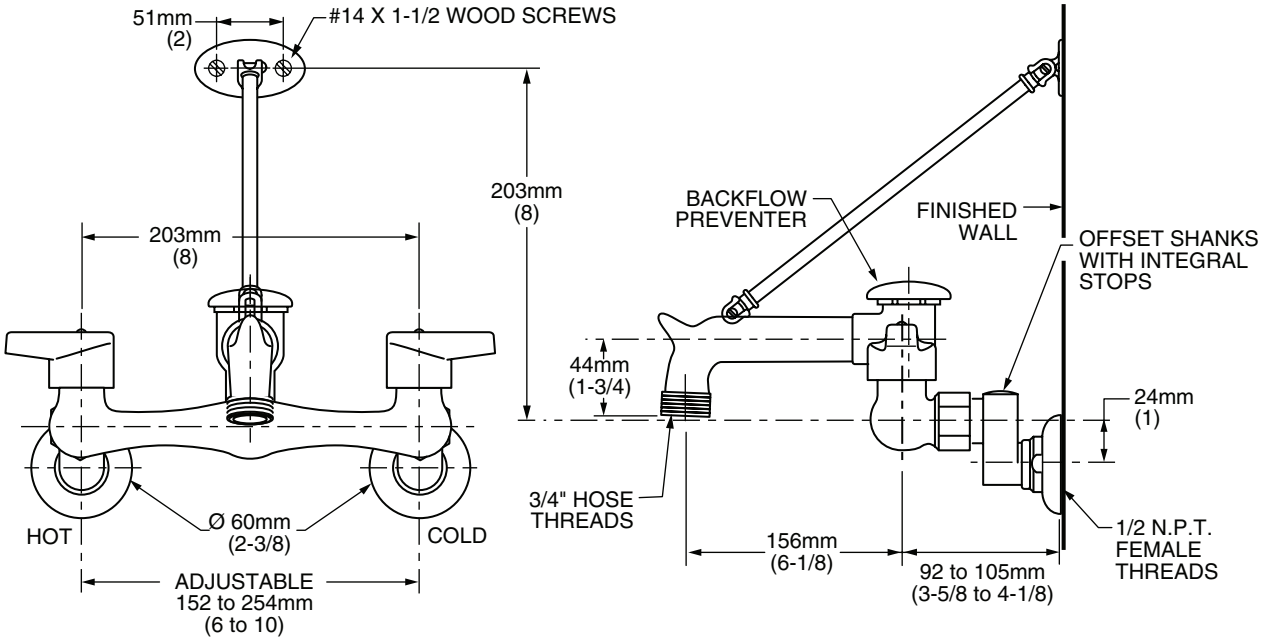
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EXPOSED YOKE WALL-MOUNT UTILITY FAUCET
WITH TOP BRACE



MODEL NUMBER:

❑ **8344.112 Exposed Yoke Wall-Mount Utility Faucet**
Top brace. Vacuum breaker. Offset shanks with integral stops. Metal lever handles. 6" threaded spout. 1/2" NPT female inlets.



GENERAL DESCRIPTION:

Cast brass body. Metal lever handles with hot and cold indicators. 1/4 turn ceramic disc valve cartridges that are reversible for use on both "hot" and "cold" sides. Vacuum breaker prevents back flow. Offset shanks with integral stops. Spout, top braced to wall, with bucket hook and threaded hose end. 1/2" female inlets adjustable from 6" to 10".

PRODUCT FEATURES:

Cast Brass Construction: Durable - Excellent in high use applications.

Ceramic Disc Valve Cartridges: Assure a lifetime of drip-free performance.

Vacuum Breaker: Prevents back flow.

Offset Shanks with Integral Stops: Permits easy and convenient access. Adjustable rough-in from 6 to 10 inches.

Top Brace: Provides additional support.

Choice of Finishes: Available in Polished or Rough Chrome.

SUGGESTED SPECIFICATION

Exposed yoke wall-mount utility faucet shall feature a cast brass body and spout with bucket hook, top brace, and metal lever handles. Shall feature vacuum breaker and offset shanks with integral stops. Shall also feature 1/4 turn washerless ceramic disc valve cartridges. Fitting shall be American Standard Model # 8344.112.___

© 2008 AS America Inc.

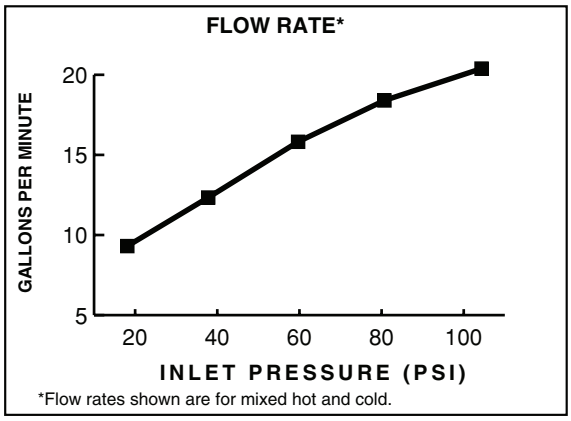
American Standard
Style That Works Better

EXPOSED YOKE WALL-MOUNT UTILITY FAUCET
WITH TOP BRACE

CODES AND STANDARDS

These products meet or exceed the following codes and standards:

ASME A112.18.1
CSA B 125
ASSE 1001
ANSI A117.1



Product Number	Description	Finish Options	
		Polished Chrome 002	Rough Chrome 004
8344.112	Exposed yoke wall-mount utility faucet. Top brace. Vacuum breaker. Offset shanks with integral stops.		

Meets the American Disabilities Act Guidelines and **ANSI A117.1** Requirements for the physically challenged.

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HydroGuard® XP

The Next Wave in Emergency Tempering Valve Technology

- ASSE 1071 and IAPMO UPC Listed
- Internal Cold Water Bypass - Patent Pending
- Eye and Face Washes, Drench Showers, Combination Units

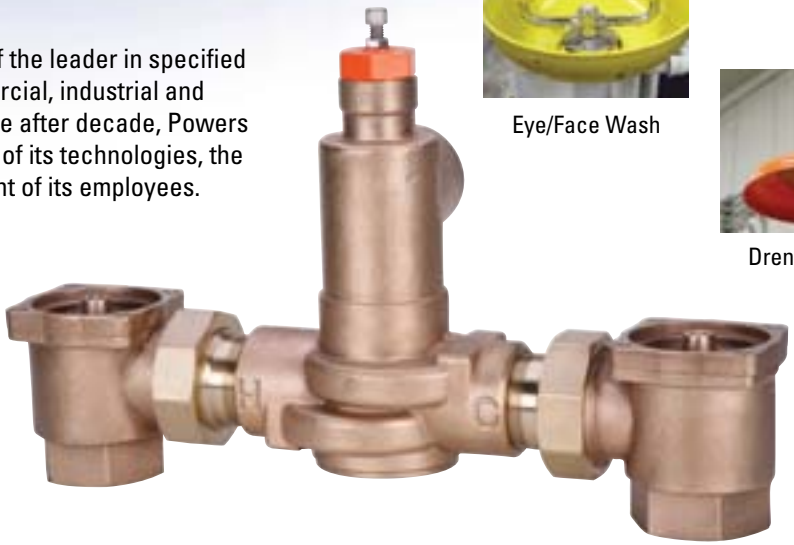
POWERS™

POWERS™

A History of Tempering Valve Innovation and Leadership It's in our DNA

Since 1891, Powers continues to prove itself the leader in specified water tempering control devices for commercial, industrial and institutional facilities. Year after year, decade after decade, Powers improves its products through the evolution of its technologies, the innovation of its designs and the commitment of its employees.

Today, Powers introduces HydroGuard® XP, the next wave of ASSE 1071 listed valves with more features, a simplified design and greater bypass flows. Four new and completely re-engineered valves meet a broad range of capacity requirements and applications. When considering your next specification, consider the company whose DNA is tempering.





Eye/Face Wash



Drench Shower

ASSE 1071 Listed!

Powers' HydroGuard XP series valves meet the stringent performance requirements of ASSE 1071, "Temperature Actuated Mixing Valves for Plumbed Emergency Equipment". The XP series carries the coveted ASSE seal. They are designed to deliver tepid (lukewarm) water to eye/face wash, drench shower and combination fixtures.

Important Requirements of ASSE 1071 Include:

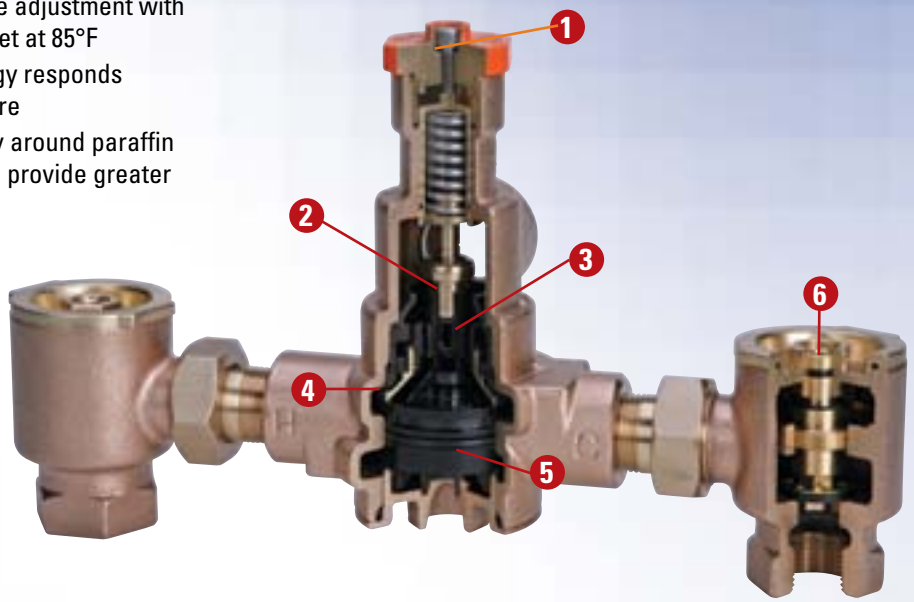
1. Intended to be installed with fixtures that comply with ANSI Z358.1-2004.
2. Valves must have an adjustable outlet temperature range, with a portion that falls within 65.0°F to 95.0°F (18.3°C to 35.0°C). The outlet temperature cannot exceed 100.0°F under normal operating conditions (Section 1.2.4.2).
3. Upon hot water failure, valves must continue to provide cold-water flow at the manufacturers rated bypass flow, at a 30psi differential (Section 1.2.5).
4. Upon cold-water failure, valves must restrict hot water flow per Table 1 (Section 1.2.6). Flow varies by valve capacity.
5. The temperature control test requires valves to maintain temperature within a specified variation based on capacity. First, flow is recorded at a 30 psid differential, then reduced to 3 gpm or manufacturer's minimum stated flow, whichever is lower. Valve is restored back to full flow and hot water temperature is increased by 25°F over 5 minutes. Flow is again reduced to 3 gpm.

ASSE 1071 - Temperature Control and Cold Water Failure Limits

Flow at 30 psid		Permissible Temperature Variation		Max. Allowable Flow with CW Shutoff	
GPM	*L/min*	*°F*	*°C*	*GPM*	*L/min*
< 7.0	< 26.5	+ 3.0 / -5.0	+ 1.7 / -2.8	0.5	1.9
7.0 < 20.0	26.5 < 75.7	+ 5.0 / -8.0	+ 2.8 / -4.4	1.0	3.8
20.0 < 40.0	75.7 < 151.4	+ 7.0 / -12.0	+ 3.9 / -6.7	1.5	5.7
40.0 and over	151.4 and over	+ 7.0 / -15.0	+ 3.9 / -8.3	2.0	7.6

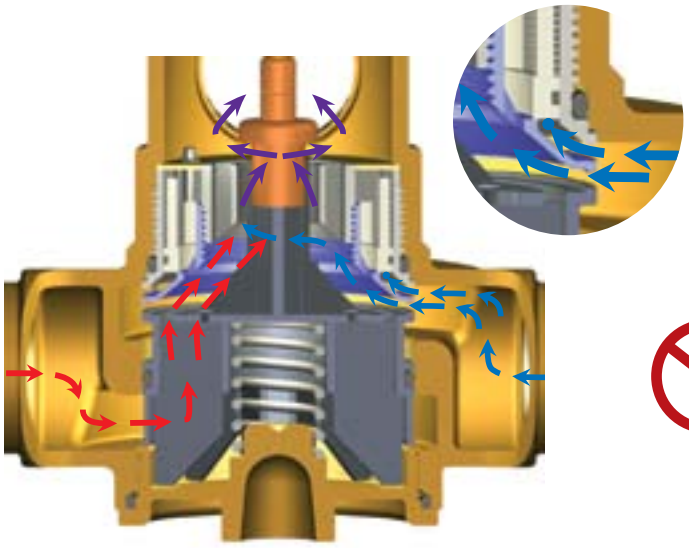
Engineered with Performance and Safety in Mind

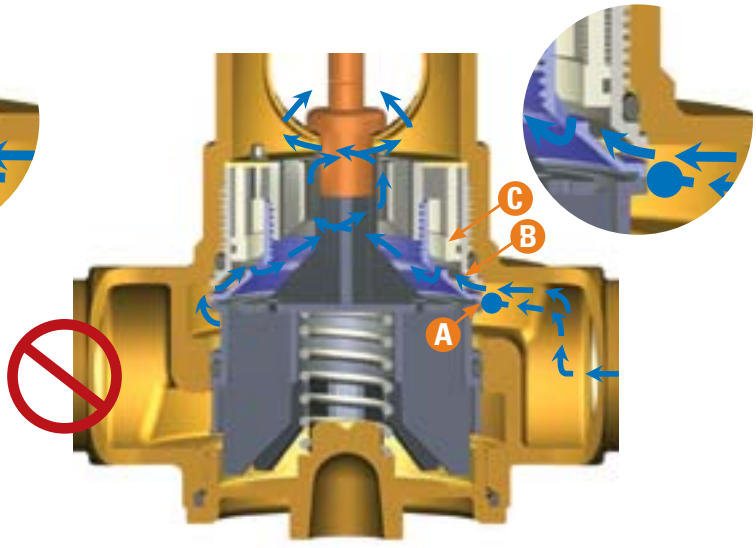
1. Lockable, vandal-resistant temperature adjustment with high temperature limit stop is factory set at 85°F
2. Advanced paraffin actuation technology responds quickly to changes in water temperature
3. Booster funnel channels water directly around paraffin actuator to improve response time and provide greater low flow control
4. Patented internal bypass allows cold-water flow in the event of hot water failure
5. Corrosion resistant internals resist seizing or sticking in harsh water conditions, ensuring safe and consistent valve performance after extended periods of down time
6. Triple-duty check stops prevent cross flow, provide valve isolation for repair and include screens to filter out debris.



Cold Water Bypass

Unlike standard master tempering valves, Powers' new Emergency Valve series provides substantial cold-water flow in the event of hot water supply loss. This is accomplished through a unique and patented internal bypass channel and check valve.



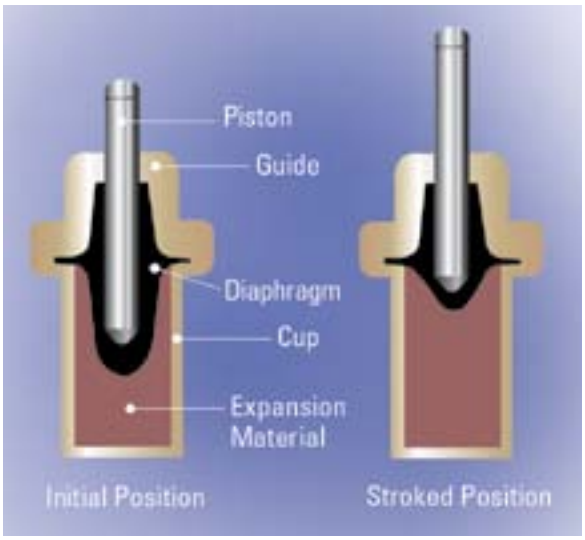


Normal Operation – *Blended, Controlled Outlet Temperature Cold Water Bypass Closed*
Hot and cold water enter internal chamber through seating areas, are blended together, and directed around actuator to the outlet. Paraffin actuator expands and contracts based on outlet water temperature.

Hot Water Supply Loss – *Cold Water Bypass Opens*
Loss of hot water causes paraffin actuator to contract. Lower spring pushes mixing assembly upwards and closes off cold water supply at **Seating Area** A. With closing of Seating Area A, pressure builds in Bypass **Channel** B, pushing **Check Assembly** C off of seat and allows cold water to flow through to the outlet.

The Heart of HydroGuard® XP

At the core is Powers' paraffin-based Advanced Thermal Actuation technology that operates on the principle of converting heat energy into mechanical energy, using the expansion of paraffin from a solid to a liquid state. As shown in this illustration, when the temperature of the water enveloping the sensor increases, the expansion of the paraffin actuates the valve piston. As the water cools, the paraffin contracts into a solid and the valve piston returns to its starting position.
Powers' paraffin sensor is significantly smaller in size than bi-metal and chemical filled elements and requires only a small volume of water to initiate thermal transfer and response.



ATA
Advanced Thermal Activation

Product Specification

Maximum Operating Pressure ..... 125psi (861 kPa)
Maximum Hot Water Temperature ..... 180°F (82°C)
Temperature Adjustment Range ..... 60 – 95°F (15 – 35°C)
Factory Set Temperature*..... 85°F (29°C)
Maximum Flow with Cold Water Shutoff* ..... 0.5 gpm (1.9 lpm)

Listing…ASSE 1071 and IAPMO UPC

*When tested to ASSE 1071 standard

Capacity

				Pressure					
Model	**Min Flow to ASSE 1071**	**C_V**	**CW Bypass @ 30psi**	**5psi 34 kPa**	**10psi 69 kPa**	**15psi 103 kPa**	**20psi 138 kPa**	**30psi 207 kPa**	**45psi 310 kPa**
ES150	1.0 gpm 3.8 lpm	1.59	6.5 gpm 25 lpm	3.6 gpm 13.6 lpm	5.0 gpm 18.9 lpm	6.2 gpm 23.5 lpm	7.1 gpm 26.9 lpm	8.7 gpm 32.9 lpm	10.7 gpm 40.5 lpm
ETV200	3.0 gpm 11.4 lpm	6.0	30 gpm 114 lpm	13.4 gpm 50.7 lpm	19.0 gpm 71.9 lpm	23.2 gpm 87.8 lpm	26.8 gpm 101.4 lpm	32.9 gpm 124.5 lpm	40.2 gpm 152.2 lpm
ETV400	3.0 gpm 11.4 lpm	15.2	50 gpm 189 lpm	34.0 gpm 128.7 lpm	48.1 gpm 182.0 lpm	58.9 gpm 223.0 lpm	68.0 gpm 257.4 lpm	83.2 gpm 315.0 lpm	102.0 gpm 386.1 lpm
ETV500	3.0 gpm 11.4 lpm	21.8	81 gpm 307 lpm	48.7 gpm 184.3 lpm	68.9 gpm 260.8 lpm	84.4 gpm 319.5 lpm	97.5 gpm 369.1 lpm	119.4 gpm 452.0 lpm	146.2 gpm 553.4 lpm

Flow capacity at 85°F (29°C)

© 2010 Powers

model 8300-8309

AXION MSR™ Emergency Shower and Eye/Face Wash

FEATURES & BENEFITS

CONSTRUCTION

1-1/4" IPS Schedule 40 hot-dipped galvanized steel pipe and fittings along with powder-coated cast-iron 9" (22.9 cm) diameter floor flange and 11" (27.9 cm) stainless steel receptor provide an additional corrosion resistance in a long lasting product.

QUALITY CONTROL

Eye/face wash and valve assembly are pre-built and fully water/pressure tested to ensure no leaks and proper function which ultimately reduces installation time.

VALVES

Eyewash and shower ball valves are designed to make the flushing of contaminants occur with the simple pull of a lever or push of a stainless steel flag. Both valves come equipped with stainless steel ball and stem to provide greater protection against corrosion and breakage.

STRAINERS/FILTERS

Chrome-plated brass in-line 50 x 50 mesh water strainer prevents debris from reaching the eyewash so the unit stays functioning at its best. Strainer is easily serviceable.

SHOWER HEAD

AXION MSR™ ABS plastic drench showerhead uses a hydrodynamic design to give equal distribution of water throughout the entire footprint of flow.

EYE/FACE WASH

AXION MSR-™ eye/face wash head (patent pending) uses an inverted directional laminar flow to sweep contaminants away from the vulnerable nasal cavity.

OPTIONS

- ☐ Test Tag: SP170 is a green waterproof test card with space for date and initials of inspector. Used to record weekly testing of emergency equipment.
- ☐ Large Shower/Eyewash Sign: Model SP178LG large vertical universal combination emergency shower and eyewash sign. Size: 18" x 24" (45.7 x 61 cm).
- ☐ Foot Treadle: Model SP220 foot control assembly, including powder-coated aluminum treadle for hands free activation of eyewash.
- ☐ Dust Cover: Model 9102 is a stainless steel cover that protects the eyewash heads as well as the bowl. Pushing the stainless steel flag will activate the unit while raising the dust cover. (Picture shows cover mounted to an eyewash.)

To see all options for this model, visit www.hawsco.com



SPECIFICATIONS

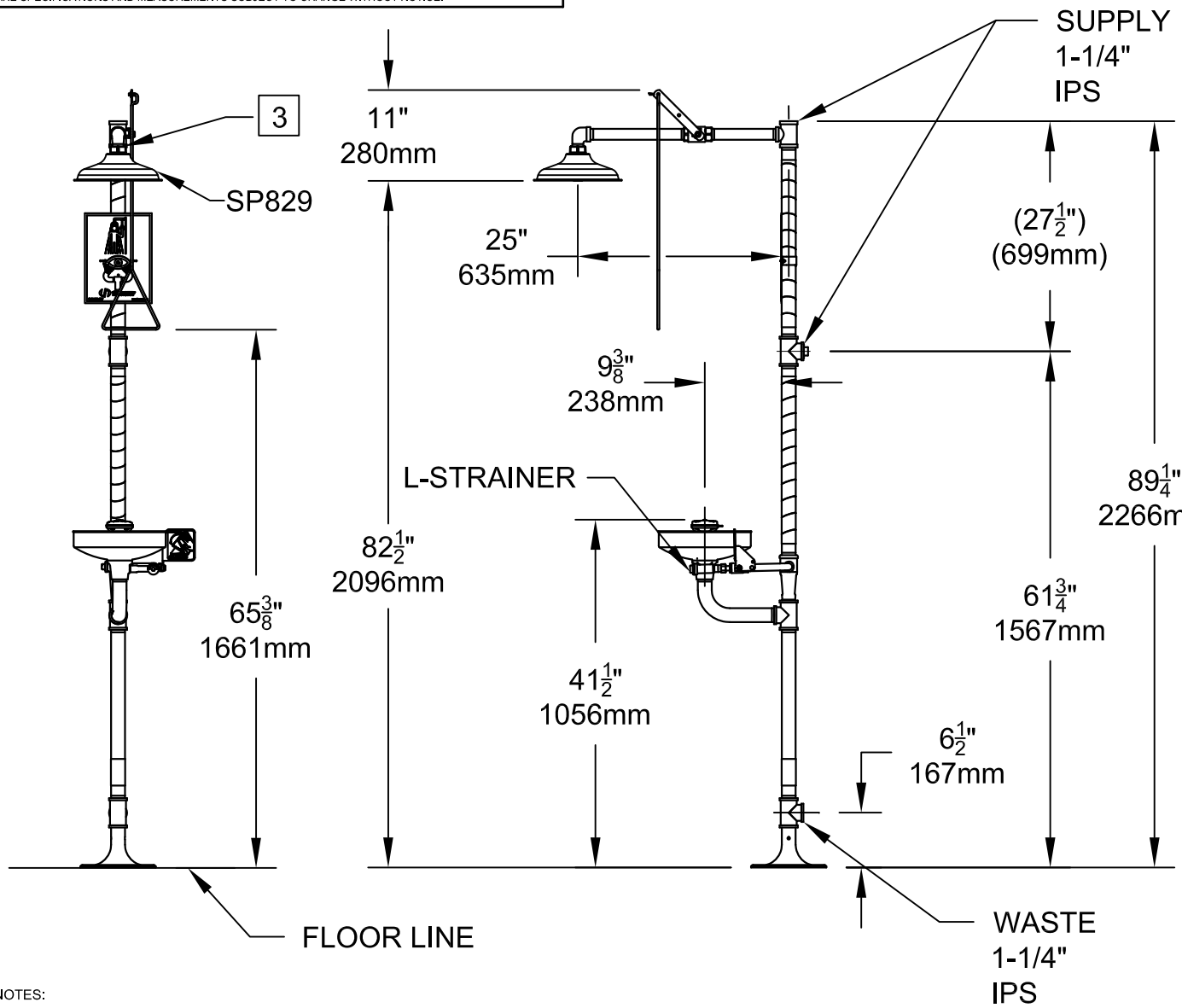
Model 8300-8309 combination shower and eye/face wash shall include a stainless steel 11" (27.9 cm) round bowl, an AXION MSR™ eye/face wash head shall feature inverted directional laminar flow which achieves zero vertical velocity supplied by an integral flow control. Unit shall also include the AXION MSR hydrodynamic designed ABS plastic showerhead with flow control, chrome-plated brass stay-open ball valve equipped with stainless steel ball and stem, and chrome-plated brass in-line 50 x 50 mesh water strainer. Unit shall also include Schedule 40 hot-dipped galvanized steel pipe and fittings, powder-coated cast-iron 9" (22.9 cm) diameter floor flange, self-adhesive high visibility safety green and bright yellow stripes, universal sign, and 1-1/4" IPS supply.

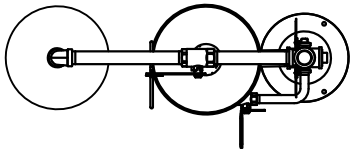
APPLICATIONS

Where the eyes or body of any person may be exposed to injurious or corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use. Emergency eyewash facilities and deluge showers shall be in unobstructed and accessible locations that require no more than 10 seconds for the injured person to reach.Model 8300-8309 is certified by CSA to meet the ANSI Z358.1 Standard for Emergency Eyewash and Shower Equipment.

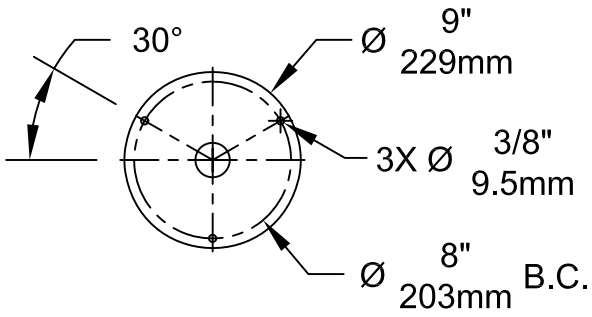
DISCLAIMER: Continued product improvements make specifications subject to change without notice. Check www.hawsco.com for the latest product information and updates.

THIS DOCUMENT IS TRUE AND CORRECT AT TIME OF PUBLICATION. CONTINUED PRODUCT IMPROVEMENTS MAKE SPECIFICATIONS AND MEASUREMENTS SUBJECT TO CHANGE WITHOUT NOTICE.





TOP VIEW



MOUNTING DETAIL

SCALE 10:1

NOTES:

1. DIMENSIONS MAY VARY BY ± 1/2 INCH [13mm].

2. TO COMPLY WITH ANSI Z358.1-2009 FOR EMERGENCY EYEWASH OR EYE/FACE WASH AND SHOWER EQUIPMENT:
   - UNIT SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND ACCEPTABLE PLUMBING PRACTICES.
   - EYEWASH OR EYE/FACE WASH SHALL BE POSITIONED WITH NOZZLES NOT LESS THEN 83.8 CM (33 IN.) AND NO GREATER THAN 114.3 CM (45 IN.) FROM SURFACE ON WHICH USER STANDS AND 15.3 CM (6 IN.) MINIMUM FROM WALL OR NEAREST OBSTRUCTION.
   - SHOWER SHALL BE POSITIONED SO THAT SHOWER HEAD IS NOT LESS THAN 208.3 CM (82 IN.) NOR MORE THAN 243.8 CM (96 IN.) FROM SURFACE ON WHICH USER STANDS.
   - SHOWER SPRAY PATTERN SHALL HAVE A MINIMUM DIAMETER OF 50.8 CM (20 IN.) AT 152.4 CM (60 IN.) ABOVE SURFACE ON WHICH USER STANDS, AND CENTER OF SPRAY PATTERN SHALL BE LOCATED AT LEAST 40.6 CM (16 IN.) FROM ANY OBSTRUCTION.

3. DO NOT USE REGULAR PIPE SEALANT. IF NECESSARY USE DOW CORNING 832 SEALANT PLACING 5 SMALL BEADS ON THE MALE THREADS, JUST ABOVE THE FIRST THREAD.

Haws®
1455 KLEPPE LANE
SPARKS, NEVADA 89431
(775) 359-4712 FAX (755) 359-7424
E-MAIL: HAWS@HAWSCO.COM
WEBSITE: WWW.HAWSCO.COM

ECN NO.	REVISED PER	BY:
	ECN: 4621	4621
DRAWN: SLS	DATE: 04/25/08	CHK'D.:
APPROVED:	DATE:	

MODEL(S)
8300/8300CRP/8309/8309CRP

PART NUMBER 0002080162.D
DRAWING NO. 09459A00 REV 20

SCALE: 1:1 | DRAWING TYPE: INSTALLATION | SIZE: A | SHEET 1 OF 1

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ELKAY®

SPECIFICATIONS

Sturdibilt® Scullery Sink
Square Corner Single Compartment

GENERAL

Model No. SS_____ #14 gauge, type 304 stainless steel scullery sink. Compartments 14" deep. Square corner welded construction. Full length 8" high backsplash with 45° sloped top. 1-1/2" wide sloping top channel rims. Integral drainboard/s, sink compartments pitched to drain. Exposed surfaces polished to a satin finish.

Sink, supported on (4) LK251 stainless steel, 1-5/8" O.D. tubular legs, #16 gauge wall thickness. Adjustable bullet shaped feet.

Shaded areas are models carried in stock with standard faucet location.

Non-shaded areas with specified dimensions are standard models which must be made to order – standard faucet location unless otherwise specified.

• Last item in each group is custom. Fill in dimensions. Standard faucet location unless otherwise specified.

Drainboards over 25-1/2" furnished with one tubular leg.

Drainboards over 48" furnished with two tubular legs.

SPECIFIED FITTINGS:

SUPPLY:

DRAIN:

FURNISHED WITH:

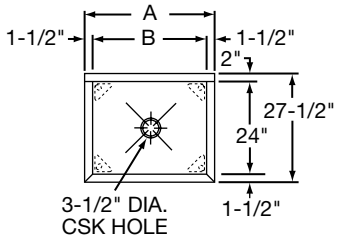
LK251. (Four) Stainless steel tubular legs, 1-5/8" O.D., #16 gauge. Adjustable bullet feet.

ALL DIMENSIONS IN INCHES.
SEE OTHER SIDE FOR DIMENSIONS IN MILLIMETERS.

(CHECK MODEL SPECIFIED):

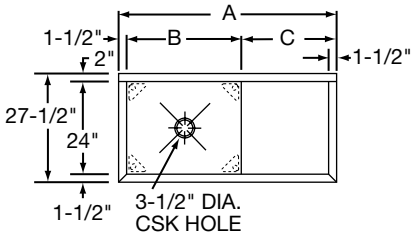
NO DRAINBOARD

Model Number	Dimensions A	B
SS8124	27	24
SS8130	33	30
SS8136	39	36
• SSC8100		



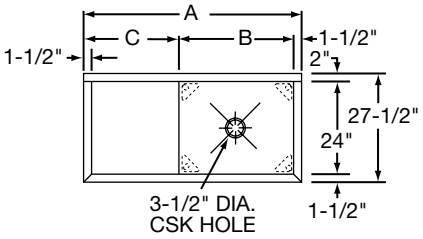
RIGHT DRAINBOARD

Model Number	Dimensions A	B	C
SS8124R	49½	24	24
SS8130R	55½	30	24
SS8136R	61½	36	24
• SSC8100R			



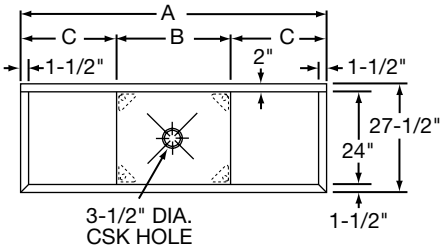
LEFT DRAINBOARD

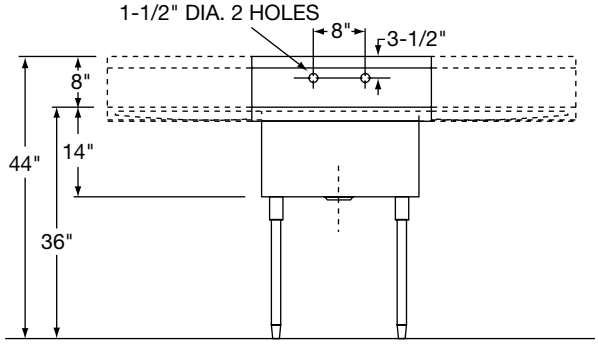
Model Number	Dimensions A	B	C
SS8124L	49½	24	24
SS8130L	55½	30	24
SS8136L	61½	36	24
• SSC8100L			



RIGHT & LEFT DRAINBOARD

Model Number	Dimensions A	B	C
SS8124LR	72	24	24
SS8130LR	78	30	24
SS8136LR	84	36	24
• SSC8100LR			





INDICATE NUMBER OF FAUCET HOLES WHEN PLACING ORDER. (NON-STANDARD FAUCET AND OVERFLOW DRILLING LOCATIONS ARE AVAILABLE. SPECIFY ON DRAWING AT RIGHT.)

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Sturdibilt® Scullery Sink
Square Corner Single Compartment

ELKAY®
SPECIFICATIONS

GENERAL

Model No. SS_____ #14 gauge, type 304 stainless steel scullery sink. Compartments 356mm deep. Square corner welded construction. Full length 203mm high backsplash with 45° sloped top. 38mm wide sloping top channel rims. Integral drainboard/s, sink compartments pitched to drain. Exposed surfaces polished to a satin finish.

Sink, supported on (4) LK251 stainless steel, 41mm O.D. tubular legs, #16 gauge wall thickness. Adjustable bullet shaped feet.

Shaded areas are models carried in stock with standard faucet location.

Non-shaded areas with specified dimensions are standard models which must be made to order – standard faucet location unless otherwise specified.

• Last item in each group is custom. Fill in dimensions. Standard faucet location unless otherwise specified.

Drainboards over 648mm furnished with one tubular leg.

Drainboards over 1,219mm furnished with two tubular legs.

SPECIFIED FITTINGS:

SUPPLY:

DRAIN:

FURNISHED WITH:

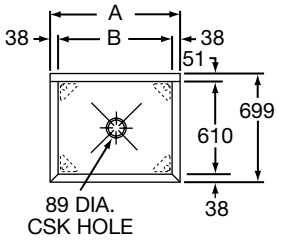
LK251. (Four) Stainless steel tubular legs, 41mm O.D., #16 gauge. Adjustable bullet feet.

ALL DIMENSIONS IN MILLIMETERS.
SEE OTHER SIDE FOR DIMENSIONS IN INCHES.

(CHECK MODEL SPECIFIED):

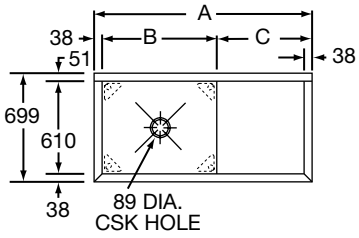
NO DRAINBOARD

Model Number	Dimensions A	B
SS8124	686	610
SS8130	838	762
SS8136	991	914
• SSC8100		



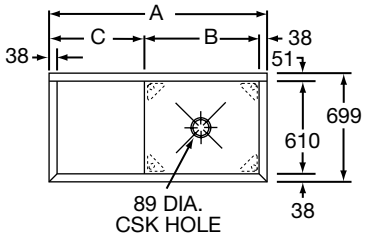
RIGHT DRAINBOARD

Model Number	Dimensions A	B	C
SS8124R	1257	610	610
SS8130R	1410	762	610
SS8136R	1562	914	610
• SSC8100R			



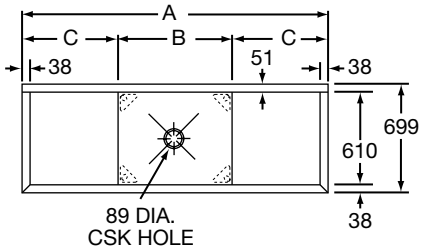
LEFT DRAINBOARD

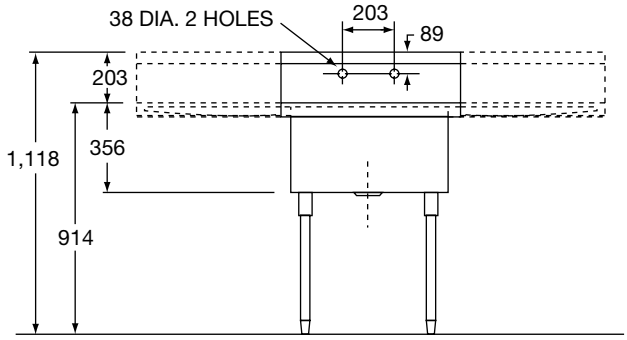
Model Number	Dimensions A	B	C
SS8124L	1257	610	610
SS8130L	1410	762	610
SS8136L	1562	914	610
• SSC8100L			



RIGHT & LEFT DRAINBOARD

Model Number	Dimensions A	B	C
SS8124LR	1829	610	610
SS8130LR	1981	762	610
SS8136LR	2134	914	610
• SSC8100LR			





INDICATE NUMBER OF FAUCET HOLES WHEN PLACING ORDER. (NON-STANDARD FAUCET AND OVERFLOW DRILLING LOCATIONS ARE AVAILABLE. SPECIFY ON DRAWING AT RIGHT.)

2222 Camden Court
Oak Brook, IL 60523
elkayusa.com

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ELKAY®

SPECIFICATIONS

Wall Mount 8" Center Commercial Faucet
Models LK940HA10L2H, LK940HA10T4H, LK940HA10T6H

FEATURES

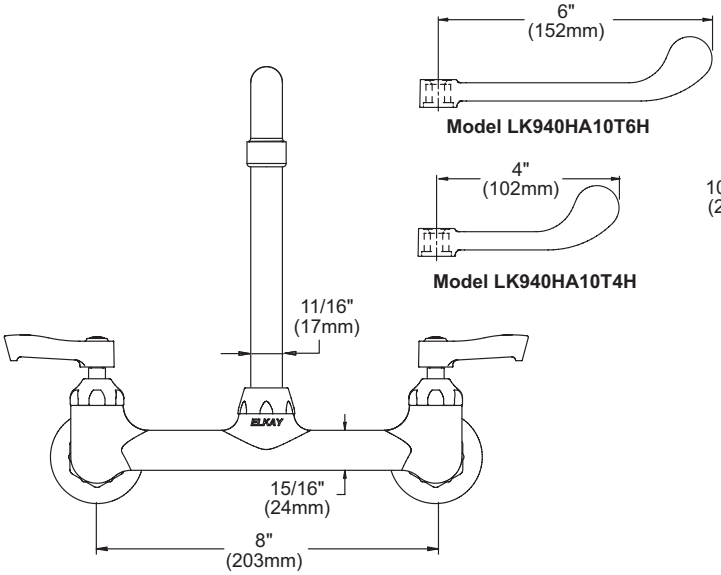
Model LK940HA10L2H
- Two hole dual handle wall mount faucet
- Quarter turn ceramic disc cartridge
- 1/2" adjustable inlets
- Solid brass construction
- Chrome finish
- 2.2 GPM VR aerator with 1.5 and .5 GPM inserts
- Includes spout swing restriction pin

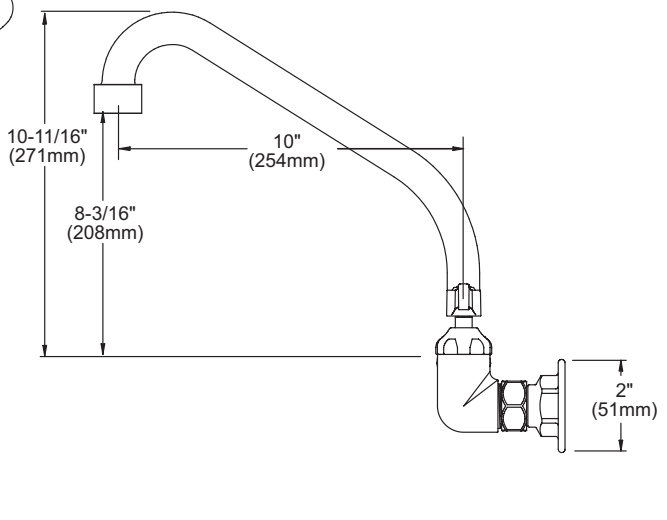
Model LK940HA10T4H
- Same as LK940HA10L2H except with 4” wrist blades handles

Model LK940HA10T6H
- Same as LK940HA10L2H except with 6” wrist blades handles



COMPLIES WITH:
- ASME/ANSI A112.18.1
- CSA B125-01
- NSF/ANSI 61 Annex G
- ADA
- UPC/CUPC
- IAPMO Listed
- Certified AB1953





Job Name:	**Item #:**
Notes:	
Architect/Engineer Approval:	**Date:**

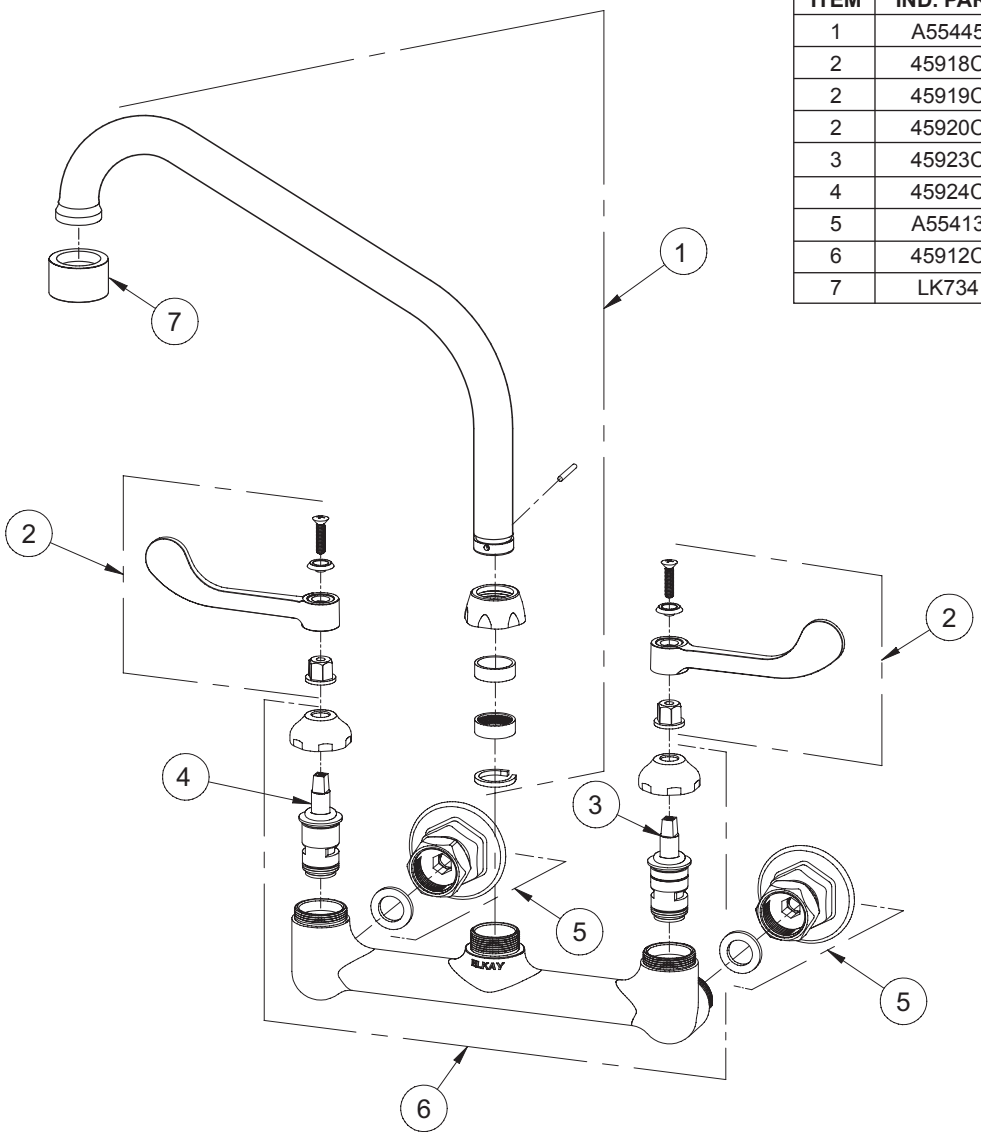
SEE OTHER SIDE FOR REPLACEMENT PARTS

Elkay
elkayusa.com
2222 Camden Court, Oak Brook, IL 60523
1-630-574-8484 Fax: 1-630-574-4509
©2011 Elkay

ELKAY®

REPLACEMENT PARTS

Wall Mount 8" Center Commercial Faucet
Models LK940HA10L2H, LK940HA10T4H, LK940HA10T6H



ITEM	IND. PART	DESCRIPTION
1	A55445	Spout
2	45918C	Handle, 2"
2	45919C	Handle, 4"
2	45920C	Handle, 6"
3	45923C	Right Cold Cartridge
4	45924C	Left Hot Cartridge
5	A55413	1/2" Adjustable Inlet
6	45912C	Body
7	LK734	2.2 GPM VR Aerator

Elkay
elkayusa.com
2222 Camden Court, Oak Brook, IL 60523
1-630-574-8484 Fax: 1-630-574-4509
©2011 Elkay

American Standard
Style That Works Better

BARRIER FREE

FloWise® FLUSH-FREE WATERLESS URINAL
VITREOUS CHINA

FloWise® FLUSH-FREE WATERLESS URINAL

- Vitreous china no water wall hung urinal with integral housing and drain insert
- Includes Mounting Hardware and Wall Bracket
- Drain Flange Coupler
- Odor Barrier Liquid
- Insert Key
- Drain Insert
- Installation and Maintenance Instructions

❑ **6150.100** Large
Nominal Dimensions:
502 x 705 x 394mm
(19-3/4" x 27-3/4" x 15-1/2")



6150.100

❑ **6154.100** Medium
Nominal Dimensions:
403 x 622 x 394mm
(15-7/8" x 24-1/2" x 15-1/2")



6154.100

❑ **6155.100** Small
Nominal Dimensions:
342 x 502 x 327mm
(13-1/4" x 19-3/4" x 12-7/8")

❑ **6156.100** Replacement Kit

Compliance Certifications -
Meets or Exceeds the Following Specifications:
• ASME A112.19.19 for Vitreous China Fixtures

To Be Specified:
❑ Color: ❑ White



6155.100

WATER EFFICIENT PRODUCT

MEETS THE AMERICANS WITH DISABILITIES ACT GUIDELINES AND ANSI A117.1 ACCESSIBLE AND USABLE BUILDINGS AND FACILITIES - CHECK LOCAL CODES.
● When installed so top of rim is 387mm (15-1/4") from finished floor.

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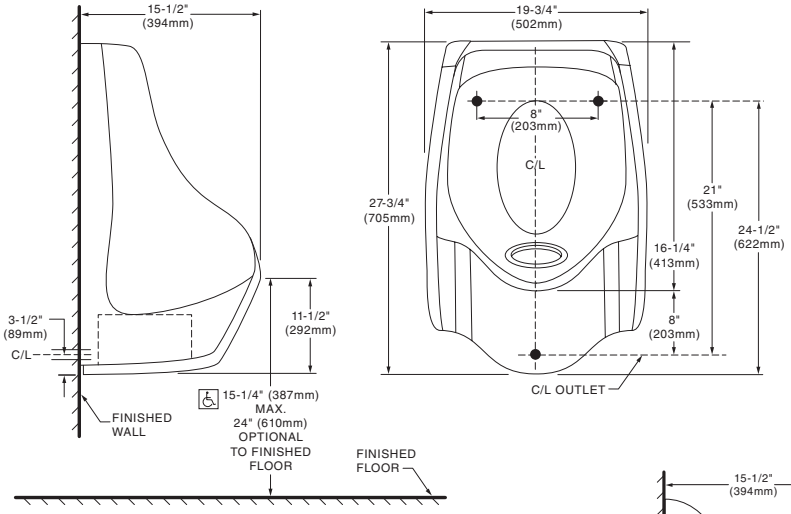
American Standard
Style That Works Better

BARRIER FREE

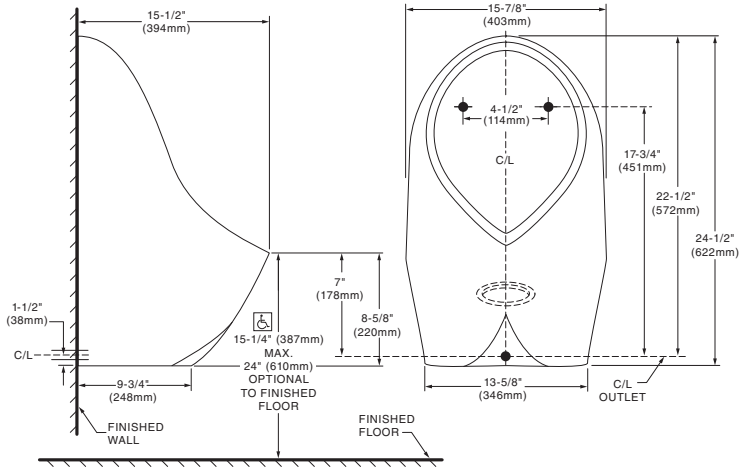
FloWise® FLUSH-FREE WATERLESS URINAL

VITREOUS CHINA

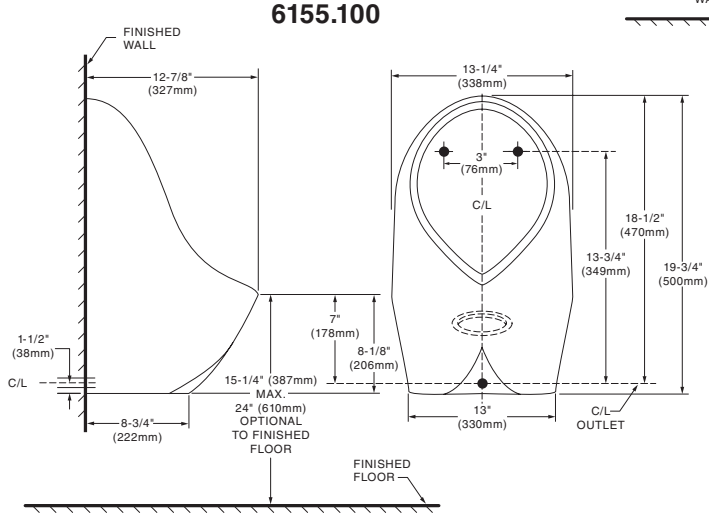
6150.100



6154.100



6155.100



NOTES:
PROVIDE SUITABLE REINFORCEMENT FOR ALL WALL SUPPORTS.

IMPORTANT: Dimensions of fixtures are nominal and may vary within the range of tolerances established by ANSI Standard A112.19.2. These measurements are subject to change or cancellation. No responsibility is assumed for use of superseded or voided pages.

© 2011 AS America Inc.

KOHLER®

San Souci™

Comfort Height® Touchless Toilet

K-4000

Features

- Simply hold your hand over the sensor to activate.
- Powered by 4 AA batteries (included).
- Easy to clean concealed trapway.
- Compact elongated, space saving bowl.
- Large 3-1/4" canister flush valve features a powerful jet action, providing rapid water delivery from tank to bowl.
- High-efficiency system offers bulk flushing performance and best in class cleanliness.

Water Conservation & Rebates

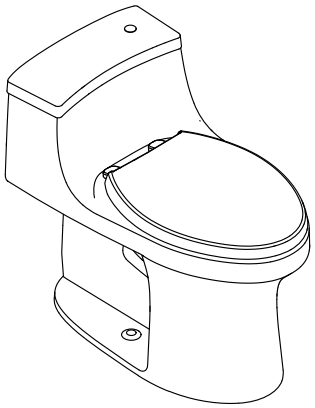
- Significant water savings of as much as 16,500 gallons of water annually over a 3.5 gallon toilet.
- Meets strict flushing performance guidelines established by the EPA's WaterSense® program.
- Qualifies as an HET (High Efficiency Toilet). Consumer rebates are available in some municiaplites.
- This product can help a building earn Water Efficiency points in the LEED Green Building Rating System.

Components

Product includes:

K-4008 Toilet seat

Additional included component/s: Tank Cover, Low Profile Bolt Cap Accessory Pack, Tank Accessory Pack, and Touchless Flush System.



For complete listing of available colors, go to kohler.com.

WaterSense Meets EPA Criteria
Certified by IAPMO R&T

Codes/Standards

ASME A112.19.2/CSA B45.1
EPA WaterSense®

KOHLER® One-Year Limited Warranty

See website for detailed warranty information.

Product Specification

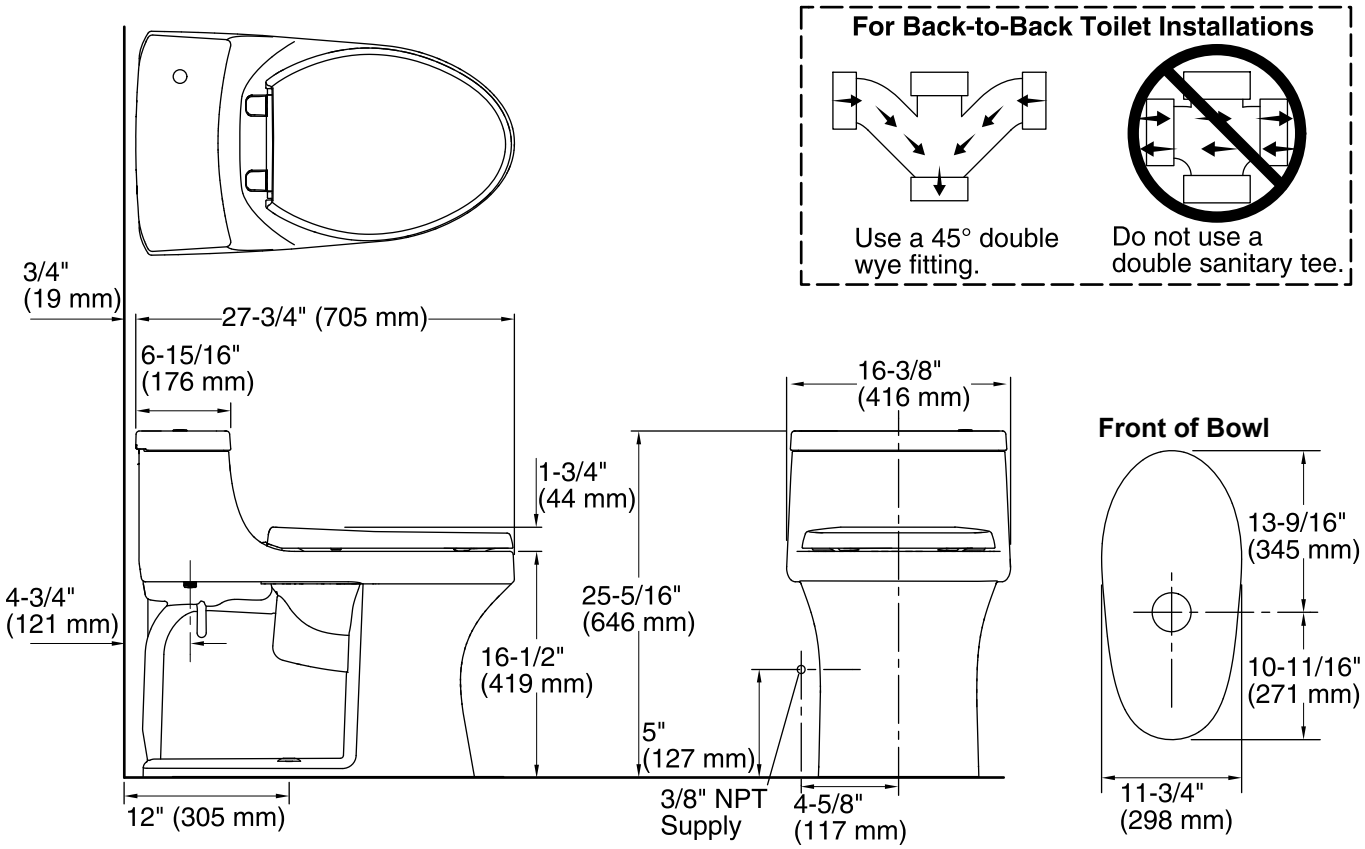
Toilet shall be 27-3/4" (705 mm) in length, 16-3/8" (416 mm) in width, and 25-5/16" (646 mm) in height. Toilet shall be made of vitreous china. Toilet shall be one-piece. Toilet shall feature touchless flush actuation. Toilet shall be a 12" (305 mm) rough-in. Toilet shall be KOHLER Model K-4000.

KOHLER®

San Souci™

Comfort Height® Touchless Toilet

K-4000



Technical Information

All measurements are nominal.

Toilet style:	One-piece
Bowl shape:	Compact Elongated front
Seat hinge type:	Quick-Attach®, Quiet-Close™
Passageway:	2-1/8" (54 mm)
Flush rate - full:	1.28 gpf (4.8 lpf)
Water area:	10-3/4" x 7-1/2" (273 mm x 191 mm)
Rim to water height:	5-3/8" (137 mm)
Rough-in:	12" (305 mm)
Seat hole centers:	5-1/2" (140 mm)

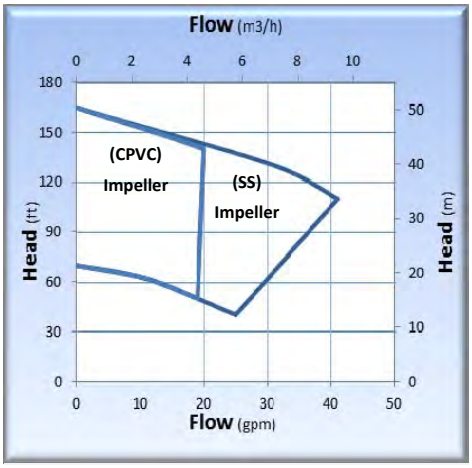
Installation Notes

Install this product according to the installation guide.

For back-to-back toilet installations: Use only a 45° double wye fitting.

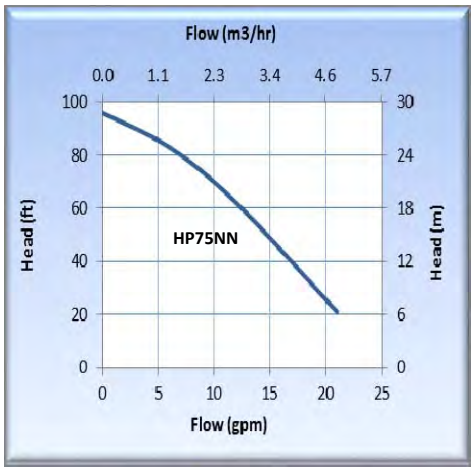
PRICE® PUMP

Type HP



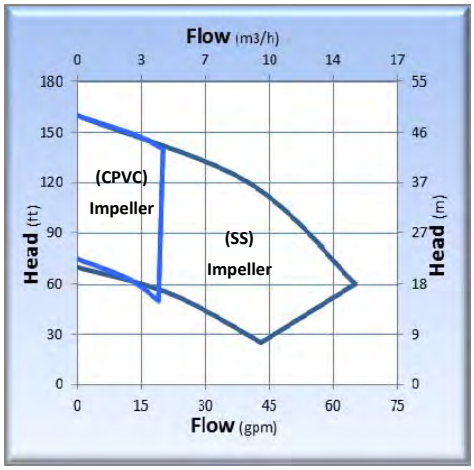
MODELS:

HP75 – 3/4” x 3/4” x 6.00”



MODELS:

HP75 – 3/4” x 3/4” x 4.50”



MODELS:

HP75 – 3/4” x 3/4” x 6.00”
HP100 – 1” x 1” x 6.00”

Flows to 40 GPM / Heads to 160 feet

MATERIALS:

- BN (Bronze volute)
- CN (CPVC volute)
- NN (Noryl volute)

HP75CN



APPLICATIONS:

- Circulating chilled water
- Booster pumps
- Sprinkler pumps
- Deionized Water
- Chiller pumps
- Air conditioning
- Laser coolers

FEATURES:

- Compact close coupled design
- NEMA 56J motor frame - Standard
- Mechanical Seal: 5/8” Type 6 Buna, carbon vs. ceramic
- Type 6, 2106, 21 and silicon carbide faces are among the many seal options available from stock
- Impeller materials (CPVC, 316 Stainless Steel

Curves for reference only.

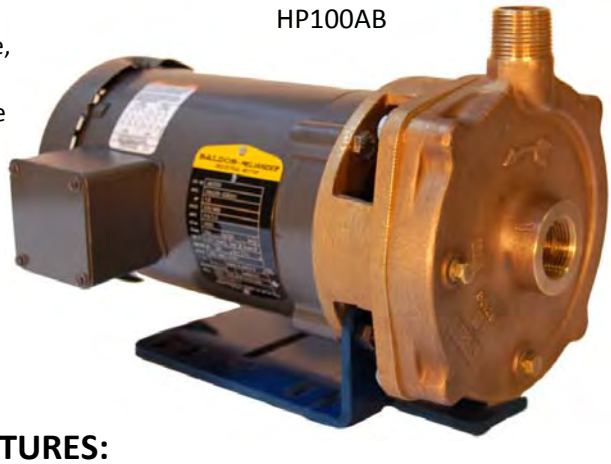
Type HP

Flows to 70 GPM / Heads to 160 feet

MATERIALS:

- SS (316 Stainless Steel volute, bracket, and impeller)
- SC (316 Stainless Steel volute and bracket, CPVC impeller)
- AB (All Bronze)

HP100AB

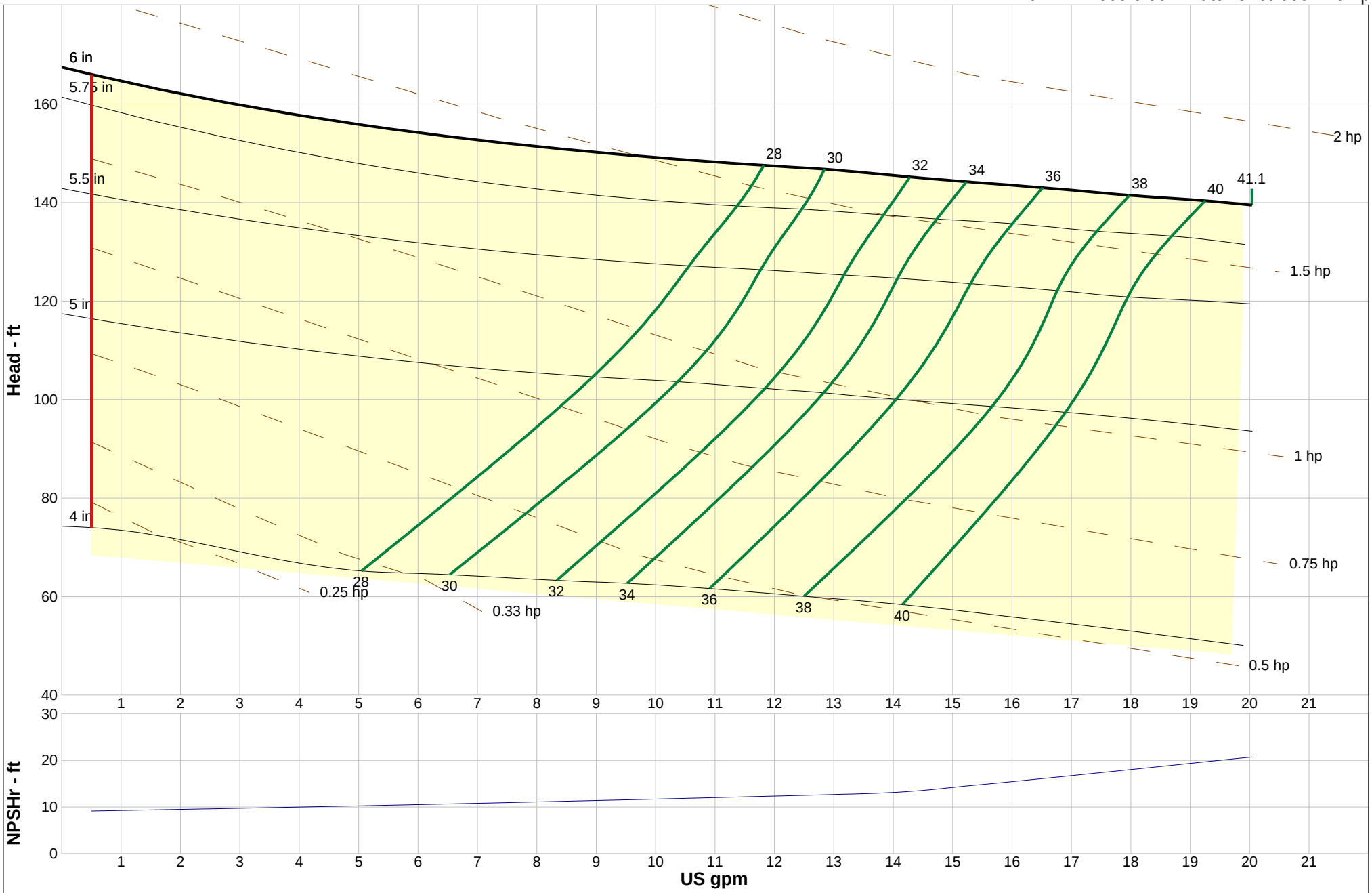


APPLICATIONS:

- Circulating chilled water
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- Deionized Water
- Chiller pumps
- Air conditioning
- Laser coolers

FEATURES:

- NEMA 56J motor frame - Standard
- Compact close coupled design
- Mechanical seal: 5/8” Type 21 Viton®, carbon vs. ceramic



Company: Price Pump Co
Name:
3/8/2013

Price Pump Company
Catalog: Price Close Coupled Pumps.60, Vers 1.4
HP75 - 3600

Model: HP75-100CPVC
Speed: 3500 rpm
Dia: 6 in
Curve: 8800001-1

PRICE® PUMP CO.

Glycol Feed Systems

Purpose

Neptune Glycol Feeders are designed for the addition of glycol solution to closed loop chilled or hot water systems. The system automatically maintains pressure in the loop by adding glycol solution to make up for losses which occur due to leakage.

Glycol addition is controlled by a pressure switch with adjustable low and high set points.

Standard Pressure Switch:
Cut-In Range: 10-45 PSI Cut-Out Range: 20-60 PSI
Adjustable Differential: 10-30 PSI
Other pressure switches available.

When the pressure in the loop reaches the low set point, the pump begins to feed glycol into the system until the high pressure set point is achieved and stops the pump.

Features

- 50 gallon polyethylene tank mounted in a steel frame
- Bronze rotary gear pump (1.5 gpm @ 100 psi)
- Float switch for low level pump shutoff and alarm
- NEMA 4X control panel

Panel includes:

- Hand-off-auto selector switch for pump motor
- Pump "on" indicator light
- "Low" tank level indicator light
- Dry contact for remote low level indication
- Power cord with plug, 115V 60C

Optional audible alarm and push button silence available.
(Audible alarm is not watertight.)

Neptune
A DOVER COMPANY



MODEL G-50-1

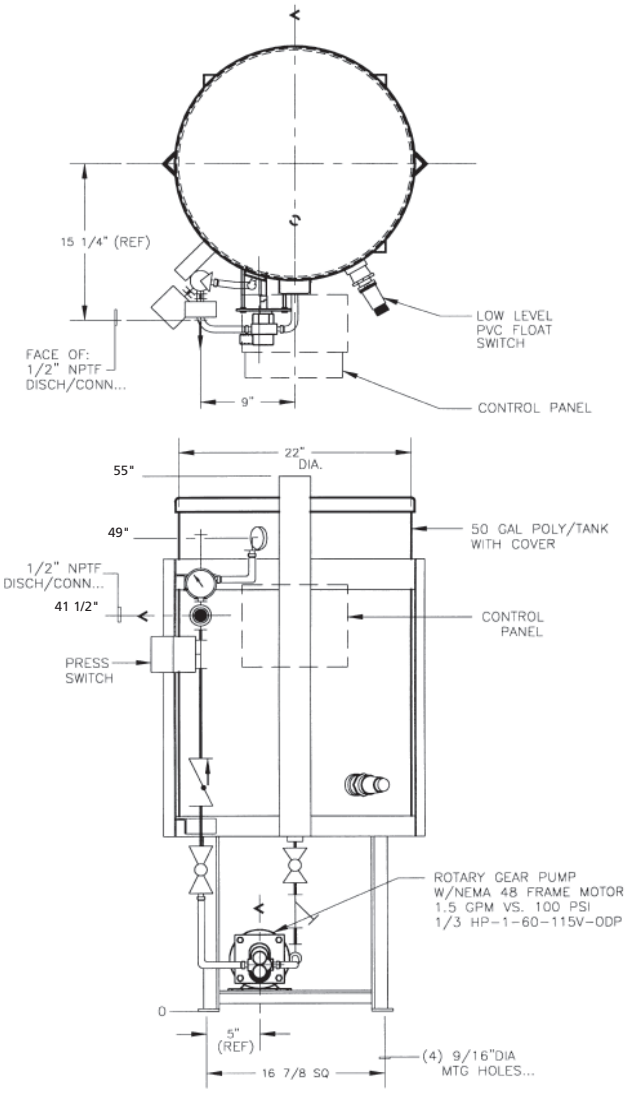
Each Neptune Glycol Feeder is fully piped and wired with the following components:

Suction assembly includes:

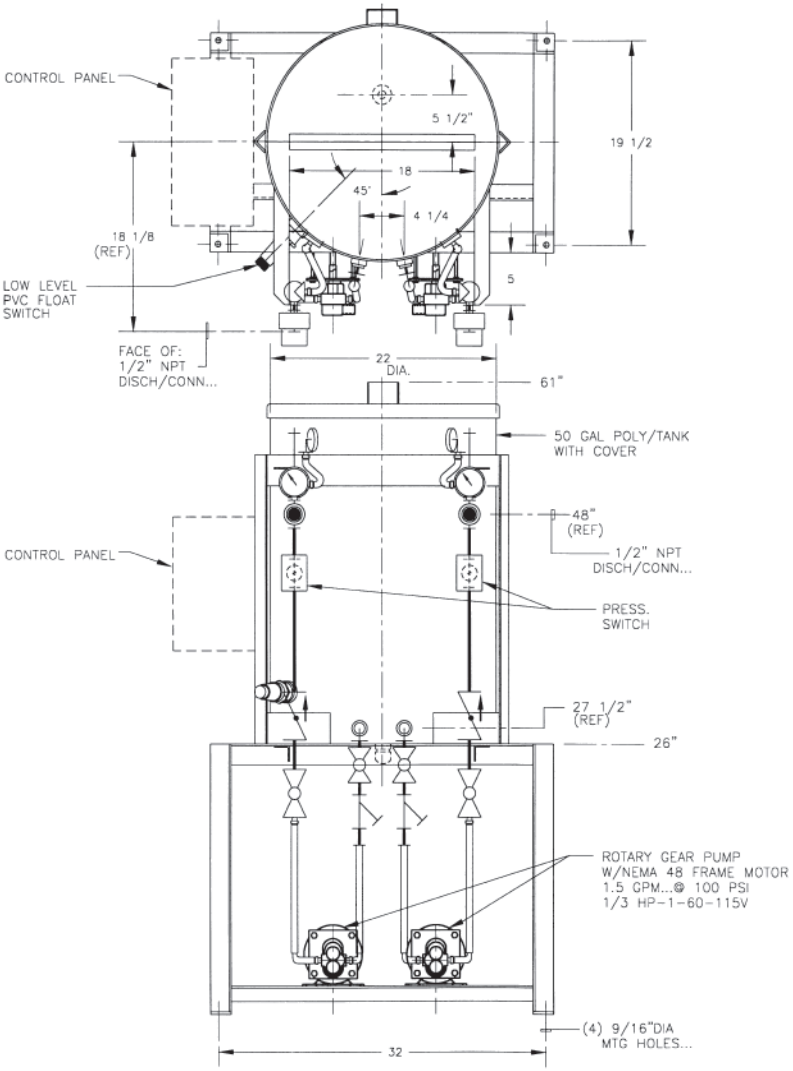
- PVC tubing and fittings
- PVC ball valve
- Cast iron "Y" strainer

Discharge assembly includes:

- Schedule 40 brass pipe and fittings
- PVC ball valve • Brass check valve • Pressure gauge
- Brass relief valve with return to tank tubing



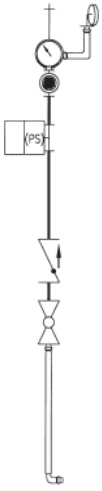
MODEL G-50-1 & G-50-1A



MODEL G-50-2A

SELECTION CHART

MODEL	DESCRIPTION
G-50-1	Complete system including 1.5 gpm (@ 100 psi) pump and low level light.
G-50-1A	Complete system including 1.5 gpm (@ 100 psi) pump, low level light and audible alarm.
G-50-2A	Complete system including two 1.5 gpm (@ 100 psi) pumps, low level light and audible alarm. Separate discharges and pressure switches allow feeding two separate closed loop systems independently from a single tank.
LP	Option to furnish larger pump rated 3.75 gpm (@ 100 psi). Add "LP" to Model Number to specify larger pump; Example G-50-1-LP.



EACH DISCHARGE ASSEMBLY CONTAINS:

- ½" S40/BRASS/PIPE w/NPT FITTINGS
- ½" BALL VALVE/PVC
- ½" CHECK VALVE/BRASS
- ½" RELIEF VALVE/BRASS (SET @ 100 PSI) w/PVC RETURN LINE
- PRESSURE GAUGE (0–100 PSI)
- PRESSURE SWITCH



EACH SUCTION ASSEMBLY CONTAINS:

- ½" S80/PVC/PIPE w/NPT FITTINGS & PVC TUBING
- ½" BALL VALVE/PVC
- ½" Y-STRAINER/CAST IRON

Neptune
A DOVER COMPANY

SOLD BY:

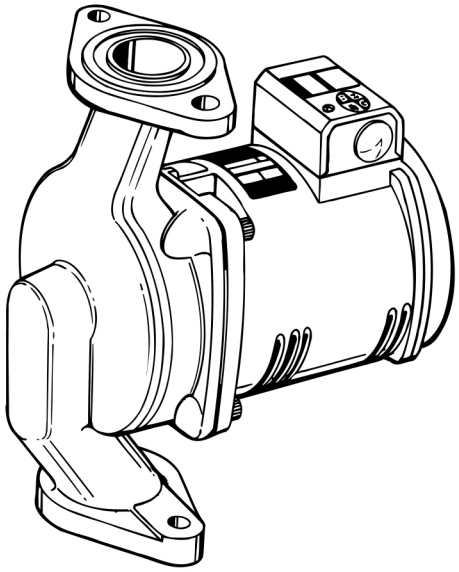
NEPTUNE MEMBER OF PSG PUMP SOLUTIONS GROUP A DOVER COMPANY

P.O. Box 247 • Lansdale, PA 19446-0247
Tel: 215-699-8700 • Fax: 215-699-0370
Toll-Free Tel: 1-888-3NEPTUNE (1-888-363-7886)
Toll-Free Fax: 1-800-255-4017
Web Site: http://www.neptune1.com
E-mail: pump@neptune1.com

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Bell & Gossett
a xylem brand

INSTRUCTION MANUAL
P81884
REVISION I



c UL US LISTED

SERIES PL™ Booster Pumps

INSTALLER: PLEASE LEAVE THIS MANUAL FOR THE OWNER'S USE.

NOTE: Bell & Gossett recommends Bronze Booster Pumps be used for pumping potable water.

This pump is nonsubmersible, for indoor use only.

SAFETY INSTRUCTIONS

This safety alert symbol will be used in this manual and on the pump safety instructions decal to draw attention to safety related instructions. When used, the safety alert symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED! FAILURE TO FOLLOW THE INSTRUCTIONS MAY RESULT IN A SAFETY HAZARD.

Your Series PL™ Booster Pump should have the warning/caution label and nonsubmersible warning label (Fig. 1) displayed on the pump conduit box. If this warning and caution is missing or illegible, contact your local Bell & Gossett Representative for a replacement.

DESCRIPTION

The Series PL™ Booster Pump features permanently lubricated bearings, non-overloading permanent split capacitor motor with thermal protection and quiet operating construction.

OPERATIONAL LIMITS

These pumps are designed to pump liquids compatible with their iron or bronze body construction.

Maximum Working Pressure:	150 psi (10 bar)
Maximum Operating Temperature:	225°F (107°C)
Electrical Rating:	115V, 60 Hz, 1PH
	230V, 60 Hz, 1PH
	277V, 60 Hz, 1PH

Do not exceed these values.

⚠ WARNING

BEFORE INSTALLING, USING OR SERVICING THIS PRODUCT, READ THE INSTRUCTIONS. TO REDUCE RISK OF ELECTRICAL SHOCK SEE INSTRUCTIONS FOR PROPER INSTALLATION. P48405

⚠ CAUTION

FOR SUPPLY CONNECTIONS USE WIRE SUITABLE FOR AT LEAST 90°C. USE COPPER CONDUCTORS ONLY. EMPLOYER DES FILS D'ALIMENTATION ADEQUATS POUR 90°C. FOR INDOOR USE ONLY. EMPLOYER UNIQUEMENT A L'INTERIEUR.

⚠ WARNING

RISK OF ELECTRIC SHOCK; THIS PUMP HAS NOT BEEN INVESTIGATED FOR USE IN SWIMMING POOL AND MARINE AREAS. -NONSUBMERSIBLE PUMP- P86313

FIG. 1

PUMP APPLICATION

The Series PL™ Booster Pump may be used for water circulating applications in hydronic and solar systems.

It has not been investigated, nor is it intended for use in swimming pool and marine areas.

SAFETY REQUIREMENTS

MECHANICAL SAFETY

WARNING: EXCESSIVE SYSTEM PRESSURE HAZARD
The maximum working pressure of the pump is listed on the nameplate – DO NOT EXCEED THIS PRESSURE. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

WARNING: EXCESSIVE PRESSURE HAZARD – VOLUMETRIC EXPANSION
The heating of water and other fluids causes volumetric expansion. The associated forces may cause failure of system components and the release of high temperature fluids. This can be prevented by installing properly sized and located expansion tanks and pressure relief valves. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

THERMAL SAFETY

WARNING: EXTREME TEMPERATURE HAZARD
If the pump, motor, or piping are operating at extremely high or low temperature, guarding or insulation is required. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

ELECTRICAL SAFETY

WARNING: ELECTRICAL SHOCK HAZARD
Electrical connections are to be made by a qualified electrician in accordance with all applicable codes, ordinances and good practices. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

WARNING: ELECTRICAL GROUNDING HAZARD
Adequate electrical grounding is required for the safe operation of B&G Pumps. The use of grounded metal conduit assures this requirement. If the means of connection to the supply-connection box (wiring compartment) is other than grounded metal conduit, ground the pump back to the service by connecting a copper conductor at least the size of the circuit conductors supplying the pump to the green grounding screw provided within the wiring compartment. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

WARNING: RISK OF ELECTRIC SHOCK
Do not install this pump in swimming pool or marine areas. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

REMOVAL OF THE PUMP FROM EXISTING SYSTEM FOR REPLACEMENT

WARNING: ELECTRICAL SHOCK HAZARD
Disconnect and lockout the power before servicing. Failure to follow these instructions could result in serious personal injury or death.

1. Close the valves on the suction and discharge sides of the pump. If no valves have been installed, it may be necessary to drain the system.

WARNING: HOT WATER HAZARD
Before draining the system, allow water to cool to 100°F max. open the drain valve (take precautions against water damage) and leave the drain valve open until servicing is complete. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

WARNING: ELECTRICAL SHOCK HAZARD
Be certain the electrical power is not present at the motor leads before continuing. Failure to follow these instructions could result in serious personal injury or death.

2. Loosen the conduit box cover screw and remove the cover.

WARNING: UNEXPECTED START-UP HAZARD
Single phase motors are equipped with automatic reset overload protectors. The pump can restart without warning. Disconnect and lockout power before servicing. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

3. Disconnect the electrical supply lines to the pump.

WARNING: HIGH PRESSURE HAZARD
Pressure may be present in the pump body. This pressure can be relieved by loosening the flange bolts and shifting the pump assembly slightly to allow the pressurized water to escape. Failure to follow these instructions could result in serious personal injury or death.

4. Remove the flange bolts and nuts and then remove the pump from the piping.

PUMP INSTALLATION

Locate the pump so there is sufficient room for inspection, maintenance and service. Bell & Gossett recommends the installation of service valves on the suction and discharge of all pumps to facilitate servicing or replacement of the pump without draining the system.

Install suction and discharge flanges on the pipe ends. The use of teflon tape sealer or a high quality thread sealant is recommended.

Be sure to minimize any pipe-strain on the pump. Support the suction and discharge piping by the use of pipe hangers near the pump. Line up the vertical and horizontal piping so that the bolt-holes in the pump flanges match the bolt-holes in the pipe flanges. (DO NOT ATTEMPT TO SPRING THE SUCTION OR DISCHARGE LINES IN POSITION. THIS MAY RESULT IN UNWANTED STRESS IN THE PUMP BODY, FLANGE CONNECTIONS AND PIPING.) The code for Pressure Piping (ANSI B31.1) lists many types of supports available for various applications.

Bell & Gossett flange gaskets must be installed between the Series PL™ pump body flanges and the suction and discharge pipe flanges. Use $^{7}/_{16}$" diameter x $1^{1}/_{2}$" long capscrew and matching nut to connect the pump to the flanges.

WARNING: HOT WATER HAZARD
When disassembling a gasketed joint, always use a new gasket upon reassembly. NEVER RE-USE OLD GASKETS. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

WARNING: HOT WATER HAZARD
Make sure that each flange gasket remains seated in the flange groove during and after installation. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

Apply torque in even increments to both flange bolts until a value of 96-132 in-lbs. is reached. Both the suction and discharge flange bolts must be torqued in this manner.

WARNING: WATER LEAKAGE HAZARD
To prevent leakage, make certain that the flange bolts have been adequately torqued. Failure to follow these instructions could result in serious personal injury and/or property damage.

WIRING INSTRUCTIONS

WARNING: ELECTRICAL SHOCK HAZARD
Disconnect and lockout the power before making electrical connections. Failure to follow these instructions could result in serious personal injury or death.

A. Loosen the screw securing the conduit box cover (wiring compartment), and remove the screw & cover.

B. Attach the appropriate size connector to the hole on the side of the conduit box.

C. Using a minimum size 14 AWG copper electrical wire (refer to your local code for wiring restrictions), wire the motor to a single phase power source as listed on the pump nameplate. See Fig. 3.

D. Connect the ground wire to the inside of the conduit box with one of the green screws provided inside the box. See Fig. 4.

NOTE: Electrical supply and grounding wires must be suitable for at least 90°C (194°F).

NOTE: Series PL™ Booster Pumps are thermally protected and do not require external overload protection.

WARNING: ELECTRICAL SHOCK HAZARD
Be certain that all connections are secure and the conduit box cover is closed before electrical power is connected. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

SYSTEM PREPARATION

Prior to pump start up, closed heating and cooling systems should be cleaned, drained and refilled with clean water. System ph must be maintained between 7 and 9.

STARTUP

CAUTION: SEAL DAMAGE HAZARD
Do not run pump dry, seal damage may occur. Failure to follow these instructions could result in property damage and/or moderate personal injury.

Do not start pump until the system has been filled and vented. Air should be vented from the system by means of an air vent located at a high point in the system, or by an alternate method. The system must be completely vented prior to pump operation. Do not run pumps dry. Pump operation without water circulation could result in pump and motor damage.

WARNING: HOT WATER LEAKAGE HAZARD
Pressurize the body slowly while checking for leaks at all joints with gaskets. Failure to follow these instructions could result in serious personal injury and/or property damage.

MODE OF DISCHARGE

The Series PL™ pump can be installed to discharge up or down, horizontally, left or right, but the motor shaft must remain in the horizontal position, the arrow on the body must point in the direction of flow and the conduit box must be positioned on the top of the motor housing (see figure 2).

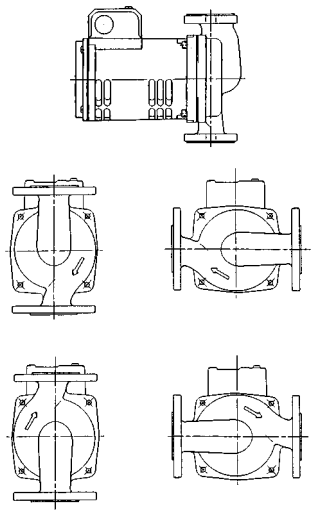


FIG. 2

PUMP BODY MAY BE ROTATED AS SHOWN, BUT CONDUIT BOX MUST REMAIN AT TOP.

TYPICAL WIRING INSTALLATION SCHEMATIC FOR 1Ø POWER SOURCE

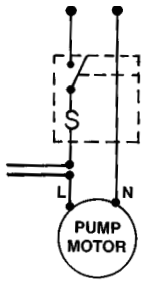


FIG. 3

CONDUIT BOX WIRING DETAIL

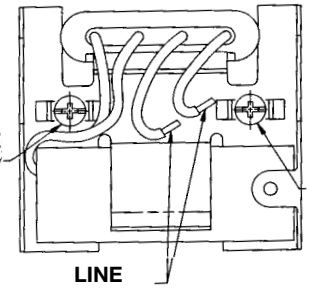


FIG. 4

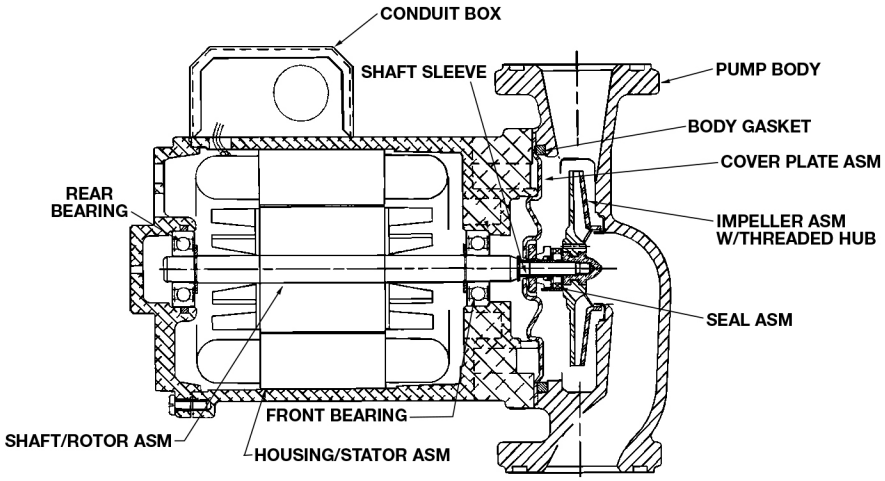
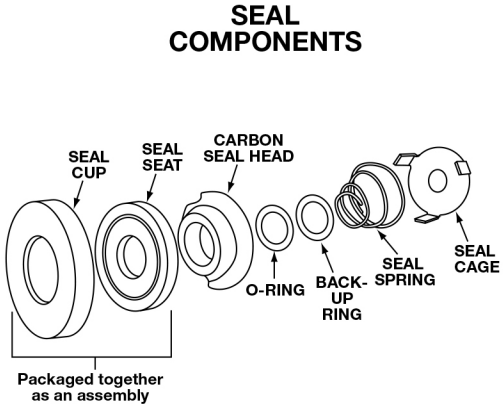


FIG. 5



INSTRUCTIONS FOR REPAIRING MECHANICAL SEAL

1. Follow steps 1 through 4 of section titled “REMOVAL OF PUMP FROM EXISTING SYSTEM FOR REPLACEMENT.”
2. Loosen the four capscrews that hold the motor housing to the pump body. Remove these screws and remove the housing from the pump body.
3. Place the pump on a flat work surface and insert a screwdriver into one of the endplate ventilation slots until it engages one of the rotor cooling fins. While holding the rotor with the screwdriver, turn the impeller clockwise. Note that the impeller is molded around a metal hub with a left hand thread. Remove the impeller from the shaft.
4. Remove the seal assembly from the shaft by sliding it off the shaft sleeve.
5. Clean the seal seat with a clean rag and inspect for grooving or cracks. If it shows no grooving or cracks, it may be cleaned and reused.
6. If the seal seat is to be replaced, the face plate must be removed from the motor housing. Remove it by gently prying it away from the housing.
7. Remove the seal seat and cup. Lubricate the cup with soapy water and install new parts in the face plate recess. Reposition the face plate on the motor housing. Gently tap the face plate evenly around its diameter to drive it into the recess provided in the motor housing.
8. Clean the shaft and sleeve before installing the new seal.
9. Slide the new carbon seal head onto the shaft sleeve until it contacts the seal seat. Slide the new “O-Ring” and back-up ring along the shaft sleeve until they fit inside the counter bore in the seal head. Place the seal spring between the back-up ring and the seal cage while positioning the seal cage flush with the end of the sleeve. Place the small end of the spring against the back-up ring. The three driving legs of the seal cage should engage the three slots on the seal head. While holding the rotor assembly with the screwdriver, thread the impeller onto the shaft in a counter clockwise direction. Tighten the impeller with light hand pressure. Take care to avoid bending a rotor cooling fin or damaging the shaft sleeve.
10. Clean the recess in the pump body and install a new body gasket.
11. Install the pump in the body and secure with four capscrews. Apply torque evenly in a criss cross pattern in 40 in-lb (4.52 N•m) increments to a torque of 80 in-lb (9.04 N•m).
12. Reinstall into the system using new flange gaskets. For instructions, see sections “PUMP INSTALLATION” and “WIRING INSTRUCTIONS” on pages 2 and 3.

PERIODIC INSPECTION

Bell & Gossett Booster Pumps are designed to provide years of trouble free service. It is recommended that periodic inspections be made to check for potential problems with the pump. If any leakage or evidence of leakage is present repair or replace the unit.

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ASME Commercial Expansion Tanks



EXTROL L Series

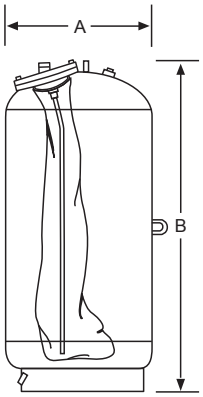
- Replaceable, full acceptance bladder design.
- Heavy duty butyl bladder; industry's thickest.
- Free-standing on integral welded ring base.
- Factory pre-charge: 12 psig.
- Maximum operating temperature: 240° F.

How to Order: Specify Item & Options

800-L-175-SGR

Base Item Number
Pressure
Sight Glass Option
Restraint Option

800-L 175 PSI Rating with Sight Glass & Restraints



L Series Specifications

Model Number	Tank Volume (Gallons)	Max. Accept. Volume (Gallons)	A Diameter (Inches)	B Height (Inches)	System Conn.[1] NPTF (Inches)	Shipping Weight (lbs.) Max. Working Pressure				
						125 PSI	150 PSI	175 PSI	250 PSI	300 PSI
200-L	53	53	24	38	1	190	205	250	290	297
300-L	80	80	24	52	1	230	292	320	385	372
400-L	106	106	24	66	1	275	343	375	465	595
500-L	132	132	24	79	1	311	372	435	545	750
600-L	159	159	30	64	1½	439	510	595	720	810
800-L	211	211	30	82	1½	543	565	620	905	950
1000-L	264	264	36	74	1½	609	750	750	1,015	1,065
1200-L	317	317	36	86	1½	700	860	860	1,175	1,235
1400-L	370	370	36	98	1½	783	970	970	1,335	1,400
1600-L	422	422	48	69	1½	1,106	1,425	1,650	1,916	2,015
2000-L	528	528	48	84	1½	1,284	1,675	2,386	2,410	2,651
2500-L	660	660	48	101	2	1,544	1,945	2,411	2,585	2,715
3000-L	793	793	48	118	2	1,719	2,225	2,500	2,950	3,100
3500-L	925	925	54	111	2	2,187	2,375	2,620	3,660	3,780
4000-L	1,057	1,057	54	125	2	2,352	2,640	3,000	4,080	4,285
5000-L	1,321	1,321	60	128	2	2,450	3,740	4,100	4,200	5,200
7500-L	1,980	1,980	72	127	3	4,000	4,300	4,500	5,550	6,750
10000-L	2,640	2,640	72	159	3	4,900	5,300	5,500	6,800	11,000
15000-L	3,963	3,963	72	233	3	6,000	7,600	7,900	9,800	12,500

[1]Malleable Iron System Connection.



EXTROL LBC Series

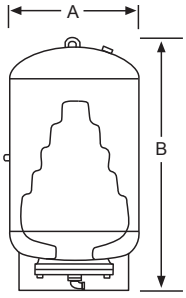
- Replaceable, partial acceptance bladder design.
- Heavy duty butyl bladder; industry's thickest.
- Free-standing on integral welded ring base.
- Factory pre-charge: 12 psig.
- Maximum operating temperature: 240° F.

How to Order: Specify Item & Options

130-LBC-125 R

Base Item Number
Pressure
Sight Glass Option
Restraint Option

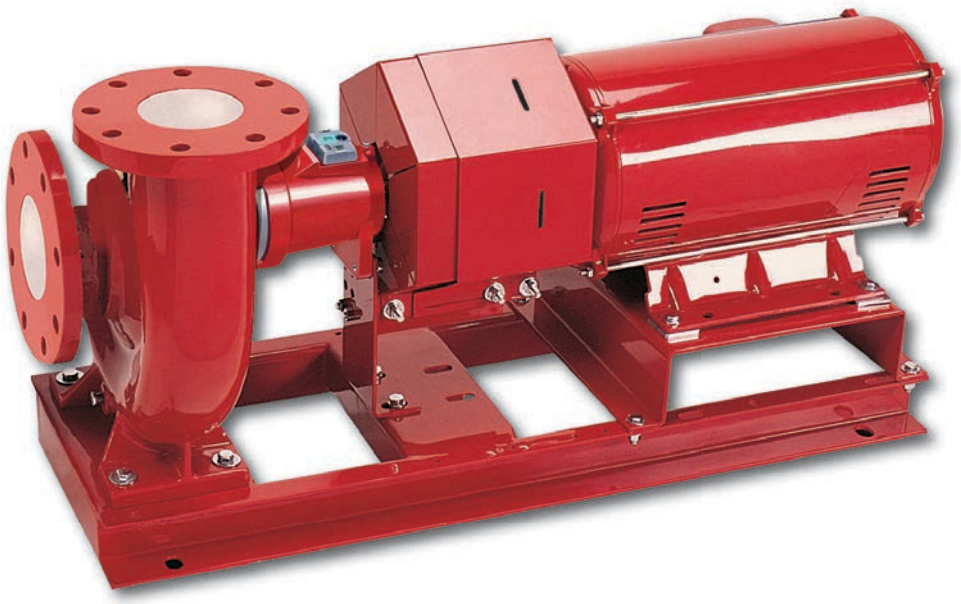
130-LBC 125 PSI Rating with Restraints (No Sight Glass)



LBC Series Specifications

Model Number	Tank Volume (Gallons)	Max. Accept. Volume (Gallons)	A Diameter (Inches)	B Height (Inches)	System Conn.[1] NPTF (Inches)	Shipping Weight (lbs.) Max. Working Pressure				
						125 PSI	150 PSI	175 PSI	250 PSI	300 PSI
35-LBC	10	10	10	37	1	67	76	80	94	100
50-LBC	13	11	12	37	1	76	78	91	106	114
85-LBC	22	11	16	35	1	92	95	110	129	138
100-LBC	26	11	16	39	1	99	102	119	138	150
130-LBC	34	27	20	35	1	135	140	162	189	202
165-LBC	44	27	20	40	1	149	153	178	214	225
200-LBC	53	27	24	41	1	195	205	234	273	293
300-LBC	80	27	24	56	1	233	254	280	326	350
400-LBC	106	53	24	69	1	274	308	329	383	411
500-LBC	132	53	24	83	1	310	352	372	434	465
600-LBC	158	53	30	67	1	438	442	525	613	657

[1]Malleable Iron System Connection.



Series 1510

Centrifugal Pumps

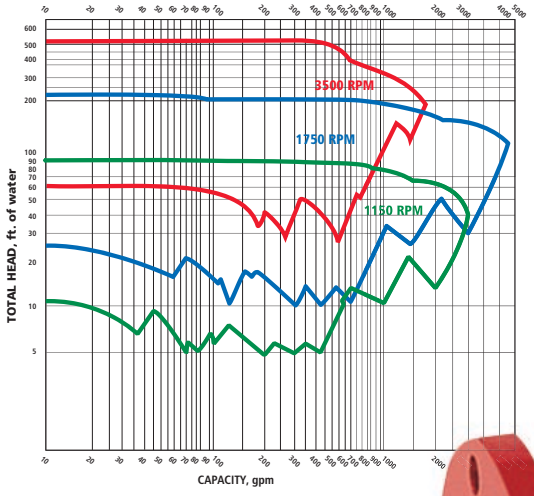
The industry standard in end suction pump design.

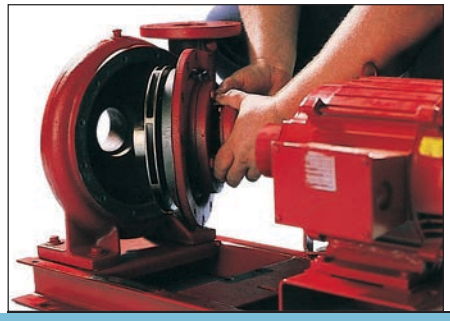
B-206F

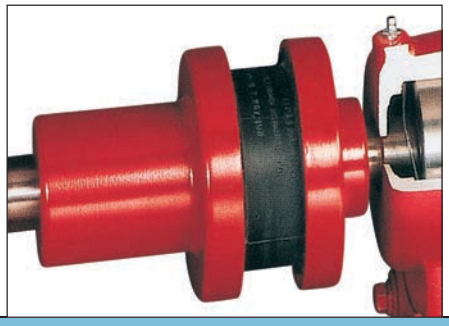
Bell & Gossett
a xylem brand

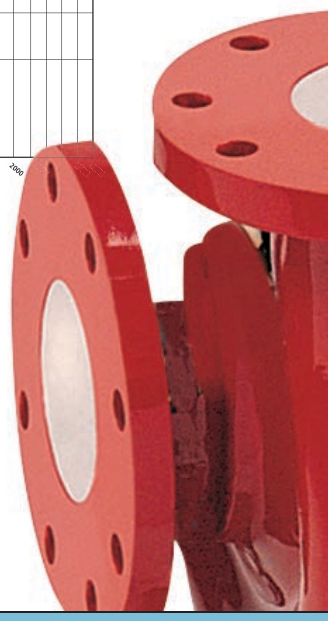
Series 1510 End Suction Pumps define true pull-out capability.

Bell & Gossett Series 1510 pump is like no other pump available today. It was designed with specific features to extend pump life, provide optimum hydraulic performance, and reduce maintenance time and costs – all while providing a true back pull-out capability.







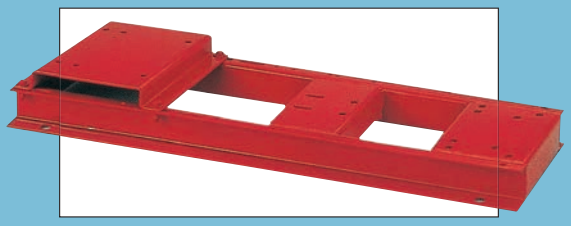


True back pull-out design

End section pump suppliers have used the term "back pull-out" for years. Truly defined, the statement should indicate ease of service and disassembly of the pump for service. Specifically, the bearing frame and impeller should be able to be removed for service without disturbing the pump volute or motor assembly. This capability substantially reduces pump downtime and decreases maintenance costs. Bell & Gossett's Series 1510 fully meets these parameters.

Center drop-out spacer coupling

Unlike conventional jaw type or rigid style couplings, a center drop-out spacer coupling allows removal of the bearing frame and rotating element without disturbing the pump end pipe alignment or motor electrical connections.



Heavy-duty base plate assembly

The Series 1510 base plate provides a heavy-duty saddle assembly, full seam welds, closed ends and an open top to provide ease of access for proper equipment grouting. Meets Hydraulic Institute Standards ANSI/HI 9.6.4-2009 (Figure 9.6.4.2.3.1) for recommended acceptable unfiltered field vibration limits.

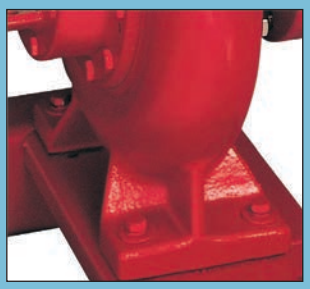
Patented i-ALERT™ condition monitor option

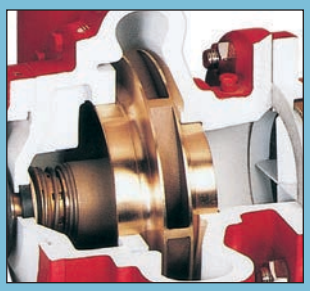
Continuously measures vibration and temperature at the outboard bearing and automatically indicates when pre-set levels of vibration and temperature have been exceeded, so that changes can be made before failure occurs. A visual indication of pump health makes walk-around inspections more efficient and accurate. This onboard pump intelligence helps minimize life-cycle costs while maximizing performance.

ANSI/OSHA-compliant coupling guard

The coupling guard complies with ANSI B15.1 and OSHA 1910.219. The guard offers increased protection against potential injuries. The guards include slotted viewing windows for easy inspections.







Foot-mounted volute

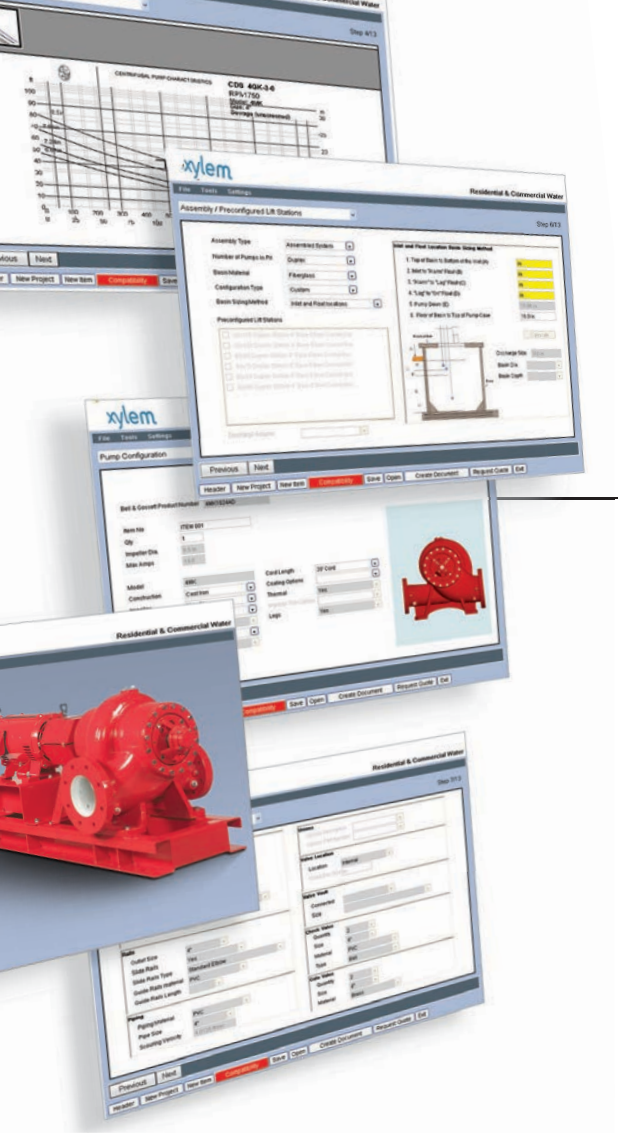
An integrally cast volute foot ensures that the alignment between the volute and motor assembly is maintained. Without this type of support, the piping weight alone can cause distortion leading to premature bearing, shaft and seal failure. In hot water applications, the solid foundation of the Series 1510 eliminates the deflections, which would otherwise exist within an unsupported overhung volute during normal thermal expansion of the system piping against the volute.

Self-flushing mechanical seal

Bell & Gossett was the first to introduce self-flushing mechanical seals to the HVAC industry. This standard feature ensures maximum seal face lubrication, heat dissipation and debris removal without vulnerable external flush tubing. The internal flushing action passes two and a half to three times the liquid over the seal faces compared to common externally flushed stuffing box configurations.

Balance standards

Impellers are balanced to Hydraulic Institute Standards ANSI/HI 9.6.4-2009. The allowable residual unbalance in the impeller rotating assembly conforms to ANSI grade G6.3 (Ref. ISO 1940).



ESP-Design PLUS system selection software.

With Xylem's easy-to-navigate web site and proprietary software allows you to quickly produce accurate, comprehensive specs, schematics and drawings that meet the needs of your building project, cutting the approval process time in half and protecting your job deadlines. The program includes automatic calculations of payback and operating costs, equipment schedules, submittals and more.

Trust the name that set the standard in the industry.

By choosing Xylem as your single-source provider for all your pumps and pumping system needs, you'll have the tools and resources you need to select the most efficient, high-performing system for your project. With more than 90 years of pump, HVAC and plumbing systems experience, Bell & Gossett delivers the knowledge you need to design a complete system that fits your application. And because we're part of Xylem, the largest pump manufacturer in the world, you can feel confident you'll get tough, high performing products you can depend on.

Your local Bell & Gossett Representative is an experienced professional with a wealth of technical expertise. Because they know systems from design to operation, they can give you the advice and support you need to successfully install, operate and maintain your systems.



Unparalleled training and product support.

The famous Bell & Gossett Little Red Schoolhouse® opened in 1954 as a dedicated facility for training. Over the past 60 years we have trained more than 60,000 engineers, contractors and installers in the proper design, installation and maintenance of HVAC systems. Our fully equipped learning center is the only facility of its kind, and Bell & Gossett is proud to set the standard for professional education and HVAC and pump system innovation.

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PIONEER EQUIPMENT INC.

3738 E. Miami Ave, Phoenix, AZ 85040
Tel: 602 437-4312 Fax: 602 437-0174

SALES QUOTE

Page: 1

Sales Quote Number: 2141640

Sales Quote Date: 09/23/14

To: Scott Zimmerman
M3 Engineering & Technology
2051 W. Sunset Road
Tucson, AZ 85704

Quoted By: Eric Lock

We are pleased to quote on the following equipment:

Qty.	Item No.	Description	Unit Price	Total Price
		BUDGET QUOTE ONLY SPMT Domestic Water Booster Pump		
2		Grundfos 60S30-5 Well Pump with 3hp 3/60/460V Subm. 3450rpm Motor	2,148.00	4,296.00
1		Amtrol WX-407 132gal Non-ASME Tank	3,600.00	3,600.00
1		Duplex Pump Control NEMA 3R Panel with - Circuit breakers - Disconnect - Alternator - HOA switch - Elapsed hour meter - Indicating light - Surge/Lightning arrestor - Aux. contacts - Motor Saver 777 - Wall mount ONLY (shade cover required - not included)	8,590.00	8,590.00

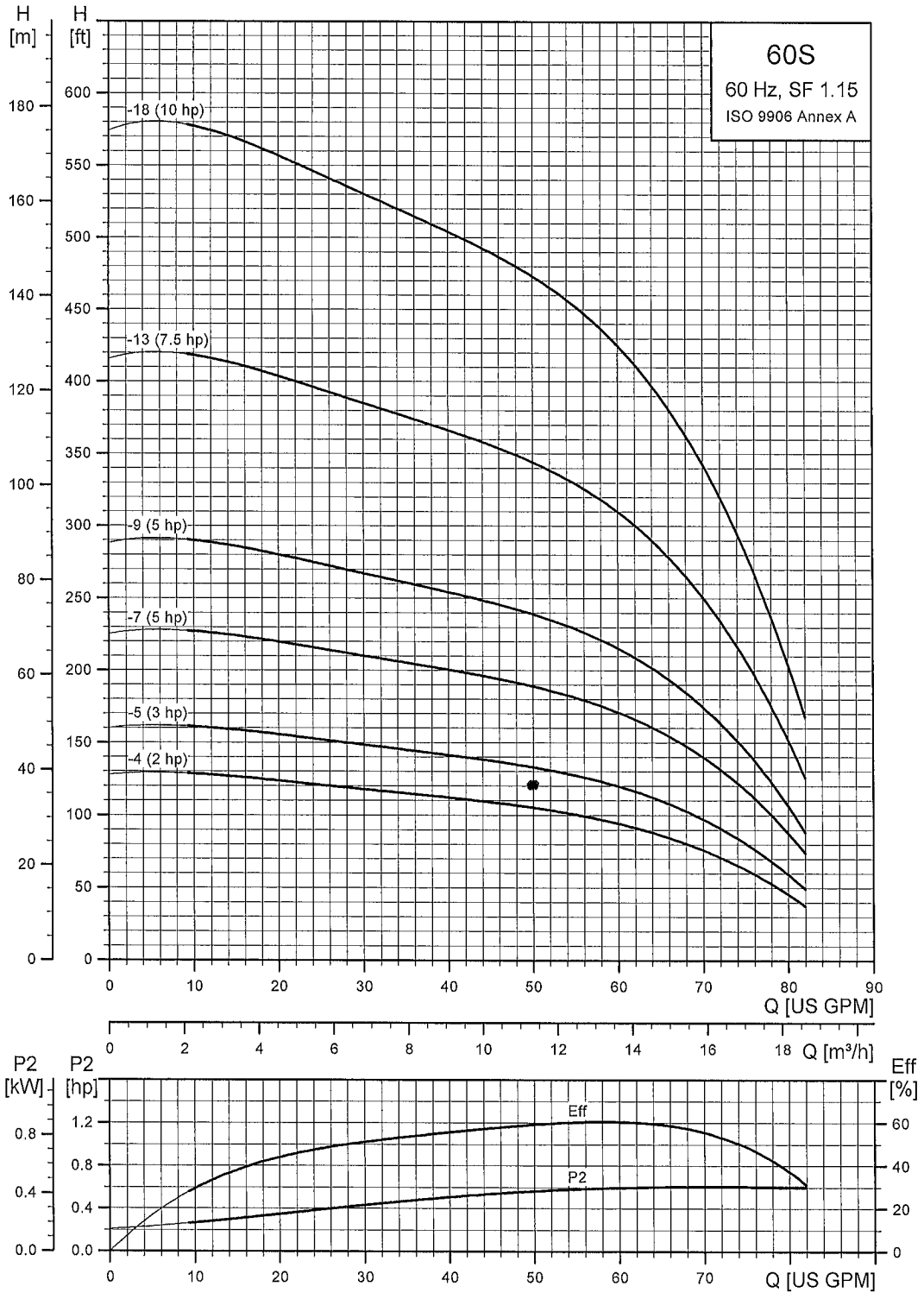
Notes:
- Installation and anchor bolts NOT included.
- Piping, reducers and valves are NOT included.
- Gauges, sensors & instrumentation NOT included.
- Well heads NOT included.
- Factory and Field tests are NOT included.
- Freight from factory to site is EXTRA.
- Wiring NOT included.
- Standard domestic packaging ONLY.
- Manufacturer's standard paint and prep ONLY.
- See attached for details.

Lead Time 10-12 Weeks
F.O.B.: Ship Point (freight extra)
Terms: SPECIAL TERMS APPLY

Sales: Kevin Gilbreth

Prices quoted are subject to adjustment to price in effect at time of shipment.
Orders which require financing are subject to the approval of our credit department.
Delivery date given on this order is contingent upon promised shipment from our suppliers and upon government restrictions or other factors beyond our control.
All applicable taxes to apply.

60S (60 gpm)



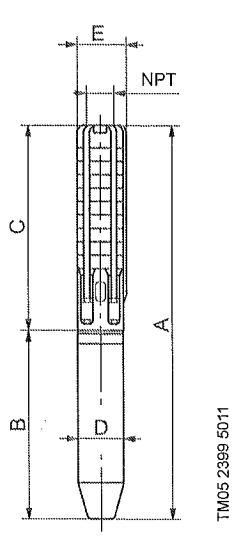
TM05 1736 2112

SP

60S (60 gpm)

Pump model	Nom. head [ft]	Ph	Volts [V]	Motor [Hp]		Dimensions A [in (mm)]	B [in (mm)]	C [in (mm)]	D [in (mm)]	E [in (mm)]	Net weight (complete) [lb]
60S - Motor dia. 4 inch, 3 wire motor, 60 Hz, rated flow 60 gpm (2" NPT)											
60S20-4	93	1	230	2	●	37.01 (940)	19.49 (495)	17.52 (445)	3.74 (95)	3.97 (101)	36.0
		3	230	2	■	31.23 (793)	13.71 (348)	17.52 (445)	3.74 (95)	3.97 (101)	36.0
			460	2	■	31.23 (793)	13.71 (348)	17.52 (445)	3.74 (95)	3.97 (101)	36.0
60S30-5	117	1	230	3	●	42.68 (1084)	22.60 (574)	20.08 (510)	3.74 (95)	3.97 (101)	61.2
		3	230	3	●	38.08 (967)	18.00 (457)	20.08 (510)	3.74 (95)	3.97 (101)	49.5
			460	3	●	38.08 (967)	18.00 (457)	20.08 (510)	3.74 (95)	3.97 (101)	58.5
60S50-7	164	1	230	5	●	51.82 (1316)	26.62 (676)	25.20 (640)	3.74 (95)	3.97 (101)	81.0
		3	230	5	●	47.92 (1217)	22.72 (577)	25.20 (640)	3.74 (95)	3.97 (101)	49.5
			460	5	●	47.92 (1217)	22.72 (577)	25.20 (640)	3.74 (95)	3.97 (101)	72.0
60S50-9	210	1	230	5	●	56.93 (1446)	26.62 (676)	30.32 (770)	3.74 (95)	3.97 (101)	85.5
		3	230	5	●	53.04 (1347)	22.72 (577)	30.32 (770)	3.74 (95)	3.97 (101)	76.5
			460	5	●	53.04 (1347)	22.72 (577)	30.32 (770)	3.74 (95)	3.97 (101)	76.5
60S75-13	304	3	230	7.5	●	67.21 (1707)	26.66 (677)	40.56 (1030)	3.74 (95)	3.97 (101)	83.3
			460	7.5	●	67.21 (1707)	26.66 (677)	40.56 (1030)	3.74 (95)	3.97 (101)	136.8
60S100-18	420	3	460	10	●	83.94 (2132)	30.60 (777)	53.35 (1355)	3.74 (95)	3.97 (101)	175.5
60S - Motor dia. 6 inch, 3 wire motor, 60 Hz, rated flow 60 gpm (2" NPT)											
60S75-13	304	3	230	7.5	▲	65.24 (1657)	22.25 (565)	43.00 (1092)	5.63 (143)	5.43 (138)	136.8
			460	7.5	▲	65.24 (1657)	22.25 (565)	43.00 (1092)	5.63 (143)	5.43 (138)	136.8
60S100-18	420	3	230	10	▲	79.02 (2007)	23.23 (590)	55.79 (1417)	5.63 (143)	5.43 (138)	207.0
			460	10	▲	79.02 (2007)	23.23 (590)	55.79 (1417)	5.63 (143)	5.43 (138)	207.0

60S



TM05 2399 5011

E = Maximum diameter of pump including cable guard and motor.

Notes:
Control box is required for 3-wire, single-phase applications. Data does not include control box.diameter.
Performance conforms to ISO 9906. 1999 (E) Annex A. Minimum submergence is 5 feet.

■ MS402 motor.
● MS4000 motor.
▲ MS6 motor.
∧ MMS6000 motor.
★ MMS8000 motor.
♦ Takes MS6 motor; not available as complete.
☼ Takes MMS6000 motor; not available as complete.
* Takes MMS8000 motor; not available as complete.
† Takes MMS10000 motor; not available as complete.

AMTROL INC

WELL-X-TROL®

WX-400 Series (Non-ASME)

150 PSIG Working Pressure

Non-ASME Models

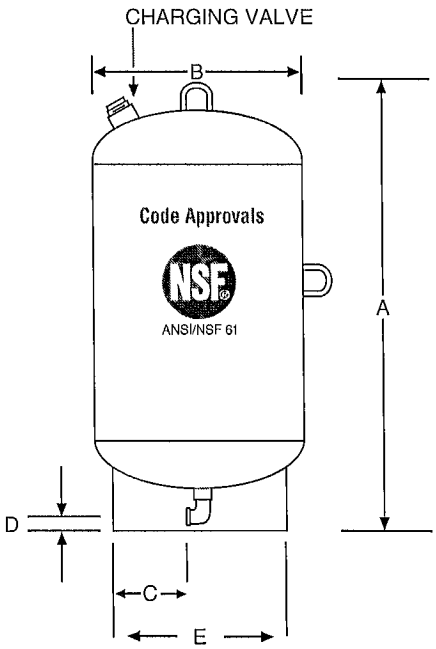
Model No.	Tank Vol. Lit.	Tank Vol. Gal	Max. Accept. Factor	A Height mm	A Height ins.	B Diameter mm	B Diameter ins.	C Conn. mm	C Inset ins.	D Conn.Centerline mm	D Conn.Centerline ins.	E ins.	Sys. Conn. ins.	Ship Wt. kg	Ship Wt. lbs.
WX-401	68	18	.65	794	31¼	413	16¼	124	4⅞	38	1½	12¾	1	43	95
WX-402	95	25	.45	1010	39¾	413	16¼	124	4⅞	38	1½	12¾	1	51	112
WX-403	129	34	.33	1251	49¼	413	16¼	124	4⅞	38	1½	12¾	1	56	123
WX-404	258	68	.50	1200	47½	610	24	159	6¼	41	1⅝	16	1¼	95	210
WX-405	341	90	.39	1505	59¼	610	24	159	6¼	41	1⅝	16	1¼	127	280
WX-406	417	110	.31	1778	70	610	24	159	6¼	41	1⅝	16	1¼	152	335
WX-407	500	132	.35	1435	56½	762	30	254	10	41	1⅝	24	1¼	207	456

Maximum Operating Conditions

Operating Temperature	200° F (93° C)
Working Pressure	150 PSIG (10.5 kg/cm²)

Specifications

Description	Standard Construction
Shell	Steel
Diaphragm	Heavy Duty Butyl/EPDM ANSI/NSF61
System Connection	Malleable Iron (NPT)
Liner	Polypropylene
Coating	Red Oxide Primer
Factory Precharge	30 PSIG (2.2 kg/cm²)



All dimensions and weights are approximate.

Job Name _____

Location _____

_____

_____

Engineer _____

Contractor _____

Contractor P.O. No. _____

Sales Representative _____

Model No. Ordered _____

System Pressure Range _____

Pre-Charge Pressure _____

Pump GPM _____

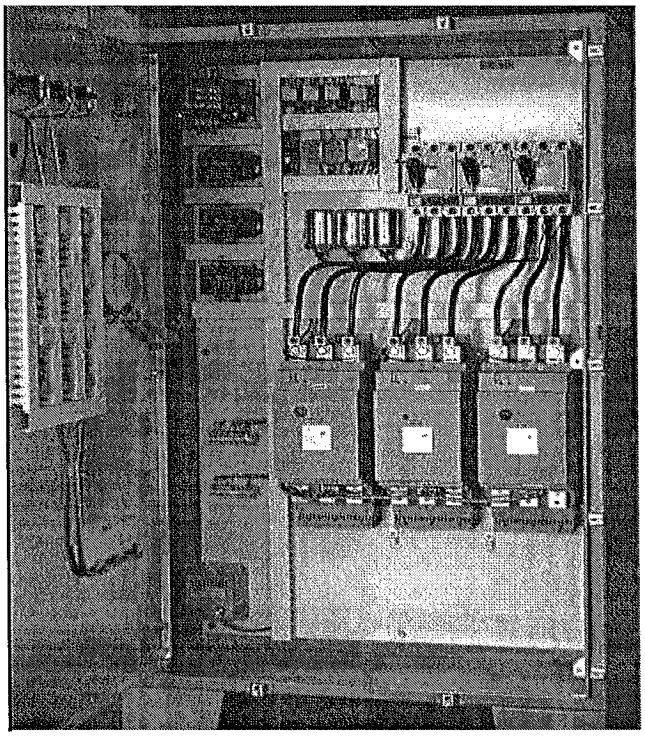
Date Submitted _____

*Submittal data sheets can **ONLY** be ordered as a "Submittal Data Sheet Pack", using **MC# 4400**. They are not available to order on an individual basis, however each data sheet is available on the Amtrol Web Site and can be downloaded and printed for use as needed.*

UL Listed Pump Control Panels

Applied Motor Controls' only business is that of building custom and standard Motor Starters and Control Panels for use in water and wastewater applications.

Our products can be found hard at work protecting and controlling pumps in the following applications: Industrial, Municipal, Irrigation and Commercial.



As an independent builder of industrial controls panels, we can offer our customers the capability of integrating power and control products from a wide selection of the leading brands such as: Allen Bradley, Cutler-Hammer, Siemens, and Square-D.

All of our products are UL 508 Listed Industrial Controls and built to the highest and latest standards of quality, reliability, and safety.

Built Right and On-Time...Every Time!

AMC
APPLIED MOTOR CONTROLS

Duplex Booster Pump Control Panels

Product Description

Duplex Pump Controls Panels are designed to operate and control two booster pump motors on single system.

These panels are widely used in those applications where maintaining a specific system pressure is required.

Applied Motor Controls' standard duplex pump panel is designed to provide both "alternating" and "duplexing" modes.

Alternating mode: This function provides for relatively equal wear of the two pump motors, typically of the same HP rating, driven by the controller by reversing the "Lead" and "Lag" roles of the motors on each successive cycle. Automatic alternation is accomplished when one or both motors come to a stop.

Duplexing mode: This mode provides stand-by capacity for use of a second pump motor when the system demand exceeds the normal requirements of a single motor, or when one of the motors fail.

Applied Motor Controls offers a wide range of UL Listed factory-installed options which can enhance the control and protection of the pumps.

Typical options include:

- Main Disconnect Switch
- Jockey Pump Starter
- Minimum Run Timer
- Low System Pressure alarm
- Low Suction cut-off
- High System Pressure shutdown
- Elapsed Hour Meters
- Pilot Lights
- Pressure Switches, etc.

Standard Features

- Fully welded heavy-duty steel enclosure with gasketed hinged door and provisions for padlocking
- Type 3R rating suitable for use outdoors. Rain and sleet resistant
- Gray powder-coating finish suitable for use in harsh environments
- Power Terminal Block for termination of line supply cables
- Choice of two disconnects: Fusible Switches with J-Class Factory-installed power fuses, or Thermal-Magnetic Molded Case Circuit Breakers
- (2) Through the door disconnect operators with provisions for padlocking in the off position
- (2) Full Voltage Magnetic Motor Starters with 120VAC coil voltage
- (2) Solid State Class 10 Overload Relays with adjustable trip point and inherent protection against loss of phase
- Solid State Duplex Alternator with Alternating and Duplexing functions
- 120V Control Circuit Transformer with primary and secondary protective fuses
- (2) Hand-Off-Auto Selector Switches
- (2) Terminal Blocks for two remote pressure switches
- UL 508 Listed Industrial Controls

Built Right and On-Time...Every Time!

Duplex Booster Pump Panels — Options

Description	Option Code	List Price	
Low Suction Cut-Off Option includes a terminal block for remote pressure switch, a Red Indicating Light, and a Timing Relay	LSC	$ 730	NO
Low Pressure Alarm Option includes a terminal block for remote pressure switch, a Red Indicating Light, and a Timing Relay	LSP	$ 730	NO
High Pressure Shutdown Option includes a terminal block for remote pressure switch, a Red Indicating Light, and manual Reset Pushbutton	HPS	$ 610	NO
Interposing Relay For use with separate control voltage (** Indicate required Voltage when ordering)	IR-**	$ 230	NO
Time Delay Relay (** Indicate required function when Ordering)	TD-**	$ 450	NO
Programmable Time Clock 24 Hour, 7 Day function	TC	$ 450	NO
Elapsed Hour Meter 99999.9 Hours, Non Reset Quantity Two	ETM	$ 600	YES
Cycle Counter 6 Digits, Non Reset Quantity Two	CC	$ 650	NO
Indicating Light (** Indicate Lens color and Function when ordering)	PL-**	$ 200	YES

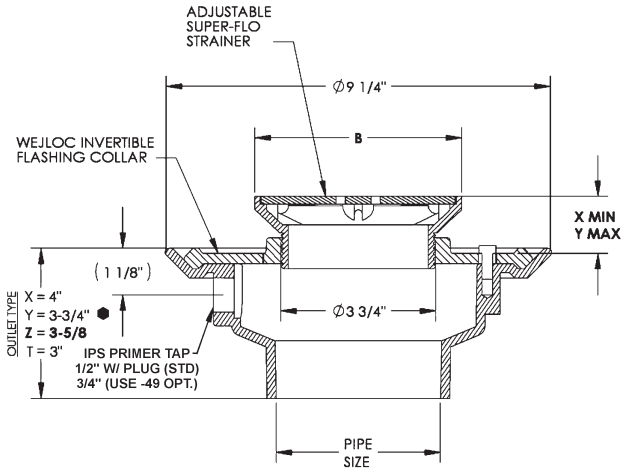
Duplex Booster Pump Panels — Options

Description	Option Code	List Price	
Phase & Voltage Monitor Protects 3-Phase motors against: High Voltage, Low Voltage, Phase Reversal, Loss of Phase, and Unbalance	PMR	$ 750	NO
Surge/Lightning Arrester	LA	$ 360	YES
Surge Capacitor	SC	$ 360	NO
Starter Auxiliary Contacts Option includes 1-N.O. & 1-N.C. Auxiliary Dry or Powered Contacts for interfacing with remote loads or monitoring Quantity Two Sets (one per starter)	AUX	$ 500	YES
Electronic Programmable Overload Relay (Model Motor Saver 777) Protects 3-Phase Motors against: Overload, Underload, High Voltage, Low Voltage, Loss of Phase, Phase Reversal, Phase & Voltage Unbalance, Rapid Cycling, and Ground Fault Quantity Two <u>Motor Full Load Amps:</u> 2 – 90 Amps	DEOL	$ 3,120	YES
External Electric Reset Pushbutton for Motor Saver 777 Quantity Two	EOLR	$ 580	NO
Deduct for Auto Duplex Alternator	NALT	- $ 300	NO
Terminal Block 3P, 600V, 30 AMPS (Specify Function)	TB	$ 50	NO

FLOOR DRAINS • Body/Strainer Combinations

30000-S SERIES

Body with Square SUPER-FLO® Strainer

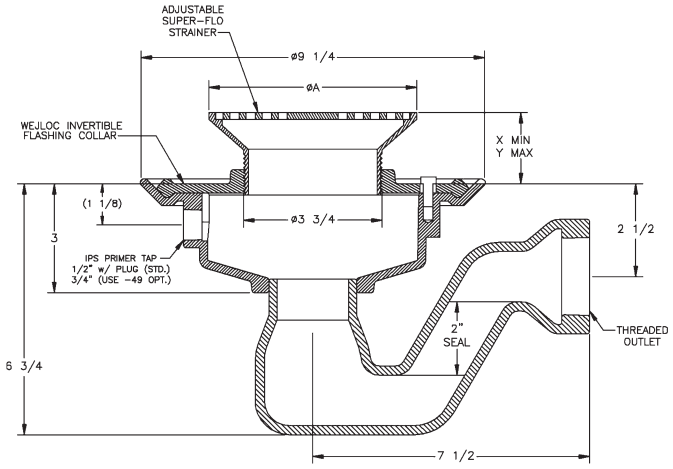


⬢ CONFORMS WITH ASTM-C564.

TYPE NO.	PIPE SIZE	ADJUSTABLE STRAINER TYPE NO.	ADJUSTMENT B	X	Y	FREE AREA	LBS.†
30002	2	5S	5	7/8	1-7/8	9.1	15
30003	3	6S	6	7/8	2-1/4	13.8	16
30004	4	8S	8	1-1/4	2-1/2	24.5	21
† STRAINER W/BODY							

30002-ST-A SERIES

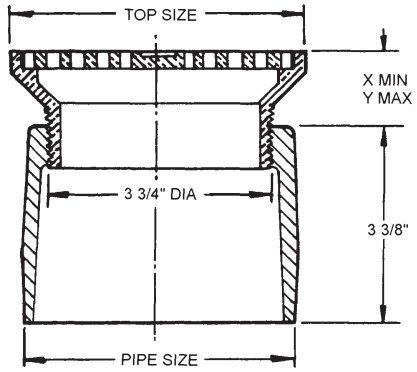
Body with Shallow Trap & Round SUPER-FLO® Strainer



TYPE NO.	PIPE SIZE	ADJUSTABLE STRAINER TYPE NO.	A DIA.	ADJUSTMENT X	Y	FREE AREA	LBS.†
30002-ST-A	2	5A	5	3/4	2-1/8	7.8	19
		6A	6	1-1/4	2-3/8	11.0	20
		7A	7	1-1/8	2-7/8	13.2	21
†STRAINER W/BODY		8A	8	1-5/8	2-5/8	16.2	22

30304-Z-A SERIES

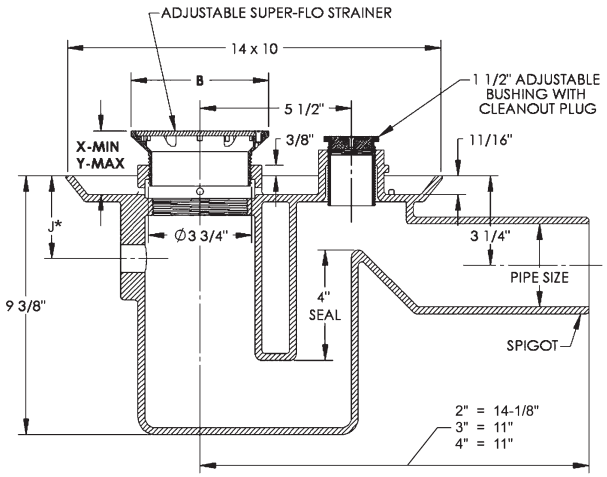
Body with Round SUPER-FLO® Strainer



TYPE NO.	PIPE SIZE	ADJUSTABLE STRAINER TYPE NO.	TOP SIZE	ADJUSTMENT X	Y	FREE AREA	LBS.†
30304-Z	4	5A	5	3/4	2-1/8	7.8	5
		6A	6	1-1/4	2-3/8	11.0	6
		7A	7	1-1/8	2-7/8	13.2	7
† STRAINER W/BODY		8A	8	1-5/8	2-5/8	16.2	8

30500-A SERIES

Body with Cleanout & Round SUPER-FLO® Strainer

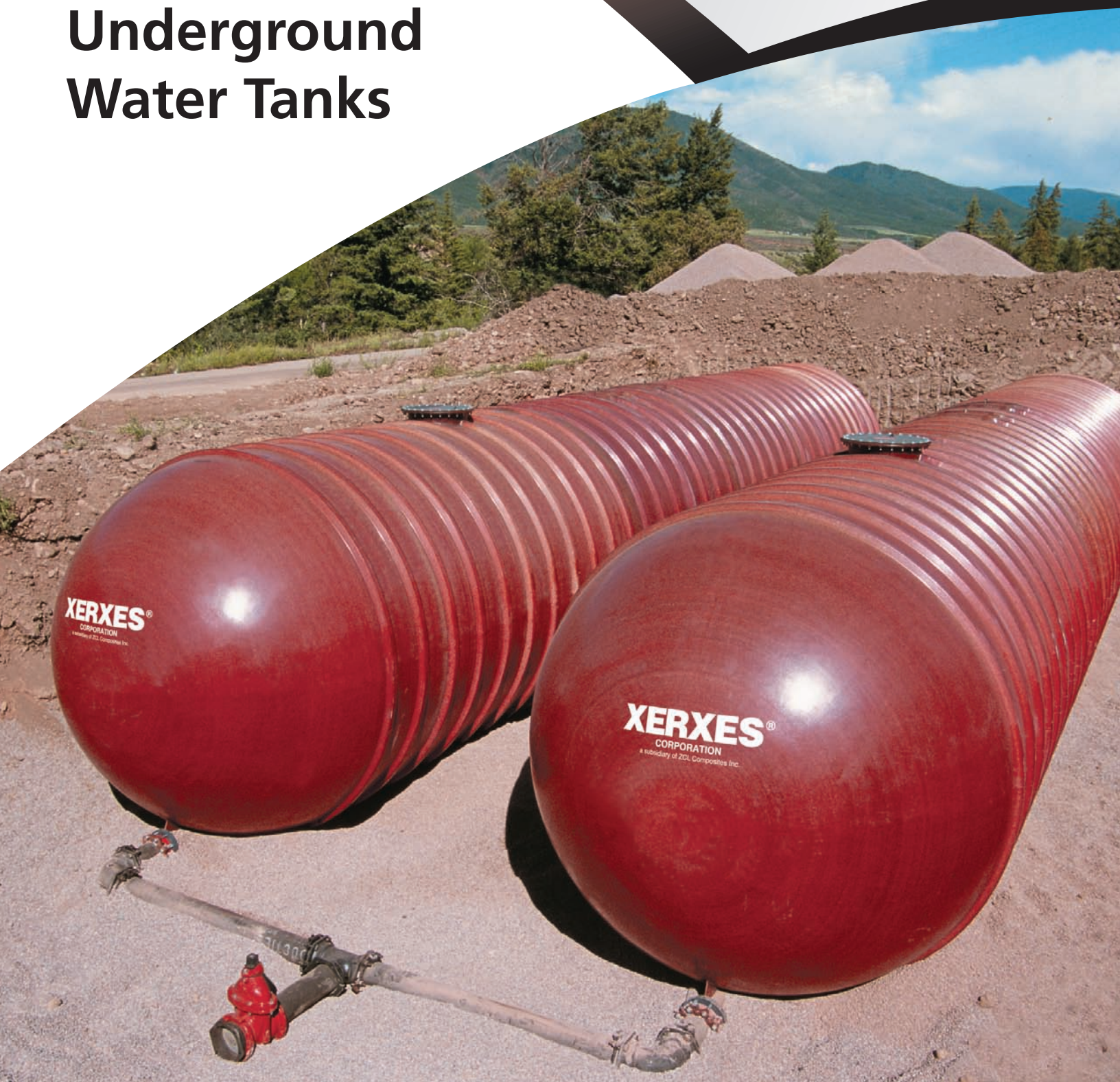


* IPS PRIMER TAPPING (-49) & (-50)
AUX. THREADED INLET (-51) & (-52)

TYPE NO.	PIPE SIZE	J*	ADJUSTABLE STRAINER TYPE NO.	ADJUSTMENT B	X	Y	FREE AREA	LBS.†
30502	2	3	5A	5	1-3/8	2-1/8	7.8	30
30503	3	3-1/2	6A	6	1-5/8	2-3/8	11.0	31
30504	4	4-1/8	7A	7	1-5/8	2-3/8	13.2	32
† STRAINER W/BODY			8A	8	2	2-5/8	16.2	33

XERXES®
CORPORATION
a subsidiary of ZCL Composites Inc.

Fiberglass Underground Water Tanks



Xerxes® Fiberglass Water Tanks

Fiberglass Tanks for Long-Term Storage of Water

As communities, businesses and industries become increasingly accountable to meet environmental requirements for liquids that require safe, design-proven storage, Xerxes is in the forefront with innovative answers. When considering the options in customized systems to store water, facility designers and owners look for a long-term, structurally strong, watertight and cost-effective option. That is exactly what the Xerxes® fiberglass tank is.

For decades, Xerxes has been well-known as a major tank supplier to the petroleum industry, with more than 100,000 tanks installed. Many of the world's largest oil companies rely on Xerxes to supply environmentally safe underground tanks for storage of gasoline at their retail service stations. Throughout the neighborhoods and communities of America, Xerxes® underground tanks are in place, simultaneously storing products and protecting the environment.

Today Xerxes is taking its place in those same neighborhoods and communities as a major supplier of storage tanks for water — potable water, fire-protection water, irrigation water, gray water, rain water, stormwater and emergency-supply water — as well as other liquids, such as septage, leachate and chemicals. Each time a Xerxes fiberglass underground tank is delivered to a customer, the same performance standard has been met — a vessel for safe underground storage of liquid and careful protection of the environment.

Tanks Designed and Manufactured by a Long-Time Industry Leader

Xerxes is a leader in the design and manufacture of high-quality, cost-effective products that help protect the fragile relationship between humans and their environment. Each Xerxes water tank represents decades of innovation and proven experience developing and fabricating fiberglass storage tanks for underground storage of liquids.

At Xerxes, excellence in service is as highly valued as excellence in product design and manufacturing. Xerxes' strategically located manufacturing facilities in the United States provide customers with prompt, economical delivery and quality service. That gives Xerxes tanks one more advantage — they are readily available to customers wherever they are.



Features of Xerxes Water Tanks

- Constructed of rustproof, long-lasting fiberglass
- Manufactured to meet customers' functional requirements
- Designed for added strength with integral ribs
- Designed for H-20 and HS-20 load conditions
- Easy to ship and install
- Can be purchased with accessories that allow for both preinstallation and postinstallation pressure testing
- Manufactured to applicable requirements of Underwriters Laboratories (UL) 1316
- Manufactured with resin conforming to NSF Standard 61 requirements (potable water tanks)
- NSF listed tanks also available
- Available in sizes from 600 gallons to sizes in excess of 50,000 gallons



Watertight Tanks Featuring the Many Benefits of Fiberglass

A fiberglass water tank, both by virtue of its materials and its design, is inherently the superior choice for safe, long-term storage of water for a wide range of applications. The best storage system for water is structurally strong, corrosion-resistant, watertight, easily installed and cost-effective. All these elements come together in the design and manufacture of a Xerxes fiberglass water tank.

Xerxes uses only high-quality resin and glass in the manufacture of its fiberglass tanks. Integral ribs in the tanks add strength to the structure. Because the integral ribs and tanks are made of the same materials and are manufactured simultaneously, the result is an extremely robust tank.

Another common material used in tanks today is concrete, in either the form of precast concrete or cast-in-place concrete. Precast tanks are heavy, and therefore can be difficult to ship and to install. When larger capacity tanks (approximately 6,000 gallons and greater) are required, precast tanks are generally not available. Therefore, a cast-in-place tank is the only concrete option. Cast-in-place tanks cannot undergo the careful quality-control process that fiberglass tanks manufactured in a factory do. This quality control is key to producing a strong, watertight tank. The installation and proper curing of cast-in-place tanks can be very time-consuming, taking days or weeks, as opposed to the one-day installation typical for a Xerxes fiberglass tank.

Since a Xerxes fiberglass tank is significantly lighter in weight than comparably sized concrete tanks, a fiberglass tank is much easier to ship and install. This is especially important for water applications because many of these tanks are installed in hard-to-access or even remote locations, or are at sites with limited excavation space, and the heavy equipment required to install concrete or steel tanks presents a problem.

Lightweight fiberglass tanks are ideally suited to a variety of water tank projects, whether the site is in a rural community, a remote location or the middle of a city. A few examples of the many recent Xerxes® water tank installations are: potable water in a mountain housing development, emergency drinking supplies in a Florida community and firewater reserves in a U.S. National Forest Service ranger station.

Since water by nature can create a corrosive environment, it is likely that rust can be a major weakness in certain underground water storage systems. Unlike tanks made of other materials, Xerxes® fiberglass tanks are constructed of materials that are inherently rustproof. In contrast, to guard against corrosion or to provide compatibility with the water being stored, tanks constructed of concrete or steel may require internal and external coatings. Of the tank options available for water storage, a fiberglass tank offers the best long-term protection against leakage due to both internal and external corrosion.

Not only is a Xerxes tank rustproof, it is also watertight. Easily equipped for on-site pressure testing before and after installation, Xerxes water tanks give owners the confidence that the tank is watertight from the time it is installed.

Fiberglass Water Tanks for Potable Water Applications

Each Xerxes potable water tank is designed and manufactured to meet a customer's specific requirements. A major benefit of ordering a Xerxes® potable water tank is that it can be manufactured with materials that conform to the requirements of NSF / ANSI 61 — Drinking Water System Components — Health Effects. A Xerxes potable water tank is also available as an NSF-listed and labeled tank.

The National Sanitation Foundation (NSF) is a leading international organization that develops standards, and tests and certifies products in the areas of public health safety and environmental protection. Xerxes potable water tanks are manufactured with a resin that has been approved as conforming to NSF standards for drinking water system components, demonstrating once again that Xerxes is a pioneer in its industry.

The process by which Xerxes manufactures potable water tanks with NSF-listed materials offers a significant advantage over steel and concrete tanks. The Xerxes fiberglass potable water tank is an integral structure incorporating an NSF-listed-resin interior with a polyester-resin-glass exterior. This is the most effective combination for a potable water tank.

Steel and concrete storage systems typically use internal linings to meet industry standards for potable water. In order to be effective, these linings require a degree of adhesion that can be difficult to obtain in the manufacturing process and to maintain over the life of the system. When linings are constructed



of materials different from the tank materials, the durability of the end product can be compromised. In short, a Xerxes fiberglass potable water tank offers many advantages over these systems.

Another significant advantage of a Xerxes potable water tank is that because it is lightweight a Xerxes tank can be easily installed in the remote locations that are common to potable water system installations, such as campgrounds, resorts, national parks and private homes.



Fiberglass Water Tanks for Fire-Protection Water Applications

Growing concerns about fire safety and increased use of sprinkler systems in building construction have resulted in a new demand for underground tanks for the storage of fire-protection water. Because of this, residential and commercial building designers need to find safe, reliable and cost-effective systems for the storage of fire-protection water in their projects. Often, new regulatory codes and insurance requirements are calling for stand-alone, standby water supplies. Common examples of fire-protection water applications are schools, housing developments, medical centers, resort properties and casinos.

Xerxes fiberglass water tanks are becoming an especially popular choice for all types of water applications in rural, suburban and urban facilities. Whether the need is as a sole source of water in rural areas or as a standby water reservoir to supplement a pressurized municipal water system, a Xerxes tank provides maintenance-free underground storage of water.

Recent changes in NFPA codes require system design alternatives, such as standby water reservoirs when the existing pressurized water supply is inadequate or when water-pressure levels are not dependable. The 2007 edition of NFPA 1142 Standard on Water Supplies for Suburban and Rural Fire Fighting depicts a fiberglass underground storage tank to illustrate a sole-source water cistern.

A Xerxes underground tank used as a water reservoir has many advantages over an aboveground tank used for the same purpose.



For instance, it does not occupy valuable property that could be used for parking or other needs, and it makes the property aesthetically pleasing. Also, since the tank is buried, it does not require the expensive protection against water freezing that might be necessary with an aboveground tank.

A growing trend is to use a water tank as a dual-purpose tank, such as for potable water and fire-protection water. A Xerxes fiberglass tank using NSF-listed resin is ideally suited for such dual-purpose applications.


Fire-Protection Water Tank

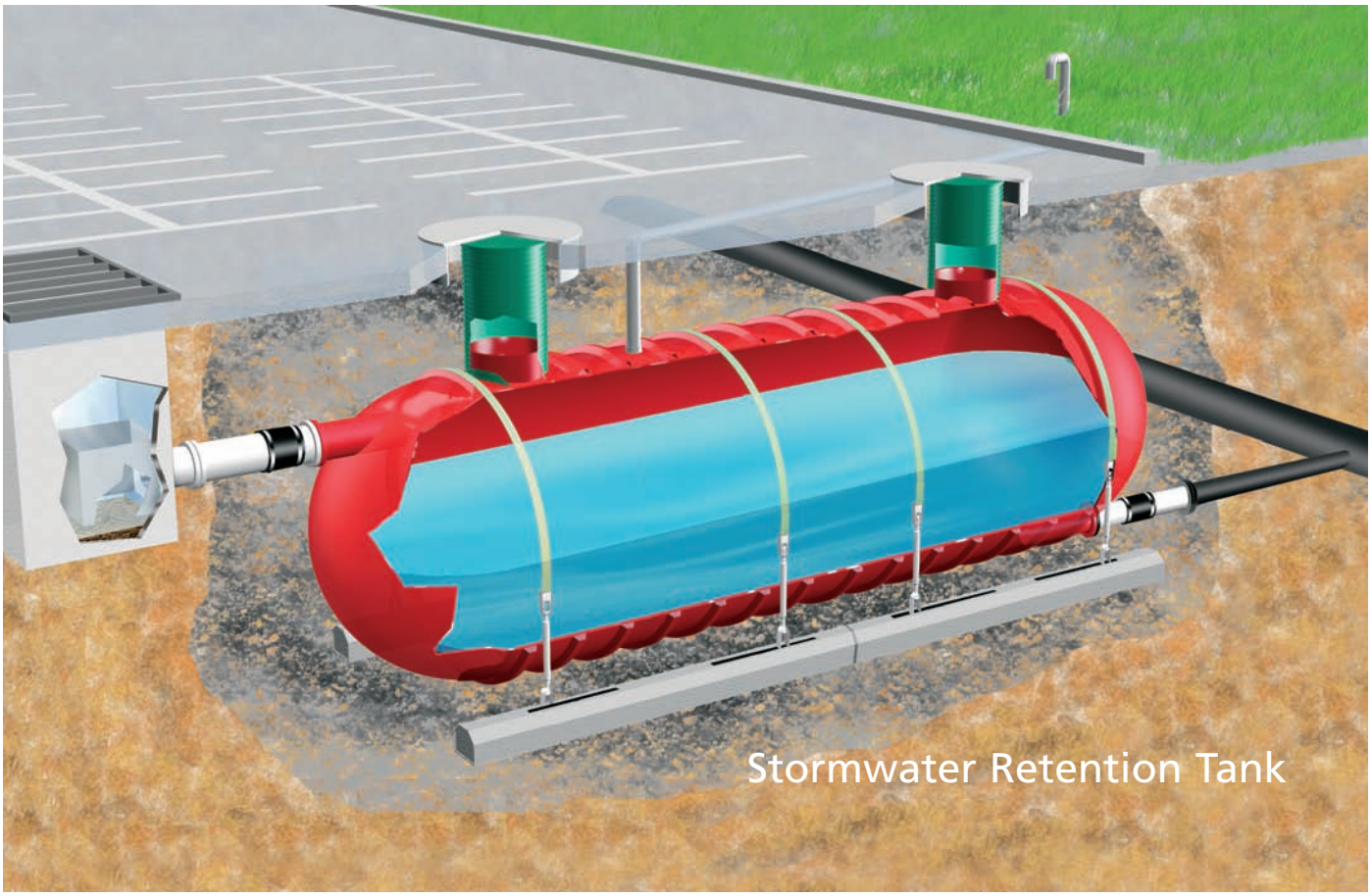
Fiberglass Water Tanks for Stormwater Retention Applications

Changes in stormwater management are being driven from two directions — environmental concerns and land costs. To address the groundwater contamination or flooding that can occur when stormwater runs directly into sewer systems, new regulations in many communities require a specific retention time before allowing stormwater to run into the drainage system.

Traditionally, a retention pond has been used to meet this requirement. One of the major benefits of using an underground water tank for stormwater retention is that it allows developers and property owners to make better use of the property while simultaneously meeting retention-in-time requirements and protecting the environment. With property values high and parking space limited at many commercial sites, this is a significant advantage to property owners. In addition, a Xerxes tank is available nationwide and in a variety of sizes.

A Xerxes stormwater retention tank has all the usual advantages of an underground fiberglass tank. It is lightweight and, therefore, easy to install. It is watertight and can be purchased to be testable for watertightness. It is corrosion-resistant, thus easy to maintain. It is H-20 and HS-20 axle-load rated, which means it is ideally suited for use beneath parking lots. When a higher level of stormwater treatment is necessary, a Xerxes underground oil/water separator is a superior option. Xerxes has a variety of fiberglass products that meet the ever-changing needs of customers for stormwater retention.





Other Common Applications for a Xerxes Fiberglass Water Tank

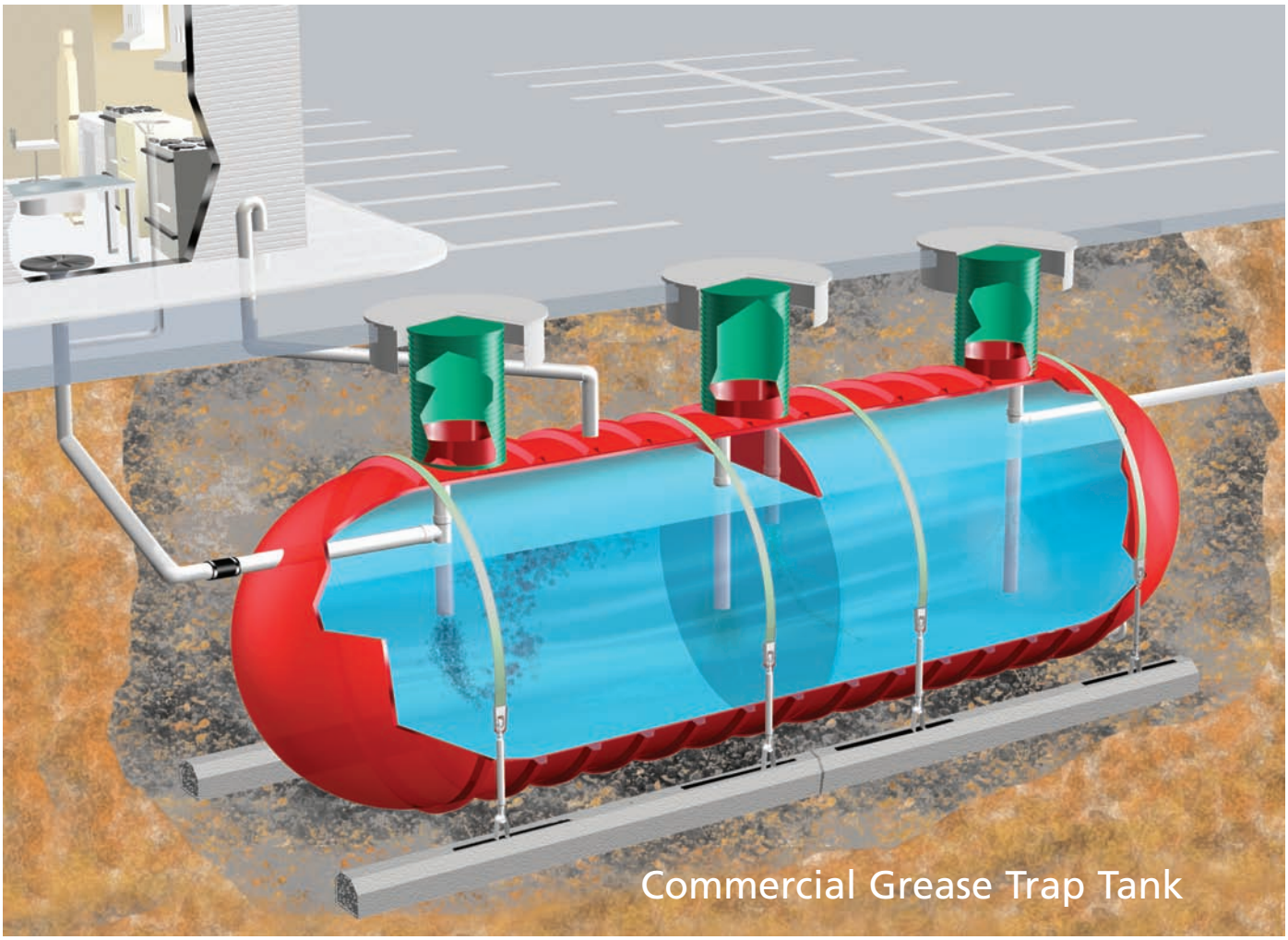
In addition to these uses of a Xerxes water tank — for potable water, fire-protection water and stormwater retention — a fiberglass water tank is a superior choice for numerous other water applications. Examples of the flexibility of Xerxes water tanks is that they can be designed and manufactured for such diverse applications as field-irrigation water, rainwater collection, livestock and wildlife water supplies, emergency water supplies and gray water (for example, residential dish-washing water, laundry water and bath water). Again, whatever a customer's water tank needs, a Xerxes water tank can be designed and manufactured to meet that particular application.

In addition to the specific types of water tanks outlined in this brochure, Xerxes also manufacturers tanks for other water and wastewater applications, oil/water separators with coalescers that can reduce the oil content of stormwater runoff to 10 ppm, grease traps commonly used in commercial kitchen applications and a wide variety of septic tanks that are increasingly popular in on-site wastewater systems. (Contact your Xerxes sales representative to obtain Xerxes sales literature on these specific products.)

Xerxes has a proven record of innovative design and a quality-driven manufacturing process at its network of plants across the country. This results in a Xerxes tank that is high-quality and competitively priced. A Xerxes water tank has the added benefit that it can be removed, recertified and relocated. These features make a Xerxes tank a cost-effective option with expanded value for an initial investment.

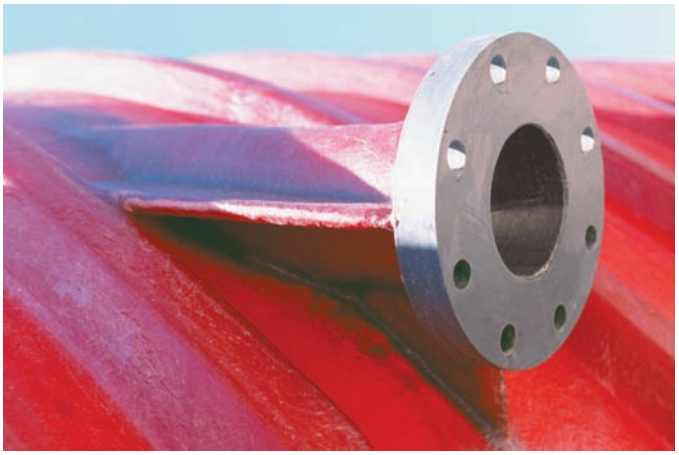
Typical Water Applications

- National and state parks
- Housing developments
- Schools
- Resorts
- Campgrounds
- Emergency water supplies
- Rural properties
- Rest areas
- Truck stops
- Casinos
- Water recirculation systems
- Large private properties
- Livestock feeding operations
- Residential cisterns
- Car washes



Commercial Grease Trap Tank

Optional Tank Accessories to Fit a Variety of Water Applications



As the demand for Xerxes tanks expands into ever-growing types of water applications, the need for specific accessories to complement these tanks expands as well. A goal at Xerxes has always been to meet the challenge of a constantly changing market by meeting the functional requirements of system designers and owners. Xerxes meets that challenge by developing and manufacturing a wide — and growing — range of water tank accessories such as those listed on this page.



In some cases, Xerxes products that are commonly used in the petroleum industry, such as FRP hold-down straps and prefabricated concrete deadmen, have direct application in water tank system designs. In other cases, Xerxes has designed products specifically for use as water tank accessories, such as baffles/partition walls, access risers, pump platforms and anti-vortex plates (to name just a few). Together, these products provide solutions for the needs of the water storage industry.



One example of a cost-saving innovation introduced by Xerxes is the large-diameter tank bottom sump, which Xerxes designed to eliminate the need and expense of a separate lift station when full use of a tank's capacity is necessary. The Xerxes bottom sump provides that requirement while at the same time eliminating a potential source of leakage in the piping between a lift station and tank.



Whether a customer's particular water storage need is met by the full range of complementary accessories now available, or by a unique solution Xerxes develops for a specific customer requirement, Xerxes works diligently with customers and the industry to continue to offer solutions to a host of water storage needs.

Optional Water Tank Accessories

- FRP manways (22-inch, 30-inch and 36-inch in diameter)
- FRP manway extensions (variable length)
- FRP or PVC drop/fill tubes
- FRP ladders
- Internal pump platforms
- FRP anti-vortex plates
- Flanged FRP nozzles
- Threaded FRP or steel fittings
- Large-diameter bottom sumps
- Internal baffles/Partition walls
- Hinged and lockable lids
- FRP hold-down straps
- Concrete deadmen

Single-Wall Tank Chart

Nominal Capacity (gallons)	Actual Capacity (gallons)	Tank Length	Shipping Weight (pounds)	Number of Hold-Down Straps Required
4-Foot-Diameter Tanks				
600	602	6′-11 7/8″	500	2
1,000	1,009	11′-3 7/8″	700	2
1,500	1,449	16′-0″	1,000	2
6-Foot-Diameter Tanks				
1,500	1,779	10′-7 1/4″	800	2
2,000	2,376	13′-5 3/4″	1,000	2
3,000	2,973	16′-4 1/4″	1,200	2
4,000	4,131	21′-11 1/8″	1,600	2
5,000	5,064	26′-5″	1,900	4
6,000	5,960	30′-8 3/4″	2,200	4
8-Foot-Diameter Tanks				
2,000	2,189	9′-1/2″	900	2
3,000	3,271	12′-3″	1,200	2
4,000	4,218	15′-1/2″	1,400	2
5,000	5,165	17′-8 1/2″	1,700	2
6,000	6,084	20′-6 1/2″	2,000	2
7,000	6,946	23′-1″	2,200	4
8,000	7,950	26′-1/2″	2,500	4
9,000	8,869	28′-9″	2,700	4
10,000	9,816	31′-6 1/2″	3,000	4
11,000	10,763	34′-4″	3,200	4
12,000	11,682	37′-1/2″	3,500	4
13,000	13,081	41′-2″	4,000	6
14,000	14,028	43′-11 1/2″	4,200	6
15,000	14,975	46′-9″	4,500	6
10-Foot-Diameter Tanks				
10,000	10,563	21′-5 1/4″	3,200	4
11,000	11,364	22′-9 3/4″	3,400	4
12,000	12,068	24′-1/4″	3,600	4
13,000	12,966	25′-6 3/4″	3,800	4
14,000	13,767	26′-11 1/4″	4,000	4
15,000	15,248	29′-5 3/4″	4,500	4
20,000	20,055	37′-8 3/4″	5,700	6
22,000	22,580	42′-3/4″	6,600	8
25,000	25,783	47′-6 3/4″	7,900	8
30,000	30,590	55′-9 3/4″	9,400	10
35,000	35,397	64′-3/4″	10,500	12
40,000	41,004	73′-8 1/4″	12,100	14
12-Foot-Diameter Tanks				
20,000	20,781	29′-4″	9,200	6
25,000	25,541	35′-7″	10,600	8
30,000	31,253	43′-1″	12,500	10
35,000	36,013	49′-4″	13,900	12
40,000	39,821	54′-4″	15,000	12
48,000	48,389	65′-7″	17,700	18
50,000	50,293	68′-1″	18,300	18

Guide Specifications – Single and Double Wall Tanks for NSF Listed Potable Water Use

Short Form

The contractor shall provide a single-wall or double wall fiberglass reinforced plastic (FRP) NSF listed potable water tank as shown on the drawings. The tank size, fittings and accessories shall be as shown on the drawings. The fiberglass NSF listed potable water tank shall be manufactured by Xerxes® Corporation.

The NSF listed potable water tank shall be tested and installed according to the Xerxes Installation Manual and Operating Guidelines for Fiberglass Underground Storage Tanks in effect at time of installation.

Long Form

Part I: General

1.01 Quality Assurance

A. Acceptable Manufacturer: Xerxes Corporation

B. Governing Standards, as applicable:

1. Tank manufacturer shall be listed by NSF under NSF/ANSI Standard 61
Drinking Water System Components – Health Effects

2. Tank manufacturer shall be in the business of manufacturing tanks with materials conforming to the requirements of ANSI/AWWA D120-02 Thermosetting Fiberglass-Reinforced Plastic Tanks.

3. Tank manufacturer shall be in the business of manufacturing tanks to UL 1316 standards.

4. American Society for Testing and Materials (ASTM) Standards:

a. ASTM D883: Standard Terminology Related to Plastics

5. Shop Drawings

a. The manufacturer shall supply to engineer, contractor, and / or owner, a complete set of scale drawings detailing dimensions of heights, diameter, elevations to invert, pipe sizes and any other necessary details.

6. Calculations

a. The manufacturer (upon request) shall supply the engineer, contractor, and / or owner buoyancy calculations assuming a fully flooded excavation with an installed empty tank.

b. The sizing and construction of this tank shall be consistent with industry protocols and shall comply with the applicable regulations.

Part II: Products

2.01 Fiberglass Underground NSF listed potable water storage tanks

A. Loading Conditions – Potable water tank shall meet the following design criteria:

1. Internal Load – All potable tanks shall be testable and shall withstand a 5-psig air-pressure test with 5:1 safety factor. Maximum test pressure is 5 psig.

2. Surface Loads – Potable water tank shall withstand surface H-20 and HS-20 axle loads when properly installed according to manufacturers current Installation Manual and Operating Guidelines.

3. External Hydrostatic Pressure and Burial Depth – tank shall be capable of being buried in ground with 7' of overburden over the top of the tank, the hole fully flooded, and maintain a safety factor of 5:1 against gene ral buckling.

4. Tank shall support accessory equipment – such as manways, manway extensions, collar/ risers, FRP inlet/outlet piping, baffle wall, anti-vortex plates and pump platforms when installed according to tank manufacturers current Installation Manual and Operating Guidelines.

5. Buried tanks shall be manufactured with integral trapezoidal ribs for structural integrity.

B. Product Storage

1. Tank shall be capable of handling liquids with specific gravity up to 1.1.

2. Tank shall be vented to atmospheric pressure.

3. Tank shall be capable of handling Potable water for domestic use at ambient tempature.

C. Materials

1. Tank shall be manufactured with 100% premium resin (Terephthalic polyester or highly cross-linked Isophthalic polyester resins for the exterior and NSF Listed resin for the interior only), and chopped glass. No fillers or extenders will be used.

2. No General, Orthophthalic, or odd lot resin will be used.

3. All associated internal mounting hardware shall be rustproof.

4. Exposed internal FRP components to be constructed using NSF listed materials

D. Potable Water Tank Dimensions and Capability

1. Tank shall have nominal working capacity of _____ gallons.

2. Tank shall have nominal outside diameter of _____ feet.

3. Tank shall weight shall be approximately _____ pounds.

E. Interstitial Space (Double-Wall Applications)

1. Tank shall have a space between the primary and secondary walls to allow for the free flow and containment of leaked product from the primary tank. The space also allows the insertion of a monitoring device through a monitoring fitting.

2. Each interstitial space monitor fitting shall consist of a 4" NPT fitting.

2.02 Accessories

A. Manway Opening

1. All potable water tanks shall require at least one manway opening.

2. All manway openings shall be FRP, flanged, and a minimum of 22" (based on drawing), complete with gaskets, bolts, and covers.

3. Location(s) are shown on submittal drawing.

4. Optional manway extensions shall be FRP and provided by tank manufacturer

B. Internal Piping

1. All internal piping shall meet ANSI/NSF Standard 61

2. Location is shown on submittal drawings.

D. Fittings

1. All FRP nozzles shall be flat-faced, flanged (gusseted when needed), and conform to ANSI B16.5 150# bolting pattern and shall meet ANSI/NSF Standard 61

2. All threaded fittings shall be constructed of FRP, carbon steel or 304 Stainless Steel

E. Lifting Lugs

1. All Tanks shall have lifting lug(s) that are capable of withstanding weight of tank with a safety factor of at least 2:1.

F. Optional Suction/Fill tubes

1. Suction/Fill tubes shall be manufactured with materials listed under ANSI/NSF Standard 61

2. Suction/Fill tubes must be factory installed

Guide Specifications – Single and Double Wall Tanks for NSF Listed Potable Water Use

3. Suction/Fill tubes shall terminate 4 inches above the bottom of tank

4. Location shall be as shown on submittal drawings.

G. Optional Anchoring

1. Straps shall be FRP anchor straps as supplied by tank manufacturer.

2. Number and location of straps shall be shown on submittal drawings.

3. Deadman shall be pre-manufactured and supplied by the tank manufacturer.

H. Optional Ladders

1. FRP ladders shall be NSF Listed under ANSI/NSF Standard 61 as supplied by tank manufacturer.

I. Optional Pump Platforms

1. FRP pump platforms shall be NSF Listed under ANSI/NSF Standard 61 as supplied by tank manufacturer.

Part III: Testing and Installation

3.01 Testing

A. Tank shall be tested according to the Xerxes Installation Manual and Operating Guidelines for Fiberglass Underground Storage Tanks in effect at time of installation.

3.02 Installation

A. Tank shall be installed according to the Xerxes Installation Manual and Operating Guidelines for Fiberglass Underground Storage Tanks in effect at time of installation.

B. Contractor shall be trained by the tank manufacturer, the state or other approved agency.

3.03 Operation and Maintenance

A. Tank should be set up on a regular clean out schedule and best management practices according to local jurisdictions.

Part IV: Warranty

4.01 Warranty

A. Warranty shall be manufacturer's Limited Warranty for Underground Potable Water Tanks in effect at time of purchase.

Limited Warranty

Underground Water and Potable Water Tanks

Xerxes® Corporation ("Xerxes") warrants to ("Owner") that our underground storage tanks for water other than potable water, if installed, used and maintained in the United States or Canada in accordance with Xerxes' published specifications, installation instructions and operating guidelines, and all applicable laws and regulations, and limited to the storage of water, other than potable water, at temperatures not to exceed 150° F (65° C), will be free from material defects in materials and workmanship for a period of one (1) year from date of original delivery by Xerxes.

Xerxes warrants to Owner that our underground storage tanks for potable water, if installed, used and maintained in the United States or Canada in accordance with Xerxes' published specifications, installation instructions and operating guidelines, and all applicable laws and regulations, and limited to the storage of potable water:

1) Will not fail for a period of thirty (30) years from date of original delivery by Xerxes due to natural external corrosion.
2) Will not fail for a period of thirty (30) years from date of original delivery by Xerxes due to internal corrosion, provided the tank is used solely for potable water, the customer provides Xerxes with written notice of its intended use before the tank is manufactured, and the water is stored at ambient temperatures.
3) Will not fail for a period of thirty (30) years from date of original delivery by Xerxes due to structural failure (defined as spontaneous breaking or collapse caused by material defects in materials or workmanship).
4) Will meet Xerxes' published specifications and will be free from material defects in materials and workmanship for a period of one (1) year following the date of original delivery by Xerxes.

Xerxes warrants to Owner that all Xerxes manufactured accessories for potable water tanks and water tanks other than for potable water, if installed, used and maintained in the United States or Canada in accordance with Xerxes' published specifications, installation instructions and operating guidelines, and all applicable laws and regulations, will be free from material defects in materials and workmanship for a period of one (1) year following the date of original delivery by Xerxes.

If any tank is to be removed from an installation, moved to Owner's new location and is intended for active service at the new location, the tank must be recertified by Xerxes in order to maintain the limited warranty as originally extended. The foregoing limited warranty does not extend to tanks or accessories (individually and collectively "Goods") damaged due to acts of God, war, terrorism, or failure of Goods caused, in whole or in part, by misuse, unlawful use, improper installation, storage, servicing or maintenance, or operation in excess of their rated capacity or contrary to their recommended use, whether intentional or otherwise, or any other cause or damage of any kind not the fault of Xerxes. Xerxes only warrants repairs or alterations performed by Xerxes or its authorized contractors. Xerxes does not warrant any product, components or parts manufactured by others.

Owner's sole and exclusive remedy for breach of warranty is limited at Xerxes' option to: (a) repair of the defective tank or accessory, (b) delivery of a replacement tank or accessory, to the point of original delivery, or (c) refund of the original purchase price. In the event of a breach of warranty claim, a claimant must give Xerxes the opportunity to observe and inspect the installation prior to the removal of any backfill below the tank top, and the removal of the tank and any accessory from the ground, or the claim will be forever barred. All claims must be made in writing within one (1) year after tank and/or accessory failure or be forever barred. THE FOREGOING LIMITED WARRANTY CONSTITUTES XERXES' EXCLUSIVE OBLIGATION AND XERXES MAKES NO OTHER WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, WITH RESPECT TO THE GOODS, OR ANY SERVICE, ADVICE, OR CONSULTATION, IF ANY, FURNISHED TO OWNER BY XERXES OR ITS REPRESENTATIVES, WHETHER AS TO MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE. THE SELLER (XERXES) UNDERTAKES NO RESPONSIBILITY FOR THE QUALITY OF THE GOODS, EXCEPT AS OTHERWISE PROVIDED IN THIS CONTRACT. THE SELLER (XERXES) ASSUMES NO RESPONSIBILITY THAT THE GOODS WILL BE FIT FOR ANY PARTICULAR PURPOSE FOR WHICH YOU (OWNER) MAY BE BUYING THESE GOODS, EXCEPT AS OTHERWISE PROVIDED IN THE CONTRACT. THE REMEDIES SET FORTH IN THE ABOVE WARRANTY ARE THE ONLY REMEDIES AVAILABLE TO ANY PERSON OR ENTITY FOR BREACH OF WARRANTY OR FOR BREACH OF ANY OTHER COVENANT, DUTY, OR OBLIGATION ON THE PART OF XERXES. XERXES SHALL HAVE NO LIABILITY OR OBLIGATION TO ANY PERSON OR ENTITY FOR BREACH OF ANY OTHER COVENANT, DUTY, OR OBLIGATION UNDER THIS LIMITED WARRANTY EXCEPT AS EXPRESSLY SET FORTH HEREIN. IT IS EXPRESSLY AGREED THAT THIS LIMITED WARRANTY DOES NOT FAIL OF ITS ESSENTIAL PURPOSE. XERXES SHALL HAVE NO LIABILITY FOR COSTS OF INSTALLATION OR REMOVAL OF GOODS, ENVIRONMENTAL CONTAMINATION, FIRES, EXPLOSIONS, OR ANY OTHER CONSEQUENCES ALLEGEDLY ATTRIBUTABLE TO A BREACH OF WARRANTY, OR STATUTORY ASSESSMENTS, FINES, PENALTIES, INCIDENTAL, CONSEQUENTIAL, PUNITIVE OR OTHER DAMAGES OF ANY DESCRIPTION, WHETHER ANY SUCH CLAIM OR DAMAGES BE BASED UPON WARRANTY, CONTRACT, NEGLIGENCE, STRICT LIABILITY OR OTHER TORT, OR OTHERWISE. IN NO EVENT SHALL XERXES' TOTAL LIABILITY HEREUNDER EXCEED THE ORIGINAL PURCHASE PRICE OF THE GOODS WHICH GAVE RISE TO SUCH LIABILITY.

Consumer Notice: This warranty gives you (Owner) specific legal rights. You (Owner) may also have other rights which vary from state to state.

Xerxes® is a trademark of Xerxes Corporation



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Fax 714.632.7133

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Fax 301.223.6836

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BRADFORD WHITE®
WATER HEATERS

Residential Upright Energy Saver Electric Water Heater



Photo is of
M-2-50T6DS



Copper Screw Type Immersion Element
(Incoloy type immersion element available upon request)

The Upright Electric Models Feature:

- **DOE**—All residential storage models meet or exceed efficiency requirements of the Department of Energy, ASHRAE Standard 90.1 b (current standard) and the National Appliance Energy Conservation Act of 1987 recent amendment effective January 20, 2004 which supercedes all state and local efficiency requirements.
- **Fully Automatic Controls**—Fast acting surface-mount thermostats for automatic temperature control. Factory installed sensitive manual reset energy cutoff for safety to prevent overheating.
- **Direct Heat Transfer With Immersed Elements**—Transfers heat directly and efficiently to the water. Screw-in style.
- **Factory Installed Hydrojet® Total Performance System**—Cold water inlet sediment reducing device helps prevent sediment build up in tank. Increases first hour delivery of hot water while minimizing temperature build up in tank.
- **Vitraglas® Lining**—Bradford White tanks are lined with an exclusively engineered enamel formula that provides superior tank protection from the highly corrosive effects of hot water. This formula (Vitraglas®) is fused to the steel surface by firing at a temperature of over 1600°F (871°C).
- **2" Non-CFC Foam Insulation**—Covers the sides and top of the tank, reducing the amount of heat loss. This results in less energy consumption, improved operation efficiencies and jacket rigidity.
- **Water Connections**— 3⁄4" NPT factory installed true dielectric fittings extend water heater life and eases installation (M-2-120R has 1" NPT dielectric waterway fittings).
- **Factory Installed Heat Traps**—Design incorporates a flexible disk that reduces heat loss in piping and eliminates the potential for noise generation (Except M-2-120R).
- **Protective Magnesium Anode Rod**—Provides added protection against corrosion for long trouble-free service.
- **Simultaneous and Non-Simultaneous Operation Available**—Simultaneous operation indicates when both elements (if equipped) are being heated at the same time. Non-Simultaneous operation indicates when one element is being heated at a time.
- **Voltages Available**—120V, 208V, 240V, 277V, 480V.
- **Single Phase or Three Phase Operation Available**—277V may only be wired for single phase operation.
- **T&P Relief Valve Included**—All models have special tapping on top of tank.
- **Low Restriction Brass Drain Valve—**Durable tamper proof design.
- **Design evaluated by ETL in accordance with Part 280.707(d) of HUD Mobile Home Construction and Safety Standards for Energy Efficiency**.

AHRI

Intertek Intertek LLC - Low Lead Content

6 or 10-Year Limited Tank Warranties / 6 or 10-Year Limited Warranty on Component Parts.

For more information on warranty, please visit www.bradfordwhite.com

For products installed in USA, Canada and Puerto Rico. Some states do not allow limitations on warranties. See complete copy of the warranty included with the heater.

MANUFACTURED UNDER ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,954,492; 5,761,379; 5,943,984; 5,081,696; 5,988,117; 6,142,216; 5,199,385; 5,574,822; 5,372,185; 5,485,879; 5,277,171; (B1)5,341,770; 5,660,165; 5,596,952; 5,682,666; 4,904,428; 5,023,031; 5,000,893; 4,669,448; 4,829,983; 4,808,356; 5,115,767; 5,092,519; 5,052,346; 4,416,222; 4,628,184; 4,861,968; 4,672,919; Re. 34,534; 7,270,087 B2. OTHER U.S. AND FOREIGN PATENT APPLICATIONS PENDING. CURRENT CANADIAN PATENTS: 1,272,914; 1,280,043; 1,289,832; 2,045,862; 2,112,515; 2,108,186; 2,107,012; 2,092,105; 2,409,271.
Vitraglas® and Hydrojet® are registered trademarks of Bradford White® Corporation.

Residential Electric Water Heater

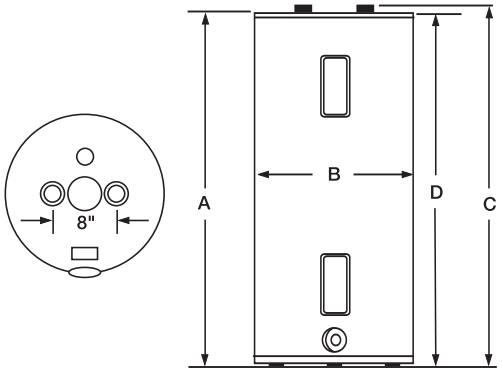
Upright Energy Saver Models

C.E.C. Listed

Model Number	Capacity U.S. Gal.	Capacity Imp. Gal.	Recovery 90°F Rise U.S. GPH*	Recovery 90°F Rise Imp. GPH*	A Floor to Heater Top in.	B Jacket Dia. in.	C Floor to Water Conn. in.	D Floor to T&P Conn. in.	Approx. Shipping Weight lbs.
M-2-30R6DS	30	25	21	18	46 7/8	18	48 1/8	47 3/16	85
M-2-40S6DS	40	33	21	18	46 7/8	20	47 7/8	46 7/8	103
M-2-40T6DS	40	33	21	18	59 3/4	18	60 3/4	59 3/4	110
M-2-50S6DS†	50	42	21	18	46 1/2	22	47 1/2	46 1/2	130
M-2-50T6DS	50	42	21	18	57 1/2	20	58 1/2	57 1/2	123
M-2-65R6DS	65	54	21	18	59 1/4	22	60 1/4	59 1/4	156
M-2-80R6DS	80	67	21	18	59 1/4	24	60 1/4	59 1/4	183
M-2-120R6DS	119	99	21	18	62 3/4	28	64 1/4	62 1/4	305

Model Number	Capacity Liters	Recovery 50°C Rise Liters/Hour*	A Floor to Heater Top mm.	B Jacket Dia. mm.	C Floor to Water Conn. mm.	D Floor to T&P Conn. mm.	Approx. Shipping Weight kg.
M-2-30R6DS	114	79	1191	457	1222	1199	39
M-2-40S6DS	151	79	1191	508	1216	1191	47
M-2-40T6DS	151	79	1518	457	1543	1518	50
M-2-50S6DS†	189	79	1181	559	1207	1181	59
M-2-50T6DS	189	79	1461	508	1486	1461	56
M-2-65R6DS	246	79	1505	559	1530	1505	71
M-2-80R6DS	303	79	1505	610	1530	1505	83
M-2-120R6DS	450	79	1594	711	1632	1581	138

†Available with optional hand hole cleanout.
For 10 year models, change suffix "6" to "10".
For single element models change suffix "D" to "S".
(M-2-120 not available as a single element model).
*Based on 4500W/4500W, Non-Simultaneous operation.



Wattage	Recovery ▲ GPH Temperature Rise °F 60	80	90	100	120
1500W	10	8	7	6	5
2000W	14	10	9	8	7
2500W	17	13	11	10	9
3000W	21	15	14	12	10
3500W	24	18	16	14	12
4000W	28	21	18	16	14
4500W	31	23	21	19	15
5000W	34	26	23	21	17
5500W	38	29	25	23	19
6000W	41	31	28	25	21

▲(GPH based on Non-Simultaneous operation, when Simultaneous operation the GPH will approximately double.)

Wattage Limitations for Simultaneous Operation	Voltage 120V	208V	240V	277V	480V
1500W / 1500W	yes	yes	yes	yes	yes
2000W / 2000W	no	yes	yes	yes	yes
2500W / 2500W	no	yes	yes	yes	yes
3000W / 3000W	no	yes	yes	yes	yes
3500W / 3500W	no	yes	yes	no	no
4000W / 4000W	no	yes	yes	yes	yes
4500W / 4500W	no	yes	yes	yes	yes
5000W / 5000W	no	yes	yes	yes	yes
5500W / 5500W	no	no	yes	no	no
6000W / 6000W	no	no	no	yes	yes

Wattage Limitations for Non-Simultaneous Operation	Voltage 120V	208V	240V	277V	480V
1500W / 1500W	yes	yes	yes	yes	yes
2000W / 2000W	yes	yes	yes	yes	yes
2500W / 2500W	yes	yes	yes	yes	yes
3000W / 3000W	yes	yes	yes	yes	yes
3500W / 3500W	no	yes	yes	no	no
4000W / 4000W	no	yes	yes	yes	yes
4500W / 4500W	no	yes	yes	yes	yes
5000W / 5000W	no	yes	yes	yes	yes
5500W / 5500W	no	yes	yes	no	no
6000W / 6000W	no	yes	yes	yes	yes

General
All models ETL listed. These heaters are wired inter-locking (Non-Simultaneous, Single Phase) 240V with two 4500W elements, unless otherwise specified.
All water and electrical connections are 3/4" NPT (19mm), 120 gallon model has 1"(25mm) NPT.
All models certified at 300 psi test pressure (2068 kPa) and 150 psi working pressure (1034 kPa.)

Dimensions and specifications subject to change without notice in accordance with our policy of continuous product improvement.

BRADFORD WHITE®
WATER HEATERS
Ambler, PA
For U.S. and Canada field service, contact your professional installer or local Bradford White sales representative.
Sales **800-523-2931** • Fax **215-641-1670** / Technical Support **800-334-3393** • Fax **269-795-1089** • Warranty **800-531-2111** • Fax **269-795-1089**
International: Telephone **215-641-9400** • Telefax **215-641-9750 / www.bradfordwhite.com**

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Built to be the Best™

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KELTECH INCORPORATED
A Subsidiary of Bradley

HL Series - Commercial Heaters

Tankless Water Heating Solutions

- 5-18 kW (17,000 - 61,400 BTUs)
- Low flow activation options at .15 and .25 GPM (0.6 and 0.9 L-Min)
- Certified Lead-Free Design
- Variable Temp Heat Exchanger
- Pressure Drop Advantage
- NEMA 1 enclosure
- 3/4" connections
- ETL certified to UL Standards
- Liquid-Cooled Triac Switches
- Surface Mounted Bi-Metal Thermostat with Manual Reset
- Internal fusing (included) adds safety and permits single power connection



Standard Equipment

Tankless Water Heating Specifications

Keltech, Inc. HL-Series Tankless Water Heaters are designed to accommodate most commercial fluid heating applications including: environments where demand is < 18kW and total flow is ≤ 7 GPM, and environments where lower activation flows are required: standard units are .5 GPM with options as low as .15 GPM. HL-Series units are also suited to applications where only single phase service is available or 3-Phase 208V, 240V and 480V is required. HL Series products include a NEMA 1 enclosure as standard, with NEMA 4 and 4X options available.

Construction

Temperature Controller

Keltech's PID Temperature Controller is more energy efficient and reliable than traditional microprocessors using staged elements. Power is infinitely variable, with no fixed inputs. The PID controller makes it possible to modulate the amount of power applied to the elements while also dispersing the required power evenly across all elements. This unique feature increases the product's life cycle.

Heating Element

Each heater features a heavy duty, low watt density, incoloy 800 sheathed resistive element. The Keltech design ensures greater protection, durability and resistance to scaling from hard water because water is only heated when flowing; this means sediment will not collect in the heat exchanger.

Triac Switches

The liquid cooled, triac switches provide silent switching which has a faster response than mechanical relays to assist in maintaining an accurate temperature.

Electrical

The HL-Series requires only one service feed per unit. Includes internal fusing as standard. Internal fusing provides superior protection so the incoming circuit can be higher than 48 amps (NEC). Keltech protects both hot sides of each heating element with fusing.

Independent Safety

The surface mounted bi-metal thermostat with manual reset acts as a fail-safe. In the event the temperature limit is exceeded, it must be manually reset before power is restored to the elements.

Cabinet Enclosure

Standard cabinet enclosure is NEMA 1 rated and made from 18 gauge electro galvanized and powder coated steel. The HL-Series also features an optional 18 gauge NEMA 4 enclosure with ANSI 61 gray, corrosive resistant paint. The NEMA 4X enclosures are for harsher environments made from 16 gauge 304 stainless steel. The NEMA 4X enclosure can also be specified with 316 stainless steel.

Code Compliance and Certifications

Lead-Free

Products marked with the Lead-Free logo comply with the Safe Drinking Water Act (SDWA) requirements of a weighted average of less than 0.25% lead content on wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures.

ETL listed to UL499

Intertek

Standard product selections contained within this document are third party CERTIFIED to NSF/ANSI 372 meeting the Lead-Free content requirement. Any product configured with custom options will be COMPLIANT with NSF/ANSI 372 meeting the Lead-Free content requirement.

Certified to NSF/ANSI 372

Product Options

Building Management System Integration

The D1 option transfers control of the heater to a Building Management System (BMS). The heater is no longer adjusted or controlled at the heater location. 4-20mA input for integration with BMS. The D1 option requires selecting a NEMA 4/4X cabinet enclosure.

Other Product Options

For additional heater options and installation accessories, reference the appropriate section at the end of this document.

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www.keltech-inc.com

KELTECH INCORPORATED
A Subsidiary of Bradley

HL Series - Commercial Heaters

Tankless Water Heating Solutions

Electrical Specifications for the Heater (1-Phase)

All internal fuses necessary for installation are included with the unit.

Capacity (kW)	Voltage	Maximum Amperage	Minimum AWG Wire Size
5	208	25	10
5	240	21	10
6	208	29	8
6	240	25	10
6	277	22	10
6	480	13	12
10	208	48	6
10	240	42	6
12	208	58	6
12	240	50	6
12	480	25	10
12	277	43	6
15	208	72	4
15	240	63	4
18	208	87	4
18	240	75	4
18	277	65	4
18	480	38	8

HL Pressure Drop Advantage

Pressure Drop							
GPM	1	2	3	4	5	6	7
PSI	0	2	4	8	12	17	24
L-MIN	3.8	7.6	11.3	15.1	18.9	22.7	26.5
BAR	0.0	0.1	0.3	0.5	0.8	1.2	1.6

Electrical Specifications for the Heater (3-Phase)

All internal fuses necessary for installation are included with the unit.

Capacity (kW)	Voltage	Maximum Amperage	Minimum AWG Wire Size
10	208	28	10
10	480	13	12
15	208	42	6
15	240	36	8
18	208	50	6
18	240	43	6
18	480	22	10

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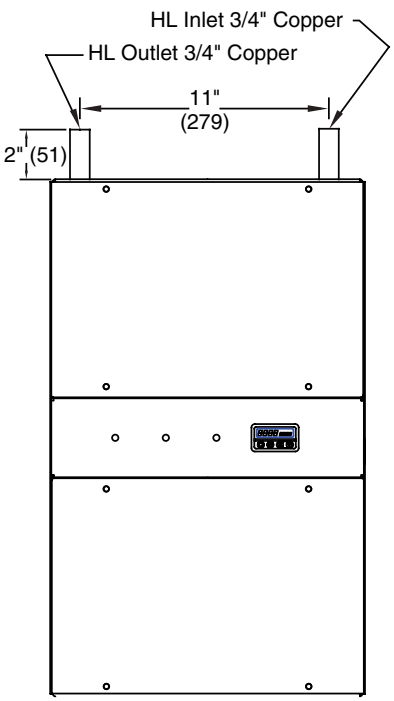
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HL Series - Commercial Heaters

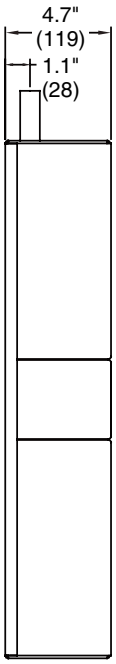
Tankless Water Heating Solutions

HL Series - NEMA 1 Dimensions (mm)

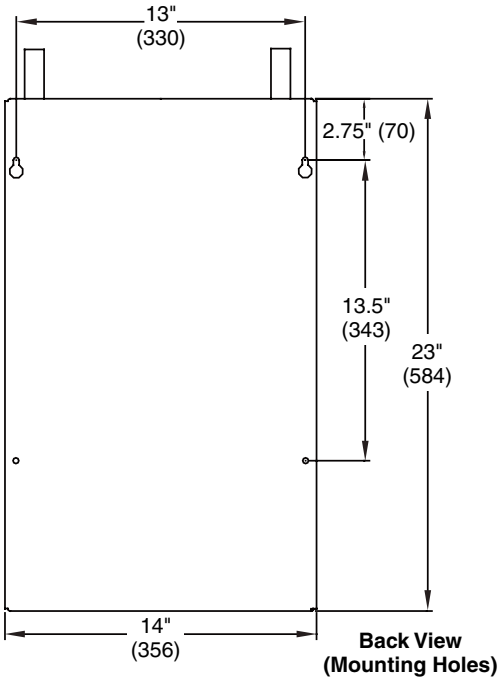
☑ *Select product options shown. Other options available.*



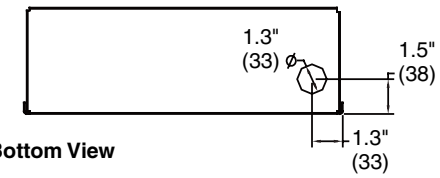
Front View



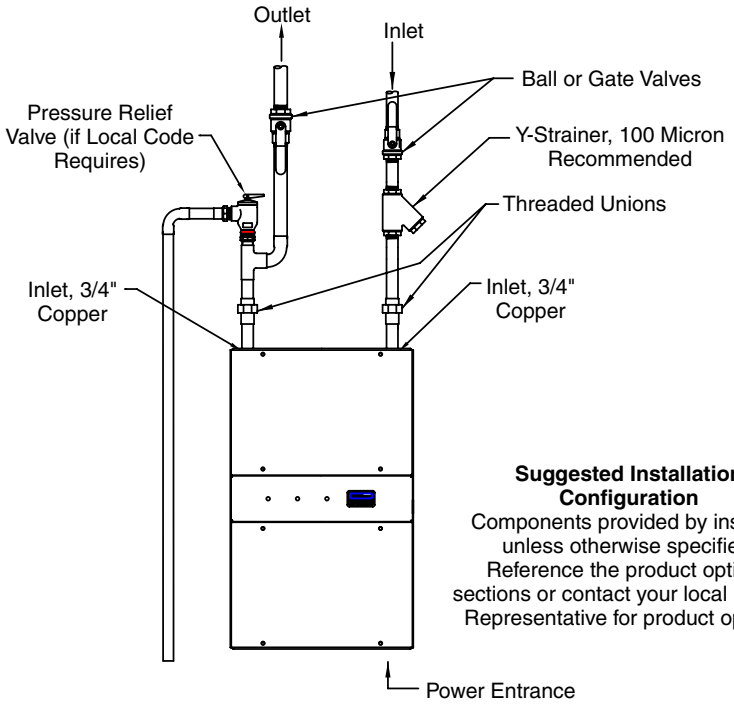
Side View



Back View (Mounting Holes)



Bottom View



Suggested Installation Configuration
Components provided by installer unless otherwise specified. Reference the product options sections or contact your local Bradley Representative for product options.

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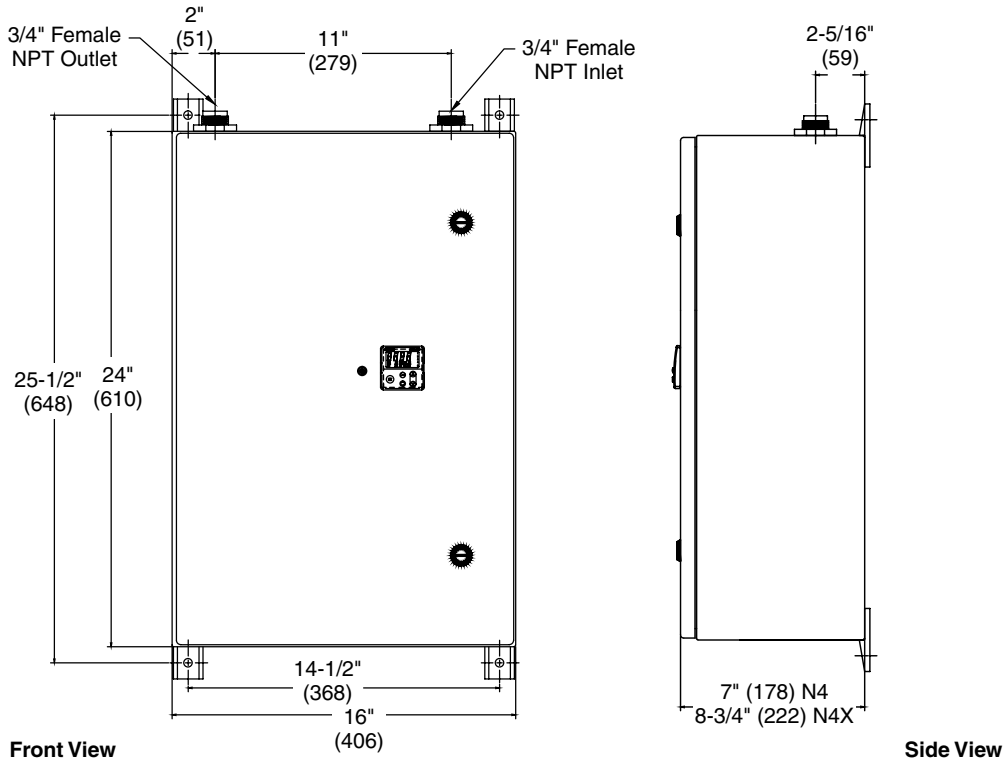
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HL Series - Commercial Heaters

Tankless Water Heating Solutions

HL Series - NEMA 4/4X Dimensions (mm)

Select product options shown. Other options available.



Front View **Side View**

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HL Series - Commercial Heaters

Tankless Water Heating Solutions

kW Calculator

HL Series (kW): 5, 6, 10, 12, 15, 18

		Temperature Δ°F (°C)																										
		10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	100°	105°	110°	115°	120°	125°	130°	135°	140°
	GPM L-MIN	(6°)	(8°)	(11°)	(14°)	(17°)	(19°)	(22°)	(25°)	(28°)	(31°)	(33°)	(36°)	(39°)	(42°)	(44°)	(47°)	(50°)	(53°)	(56°)	(58°)	(61°)	(64°)	(67°)	(69°)	(72°)	(75°)	(78°)
	0.15 0.6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	0.25 0.9	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6
	0.50 1.9	5	5	5	5	5	5	5	5	5	5	5	5	6	6	6	10	10	10	10	10	10	10	10	10	10	10	12
	0.75 2.8	5	5	5	5	5	5	5	5	6	6	10	10	10	10	10	10	10	12	12	12	15	15	15	15	15	15	18
Flow	1 3.8	5	5	5	5	5	6	6	10	10	10	10	10	12	12	12	15	15	15	15	18	18	18	18	-	-	-	-
	1.5 5.7	5	5	5	6	10	10	10	10	12	15	15	15	18	18	18	-	-	-	-	-	-	-	-	-	-	-	-
	2 7.6	5	5	6	10	10	12	12	15	15	18	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3 11.3	5	10	10	12	15	18	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4 15.1	6	10	12	12	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5 18.9	10	12	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6 22.7	10	15	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7 26.5	12	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Sizing for the proper flow rate is important. If the temperature rise requirements exceed a single HL model, consider using multiple HL-Series units or the C1N & C2N Series. Please contact your Keltech Representative for additional product information.

How to Size a Heater

1. Calculate Delta-T (ΔT).
   Set point temp - coldest ground water temp = ΔT ΔT = _____
2. Select kW required by using chart or formula below.
   Peak demand in GPM x ΔT x .1465 = kW kW = _____
3. Confirm voltage and phase available on site. Voltage and Phase = _____
4. Confirm minimum flow. Minimum Flow = _____

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HL Series - Commercial Heaters

Tankless Water Heating Solutions

Standard Product - HL Series (Single Phase)

5kW Commercial Heaters
- ☐ **HL050/208D** Single Phase 5kW, 208V Commercial Heater
- ☐ **HL050/240D** Single Phase 5kW, 240V Commercial Heater**

6kW Commercial Heaters
- ☐ **HL060/208D** Single Phase 6kW, 208V Commercial Heater
- ☐ **HL060/240D** Single Phase 6kW, 240V Commercial Heater
- ☐ **HL060/277D** Single Phase 6kW, 277V Commercial Heater
- ☐ **HL060/480D** Single Phase 6kW, 480V Commercial Heater

10kW Commercial Heaters
- ☐ **HL100/208D** Single Phase 10kW, 208V Commercial Heater
- ☐ **HL100/240D** Single Phase 10kW, 240V Commercial Heater**

12kW Commercial Heaters
- ☐ **HL120/208D** Single Phase 12kW, 208V Commercial Heater
- ☐ **HL120/240D** Single Phase 12kW, 240V Commercial Heater
- ☐ **HL120/277D** Single Phase 12kW, 277V Commercial Heater
- ☐ **HL120/480D** Single Phase 12kW, 480V Commercial Heater

15kW Commercial Heaters
- ☐ **HL150/208D** Single Phase 15kW, 208V Commercial Heater
- ☐ **HL150/240D** Single Phase 15kW, 240V Commercial Heater**

18kW Commercial Heaters
- ☐ **HL180/208D** Single Phase 18kW, 208V Commercial Heater
- ☐ **HL180/240D** Single Phase 18kW, 240V Commercial Heater
- ☐ **HL180/277D** Single Phase 18kW, 277V Commercial Heater
- ☐ **HL180/480D** Single Phase 18kW, 480V Commercial Heater

** This specific model may have a longer lead time if ordered with the TE2 option.

☑ **Only 480V heaters can be down rated to 380, 400 and 415 volts.**

Standard Product - HL Series (Three Phase)

10kW Commercial Heaters (Three Phase)
- ☐ **HL103/208D** Three Phase 10kW, 208V Commercial Heater
- ☐ **HL103/480D** Three Phase 10kW, 480V Commercial Heater

15kW Commercial Heaters (Three Phase)
- ☐ **HL153/208D** Three Phase 15kW, 208V Commercial Heater
- ☐ **HL153/240D** Three Phase 15kW, 240V Commercial Heater**

18kW Commercial Heaters (Three Phase
- ☐ **HL183/208D** Three Phase 18kW, 208V Commercial Heater
- ☐ **HL183/240D** Three Phase 18kW, 240V Commercial Heater
- ☐ **HL183/480D** Three Phase 18kW, 480V Commercial Heater

Product Options

☐	**D1***	4-20mA Input for Integration with Facility Controls*
☐	**IC**	Temperature Lock Out at _____°F (40-160°F) or _____°C (5-71°C)
☐	**L15**	Low Flow .15 GPM Turn On Point
☐	**L25**	Low Flow .25 GPM Turn On Point
☐	**N4**	NEMA-4 Enclosure (NEMA 1 Standard)
☐	**N4X**	NEMA-4X Enclosure - Stainless Steel
☐	**N4-EXP2**	NEMA-4 Enclosure w/ Explosion Proof Class1/Division2
☐	**N4X-EXP2**	NEMA-4X Stainless Steel Enclosure w/ Explosion Proof Class1/Division2
☐	**T190**	High Temperature Package_____ (Specify temp between 160°F and 190°F)
☐	**TE2**	Xylan Fluoropolymeric Coated Heat Exchanger with Bright Annealed Stainless Steel Elements, FDA Approved for Food Contact (Use in deionized water applications)

* D1 requires NEMA 4 and NEMA 4X Enclosure

Installation Accessories

☐	**BSPP†**	Stainless steel thread adapter converts NPT to BSPP
☐	**PR**	Pressure and Temperature Relief Valve
☐	**PRS**	ASME pressure relief valve, stainless steel
☐	**YS**	Y-Strainer
☐	**YSS**	Y-Strainer, stainless steel

† Use with NEMA 4 or NEMA 4X Enclosure only.

☑ **Keltech Tankless Water Heaters are non-cancelable, non-refundable and non-returnable.**

Enhanced Performance Tuning

Please select your type of application. Keltech will precisely "tune" your heater specifically to your application for the highest level of performance at no additional charge.

- ☐ **Process Heating**
- ☐ **Potable**
- ☐ **Boosting**
- ☐ **Re-Circulating**

Application Attributes (MANDATORY)

Coldest ground water temperature:_____

Minimum Flow:_____

Maximum Flow:_____

Set point temperature:_____

Delta T Calculation

Set Point Temperature - Coldest Incoming Water Temperature = Minimum Delta T for Application

Model Number Configuration

HL____/____D-____-____-____-____-____-____-____

List applicable option codes alphabetically. Do not include Installation Accessories in configuration.

Customer Signoff_____

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AC Power
For *Business-Critical Continuity™*

Liebert® NX™

UPS For Small And Medium Business





EMERSON™
Network Power

Emerson Network Power Has A UPS That Matches Your Growth Plans

Changing data centers, rapid and unpredictable growth, plus a myriad of other power-related challenges are making it increasingly difficult to protect critical network equipment and other electronic components.

As you upgrade and expand your business, do you find small UPS proliferating throughout your racks? Do you lose track of how old each UPS is and when the batteries should be replaced? Are dropped loads your first indication that the UPS has a problem?

If this situation sounds familiar, then a data center UPS like the Liebert NX can simplify your life by eliminating multiple points of failure, and consolidating your power equipment into one professionally serviced system. If your power requirements are changing faster than your UPS can, there is a Liebert NX model that is perfect for your application.



Liebert NX: The Right Combination Of Features And Flexibility For Growing Data Centers

Liebert NX is a true on-line, double conversion, three-phase UPS system that delivers complete, centralized power protection for mission-critical systems. Designed to meet the high availability power needs of a wide variety of IT applications, this power solution delivers advanced operating features and low cost of ownership.

There Is A Liebert NX UPS System That Is Ideally Suited To Power Electronic Equipment In Your Small To Medium Business:

- Small to mid-size data centers
- Server rooms
- Production
- Labs and testing
- Telecommunications
- Process control
- Point-of-sale
- And other sensitive electronics

A Power Solution For Every Level Of Need

The full line of Liebert NX power systems covers a range of UPS capacities to meet the needs of small and medium data centers:

Small Data Centers with up to 10 Racks:
Liebert NX 10-30 kVA UPS



Liebert NX
10, 15, 20 & 30 kVA

Liebert NX 10-30 kVA UPS

- Increases growth flexibility by handling larger loads, plus the ability to parallel 20 and 30 kVA modules for increased capacity and redundancy.
- Achieves higher availability by reducing the number of UPS units required to power your room.
- Reduces total cost of ownership through the use of longer life batteries and simplified preventive maintenance.

Small Data Centers with 10-30 Racks
Liebert NX 40-120 kVA UPS with Softscale™



Liebert NX
40, 60, 80, 100 & 120 kVA

Medium Data Centers with up to 200 Racks
Liebert NX 160-200 kVA UPS with Softscale



Liebert NX
160 & 200 kVA

Liebert NX 40-200 kVA UPS

- Softscale™ technology provides flexibility to increase UPS capacity by 20 or 40 kVA without changes in your infrastructure.
- Parallel UPS modules for capacity and redundancy and eliminate the batteries as a single point of failure because each UPS has its own isolated battery.
- Softscale™ technology, paralleling capabilities and Eco-mode™, all contribute to lower initial, incremental and operating costs.

Liebert NX: Flexible, Reliable And Economical



The Liebert NX family of UPS systems combines numerous technology advances and innovations to create a power system that combines high performance, compact size, reliability and cost-efficiency. Liebert NX models are available with characteristics to fit the flexibility and availability needs of different sites.

Flexibility:

- Parallel units that are the same or different capacities for greater flexibility in managing power growth.
- Generator compatible.
- Power communications available through Liebert IntelliSlot® Web Card LB and Liebert MultiLink™ shutdown software.
- Large and user-friendly LCD display provides operating information in twelve languages.
- Internal automatic bypass transfers load to bypass in the unlikely event that a fault occurs in the UPS. Optional wrap-around maintenance bypass allows the UPS to be powered down or taken out of service without disconnecting power to the load.
- Easy servicing due to front accessibility of critical components, self-diagnostics and various monitoring options.
- Optional Bypass Distribution Cabinets.

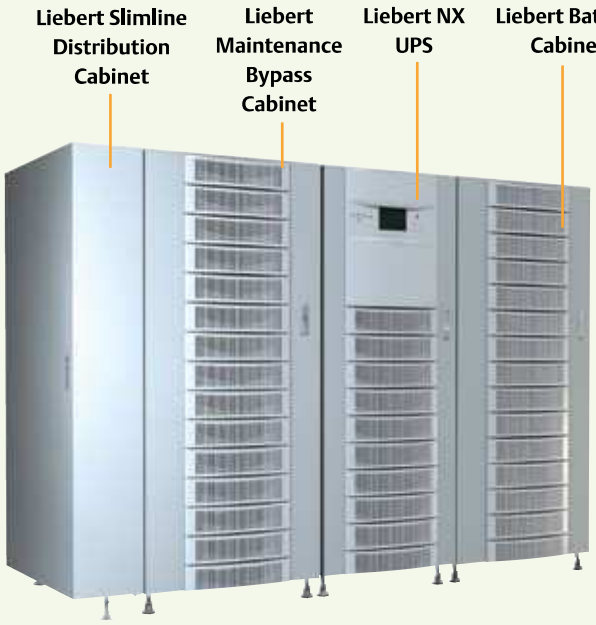
Higher Availability:

- Wider input voltage window and frequency tolerances help to minimize transfer to battery, reducing the number of charging and discharging cycles.
- High overload rating capable of clearing a 20 A branch circuit breaker.
- True on-line double conversion technology protects and conditions against the full range of power irregularities, requiring fewer transfers to battery.
- Advanced inverter control technology provides the highest output power quality to maximize efficiency and operating life of connected equipment.
- Load Bus Synchronization provides the capability to synchronize the outputs of two independent UPS modules when they are configured as a redundant system feeding independent distribution paths.
- An intelligent battery management algorithm monitors the battery to detect any premature battery failure.

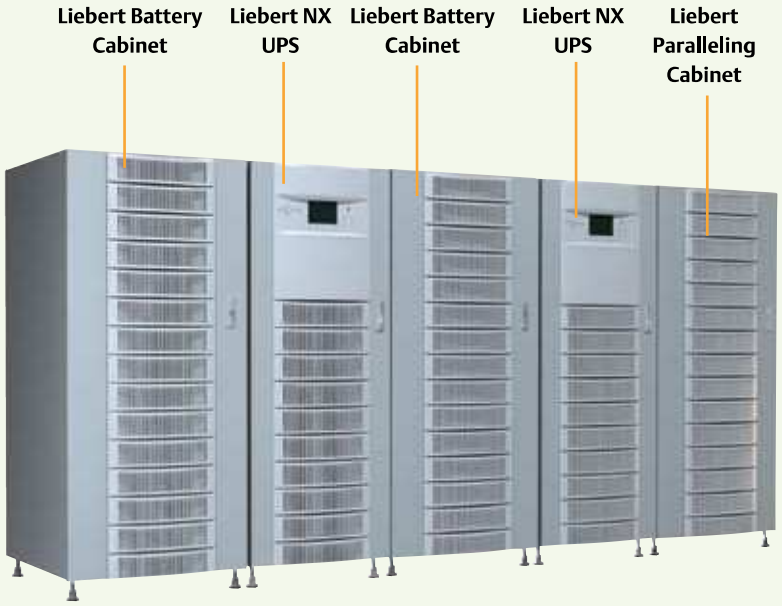
Lowest Total Cost Of Ownership:

- Soft-switching technology optimizes operation with the same high efficiency at 40% utilization as at 100% utilization.
- Adaptive input voltage window results in fewer hits on the battery.
- The unit's compact footprint requires less floor space, leaving you with more room for other equipment.
- Temperature-compensated battery charging extends battery life.
- Softscale technology allows you to purchase the capacity you need now and economically upgrade in the future without the expense of additional cabinets or floorspace.

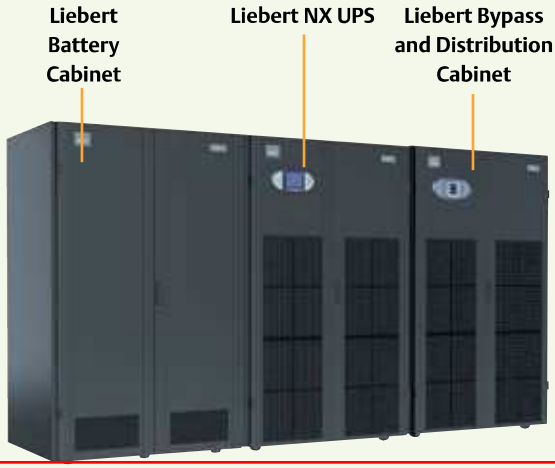
10-30 KVA Liebert NX *Single Module*



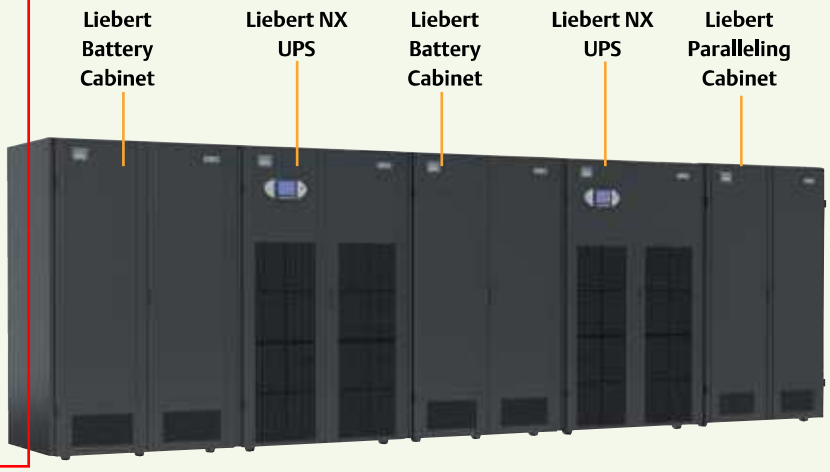
20-30 KVA Liebert NX *Multi-Module*



40-200 KVA Liebert NX *Single Module*



40-200 KVA Liebert NX *Multi-Module*



40-120 KVA Liebert NX



Specifications

Models	NX 40 kVA UPS	NX 60 kVA UPS	NX 80 kVA UPS	NX 80 kVA UPS	NX 100 kVA UPS	NX 120 kVA UPS	31" Battery Cabinet	54" Battery Cabinet	BDC
Power Rating - kVA	40	60	80	80	100	120	80	120	75, 125
Power Rating - kW	36	54	72	72	90	108	72	108	75, 125
Input AC Specifications									
Phase	3						N/A		3
Power Factor	> 0.99 at full load; >0.98 at half load						N/A		1
Frequency - Hz	50 or 60Hz.						N/A		60hZ
Input Voltage	480, 3 Wire + Ground						N/A		208, 220, 240, 480, 600
Input Voltage Range	+15, -20						N/A		+15-20
General Specifications									
Technology	On-Line, double conversion UPS						VRLA Battery Cabinet		Optional Maintenance Bypass & Distribution
Battery Specifications									
Battery Test Type	On-Line						Optional Alber Battery Monitoring		N/A
Battery Technology	VRLA, Wet Cells, Nicad						Valve Regulated Lead Acid (VRLA)		N/A
Output AC Specifications									
Nominal Voltage	480 VAC, 3 wire plus ground						480 VDC		208/120, 220/127, 480. 600
Frequency - Hz	60 (50 Hz in frequency converter mode)						N/A		60 Hz.
Output Waveform	Sinewave						N/A		Sinewave
Distribution	N/A						N/A		Optional subfeeds, panelboards or terminals
User Interface									
LCD Display	Yes						N/A		LCD Display
Communications									
Communications Options	Intellislot, SNMP, Relay Card, MultiLink						Optional Alber Battery Monitoring		Local V & I, Optional ModBUS
Physical Data									
Form Factor	Rack								
Unit Height - inches (mm)	78.7 (2000)								
Unit Width - inches (mm)	25.5 (648)		41 (1040) 25.5 (648) when used with BDC				33.5 (850)	48.8 (1240)	24-71 (609-1803)
Unit Depth - inches (mm)	39.0 (990)								
Unit Weight - lbs. (kg)	1290 (585)		1422 (645)				1750 - 2620 (794 - 1188)	3438 - 5502 (1560 - 2496)	varies by configuration
Shipping Height - inches (mm)	86 (2185)		86 (2185)				86 (2185)	86 (2185)	varies by configuration
Shipping Width - inches (mm)	48.0 (1200)		48.0 (1200)				48 (1220)	48 (1220)	varies by configuration
Shipping Depth - inches (mm)	48.0 (1200)		60.0 (1524)				48 (1220)	65 (1651)	varies by configuration
Shipping Weight - lbs. (kg)	1440 (653)		1572 (713)				1900 - 2770 (885 - 1280)	3638 - 5702 (1650 - 2586)	varies by configuration
Environmental									
Operating Temperature, Min., °F (°C)	32 (0)								
Operating Temperature, Max., °F (°C)	104 (40)								
Storage Temperature, Min., °F (°C)	-4 (-20)								
Storage Temperature, Max., °F (°C)	158 (70) Note: Batteries should not be stored above 86 (30)								
Relative Humidity	0% to 95%, Non Condensing								
Operating Elevation - ft. (m)[2]	3,300 (1000) per IEC 62040/3								
Sound Emission/Audible Noise	61		63				N/A		55
Cooling	Fan Cooled						convection		convection
Agency/Certification/Conformance									
Agency Approval	UL 1778, c-UL, FCC Class A								UL 60950, c-UL, FCC Class A
Warranty									
Standard	1 Year								



160-200 KVA Liebert NX

Specifications

Models	NX 160 kVA	NX 200 kVA	NX Battery Cabinet 160-200 kVA	NX BDC
Power Rating - kVA	160	200	200	225
Power Rating - kW	144	180	180	225
Input AC Specifications				
Phase	3		N/A	3
Power Factor	> 0.99 at full load; >0.98 at half load		N/A	1
Frequency - Hz	50 or 60Hz		N/A	60hZ
Input Voltage	480, 3 Wire + Ground		N/A	208, 220, 240, 480, 600
Input Voltage Range	+15, -20		N/A	+15-20
General Specifications				
Technology	On-Line, double conversion		VRLA Battery Cabinet	Optional Maintenance Bypass & Distribution
Battery Specifications				
Battery Test Type	On-Line		Optional Alber Battery Monitoring	N/A
Battery Technology	VRLA, Wet Cells, Nicad		Valve Regulated Lead Acid (VRLA)	N/A
Output Specifications				
Nominal Voltage	480VAC, 3 wire plus ground		480 VDC	208/120, 220/127, 480. 600
Frequency - Hz	60 (50 Hz in frequency converter mode)		N/A	60 Hz
Output Waveform	Sinewave		N/A	Sinewave
Distribution	N/A		N/A	Optional subfeeds, panelboards or terminals
User Interface				
LCD Display	Yes		N/A	Yes
Communications				
Communications Options	Intellislot, SNMP, Relay Card, MultiLink		Optional Alber Battery Monitoring	Local V & I, Optional ModBUS
Physical Data				
Form Factor	Rack			
Unit Height - inches (mm)	78.7 (2000)			
Unit Width - inches (mm)	64.4 (1636)		48.8 (1240)	47 - 94 (1194 - 2388)
Unit Depth - inches (mm)	39 (990)			
Unit Weight - lbs. (kg)	2201 (1000)		3438 - 5502 (1560 - 2496)	varies by configuration
Shipping Height - inches (mm)	86 (2185)		86 (2185)	varies by configuration
Shipping Width - inches (mm)	48 (1220)		48 (1220)	varies by configuration
Shipping Depth - inches (mm)	48 (1220)		65 (1651)	varies by configuration
Shipping Weight - lbs. (kg)	2500 (1134)		3638 - 5702 (1650 - 2586)	varies by configuration
Environmental				
Operating Temperature, Min., °F (°C)	32 (0)			
Operating Temperature, Max., °F (°C)	104 (40)			
Storage Temperature, Min., °F (°C)	-4 (-20)			
Storage Temperature, Max., °F (°C)	158 (70) Note: Batteries should not be stored above 86 (30)			
Relative Humidity	0% to 95%, Non Condensing			
Operating Elevation - ft. $(m)^2$	3,300 (1000) per IEC 62040/3			
Sound Emission/Audible Noise	68.5		N/A	55
Cooling	Fan Cooled		convection	convection
Agency/Certification/Conformance				
Agency Approval	UL 1778, c-UL, FCC Class A UL 1778, c-UL, FCC Class A			UL 60950, c-UL, FCC Class A
Warranty				
Standard	1 Year			

Ensuring The High Availability Of Mission-Critical Data And Applications.

Emerson Network Power, a business of Emerson (NYSE:EMR), is the global leader in enabling *Business-Critical Continuity*™ from grid to chip for telecommunication networks, data centers, health care and industrial facilities. Emerson Network Power provides innovative solutions and expertise in areas including AC and DC power and precision cooling systems, embedded computing and power, integrated racks and enclosures, power switching and controls, infrastructure management, and connectivity. All solutions are supported globally by local Emerson Network Power service technicians. Liebert AC power, precision cooling and monitoring products and services from Emerson Network Power deliver Efficiency Without Compromise™ by helping customers optimize their data center infrastructure to reduce costs and deliver high availability.

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Distribution Dry-Type Transformers Overview

Energy-Efficient Transformers



NEMA TP-1 Energy-Efficient Ventilated Transformer

Eaton's family of energy-efficient transformers meet NEMA TP-1 efficiency requirements and federal energy efficiency laws mandated by the Energy Policy Act of 2005. Distribution transformers installed in the United States are required to meet these energy efficiency requirements. Energy-efficient transformers are especially designed to have low no load (core) losses. Minimum efficiency levels have been established for these transformers when loaded at 35% of their full load capacity. Available 600V. Eaton offers a wide variety of energy-efficient transformers, including 150°C, 115°C or 80°C; general purpose or K-factor rated; with aluminum or copper windings. Eaton's energy-efficient transformers are manufactured with a NEMA 2 enclosure as standard, and are suitable for installation outdoors when a NEMA 3R weathershield kit is installed. Eaton's energy-efficient transformers use a 220°C insulation system with 150°C temperature rise as standard.

Installation of energy-efficient transformers may help facilities earn points toward LEED® certification from the U.S. Green Building Council.

Refer to **Page 19.1-16** for additional information.

K-Factor Rated Nonlinear Transformers



Ventilated Transformer

Eaton K-Factor nonlinear transformers are specifically designed to withstand the harmful overheating effects caused by harmonics generated by nonlinear (non-sinusoidal) loads. These loads include computers, laser printers, copiers and other office equipment, as well as video monitors and other electronic equipment. The core and coils of K-Factor transformers are especially designed to have reduced induction levels, which result in a reduction in stray losses. Oversized (200% rated) neutrals and electrostatic shielding are provided as standard on K-Factor transformers. Eaton K-Factor transformers are available in ratings with a K-factor of 4, 13, 20, 30, 40 and 50. 600V-class single-phase models are available to 167 kVA; three-phase ratings to 1500 kVA. Eaton's family of K-Factor transformers are manufactured with the same high-quality construction features as our ventilated transformer products, including NEMA 2 enclosures and the 220°C (Class R) insulation system with 150°C temperature rise as standard.

Refer to **Page 19.1-11** for additional information. Eaton K-Factor–rated transformers comply with NEMA TP-1 standards.

Harmonic Mitigating Transformers



Harmonic Mitigating Ventilated Transformer

Eaton's harmonic mitigating transformers (HMTs) are specially designed transformers that treat a wide variety of harmonics. Also called "phase-shifting" transformers, their low zero-sequence impedance wye zig-zag secondary windings prevent harmful triplen (3rd, 9th, 15th, etc.) harmonic currents from coupling into the primary delta, where they can progress upstream to the service entrance. Multiple HMTs with a variety of phase-shift configurations can be applied in a coordinated scheme to target 5th, 7th, and higher order harmonics at the common bus feeding all of the transformers. HMTs are ideally suited for installations rich in harmonic loads, such as educational facilities (K-12 and universities), government, commercial, medical and call-center applications. HMTs are manufactured with the same high-quality features as Eaton's ventilated transformers, including NEMA 2 enclosures and the 220°C (Class R) insulation system with 150°C temperature rise as standard. Additionally, Eaton's HMTs are manufactured with a 200% neutral and electrostatic shield as standard.

Refer to **Page 19.1-12** for additional information.

HMTs are available in four configurations:

- Type NON (0° phase-shift)
- Type THR (30°)
- Type POS (+15°)
- Type NEG (–15°)

Available in three-phase ratings to 500 kVA and 600V. All Eaton HMTs meet or exceed NEMA TP-1 efficiency levels, when operated under either linear or nonlinear load profiles Eaton HMT transformers comply with NEMA TP-1 standards.

General Construction Features of General Purpose (TP-1, K-Factor TP-1 and HMT TP-1) Ventilated Transformers Rated 600V and below

General Description

Eaton's single-phase and three-phase general purpose dry-type ventilated transformers are of the two-winding type, self-cooled, and are available in a wide variety of primary and secondary voltage combinations.

Eaton's transformers are designed, manufactured and tested in accordance with all of the latest applicable ANSI, NEMA and IEEE standards. All 600V class ventilated transformers with ratings through 1500 kVA are UL® listed and bear the UL label. Open core and coil assemblies are UR labeled products.

These transformers are designed for continuous operation at rated kVA for 24 hours a day, 365 days a year, with normal life expectancy as defined in ANSI C57.96.

Insulation System

Industry standards classify insulation systems and temperature rise as shown below.

Table 19.1-1. Insulation System Classified

Ambient Temperature	+ Winding Rise	+ Hot Spot	= Temp. Class
40°C	80°C	30°C	150°C
40°C	115°C	30°C	185°C
40°C	150°C	30°C	220°C

The design life of transformers having different insulation systems is the same; the lower temperature systems are designed for the same life as the higher temperature systems.

Eaton's ventilated transformers, regardless of their temperature rise, are manufactured using a 220°C insulation system. Required performance is obtained without exceeding the insulation system rating at rated temperature rise in a 40°C maximum ambient, with an average ambient temperature of 30°C over a 24-hour period.

All insulation materials used are flame-retardant and do not support combustion as defined in ASTM Standard Test Method D635.

Core and Coil Assemblies

The transformer core is constructed using high-grade, non-aging, silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Maximum magnetic flux densities are substantially below the saturation point. The transformer core volume allows for efficient transformer operation at 10% above the nominal tap voltage. The core laminations are tightly clamped and compressed. Coils are wound of electrical grade aluminum or copper, and are of continuous wound construction. The BIL (basic impulse level) for all 600V-class windings is 10 kV. The core and coil assembly is installed on vibration-absorbing pads.

Ventilated transformers with wye-connected secondaries have the neutral brought out to a separate XO terminal or bus bar.

The core and coil assembly is grounded to the transformer enclosure by means of a visible flexible copper ground strap. The copper ground strap is sized per the NEC to be a grounding conductor.

Taps

Primary taps are available on most Eaton ventilated transformers to allow compensation for source voltage variations.

Winding Terminations

Primary and secondary windings are terminated in the wiring compartment. Encapsulated units have copper leads or stabs brought out for connections. Ventilated transformers have leads brought out to aluminum or copper pads that are pre-drilled to accept Cu/Al lugs. Aluminum-wound transformers have aluminum pads; copper-wound transformers have copper pads. Lugs are not supplied with Eaton transformers; however, lug kits are available as a field-installed accessory. Eaton recommends external cables be rated 90°C (sized at 75°C ampacity) for encapsulated designs and rated 75°C for ventilated designs.

Series-Multiple Windings

Series-multiple windings consist of two similar coils in each winding that can be connected in series or parallel (multiple). Transformers with series-multiple windings are designated with an "x" or a "/" between the voltage ratings, such as voltages of "240 x 480" or "120/240." If the series-multiple winding is designated by an "x," the winding can be connected only in series or parallel. With a "/" designation, a mid-point also becomes available in addition to the series or parallel connection. As an example, a 240 x 480 winding can be connected for either 240 (parallel) or 480 (series). A 120/240 winding can be connected for either 120 (parallel) or 240 (series), or 240 with a 120 mid-point.

Enclosures

The transformer enclosure is made of heavy-gauge steel and is finished using a continuous process of degreasing, cleaning and phosphatizing, followed by electrostatic deposition of a thermo-setting polyester powder coating and subsequent baking. The coating color is ANSI 61 and is UL recognized for outdoor use. In compliance with NEMA ST-20, Eaton's ventilated transformers are designed such that the maximum temperature on the top of the enclosure does not exceed 50°C rise above the ambient temperature.

For ventilated transformers, the enclosure construction is ventilated, drip-proof, NEMA 2, with lifting provisions. All ventilation openings are protected against falling dirt. Proper installation of weathershields on ventilated transformers makes the enclosure NEMA 3R rated and suitable for outdoor use.

To ensure proper ventilation and cooling of the transformer, follow manufacturer's recommended clearances around ventilation openings.

Installation Clearances

Eaton's transformers should be installed with a minimum of 6 inches of clearance around the transformer enclosure to prevent accidental contact with flammable or combustible materials. Most Eaton ventilated transformers require a minimum of 6 inches of clearance in front and in back of the transformer to allow for proper airflow through the transformer. Care should be taken to avoid restricting the airflow through the bottom of the transformer.

Transformers should be located in areas not accessible to the public.

Sound Levels

All transformers emit some audible sound due mainly to the vibration generated in their core by alternating flux. NEMA ST-20 defines the maximum average sound levels for transformers.

Table 19.1-2. NEMA ST-20 and IEEE C57.12.01 Maximum Audible Sound Levels for 600V Class Transformers (dB 40)

kVA	Ventilated Transformers	Encapsulated Transformers
0–9	40	45
10–50	45	50
51–150	50	55
151–300	55	57
301–500	60	—
501–700	62	—
701–1000	64	—
1001–1500	65	—

All Eaton ventilated transformers are designed to have audible sound levels lower than those required by NEMA ST-20. However, consideration should be given to the specific location of a transformer and its installation to minimize the potential for sound transmission to surrounding structures and sound reflection. Installation and ambient conditions at a specific location can result in field-measured audible sound levels as much as 15 dBA greater than those levels measured in a sound-proof chamber. The following installation methods should be considered:

1. If possible, mount the transformer away from corners of walls or ceilings. For installations that must be near a corner, use sound-absorbing materials on the walls and ceiling if necessary to eliminate reflection.
2. Provide a solid foundation for mounting the transformer and use vibration dampening mounts if not already provided in the transformer. Eaton's ventilated transformers contain a built-in vibration dampening system to minimize and isolate sound transmission. However, supplemental vibration dampening mounts installed between the floor and the transformer may provide additional sound dampening.
3. Make electrical connections to the transformer using flexible conduit.
4. Locate the transformer in an area where audible sound is not offensive to building inhabitants.
5. If a transformer is going to be installed in a location where the audible sound could be objectionable, consider installing a transformer specifically designed to have reduced sound levels. Eaton offers many transformers with a sound reduction up to 5 dB below NEMA ST-20 limits.

Applicable Standards

600V-class ventilated transformers are manufactured per the following standards:

- UL 1561
- NEMA ST-20
- ANSI C57.12.01
- IEC 60726 for CE-marked ventilated models

Seismic Qualification



Refer to **Tab 1** for information on seismic qualification for this and other Eaton products.

Standard Production Tests

The following production tests are performed as standard on all Eaton transformers, prior to shipment:

1. Ratio tests at the rated voltage connection and at all tap connections.
2. Polarity and phase relation tests on the rated voltage connection.
3. Applied potential tests.
4. Induced potential tests.
5. No-load and excitation current at rated voltage on the rated voltage connection.

Operation

Eaton's ventilated transformers are designed for continuous operation at rated kVA for 24 hours a day, 365 days a year, with normal life expectancy as defined in ANSI C57.96.

Short-term overload capacity is designed into transformers, as required by ANSI. Ventilated transformers will deliver 200% of nameplate load for 30 minutes; 150% of nameplate load for 1 hour; and 125% of nameplate load for 4 hours without being damaged, provided that a constant 50% load precedes and follows the overload. Refer to ANSI C57.96-01.250 for additional limitations.

Note: Continuous overload capacity is not deliberately designed into transformers. The design objective is to be within the allowable winding temperature rise at nameplate full load capacity.

However, because Eaton's ventilated transformers are manufactured using a 220°C insulation system, 115°C and 80°C low temperature rise transformers can be operated as 150°C rise transformers. The excess thermal capacity of these low temperature rise transformers allows a 115°C transformer to be operated as a 150°C rise transformer and overloaded by 15% of its nameplate kVA without compromising the normal life of the transformer. Likewise, an 80°C rise transformer operated as a 150°C rise transformer is capable of a constant 30% overload without compromising the normal life expectancy of the transformer.

Table 19.1-3. Rated Line Amperes for kVA and Voltages of Single-Phase Transformers

kVA Rating	Rated Line Voltage								
	120	208	240	277	480	600	2400	4160	4800
1	8.3	4.8	4.2	3.6	2.1	1.7	0.4	0.2	0.2
1.5	12.5	7.2	6.3	5.4	3.1	2.5	0.6	0.4	0.3
2	16.7	9.6	8.3	7.2	4.2	3.3	0.8	0.5	0.4
3	25.0	14.4	12.5	10.8	6.3	5.0	1.3	0.7	0.6
5	41.7	24.0	20.8	18.0	10.4	8.3	2.1	1.2	1.0
7.5	62.5	36.6	31.3	27.1	15.6	12.5	3.1	1.8	1.6
10	83.3	48.1	41.7	36.1	20.8	16.7	4.2	2.4	2.1
15	125.0	72.1	62.5	54.2	31.3	25.0	6.3	3.6	3.1
25	208.3	120.2	104.2	90.3	52.1	41.7	10.4	6.0	5.2
37.5	312.5	180.3	156.3	135.4	78.1	62.5	15.6	9.0	7.8
50	416.7	240.4	208.3	180.5	104.2	83.3	20.8	12.0	10.4
75	625.0	360.6	312.5	270.8	156.3	125.0	31.3	18.0	15.6
100	833.3	480.8	416.7	361.0	208.3	166.7	41.7	24.0	20.8
167	1391.7	802.9	695.8	602.9	347.9	278.3	69.6	40.1	34.8
250	2083.3	1201.9	1041.7	902.5	520.8	416.7	104.2	60.1	52.1
333	2775.0	1601.0	1387.5	1202.2	693.8	555.0	138.8	80.0	69.4
500	4166.7	2403.8	2083.3	1805.1	1041.7	833.3	208.3	120.2	104.2

Note: Line Current = (kVA x 1000)/Line Voltage.

Table 19.1-4. Rated Line Amperes for kVA and Voltages of Three-Phase Transformers

kVA Rating	Rated Line Voltage						
	208	240	480	600	2400	4160	4800
3	8.3	7.2	3.6	2.9	0.7	0.4	0.4
6	16.7	14.4	7.2	5.8	1.4	0.8	0.7
9	25.0	21.6	10.8	8.7	2.2	1.3	1.1
15	41.6	36.1	18.0	14.4	3.6	2.1	1.8
30	83.3	72.2	36.1	28.9	7.2	4.2	3.6
45	125.0	108.4	54.2	43.3	10.9	6.3	5.4
75	208.2	180.4	90.2	72.2	18.0	10.4	9.0
112.5	312.5	271.6	135.3	108.2	27.1	15.6	13.5
150	416.3	360.8	180.4	144.3	36.1	20.8	18.0
225	625.0	541.9	270.7	216.5	54.2	31.3	27.1
300	832.7	721.7	360.8	288.7	72.2	41.6	36.1
500	1387.8	1202.8	601.4	481.1	120.3	69.4	60.1
750	2081.9	1804.3	902.1	721.7	180.4	104.1	90.2
1000	2775.8	2405.7	1202.9	962.3	240.6	138.8	120.3

Note: Three-Phase Line Current = (kVA x 1000)/(Line Voltage x 1.732).

General Construction Features of General Purpose Encapsulated Transformers Rated 600V and Below

General Description

Eaton's single-phase and three-phase general purpose encapsulated dry-type transformers are of the two-winding type, self-cooled, and are available in a wide variety of primary and secondary voltage combinations.

Eaton's transformers are designed, manufactured and tested in accordance with all of the latest applicable ANSI, NEMA and IEEE standards. All 600V-class encapsulated transformers with ratings through 75 kVA are UL listed and CSA certified, and bear the UL and CSA labels.

These transformers are designed for continuous operation at rated kVA for 24 hours a day, 365 days a year, with normal life expectancy as defined in ANSI C57.96.

Insulation Systems

Industry standards classify insulation systems and temperature rise as shown below.

Table 19.1-5. Insulation System Classification

Ambient Temperature	+ Winding Rise	+ Hot Spot	= Temp. Class
40°C	55°C	10°C	105°C
40°C	80°C	30°C	150°C
25°C	135°C	20°C	180°C
40°C	115°C	30°C	185°C
40°C	150°C	30°C	220°C

The design life of transformers having different insulation systems is the same; the lower temperature systems are designed for the same life as the higher temperature systems.

Eaton's encapsulated transformers are manufactured using a 180°C insulation system. Required performance is obtained without exceeding the insulation system rating at rated temperature rise in a 40°C maximum ambient, with an average ambient temperature of 30°C over a 24-hour period.

All insulation materials are flame-retardant and do not support combustion as defined in ASTM Standard Test Method D635.

Core and Coil Assemblies

The transformer core is constructed using high-grade, non-aging, silicon steel with high-magnetic permeability, and low hysteresis and eddy current losses. Maximum magnetic flux densities are substantially below the saturation point. The transformer core volume allows for efficient transformer operation at 10% above the nominal tap voltage. The core laminations are tightly clamped and compressed. Coils are wound of electrical grade aluminum or copper, and are of continuous wound construction. The BIL (basic impulse level) for all 600V-class windings is 10 kV. In encapsulated transformers, the core and coil assembly is completely encased in a proportioned mixture of resin or epoxy, and aggregate to provide a moisture-proof, shock-resistant seal. The core and coil encapsulation system is designed to minimize the audible sound level.

Taps

Primary taps are available on many Eaton encapsulated transformers to allow compensation for source voltage variations.

Winding Terminations

Primary and secondary windings are terminated in the wiring compartment. Encapsulated units have copper leads or stabs brought out for connections. Ventilated transformers have leads brought out to aluminum or copper pads that are pre-drilled to accept Cu/Al lugs. Aluminum-wound transformers have aluminum pads; copper-wound transformers have copper pads. Lugs are not supplied with Eaton's transformers; however, lug kits are available as a field-installed accessory. Eaton recommends external cables be rated 90°C (sized at 75°C ampacity) for encapsulated designs and rated 75°C for ventilated designs.

Series-Multiple Windings

Series-multiple windings consist of two similar coils in each winding that can be connected in series or parallel (multiple). Transformers with series-multiple windings are designated with an "x" or a "/" between the voltage ratings, such as voltages of "240 x 480" or "120/240." If the series-multiple winding is designated by an "x," the winding can be connected only in series or parallel. With a "/" designation, a mid-point also becomes available in addition to the series or parallel connection. As an example, a 240 x 480 winding can be connected for either 240 (parallel) or 480 (series). A 120/240 winding can be connected for either 120 (parallel) or 240 (series), or 240 with a 120 mid-point.

Enclosures

The transformer enclosure is made of heavy-gauge steel and is finished using a continuous process of degreasing, cleaning and phosphatizing, followed by electrostatic deposition of a thermo-setting polyester powder coating and subsequent baking. The coating color is ANSI 61 and is UL recognized for outdoor use. In compliance with NEMA ST-20, Eaton's transformers are designed such that the maximum temperature on the top of the enclosure does not exceed 50°C rise above the ambient temperature.

For encapsulated transformers, the enclosure construction is totally-enclosed, non-ventilated NEMA 3R, with lifting provisions.

Wall mounting brackets are provided on many Eaton encapsulated transformers. These mounting brackets are designed to provide the proper spacing between the mounting surface and the transformer enclosure.

To ensure proper ventilation and cooling of the transformer, follow manufacturer's recommended clearances around encapsulated transformers.

Sound Levels

All transformers emit some audible sound due mainly to the vibration generated in their core by alternating flux. NEMA ST-20 defines the maximum average sound levels for ventilated transformers, and IEEE C57.12.01 defines the maximum average sound level for encapsulated transformers.

Table 19.1-6. NEMA ST-20 and IEEE C57.12.01 Maximum Audible Sound Levels for 600V Class Transformers (dB 40)

kVA	Ventilated Transformers	Encapsulated Transformers
0–9	40	45
10–50	45	50
51–150	50	55
151–300	55	57
301–500	60	—
501–700	62	—
701–1000	64	—
1001–1500	65	—

All Eaton encapsulated transformers are designed to have audible sound levels lower than those required by IEEE C57.12.01. However, consideration should be given to the specific location of a transformer and its installation to minimize the potential for sound transmission to surrounding structures and sound reflection. Installation and ambient conditions at a specific location can result in field-measured audible sound levels as much as 15 dBA greater than those levels measured in a sound-proof chamber. The following installation methods should be considered:

1. If possible, mount the transformer away from corners of walls or ceilings. For installations that must be near a corner, use sound-absorbing materials on the walls and ceiling if necessary to eliminate reflection.
2. Provide a solid foundation for mounting the transformer and use vibration-dampening mounts if not already provided in the transformer. Eaton's encapsulated transformers use a special encapsulation system to minimize and isolate sound transmission. However, supplemental vibration dampening mounts installed between the floor and the transformer may provide for additional sound dampening.
3. Make electrical connections to the transformer using flexible conduit.
4. Locate the transformer in an area where audible sound is not offensive to building inhabitants.
5. If a transformer is going to be installed in a location where the audible sound could be objectionable, consider installing a transformer specifically designed to have reduced sound levels. Eaton offers many transformers with a sound reduction up to 5 dB below IEEE C57.12.01 limits.

19.1-10 Distribution Dry-Type Transformers General Purpose Encapsulated Transformers

Description

Applicable Standards

600V-class encapsulated transformers are manufactured per the following standards:

- UL 5085 up to 15 kVA
- UL 1561 15 kVA and larger
- NEMA ST-20
- ANSI C57.12.01
- IEEE C57.12.01
- IEC 61558 for single-phase CE-marked models
- CSA C22.2 No. 47-M90

Seismic Qualification



Refer to **Tab 1** for information on seismic qualification for this and other Eaton products.

Standard Production Tests

The following production tests are performed as standard on all Eaton transformers, prior to shipment:

1. Ratio tests at the rated voltage connection and at all tap connections.
2. Polarity and phase relation tests on the rated voltage connection.
3. Applied potential tests.
4. Induced potential tests.
5. No-load and excitation current at rated voltage on the rated voltage connection.

Operation

Eaton's encapsulated transformers are designed for continuous operation at rated kVA for 24 hours a day, 365 days a year, with normal life expectancy as defined in ANSI C57.96.

Short-term overload capacity is designed into transformers, as required by ANSI. Encapsulated transformers will deliver 200% of nameplate load for 30 minutes; 150% of nameplate load for 1 hour; and 125% of nameplate load for 4 hours without being damaged, provided that a constant 50% load precedes and follows the overload. Refer to ANSI C57.96-01.250 for additional limitations.

Note: Continuous overload capacity is not deliberately designed into transformers because the design objective is to be within the allowable winding temperature rise at nameplate full load capacity.

Table 19.1-7. Rated Line Amperes for kVA and Voltages of Single-Phase Transformers

kVA Rating	Rated Line Voltage								
	120	208	240	277	480	600	2400	4160	4800
1	8.3	4.8	4.2	3.6	2.1	1.7	0.4	0.2	0.2
1.5	12.5	7.2	6.3	5.4	3.1	2.5	0.6	0.4	0.3
2	16.7	9.6	8.3	7.2	4.2	3.3	0.8	0.5	0.4
3	25.0	14.4	12.5	10.8	6.3	5.0	1.3	0.7	0 6
5	41.7	24.0	20.8	18.0	10.4	8.3	2.1	1.2	1.0
7.5	62.5	36.6	31.3	27.1	15.6	12.5	3.1	1.8	1.6
10	83.3	48.1	41.7	36.1	20.8	16.7	4.2	2.4	2.1
15	125.0	72.1	62.5	54.2	31.3	25.0	6.3	3.6	3.1
25	208.3	120.2	104.2	90.3	52.1	41.7	10.4	6.0	5.2
37.5	312.5	180.3	156.3	135.4	78.1	62.5	15.6	9.0	7.8
50	416.7	240.4	208.3	180.5	104.2	83.3	20.8	12.0	10.4
75	625.0	360.6	312.5	270.8	156.3	125.0	31.3	18.0	15.6
100	833.3	480.8	416.7	361.0	208.3	166.7	41.7	24.0	20.8
167	1391.7	802.9	695.8	602.9	347.9	278.3	69.6	40.1	34.8
250	2083.3	1201.9	1041.7	902.5	520.8	416.7	104.2	60.1	52.1
333	2775.0	1601.0	1387.5	1202.2	693.8	555.0	138.8	80.0	69.4
500	4166.7	2403.8	2083.3	1805.1	1041.7	833.3	208.3	120.2	104.2

Note: Line Current = (kVA x 1000)/Line Voltage.

Table 19.1-8. Rated Line Amperes for kVA and Voltages of Three-Phase Transformers

kVA Rating	Rated Line Voltage						
	208	240	480	600	2400	4160	4800
3	8.3	7.2	3.6	2.9	0.7	0.4	0.4
6	16.7	14.4	7.2	5.8	1.4	0.8	0.7
9	25.0	21.6	10.8	8.7	2.2	1.3	1.1
15	41.6	36.1	18.0	14.4	3.6	2.1	1.8
30	83.3	72.2	36.1	28.9	7.2	4.2	3.6
45	125.0	108.4	54.2	43.3	10.9	6.3	5.4
75	208.2	180.4	90.2	72.2	18.0	10.4	9.0
112.5	312.5	271.6	135.3	108.2	27.1	15.6	13.5
150	416.3	360.8	180.4	144.3	36.1	20.8	18.0
225	625.0	541.9	270.7	216.5	54.2	31.3	27.1
300	832.7	721.7	360.8	288.7	72.2	41.6	36.1
500	1387.8	1202.8	601.4	481.1	120.3	69.4	60.1
750	2081.9	1804.3	902.1	721.7	180.4	104.1	90.2
1000	2775.8	2405.7	1202.9	962.3	240.6	138.8	120.3

Note: Three-Phase Line Current = (kVA x 1000)/(Line Voltage x 1.732).

K-Factor Rated Nonlinear Transformers Rated 600V and Below

Applications

Eaton K-Factor transformers are specifically designed to withstand the harmful overheating effects caused by harmonics generated by nonlinear (non-sinusoidal) loads. These loads include computers, laser printers, copiers and other office equipment, as well as video monitors and other electronic equipment. Eaton K-Factor transformers are not simply over-sized transformers. The core and coils of our K-Factor transformers are specially designed to have reduced induction levels, which results in a reduction in stray losses. Oversized (200% rated) neutrals and electrostatic shielding are typical features found in our K-Factor transformers. Eaton K-Factor transformers are manufactured with the same high-quality construction features as our other ventilated transformer products, including NEMA 2 enclosures as standard.

Technical Data

Available Ratings

Eaton K-Factor transformers are available in a wide range of ratings to meet specific voltage conversion requirements. Eaton offers transformers with K-factor ratings of 4, 13, 20, 30, 40 and 50.

kVA Capacity

Single-phase ventilated designs are available in ratings from 15 kVA through 167 kVA; three-phase ratings 15 kVA through 1500 kVA.

Insulation System and Temperature Rise

Ventilated transformers are manufactured using a 220°C insulation system with 150°C temperature rise as standard. Low temperature rise designs (115°C and 80°C temperature rise) are available as options.

Frequency

Most ventilated transformers are designed to operate in 60 Hz systems. 50/60 Hz designs are available as an option. Eaton's ventilated transformers can be designed to operate at a variety of frequencies.

Winding Material

Aluminum conductor and terminations are provided as standard on ventilated transformers. Copper winding conductors and terminations are available as an option.

Installation Clearances

Eaton's ventilated transformers should be installed with a minimum of 6.00 inches of clearance around the transformer enclosure to prevent accidental contact with flammable or combustible materials. Most Eaton ventilated transformers require a minimum of 6.00 inches of clearance in front and in back of the transformer to allow for proper airflow through the transformer. Care should be taken to avoid restricting the airflow through the bottom of the transformer. Transformers should be located in areas not accessible to the public.

Wiring Compartment

Eaton's ventilated transformers have wiring compartments sized to comply with NEMA and NEC standards.

The K-factor

A common industry term for the amount of harmonics produced by a given load is the K-factor. The larger the K-factor, the more harmonics are present. Linear loads, for example, have a K-factor of 1. Transformers may carry a K-factor rating to define the transformer's ability to withstand the additional heating generated by harmonic currents.

Calculating the K-factor

All nonlinear waveforms can be broken down mathematically into a fundamental frequency and its harmonics. IEEE C57.110 establishes a direct relationship between these harmonics and transformer heating. Underwriters Laboratories has established a similar relationship, the K-factor, which is derived by summing the square of the percentage current at a given harmonic level multiplied by the square of the harmonic order.

$$K = \sum(I_h)^2(h)^2$$

I_h = Percent Current at Harmonic h

h = Harmonic Order, i.e., 3rd, 5th, 7th

For example, a load that is 90% of the fundamental, 30% of the third harmonic, and 20% of the fifth harmonic would yield $(.9)^2(1)^2 + (.3)^2(3)^2 + (.2)^2(5)^2$ or a K-factor of 2.62. This load would require a transformer with a K-factor rating of 4.

Transformers that carry a K-factor rating define the transformer's ability to withstand a given harmonic load while operating within the transformer's insulation class.

An analysis of harmonic loads and a calculation of the K-factor must be made to properly apply transformers in any building or facility. Note that the calculated K-factor is not constant since nonlinear loads change throughout the day as equipment and lighting is turned off and on. These harmonic loads also change over the life of the building or facility as equipment is added or removed.

Harmonic Currents

Harmonic currents are found in nonlinear loads. These currents are generated by various types of equipment including switching mode power supplies that abruptly switch current on and off during each line cycle. Switching mode power supplies or diode capacitor power supplies convert AC line voltage to low voltage DC. This process accomplished by charging capacitors during each line cycle with narrow pulses of current that are time-coincident with line voltage peaks. Examples of this equipment include electronic ballasts for fluorescent lighting, personal computers, printers, fax machines, electronic and medical test equipment uninterruptible power supplies and solid-state motor drives.

Note: Nonlinear is synonymous with the term non-sinusoidal.

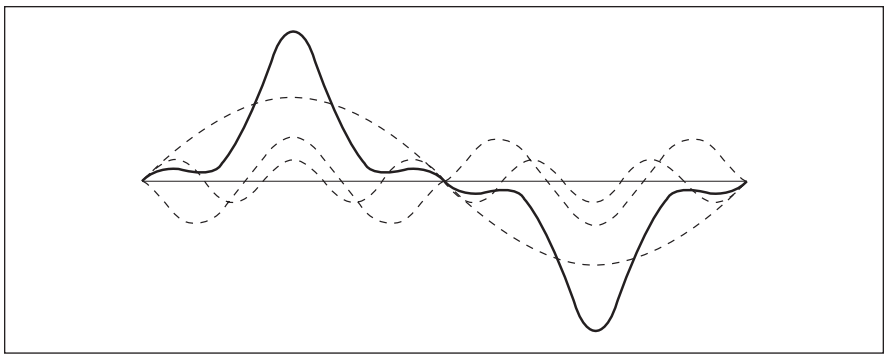


Figure 19.1-1. Harmonic Currents Found in Nonlinear Loads Cause Wave Shape Distortion and Create Added Stresses on Transformers

Harmonic Mitigating Transformers Rated 600V and Below

Applications

Eaton's harmonic mitigating transformers (HMTs) are specially designed transformers that treat a wide variety of harmonics. Also called "phase-shifting" transformers, their low zero-sequence impedance wye zig-zag secondary windings prevent harmful triplen (3rd, 9th, 15th, etc.) harmonic currents from coupling into the primary delta, where they can progress upstream to the service entrance. Multiple HMTs with a variety of phase-shift configurations can be applied in a coordinated scheme to target 5th, 7th and higher-order harmonics at the common bus feeding all of the transformers. HMTs are ideally suited for installations rich in harmonic loads, such as educational facilities (K–12 and universities), government, commercial, medical and call-center applications. HMTs are manufactured with the same high-quality features as Eaton's ventilated transformers, including NEMA 2 enclosures and the 220°C (Class R) insulation system with 150°C temperature rise as standard. Additionally, Eaton's HMTs are manufactured with a 200% neutral and electrostatic shield as standard. Eaton's harmonic mitigating ventilated transformers are designed primarily for indoor installations. Ventilated transformers have NEMA 2 enclosures as standard, and are suitable for installation outdoors when NEMA 3R weathershield kits are installed. Ventilated transformers are typically floor-mounted on an elevated housekeeping pad. When properly supported, they are also suitable for wall mounting or trapeze-mounting from ceilings.

Technical Data

Available Ratings

Eaton's harmonic mitigating transformers are available in a wide range of ratings to meet specific voltage conversion requirements. Eaton's HMTs accept a three-phase three-wire input and have a three-phase four-wire (phases and neutral) output.

kVA Capacity

Three-phase ratings 15 kVA through 500 kVA.

Insulation System and Temperature Rise

Eaton's harmonic mitigating transformers are manufactured using a 220°C insulation system with 150°C temperature rise as standard. Low temperature rise designs (115°C and 80°C temperature rise) are available as options.

Frequency

Eaton's harmonic mitigating transformers are designed to operate in 60 Hz systems. 50/60 Hz designs are available as an option. The transformers can be designed to operate at a variety of frequencies.

Winding Material

Copper conductor and terminations are provided as standard on harmonic mitigating transformers. Aluminum winding conductors and terminations are available as an option.

Installation Clearances

Eaton's harmonic mitigating transformers should be installed with a minimum of 6.00 inches of clearance around the transformer enclosure to prevent accidental contact with flammable or combustible materials. Most Eaton ventilated transformers require a minimum of 6.00 inches of clearance in front and in back of the transformer to allow for proper airflow through the transformer. Care should be taken to avoid restricting the airflow through the bottom of the transformer.

Transformers should be located in areas not accessible to the public.

Wiring Compartment

Eaton's ventilated transformers have wiring compartments sized to comply with NEMA and NEC standards.

Thermal Sensors

Harmonic mitigating transformers are available with "warning" and/or "alarm" thermal sensors imbedded in their coils. Thermal sensors are normally open dry contacts that can be wired to provide a signal to remote locations to indicate a potential heating problem within the transformer coils. Contacts are rated 180°C (warning) and 200°C (alarm).

Application Considerations

Eaton offers harmonic mitigating transformers with four different phase-shift options:

- Type NON (0° phase-shift)
- Type POS (+15° phase-shift)
- Type NEG (–15° phase-shift)
- Type THR (–30° phase-shift)

To select the proper HMT, the nonlinear load profile of a particular application must be known.

Type NON (0°) HMTs are ideally suited for treating 3rd and other triplen harmonics that are the signature of single-phase nonlinear loads. This is the most common application encountered. Type NON HMTs use electromagnetic flux cancellation to cancel triplen harmonics. There, harmonics are treated in the secondary windings and prevented from coupling into the primary delta windings, where they may be transmitted upstream to the service entrance location. Type NON HMTs can be deployed singly to treat triplen harmonics. As with most other harmonic mitigating methods, the closer the HMT can be installed to the load, the greater the benefit.

Type POS (+15°) and Type NEG (–15°) harmonic mitigating transformers are typically used together in coordinated pairs to treat 5th, 7th and other harmonics that are generated by three-phase nonlinear loads. 5th, 7th and higher order harmonics pass through the harmonic mitigating transformers, to a point of common coupling; the first common electrical point that is shared by the HMTs. At this common point, balanced portions of the 5th, 7th, etc., harmonic currents are canceled and prevented from flowing further upstream in the distribution system. Type POS and Type NEG HMTs have nearly identical electrical characteristics, including zero-sequence and positive-sequence impedance and reactance. The more closely matched the coordinated pairs of transformers, the more thorough the harmonic cancellation.

Coordinated pairs of Type NON and Type THR transformers, as well as coordinated pairs of Type NON, Type THR, Type POS and Type NEG HMTs provide treatment of 3rd and other triplen harmonics within their secondary windings. This cancellation is achieved by virtue of their wye zig-zag winding configuration.

Harmonic Mitigating Transformers

As our world becomes even more dependent on electrical and electronic equipment, there is an increased likelihood that operations will experience the negative effects of harmonic distortion. The productivity and efficiency gains achieved from increasingly sophisticated pieces of equipment have a drawback: increased harmonic distortion in the electrical distribution system. The difficult thing about harmonic distortion is determining the source. Once this task has been completed, the solution can be easy. Harmonic mitigating transformers (HMTs) are one of the many possible solutions to help eliminate these harmful harmonics.

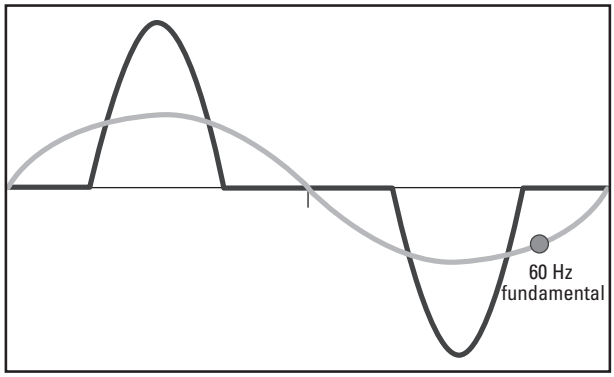


Figure 19.1-2. Typical Waveform of Single-Phase Devices

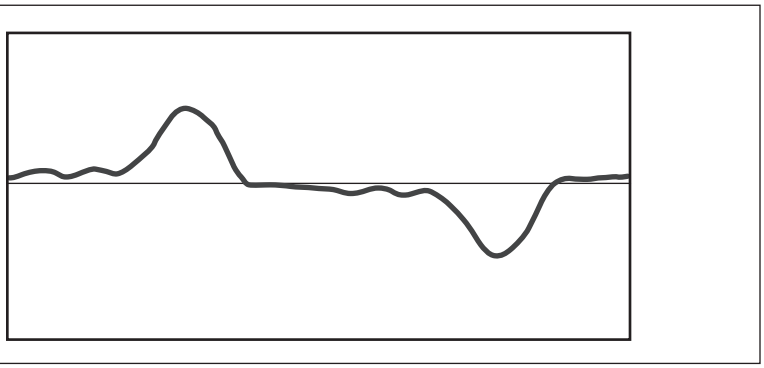


Figure 19.1-3. Composite Waveform

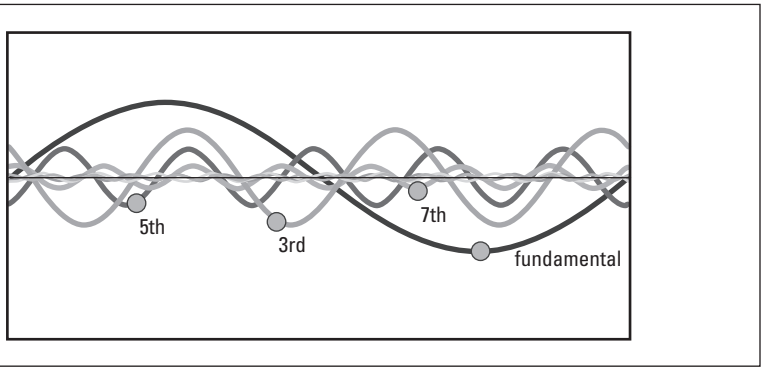


Figure 19.1-4. Components of a Nonlinear Waveform

What are Harmonics?

An understanding of how harmonics are generated and what harmonics really are is necessary in order to understand how HMTs can provide harmonic mitigation. Electronic equipment requires DC voltage to operate. Rectifiers and capacitors are used to convert AC voltage to DC voltage within the equipment. These devices are frequently referred to as switch mode power supplies. As the capacitors charge and discharge during this conversion, the capacitor draws current in pulses, not at a continuous rate. This irregular current demand, as depicted in **Figure 19.1-2**, distorts the linear 60 Hz sine wave. As a result, these types of loads are commonly referred to as non-sinusoidal, or nonlinear.

As shown in **Figures 19.1-3** and **19.1-4**, the waveform created by the nonlinear source is actually the mathematical sum of several sine waves, each with a different frequency and magnitude. Each of these individual waveforms is called a harmonic, and is identified by its frequency relative to the fundamental frequency, 60 Hz. In other words, each individual harmonic is identified by a number, which is the number of complete cycles the specific harmonic goes through in a single 60 Hz cycle.

In **Figure 19.1-4**, the fundamental frequency is 60 Hz. The fundamental frequency is assigned the harmonic number of 1, and is the benchmark for all other harmonic numbering. The fundamental, 60 Hz sine wave completes 60 full cycles in one second. The 3rd harmonic completes three full cycles in the time it takes the fundamental to complete just one cycle, or 180 cycles per second. Likewise, the 5th harmonic completes five full cycles in the time it takes the fundamental harmonic to complete a single cycle, which equates to 300 cycles per second. Odd multiples of the 3rd harmonic (3rd, 9th,15th, 21st, etc.) are commonly referred to as triplen harmonics.

The proliferation of electronic equipment (including computers, fax machines, copiers, electronic ballasts, office equipment, cash registers, slot machines, electronic monitoring devices, video games, medical diagnostic equipment and the like) is what makes single-phase devices the most common source of harmonics. These devices generate a typical waveform shown in **Figure 19.1-2**, and have a harmonic profile as shown in **Table 19.1-9**. As one can see, the predominant harmonic is the 3rd harmonic.

Three-phase, nonlinear loads such as drives, on the other hand, are typically rich in 5th and 7th harmonics.

What Problems do Harmonics Cause?

The distorted current waveform that is created by nonlinear loads can cause many problems in an electrical distribution system. Depending upon the severity of the harmonic distortion, the negative effects of harmonics may be tolerable, and the installation of a K-factor–rated transformer may be an adequate solution. K-factor–rated transformers do not provide any harmonic treatment. Rather, they are designed to withstand the destructive effects of the additional heat generated by harmonic currents in the transformer's windings.

In many instances, the harmful effects of harmonics are too severe, and simply tolerating them is not an acceptable option. Harmonic currents can cause excessive heating in distribution transformers. This additional heat not only reduces the life expectancy of a transformer, it also reduces the usable capacity of the transformer. Another side effect is that the audible noise of a transformer may be amplified when installed in a system that contains harmonics.

An important characteristic of harmonics is that they are transmitted upstream from the load, to the transformer's secondary windings, through the primary windings of the transformer, back to the service entrance, and eventually to the utility lines.

Harmonic currents flowing upstream from nonlinear loads, through the system impedance of cables and transformers, create harmonic voltage distortion. When linear loads, like motors, are subjected to harmonic voltage distortion, they will draw a nonlinear harmonic current. As with distribution transformers, harmonic currents cause increased heating, due to iron and copper losses, in motors and generators. This increased heating can reduce the life of the motor, as well as the motor's efficiency. In electrical cables, harmonic currents may also create increased heating, which can lead to premature aging of the electrical insulation. Nuisance tripping of the circuit breakers protecting the cable may also occur. Communications equipment and data processing equipment are especially susceptible to the harmful effects of harmonics because they rely on a nearly perfect sinusoidal input. This equipment may malfunction, or even fail, when installed in systems that are rich in harmonics.

The costs associated with downtime resulting from the malfunction or failure of electrical or electronic equipment can be staggering. These costs can easily surpass thousands, if not millions, of dollars per hour in lost production or lost productivity. In addition to the well-defined costs associated with the most catastrophic of harmonic effects, there are many less quantitative costs that are often overlooked when evaluating the need for harmonic mitigation. The increased heating caused by harmonics in cables, motors and transformers increases the cooling requirements in air-conditioned areas. The same increases in heating result in increased maintenance costs and more frequent equipment replacement in order to avoid failures that could shut down a building for a period of time.

What do HMTs do?

HMTs are an economical solution in the battle against the harmful effects of harmonics. HMTs are passive devices: they don't have any moving parts and they are typically energized 24 hours a day, 7 days a week, 365 days a year. This means that they are always "on the job" treating harmonics, regardless of the level of load they are serving at a given point in time. Whenever the HMT is energized, it will provide harmonic treatment.

Harmonic mitigating transformers are commonly referred to as "phase-shifting" transformers. The HMT offering from Eaton's electrical business has delta-connected primary windings and wye zig-zag connected secondary windings. The use of wye zig-zag secondary windings allows a transformer to be designed in a wide variety of different phase-shifts (–30°, –15°, 0°, +15°). In standard delta-wye transformers, including K-factor–rated transformers, triplen harmonics are passed from the secondary windings into the primary delta windings, where they are trapped and circulate. In HMTs, the electromagnetic flux cancellation created by the wye zig-zag winding configuration prevents 3rd and other triplen harmonics from being transmitted into the primary delta winding. Harmonic treatment is provided entirely by electromagnetic flux cancellation; no filters, capacitors or other such devices are used. It is important to remember that the harmonic currents still flow in the secondary windings.

Benefits of Installing HMTs

In addition to improved system reliability and reduced maintenance costs, HMTs also have excellent energy-saving characteristics. With the cost of electricity continuing to increase around the world, there is an ever-increasing interest in energy-efficient products. In many facilities, the cost of electricity is the second largest expense, eclipsed only by salaries and wages.

Transformers consume energy even when they are lightly loaded or not loaded at all. Significant energy savings may be attained if the no-load losses of a transformer are reduced. NEMA® Standard TP-1 addresses this issue by requiring high efficiency levels when a transformer is loaded at 35% of its full capacity. However, this standard applies to linear load profiles only, and tests to validate compliance with NEMA TP-1 are performed using linear loads.

In actual applications, the growing presence of electronic devices creates nonlinear load profiles. Nonlinear loads cause the losses in distribution transformers to increase, thereby reducing their realized efficiency. Therefore, NEMA TP-1 efficiency compliance may not be a true indication of the efficiency of a transformer exposed to nonlinear loads. Though a measure of linear load efficiency, Eaton's family of HMTs meets the efficiency standards set forth in NEMA Standard TP-1. Because HMTs are intended to be installed in systems that contain high levels of nonlinear loads, Eaton's family of HMTs is designed to meet the NEMA TP-1 efficiency levels when applied to nonlinear load profiles with 100% harmonic distortion, across a broad range of load levels, not just the 35% load level used in NEMA TP-1. These energy savings are realized over the entire life of the transformer.

Table 19.1-9. Typical Harmonic Profile of Single-Phase Switched Mode Power Supply

Harmonic	Magnitude
1	1.000
3	0.810
5	0.606
7	0.370
9	0.157
11	0.024
13	0.063
15	0.079

Application Information

The closer that an HMT can be located to the load, the greater the benefits of harmonic treatment. Installation of a large capacity HMT at the service entrance of a large building would certainly provide some harmonic treatment. However, installation of several smaller rated HMTs, perhaps one or more on each floor of a building, provides greater benefits that will be noticed throughout the facility. For this reason, the most popular HMTs will be rated 75 kVA and less. This complements the cost-efficiencies that can be gained by distributing higher voltages through smaller cables to the point where a safer, lower voltage is needed to operate equipment.

When connecting the loads to the transformer, it is important to remember that the balanced portion of the harmonic loads will be treated. To achieve the maximum harmonic treatment, when considering the triplen harmonics that are treated in the secondary windings, each phase should be balanced, and the harmonic profile of the loads should be as similar as possible. When treating 5th, 7th and higher order harmonics by using multiple transformers, the loads should likewise have similar harmonic profiles, and the kVA and impedance of the transformers should be identical as well. For example, two 75 kVA HMTs can be "paired" with a single 150 kVA HMT to provide maximum harmonic performance. In instances where transformers of unequal kVA are used in combination, harmonic treatment is provided for the lowest kVA load. For example, if, instead of pairing two 75 kVA HMTs with a single 150 kVA HMT, one would pair two 45 kVA HMTs with a 150 kVA HMT. Only 90 kVA (two times 45 kVA) of the 150 kVA load would be treated (if they were fully loaded). In real-world situations, it is nearly impossible to have perfectly matched loads. However, the benefits of treating harmonics, even in situations where the loads are unbalanced, are a far superior option than to not treat them at all.

Eaton HMT transformers comply with NEMA TP-1 standards.

NEMA TP-1 Energy-Efficient Transformers Rated 600V and Below

Applications

Eaton's family of NEMA TP-1-2002, ventilated transformers are another option available to customers interested in reducing their energy consumption. These transformers comply with all state and local regulations that mandate installation of energy-efficient distribution transformers in new construction. NEMA TP-1 transformers are typically installed in commercial construction, as well as in educational (K–12 and universities), government and industrial facilities. NEMA TP-1 compliant transformers are especially designed to have low no-load (core) losses. Minimum efficiency levels have been established for these transformers when loaded at 35% of their full load capacity. NEMA TP-1 transformers are manufactured using the same high-quality construction features as Eaton's ventilated transformer products, including NEMA 2 enclosures and the 220°C (Class R) insulation system with 150°C temperature rise as standard. Ventilated transformers are typically floor-mounted on an elevated housekeeping pad. When properly supported, they are also suitable for wall mounting or trapeze-mounting from ceilings.

Technical Data

Available Ratings

As an Energy Star Partner, Eaton's brand offers a wide range of NEMA TP-1 energy-efficient transformers to meet specific voltage conversion requirements.

kVA Capacity

Eaton's NEMA TP-1 ventilated transformers are available in the same kVA ratings as single-phase and three-phase general purpose ventilated transformers.

Insulation System and Temperature Rise

Eaton's NEMA TP-1 energy-efficient transformers are manufactured using a 220°C insulation system with 150°C as standard. NEMA TP-1 transformers are also available in either 115°C or 80°C temperature rise.

Frequency

Most NEMA TP-1 transformers are designed to operate in 60 Hz systems. 50/60 Hz designs are available as an option. Eaton's transformers can be designed to operate at a variety of frequencies.

Winding Material

Aluminum conductor and terminations are provided as standard on ventilated transformers. Copper winding conductors and terminations are available as an option.

Installation Clearances

Eaton's NEMA TP-1 transformers require clearances that are identical to those for general purpose ventilated transformers.

Transformers should be located in areas not accessible to the public.

Wiring Compartment

Eaton's NEMA TP-1 energy-efficient transformers have wiring compartments sized to comply with NEMA and NEC standards.

What is NEMA TP-1?

The Energy Act of 1992, H.R. 776 empowered the U.S. Department of Energy (DOE) to set guidelines for more efficient electrical devices that would reduce the nation's energy consumption. In 1996, in conjunction with the DOE, NEMA adopted a new standard for efficiencies of distribution transformers: NEMA Standard TP-1-1996. This standard set minimum efficiency levels for standard transformer kVA ratings. Prior studies had shown that transformers in commercial and industrial facilities are loaded at an average of 35% of their nameplate full-load capacity. The minimum efficiency levels included in NEMA TP-1 for low voltage transformers (600V and below) are based upon this 35% loading, and at 75°C ambient temperature. The Environmental Protection Agency adopted the efficiency levels set forth in NEMA TP-1 as part of their Energy Star program. The DOE, in conjunction with NEMA, is continually looking at the attainable efficiency levels for distribution transformers, and revising them upward.

Since distribution transformers are typically energized 24 hours a day, seven days a week, 365 days a year, the energy savings gained by installing high-efficiency transformers is realized for the vast majority of a transformer's 20-year or greater anticipated life.

The Energy Policy Act of 2005

The Energy Policy Act of 2005 and the resulting Federal Law 10 CFR Part 431 require that efficiency of low voltage dry-type distribution transformers manufactured after January 1, 2007, shall be no less than the efficiency levels listed in Table 4-2 of NEMA Standard TP-1-2002. Transformers specifically excluded from the scope of this law include: transformers rated less than 15 kVA, transformers rated greater than 600V, transformers rated for operation at anything other than 60 Hz, transformers with a tap range greater than 20%, drive transformers, rectifier transformers, autotransformers, uninterruptible power supply transformers, special impedance transformers, regulating transformers, sealed and nonventilated transformers, machine tool transformers, welding transformers, grounding transformers and testing transformers.

Table 19.1-10. NEMA TP-1-2002 Efficiency Levels

Tables of Energy Efficiency NEMA Class 1 Efficiency Levels Dry-Type Distribution Transformers— Low Voltage (600V and below)			
Single-Phase		**Three-Phase**	
kVA	**Efficiency**	**kVA**	**Efficiency**
15	97.7	15	97.0
25	98.0	30	97.5
37.5	98.2	45	97.7
50	98.3	75	98.0
75	98.5	112.5	98.2
100	98.6	150	98.3
167	98.7	225	98.5
250	98.8	300	98.6
333	98.9	500	98.7
—	—	750	98.8
—	—	1000	98.9

TrueAlarm Addressable Fire Alarm Control Panels

*UL, ULC, CSFM Listed; FM Approved; MEA (NYC) Acceptance**

4008 Fire Alarm Control Panel for IDNet Addressable Devices and TrueAlarm Addressable Smoke Detection

Features

Control panel operator convenience features:

- Wide viewing angle 2 x 20 (40 character) alphanumeric LCD and dedicated LEDs provide convenient panel status information
- Operation is programmable using a multi-function keypad and the panel LCD or via service computer (PC)
- RS-232 service port provides upload/download PC access for panel configuration and event history logs
- Software updates are via PC download
- Convenient library of standard custom label terms
- Standard on-board DACT provides: Contact ID, 3/1, 4/2, BFSK, and SIA formats
- WALKTEST silent or audible system test
- Voltage and current for both the battery charger and the battery can be displayed at the front panel LCD

Addressable Devices:

- Using IDNet communications, up to 200 addressable TrueAlarm detection points or addressable device points are available (see page 3 for details)

Two Standard Notification Appliance Circuits (NACs):

- Class A or Class B outputs with solid state overcurrent protection per NAC, each rated for 2 A
- Selectable for Simplex® SmartSync two-wire horn/strobe control or synchronized strobe control

Standard Power Supply:

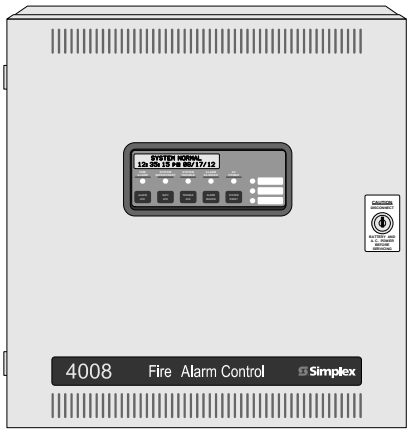
- Provides 3 A maximum @ nominal 24 DC
- Automatic input power selection operates with 120 VAC or 240 VAC, 50 or 60 Hz
- On-board temperature compensated battery charger for up to 12.7 Ah batteries in cabinet (UL and ULC) and up to 25 Ah batteries in separate cabinet (UL only)

Additional standard features:

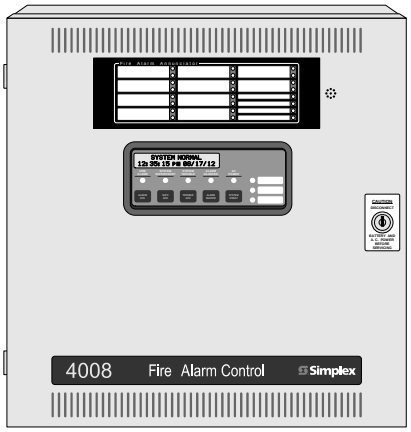
- Programmable Active Status Reminder
- Two auxiliary relays
- NACs, Relay outputs, and communications circuits are power limited (AC input, battery circuits, and City Circuit Module outputs are non-power limited)
- Available with beige or red cabinet
- UL listed to Standard 864

Available option modules:

- Door mounted 24 LED annunciator (standard on ULC models)
- 3 A Expansion Power Supply with two on-board 2 A NACs that operate the same as standard NACs
- City Interface Module and Auxiliary Relay Module
- Remote LCD and LED/Switch Annunciators



4008-9102 (Beige) Standard Control Panel



4008-9122 (Beige) Control Panel with 24 LED Annunciator (required for ULC applications)

Description

For areas requiring up to 200 addressable input devices and up to 4 NACs, the Simplex 4008 Series fire alarm control panels provide flexible initiating circuit monitoring, extensive programmable control capability, and LCD annunciated circuit-specific 20 character custom labels.

* See page 2 for additional ULC and MEA information. This product has been approved by the California State Fire Marshal (CSFM) pursuant to Section 13144.1 of the California Health and Safety Code. See CSFM Listing 7165-0026:318 for allowable values and/or conditions concerning material presented in this document. It is subject to re-examination, revision, and possible cancellation. Additional listings may be applicable, contact your local Simplex product supplier for the latest status. Listings and approvals under Simplex Time Recorder Co. are the property of Tyco Fire Protection Products.

Standard Feature Details

Addressable operation is provided by an IDNet signaling line circuit (SLC) capable of communicating to up to 200 addressable devices (points). Addressable devices include: TrueAlarm smoke detection, heat detection, and duct detection; supervised addressable modules for single and multiple contact monitoring, manual stations, isolation modules, and a remote signal module (see list on page 4.) (Please note that this panel provides a limited TrueAlarm operation feature set. For larger applications that require the full complement of TrueAlarm features, contact your local Simplex product supplier.)

Two, 2 A On-Board NACs provide conventional reverse polarity operation, selectable as Class A or Class B, with electronic control and overcurrent protection. Operation is selectable for synchronized strobe or SmartSync horn/strobe two wire operation. Horn control can be selected at the panel for: Temporal pattern coding, Steady On, Slow March Time of 20 beats per minute (BPM), or Fast March Time of 120 BPM. **Note:** When selected for SmartSync horn/strobe control, March Time produces 60 BPM.

The 24 VDC Auxiliary output provides up to 500 mA for system use. (Auxiliary output current is counted for total power supply capacity.)

Standard Auxiliary Relay Outputs. Two relay outputs are available, selectable as normally open or normally closed, rated 2 A @ 30 VDC per below:

Aux Relay 1 is normally assigned to General Alarm operation but is programmable (see page 7)

Aux Relay 2 (Trouble) is energized when Normal and is de-energized with a Trouble condition.

Standard Feature Details *(Continued)*

On-Board Dual Line DACT. Operation can be selected for Contact ID, SIA, 3/1, 4/2, and BFSK formats. Reporting includes Alarm, Supervisory, Trouble, and AC Failure. Operation includes automatic 24 hour test and programmable power fail report delay.

Power Supply and Battery Charger. DC power output is 3 A @ 24 VDC for panel use. The temperature compensated battery charger (sealed lead-acid batteries only) is rated for up to 25 Ah batteries per UL 864 and up to 12.7 Ah per ULC-S527. (Up to 12.7 Ah batteries fit in the cabinet, larger batteries require an external cabinet.) Panel electronics can measure and display voltage and current for the power supply, batteries and the battery charger (standard and expansion power supply). Depleted battery trouble is monitored and annunciated and depleted battery cutout can be selected. Active battery status monitor supervises charger operation.

Optional Feature Details

Expansion Power Supply. Provides 3 A total @ 24 VDC, two additional 2 A NACs, and an additional auxiliary power output of 500 mA. Output operation is the same as on the standard power supply.

Expansion Relay Module. Provides three relays, one each for Alarm, Supervisory, and Trouble conditions. Each is jumper selectable as N.O. or N.C. Contacts are rated 2 A @ 30 VDC. Location is the same as for the City Circuit Modules.

City Circuit Modules. These modules are available with or without on-board disconnect switches, depending on local requirements (either type can be disconnected through the front panel under password control). Connections are for Remote Station (reverse polarity) or Municipal Master (local energy). Reporting includes Alarm, Supervisory, and Trouble.

Product Selection

Control Panel

Model	Color	Description	Listings		Standard Feature Summary
4008-9102	Beige	Standard fire alarm control panel	MEA	UL, FM, & CSFM	SLC with 200 addressable points, 2 Class B/Class A NACs, 3 A power supply with battery charger; on-board DACT; for input voltage of 120/240 VAC, 50/60 Hz (autoselect)
4008-9101	Red				
4008-9122	Beige	Fire alarm control panel with 24 LED Annunciator on front door	ULC		
4008-9121	Red				

Option Modules

Model	Description	
4008-9801	Expansion Power Supply; 3 A, with 2 NACs, 120/240 VAC, 50/60 Hz	Select one if required
4008-9802	Expansion Relay Module; 3 relays selectable as either N.O. or N. C.	Select one if required
4006-9805*	City Circuit Modules with disconnect switch	
4006-9806*	City Circuit Modules without disconnect switch	

* These City Circuit modules are also used on the 4006 Series control panels.

Accessories

Model	Description
2975-9811	Beige semi-flush trim kit; 1 7/16" (37 mm) wide; includes four corners and trim pieces for top, bottom, and sides
2975-9812	Red semi-flush trim kit; 1 7/16" (37 mm) wide; includes four corners and trim pieces for top, bottom, and sides
4009-9801	Beige External Battery Cabinet for up to 25 Ah batteries; mounts close-nippled to control panel cabinet; dimensions = 16 ¼" W x 13 ½" H x 5 ¾" D (413 mm x 343 mm x 146 mm)

Batteries, 12 Volt (select one battery model per system standby requirements; order quantity of two)

Model	Size	Model	Size	Location	Model	Size	Location
2081-9272	6.2 Ah	2081-9288	12.7 Ah	For cabinet mount	2081-9275	18 Ah	Requires 4009-9801 External Battery Cabinet (UL listed only)
2081-9274	10 Ah				2081-9827	25 Ah	

TrueAlarm Smoke Detection

TrueAlarm Addressable Detection. IDNet addressable device compatibility includes Simplex TrueAlarm photoelectric smoke and temperature sensors. The 4008 fire alarm control panel provides a subset of the complete analog TrueAlarm features. TrueAlarm sensors appear to the panel essentially as addressable detectors and that term is used for 4008 documentation.

Approximately every four seconds the addressable smoke detectors transmit an output value based on their smoke chamber condition. The panel CPU internally maintains a current value, peak value, and an average value for each detector's output. Status is determined by comparing the current value to its average value. Tracking this average value as a continuously shifting reference point filters out environmental factors that cause shifts in sensitivity.

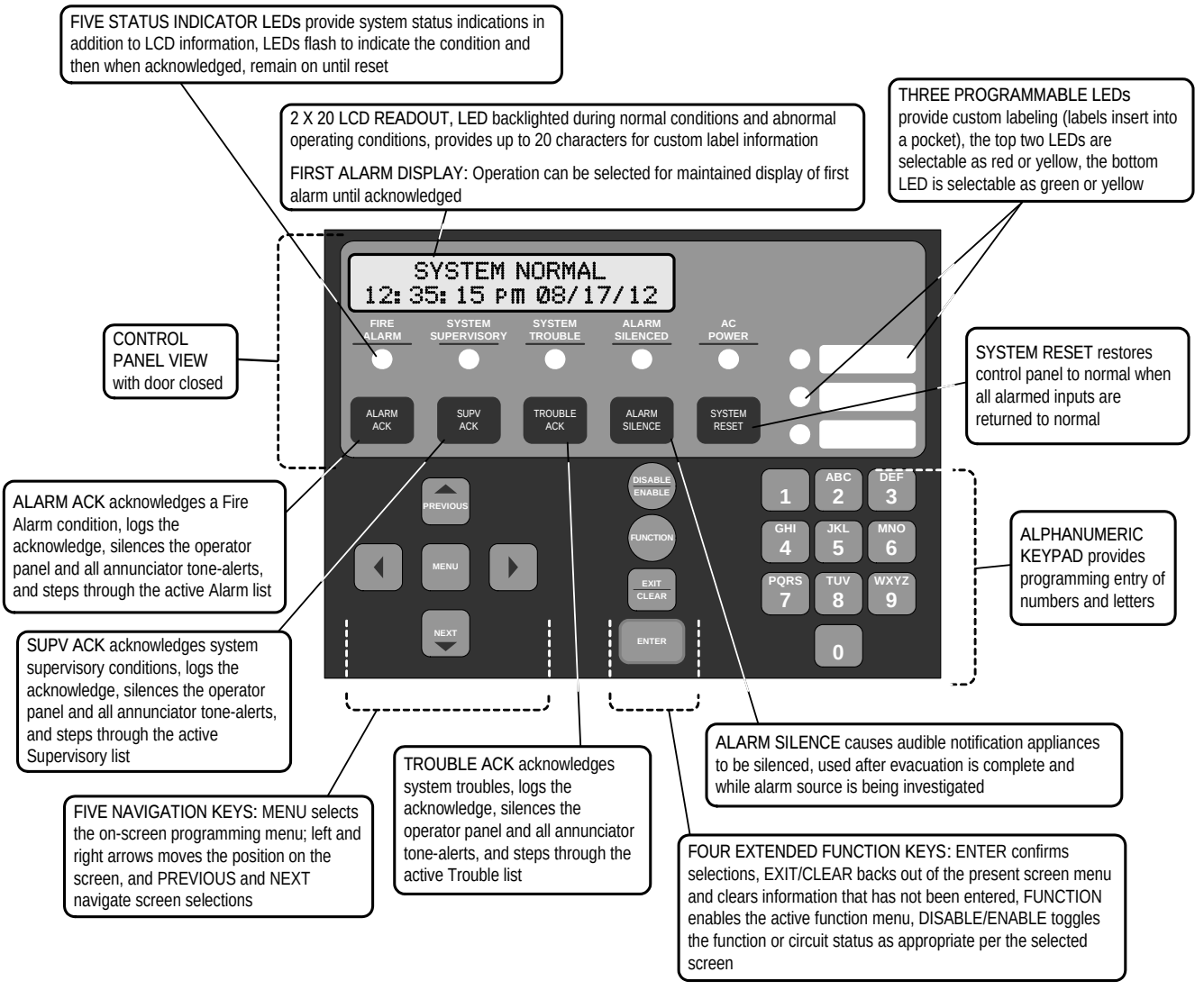
Alarm Determination. Photoelectric detection sensitivity is 2.5%/ft obscuration. All detectors can be selected for a reduced sensitivity detection mode that satisfies the city of Boston requirements. Addressable heat detectors provide a fixed temperature alarm at 135° F (57° C) and may be individually selected to also provide rate-of-rise alarm of 15° F (8.3° C) per minute where applicable.

Diagnostics and Default Device Type

Status Monitoring. 4008 TrueAlarm operation provides the ability to automatically indicate when an addressable detector is dirty or excessively dirty. The NFPA 72 (*National Fire Alarm and Signaling Code*) requirement for a test of the sensitivity range of the detectors is fulfilled by the TrueAlarm ability to maintain the sensitivity level of each addressable detector.

Modular Addressable Detector/Base Combination. Modular TrueAlarm addressable detectors use the same base which allows different detector head types (photoelectric smoke, or heat) to be easily interchanged to meet specific application requirements. This feature also allows intentional detector (sensor head) substitution during building construction. When conditions are temporarily dusty, instead of covering the smoke detectors (causing them to be disabled), heat detector heads may be installed without reprogramming the control panel. Although the control panel will indicate an incorrect detector type, the heat detector will operate at a default setting to provide heat detection for building protection at that location.

Keyboard Reference



Compatible Simplex Peripherals (see specifications on page 5 for notification appliances)

Detector Heads and Addressable Bases (refer to page 3 for 4008 detector/sensor terminology)

Model	Detector Head Type	Compatible Addressable Base		Data Sheet
4098-9714 4098-9733	Photoelectric Heat, 135° F (57° C)	4098-9792, Standard detector base		S4098-0019
		4098-9789, Base for remote LED or relay		
		4098-9791, Features of 4098-9789 and remote supervised relay		
		4098-9794, Sounder base		S4098-0028
		4098-9793, IDNet Isolator base		S4098-0025
4098-9754	Photo and Heat	4098-9795, Dual address sounder base	**NOTE:** These bases require **two** addresses	S4098-0033
		4098-9796, Dual address standard base		

Duct Detection

Model	Description	Data Sheet
4098-9755	Addressable Duct Detector Housing with 4098-9714 detector, no relay control	S4098-0030
4098-9756	Addressable Duct Detector Housing with 4098-9714 detector, with remote relay control	

Addressable Devices

Model and Description	Data Sheet	Model and Description	Data Sheet	Model and Description	Data Sheet
4090-9001 Supervised IAM	S4090-0001	4090-9101 CL B ZAM	S4090-0003	4090-9007 Signal IAM	S4090-0010
4090-9051 Supervised IAM		4090-9106 CL A ZAM		4099-9001, 4099-9002, & 4099-9003 Manual Stations	S4099-0001
4090-9002 Relay IAM	S4090-0002	4090-9116 IDNet Isolator	S4090-0005		

Compatible System Expansion Panels

Model	Type	Description	Data Sheet
4003 Series	Voice Control Panel	Provides a remote voice control panel with on-board NACs, internal microphone, and remote microphone input	S4003-0002
4009 Series	Remote NAC Extender	Provides remote NACs; includes power supply and battery charger; **4 extenders** max/NAC; **4008 uses NAC output to provide control**	S4009-0002

Note: Contact your local Simplex Product Supplier for additional compatible peripherals.

Remote Annunciator Options

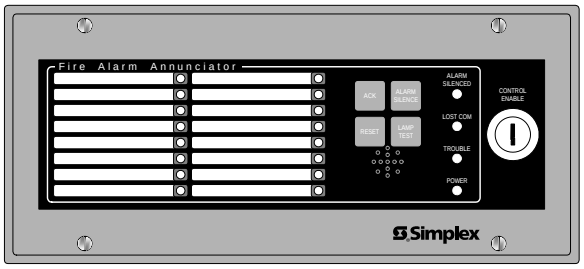
The 4008 supports up to four annunciator options including:

- Door Mounted 24 LED Annunciator
- 4610-9111 Remote LED/Switch Annunciators
- 4606-9101 Remote LCD Annunciators

Annunciators communicate at a rate of 9600 baud with power supplied by separate wiring.

4610-9111 LED Annunciator Features:

- 16 LEDs with programmable functions and dedicated LEDs for Alarm Silenced, Lost Communications, Trouble, and Power-on
- Keyswitch access controlled switches for Acknowledge, Alarm Silence, Reset, and Lamp Test
- Local tone-alert



4610-9111 LED/Switch Annunciator

4606-9101 LCD Annunciator Features:

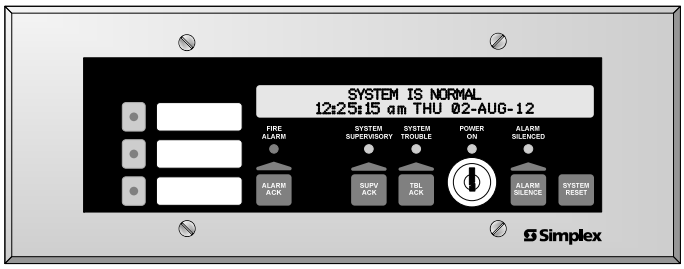
- LCD readout with two lines of 40 characters each and LED backlighting
- Wide viewing angle, super-twist design
- Keyswitch access controlled

Control switches and status LEDs for:

- Alarm, supervisory, or trouble acknowledge
- Alarm silence and System Reset

Three programmable LED indicators:

- Two LEDs are selectable as red or yellow
- One LED is selectable as green or yellow
- With provisions for custom labeling



4606-9101 LCD Annunciator

Specifications (Refer to Installation Instructions 579-716 for additional information)

AC Input	Input Voltage	120 VAC, 60 Hz; 220/230/240 VAC, 50/60 Hz, auto-select
	Input Current, Standard	2 A maximum @ 120 VAC input; 1.5 A maximum @ 240 VAC input
	Input Current with Expansion Power Supply	4 A maximum @ 120 VAC input; 3 A maximum @ 240 VAC input
Power Supply Output		3 A maximum @ 24 VDC in alarm
Battery Charger		Temperature compensated charger is rated for up to 25 Ah per UL 864; up to 12.7 Ah per ULC-S527
Notification Appliance Circuits (NACs) (NOTE: Total DC current = 3 A maximum per power supply)		
General Rating		2 A maximum @ 24 VDC, per NAC; available as Class A or Class B; Class B end-of-line resistor = 10 kΩ, ½ W; Model 4081-9008 (P/N 733-894)
Special Application Rating = 2 A per NAC Strobe synchronization is UL listed across all four system NACs for these 4906 Series appliances		Simplex 4901 Series (horns) and 4906 Series Multi-Candela non-addressable strobes, horn/strobes, and speaker/strobes (contact your Simplex product representative for compatible appliances)
Regulated 24 VDC Rating = 1.5 A per NAC **NOTE:** Maximum strobe load on main power supply or expansion power supply is **1.35 A** per power supply (2.7 A total); remainder of power supply rating is available for other loading		Power for other UL listed appliances; use associated external synchronization modules where required
Standard Circuit Ratings (NOTE: Total DC current = 3 A maximum per power supply)		
Auxiliary Power Output		500 mA maximum @ 24 VDC
Standard Auxiliary Relay Outputs	Relay 1	Programmable operation — Contacts rated 2 A @ 30 VDC, 0.35 power factor; jumper selectable as N.O. or N.C.
	Relay 2	Trouble operation
Wiring Connections		Terminals rated for 18 AWG to 12 AWG (0.82 mm^2 to 3.31 mm^2)
IDNet Communications		
Quantity		Up to 200 addressable devices (see list on page 4)
Suppression		For wiring external to building, use Overvoltage Protector 2081-9044 at each end of the connection; refer to data sheet S2081-0016 for details
Wire Size		18 AWG (0.82 mm^2)
Wire Types	Unshielded twisted pair (UTP)	Acceptable for most applications; not for use with wiring in conduit with either NAC or AC power wiring (or similar)
	Shielded twisted pair (STP)	Shielded wire may provide protection from unexpected sources of interference and may be required for some applications; review system with your local Simplex product supplier
Distance from Control Panel to Farthest Device		Up to 4000 feet (1219 m) with 125 devices; 32 Ω
		Up to 2500 feet (762 m) with 200 devices; 51 Ω
Total Wire Length Allowed With "T" Taps for Class B Wiring		Up to 10,000 ft (3 km)
Total Capacitance Allowed		0.6 µF (600 nF)
Annunciator Communications		
Quantity Supported		Up to four annunciator modules per panel (see page 4 for details)
Wiring Size and Type		See description for IDNet wiring above
Wiring Distances	Bus-Style Wiring	Up to 4000 ft (1219 m); 0.58 µF (580 nF) maximum capacitance; 35 Ω max.
	"T-Tap" Wiring	Up to 10,000 ft (3048 m) total wiring; up to 2500 ft (762 m) to farthest device
Line Matching Resistor	Bus-Style Wiring	Connect one at panel and one at end of line — 100 Ω, ½ W; 4081-9011; (part number 733-974)
	"T-Tap" Wiring	Connect one at panel and one at farthest device
Suppression		Use 2081-9044 Overvoltage Protectors where wiring leaves and enters a building (refer to data sheet S2081-0016)
Option Module Ratings		
Expansion Relay Module 4008-9802	Contact Ratings	2 A @ 30 VDC, 0.35 power factor; jumper selectable as N.O. or N.C.
	Wiring	Terminals rated for 18 AWG to 12 AWG (0.82 mm^2 to 3.31 mm^2)
Environmental Ratings		
Operating Temperature Range		32° to 120°F (0° to 49° C)
Operating Humidity Range		Up to 93% RH, non-condensing @ 100.4° F (38° C) maximum

Supervisory and Alarm Currents

Model	Module	Supervisory	Alarm
4008-9101 4008-9102	Standard fire alarm control panel	135 mA + 0.8 mA per IDNet device	190 mA + 1 mA per IDNet device
4008-9121 4008-9122	Control panel with 24 LED Annunciator	153 mA + 0.8 mA per IDNet device	240 mA + 1 mA per IDNet device
4008-9801	Expansion Power Supply	50 mA	60 mA
4008-9802	Expansion Relay Module	10 mA per energized relay	10 mA per energized relay
4006-9805	City Circuit Module with disconnect switch	30 mA	60 mA
4006-9806	City Circuit Module without disconnect switch	30 mA	60 mA
4606-9101	Remote LCD Annunciator (see data sheet S4606-0001)	65 mA	140 mA
4610-9111	Remote LED/Switch Annunciator (see data sheet S4610-0001)	40 mA	70 mA (all LEDs and tone-alert on)

**** Current Calculation Information:**

1. To determine total supervisory current, add currents of modules in panel to base system value **and** all auxiliary loads.
2. To determine total alarm current, add currents of modules in panel to base system alarm current **and** add all panel NAC loads **and** all auxiliary loads.

Addressable Device Information

The following addressable device types and hardware point types are provided. A combination of autoprogram, and either front panel or PC programming allows the operation to be selected per application.

Available Fire Detection Device Types

Device	Description	Options	
Photoelectric Addressable Detector	TrueAlarm operation with sensitivity = 2.5%/ft	Sounder base (selectable for single station operation)	With communications isolator
		With relay output	Selectable for all detectors to be at city of Boston sensitivity of 3.7%/ft
Heat Detector	Fixed temperature thermal detection at 135° F (57.2° C)	Sounder base (selectable for single station operation)	With communications isolator
		With relay output	Individually selectable to add rate-of-rise heat detection of 15° F/minute (8.3° C/minute)
Photoelectric Detector with Heat Detector	Combination detector, dual address base with options available per above		

Addressable Hardware Point Types

Function Type	Description	Function Type	Description
FIRE	Fire monitor device	WSO	Combination waterflow and water supervisory device
WATER	Waterflow monitor device	SUPV	Supervisory monitor
HEAT	Heat detector device	UTIL	Supervised utility monitor
DUCT	Duct detector device	TROUBLE	Trouble monitor
PULL	Manual (pull) station device	VSMOKE	Verified fire alarm; an alarm level causes the alarm verification cycle to start
SMOKE	Smoke detector device	STYLEC	Style C fire monitor
SO	Sprinkler Supervisory	LATSUPV	Latching supervisory monitor (supervisory latches until system is reset)
IAM	Individual Addressable Module	ISOL	Addressable Isolator
		MBZAM	Class B addressable IDC monitor module
SIGNAL	Signal IAM	MAZAM	Class A addressable IDC monitor module
RIAM	Addressable Relay	ADRPUL	Addressable manual station

NAC Operation Modes

Function Type	Description
SSIG	Alarm signal, on until silenced
RSIG	Alarm signal, on until reset
TROUBLE	Trouble signal
SUPV	Supervisory signal
QALERT	SmartSync 2-wire horn/strobe control; horn on until silenced, strobe on until reset
WHEELOCK	Provides Wheelock strobe synch protocol when using only Wheelock strobes on panel, not to be mixed with Simplex strobes
UTILITY	Utility signal, generic non-alarm

Relay Operation Modes

The following relay operations are selectable from either the front panel or the PC programmer.

Common Fire Alarm Operations

Function Type	Relay Activates Upon	Relay Deactivates Upon
SRELAY	General Alarm	Silence
RRELAY	General Alarm	Reset
SUPV	Supervisory condition	Clear
TRBL	Trouble condition	Clear

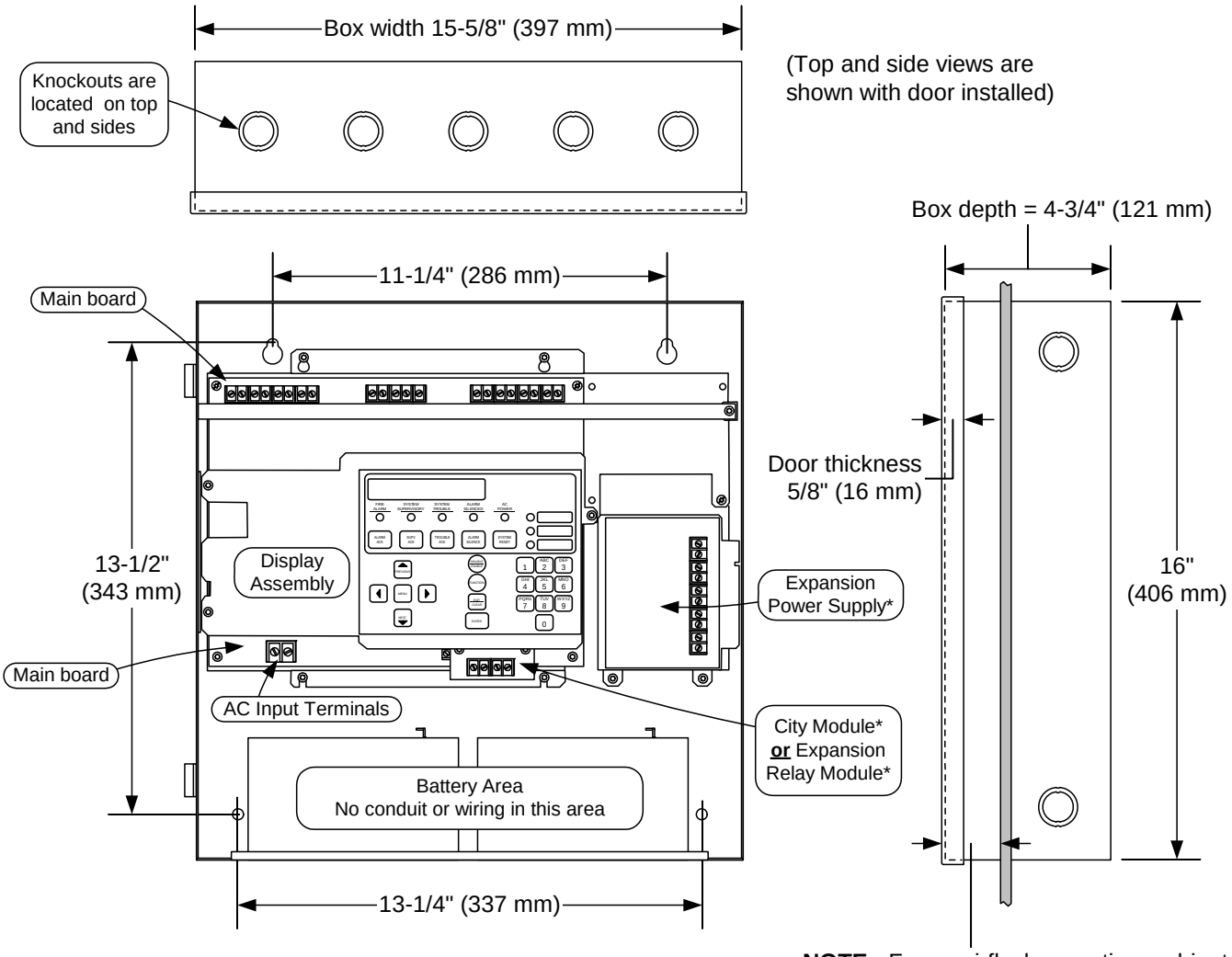
Special Functions

Function Type	Description
UTILITY	Utility input in the same alarm group activates
PRIMARY	General alarm; relay is tied to Primary Elevator Recall contacts
ALTERN	General alarm; relay is tied to Alternate Elevator Recall contacts
DRESET	Relay provides 24 VDC power to 4-wire addressable detectors; relay turns off for 5 seconds on System Reset
DHOLDER	Relay provides 24 VDC to larger door holder relay with separate power source; relay activates on general alarm to remove power to door holder relay and close doors

Additional Programming Feature Details

Function	Details
Custom labels	Up to 20 characters per point; a built-in message library provides for commonly used words for easy front panel programming
Message Library	For front panel label creation convenience, the following words can be selected as part of a custom label (_designates a built-in space; typing the first letter of a word/number will select the closest word in alphabetical/numerical sequence)
	North South East West Front
	Center rear 5th Flr_1 Flr_2
	Flr_3 Flr_4 Flr_5 RM_
	Basement Floor Garage Hallway HVAC_Room Kitchen
	Lobby Office Patient upper lower
	main first 2nd 3rd 4th
	Boiler_RM Classroom Closet_ Corridor Elect_RM
	Elevator Entrance Restroom Room Stairway
	Storeroom Wing Zone
History logs	Three separate logs: Alarm (100 entries), Supervisory (100 entries), and Trouble (300 entries); logs can be queried separately, or as a combined log; logs can be downloaded for printing or archiving using the RS-232 service port
Autoprogram	Automatically scans system for installed option modules and configures panel programming accordingly; modes are available to detect new modules only, recreate default programming and then add all modules found; Scans of addressable loop adds addressable devices, displays total added; checks for duplicate addresses and identifies errors
Alarm Groups	Up to 99 alarm groups are available, any point may be in up to 3 alarm groups; this allows NAC and relay operation to be associated with inputs according to local response requirements
WALKTEST	Allows one person to perform system testing; alarm or trouble tests are followed by automatic reset; the alarm zone is sounded out by associated audible notification or the response is silently logged into the Alarm log
Manual Control	Allows selection of individual relays or NACs for system testing
Passcode Protection (4-digit number)	Level 1 = Acknowledge, Silence, System Reset, View logs, View point information, and Lamp Test Level 2 = All Level 1 + Set Time/Date, Point Control, Enable/Disable points Level 3 = All Level 2 + Clear logs, Clear verification tallies, Custom label editing, and WALKTEST Level 4 = All Level 3 + Programming, Upload/Download; this is the Service access level

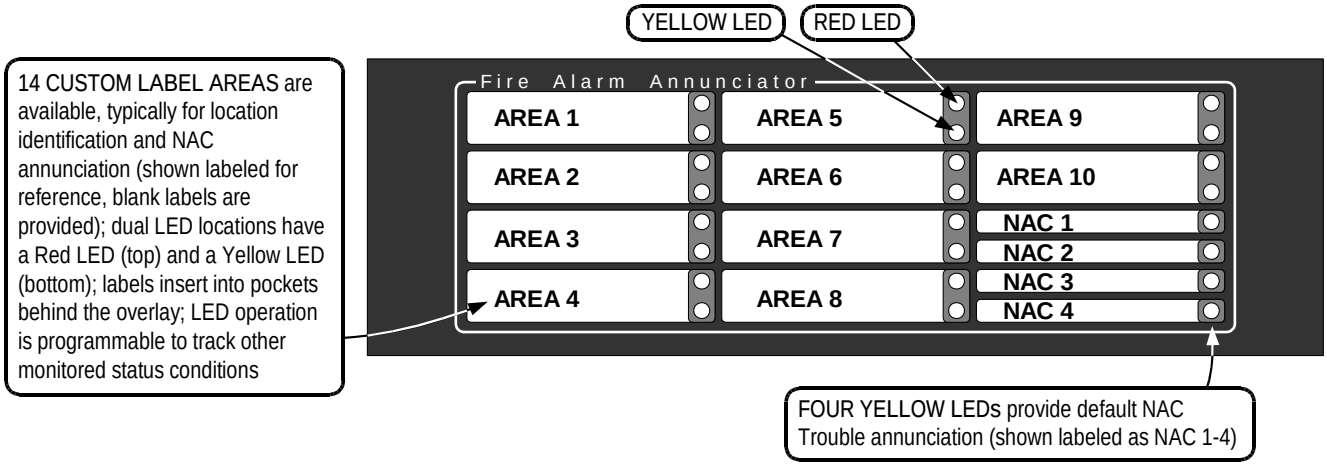
Installation and Module Placement Reference



* Indicates optional modules

NOTE: For semi-flush mounting, cabinet must extend 1-1/2" (38 mm) minimum from wall surface

Door LED Annunciator Details



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LITHONIA LIGHTING®

Catalog Number	LQM-P-W-3-R-120/277-SW15
Notes	
Type	E2

APPLICATION GUIDE: STANDARD SPECIAL SIGNAGE

Lithonia Lighting offers special signage signs to suit many applications. The Signature and Quantum families highlighted below are illuminated with energy-efficient, long-life Light Emitting Diodes (LEDs).

WARRANTY — Complete warranty terms located at
www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Actual performance may differ as a result of end-user environment and application.

Note: Specifications subject to change without notice.



LE P
Signature



LQM P
Quantum



LHQM P
Quantum



SW01



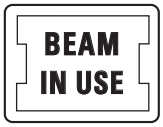
SW02



SW03



SW04



SW05



SW06



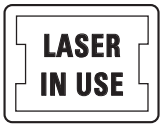
SW07



SW08



SW09



SW10



SW11



SW12



SW13



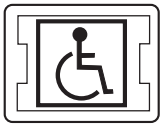
SW14



SW15



SW16



SW17

ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

Example: LE P 1 R 120/277 EL N SW02

LQM	P		3	R	120/277	
Family	**Face type**	**Housing color**	**Number of faces**	**Letter color**	**Input voltage**	**Operation[6]**
LE Signature die-cast aluminum sign[1]	P Panel	(blank) Matte black, brushed aluminum face	1 Single face	R Red	120/277 Dual voltage	(blank) AC only
LQM Quantum thermoplastic sign[2,3]		W White	2 Double face	G Green		EL N Nickel-cadmium battery
LHQM Quantum thermoplastic[2,4]			3 Single face with extra faceplate and color panel[5]			

SW15

Special wording

SW01	AREA OF REFUGE[7]	SW05	BEAM IN USE[7,8]	SW09	IN USE[7,8]	SW13	ON AIR[7,8]
SW02	AREA OF RESCUE[7]	SW06	DARK ROOM IN USE[7,8]	SW10	LASER IN USE[7,8]	SW14	ROOM IN USE[7,8]
SW03	AREA OF RESCUE ASSISTANCE[7]	SW07	EXIT Arabic/English[9,10]	SW11	MAGNET IN USE[7,8]	SW15	SALIDA[9,10]
SW04	AREA OF RESCUE ASSISTANCE with access pictogram[7]	SW08	EXIT with access pictogram[10]	SW12	NO EXIT[10]	SW16	X-RAY IN USE[7,8]
						SW17	Handicap Symbol[7]

Notes

1 See spec sheet LE or LE ELN for complete specifications
2 Only available in white housing.
3 See spec sheet LQM or LQM ELN for complete specifications
4 See spec sheet LHQM for complete specifications
5 Only available with LQM or LHQM family.
6 Leave blank for LHQM family.
7 UL Listed as an electric sign.
8 Not available with LHQM family or EL N operation.
9 Only available in red letter color.
10 Not available with UL listing.

CUSTOM SIGNAGE

MAINTENANCE

All life safety equipment, including emergency lighting for path of egress must be maintained, serviced, and tested in accordance with all National Fire Protection Association (NFPA) and local codes. Failure to perform the required maintenance, service, or testing could jeopardize the safety of occupants and will void all warranties.

EMERGENCY: One Lithonia Way, Conyers, GA 30012 Phone: 800-334-8694 Fax: 770-981-8141 www.lithonia.com © 2010-2013 Acuity Brands Lighting, Inc. All rights reserved. Rev. 03/09/13

LITHONIA LIGHTING®

Catalog Number	ELA-B-T-Q-L0304-
Notes	
Type	E3

QUANTUM®

Thermoplastic Emergency Light

ELA Q

Remote Fixture
Adjustable LED Lamp Head

LED

FEATURES & SPECIFICATIONS

INTENDED USE

To be powered by Quantum® LED series unit or combo with high-output option as part of an emergency lighting system providing light for the path of egress. Remote lamp head matches the appearance of the Quantum LED series family units. **Certain airborne contaminants can diminish integrity of acrylic.** Click here for Acrylic Environmental Compatibility table, for suitable uses.

CONSTRUCTION

Single or twin heads available. Fully adjustable lamp heads to meet all aiming requirements. Strong, compact and corrosion-resistant with a UL94V-0 flame rating. Constructed of UV-stabilized thermoplastic that resists discoloration by natural or artificial sunlight. Lamp housing snaps off for easy lamp replacement.

Lamps: 12 series-parallel white LEDs per head. The typical life of the LED lamp is 10 years.

INSTALLATION

Universal mounting base for use with single- or twin-head applications. Mounts to a single-gang switch box.

LISTINGS

UL Listed. Damp location listed (ELA Q) 50°F to 104°F (10°C to 40°C). Wet location listed (ELA QWP) 14°F to 122°F (-10°C to 50 °C).

WARRANTY

Complete warranty terms located at
www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Actual performance may differ as a result of end-user environment and application.

Note: Specifications subject to change without notice.



ELA Q



ELA QWP



ELA T Q



ELA T QWP

Specifications

Q single:	6-5/8" W x 4-3/4" H
Q twin:	8-1/4" W x 4-1/4" H
QWP single:	4-1/2" W x 5-3/4" H
QWP twin:	8-1/2" W x 5-3/4" H

ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

Example: ELA Q L0304

ELA	B	T	Q	L0304	
Family	**Housing**	**Number of heads**	**Fixture**	**Lamp type**	**Options**
ELA	(blank) White/gray[1] B Black	(blank) Single T Twin	Q Quantum LED series adjustable lamp head QWP Quantum LED series adjustable lamp head, weather-proof, cast aluminum	L0304 1.5W/3.6V LED lamps, per lamp head[2] L0309 1.5W/9.6V LED lamps, per lamp head[3]	SD For use with self-diagnostic fixtures[5]

Accessories: *Order as separate item.*	
ELA WG1	Wireguard, 15"W x 13-1/2" H x 6" D[4]

Notes

1 White standard for Q, gray standard for QWP.
2 For use with ELM2 LED only.
3 For use with LHQM LED only.
4 See spec sheet ELA_WG.
5 SD must be ordered in combination with ELM2 LED and LHQM LED fixtures.

ELA Q LED QUANTUM® Thermoplastic Emergency Light

The following information is provided to assist in planning layouts for emergency lighting systems. The National Electrical Code limits voltage drop to a maximum of 5% of nominal. Thus, circuit runs must be of sufficient size to maintain operating voltage when remote fixtures and/or exit signs are connected to the emergency lighting equipment. The table below shows the length of wire run based on system voltage, wire gauge and total wattage on the run.

ELA_ L0304 configurations (for use with ELM2 LED)

AWG	18	16	14	12	10
DC Resistance (ohms/ft)	0.0078	0.0049	0.0031	0.0019	0.0012

Watts	Length of Run				
1.5	26	42	67	106	170
3	13	21	33	53	85
4.5	9	14	22	35	57
6	7	10	17	27	42
7.5	5	8	13	21	34
9	4	7	11	18	28
10.5	4	6	10	15	24
12	3	5	8	13	21

ELA_ L0309 configurations (for use with LHQM LED)

AWG	18	16	14	12	10
DC Resistance (ohms/ft)	0.0078	0.0049	0.0031	0.0019	0.0012

Watts	Length of Run				
1.5	188	298	475	756	1206
3	94	149	238	378	603
4.5	63	99	158	252	402
6	47	75	119	189	301
7.5	38	60	95	151	241
9	31	50	79	126	201
10.5	27	43	68	108	172
12	23	37	59	95	151

EMERGENCY: One Lithonia Way Conyers, GA 30012 Phone: 800-334-8694 Fax: 770-981-8141 www.lithonia.com

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LITHONIA LIGHTING®

FEATURES & SPECIFICATIONS

INTENDED USE — The VT Series Volumetric LED Troffer (VTL) combines the aesthetics and high performance with intelligent LED engines for applications - offices, schools, retail locations and hospitals. High-efficacy light engine delivers long life and excellent color, ensuring a superior quality lighting installation that is highly efficient and sustainable. Multiple lumen packages and driver options provide solutions for all your lighting applications. Featured nLight controls system provides design flexibility and ease of installation and optimum energy savings.

CONSTRUCTION — Rugged, one-piece cold-rolled steel coated polyester, painted after fabrication with embossed facets. Impact-modified, single clear acrylic diffuser provides excellent shielding and wide distribution. End plates include integral T-bar clips. Fixture may be mounted and wired in continuous rows. Total fixture height is only 4-3/8".

OPTICS — Volumetric illumination is achieved by creating an optimal mix of light to walls, partitions, vertical and horizontal work surfaces — rendering the interior space, objects and occupants in a more balanced, complementary luminous environment. Linear faceted reflector cavity softens and distributes light into the space while minimizing luminous contrast between the fixture and ceiling. Sloped end plates provide a smooth, luminous transition between fixture and ceiling while enhancing the perception of fixture depth.

High-performance diffuser provides LED concealment, even illumination across the diffuser and improved lumen-per-watt performance.

ELECTRICAL — Long-life LEDs, coupled with high-efficiency drivers, provide superior quantity and quality of illumination for extended service life. VTLED is rated to deliver L80 performance for 50,000 hours.

eldoLED driver options deliver choice of dimming range, and choices for control, while assuring flicker-free, low-current inrush, 89% efficiency and low EMI.

Optional integrated nLight® controls make each luminaire addressable - allowing it to digitally communicate with other nLight enabled controls such as dimmers, switches, occupancy sensors and photocontrols. Simply connect all the nLight enabled control devices and the VTLED luminaires using standard Cat-5 cabling. Unique plug-and-play convenience as devices and luminaires automatically discover each other and self-commission.

Lumen Management: Unique lumen management system (option N80) provides onboard intelligence that actively manages the LED light source so that constant lumen output is maintained over the system life, preventing the energy waste created by the traditional practice of over-lighting.

Step-level dimming option allows system to be switched to 50% power for compliance with common energy codes while maintaining fixture appearance.

Driver disconnect provided where required to comply with US and Canadian codes.

INSTALLATION — Unique grid interfacing arrangement provides mounting into standard 1" and 9/16" tee bar or screw slot grids. 9/16" allows fixture trim to hang level with architectural ceiling tiles. Drywall ceiling adaptors available. Suitable for damp location.

LISTINGS — CSA Certified to meet U.S. and Canadian standards. Patents pending. DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.designlights.org/QPL to confirm which versions are qualified.

Catalog Number	
Notes	
Type	L1

VT LED

VT Series Volumetric LED Troffer

2VTL

~~2' x 4'~~

LED

609.6mm x 1219.2mm



eldoLED DLC QPL LISTED nLIGHT

INDUSTRY RECOGNITION/AWARDS

NGL'12

2012 RECOGNIZED PRODUCT

pia11 PRODUCT INNOVATION AWARD WINNER

2011 ARCHITECTURAL SSL PRODUCT INNOVATION AWARD

WARRANTY — 5-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Note: Specifications subject to change without notice.

ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

Example: 2VTL4 48L ADP EZ1 LP835 N80

2VTL4			ADP					
Series	**Air function**	**Lumens**	**Diffuser**	**Voltage**	**Driver[3]**	**Color temperature**	**Controls**	**Options**
2VTL4 2X4 VTL	(blank) Static H Heat removal	30L 3000[1] 40L 4000[1] 48L 4800[1] 60L 6000[1] 72L 7200[1]	ADP Acrylic linear prismatic	(blank) MVOLT 347 347[2]	EZ1 eldoLED dims to 1% (0-10 volt dimming) EZB eldoLED dims to black (0-10 volt dimming) EDB eldoLED DALI[4] EXB eldoLED DMX/RDM[4] SLD Step-level dimming[4]	LP830 3000 K LP835 3500 K LP840 4000 K LP850 5000 K	(blank) No controls N80 nlight® with 80% lumen management N80EMG nlight® with 80% lumen management For use with generator supply EM power N100 nlight® without lumen management N100EMG nlight® without lumen management For use with generator supply EM power	EL7L 700 lumen battery pack EL14L 1400 lumen battery pack CP Chicago plenum

Performance Data			
Lumen Package	**Lumens**	**Input Watts[3]**	**LPW**
30L	3150 - 3650	31	103 - 118
40L	4000 - 4600	39	102 - 117
48L	4600 - 5350	47	99 - 114
60L	5050 - 6250	52	97 - 119
72L	6750 - 7800	70	98 - 111

Accessories: *Order as separate catalog number.*

2VT4 F916	Trim to adjust fixture mounting flush with 9/16" T-bar; for 2x4 fixture
DGA24	Drywall ceiling adaptor , unit installation

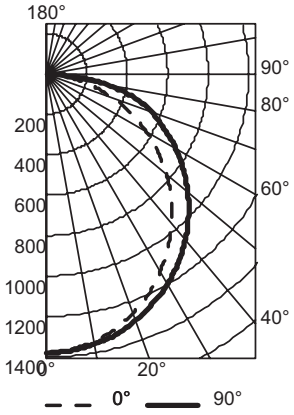
Notes

1 Approximate lumen output.
2 Consult factory for availability. Not available with SLD,EL7L or EL14 battery packs.
3 Actual wattage may differ by +/- 5% when operating between 120-277V +/- 10%.
4 Not Available with N80, N80EMG, N100, or N100EM.

2VTL Volumetric Recessed Lighting 2'x4'

PHOTOMETRICS

2VTL4 40L ADP LP835, 4211 delivered lumens, test no. LTL24782P4, tested in accordance to IESNA LM-79



CP Summary

	0°	90
0°	1380	1380
5°	1369	1374
15°	1309	1334
25°	1199	1252
35°	1050	1139
45°	873	994
55°	676	829
65°	464	649
75°	243	447
85°	53	146
90	4	9

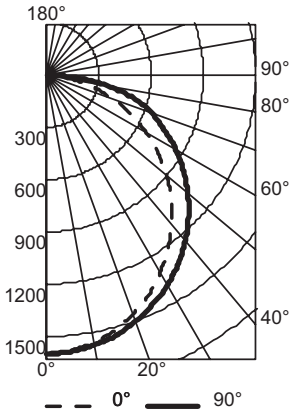
Coefficients of Utilization

RCR	pf 20% pc 80% pw 70%	50%	30%	20% pc 70% pw 50%	30%	10%	50% pc 50% pw 30%	30%	10%
0	119	119	119	116	116	116	111	111	111
1	108	103	98	100	96	92	96	92	89
2	97	89	81	87	80	74	83	78	73
3	89	77	69	76	68	61	73	66	60
4	81	68	59	67	58	52	64	57	51
5	74	61	52	60	51	44	58	50	44
6	69	55	46	54	45	39	52	44	38
7	63	50	41	49	40	34	47	39	34
8	59	45	36	44	36	30	43	36	30
9	55	41	33	41	33	27	40	32	27
10	52	38	30	38	30	25	37	30	25

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	1070	25.4	25.4
0° - 40°	1756	41.7	41.7
0° - 60°	3152	74.8	74.8
0° - 90°	4212	100.0	100.0
90° - 180°	0	0.0	0.0
0° - 180°	4212	100.0	100.0

2VTL4 48L ADP LP835, 4879 delivered lumens, test no. LTL24782P8, tested in accordance to IESNA LM-79



CP Summary

	0°	90
0°	1599	1599
5°	1586	1592
15°	1517	1546
25°	1389	1451
35°	1217	1320
45°	1012	1152
55°	784	961
65°	537	752
75°	282	517
85°	62	169
90	5	11

Coefficients of Utilization

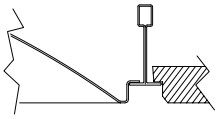
RCR	pf 20% pc 80% pw 70%	50%	30%	20% pc 70% pw 50%	30%	10%	50% pc 50% pw 30%	30%	10%
0	119	119	119	116	116	116	111	111	111
1	108	103	98	100	96	92	96	92	89
2	97	89	81	87	80	74	83	78	73
3	89	77	69	76	68	61	73	66	60
4	81	68	59	67	58	52	64	57	51
5	74	61	52	60	51	44	58	50	44
6	69	55	46	54	45	39	52	44	38
7	63	50	41	49	40	34	47	39	34
8	59	45	36	44	36	30	43	36	30
9	55	41	33	41	33	27	40	32	27
10	52	38	30	38	30	25	37	30	25

Zonal Lumen Summary

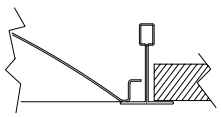
Zone	Lumens	% Lamp	% Fixture
0° - 30°	1240	25.4	25.4
0° - 40°	2035	41.7	41.7
0° - 60°	3653	74.8	74.8
0° - 90°	4881	100.0	100.0
90° - 180°	0	0.0	0.0
0° - 180°	4881	100.0	100.0

Mounting data

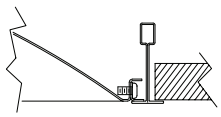
9/16



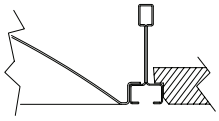
15/16



9/16 with accessory 2VT2 F916



SS



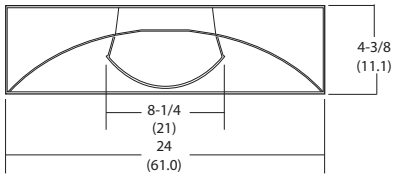
nLight® Control Accessories:
Order as separate catalog number. Visit www.sensorswitch.com/nLight for complete listing of nLight controls.

WallPod stations	Model number	Occupancy sensors	Model number
On/Off	nPODM [color]	Small motion 360°, ceiling (PIR / dual tech)	nCM 9 / nCM PDT 9
On/Off & Raise/Lower	nPODM DX [color]	Large motion 360°, ceiling (PIR / dual tech)	nCM 10 / nCM PDT 10
Graphic Touchscreen	nPOD GFX	Wall switch with raise/lower	nWSXPDTLVDX
Photocell controls	**Model number**	**Cat-5 cable bundles (plenum rated)**	**Model number**
On/Off & Dimming	nCM ADCX	10', 15 pieces per bundle	CAT5 10FT
		30', 15 pieces per bundle	CAT5 30FT

Dimensions

All dimensions are inches (centimeters) unless otherwise specified.

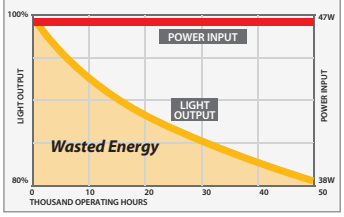
Specifications
Length: 48 (122.0)
Width: 24 (61.0)
Depth: 4-3/8 (11.1)



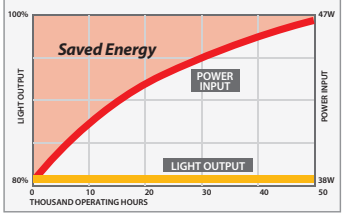
Constant Lumen Management

Enabled by the embedded nLight control, the VTLED actively tracks its run-time and manages its light source such that constant lumen output is maintained over the system life. Referred to as lumen management, this feature eliminates the energy waste created by the traditional practice of over-lighting.

Without Lumen Management
Energy is wasted and light level is inconsistent.



With Lumen Management
Energy is saved and light level remains consistent.



LITHONIA LIGHTING®
An AcuityBrands Company

2VTL-2X4

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LITHONIA LIGHTING®

FEATURES & SPECIFICATIONS

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INSTALLATION — Unique grid interfacing arrangement provides mounting into standard 1" and 9/16" tee bar or screw slot grids. 9/16" allows fixture trim to hang level with architectural ceiling tiles. Drywall ceiling adaptors available. Suitable for damp location.

LISTINGS — CSA Certified to meet U.S. and Canadian standards. Patents pending. DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.designlights.org/QPL to confirm which versions are qualified.

Catalog Number	
Notes	
Type	L2

VT LED

VT Series Volumetric LED Troffer

609.6mm X 1219.2mm

2VTL

~~2' x 4'~~
LED



eldoLED DLC QPL LISTED nLIGHT

INDUSTRY RECOGNITION/AWARDS

NGL'12
2012 RECOGNIZED PRODUCT

pia11 PRODUCT INNOVATION AWARD WINNER
2011 ARCHITECTURAL SSL PRODUCT INNOVATION AWARD

WARRANTY — 5-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Note: Specifications subject to change without notice.

ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

Example: 2VTL4 48L ADP EZ1 LP835 N80

2VTL4			ADP					
Series	**Air function**	**Lumens**	**Diffuser**	**Voltage**	**Driver[3]**	**Color temperature**	**Controls**	**Options**
2VTL4 2X4 VTL	(blank) Static H Heat removal	30L 3000[1] 40L 4000[1] 48L 4800[1] 60L 6000[1] 72L 7200[1]	ADP Acrylic linear prismatic	(blank) MVOLT 347 347[2]	EZ1 eldoLED dims to 1% (0-10 volt dimming) EZB eldoLED dims to black (0-10 volt dimming) EDB eldoLED DALI[4] EXB eldoLED DMX/RDM[4] SLD Step-level dimming[4]	LP830 3000 K LP835 3500 K LP840 4000 K LP850 5000 K	(blank) No controls N80 nlight® with 80% lumen management N80EMG nlight® with 80% lumen management For use with generator supply EM power N100 nlight® without lumen management N100EMG nlight® without lumen management For use with generator supply EM power	EL7L 700 lumen battery pack EL14L 1400 lumen battery pack CP Chicago plenum

Performance Data			
Lumen Package	**Lumens**	**Input Watts[3]**	**LPW**
30L	3150 - 3650	31	103 - 118
40L	4000 - 4600	39	102 - 117
48L	4600 - 5350	47	99 - 114
60L	5050 - 6250	52	97 - 119
72L	6750 - 7800	70	98 - 111

Accessories: *Order as separate catalog number.*

2VT4 F916	Trim to adjust fixture mounting flush with 9/16" T-bar; for 2x4 fixture
DGA24	Drywall ceiling adaptor , unit installation

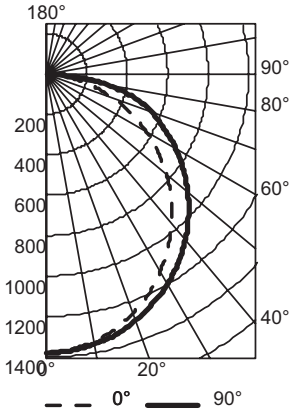
Notes

1 Approximate lumen output.
2 Consult factory for availability. Not available with SLD,EL7L or EL14 battery packs.
3 Actual wattage may differ by +/- 5% when operating between 120-277V +/- 10%.
4 Not Available with N80, N80EMG, N100, or N100EM.

2VTL Volumetric Recessed Lighting 2'x4'

PHOTOMETRICS

2VTL4 40L ADP LP835, 4211 delivered lumens, test no. LTL24782P4, tested in accordance to IESNA LM-79



CP Summary

	0°	90
0°	1380	1380
5°	1369	1374
15°	1309	1334
25°	1199	1252
35°	1050	1139
45°	873	994
55°	676	829
65°	464	649
75°	243	447
85°	53	146
90	4	9

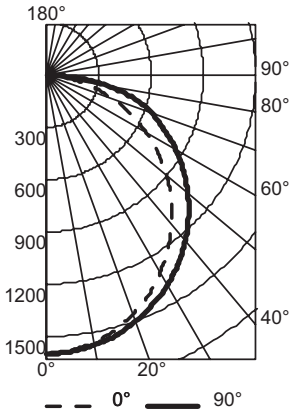
Coefficients of Utilization

RCR	pf 20% pc 80% pw 70%	50%	30%	20% pc 70% pw 50%	30%	10%	50% pc 50% pw 30%	30%	10%
0	119	119	119	116	116	116	111	111	111
1	108	103	98	100	96	92	96	92	89
2	97	89	81	87	80	74	83	78	73
3	89	77	69	76	68	61	73	66	60
4	81	68	59	67	58	52	64	57	51
5	74	61	52	60	51	44	58	50	44
6	69	55	46	54	45	39	52	44	38
7	63	50	41	49	40	34	47	39	34
8	59	45	36	44	36	30	43	36	30
9	55	41	33	41	33	27	40	32	27
10	52	38	30	38	30	25	37	30	25

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	1070	25.4	25.4
0° - 40°	1756	41.7	41.7
0° - 60°	3152	74.8	74.8
0° - 90°	4212	100.0	100.0
90° - 180°	0	0.0	0.0
0° - 180°	4212	100.0	100.0

2VTL4 48L ADP LP835, 4879 delivered lumens, test no. LTL24782P8, tested in accordance to IESNA LM-79



CP Summary

	0°	90
0°	1599	1599
5°	1586	1592
15°	1517	1546
25°	1389	1451
35°	1217	1320
45°	1012	1152
55°	784	961
65°	537	752
75°	282	517
85°	62	169
90	5	11

Coefficients of Utilization

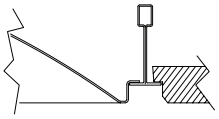
RCR	pf 20% pc 80% pw 70%	50%	30%	20% pc 70% pw 50%	30%	10%	50% pc 50% pw 30%	30%	10%
0	119	119	119	116	116	116	111	111	111
1	108	103	98	100	96	92	96	92	89
2	97	89	81	87	80	74	83	78	73
3	89	77	69	76	68	61	73	66	60
4	81	68	59	67	58	52	64	57	51
5	74	61	52	60	51	44	58	50	44
6	69	55	46	54	45	39	52	44	38
7	63	50	41	49	40	34	47	39	34
8	59	45	36	44	36	30	43	36	30
9	55	41	33	41	33	27	40	32	27
10	52	38	30	38	30	25	37	30	25

Zonal Lumen Summary

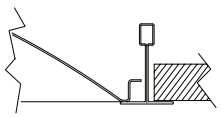
Zone	Lumens	% Lamp	% Fixture
0° - 30°	1240	25.4	25.4
0° - 40°	2035	41.7	41.7
0° - 60°	3653	74.8	74.8
0° - 90°	4881	100.0	100.0
90° - 180°	0	0.0	0.0
0° - 180°	4881	100.0	100.0

Mounting data

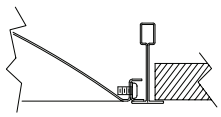
9/16



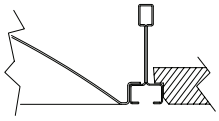
15/16



9/16 with accessory 2VT2 F916



SS



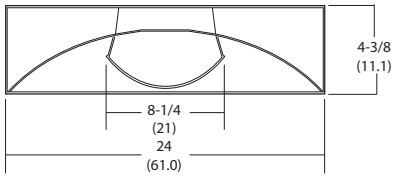
nLight® Control Accessories:
Order as separate catalog number. Visit www.sensorswitch.com/nLight for complete listing of nLight controls.

WallPod stations	Model number	Occupancy sensors	Model number
On/Off	nPODM [color]	Small motion 360°, ceiling (PIR / dual tech)	nCM 9 / nCM PDT 9
On/Off & Raise/Lower	nPODM DX [color]	Large motion 360°, ceiling (PIR / dual tech)	nCM 10 / nCM PDT 10
Graphic Touchscreen	nPOD GFX	Wall switch with raise/lower	nWSXPDTLVDX
Photocell controls	**Model number**	**Cat-5 cable bundles (plenum rated)**	**Model number**
On/Off & Dimming	nCM ADCX	10', 15 pieces per bundle	CAT5 10FT
		30', 15 pieces per bundle	CAT5 30FT

Dimensions

All dimensions are inches (centimeters) unless otherwise specified.

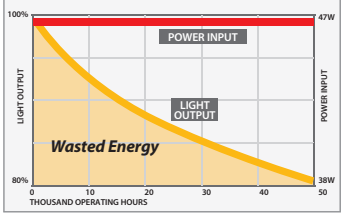
Specifications
Length: 48 (122.0)
Width: 24 (61.0)
Depth: 4-3/8 (11.1)



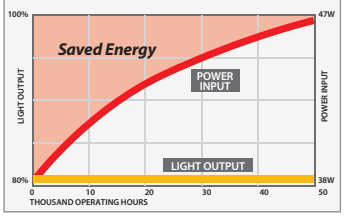
Constant Lumen Management

Enabled by the embedded nLight control, the VTLED actively tracks its run-time and manages its light source such that constant lumen output is maintained over the system life. Referred to as lumen management, this feature eliminates the energy waste created by the traditional practice of over-lighting.

Without Lumen Management
Energy is wasted and light level is inconsistent.



With Lumen Management
Energy is saved and light level remains consistent.



LITHONIA LIGHTING®
An AcuityBrands Company

2VTL-2X4

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LITHONIA LIGHTING®

FEATURES & SPECIFICATIONS

INTENDED USE — The VT Series Volumetric LED Troffer (VTL) combines the aesthetics and high performance with intelligent LED engines for applications - offices, schools, retail locations and hospitals. High-efficacy light engine delivers long life and excellent color, ensuring a superior quality lighting installation that is highly efficient and sustainable. Multiple lumen packages and driver options provide solutions for all your lighting applications. Featured nLight controls system provides design flexibility and ease of installation and optimum energy savings.

CONSTRUCTION — Rugged, one-piece cold-rolled steel coated polyester, painted after fabrication with embossed facets. Impact-modified, single clear acrylic diffuser provides excellent shielding and wide distribution. End plates include integral T-bar clips. Fixture may be mounted and wired in continuous rows. Total fixture height is only 4-3/8".

OPTICS — Volumetric illumination is achieved by creating an optimal mix of light to walls, partitions, vertical and horizontal work surfaces — rendering the interior space, objects and occupants in a more balanced, complementary luminous environment. Linear faceted reflector cavity softens and distributes light into the space while minimizing luminous contrast between the fixture and ceiling. Sloped end plates provide a smooth, luminous transition between fixture and ceiling while enhancing the perception of fixture depth.

High-performance diffuser provides LED concealment, even illumination across the diffuser and improved lumen-per-watt performance.

ELECTRICAL — Long-life LEDs, coupled with high-efficiency drivers, provide superior quantity and quality of illumination for extended service life. VTLED is rated to deliver L80 performance for 50,000 hours.

eldoLED driver options deliver choice of dimming range, and choices for control, while assuring flicker-free, low-current inrush, 89% efficiency and low EMI.

Optional integrated nLight® controls make each luminaire addressable - allowing it to digitally communicate with other nLight enabled controls such as dimmers, switches, occupancy sensors and photocontrols. Simply connect all the nLight enabled control devices and the VTLED luminaires using standard Cat-5 cabling. Unique plug-and-play convenience as devices and luminaires automatically discover each other and self-commission.

Lumen Management: Unique lumen management system (option N80) provides onboard intelligence that actively manages the LED light source so that constant lumen output is maintained over the system life, preventing the energy waste created by the traditional practice of over-lighting.

Step-level dimming option allows system to be switched to 50% power for compliance with common energy codes while maintaining fixture appearance.

Driver disconnect provided where required to comply with US and Canadian codes.

INSTALLATION — Unique grid interfacing arrangement provides mounting into standard 1" and 9/16" tee bar or screw slot grids. 9/16" allows fixture trim to hang level with architectural ceiling tiles. Drywall ceiling adaptors available. Suitable for damp location.

LISTINGS — CSA Certified to meet U.S. and Canadian standards. Patents pending. DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.designlights.org/QPL to confirm which versions are qualified.

Catalog Number	
Notes	
Type	L3

VT LED

VT Series Volumetric LED Troffer

609.6mm X 1219.2mm

2VTL

~~2' x 4'~~
LED



eldoLED DLC QPL LISTED nLIGHT

INDUSTRY RECOGNITION/AWARDS

NGL'12
2012 RECOGNIZED PRODUCT

pia11 AWARD WINNER
2011 ARCHITECTURAL SSL PRODUCT INNOVATION AWARD

WARRANTY — 5-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Note: Specifications subject to change without notice.

ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

Example: 2VTL4 48L ADP EZ1 LP835 N80

2VTL4			ADP					
Series	**Air function**	**Lumens**	**Diffuser**	**Voltage**	**Driver[3]**	**Color temperature**	**Controls**	**Options**
2VTL4 2X4 VTL	(blank) Static H Heat removal	30L 3000[1] 40L 4000[1] 48L 4800[1] 60L 6000[1] 72L 7200[1]	ADP Acrylic linear prismatic	(blank) MVOLT 347 347[2]	EZ1 eldoLED dims to 1% (0-10 volt dimming) EZB eldoLED dims to black (0-10 volt dimming) EDB eldoLED DALI[4] EXB eldoLED DMX/RDM[4] SLD Step-level dimming[4]	LP830 3000 K LP835 3500 K LP840 4000 K LP850 5000 K	(blank) No controls N80 nlight® with 80% lumen management N80EMG nlight® with 80% lumen management For use with generator supply EM power N100 nlight® without lumen management N100EMG nlight® without lumen management For use with generator supply EM power	EL7L 700 lumen battery pack EL14L 1400 lumen battery pack CP Chicago plenum

Performance Data			
Lumen Package	**Lumens**	**Input Watts[3]**	**LPW**
30L	3150 - 3650	31	103 - 118
40L	4000 - 4600	39	102 - 117
48L	4600 - 5350	47	99 - 114
60L	5050 - 6250	52	97 - 119
72L	6750 - 7800	70	98 - 111

Accessories: *Order as separate catalog number.*

2VT4 F916	Trim to adjust fixture mounting flush with 9/16" T-bar; for 2x4 fixture
DGA24	Drywall ceiling adaptor , unit installation

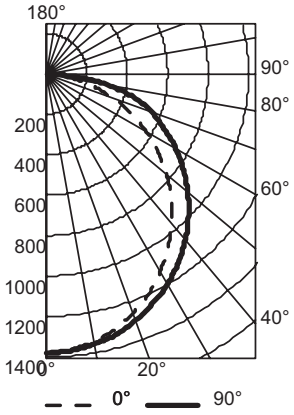
Notes

1 Approximate lumen output.
2 Consult factory for availability. Not available with SLD,EL7L or EL14 battery packs.
3 Actual wattage may differ by +/- 5% when operating between 120-277V +/- 10%.
4 Not Available with N80, N80EMG, N100, or N100EM.

2VTL Volumetric Recessed Lighting 2'x4'

PHOTOMETRICS

2VTL4 40L ADP LP835, 4211 delivered lumens, test no. LTL24782P4, tested in accordance to IESNA LM-79



CP Summary

	0°	90
0°	1380	1380
5°	1369	1374
15°	1309	1334
25°	1199	1252
35°	1050	1139
45°	873	994
55°	676	829
65°	464	649
75°	243	447
85°	53	146
90	4	9

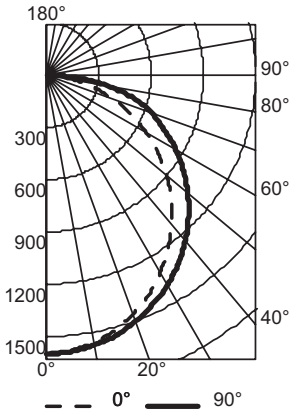
Coefficients of Utilization

RCR	pf 20% pc 80% pw 70%	50%	30%	20% pc 70% pw 50%	30%	10%	50% pc 50% pw 30%	30%	10%
0	119	119	119	116	116	116	111	111	111
1	108	103	98	100	96	92	96	92	89
2	97	89	81	87	80	74	83	78	73
3	89	77	69	76	68	61	73	66	60
4	81	68	59	67	58	52	64	57	51
5	74	61	52	60	51	44	58	50	44
6	69	55	46	54	45	39	52	44	38
7	63	50	41	49	40	34	47	39	34
8	59	45	36	44	36	30	43	36	30
9	55	41	33	41	33	27	40	32	27
10	52	38	30	38	30	25	37	30	25

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	1070	25.4	25.4
0° - 40°	1756	41.7	41.7
0° - 60°	3152	74.8	74.8
0° - 90°	4212	100.0	100.0
90° - 180°	0	0.0	0.0
0° - 180°	4212	100.0	100.0

2VTL4 48L ADP LP835, 4879 delivered lumens, test no. LTL24782P8, tested in accordance to IESNA LM-79



CP Summary

	0°	90
0°	1599	1599
5°	1586	1592
15°	1517	1546
25°	1389	1451
35°	1217	1320
45°	1012	1152
55°	784	961
65°	537	752
75°	282	517
85°	62	169
90	5	11

Coefficients of Utilization

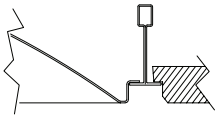
RCR	pf 20% pc 80% pw 70%	50%	30%	20% pc 70% pw 50%	30%	10%	50% pc 50% pw 30%	30%	10%
0	119	119	119	116	116	116	111	111	111
1	108	103	98	100	96	92	96	92	89
2	97	89	81	87	80	74	83	78	73
3	89	77	69	76	68	61	73	66	60
4	81	68	59	67	58	52	64	57	51
5	74	61	52	60	51	44	58	50	44
6	69	55	46	54	45	39	52	44	38
7	63	50	41	49	40	34	47	39	34
8	59	45	36	44	36	30	43	36	30
9	55	41	33	41	33	27	40	32	27
10	52	38	30	38	30	25	37	30	25

Zonal Lumen Summary

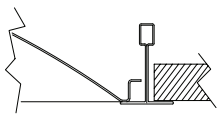
Zone	Lumens	% Lamp	% Fixture
0° - 30°	1240	25.4	25.4
0° - 40°	2035	41.7	41.7
0° - 60°	3653	74.8	74.8
0° - 90°	4881	100.0	100.0
90° - 180°	0	0.0	0.0
0° - 180°	4881	100.0	100.0

Mounting data

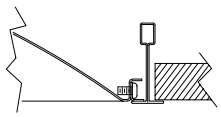
9/16



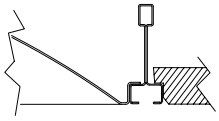
15/16



9/16 with accessory 2VT2 F916



SS



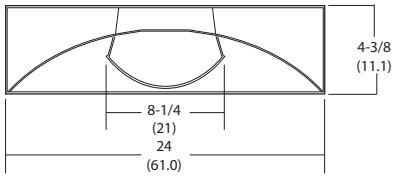
nLight® Control Accessories:
Order as separate catalog number. Visit www.sensorswitch.com/nLight for complete listing of nLight controls.

WallPod stations	Model number	Occupancy sensors	Model number
On/Off	nPODM [color]	Small motion 360°, ceiling (PIR / dual tech)	nCM 9 / nCM PDT 9
On/Off & Raise/Lower	nPODM DX [color]	Large motion 360°, ceiling (PIR / dual tech)	nCM 10 / nCM PDT 10
Graphic Touchscreen	nPOD GFX	Wall switch with raise/lower	nWSXPDTLVDX
Photocell controls	**Model number**	**Cat-5 cable bundles (plenum rated)**	**Model number**
On/Off & Dimming	nCM ADCX	10', 15 pieces per bundle	CAT5 10FT
		30', 15 pieces per bundle	CAT5 30FT

Dimensions

All dimensions are inches (centimeters) unless otherwise specified.

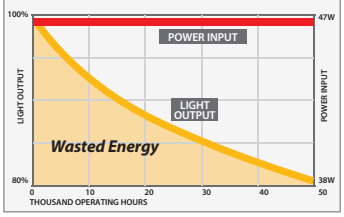
Specifications
Length: 48 (122.0)
Width: 24 (61.0)
Depth: 4-3/8 (11.1)



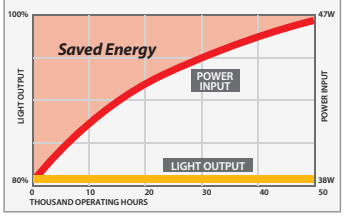
Constant Lumen Management

Enabled by the embedded nLight control, the VTLED actively tracks its run-time and manages its light source such that constant lumen output is maintained over the system life. Referred to as lumen management, this feature eliminates the energy waste created by the traditional practice of over-lighting.

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With Lumen Management
Energy is saved and light level remains consistent.



LITHONIA LIGHTING®
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2VTL-2X4

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LITHONIA LIGHTING®

Catalog Number	
Notes	
Type	L4

PROTEON™

LED High Bay

PTN

Heavy-Duty, Suspended



FEATURES & SPECIFICATIONS

INTENDED USE — Ideal one-for-one replacement of conventional high bay systems such as HID and fluorescent. Applications include manufacturing, warehousing, cold storage, commercial, retail and other large indoor spaces with mounting heights ranging from 15-40' and ambient environments between -13°F (-25°C) and 122°F (50°C). **Certain airborne contaminants can diminish integrity of acrylic and polycarbonate. Click here for Acrylic and Polycarbonate Environmental Compatibility table for suitable uses.**

CONSTRUCTION — Extruded heat sink made from 6063-T5 aluminum allows for superior thermal management to reduce LED and driver temperature providing years of trouble-free operation. The channel, endplates and driver tray are made of heavy-duty code gauge (20-gauge) steel which are painted with baked enamel; five-stage iron phosphate pre-treatment ensures superior paint adhesion and rust resistance. Access plate on the back of the channel housing allows quick and easy wiring.

OPTICS — Focus, narrow, wide and spread distributions available to meet both horizontal and vertical light level requirements. Reflectors feature precision-formed optics utilizing 97+% reflective Alanod® MIRO-SILVER® specular-aluminum. Diffuse acrylic lens standard to provide superior glare control and LED protection.

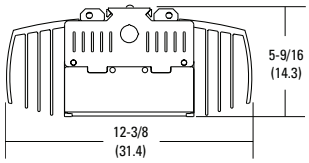
ELECTRICAL — 92% lumen maintenance at 60,000 hours; predicted life of more than 100,000 hours. Thermally protected driver(s) standard with 0-10V dimming. LEDs are driven at 350mA (nominal) to provide optimal lumens per watt and less heat to extend component life. Using pluggable harnesses, removable electrical tray allows easy access to components. Surge protector standard unless otherwise specified.

LISTINGS — CSA Certified to U.S. and Canadian safety standards (UL1598 and C22.2NO.250.0-08). Patent pending. Damp location listed. DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.designlights.org to confirm which versions are qualified.

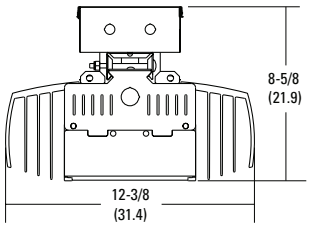
WARRANTY — 5-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Actual performance may differ as a result of end-user environment and application.

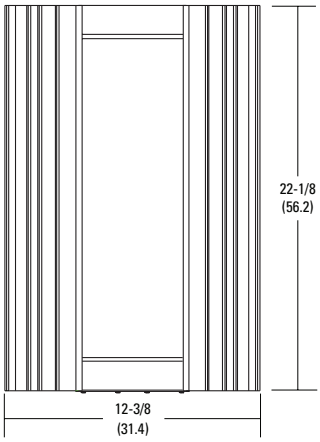
Note: Specifications subject to change without notice.



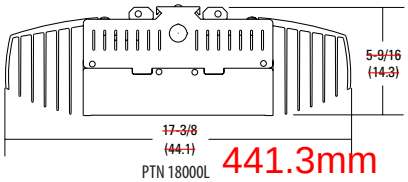
PTN 6000L and PTN 12000L



PTN 6000L and PTN 12000L with BACKPACK™



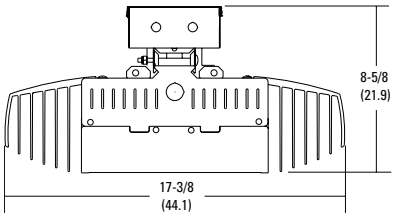
PTN 6000L and 12000L



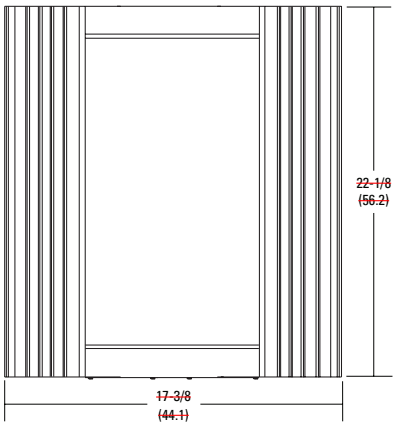
141.2mm

441.3mm

PTN 18000L



PTN 18000L with BACKPACK™



561.9mm

PTN 18000L

PROTEON LED Suspended High Bay

ORDERING INFORMATION Lead times will vary depending on options selected. Consult with your sales representative. **Example:** PTN 12000L ND LP750

PTN											
Series	**Lumens**		**Distribution**		**Lens**		**Voltage**				**Color temperature**	
PTN	6000L	6,000 lumens[1]	FD	Focus	(blank)	Semi-diffuse acrylic	(blank)	MVOLT	277	277V	LP740	70 CRI, 4000K CCT
	12000L	12,000 lumens[1]	ND	Narrow	HD125	Highly diffuse acrylic	120	120V	347	347V[3]	LP750	70 CRI, 5000K CCT
	18000L	18,000 lumens[1, 2]	MD	Medium			208	208V	480	480V[3]		
			WD	Wide								

Finish		**Options**			
(blank)	Textured dark gray with aluminum accents	DLC	DesignLights Consortium (DLC) qualified product[4]	MSE360	360° motion sensor embedded, high bay[12, 13]
DBLB	Textured black with aluminum accents	CS1W	Straight plug, 120V[5]	MSE360LB	360° motion sensor embedded, low bay[12, 13]
DWH	Gloss white with aluminum accents	CS3W	Twist-lock, 120V[5]	MSI	Aisle motion sensor, pre-wired[13, 14]
DNA	Gloss natural aluminum with natural aluminum accents	CS11W	Twist-lock, 277V[5]	MSI360	360° motion sensor, pre-wired[13, 14]
		CS93W	600V SO white cord, no plug (no voltage required)	MSI360LT	360° motion sensor, low temp. Operates down to -40°F/C[13, 14]
		CS97W	Twist-lock, 480V[5]	MSID	Aisle motion sensor, pre-wired, HI/LO dimming control[13, 14]
		L/SP	Less surge protector	MSI360D	360° motion sensor, pre-wired, HI/LO dimming control[13, 14]
		GLR	Internal fast-blow fuse	NMSI	nLight, aisle motion sensor, pre-wired[13, 14]
		BSL722	Bodine® emergency LED battery pack for 0°C and up[6, 7, 8]	NMSI360	nLight enable, 360° motion sensor, pre-wired[13, 14]
		BSL722C	Bodine® emergency LED battery pack for -20°C and up[6, 7, 8]	MSIPED	Aisle motion sensor, photocell, pre-wired[12, 13]
		IMP	Integrated modular plug[9, 10]	MSI360PED	360° motion sensor, photocell, pre-wired[12, 13]
		OUTCTR	Wiring leads pulled through back center of fixture[11]	nEPP5D	nLight dimming module[15]

Accessories: *Order as separate catalog number.*

Mounting:[11]

PTNSMB DNA	Surface mount bracket, natural aluminum finish
IBAC120 M20	10' adjustable aircraft cable; two clips; Y hanger (one pair)
IBAC240 M20	20' adjustable aircraft cable; two clips; Y hanger (one pair)
IBZPMP DNA	Pendant monopoint splice box, includes side covers, natural aluminum (DNA) finish
IBZPMPHB DNA	Pendant monopoint splice box, includes side covers (3/4" threaded hub), natural aluminum (DNA) finish

Cord sets and sensors for IMP option:

CS1WIMP	Straight plug, 120V[5]
CS3WIMP	Twist-lock, 120V[5]
CS7WIMP	Straight plug, 277V[5]
CS11WIMP	Twist-lock, 277V[5]
CS93WIMP	600V SO white cord, no plug (no voltage required)
MSIIMPF	Aisle motion sensor[10, 12]
MSI360IMPF	360° motion sensor[10, 12]

Miscellaneous:

WGPTN12 DNA	Wireguard, natural aluminum finish, 6L and 12L
WGPTN18 DNA	Wireguard, natural aluminum finish, 18L

CONFIGURATIONS
All dimensions are shown in inches (centimeters) unless otherwise noted.

LUMENS	WATTAGE				COMPARABLE HID	LENGTH	WIDTH	DEPTH WITHOUT BACKPACK	DEPTH WITH BACKPACK	WEIGHT
	120V	277V	347V	480V						
6000	73	71	77	76	175W MH	22-1/8 (56.2)	12-3/8 (31.4)	5-9/16 (14.1)	8-5/8 (21.9)	31.5 lbs. (14.3 kg)
12,000	146	142	154	151	250W MH	22-1/8 (56.2)	12-3/8 (31.4)	5-9/16 (14.1)	8-5/8 (21.9)	33.5 lbs. (15.2 kg)
18,000	219	213	231	227	400W MH	22-1/8 (56.2)	17-3/8 (44.1)	5-9/16 (14.1)	8-5/8 (21.9)	39.0 lbs. (17.7 kg)

Notes

1 Nominal design lumens. Refer to IES files for exact lumens based on LM79 testing.
2 CSA Certified for 120V - 277V only.
3 Step-down transformer utilizing BACKPACK™. No pendant monopoint or emergency battery pack.
4 Available with 12,000 and 18,000 lumen packages only.
5 All cord sets are 18/3, 6' white and voltage specific. Specify voltage. Other configurations available. Consult factory.
6 Factory installed BACKPACK™. No pendant monopoint or 347V-480V.
7 Voltage must be specified.
8 CSA Listed to 40°C max.
9 Must be factory-installed.
10 Must have "IMP"power cord to power fixture and/or sensor. Specify voltage.
11 OUTCTR required when IBZPMP is being used as wiring compartment.
12 Specify voltage;120, 277 or 347 only.
13 CSA Listed to 45°C max.
14 Specify voltage; 120, 208, 277, 347 or 480V.
15 Not available with HVOLT.

LITHONIA LIGHTING®
An AcuityBrands Company

INDUSTRIAL: One Lithonia Way Conyers, GA 30012 Phone: 800-315-4963 Fax: 770-981-8191 www.lithonia.com

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LITHONIA LIGHTING®

Catalog Number	
Notes	
Type	L5

FEATURES & SPECIFICATIONS

INTENDED USE — Built on the compact, low-profile Z strip channel, this LED strip offers long maintenance-free life, several color temperatures, lumen outputs and lengths. Ideal for new construction and retrofit applications in T8 lengths. Ideal for uplight and downlight in commercial, retail, manufacturing, warehouse, cove and display applications. **Certain airborne contaminants can diminish integrity of acrylic. Click here for Acrylic Environmental Compatibility table for suitable uses.**

CONSTRUCTION — Compact-design channel and cover are formed from code-gauge cold-rolled steel. Easy to install row aligner included for continuous row mounting.

Finish: Options include high-gloss, baked white enamel (WH), galvanized (GALV), matte black (MB) and smoke gray (SKGY). Five-stage iron phosphate pre-treatment ensures superior paint adhesion and rust resistance.

OPTICS — Standard diffuse snap on/snap off lens eliminates pixels, improves uniformity and minimizes glare. L/LENS option available.

ELECTRICAL — Utilizes high-output LEDs integrated on a two-layer circuit board, ensuring cool-running operation. Internal pluggable wiring harness prevents wiring errors. Electronic LED driver is rated for 75 input watts maximum (see Operational Data on page two for actual wattage consumption), **multi-volt input and 0-10V dimming standard**. This fixture is designed to withstand a maximum line surge of 1.5kV at 0.75kA combination wave for indoor locations, for applications requiring higher level of protection additional surge protection must be provided.

LEDs provide 83 CRI at 3000 K, 3500 K,4000 K or 5000 K.

Lumen output up to 2,000 lumens per foot. In 86°F (30°C) ambient environments, L70 is predicted to be 100,000+ hours, L85 at 65,000 hours. Luminaire should be installed in applications where ambient temperatures do not exceed 86°F (30°C). Ambient temperatures that exceed 86°F (30°C) will result in reduced life and will void warranty.

INSTALLATION — Tool-less channel cover for easy installation.

Fixture may be surface, pendant or stem mounted. Three-point aligner locks in place for easy continuous row mounting.

LISTINGS — UL Listed. CSA certified to US and Canadian safety standards. For use in damp locations between -4°F (-20°C) and 86°F (30°C).

WARRANTY — 5-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Actual performance may differ as a result of end-user environment and application.

Actual wattage may differ by +/- 5% when operating between 120-277V +/- 10%.

Note: Specifications subject to change without notice.

Z SERIES

LED Striplight

ZL1N

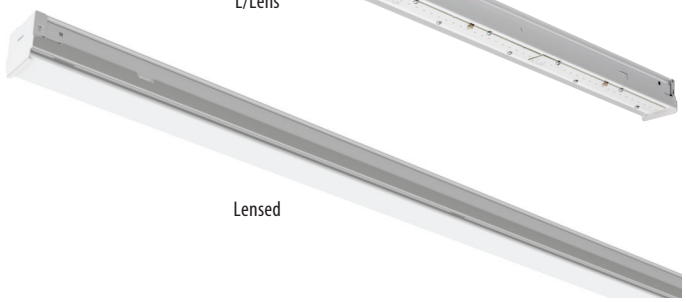
2,438.4mm in Length

~~24", 48" and 96" Lengths~~

LED



L/Lens



Lensed

ORDERING INFORMATION Lead times will vary depending on options selected. Consult with your sales representative.

Example: ZL1N L48 3000LM FST MVOLT 40K 80CRI WH

Series		Length		Nominal lumens[1]		Diffuser		Voltage		Color temperature		Color rendering index		Options		Finish	
ZL1N	LED striplight	L24	24"	3000LM	3,000 lumens	FST	Snap on frosted, diffuse	MVOLT	120-277V	40K	4000 K	80CRI	80 CRI	PLR	Plug-in wiring[3]	WH	White
		L46	46"	3000LM	3,000 lumens	L/LENS	No diffuser	HVOLT	347-480V[2]	30K	3000 K					GALV	Galvanized
		L48	48"	5000LM	5,000 lumens					35K	3500 K					MB	Matte black
				7000LM	7,000 lumens					50K	5000 K					SKGY	Smoke gray
TZL1N	LED striplight	L92	92"	6000LM	6,000 lumens												
		L96	96"	10000LM	10,000 lumens												
				14000LM	14,000 lumens												

Accessories: *Order as separate catalog number.*

HC36	Hanger chain, 36"	ZSPRG	For 15/16" T-grid only
ZACVH	Aircraft cable with hook	WGZ24	24" wireguard, white
LSXR	Sensor Switch® LSXR occupancy sensor[2]	WGZ48	48" wireguard, white[4]

EMERGENCY OPTIONS[5]

Consider EAC ISSM 125 or EAC ISSM 375

Notes

1 See Operational Data on page 2 for actual lumens.

2 Not available with L24, 24" fixture.

3 See ordering information on page 3.

4 Order 2 for tandem double length fixtures (TZL1N).

5 See ordering information on page 4.

ZL1N LED Striplight

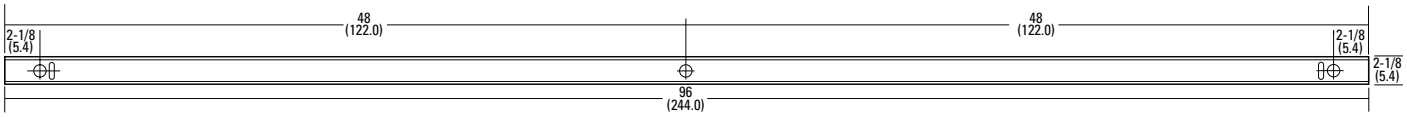
	OPERATIONAL DATA							
	Nominal lumen package	Length (inches)	Delivered lumens 3000 K CCT @ 77°F (25°C) ambient temperature	Delivered lumens 3500 K CCT @ 77°F (25°C) ambient temperature	Delivered lumens 4000 K CCT @ 77°F (25°C) ambient temperature	Delivered lumens 5000 K CCT @ 77°F (25°C) ambient temperature	Wattage @ 120V/277V	Comparable light source
Lensed	3,000LM	24	2,805	2,921	3,177	3,400	34W/32W	1-lamp 32W T8, 1-lamp 54W T5HO, 50W HID
	3,000LM	46 or 48	2,532	2,636	2,834	3,068	32W/31W	1-lamp 32W T8, 1-lamp 54W T5HO, 50W HID
	5,000LM	46 or 48	3,923	4,085	4,391	4,754	42W/41W	2-lamp 32W T8, 1-lamp 54W T5HO, 70W HID
	7,000LM	46 or 48	5,914	6,158	6,619	7,231	72W/70W	3-lamp 32W T8, 2-lamp 54W T5HO, 100W HID
	6,000LM	92 to 96	5,064	5,273	5,668	6,136	64W/62W	3-lamp 32W T8, 2-lamp 54W T5HO, 100W HID
	10,000LM	92 to 96	7,846	8,170	8,782	9,508	84W/82W	4-lamp 32W T8, 2-lamp 54W T5HO, 100W HID
	14,000LM	92 to 96	11,828	12,316	13,239	14,462	144W/140W	4-lamp 32W T8, 3-lamp 54W T5HO, 150W HID
Unlensed	3,000LM	24	3,165	3,295	3,582	3,835	34W/32W	1-lamp 32W T8, 1-lamp 54W T5HO, 50W HID
	3,000LM	46 or 48	2,865	2,983	3,207	3,472	32W/31W	1-lamp 32W T8, 1-lamp 54W T5HO, 50W HID
	5,000LM	46 or 48	4,439	4,622	4,968	5,379	42W/41W	2-lamp 32W T8, 1-lamp 54W T5HO, 70W HID
	7,000LM	46 or 48	6,737	7,015	7,541	8,164	72W/70W	3-lamp 32W T8, 2-lamp 54W T5HO, 100W HID
	6,000LM	92 to 96	5,730	5,966	6,413	6,944	64W/62W	3-lamp 32W T8, 2-lamp 54W T5HO, 100W HID
	10,000LM	92 to 96	8,878	9,244	9,937	10,759	84W/82W	4-lamp 32W T8, 2-lamp 54W T5HO, 100W HID
	14,000LM	92 to 96	13,474	14,031	15,082	16,329	144W/140W	4-lamp 32W T8, 3-lamp 54W T5HO, 150W HID

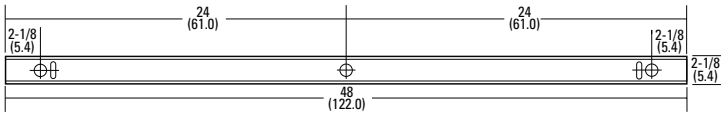
PROJECTED LUMEN MAINTENANCE								
Operating hours	0	10,000	20,000	30,000	40,000	50,000	60,000	100,000
Lumen maintenance factor	1	0.9678	0.9454	0.9235	0.9021	0.8812	0.8605	0.7839
Based on incomplete LM-80 data. Update expected Q1 2014.								

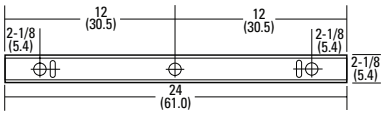
DIMENSIONS

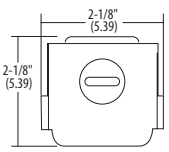
All dimensions are shown in inches (centimeters) unless otherwise noted.

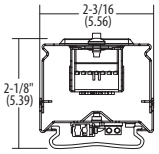
Specifications subject to change without notice.











PHOTOMETRICS

Please see www.lithonia.com.

LITHONIA LIGHTING®

Catalog Number	
Notes	
Type	L5A

FEATURES & SPECIFICATIONS

INTENDED USE — Built on the compact, low-profile Z strip channel, this LED strip offers long maintenance-free life, several color temperatures, lumen outputs and lengths. Ideal for new construction and retrofit applications in T8 lengths. Ideal for uplight and downlight in commercial, retail, manufacturing, warehouse, cove and display applications. **Certain airborne contaminants can diminish integrity of acrylic. Click here for Acrylic Environmental Compatibility table for suitable uses.**

CONSTRUCTION — Compact-design channel and cover are formed from code-gauge cold-rolled steel. Easy to install row aligner included for continuous row mounting.

Finish: Options include high-gloss, baked white enamel (WH), galvanized (GALV), matte black (MB) and smoke gray (SKGY). Five-stage iron phosphate pre-treatment ensures superior paint adhesion and rust resistance.

OPTICS — Standard diffuse snap on/snap off lens eliminates pixels, improves uniformity and minimizes glare. L/LENS option available.

ELECTRICAL — Utilizes high-output LEDs integrated on a two-layer circuit board, ensuring cool-running operation. Internal pluggable wiring harness prevents wiring errors. Electronic LED driver is rated for 75 input watts maximum (see Operational Data on page two for actual wattage consumption), **multi-volt input and 0-10V dimming standard**. This fixture is designed to withstand a maximum line surge of 1.5kV at 0.75kA combination wave for indoor locations, for applications requiring higher level of protection additional surge protection must be provided.

LEDs provide 83 CRI at 3000 K, 3500 K,4000 K or 5000 K.

Lumen output up to 2,000 lumens per foot. In 86°F (30°C) ambient environments, L70 is predicted to be 100,000+ hours, L85 at 65,000 hours. Luminaire should be installed in applications where ambient temperatures do not exceed 86°F (30°C). Ambient temperatures that exceed 86°F (30°C) will result in reduced life and will void warranty.

INSTALLATION — Tool-less channel cover for easy installation.

Fixture may be surface, pendant or stem mounted. Three-point aligner locks in place for easy continuous row mounting.

LISTINGS — UL Listed. CSA certified to US and Canadian safety standards. For use in damp locations between -4°F (-20°C) and 86°F (30°C).

WARRANTY — 5-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Actual performance may differ as a result of end-user environment and application.

Actual wattage may differ by +/- 5% when operating between 120-277V +/- 10%.

Note: Specifications subject to change without notice.

Z SERIES

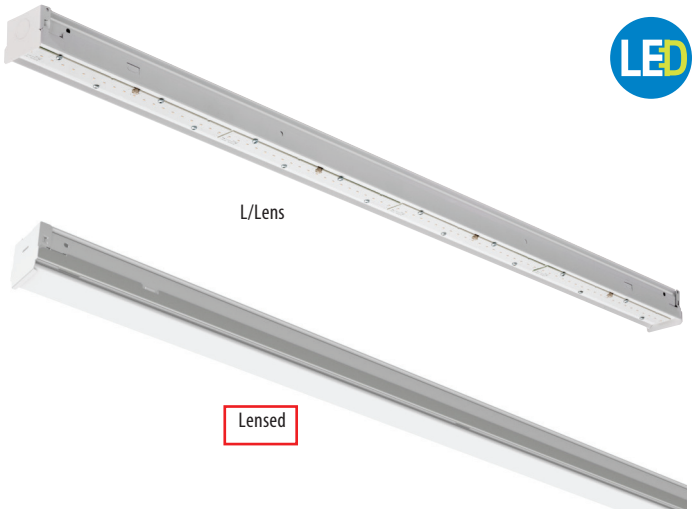
LED Striplight

ZL1N

1219.2mm

~~24", 48" and 96"~~ Lengths

LED



L/Lens

Lensed

ORDERING INFORMATION Lead times will vary depending on options selected. Consult with your sales representative.

Example: ZL1N L48 3000LM FST MVOLT 40K 80CRI WH

Series	Length	Nominal lumens[1]	Diffuser	Voltage	Color temperature	Color rendering index	Options	Finish
ZL1N LED striplight	L24 24"	3000LM 3,000 lumens	FST Snap on frosted, diffuse	MVOLT 120-277V	40K 4000 K	80CRI 80 CRI	PLR Plug-in wiring[3]	WH White
	L46 46"	3000LM 3,000 lumens	L/LENS No diffuser	HVOLT 347-480V[2]	30K 3000 K			GALV Galvanized
	L48 48"	5000LM 5,000 lumens			35K 3500 K			MB Matte black
		7000LM 7,000 lumens			50K 5000 K			SKGY Smoke gray
TZL1N LED striplight	L92 92"	6000LM 6,000 lumens						
	L96 96"	10000LM 10,000 lumens						
		14000LM 14,000 lumens						

Accessories: *Order as separate catalog number.*

HC36	Hanger chain, 36"	ZSPRG	For 15/16" T-grid only
ZACVH	Aircraft cable with hook	WGZ24	24" wireguard, white
LSXR	Sensor Switch® LSXR occupancy sensor[2]	WGZ48	48" wireguard, white[4]

EMERGENCY OPTIONS[5]

Consider EAC ISSM 125 or EAC ISSM 375

Notes

1 See Operational Data on page 2 for actual lumens.

2 Not available with L24, 24" fixture.

3 See ordering information on page 3.

4 Order 2 for tandem double length fixtures (TZL1N).

5 See ordering information on page 4.

ZL1N LED Striplight

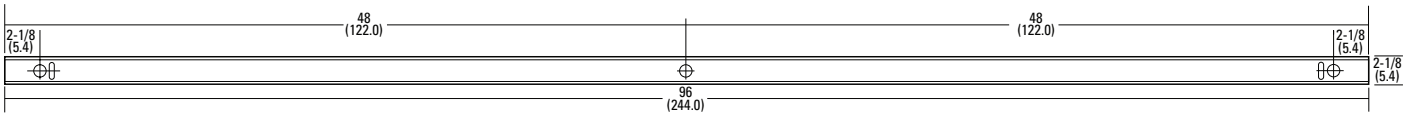
	OPERATIONAL DATA							
	Nominal lumen package	Length (inches)	Delivered lumens 3000 K CCT @ 77°F (25°C) ambient temperature	Delivered lumens 3500 K CCT @ 77°F (25°C) ambient temperature	Delivered lumens 4000 K CCT @ 77°F (25°C) ambient temperature	Delivered lumens 5000 K CCT @ 77°F (25°C) ambient temperature	Wattage @ 120V/277V	Comparable light source
Lensed	3,000LM	24	2,805	2,921	3,177	3,400	34W/32W	1-lamp 32W T8, 1-lamp 54W T5HO, 50W HID
	3,000LM	46 or 48	2,532	2,636	2,834	3,068	32W/31W	1-lamp 32W T8, 1-lamp 54W T5HO, 50W HID
	5,000LM	46 or 48	3,923	4,085	4,391	4,754	42W/41W	2-lamp 32W T8, 1-lamp 54W T5HO, 70W HID
	7,000LM	46 or 48	5,914	6,158	6,619	7,231	72W/70W	3-lamp 32W T8, 2-lamp 54W T5HO, 100W HID
	6,000LM	92 to 96	5,064	5,273	5,668	6,136	64W/62W	3-lamp 32W T8, 2-lamp 54W T5HO, 100W HID
	10,000LM	92 to 96	7,846	8,170	8,782	9,508	84W/82W	4-lamp 32W T8, 2-lamp 54W T5HO, 100W HID
	14,000LM	92 to 96	11,828	12,316	13,239	14,462	144W/140W	4-lamp 32W T8, 3-lamp 54W T5HO, 150W HID
Unlensed	3,000LM	24	3,165	3,295	3,582	3,835	34W/32W	1-lamp 32W T8, 1-lamp 54W T5HO, 50W HID
	3,000LM	46 or 48	2,865	2,983	3,207	3,472	32W/31W	1-lamp 32W T8, 1-lamp 54W T5HO, 50W HID
	5,000LM	46 or 48	4,439	4,622	4,968	5,379	42W/41W	2-lamp 32W T8, 1-lamp 54W T5HO, 70W HID
	7,000LM	46 or 48	6,737	7,015	7,541	8,164	72W/70W	3-lamp 32W T8, 2-lamp 54W T5HO, 100W HID
	6,000LM	92 to 96	5,730	5,966	6,413	6,944	64W/62W	3-lamp 32W T8, 2-lamp 54W T5HO, 100W HID
	10,000LM	92 to 96	8,878	9,244	9,937	10,759	84W/82W	4-lamp 32W T8, 2-lamp 54W T5HO, 100W HID
	14,000LM	92 to 96	13,474	14,031	15,082	16,329	144W/140W	4-lamp 32W T8, 3-lamp 54W T5HO, 150W HID

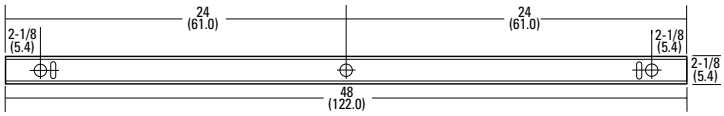
PROJECTED LUMEN MAINTENANCE								
Operating hours	0	10,000	20,000	30,000	40,000	50,000	60,000	100,000
Lumen maintenance factor	1	0.9678	0.9454	0.9235	0.9021	0.8812	0.8605	0.7839
Based on incomplete LM-80 data. Update expected Q1 2014.								

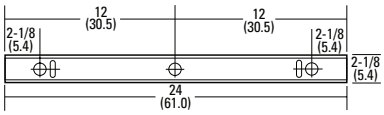
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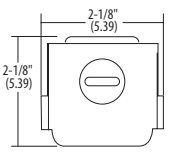
All dimensions are shown in inches (centimeters) unless otherwise noted.

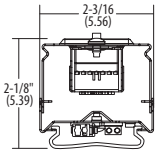
Specifications subject to change without notice.











PHOTOMETRICS

Please see www.lithonia.com.

LITHONIA LIGHTING®

Catalog Number	
Notes	
Type	L6

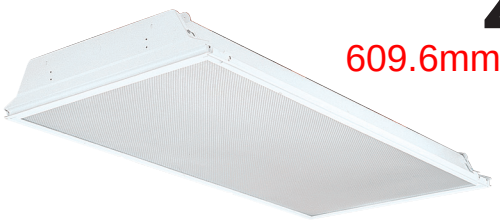
TLED

2TLED

609.6mm X 1219mm

~~2' x 4'~~

LED



FEATURES & SPECIFICATIONS

INTENDED USE — The TLED combines digital lighting and control technologies with a high-performance optical system to deliver general ambient lighting for many applications such as schools, offices and hospitals. High-efficacy light engine delivers long life and excellent color, ensuring a superior quality light installation that is highly efficient and sustainable. **Certain airborne contaminants can diminish integrity of acrylic.** Click here for Acrylic Environmental Compatibility table for suitable uses.

CONSTRUCTION — Housing formed from cold-rolled steel. Housing is painted after fabrication for superior finish.

Smooth hemmed sides and smooth inward-formed end flanges, for easy handling.

Standard extruded aluminum door frame has superior structural integrity with premium appearance and mitered corners. Door frame is painted after fabrication, standard. Powder-painted rotary cam latches provide easy, secure door closure. Integral T-bar clips are standard. Acrylic shielding material is 100% UV stabilized.

OPTICS — Standard pattern #19 lens, 0.156" thick with highly transmissive overlay, is standard for superior brightness control. Overlay is 0.040" thick. Other lenses are available.

ELECTRICAL — Long-life LEDs, coupled with high-efficiency drivers, provide superior level and quality of illumination for extended service life. TLED is rated to deliver L80 performance for 50,000 hours.

Standard nLight® embedded controls continuously monitor system performance, allow for constant lumen management/compensation function, facilitate simple "plug-and-play" network and controls upgrading via Cat-5 cable.

LED Accudrive™ driver, delivers full-range dimming from 0-10V control signal.

Ballast disconnect is provided where required to comply with U.S. and Canadian codes.

INSTALLATION — Drivers and internal components are accessible from floor. LED boards include plug-in connectors for easy replacement or servicing. Suitable for direct insulation contact. Suitable for damp location.

LISTING — CSA certified to U.S. and Canadian standards.

DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.designlights.org/QPL to confirm which versions are qualified.

WARRANTY — 5-year limited warranty. Complete warranty terms located at

www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Note: Specifications subject to change without notice.

ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

Example: 2TL4 46L RW A19 D50 LP835 N100

2TL4	46L				D50			
Series	**Lumens**	**Door**	**Lens**	**Voltage**	**Wattage**	**Color temperature**	**Control**	**Options**
2TL4 Recessed LED	46L 4600 lumens[1]	FW Flush aluminum, white RW Regressed aluminum, white	A12 #12 pattern acrylic A19 #19 pattern acrylic, 0.156" thick MWS Matte white .040 thick MPL Micro Prism SWL Satin white	(blank) MVOLT (120-277V)	D50 50W[2, 3]	LP830 82 CRI, 3000 kelvin[4] LP835 82 CRI, 3500 kelvin LP840 82 CRI, 4000 kelvin LP850 82 CRI, 5000 kelvin[4]	NX Dimming, no nLight BLD Bi-level dimming N80 nLight with 80% (L80) lumen management N80EMG nLight with 80% (L80) lumen management for use with generator supply EM power N100 nLight without lumen management N100EMG nLight without lumen management for use with generator supply EM power	EL14L 1400 lumen emergency battery

Accessories: *Order as separate catalog number.*

DGA24	Drywall grid adapter for 2x4 recessed fixture.

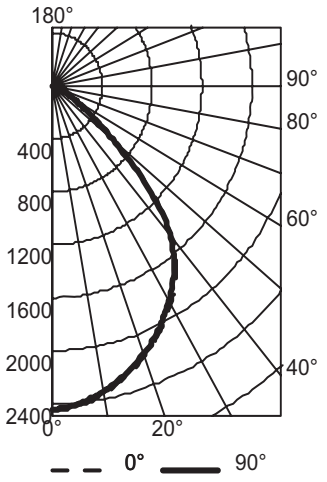
Notes

1 Nominal lumens.
2 Nominal wattage.
3 Actual wattage may differ by +/- 5% when operating between 120-277V +/- 10%.
4 Extended lead time.

2TLED 2X4 Recessed LED Lighting

PHOTOMETRICS

2TL4 46L RW A19 D50 LP835 N100, 4,549 delivered lumens,test no. LTL20533, tested in accordance to IESNA LM-79.



CP Summary

	0°	90
0°	2443	2443
5°	2426	2412
15°	2274	2259
25°	2045	2023
35°	1735	1699
45°	1113	1084
55°	408	357
65°	128	114
75°	111	100
85°	46	48
90	0	0

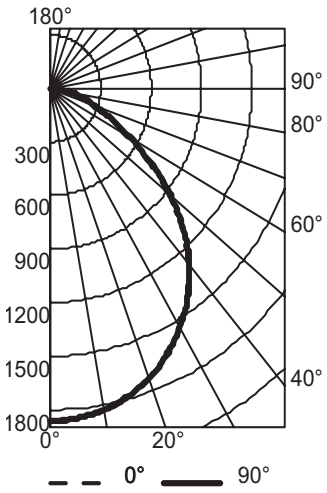
Coefficients of Utilization

	pf	20%								
	pc	80%			70%			50%		
	pw	70%	50%	30%	50%	30%	10%	50%	30%	10%
RCR	0	119	119	119	116	116	116	111	111	111
	1	111	107	103	105	102	99	101	98	96
	2	103	96	90	94	89	85	91	86	83
	3	95	86	80	85	79	73	82	77	72
	4	88	78	71	77	70	65	75	69	64
	5	82	71	63	70	63	57	68	62	57
	6	77	65	57	64	57	51	62	56	51
	7	72	60	52	59	51	46	57	51	46
	8	67	55	47	54	47	42	53	46	42
	9	63	51	43	50	43	38	49	43	38
	10	59	47	40	47	40	35	46	39	35

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	1799	39.5	39.5
0° - 40°	2852	62.7	62.7
0° - 60°	4137	90.9	90.9
0° - 90°	4549	100.0	100.0
90° - 180°	0	0.0	0.0
0° - 180°	4549	100.0	100.0

2TL4 46L RW SWL D50 LP835, 4,485 delivered lumens,test no. LTL20938, tested in accordance to IESNA LM-79.



CP Summary

	0°	90
0°	1859	1859
5°	1848	1854
15°	1779	1787
25°	1635	1643
35°	1416	1427
45°	1106	1125
55°	712	732
65°	383	395
75°	192	193
85°	60	56
90	0	0

Coefficients of Utilization

	pf	20%								
	pc	80%			70%			50%		
	pw	70%	50%	30%	50%	30%	10%	50%	30%	10%
RCR	0	119	119	119	116	116	116	111	111	111
	1	110	105	102	103	100	96	99	96	93
	2	101	93	87	91	85	81	88	83	79
	3	92	83	75	81	74	68	78	72	67
	4	85	74	66	72	65	59	70	63	58
	5	79	66	58	65	57	51	63	56	51
	6	73	60	52	59	51	45	57	50	45
	7	68	55	46	54	46	40	52	45	40
	8	63	50	42	49	42	36	48	41	36
	9	59	46	38	45	38	33	44	37	33
	10	55	43	35	42	35	30	41	34	30

Zonal Lumen Summary

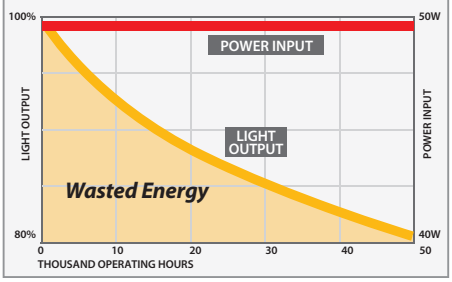
Zone	Lumens	% Lamp	% Fixture
0° - 30°	1433	31.9	31.9
0° - 40°	2319	51.7	51.7
0° - 60°	3823	85.2	85.2
0° - 90°	4485	100.0	100.0
90° - 180°	0	0.0	0.0
0° - 180°	4485	100.0	100.0

Constant Lumen Management

Enabled by the embedded nLight control, the TLED actively tracks its run-time and manages its light source such that constant lumen output is maintained over the system life. Referred to as lumen management, theis feature eliminates the energy waste created by the traditional practice of over-lighting.

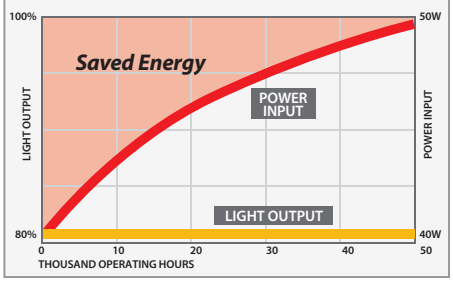
Without Lumen Management

Energy is wasted and light level is inconsistent.



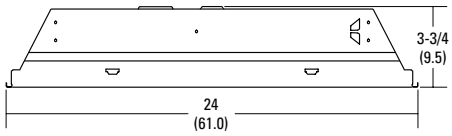
With Lumen Management

Energy is saved and light level remains consistent.



DIMENSIONS

All dimensions are inches (centimeters) unless otherwise noted.



Specifications

Length: 48 (122.0)

Width: 24 (61.0)

Depth: 3-3/4 (9.5)

LITHONIA LIGHTING®
An AcuityBrands Company

LED: One Lithonia Way Conyers, GA 30012 Phone: 800-858-7763 Fax: 770-929-8789 www.lithonia.com
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Rev. 12/12/13

LITHONIA LIGHTING®

Catalog Number	
Notes	
Type	L7

TLED

2TLED

609.6mm X 1219.2mm

~~2' x 4'~~

LED



FEATURES & SPECIFICATIONS

INTENDED USE — The TLED combines digital lighting and control technologies with a high-performance optical system to deliver general ambient lighting for many applications such as schools, offices and hospitals. High-efficacy light engine delivers long life and excellent color, ensuring a superior quality light installation that is highly efficient and sustainable. **Certain airborne contaminants can diminish integrity of acrylic.** Click here for Acrylic Environmental Compatibility table for suitable uses.

CONSTRUCTION — Housing formed from cold-rolled steel. Housing is painted after fabrication for superior finish.

Smooth hemmed sides and smooth inward-formed end flanges, for easy handling.

Standard extruded aluminum door frame has superior structural integrity with premium appearance and mitered corners. Door frame is painted after fabrication, standard. Powder-painted rotary cam latches provide easy, secure door closure. Integral T-bar clips are standard. Acrylic shielding material is 100% UV stabilized.

OPTICS — Standard pattern #19 lens, 0.156" thick with highly transmissive overlay, is standard for superior brightness control. Overlay is 0.040" thick. Other lenses are available.

ELECTRICAL — Long-life LEDs, coupled with high-efficiency drivers, provide superior level and quality of illumination for extended service life. TLED is rated to deliver L80 performance for 50,000 hours.

Standard nLight® embedded controls continuously monitor system performance, allow for constant lumen management/compensation function, facilitate simple "plug-and-play" network and controls upgrading via Cat-5 cable.

LED Accudrive™ driver, delivers full-range dimming from 0-10V control signal.

Ballast disconnect is provided where required to comply with U.S. and Canadian codes.

INSTALLATION — Drivers and internal components are accessible from floor. LED boards include plug-in connectors for easy replacement or servicing. Suitable for direct insulation contact. Suitable for damp location.

LISTING — CSA certified to U.S. and Canadian standards.

DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.designlights.org/QPL to confirm which versions are qualified.

WARRANTY — 5-year limited warranty. Complete warranty terms located at

www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Note: Specifications subject to change without notice.

ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

Example: 2TL4 46L RW A19 D50 LP835 N100

2TL4	46L				D50			
Series	**Lumens**	**Door**	**Lens**	**Voltage**	**Wattage**	**Color temperature**	**Control**	**Options**
2TL4 Recessed LED	46L 4600 lumens[1]	FW Flush aluminum, white RW Regressed aluminum, white	A12 #12 pattern acrylic A19 #19 pattern acrylic, 0.156" thick MWS Matte white .040 thick MPL Micro Prism SWL Satin white	(blank) MVOLT (120-277V)	D50 50W[2, 3]	LP830 82 CRI, 3000 kelvin[4] LP835 82 CRI, 3500 kelvin LP840 82 CRI, 4000 kelvin LP850 82 CRI, 5000 kelvin[4]	NX Dimming, no nLight BLD Bi-level dimming N80 nLight with 80% (L80) lumen management N80EMG nLight with 80% (L80) lumen management for use with generator supply EM power N100 nLight without lumen management N100EMG nLight without lumen management for use with generator supply EM power	EL14L 1400 lumen emergency battery

Accessories: *Order as separate catalog number.*

DGA24	Drywall grid adapter for 2x4 recessed fixture.

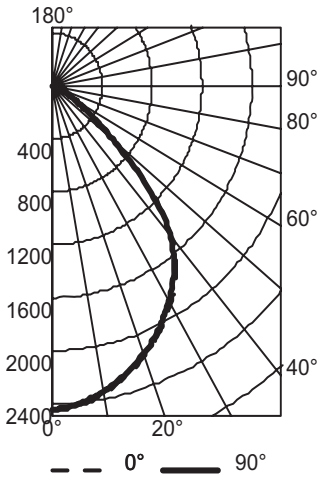
Notes

1 Nominal lumens.
2 Nominal wattage.
3 Actual wattage may differ by +/- 5% when operating between 120-277V +/- 10%.
4 Extended lead time.

2TLED 2X4 Recessed LED Lighting

PHOTOMETRICS

2TL4 46L RW A19 D50 LP835 N100, 4,549 delivered lumens,test no. LTL20533, tested in accordance to IESNA LM-79.



CP Summary

	0°	90
0°	2443	2443
5°	2426	2412
15°	2274	2259
25°	2045	2023
35°	1735	1699
45°	1113	1084
55°	408	357
65°	128	114
75°	111	100
85°	46	48
90	0	0

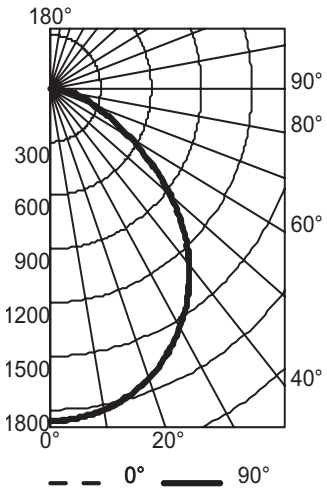
Coefficients of Utilization

	pf	20%								
	pc	80%			70%			50%		
	pw	70%	50%	30%	50%	30%	10%	50%	30%	10%
RCR	0	119	119	119	116	116	116	111	111	111
	1	111	107	103	105	102	99	101	98	96
	2	103	96	90	94	89	85	91	86	83
	3	95	86	80	85	79	73	82	77	72
	4	88	78	71	77	70	65	75	69	64
	5	82	71	63	70	63	57	68	62	57
	6	77	65	57	64	57	51	62	56	51
	7	72	60	52	59	51	46	57	51	46
	8	67	55	47	54	47	42	53	46	42
	9	63	51	43	50	43	38	49	43	38
	10	59	47	40	47	40	35	46	39	35

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	1799	39.5	39.5
0° - 40°	2852	62.7	62.7
0° - 60°	4137	90.9	90.9
0° - 90°	4549	100.0	100.0
90° - 180°	0	0.0	0.0
0° - 180°	4549	100.0	100.0

2TL4 46L RW SWL D50 LP835, 4,485 delivered lumens,test no. LTL20938, tested in accordance to IESNA LM-79.



CP Summary

	0°	90
0°	1859	1859
5°	1848	1854
15°	1779	1787
25°	1635	1643
35°	1416	1427
45°	1106	1125
55°	712	732
65°	383	395
75°	192	193
85°	60	56
90	0	0

Coefficients of Utilization

	pf	20%								
	pc	80%			70%			50%		
	pw	70%	50%	30%	50%	30%	10%	50%	30%	10%
RCR	0	119	119	119	116	116	116	111	111	111
	1	110	105	102	103	100	96	99	96	93
	2	101	93	87	91	85	81	88	83	79
	3	92	83	75	81	74	68	78	72	67
	4	85	74	66	72	65	59	70	63	58
	5	79	66	58	65	57	51	63	56	51
	6	73	60	52	59	51	45	57	50	45
	7	68	55	46	54	46	40	52	45	40
	8	63	50	42	49	42	36	48	41	36
	9	59	46	38	45	38	33	44	37	33
	10	55	43	35	42	35	30	41	34	30

Zonal Lumen Summary

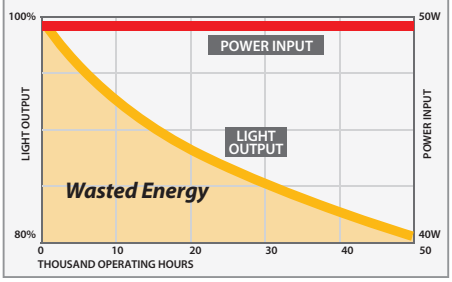
Zone	Lumens	% Lamp	% Fixture
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0° - 40°	2319	51.7	51.7
0° - 60°	3823	85.2	85.2
0° - 90°	4485	100.0	100.0
90° - 180°	0	0.0	0.0
0° - 180°	4485	100.0	100.0

Constant Lumen Management

Enabled by the embedded nLight control, the TLED actively tracks its run-time and manages its light source such that constant lumen output is maintained over the system life. Referred to as lumen management, theis feature eliminates the energy waste created by the traditional practice of over-lighting.

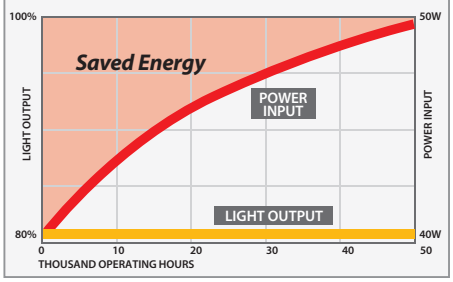
Without Lumen Management

Energy is wasted and light level is inconsistent.



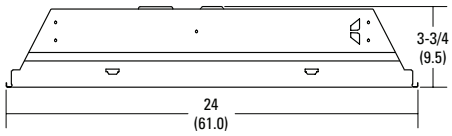
With Lumen Management

Energy is saved and light level remains consistent.



DIMENSIONS

All dimensions are inches (centimeters) unless otherwise noted.



Specifications

Length: 48 (122.0)

Width: 24 (61.0)

Depth: 3-3/4 (9.5)

LITHONIA LIGHTING®
An AcuityBrands Company

LED: One Lithonia Way Conyers, GA 30012 Phone: 800-858-7763 Fax: 770-929-8789 www.lithonia.com
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Rev. 12/12/13

LITHONIA LIGHTING®

Catalog Number	
Notes	
Type	L8

FEATURES & SPECIFICATIONS

INTENDED USE — Ideal for use in applications where smart, energy-efficient fixtures are desired. Typical applications include parking garage, canopy, transportation, school, hospital, cold storage and exterior retail environments where moisture or dust is a concern. Polycarbonate enclosure protects fixture while remaining easy to service and clean.

CONSTRUCTION — UV-stabilized, injection-molded, impact-resistant, frosted polycarbonate housing with continuous poured-in-place, closed-cell gasket. 20-gauge steel channel and channel cover. Aluminum sheet metal board plate for thermal conduction and support. Fixture design allows for uplight.

OPTICS — UV-stabilized, injection-molded, impact-resistant, clear transparent, polycarbonate lens with aesthetic rib detail (.080" thick). Asymmetric (ASY) optical control film provides broad light distribution (ideal for lower mounting heights). Symmetric (SYM) optical control film is well suited for general lighting environments. Clear transparent, tamper-resistant, polycarbonate latches standard (8 Torx T-20 tamper-resistant screws included). Stainless steel latches also available.

ELECTRICAL — Utilizes high-efficiency LEDs mounted to core circuit boards. 4100 Kelvin temperature standard, with additional color temperatures also available. High efficiency driver operates 100V through 277V, 50-60HZ. Integral surge protection standard and tested in accordance with IEEE/ANSI C62.41.2 to Category C Low. Includes a temperature-sensing component that will limit the temperature of the LEDs in case of excessive ambient temperatures or mis-application. One driver used for 39W and 59W; two drivers used for 79W and 114W. Low (0-10) voltage dimming standard (see options for prewiring). L93 at 60,000 hours (350mA) and L85 at 60,000 hours (525mA).

INSTALLATION — Stainless steel surface spring-mounting brackets standard (2 included) allows for ceiling or suspended mount. A variety of stainless steel mounting options also available: J-box mounting and mounting brackets for suspension with aircraft cable (cable not included). Optional stainless steel V-hooks available for chain hanging (chain not included). Surface conduit entry on each end and on top. For horizontal and vertical mounting on a wall, application must be under a covered ceiling and QMB option recommended. 1/2" - 3/4" KO.

LISTINGS — CSA Certified to UL and C-UL standards. Minimum ambient temperature of -20°F (-29°C) (see matrix on page 2 for maximum ambient temperatures). NOM Certified (see Options). VAP LED is wet location listed for covered ceiling applications. IP65 and IP66 rated. Product will be rated for damp location only when wall mounted.

See "ARCHWAY™ PASSAGE™ LED Specification Matrix" below for ambient temperature listings.

WARRANTY — 5-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

For installed Rough Service Product(s), Acuity warrants that, for the lifetime of the product(s), the polycarbonate lens and/or polycarbonate housing will withstand breakage resulting from occasional physical abuse and rough handling (the "Rough Service Warranty"), notwithstanding the vandalism exclusion set forth at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Actual performance may differ as a result of end-user environment and application.

Actual wattage may differ by +/- 5% when operating between 120-277V +/- 10%.

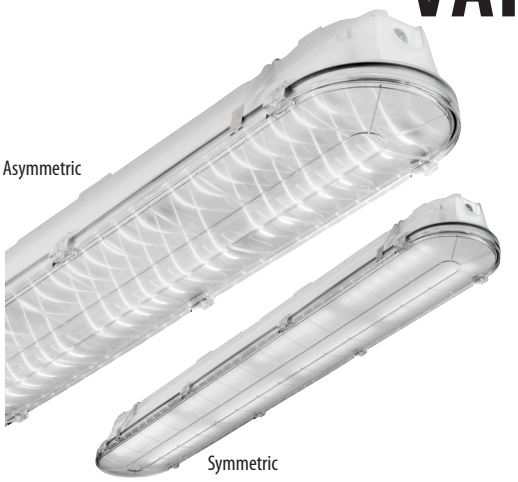
Note: Specifications subject to change without notice.

ARCHWAY™ PASSAGE™

Rough Service Fixture

VAP LED

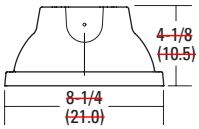
CEILING/
SUSPEND MOUNT



LED

Specifications

Length: ~~54 3/4 (139.1)~~ 1390.6mm
Width: ~~8 1/4 (21.0)~~ 209.5mm
Depth: ~~4 1/8 (10.5)~~ 104.7mm
Weight: 13.5 lbs. (5.9 kg)



All dimensions are shown in inches (centimeters) unless otherwise noted.

ORDERING INFORMATION Lead times will vary depending on options selected. Consult with your sales representative.

Example: VAP 39LED ASY

VAP	79LED /		ASY	277	
Series	**Wattage/Color temperature**[1]		**Light control film**	**Voltage**	**Options**[2]
VAP	39LED 39 watts 59LED 59 watts 79LED 79 watts 114LED 114 watts	(blank) 4100K (CRI 65) 27 2700K (CRI 80) 35 3500K (CRI 80) 57 5700K (CRI 70) AMB Amber LED's	ASY Asymmetric beam SYM Symmetric beam	(blank) MVOLT 120 120V 277 277V 347 347V 480 480V	SF Single fuse[3] BSL722 Bodine® emergency LED battery pack for 0°C and up[3,4] BSL722C Bodine® emergency LED battery pack for -20°C and up[3,4] WLF Wet location fitting (two outboard, top)[5] WLFIN Wet location fitting (two inboard, top)[5] WLFEND Wet location fitting (one end)[5] WLFEND2 Wet location fitting (both ends)[5,6] CS89 6' white cord, 16/3, no plug, wet location CS88 6' Brad Harrison 16/3 cord and straight blade plug set CS88L12 12' Brad Harrison 16/3 cord and straight blade plug set STSL Stainless steel tamper resistant latches QMB Quick-mount ceiling bracket CMB Chain-mount suspension bracket JSB Junction box snap-bracket	DIM Pre-wired for 0-10V low-voltage dimming (100-10%) DIM2 Line-voltage power control (100-50%)[7] L/SP Less surge protector MSI__ Wet location motion sensor and bracket[4,8] PE Photoelectric cell (button type)[3] NOM NOM Certified LSC Lens safety clip

Accessories: *Order as separate catalog number. (Ships separately)*

VAPSMB	Surface spring-mount bracket	RK1 T20BIT	Hex base driver bit, Torx T20. Tamper resistant screws with center reject pin
VAPQMB	Quick-mount ceiling bracket		
VAPCMB	Chain-mount bracket[9]	RK1 T20DRV	Torx T20 screwdriver for use with tamper resistant screws with center reject pin
VAPJSB	Junction box snap bracket		
HC36	Wire hook and 36" chain set[9,10]		

Notes

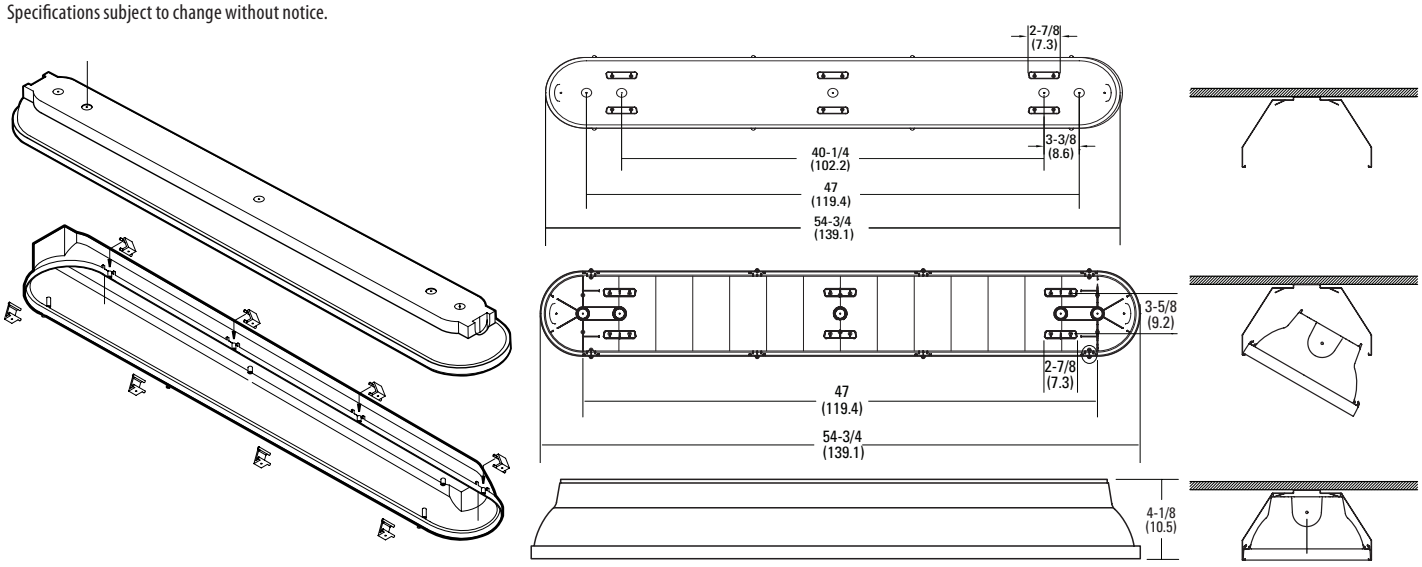
1 The CCT value provided is of lamp source and actual CCT will vary upon levels.
2 For additional options, consult factory.
3 Must specify voltage.
4 Not available with 114LED.
5 5/8" long NPT threaded hub.
6 Not available with cord, sensor or photocell options.
7 Available with 79LED and 114LED only.
8 For mounting up to 8', specify MSI8; for mounting up to 20', specify MSI20.
9 Requires CMB (chain mount bracket) option.
10 For stainless steel, specify STS (example: HC36 STS).

VAP Linear Rough Service, LED

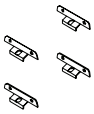
DIMENSIONS

All dimensions are shown in inches (centimeters) unless otherwise noted.

Specifications subject to change without notice.



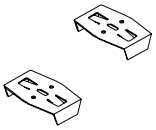
MOUNTING ACCESSORIES



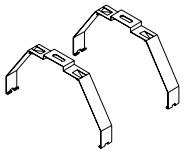
CMB - Ceiling Mounting Brackets



JSB - Junction Box Mounting Bracket



QMB - Quick-Mount Mounting Brackets



SMB - Surface Mounting Brackets (ship with fixture as standard)

ARCHWAY™ PASSAGE™ LED Specification Matrix								
System watts	Initial delivered lumens with asymmetric optics*		Initial delivered lumens with symmetric optics*		mA	Comparable source	LLF	Maximum Ambient Temperature
	4100K	5700K	4100K	5700K				
39	3040	3335	2975	3335	350	1x32W T8, 70W MH	.837 (L93)	40°C
59	4170	4495	4050	4600	525	1x54W T5, 2x32W T8, 70W HPS	.765 (L85)	40°C
79	5725	6015	5820	6110	350	3x32W T8, 100W MH	.837 (L93)	40°C
114	7680	7970	7720	8170	525	2x54W T5, 100W HPS	.765 (L85)	25°C

*4100K and 5700K are LED CCTs.

LITHONIA LIGHTING®
An AcuityBrands Company

INDUSTRIAL: One Lithonia Way, Conyers, GA 30012 Phone: 800-315-4963 Fax: 770-981-8191 www.lithonia.com © 2010-2014 Acuity Brands Lighting, Inc. All rights reserved. Rev. 01/23/2014

Eco-Lock Basic Cleanspace Series

1x4, 2x2 and 2x4 High Efficiency with T5, T5HO, T8 and LED Sources Certified for ISO-5, 209E Class 100 Cleanspaces

Project: SPMT
Fixture Type: L9
Cat. Number:
Approved By:

Specifications:

Housing: One piece, seam welded, hole free 20-gauge CRS, stainless steel or aluminum construction. Each are only 4.5 inches tall.

Door Frame: 20-gauge CRS, Aluminum or type 304 stainless steel channel door frame hinged to housing with two stainless steel cables. Secured by captive stainless steel screws. See Options for 85 PSI rating (HD85).

Sources: T5, T5HO, T8 and LED (Lamps supplied by others.)

Reflector: Die formed metal with high reflectance white polyester powder coat finish. (minimum reflectivity 92%).

Lens: High durability .135" thick virgin acrylic with P12 prismatic pattern inverted. Sealed to Door with NSF listed RTV silicone. See "Options" for other choices.

Installation: Flanged: Adjustable toggle arm mounting standard. Supply entry via 1/2" trade size flattened and silicone sealed knockouts.

Installation: Grid: Standard luminaires accommodate 1.0" & 1.5" and some 2.0" T-Bar Grid.

Installation: Surface: Four .312" dia. mounting holes and a removable gasketed wiring access plate.

Gaskets: Neoprene, 100% pure, closed cell located at interface of door to housing and door to lens. See Option "GG" for SealPro™ NSF Listed closed cell gasketing.

Electrical: Standard ballast - Electronic <10% THD high performance instant start universal voltage (120-277 volt). LED drivers are commercially available high efficiency and dimmable with 0-10v control. Suitable for through wiring.

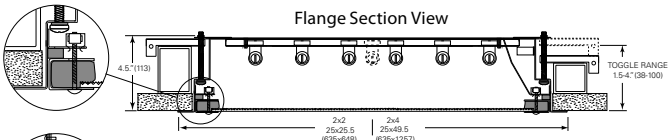
Finish: Gloss white high reflectance 1000 hr. salt spray polyester powder coat finish standard for all housings and CRS or Aluminum doorframes. Stainless steel doorframes are satin polished unless option WHT is chosen. Consult factory for satin polished housings.

Listings: UL and CUL listed for wet Location. Dust and water resistance rated IP-55. Optional NSF -C2 listed for non-food zone. Certified ISO-14644-1 classes 5 to 9 Fed. Std. 209E Class 100. See "Options" for Class I, Div. 2 Groups A, B, C & D Listing (X12) . Bio Safety levels 3 & 4. Rated at 85 PSI Hosedown.

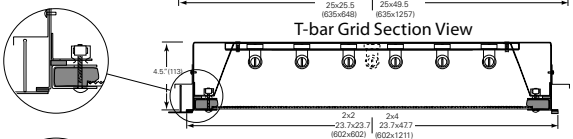
Warranty: 25 year limited warranty. See website for details.

Standard	Optional
UL WET LOCATION	UL Hazardous Location Class 1 Division 2
ISO 5 ISO 14644-1 CLASS 5	NSF C-2 NON-FOOD ZONE
209E 1 FED STD 209E CLASS 1	Bio Safety Levels BSL 1 & 2
IP 55 IEC 60529	HOSE DOWN 85 PSI RATED
25 Year Warranty	QUICK SHIP

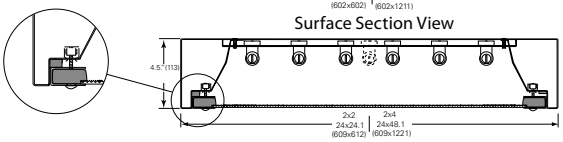
Flange Section View



T-bar Grid Section View



Surface Section View





Ordering Information: (Example: *EL-F-1-1x4-2/T5-UNV-FF)*

EL - F-4-2X4-3/LEDR40-277- - / - -

Series	Installation Type	Material	Size	Source	Voltage	Options
EL	*F* = Flange *G* = Grid *S* = Surface	*1* = CRS Hsg. & CRS Door *2* = CRS Hsg. & SS Door *3* = SS Hsg. & SS Door *4* = AL Hsg. & SS Door *5* = AL Hsg. & AL Door *6* = CRS Hsg. & AL Door			*120V* *277V* *347V** *UNV**	*FF* = Fuse & Holder *FD* = Two Fuses & Holders *2/EB* = Two Ballasts, (Two Circuits)* *EBL* = -20°F Electronic Ballast* *EBPRS* = Program Rapid Start Ballast* *1/EM* = 1 Lamp Battery Pack (700L)* *2/EM* = 2 Lamp Battery Pack (1300L)* *H/EM* = 1 Lamp Hazardous Battery Pack *WHT* = White Finished Stainless Steel Door & Hsg. *GG* = NSF Listed Seal-Pro Gaskets (Non-Food Zone) *HD85* = 85 PSI Hosedown Resistance *LEX* = .125" Prismatic Polycarbonate *A19* = Prismatic P19 Pattern Clear Acrylic *HIA* = High Impact P12 Pattern Acrylic *TG* = Prismatic (C73) Tempered Glass *X12* = Class I, Div. 2, groups A, B, C, D listing.* *SW* = Sealed Wireway *(contact Kurtzon for details)* † = SS Hsg. not available with 6/T5HO
				Fluorescent / *LED Arrays*		
1x4 = 1'x4' Housing				*1, 2 or 3/T8* = F32T8 *1, 2 or 3/T5* = F28T5* *1 or 2/T5HO* = F54T5HO* *1 or 2/LEDR30* =4400L◊ 3000k CCT *1 or 2/LEDR35* =4400L◊ 3500k CCT *1 or 2/LEDR40* =4400L◊ 4000k CCT		
2x2 = 2'x2' Housing				*2, 3, 4 or 6/T5* = F14T5 *2, 3, 4 or 6/T5HO* = F24T5HO* *2, 3, 4 or 6/T8* = F17T8 *1 or 2/T8U6* = T8 6" U-Lamp *2 or 3/T8U1* = T8 1.6" U-Lamp *2, 3 or 4/BX* = PL-L, BX 40W* *2 or 3/LEDR30* =2200L◊ 3000k CCT *2 or 3/LEDR35* =2200L◊ 3500k CCT *2 or 3/LEDR40* =2200L◊ 4000k CCT ◊ For total lumens generated in a fixture multiply array lumens by the number of arrays. Example 2200L x 3 arrays = 6600 lumens.		
2x4 = 2'x4' Housing				*2, 3, 4 or 6/T8* = F32T8 *2, 3, 4 or 6/T5* = F28T5* *2, 3, 4 or 6/T5HO* = F54T5HO* *2 or 3/LEDR30* =4400L◊ 3000k CCT *2 or 3/LEDR35* =4400L◊ 3500k CCT *2 or 3/LEDR40* =4400L◊ 4000k CCT		

* Note: Not all options are compatible with other options. Consult factory for additional lamp choices & options marked "*".

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LITHONIA LIGHTING®

Catalog Number	
Notes	
Type	L10

FEATURES & SPECIFICATIONS

INTENDED USE — An attractive and energy-efficient surface-mounted or suspended LED luminaire, suitable for wet, damp and/or cold locations. For challenging situations where relatively low fixture mounting heights and wide fixture spacings are common — such as industrial facilities, parking garages, retail malls, multi-purpose rooms, garden centers, and airports. **Certain airborne contaminants can diminish integrity of acrylic. Click here for Acrylic Environmental Compatibility table, for suitable uses.**

CONSTRUCTION — One-piece 5VA fiberglass housing with integral perimeter channel utilizing continuous poured-in-place closed cell gasket. Approved as a wireway and through wiring. Tool-less driver and wiring access. Stainless steel latches are standard. Polycarbonate latches also available (See Options).

Power connection is easily accommodated through pre-drilled holes at each end, with wet location fittings provided for maximum flexibility. Easily mounted to ceilings and structure, or suspended with chain, cable or rod, using stainless steel mounting brackets (included).

OPTICS — 100% impact modified frosted acrylic lens with lineal ribs. Also available is an optically clear or frosted deep acrylic lens.

ELECTRICAL — Utilizes high-efficiency LED's on metal core circuit boards. 4100 Kelvin temperature standard with additional color temperatures also available. High efficiency driver operates 120V through 277V, 50-60HZ. Integral surge protection tested in accordance with IEEE/ANSI C62.41.2 to Category C Low. Includes a temperature-sensing component that will limit the temperature of the LEDs in case of excessive ambient temperatures or misapplication. 0-10V dimming driver standard.

Expected service life of 60,000 hours at 80% lumen maintenance (L80); predicted life of more than 100,000 hours.

INSTALLATION — Fixture can be ceiling or suspended mounted. Stainless steel mounting brackets included (two per luminaire), pre-punched for easy field-attachment of bolts, screws and other mounting hardware. Covered ceiling is not required to maintain wet location listing or IP rating.

LISTINGS — CSA certified to UL and C-UL standards. Listed for wet locations up to 25°C ambient temperature when fixture is surface mounted or 40°C when fixture is suspended at least 6" from ceiling (driver would have 3 year warranty). IP65, IP66 and IP67 rated. NSF splash-zone certified and meets FDA/USDA guidelines. See "FEM LED Specification Matrix" for ambient temperature listing.

WARRANTY — 5-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Actual performance may differ as a result of end-user environment and application.

Note: Specifications subject to change without notice.

Low-Profile Enclosed and Gasketed Industrial

FEM LED

CEILING/ SUSPENDED MOUNT



ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

Example: FEM4 LED 4L/57 IMAFL

FEM4LED	9L / 35	IMAFL	SD	277
Series	**Lumens/Color temperature**[1]	**Diffuser**	**Distribution**	**Voltage**

Series		Nominal Lumens		Color temperature	
FEM4 LED	4'	3L	3000 lumens	(blank)	4100K (CRI 65)
FEM8 LED	8'	4L	4000 lumens	27	2700K (CRI 80)
		6L	6000 lumens	35	3500K (CRI 80)
		9L	9000 lumens	57	5700K (CRI 70)
				AMB	Amber LED

Diffuser		Distribution		Voltage	
IMAFL	Acrylic, lineal ribbed frosted lens	(blank)	General distribution	(blank)	MVOLT
IMACD	Acrylic, clear deep lens	SD	Spread distribution	120	120V
IMAFD	Acrylic, clear deep frosted lens			277	277V

Options

CS89	Cord set - NEMA type STW 16/3, 6', 600V, white, no plug, wet location	L/SP	Less surge protector	WLF	Wet location fitting (pre-installed on top of housing)
CS89L12	Cord set - NEMA type STW 16/3, 12', 600V, white, no plug, wet location	DIM	Pre-wired for 0-10V low-voltage dimming (100-10%)	WLFEND	Wet location fitting (one end)
CS88	Cord set - Brad Harrison 3P male straight 600V molded plug, 6' type STOOW yellow PVC cord, 16/3	DIM2	Line-voltage power control (100%-50%)[3]	PLCL	Polycarbonate latches
CS88L12	Cord set - Brad Harrison 3P male straight 600V molded plug, 12' type STOOW yellow PVC cord, 16/3	MSI___	Wet location 360° motion sensor pre-wired for ON/OFF operation[2,4]	DPMB	Dual pendant mounting bracket
		TRS	Tamper resistant Torx® T10 Screws		

Accessories: *Order as separate catalog number.*

HC36	Hook and 36" chain (ships as pair)
MHHK120	10' single leg air craft cable
MHHK120SS	10' single leg air craft cable, stainless steel
RK1 T10DRV	Torx® T10 screwdriver for TRS option
FEMDPMB	Dual pendant mounting bracket (ships as a pair)

Notes

1 The CCT value provided is of lamp source and actual CCT will vary upon levels.

2 Must specify voltage.

3 Available with 8' only.

4 For mounting up to 8', specify MSI8; for mounting up to 20', specify MSI20; for mounting up to 40' , specify MSI40.

FEM LED Low-Profile Enclosed and Gasketed Specular

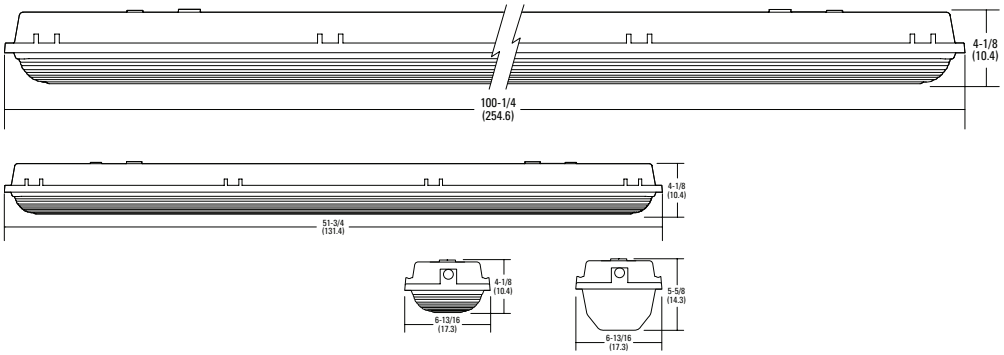
DIMENSIONS

Specifications subject to change without notice.
All dimensions are inches (centimeters) unless otherwise indicated.

FEM LED Specification Matrix*

Fixture	System watts	Actual lumens	mA	Max. ambient temp. (°C) Suspended**	Max. ambient temp. (°C) Surface mounted	Width	IMAFL depth	IMACD or IMAFD depth	Length	Comparable fluorescent/HID
FEM4 3L	39	3418	350	40	25	7 (17.8)	4 3/4 (12.1)	6 1/8 (15.5)	52 (132.1)	1-lamp 32W T8, 1-lamp 54W T5HO, 70W MH
FEM4 4L	61	4728	525	35	25	7 (17.8)	4 3/4 (12.1)	6 1/8 (15.5)	52 (132.1)	2-lamp 32W T8, 70W HPS
FEM8 6L	78	6836	350	40	25	7 (17.8)	4 3/4 (12.1)	6 1/8 (15.5)	100 1/4 (254.6)	3-lamp 32W T8, 2-lamp 54W T5HO, 100W HPS, 100W MH
FEM8 9L	122	9456	525	25	25	7 (17.8)	4 3/4 (12.1)	6 1/8 (15.5)	100 1/4 (254.6)	4-lamp 32W T8, 150W MH

*Values based on 4100K LEDs and deep clear acrylic lens. Calculations are estimated results for general informational purposes only. Results may vary depending on the application.
** Fixture must be suspended at least 6" below ceiling.



PHOTOMETRICS

See www.lithonia.com for photometry reports.

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SPECIFICATION SHEET

lumenline™2

SURFACE - WALL MOUNT
DIRECT/INDIRECT LIGHTING

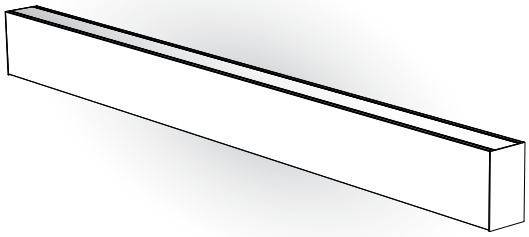
Client:

Project name: SPMT

Order #: LLI2S-WM-DI-277-4-dRO35K-iHO35K-NO-WH

Type: L11 Qty:

FEATURES AND BENEFITS



Physical :

- Aluminum extruded housing, 2" wide
- Available in 1', 2', 3', 4', 5', 6', 7' or 8' sections
- Continuous runs available in 1' increments
- Durable polyester powder coat finish
- Extruded acrylic lens
- High reflective matte white powder coated reflector
- Wall mounted
- Tool-less system for reflector assembly and control gear access
- Easy installation
- Compatible with motion sensors
- Unlit joiners and corners available for custom configurations

Performance :

- Available in 2700K, 3000K, 3500K, 4000K or RGB color mixing for direct and indirect lighting
- 55 lumens per watt (delivered, HO 3500K)
- CRI value: 80+
- Binning within a 3 step MacAdam ellipse
- Lumen maintenance: 100,000 hrs [L70 @ 25° C]
- Lumen measurements comply with LM - 79 - 08 standard
- Resolution per foot or per fixture
- Operating temperatures: -25° C to 50° C [-13F to 122F]

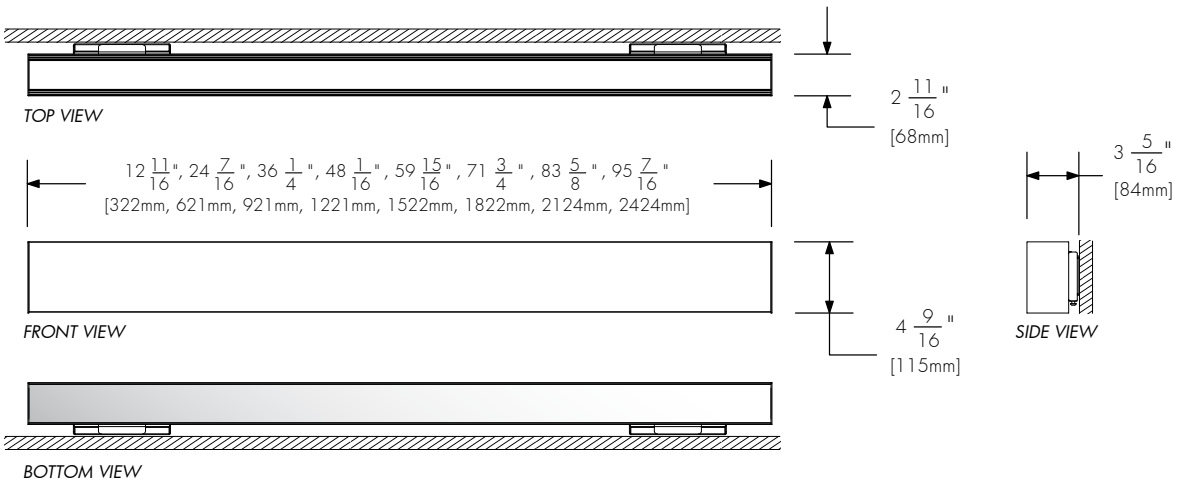
Electrical :

- Line voltage luminaire for 120 to 277V
- 7W/ft Regular Output version, direct or indirect lighting
- 14.25W/ft High Output version, direct or indirect lighting
- Dimming options for white light: 0-10 volt, DMX, DALI, Lumentalk, or Lutron® EcoSystem® enabled
- 6W/ft optional RGB source, DMX 512 ready
- Quick connectors for continuous runs

lumentalk™ EcoSystem® Enabled

Wiring detail

WIRE COLOR	*/ USE*
GREEN	*GROUND*
WHITE	*NEUTRAL*
BLACK	*LIVE 120-277V*
RED	*0-10V / DATA +*
ORANGE	*0-10V / DATA -*



5 year warranty

Lumenpulse, 1751 Richardson, Suite 1505, Montreal (Quebec) Canada H3K 1G6 1.877.937.3003 P. 514.937.3003 F. 514.937.6289
info@lumenpulse.com **www.lumenpulse.com**
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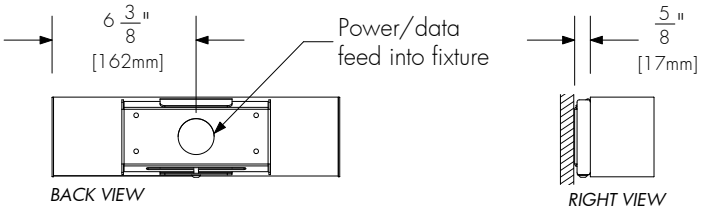
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Sustainable architectural LED lighting systems

SPECIFICATION SHEET

lumenline™ 2

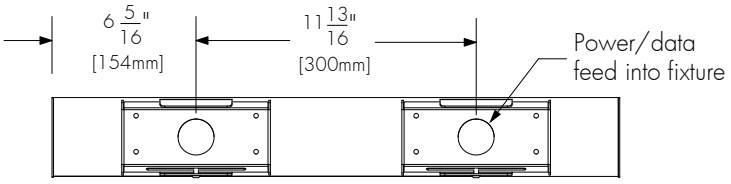
SURFACE - WALL MOUNT
DIRECT/INDIRECT LIGHTING

WALL MOUNTING DETAIL (SINGLE UNITS)



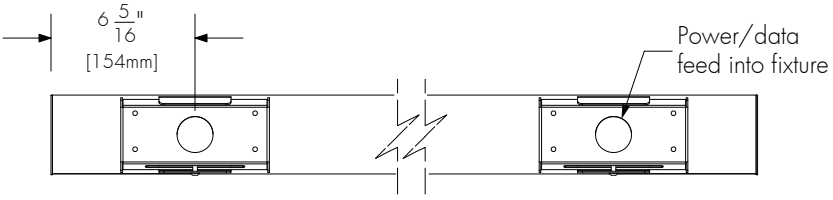
BACK VIEW *RIGHT VIEW*

Wall mounting detail for 1' units
N.B. Horizontal 2" x 4" jonction box required



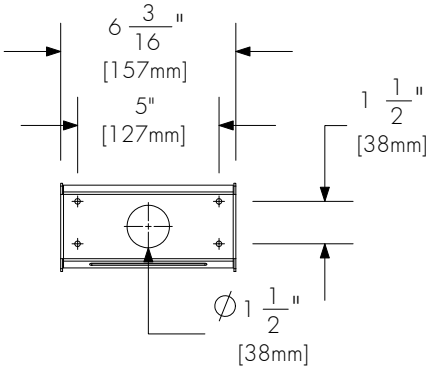
BACK VIEW

Wall mounting detail for 2' units
N.B. Horizontal 2" x 4" jonction box required



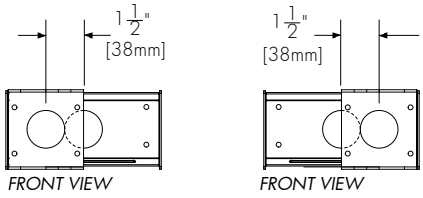
BACK VIEW

Wall mounting detail for 3' to 8' single units
N.B. Horizontal 2" x 4" jonction box required
Please consult factory for continuous runs.



BACK VIEW

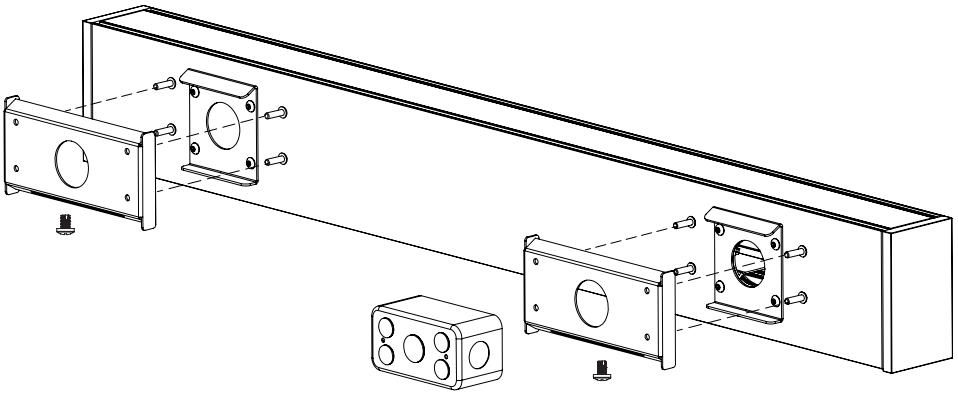
Mounting holes pattern for
Wall mounting plate



FRONT VIEW *FRONT VIEW*

Fixture's wall mounting plates
positioning horizontal tolerance

TYPICAL WALL MOUNTED FIXTURE EXPLODED VIEW



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SPECIFICATION SHEET

ACCESSORIES

Order separately

Control Systems:

LTO Lumentouch is a wall mount DMX 512 controller keypad

LCU Lumencue is a USB / mini SD DMX 512 controller

LID LumenID is a diagnostic and addressing DMX 512 controller.
It must be specified on all DMX applications.
Refer to LID specification sheet for details.

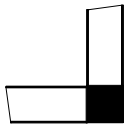
LTN Lumentone is a simple pre-programmed DMX 512 controller
with a push button rotary dial and live feedback.

CBOX :

iCBOX-___V-___-___ Interior DMX 512 data box.
Data input and output, M20 provision holes with plugs.
Voltage input and output, M20 provision holes with plugs.
Up to six outputs to fixtures, M20 provision holes with plugs.
Please specify desired input voltage and finish.
Refer to iCBOX specification sheet for details.

CBOX-___V-___-___ DMX 512 data box.
Data input and output, M20 provision holes with plugs.
Voltage input and output, M20 provision holes with plugs.
Up to six outputs to fixtures, M20 provision holes with plugs.
Please specify desired input voltage and finish.
Refer to CBOX specification sheet for details.

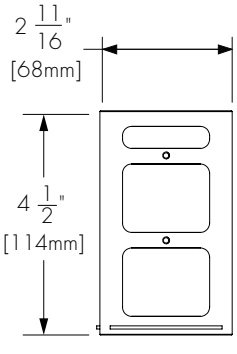
UNLIT JOINERS AND CORNERS
(CONSULT FACTORY FOR CUSTOM CONFIGURATIONS AVAILABILITY AND ORDERING)



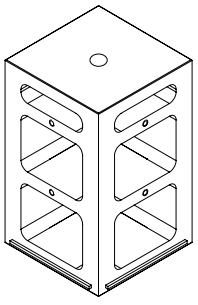
CRN
Corner 90°



LNR
Linear 180°



FRONT VIEW



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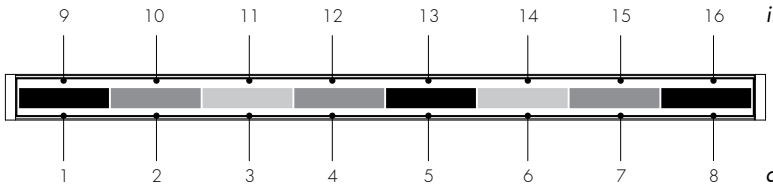
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RESOLUTION DETAILS

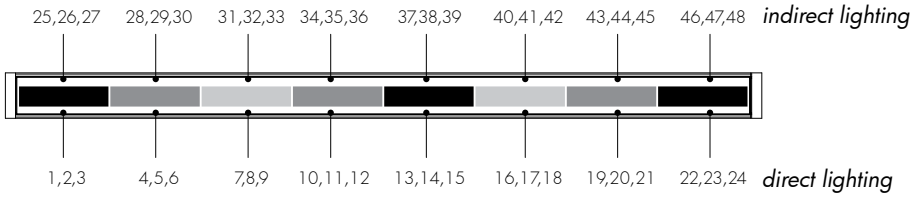
DMX 1FT - Resolution per foot: each foot is addressed independently .

DIRECT AND INDIRECT
WHITE DIMMING
DMX ADDRESSES:



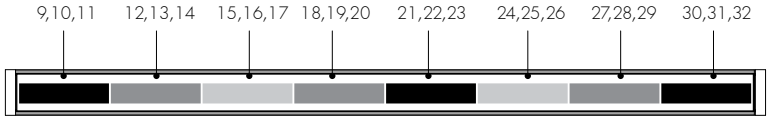
(8 ft fixture shown)

DIRECT AND INDIRECT
RGB DMX ADDRESSES:

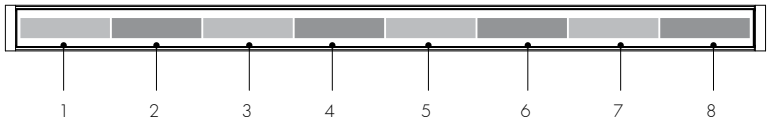


(8 ft fixture shown)

COMBINED
WHITE DIMMING
& RGB DMX ADDRESSES:



Top or bottom view
RGB
(8 ft fixture shown)



Top or bottom view
White dimming
(8 ft fixture shown)

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SPECIFICATION SHEET

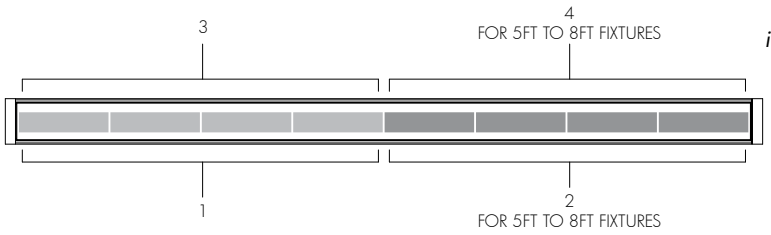
lumenline™2

SURFACE - WALL MOUNT
DIRECT/INDIRECT LIGHTING

RESOLUTION DETAILS
APPLICABLE FOR DMX DIMMING OPTION ONLY

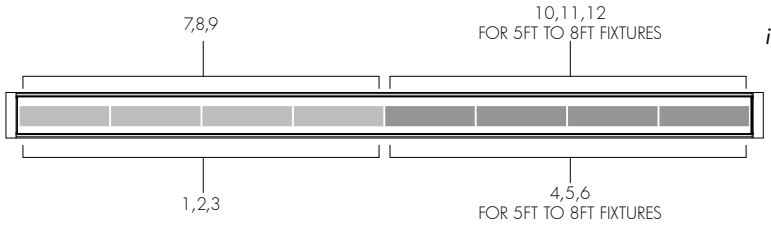
DMX 1FX - Resolution per fixture: each 4 foot segment is addressed independently

DIRECT AND INDIRECT
WHITE DIMMING
DMX ADDRESSES:



(8 ft fixture shown)

DIRECT AND INDIRECT
RGB DMX ADDRESSES:

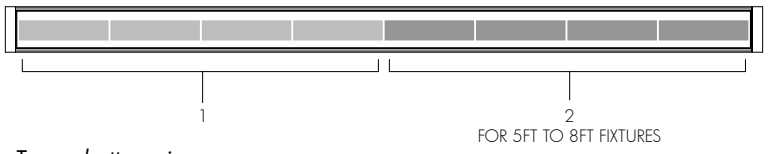


(8 ft fixture shown)

COMBINED WHITE DIMMING
& RGB DMX ADDRESSES:



Top or bottom view
RGB
(8 ft fixture shown)



Top or bottom view
White dimming
(8 ft fixture shown)

*Warning: resolution is a factory setting and cannot be changed in the field.

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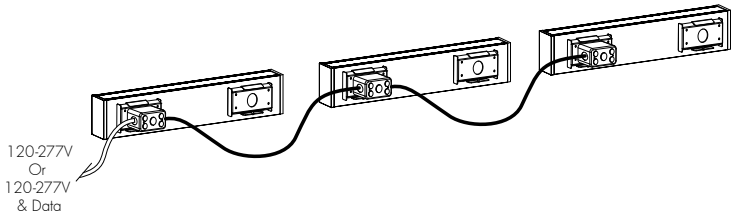
SPECIFICATION SHEET

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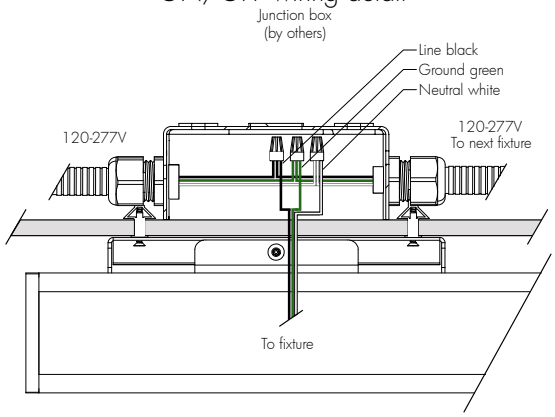
SURFACE - WALL MOUNT
DIRECT/INDIRECT LIGHTING

TYPICAL WIRING DIAGRAMS

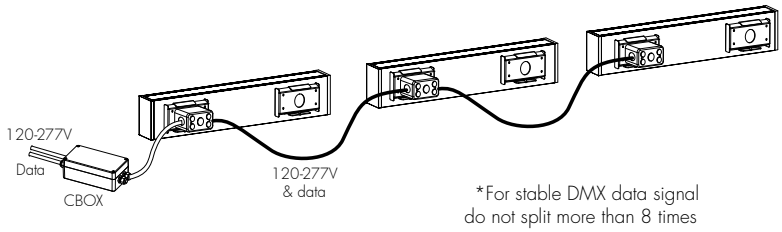
Single units, daisy chain configuration
ON/OFF, 0/10V, DALI & EcoSystem dimming



ON/OFF wiring detail

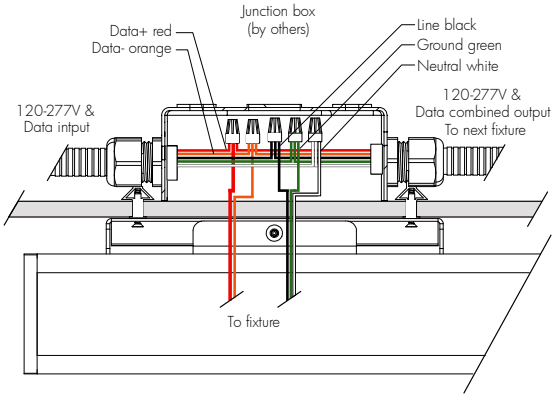


Single units, daisy chain configuration
Combined power and data input (DMX)

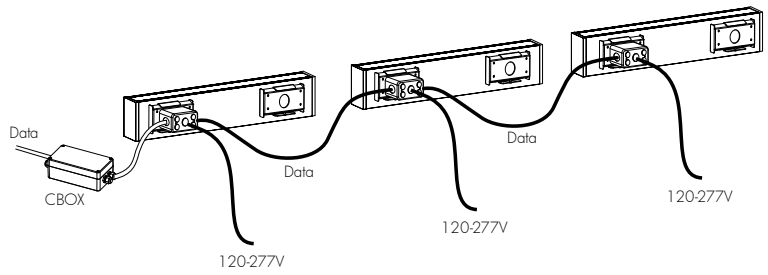


*For stable DMX data signal
do not split more than 8 times

0/10V, DMX, DALI
& EcoSystem wiring detail
Combined power and data input

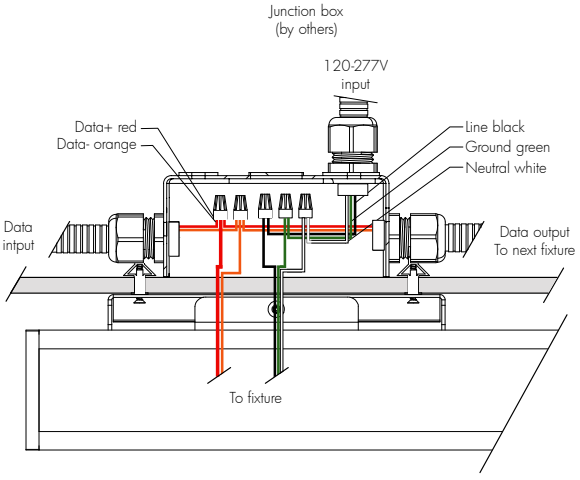


Single units, daisy chain configuration
Separated power and data inputs (DMX)



*For stable DMX data signal
do not split more than 8 times

0/10V, DMX, DALI
& EcoSystem wiring detail
Separated power and data inputs



⚠ WARNING

SEPARATION OF FIELD INSTALLED POWER LIMITED CIRCUIT (DIMMING/DATA/CONTROL) WIRING FROM THE BRANCH CIRCUIT WIRING IN THE OUTLET BOX ARE TO BE MADE IN ACCORDANCE WITH LOCAL AND/OR NATIONAL ELECTRICAL INSTALLATION CODES.

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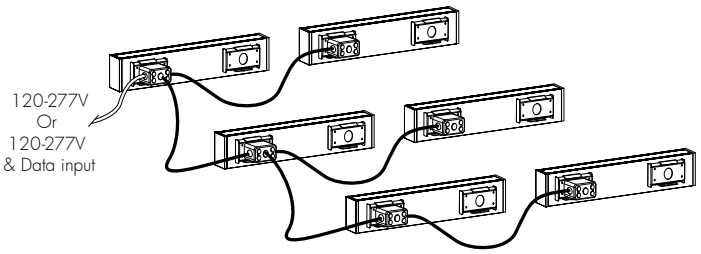
SPECIFICATION SHEET

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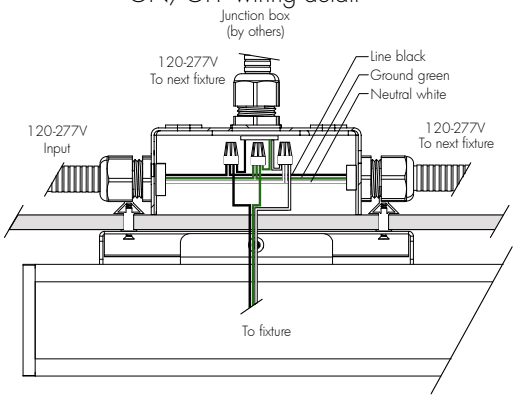
SURFACE - WALL MOUNT
DIRECT/INDIRECT LIGHTING

TYPICAL WIRING DIAGRAMS

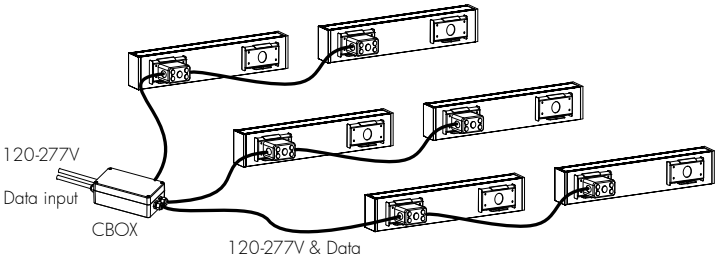
Single units, star layout configuration
ON/OFF, 0/10V, DALI, EcoSystem dimming



ON/OFF wiring detail

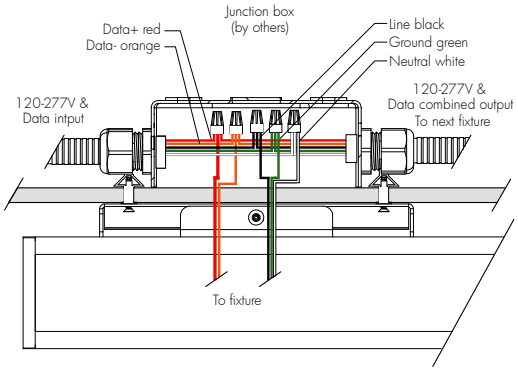


Single units, star layout configuration
Combined power and data input (DMX)

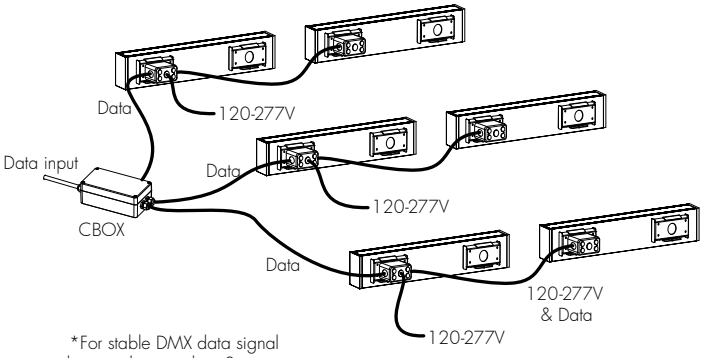


*For stable DMX data signal
do not split more than 8 times

0/10V, DMX, DALI
& EcoSystem wiring detail
Combined power and data input

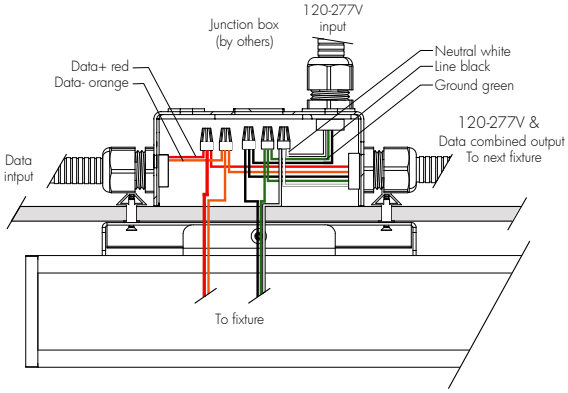


Single units, star layout configuration
Separated power and data inputs (DMX)



*For stable DMX data signal
do not split more than 8 times

0/10V, DMX, DALI
& EcoSystem wiring detail
Separated power and data inputs



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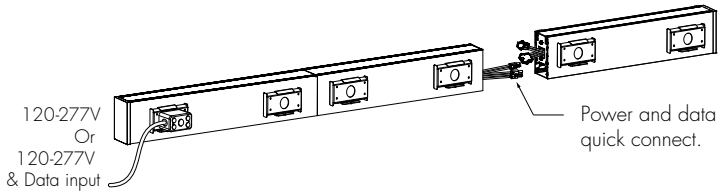
SPECIFICATION SHEET

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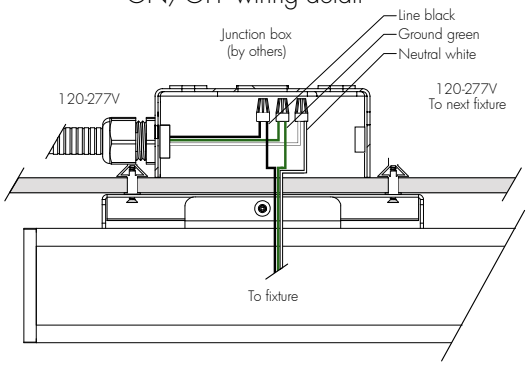
SURFACE - WALL MOUNT
DIRECT/INDIRECT LIGHTING

TYPICAL WIRING DIAGRAMS

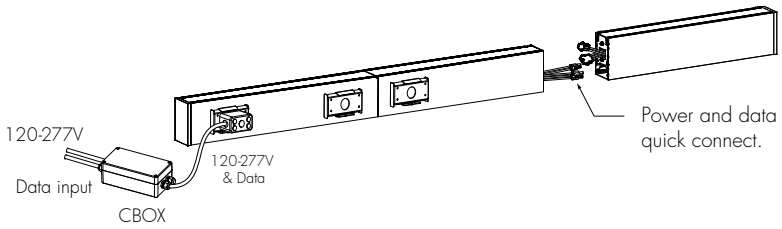
Continuous row, single feed
ON/OFF, 0/10V, DALI, EcoSystem dimming



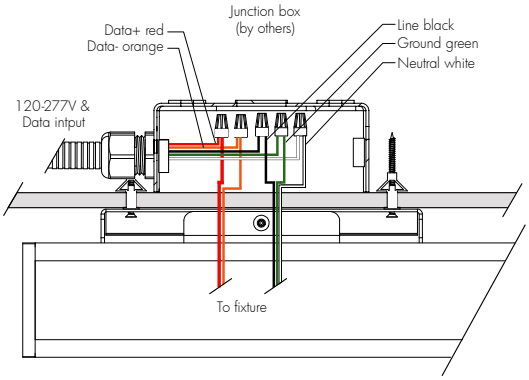
ON/OFF wiring detail



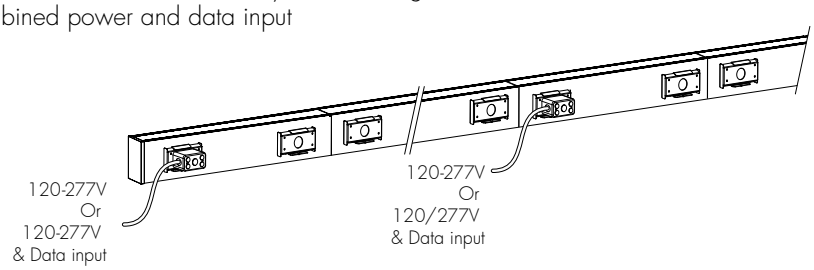
Continuous row, single feed
Combined power and data inputs (DMX)



0/10V, DMX, DALI
& EcoSystem wiring detail
Combined power and data



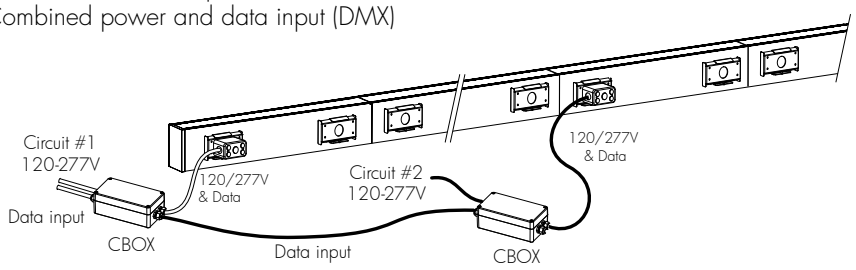
Continuous row, multiple feeds
ON/OFF, 0/10V, DALI, EcoSystem dimming
Combined power and data input



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Continuous row, multiple feeds
Combined power and data input (DMX)



Maximum run length by single circuit
7A maximum with 10 ft cable

Configuration/Voltage		120V	240V	277V
RO-RO	**Direct-indirect lighting**	56ft	116ft	136ft
HO-RO	**Direct-indirect lighting**	36ft	76ft	88ft
HO-RGB	**Direct-indirect lighting**	36ft	76ft	88ft
RO-RGB	**Direct-indirect lighting**	56ft	116ft	136ft
RGB-RGB	**Direct-indirect lighting**	56ft	116ft	136ft

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SPECIFICATION SHEET

lumenline™ 2

SURFACE - WALL MOUNT
DIRECT/INDIRECT LIGHTING

HOW TO ORDER

LLI2S	WM	DI	277	4	dRO 35K	iHO 35K	NO	WH
Housing	Mounting	Light Direction	Voltage	Length	Direct Lighting Output & Color temperature	Indirect Lighting Output & Color temperature	Control	Finish
1	2	3	4	5	6	7	8	9

1

Housing:

LLI2S - Lumenline™ Surface 2" wide

2

Mounting:

WM - Wall Mount

3

Light Direction:

DI - Direct/Indirect lighting

4

Voltage:

120 - 120 volts
208 - 208 volts
220/240 - 220 to 240 volts
277 - 277 volts

5

Length:

1 - 12 11/16 inches (322mm)
2 - 24 7/16 inches (621mm)
3 - 36 1/4 inches (921mm)
4 - 48 1/16 inches (1221mm)
5 - 59 15/16 inches (1522mm)
6 - 71 3/4 inches (1822mm)
7 - 83 5/8 inches (2124mm)
8 - 95 7/16 inches (2424mm)
C__ - Continuous run, specify in 1' increments.

6

Direct Lighting Output & Color temperature:

dRO 27K - 2700K regular output 7W/ft
dRO 30K - 3000K regular output 7W/ft
dRO 35K - 3500K regular output 7W/ft
dRO 40K - 4000K regular output 7W/ft
dHO 27K - 2700K high output 14.25W/ft*
dHO 30K - 3000K high output 14.25W/ft*
dHO 35K - 3500K high output 14.25W/ft*
dHO 40K - 4000K high output 14.25W/ft*

***High output direct lighting cannot be combined with High ouptut indirect lighting.**

dRGB - Additive red, green and blue direct lighting 6W/ft
N.B. **dRGB** options require DALI or DMX control specified in section 8.

7

Indirect Lighting Output & Color temperature:

iRO 27K - 2700K regular output 7W/ft
iRO 30K - 3000K regular output 7W/ft
iRO 35K - 3500K regular output 7W/ft
iRO 40K - 4000K regular output 7W/ft
iHO 27K - 2700K high output 14.25W/ft*
iHO 30K - 3000K high output 14.25W/ft*
iHO 35K - 3500K high output 14.25W/ft*
iHO 40K - 4000K high output 14.25W/ft*

***High output indirect lighting cannot be combined with High ouptut direct lighting.**

iRGB - Additive red, green and blue indirect lighting 6W/ft
N.B. **iRGB** options require DALI or DMX control specified in section 8.

8

Control:

NO - On/Off control
LT - Lumentalk (available with white light only)
(available for 2-8' lengths only)
(1% minimum dimming value)
DIM - 0-10V Dimming option
(10% minimum dimming value)
DMX 1FT - DMX Dimming option, resolution per foot
(1% minimum dimming value)
DMX 1FX - DMX Dimming option, resolution per fixture
(1% minimum dimming value)
DALI - DALI Dimming option
(1% minimum dimming value)
ES - Lutron® EcoSystem® Enabled Dimming (available with white light only)
(available for 2-8' lengths only)
(1% minimum dimming value)

9

Finish:

WH - White
SI - Silver
CC - Custom (please specify RAL color)

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Sustainable architectural LED lighting systems

LITHONIA LIGHTING®

Catalog Number	
Notes	
Type	R1

LDN6

FEATURES & SPECIFICATIONS

INTENDED USE — Typical applications include corridors, lobbies, conference rooms and private offices.

CONSTRUCTION — 16-gauge galvanized steel mounting/plaster frame with trim clips to mount open conical shape reflector.

Vertically adjustable mounting brackets that use 16-gauge flat bar hangers (included), 1/2" conduit or C channel T-bar fasteners. Provides 3-3/4" total adjustment.

Post installation adjustment possible from above or below the ceiling.

Galvanized steel junction box with bottom-hinged access covers and spring latches. Two combination 1/2"-3/4" and three 1/2" knockouts for straight-through conduit runs. Capacity: 8 (4 in, 4 out) No. 12 AWG conductors, rated for 90°C.

Secondary housing adjustment system for precise, final ceiling-to-flange alignment.

Maximum 1-1/2" ceiling thickness.

OPTICS — LED light source with diffused lens, recessed in a deep reflector with a 55-degree cutoff. Aluminum full reflectors are optically designed to maximize lumen output and to provide superior glare control.

Anodized trim colors for open and wallwash reflectors are available in clear, pewter, wheat or gold. White polyester powder coat also available.

Minimum CRI of 80.

ELECTRICAL — High-efficiency, 0-10V dimming driver mounted to the junction box, dims luminaire to 10% of its light output. 1% dimming option available in 1500 and 2000 lumen packages only.

Dimming fixture requires two (2) additional low-voltage wires to be pulled.

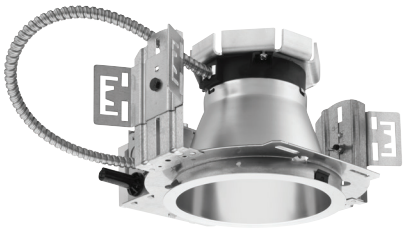
For compatible dimmers and dimming range, refer to Dimmer Compatibility Chart on page 4.

The system maintains 70% lumen output for more than 50,000 hours.

LISTINGS — CSA certified to US and Canadian safety standards. Open downlight (LO6): Wet location listed. Wallwash downlight (LW6): Rated for damp and dry locations only. ENERGY STAR® certified.

WARRANTY — 5-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Note: Specifications subject to change without notice.

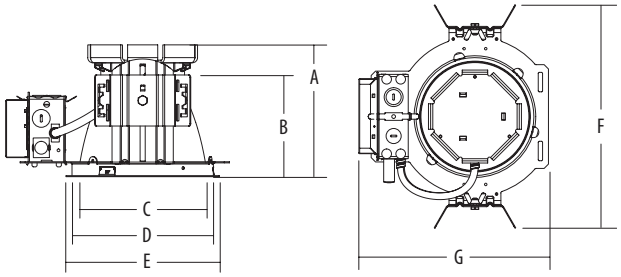


LDN6 35/15 LO6AR 120

152.4mm

~~6"~~ OPEN and WALLWASH LED
Non-IC
New Construction Downlight

WET LOCATION™ DIMMABLE LED ENERGY STAR



Overall height varies by lumen package. Reference dimension chart for details.

Maximum Overall Dimensions – All dimensions are inches (centimeters) unless otherwise indicated.

Lumen package	(A) Height	(B) Frame height	(C) Aperture	(D) Ceiling opening	(E) Outside diameter	(F) Width	(G) Length
600 lm	6-7/16 (16.4)	5-3/4 (14.6)	6-15/16 (17.6)	7-1/8 (18.1)	7-1/2 (19.1)	12-15/16 (32.8)	10-15/16 (27.8)
1000 lm							
1500 lm							
2000 lm	~~7-13/16 (19.9)~~						

198.4mm

ORDERING INFORMATION Lead times will vary depending on options selected. Consult with your sales representative.

Example: LDN6 35/15 LO6AR 120

LDN6	40/20		LO6AR			277	
Series	**Color temperature**	**Lumens [1,2]**	**Reflector**	**Trim color**	**Finish**	**Voltage**	**Options**
LDN6	27/ 2700 K	06 600 lumens	LO6 Open downlight	AR Clear	(blank) Semi-specular	120	EL Emergency battery pack with integral test switch [6]
	30/ 3000 K	10 1000 lumens	LW6 Wallwash downlight [3]	PR Pewter	LD Matte-diffuse	277	ELR Emergency battery pack with remote test switch [6]
	35/ 3500 K	15 1500 lumens		WTR Wheat	LS Specular	347 [5]	SF Single fuse
	40/ 4000 K	20 2000 lumens		GR Gold			TRW White painted flange [7]
				WR White [4]			TRBL Black painted flange
							NEPP Interface for Sensor Switch® nLight® network provided with integral power supply. Refer to TN-623-01. [8]
							RRL___ RELOC®-ready luminaire connectors enables a simple and consistent factory installed option across all ABL luminaire brands. Refer to RRL for complete nomenclature.
							EZ1 eldoLED dims to 1% [9]
							CP Chicago plenum [5,10]

Accessories: *Order as separate catalog number.*

EAC ISSM 375	Compact interruptible emergency AC power system
EAC ISSM 125	Compact interruptible emergency AC power system
NSP5 D ER KIT	Sensor Switch nLight secondary relay and dimming pack device used to switch and dim luminaires powered via an emergency circuit. Refer to NSP5 D ER KIT.
GRA68 JZ	Oversized trim ring with 8" outside diameter [11]
SCA6	Sloped ceiling adapter. Refer to TECH-SCA for more options.

Notes

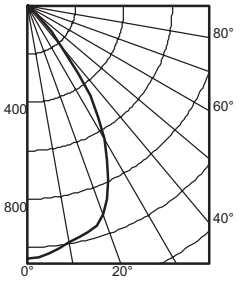
1. Approximate lumen output.
2. Overall height varies by lumen package. Reference dimension chart on page 1.
3. Rated for damp and dry locations only.
4. Not available with finishes.
5. Not available with emergency options.
6. For dimensional changes, refer to chart on page 4. Not available with CP option.
7. Not available with WR (white trim color).
8. For emergency generator/inverter applications order non-nLight enabled fixture and NSP5 D ER KIT as an accessory. Refer to NSP5 D ER KIT.
9. Only available with 1500 and 2000 lumen packages.
10. 277 volt CP products require marked spacing. Install with minimal spacing between: (a) Center-to-center of adjacent luminaires: 2 ft.; (b) Top of luminaire to overhead building member: 3 in.; (c) Luminaire center to side of building member: 1 ft.
11. Refer to TECH-GOOF RINGS for more options.

LDN6

PHOTOMETRY

Distribution Curve | **Distribution Data** | **Output Data** | **Coefficient of Utilization** | **Illuminance Data at 30" Above Floor for a Single Luminaire**

LDN6 35/10 LO6AR 120, input watts: 18, delivered lumens: 1089, LM/W = 61, spacing criterion at 0 = 1.03, test no. LTL25148SL.



	Ave	Lumens
0	1048	
5	1028	97
15	968	272
25	797	361
35	452	273
45	87	76
55	4	6
65	2	2
75	1	0
85	0	0
90	0	

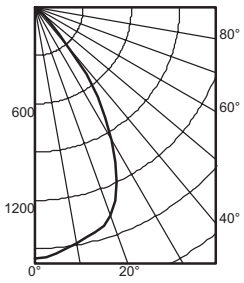
Zone	Lumens	% Lamp
0° - 30°	730.5	67.1
0° - 40°	1004.0	92.2
0° - 60°	1086.4	99.8
0° - 90°	1088.8	100.0
90° - 180°	0.0	0.0
0° - 180°	1088.8	*100.0

*Efficiency

pf	80%			20%			50%		
pc	70%			50%			30%		
pw	50%	30%	10%	50%	30%	10%	50%	30%	10%
0	119	119	119	116	116	116	111	111	111
1	111	108	106	108	106	104	104	103	101
2	103	99	95	101	97	94	98	95	92
3	96	90	86	94	89	86	91	88	84
4	89	83	79	88	83	79	86	81	78
5	83	77	73	82	76	72	80	75	72
6	78	71	67	77	71	67	75	70	66
7	73	67	62	72	66	62	71	65	62
8	68	62	58	68	62	58	67	61	57
9	64	58	54	64	58	54	63	57	54
10	60	54	51	60	54	50	59	54	50

		50% beam - 53.7°		10% beam - 79.9°	
Mounting Height	Inital FC Center Beam	Diameter	FC	Diameter	FC
8.0	34.6	5.6	17.3	9.2	3.5
10.0	18.6	7.6	9.3	12.6	1.9
12.0	11.6	9.6	5.8	15.9	1.2
14.0	7.9	11.7	4.0	19.3	0.8
16.0	5.8	13.7	2.9	22.6	0.6

LDN6 35/15 LO6AR 120, input watts: 26, delivered lumens: 1633, LM/W = 63, spacing criterion at 0 = 1.03, test no. LTL25146.



	Ave	Lumens
0	1564	
5	1539	145
15	1449	407
25	1196	542
35	678	411
45	131	115
55	7	10
65	2	2
75	2	1
85	0	0
90	0	

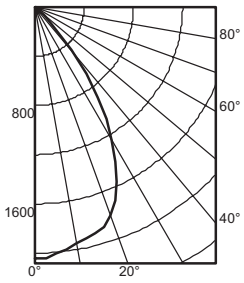
Zone	Lumens	% Lamp
0° - 30°	1094.3	67.0
0° - 40°	1505.0	92.1
0° - 60°	1629.6	99.8
0° - 90°	1633.3	100.0
90° - 180°	0.0	0.0
0° - 180°	1633.3	*100.0

*Efficiency

pf	80%			20%			50%		
pc	70%			50%			30%		
pw	50%	30%	10%	50%	30%	10%	50%	30%	10%
0	119	119	119	116	116	116	111	111	111
1	111	108	106	108	106	104	104	103	101
2	103	99	95	101	97	94	98	95	92
3	95	90	86	94	89	86	91	88	84
4	89	83	79	88	83	78	86	81	78
5	83	77	73	82	76	72	80	75	72
6	78	71	67	77	71	67	75	70	66
7	73	66	62	72	66	62	71	65	62
8	68	62	58	68	62	58	66	61	57
9	64	58	54	64	58	54	63	57	54
10	60	54	50	60	54	50	59	54	50

		50% beam - 53.9°		10% beam - 79.9°	
Mounting Height	Inital FC Center Beam	Diameter	FC	Diameter	FC
8.0	51.7	5.6	25.8	9.2	5.2
10.0	27.8	7.6	13.9	12.6	2.8
12.0	17.3	9.7	8.7	15.9	1.7
14.0	11.8	11.7	5.9	19.3	1.2
16.0	8.6	13.7	4.3	22.6	0.9

LDN6 35/20 LO6AR 120, input watts: 35, delivered lumens: 2143, LM/W = 61, spacing criterion at 0 = 1.04, test no. LTL25144.



	Ave	Lumens
0	2046	
5	2014	190
15	1899	534
25	1569	711
35	892	540
45	171	150
55	9	12
65	3	3
75	2	2
85	1	1
90	0	

Zone	Lumens	% Lamp
0° - 30°	1435.1	67.0
0° - 40°	1975.3	92.2
0° - 60°	2137.5	99.8
0° - 90°	2142.7	100.0
90° - 180°	0.0	0.0
0° - 180°	2142.7	*100.0

*Efficiency

pf	80%			20%			50%		
pc	70%			50%			30%		
pw	50%	30%	10%	50%	30%	10%	50%	30%	10%
0	119	119	119	116	116	116	111	111	111
1	111	108	106	108	106	104	104	103	101
2	103	99	95	101	97	94	98	95	92
3	95	90	86	94	89	86	91	88	84
4	89	83	79	88	83	78	86	81	78
5	83	77	73	82	76	72	80	75	72
6	78	71	67	77	71	67	75	70	66
7	73	66	62	72	66	62	71	65	62
8	68	62	58	68	62	58	66	61	57
9	64	58	54	64	58	54	63	57	54
10	60	54	50	60	54	50	59	54	50

		50% beam - 54.0°		10% beam - 80.0°	
Mounting Height	Inital FC Center Beam	Diameter	FC	Diameter	FC
8.0	67.6	5.6	33.8	9.2	6.8
10.0	36.4	7.6	18.2	12.6	3.6
12.0	22.7	9.7	11.3	15.9	2.3
14.0	15.5	11.7	7.7	19.3	1.5
16.0	11.2	13.8	5.6	22.6	1.1

Notes

- Tested in accordance with IESNA LM-79-08.
- Tested to current IES and NEMA standards under stabilized laboratory conditions.
- Actual performance may differ as a result of end-user environment and application.
- Actual wattage may differ by +/- 10% when operating between 120-277V +/- 10%.
- CRI: 80 typical.

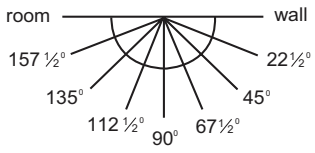
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LDN6

TECHNICAL INFORMATION

Footcandle values are initial and tables are based on minimum of six units. For fixture-to-wall distance other than those shown, use maximum of one-to-one spacing (distance between fixtures not more than distance to wall) for best results.



Candlepower Data **Footcandle values**

LDN6 35/10 LW6AR 120, input watts: 18, delivered lumens: 1090, LM/W = 61, test no. LTL25147.

	Plane angle							
Vertical Angle	Wall	22.5	45	67.5	90	112.5	135	157.5
0	888	888	888	888	888	888	888	888
5	813	811	824	854	875	902	922	926
15	652	675	728	803	862	905	930	935
25	488	524	601	678	723	748	749	741
35	319	355	387	414	409	407	409	403
45	241	229	190	139	87	76	76	74
55	181	172	114	40	9	5	7	8
65	139	117	57	11	1	2	3	4
75	74	57	19	3	2	2	3	2
85	19	13	0	0	0	0	0	0
90	5	6	0	0	0	0	0	0

	Wallwash Illuminance Study (fc) Illuminance on wall from 6 luminaires								
	Luminaire mounted 3 ft. from wall 3 ft. between luminaires			Luminaire mounted 3 ft. from wall 4 ft. between luminaires			Luminaire mounted 3 ft. from wall 5 ft. between luminaires		
ft. from ceiling	3	3.5	4	3	3.5	4	3	3.5	4
1	10	8	10	9	5	9	9	2	9
2	15	15	15	13	10	13	12	6	12
3	15	14	15	12	10	12	10	7	10
4	13	14	13	10	11	10	8	8	8
5	12	13	12	9	10	9	7	8	7
6	12	12	12	8	9	8	7	7	7
7	10	10	10	8	8	8	6	6	6
8	9	9	9	7	7	7	5	5	5
9	8	8	8	6	6	6	5	5	5
10	6	6	6	5	5	5	4	4	4

LDN6 35/15 LW6AR 120, input watts: 26, delivered lumens: 1639, LM/W = 63, test no. LTL25145.

	Plane angle							
Vertical Angle	Wall	22.5	45	67.5	90	112.5	135	157.5
0	1312	1312	1312	1312	1312	1312	1312	1312
5	1198	1187	1202	1244	1285	1326	1371	1409
15	956	976	1052	1153	1246	1333	1403	1438
25	697	720	837	953	1028	1082	1109	1126
35	442	482	548	586	583	590	612	623
45	348	336	303	222	132	105	112	115
55	283	269	196	80	19	8	10	11
65	230	191	102	22	3	2	3	6
75	121	88	30	1	1	1	1	4
85	30	18	1	1	0	0	0	0
90	5	6	0	2	1	1	1	0

	Wallwash Illuminance Study (fc) Illuminance on wall from 6 luminaires								
	Luminaire mounted 3 ft. from wall 3 ft. between luminaires			Luminaire mounted 3 ft. from wall 4 ft. between luminaires			Luminaire mounted 3 ft. from wall 5 ft. between luminaires		
ft. from ceiling	3	3.5	4	3	3.5	4	3	3.5	4
1	17	13	17	16	7	16	15	4	15
2	24	24	24	20	16	20	19	10	19
3	22	22	22	17	16	17	15	11	15
4	20	21	20	14	16	14	12	12	12
5	18	19	18	13	15	13	10	12	10
6	17	17	17	12	13	12	9	11	9
7	15	15	15	11	11	11	9	9	9
8	13	13	13	10	10	10	8	8	8
9	11	11	11	8	8	8	7	7	7
10	9	9	9	7	7	7	6	6	6

LDN6 35/20 LW6AR 120, input watts: 35, delivered lumens: 2137, LM/W = 61, test no. LTL25143.

	Plane angle							
Vertical Angle	Wall	22.5	45	67.5	90	112.5	135	157.5
0	1712	1712	1712	1712	1712	1712	1712	1712
5	1566	1544	1598	1633	1710	1739	1783	1806
15	1254	1276	1394	1533	1658	1755	1811	1834
25	913	956	1140	1307	1420	1489	1512	1521
35	592	654	766	839	851	852	855	861
45	446	425	402	325	215	170	167	167
55	335	317	248	115	32	13	12	14
65	251	213	129	35	5	4	5	5
75	121	92	39	4	1	1	1	3
85	24	14	2	0	1	0	0	0
90	1	1	1	0	1	1	1	0

	Wallwash Illuminance Study (fc) Illuminance on wall from 6 luminaires								
	Luminaire mounted 3 ft. from wall 3 ft. between luminaires			Luminaire mounted 3 ft. from wall 4 ft. between luminaires			Luminaire mounted 3 ft. from wall 5 ft. between luminaires		
ft. from ceiling	3	3.5	4	3	3.5	4	3	3.5	4
1	17	13	17	16	7	16	16	4	16
2	28	27	28	23	18	23	22	11	22
3	28	27	28	22	19	22	19	14	19
4	26	27	26	19	20	19	16	15	16
5	24	25	24	17	20	17	13	16	13
6	22	22	22	16	17	16	12	15	12
7	20	20	20	15	15	15	11	13	11
8	17	17	17	13	13	13	10	11	10
9	15	15	15	11	11	11	9	9	9
10	13	13	12	10	10	10	8	8	8

Notes

- Tested in accordance with IESNA LM-79-08.
- Tested to current IES and NEMA standards under stabilized laboratory conditions.
- Actual performance may differ as a result of end-user environment and application.
- Actual wattage may differ by +/- 10% when operating between 120-277V +/- 10%.
- CRI: 80 typical.

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LDN6

ADDITIONAL DATA

DIMMER COMPATIBILITY CHART	
Manufacturer	**Model/Series**
600 & 1000 Lumen products	
Leviton	IllumaTech - IP710-DLX
Lutron	Nova T - NTFTV-WH *For on/off control, this switch requires a power pack. Consult Lutron for more information.*
Sensor Switch	nPODM
Synergy	ISD BC 120/277
1500 & 2000 Lumen products	
Busch-Jaeger	2112U-101
Jung	240-10
Leviton Lighting Controls	IllumaTech - IP710-DLX
Lightolier Controls	ZP600FAM120
Lutron Electronics	Nova T - NTFTV
	Diva - DVTV
	Diva - NFTV
	GraphicEye - GRX-TVI w GRX3503
	Energy Savr Node - QSN-4T16-S
	TVM2 Module
Merten	5729
Pass & Seymour	CD4FB-W
Sensor Switch	nPODM
Synergy	ISD BC 120/277
The Watt Stopper	DCLV1

EL/ELR AVAILABILITY/COMPATIBILITY - INITIAL LUMENS			
Lumen package	**Watts**	**Initial lumens EL/ELR**	**Emergency LED driver**
600	12	500	PS1030
1000	18	575	PS1030
1500	26	640	Bodine BSL17C-C2
2000	35	690	Bodine BSL17C-C2

EL/ELR DIMENSIONAL CHANGES	
Add to overall housing length for EL/ELR option	**Overall housing width with EL/ELR option**
4-1/2	16-1/2

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LITHONIA LIGHTING®

Catalog Number	
Notes	
Type	W1

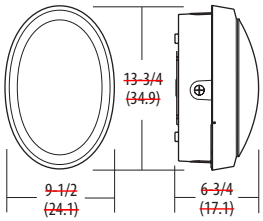
GRS GATEWAY®

Architectural Rough Service Fixture

VG01C

LED
Oval Open Face
Deep Housing
Ceiling/Wall Mounted





All dimensions are inches (centimeters).

FEATURES & SPECIFICATIONS

INTENDED USE — Architectural deep-cast luminaire provides general illumination for rough service (vandal resistant) applications. Ideal for interior or exterior applications where safety and security are a concern. Designed to complement building architecture and to endure extreme environmental conditions and physical abuse. Amber LEDs available for applications requiring turtle-safe lighting. Certain airborne contaminants can diminish integrity of acrylic. Click here for Acrylic Environmental Compatibility table for suitable uses.

CONSTRUCTION — *Bezel* - One-piece, die-cast aluminum, low copper alloy (<1% copper). Encloses lens and secures to housing with stainless steel Torx® T-10 set screws (two included) or optional stainless steel tamper-resistant screws (see options).

Housing - One-piece, die-cast aluminum, low copper alloy (<1% copper), with post-painted polyester powder coat finish. Four hole mounting detail for use directly over outlet box, or conduit entry through three 1/2" threaded openings on side or 3/4" threaded opening on rear surface. .012 gauge aluminum sheet metal internal bracket and board plate for thermal conduction and support.

Gasket - Polycarbonate: Perimeter lens gasket is one-piece silicone "O" ring, mechanically held in lens channel. Glass: Perimeter lens gasket is closed-cell silicone. Pad mounting gasket is closed-cell neoprene and seals housing to mounting surface. Gaskets help cushion impact shock.

Finish - Standard finish is textured polyester powder coat in white, black or bronze. Optional architectural colors available (see paint finishes).

OPTICS — *Polycarbonate lens* – Injection-molded lens is .125 inch thick. Designed to enrich the LED color and lumen output. Smooth exterior allows for easy cleaning, and interior pattern diffuses light for even surface illumination.

Glass lens – Tempered borosilicate lens, .250 inch thick, has smooth exterior for easy cleaning and textured interior.

ELECTRICAL — Utilizes high-efficiency LEDs mounted to 2 metal core circuit boards. 3500 Kelvin temperature. Driver: 2 electronic drivers wired in series allows total power to be reduced by half while maintaining even illumination across the 2 boards. 70% lumen maintenance at 50,000 hours. 100V through 277V, 50-60HZ operation. 6KV pulse rated. Integral surge protection standard.

INSTALLATION — Unit may be wall or ceiling mounted.

LISTINGS — CSA Certified to UL and C-UL standards. NOM Certified (see Options). CSA listed for 30°C ambient and wet locations. IP65 rated.

WARRANTY — 5-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

For installed Rough Service Product(s), Acuity warrants that, for the lifetime of the product(s), the polycarbonate lens and/or polycarbonate housing will withstand breakage resulting from occasional physical abuse and rough handling (the "Rough Service Warranty"), notwithstanding the vandalism exclusion set forth at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Actual performance may differ as a result of end-user environment and application.

Note: Specifications subject to change without notice.

ORDERING INFORMATION

For shortest lead times, configure products using **bolded options**.

Example: VG01C 40LED 120 DBLB SF LPI

VG01C	40LED			277	DWHG			LPI
Series	**Lumen output[1]/Color temperature[2]**		**Lens**	**Voltage**	**Paint finishes[3]**		**Options**	**Lamp**
VG01C	**Lumen output[1]**	**Color temperature[2]**	**(blank)** Polycarbonate	**120**	Standard textured finishes		Shipped installed in fixture	**LPI** Lamp included
	40LED 40W	**(blank)** 3500K	**GL** Borosilicate glass	**277**	**DWHG** White		DF Double fuse[4,5]	LPIAMB Amber LEDs
	25LED 25W			**MVOLT**	**DBLB** Black		**SF** Single fuse[5]	
					DDBT Dark bronze		**DS** Dual switching	
					DNAT Natural aluminum		MSI8 Wet location motion sensor[5,6]	
					DSST Sandstone		**PE** Photoelectric cell[5,7]	
							TRS Tamper-resistant screws[8]	
							NOM Meets Mexican standards	

Accessories: *Order as separate catalog number.*

RK1 T10DRV	Torx TX10 screwdriver, for use with Gateway set screws.
RK1 T20BIT	Hex-base driver bit, Torx TX20, for tamper-resistant screws with center reject pin.
RK1 T20DRV	Torx TX20 screwdriver for use with tamper-resistant screws with center reject pin.

Notes

1. Refer to table on back page.
2. The CCT value provided is of lamp source and actual CCT will vary upon power levels.
3. For additional colors, refer to Architectural Paint brochure.
4. Must specify DS option.
5. Must specify voltage. Not available with MVOLT.
6. Provided with lens for mounting up to 8'.
7. Not available with DS option.
8. T-20 screws with center reject pin.

VG01C Rough Service Ceiling/Wall-Mounted Fixture, LED

System watts	Initial delivered lumens through polycarbonate lens* 3500K	Initial delivered lumens through glass lens* 3500K	mA	Ambient temperature °C
40	1165	780	500	30
25	900	605	350	30

* 3500K is LED CCT

PHOTOMETRICS

See www.lithonia.com.

LITHONIA LIGHTING®
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SPECIAL APPLICATIONS: One Lithonia Way Conyers, GA 30012 Phone: 800.315.4963 Fax: 770-981-8191 www.lithonia.com

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D-Series Size 3
LED Flood Luminaire

Catalog Number

Notes

Type **W2**

Hit the Tab key or mouse over the page to see all interactive elements.

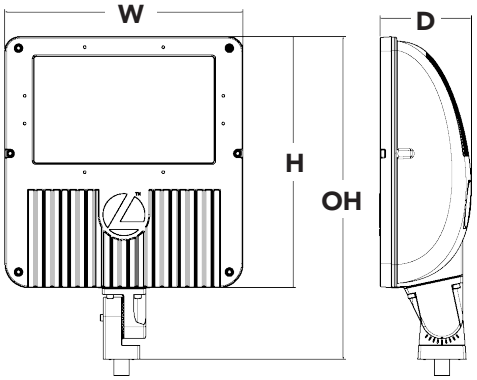
Introduction

The D-Series Size 3 Flood features precision optics to beautifully illuminate a variety of applications as its sleek, compact styling blends seamlessly with its environment.

The D-Series Flood reflector systems and cutting-edge chip-on-board LED technology produce low field-to-beam ratios for minimal spill light and incredible photometric performance. It's the ideal long-life replacement for 250 - 400W metal halide floods, with typical energy savings of 67% and expected service life of over 100,000 hours.

Specifications

EPA:	1.4 ft² *(0.13 m²)*
Depth:	5″ *(12.7 cm)*
Width:	13″ *(33.0 cm)*
Height:	13-5/8″ *(34.6 cm)*
Overall Height	17-1/2″ *(44.5 cm)*
Weight:	21 lbs *(9.5 kg)*



Ordering Information

EXAMPLE: DSXF3 LED 8 A530/40K FL MVOLT THK DDBXD

DSXF3 LED	8	A530/40K	WFR	277	YKC62		DBLXD
Series	**Light Engines**	**Performance Package**	**Distribution**	**Voltage**	**Mounting**	**Options**	**Finish** *(required)*
DSXF3 LED	6 Six COB engines 8 Eight COB engines	**530 mA options:** A530/30K 3000K A530/40K 4000K A530/50K 5000K	NSP Narrow spot MSP Medium spot MFL Medium flood FL Flood WFL Wide flood WFR Wide flood, rectangular HMF Horizontal medium flood	MVOLT [1] 120 [1] 208 [1] 240 [1] 277 [1] 347 480	**Shipped included** THK Knuckle with 3/4″ NPT threaded pipe YKC62 Yoke with 16-3 SO cord IS Integral slipfitter (fits 2-3/8″ O.D. tenon) **Shipped separately** [2] FTS CG6 Tenon slipfitter (fits 2-3/8″ to 2-7/8″ O.D. tenon. YKC62 required)	**Shipped installed** PER NEMA twist-lock receptacle only (no controls) DMG 0-10V dimming driver (no controls) DCR Dimmable and controllable via ROAM® (no controls) [3] SF Single fuse (120, 277, 347V) [4] DF Double fuse (208, 240, 480V) [4] WTB Utility terminal block **Shipped separately** [2] UBV Upper/bottom visor (universal) FV Full visor VG Vandal guard WG Wire guard SC Shorting cap [5] DLL127F 1.5 JU Photocell - SSL twist-lock (120-277V) [5] DLL347F 1.5 CUL JU Photocell - SSL twist-lock (347V) [5] DLL480F 1.5 CUL JU Photocell - SSL twist-lock (480V) [5]	DDBXD Dark bronze DBLXD Black DNAXD Natural aluminum DWHXD White

Accessories

Ordered and shipped separately.

FTS CG6 DDBXD U	Slipfitter for 2-3/8″ to 2-7/8″ OD tenons; mates with yoke mount (specify finish)	DSXF3UBV DDBXD U	Upper/bottom visor accessory (specify finish)
FRWB DDBXD U	Radius wall bracket, 2-3/8″ OD tenon (specify finish)	DSXF3FV DDBXD U	Full visor accessory (specify finish)
FSPB DDBXD U	Steel square pole bracket, 2-3/8″ OD tenon (specify finish)	DSXF3VG U	Vandal guard accessory
		DSXF3WG U	Wire guard accessory

For more mounting options, visit our Floodlighting Accessories pages.
For more control options, visit DTL and ROAM online.

NOTES

1. MVOLT driver operates on any line voltage from 120-277V. Specify 120, 208, 240 or 277 options only when ordering with fusing (SF, DF options).
2. Also available as separate accessories; see Accessories information at left.
3. Specifies a ROAM® enabled luminaire with 0-10V dimming capability; PER option required. Not available with 347 or 480V. Additional hardware and services required for ROAM® deployment; must be purchased separately. Call 1-800-442-6745 or email: sales@roamservices.net.
4. Single fuse (SF) requires 120, 277 or 347 voltage option. Double fuse (DF) requires 208, 240 or 480 voltage option.
5. Requires luminaire to be specified with PER option. Ordered and shipped as a separate line item.

LITHONIA LIGHTING
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Performance Data

Lumen Output

Lumen values are from photometric tests performed in accordance with IESNA LM-79-08. Data is considered to be representative of the configurations shown, within the tolerances allowed by Lighting Facts. Actual performance may differ as a result of end-user environment and application. Actual wattage may differ by +/- 8% when operating between 120-480V +/- 10%. Contact factory for performance data on any configurations not shown here.

Light Engines	Drive Current (mA)	Performance Package	System Watts	Dist. Type	Field Angle		Beam Angle		40K (4000K, 70 CRI)			50K (5000K, 67 CRI)		
					°H	°V	°H	°V	Max Cd	Lumens	LPW	Max Cd	Lumens	LPW
6	530	A530/--K	115W	NSP	48	49	19	19	39,299	7471	65	39,177	7448	65
				MSP	50	48	24	23	36,284	8373	73	36,171	8347	73
				MFL	60	60	47	46	15,104	8948	78	15,057	8920	78
				FL	85	84	63	62	9985	9730	85	9954	9700	84
				WFL	106	106	71	72	7488	10,230	89	7465	10,199	89
				WFR	107	88	85	64	7460	10,461	91	7436	10,429	91
				HMF	100	62	80	13	6779	3301	29	6758	3290	29
8	530	A530/--K	158W	NSP	48	49	19	19	51,658	9820	62	51,496	9790	62
				MSP	50	48	24	23	47,694	11,006	70	47,546	10,971	69
				MFL	60	60	47	46	19,854	11,761	74	19,792	11,725	74
				FL	85	84	63	62	13,125	12,790	81	13,084	12,750	81
				WFL	106	106	71	72	9843	13,448	85	9812	13,406	85
				WFR	107	88	85	64	9805	13,751	87	9775	13,708	87
				HMF	100	62	80	13	8911	4338	27	8883	4325	27

Lumen Ambient Temperature (LAT) Multipliers

Use these factors to determine relative lumen output for average ambient temperatures from 0-40°C (32-104°F).

Ambient		Lumen Multiplier
0°C	32°F	1.05
10°C	50°F	1.03
20°C	68°F	1.01
25°C	**77°F**	**1.00**
30°C	86°F	0.99
40°C	104°F	0.97

Projected LED Lumen Maintenance

Data references the extrapolated performance projections for the **DSXF LED 8 A530** platform in a **25°C ambient**, based on 8400 hours of LED testing (tested per IESNA LM-80-08 and projected per IESNA TM-21-11).

To calculate LLF, use the lumen maintenance factor that corresponds to the desired number of operating hours below. For other lumen maintenance values, contact factory.

Operating Hours	0	25,000	50,000	100,000
Lumen Maintenance Factor	1.0	0.94	0.90	0.84

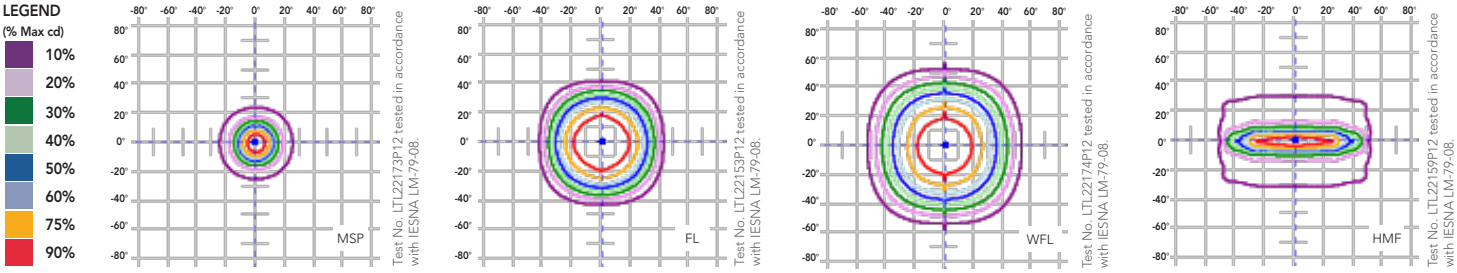
Electrical Load

Light Engines	Drive Current (mA)	System Watts	Current (A)					
			120	208	240	277	347	480
6	530	115W	1.06	0.61	0.53	0.46	0.37	0.27
8	530	158W	1.46	0.84	0.73	0.63	0.51	0.37

Photometric Diagrams

To see complete photometric reports or download .ies files for this product, visit Lithonia Lighting's D-Series Flood Size 3 homepage.

Isocandela plots for the DSXF3 LED 8 A530/40K.



FEATURES & SPECIFICATIONS

INTENDED USE

The sleek design of the D-Series Size 3 Flood reflects the embedded high performance LED technology. It is ideal for wallwash, security and general area lighting in many commercial and institutional applications.

CONSTRUCTION

Die-cast aluminum housing has integral heat sink fins to optimize thermal management through conductive and convective cooling. The LED driver is mounted in direct contact with the casting to promote low operating temperature and long life. Housing is completely sealed against moisture and environmental contaminants (IP65). Low EPA (1.4 ft²) for optimized wind loading.

FINISH

Exterior parts are protected by a zinc-infused Super Durable TGIC thermoset powder coat finish that provides superior resistance to corrosion and weathering. A tightly controlled multi-stage process ensures a minimum 3 mils thickness for a finish that can withstand extreme climate changes without cracking or peeling.

OPTICS

A variety of precision-molded vacuum-metallized specular reflectors are engineered for superior field-to-beam ratios, uniformity and spacing. Light engines are available in 3000K (80 CRI min.), 4000K (70 CRI min.) or 5000K (67 CRI min.) configurations. Optional visors offer additional versatility.

ELECTRICAL

Light engines consist of chip-on-board (COB) LEDs directly coupled to the housing to maximize heat dissipation and promote long life (100,000 hrs at 25°C, L84). Class 1 electronic driver has a power factor >90%, THD <20%, and has an expected life of 100,000 hours with <1% failure rate. (Eight-engine unit uses two drivers.) Surge protection meets a minimum Category C Low operation (per ANSI/IEEE C62.41.2).

INSTALLATION

Integral adjustable knuckle with 3/4-14 NPT threaded pipe, or yoke mounting, facilitates quick and easy installation to a variety of mounting accessories. This secure connection enables the D-Series Size 3 to withstand up to a 1.5 G vibration load rating per ANSI C136.31.

LISTINGS

CSA certified to U.S. and Canadian standards. Luminaire is IP65 rated. Rated for -40°C minimum ambient.

DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.designlights.org to confirm which versions are qualified.

WARRANTY

Five year limited warranty. Full warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx.

Note: Specifications subject to change without notice.

LITHONIA LIGHTING
One Lithonia Way • Conyers, Georgia 30012 • Phone: 800.279.8041 • Fax: 770.918.1209 • www.lithonia.com
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sensorswitch®

CM PDT 9

CP9



STANDARD RANGE 360º SENSOR
CEILING MOUNT • LOW VOLTAGE • DUAL TECHNOLOGY (PDT)

SPECIFICATIONS

FEATURES
- 100% Digital PIR Detection, Excellent RF Immunity
- 360º Coverage Pattern
- Patented Dual Technology with PIR / Microphonics Detection
- Push-Button Programmable Adjustable Time Delays
- Convenient Test Mode
- No Field Calibration or Sensitivity Adjustments Required
- 100 hr Lamp Burn-in Timer
- Green LED Indicator
- Non-Volatile Memory

LAMPMAXIMIZER® TECHNOLOGY
- Protects Lamp Life while Maximizing Energy Savings
- Minimum On Timer (15 min default)
- Occ. Time Delay (10 min default)
- LampMaximizer+ Mode - Optimizes Lamp Life & Energy Savings (disabled by default)
- Switch Counter (in 1000's)
- Total Lamp On Time (in khrs)

PHYSICAL SPECS
- SIZE: 4.55" Dia. (11.56 cm) 1.55" Deep (3.94 cm)
- WEIGHT: 6 oz
- MOUNTING: Ceiling Tile Surface, 3.5" Octagon Box, Single Gang Handy Box
- COLOR: White

ELECTRICAL SPECS
- OPERATING VOLTAGE: 12-24 VAC/VDC
- CURRENT DRAW: Standard, 4 mA; w/ **R** option, 16 mA
- DIMMING LOAD: Sinks < 20mA; ~40 Ballasts @ .5mA each
- RECOMMENDED POWER PACK: PP20

ENVIRONMENTAL SPECS
- OPERATING TEMP: 14º to 160º F (-10º to 71º C)
- RELATIVE HUMIDITY: 20 to 90% non-condensing
- SILICONE FREE
- ROHS COMPLIANT

OVERVIEW

Open area office lighting control is made cost-effective with the use of the **CM PDT 9** Series Standard Range 360° occupancy sensor. This sensor provides line-of-sight PIR detection of small motion in a circular pattern, and combines overlapping Microphonics™ coverage for detection of occupants working in their cubical space. By installing multiple **CM PDT 9**s on 30 ft (9.14 m) centers, large control zones are created (typically one per circuit of lighting). The lighting is then controlled in blocks similar to manual switching. Restrooms with stalls, large storage areas with shelving, and libraries with study carrels are also easily and cost-effectively controlled by the **CM PDT 9**.

SENSOR OPERATION

Sensors with Passive Dual Technology (PDT) first see motion using 100% digital Passive Infrared (PIR) detection and then engage Microphonics™ to hear sounds that indicate continued occupancy. This patented technology uses Automatic Gain Control (AGC) to dynamically self adapt a sensor to its environment by filtering out constant background noise and registering only noises typical of human activity. When occupancy is detected, a DC output goes high and can drive up to 200 mA of connected load. If needed, a 10 second grace period also allows the lights to be voice reactivated after shutting off. The sensor is powered with 12-24 VAC/VDC and typically operates with a **PP20** or **MP20** power pack, enabling 20 Amp circuits to be controlled.

LAMPMAXIMIZER®

This sensor also contains patented LampMaximizer technology that allows users to aggressively target energy savings while still protecting lamp life. A minimum on timer, factory set at 15 minutes, helps preserve lamp life by eliminating all lamp cycles shorter than lamp manufacturers' recommendations. A standard occupancy time delay is also present that ensures lights turn off (assuming minimum on timer has elapsed) if no occupancy is detected. This timer is factory set at 10 minutes to promote energy savings, but is adjustable between 30 seconds and 20 minutes. These adjustments can be done manually, through the unit's push-button, or automatically every two weeks through an advanced mode, called LampMaximizer+, that determines the optimum time delay in order to maximize both lamp life and energy savings. Additionally, this sensor maintains statistics on total lamp on time and number of cycles.

OPTIONS

LOW VOLTAGE RELAY (R)
- Enables sensors to interface with other systems (e.g., BMS, lighting panels)
- Provides dry contact closure via a SPDT, 1 Amp, 40 Volt relay
- Only one relay needed per zone
- Changes state when all connected sensors register unoccupied
- Relay requires sensor power to function

OCCUPANCY CONTROLLED DIMMING (D)
- Provides dimming output to control 0-10 VDC dimmable ballasts
- Provides a second occupancy time-out period that enables the lights to go to a dim setting before turning off
- Adjustable max/min dim setting
- Only one sensor per zone needs to have dimming output

PHOTOCELL (P)
- Auto set-point calibration
- Two selectable modes of operation
- On/Off mode: Photocell has full control during periods of occupancy
- Inhibit mode: Photocell can prevent lights from turning on if adequate daylight is available, but cannot turn lights off

PHOTOCELL W/ DIMMING (ADC)
- Photocell within sensor maintains total room light level by controlling levels of 0-10 VDC dimmable ballasts
- Photocell also has full on/off control during periods of occupancy
- Provides a second occupancy time-out period that enables the lights to go to a dim setting before turning off

Note: LampMaximizer+ features not available with ADC option

LOW TEMP/HIGH HUMIDITY (LT)
- Sensor electronics are coated for corrosion resistance
- Operates down to -4º F (-20º C)
- Required for bathroom & cooler/ freezer applications

c UL US LISTED

TITLE 24
ASSEMBLED in U.S.A.
5 YEAR WARRANTY

ORDERING INFO

CM PDT 9 [RELAY] [DIMMING/PHOTOCELL] [TEMP/HUMIDITY]

RELAY

Blank = None
R = Low Voltage Relay

DIMMING / PHOTOCELL *CHOOSE ONE ONLY*

Blank = None
D = Occupancy Controlled Dimming
P = Photocell
ADC = Photocell w/ Dimming

TEMP/HUMIDITY

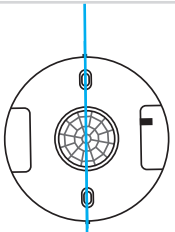
Blank = Standard
LT = Low Temp

Revised 10.11.13 © 2013 Sensor Switch

COVERAGE PATTERN

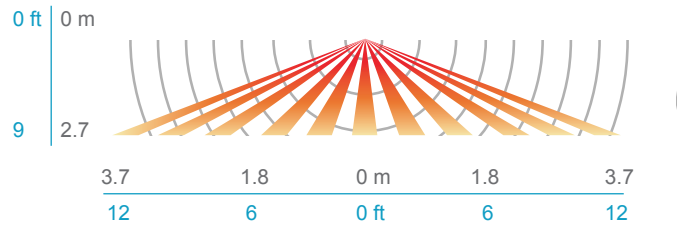
STANDARD RANGE 360° LENS WITH MICROPHONICS

- Best choice for small motion (e.g. hand movements) detection
- Viewing angle of 56° in a 360° conical shaped pattern
- Provides 12 ft (3.66 m) radial coverage when mounted to standard 9 ft (2.74 m) ceiling
- 8 to 15 ft (2.44 to 4.57 m) mounting heights provide 10 to 20 ft (3.05 to 6.10 m) radial coverage
- Microphonics™ provides overlapping detection of human activity over the complete PIR coverage area. Advanced filtering is also utilized to prevent non-occupant noises from keeping the lights on.

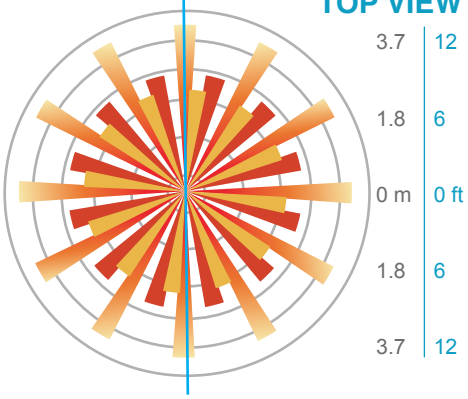


Note: Screw axis is aligned with a long detection segment

SIDE VIEW



TOP VIEW



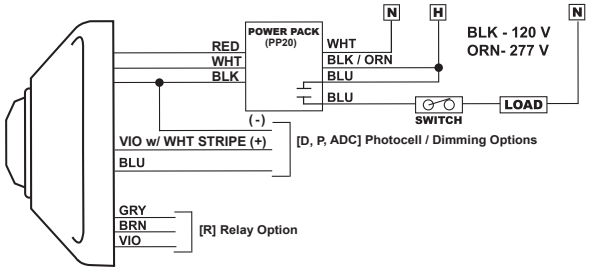
WIRING (DO NOT WIRE HOT)

STANDARD WIRING

RED - Power Input (12-24 VAC/VDC)
BLACK - Common
WHITE - Occupancy State (high VDC for occupied)

PHOTOCELL/DIMMING OPTIONS (D, P, ADC)

BLUE - Direct output to power pack for providing photocell control and/or secondary dim time out. Output is high VDC with occupancy & low light. Output also held high during secondary dim time out. For multi-level control, use two power packs and connect White wire to primary load and Blue to daylight load.
VIOLET w/ WHITE STRIPE - Connect to 0-10 VDC control wire (typically Violet) from 0-10 VDC dimmable ballast
GRAY from Ballast - Connect to sensor Black wire

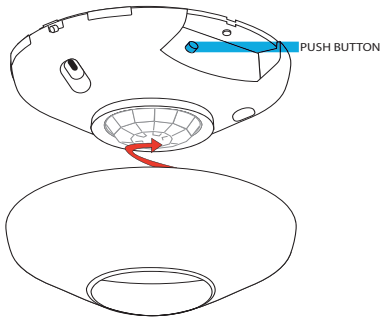


RELAY OPTION (R)

GRAY / BROWN - Connected during occupied state
VIOLET / BROWN - Connected during unoccupied state
Note: Relay is energized during unoccupied state

INSTALLATION

- Mount sensor directly to a ceiling tile or a metallic grid (two self-tapping screws provided)
- Sensor's mounting holes also align with 3.5" octagon or single gang handy box (screws not provided)
- Sensor will detect motions crossing segments more effectively than motions parallel to beams
- For optimal detection, position sensor such that segments are crossed upon entrance and unable to view outside the space
- For maximum Microphonics sensitivity avoid locating sensor near HVAC air diffusers.



PROGRAMMING

Refer to instruction card IC7 for default settings and directions on programming the sensor via the push-button.

WARRANTY: Sensor Switch warrants these products to be free of defects in manufacture and workmanship for a period of 60 months. Sensor Switch upon prompt notice of such defect, will, at its option, provide a Returned Material Authorization number and repair or replace returned product.
LIMITATIONS AND EXCLUSIONS: This Warranty is in full lieu of all other representation and expressed and implied warranties (including the implied warranties of merchantability and fitness for use) and under no circumstances shall Sensor Switch be liable for any incidental or consequential property damages or losses.

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CM PDT 10

CP9



EXTENDED RANGE 360º SENSOR
CEILING MOUNT • LOW VOLTAGE • DUAL TECHNOLOGY (PDT)

SPECIFICATIONS

FEATURES

100% Digital PIR Detection,
Excellent RF Immunity
360º Coverage Pattern
Patented Dual Technology with
PIR / Microphonics Detection
Push-Button Programmable
Adjustable Time Delays
Convenient Test Mode
No Field Calibration or Sensitivity
Adjustments Required
100 hr Lamp Burn-in Timer
Green LED Indicator

LAMPMAXIMIZER® TECHNOLOGY
- Protects Lamp Life while Maximizing Energy Savings
- Minimum On Timer (15 min default)
- Occ. Time Delay (10 min defatult)
- LampMaximizer+ Mode - Optimizes Lamp Life & Energy Savings (disabled by default)
- Switch Counter (in 1000's)
- Total Lamp On Time (in khrs)

PHYSICAL SPECS

SIZE 4.55" Dia. (11.56 cm)
1.55" Deep (3.94 cm)
WEIGHT 6 oz
MOUNTING
Ceiling Tile Surface
3.5" Octagon Box
Single Gang Handy Box
COLOR White

ELECTRICAL SPECS

OPERATING VOLTAGE
12-24 VAC/VDC
CURRENT DRAW
Standard, 4 mA
w/ R option, 16 mA
DIMMING LOAD Sinks < 20mA;
~40 Ballasts @ .5mA each
RECOMMENDED POWER PACK
PP20

ENVIRONMENTAL SPECS

OPERATING TEMP
14º to 160º F (-10º to 71º C)
RELATIVE HUMIDITY
20 to 90% non-condensing
SILICONE FREE
ROHS COMPLIANT

OVERVIEW

Classrooms are ideal applications for the **CM PDT 10** Series Extended Range 360º occupancy sensor. When mounted at 9 ft (2.74 m), this sensor provides line of sight Passive Infrared (PIR) detection of walking type motions up to 28 ft (8.53 m) in all directions. Additionally, the **CM PDT 10** provides overlapping Microphonics™ technology to detect smaller motions and occupant movements that occur behind obstructions. When comparing small motion detection, the **CM PDT 10** far out performs dual technology sensors that are specified with 2,000 ft² of coverage. Spaces with low ceiling heights are also best covered by the **CM PDT 10**.

SENSOR OPERATION

Sensors with Passive Dual Technology (PDT) first see motion using 100% digital Passive Infrared (PIR) detection and then engage Microphonics™ to hear sounds that indicate continued occupancy. This patented technology uses Automatic Gain Control (AGC) to dynamically self adapt a sensor to its environment by filtering out constant background noise and registering only noises typical of human activity. When occupancy is detected, a DC output goes high and can drive up to 200 mA of connected load. If needed, a 10 second grace period also allows the lights to be voice reactivated after shutting off. The sensor is powered with 12-24 VAC/VDC and typically operates with a **PP20** or **MP20** power pack, enabling 20 Amp circuits to be controlled.

LAMPMAXIMIZER®

This sensor also contains patented LampMaximizer technology that allows users to aggressively target energy savings while still protecting lamp life. A minimum on timer, factory set at 15 minutes, helps preserve lamp life by eliminating all lamp cycles shorter than lamp manufacturers' recommendations. A standard occupancy time delay is also present that ensures lights turn off (assuming minimum on timer has elapsed) if no occupancy is detected. This timer is factory set at 10 minutes to promote energy savings, but is adjustable between 30 seconds and 20 minutes. These adjustments can be done manually, through the unit's push-button, or automatically every two weeks through an advanced mode, called LampMaximizer+, that determines the optimum time delay in order to maximize both lamp life and energy savings. Additionally, this sensor maintains statistics on total lamp on time and number of cycles.

OPTIONS

LOW VOLTAGE RELAY (R)
- Enables sensors to interface with other systems (e.g., BMS, lighting panels)
- Provides dry contact closure via a SPDT, 1 Amp, 40 Volt relay
- Only one relay needed per zone
- Changes state when all connected sensors register unoccupied
- Relay requires sensor power to function

OCCUPANCY CONTROLLED DIMMING (D)
- Provides dimming output to control 0-10 VDC dimmable ballasts
- Provides a second occupancy time-out period that enables the lights to go to a dim setting before turning off
- Adjustable max/min dim setting
- Only one sensor per zone needs to have dimming output

PHOTOCELL (P)
- Auto set-point calibration
- Two selectable modes of operation
- On/Off mode: Photocell has full control during periods of occupancy
- Inhibit mode: Photocell can prevent lights from turning on if adequate daylight is available, but cannot turn lights off

PHOTOCELL W/ DIMMING (ADC)
- Photocell within sensor maintains total room light level by controlling levels of 0-10 VDC dimmable ballasts
- Photocell also has full on/off control during periods of occupancy
- Provides a second occupancy time-out period that enables the lights to go to a dim setting before turning off

Note: LampMaximizer+ features not available with ADC option

LOW TEMP/HIGH HUMIDITY (LT)
- Sensor electronics are coated for corrosion resistance
- Operates down to -4º F (-20º C)
- Required for cooler/freezer applications

c UL US LISTED

TITLE 24
ASSEMBLED in U.S.A.
5 YEAR WARRANTY

ORDERING INFO

CM PDT 10 [RELAY] [DIMMING/PHOTOCELL] [TEMP/HUMIDITY]

RELAY

Blank = None
R = Low Voltage Relay

DIMMING / PHOTOCELL *CHOOSE ONE ONLY*

Blank = None
D = Occupancy Controlled Dimming
P = Photocell
ADC = Photocell w/ Dimming

TEMP/HUMIDITY

Blank = Standard
LT = Low Temp

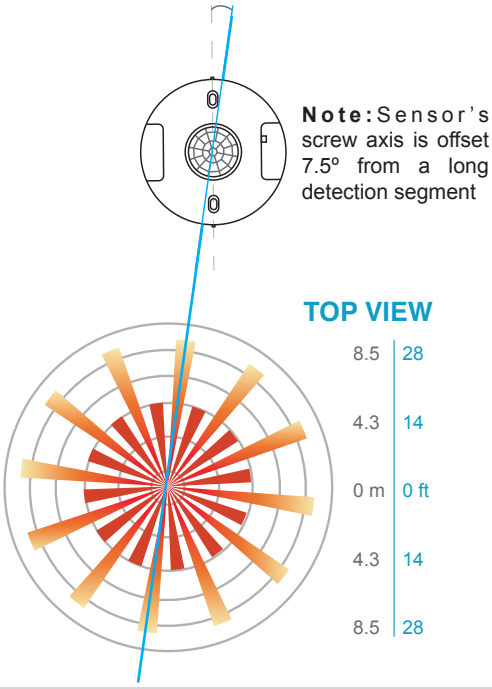
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COVERAGE PATTERN

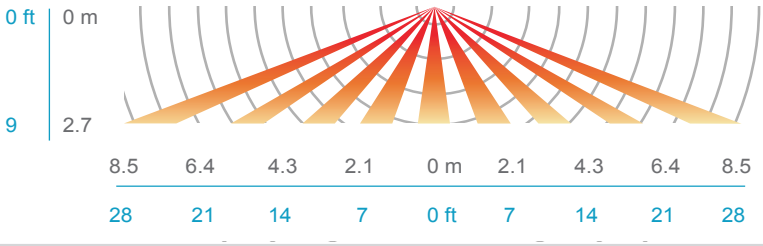
10 EXTENDED RANGE 360° LENS WITH MICROPHONICS™

- Best choice for large motion (e.g. walking) detection
- Viewing angle of 67° in a 360° conical shaped pattern
- Provides 28 ft (8.53 m) radial coverage when mounted to standard 9 ft (2.74 m) ceiling
- 7 to 15 ft (2.13 to 4.57 m) mounting heights provide 16 to 36 ft (4.88 to 10.97 m) radial coverage
- Microphonics™ provides overlapping detection of human activity over the complete PIR coverage area. Advanced filtering is also utilized to prevent non-occupant noises from keeping the lights on.

Note: Sensor's screw axis is offset 7.5° from a long detection segment



SIDE VIEW



TOP VIEW

WIRING (DO NOT WIRE HOT)

STANDARD WIRING

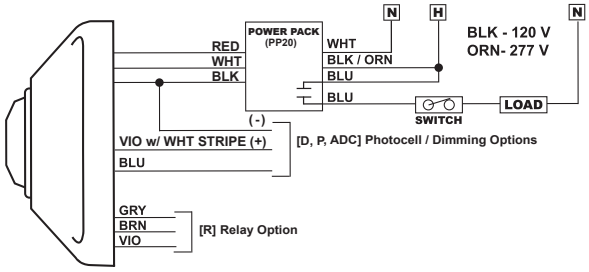
RED - Power Input (12-24 VAC/VDC)
BLACK - Common
WHITE - Occupancy State (high VDC for occupied)

PHOTOCELL/DIMMING OPTIONS (D, P, ADC)

BLUE - Direct output to power pack for providing photocell control and/or secondary dim time out. Output is high VDC with occupancy & low light. Output also held high during secondary dim time out. For multi-level control, use two power packs and connect White wire to primary load and Blue to daylight load.

VIOLET w/ WHITE STRIPE - Connect to 0-10 VDC control wire (typically Violet) from 0-10 VDC dimmable ballast

GRAY from Ballast - Connect to sensor Black wire

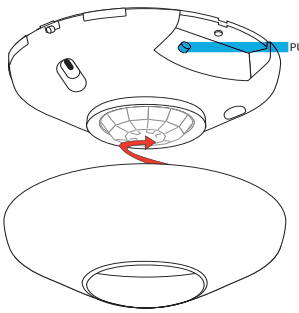


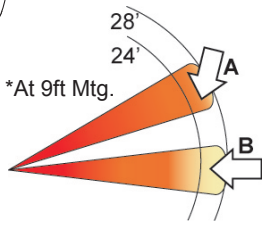
RELAY OPTION (R)

GRAY / BROWN - Connected during occupied state
VIOLET / BROWN - Connected during unoccupied state
Note: Relay is energized during unoccupied state

INSTALLATION

- Mount sensor directly to a ceiling tile or a metallic grid (two self-tapping screws provided).
- Sensor's mounting holes also align with 3.5" octagon or single gang handy box (screws not provided).
- Sensor will detect motions crossing segments more effectively than motions parallel to beams.
- For optimal detection, position sensor such that segments are crossed upon entrance and unable to view outside the space.





A: When walking across beam, detection will occur at approximately 28 ft (8.53 m)
B: When walking into beam, detection will occur at approximately 24 ft (7. 32 m)

PROGRAMMING

Refer to instruction card IC7.002 for default settings and directions on programming the sensor via the push-button.

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WARRANTY: Sensor Switch warrants these products to be free of defects in manufacture and workmanship for a period of 60 months. Sensor Switch, upon prompt notice of such defect, will, at its option, provide a Returned Material Authorization number and repair or replace returned product.
LIMITATIONS AND EXCLUSIONS: This Warranty is in full lieu of all other representation and expressed and implied warranties (including the implied warranties of merchantability and fitness for use) and under no circumstances shall Sensor Switch be liable for any incidental or consequential property damages or losses.

TS-CM-004A

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Catalog Number		
Notes	$ D$ SA	Type

WSD FAMILY

WALL SWITCH SENSOR w/ CONVERTIBLE NEUTRAL / NO NEUTRAL WIRING, PASSIVE INFRARED (PIR) or DUAL TECH (PDT)

PRODUCT OVERVIEW

The **WSD** is a stylish, easy to install, and simple to use Wall Switch Decorator style Passive Infrared (PIR) sensor. It is ideal for private offices, copy rooms, closets, or any small enclosed space without obstructions. A user programmable time delay ensures that once the room is vacated the sensor will time out and turn off the lights. Additionally, the WSD sensor has several On Modes and Switch Modes that can be programmed using the front push-button. For rooms with obstructions, the Dual Technology WSD PDT Series sensor is recommended. Additionally, all **WSD** Family sensors have a patent-pending wiring method that enables them to function either with or without a neutral connection. **WSD** units come pre-configured for wiring without a neutral; however, if connection to neutral is required by code, contractors can convert the unit in seconds (see page 3).

All **WSD** Family sensors utilize 100% digital Passive Infrared (PIR) detection. Dual Technology (**PDT** option) versions add Microphonics detection and are recommended for offices and rooms with obstructions. Additional versions include units with dual relays - perfect for bi-level applications, or bathrooms with a light and a fan.

SENSOR OPERATION — WSD sensors detect changes in the Passive Infrared (PIR) energy given off by occupants as they move within the field-of-view. In an Auto-On sensor, once occupancy is detected, an internal relay switches on the connected lighting load. In a Vacancy (Manual On) sensor, the unit's push button must first be pressed to initiate the lights on. In a dual relay sensor, once occupancy is detected the unit will automatically close Pole 1's relay while still requiring Pole 2's push-button be pressed in order to close Pole 2's relay. All modes are user adjustable (see On Modes section).

After the lights are turned on, an internal timer keeps them on during brief periods of inactivity. Once the time delay has expired, lights are turned off automatically. The default time delay is 10 minutes - chosen in order to maximize energy savings while preventing false-offs. This timer is programmable from 30 seconds to 30 minutes, and is reset every time occupancy is re-detected. Patented LampMaximzer technology is also present in these sensors, providing an additional minimum on time (disabled by default) to be utilized if desired.

WSD sensors with Passive Dual Technology (**PDT** option) first see motion using Passive Infrared (PIR) and then engage Microphonics to listen for sounds that also indicate continued occupancy. This patented technology dynamically adapts a sensor to its environment by filtering out constant background noise and detecting only noises typical of human activity.



WSD
WSD PDT



WSD 2P
WSD PDT 2P

KEY OPTIONS

VACANCY OPERATION (SA and VA)
Increased energy savings and required by many codes
- The unit's push button must first be pressed to initiate the lights on
- SA version can be reprogrammed to Auto-On operation
- VA version operates in Manual On mode only

DUAL RELAY (2P, 2P-SA, and 2P-VA)
Ideal for bi-level switched rooms or restroom with light & fan
- Includes two isolated relays, Pole 1 defaulted to Auto-On, Pole 2 to Vacancy
- Enables separate time delay per pole - programmed via each pole's push-button
- UL listed to switch different loads per pole - e.g. 277 VAC lights on Pole 1 and 120 VAC fan on Pole 2
- 2P-SA and 2P-VA versions are factory set with both poles set to manual on

LOW TEMPERATURE / HIGH HUMIDITY (LT)
Required for cold or humid areas
- Device electronics are coated for corrosion resistance
- Operates down to -40º F/C (-4º F / 20º C for PDT)

FEATURES

- 100% digital PIR detection - excellent RF immunity
- Small motion detection to 20 ft
- Dual Technology (PDT) utilizes PIR / Microphonics detection (patented)
- 100% passive detection, no potential for interference with other building systems
- Self-grounding mounting strap
- Green LED status indicator
- Device accommodates powering over ground or neutral connection (patent pending)
- Ultra low current leakage (<0.5 mA) when connected via ground
- Fully meets NEC 2011 Section 404.2C neutral requirements - no current leakage to ground when connected to neutral
- Line power and load wires are interchangeable - impossible to wire backwards (patented)
- Compatible w/ LEDs, Electronic & Magnetic Ballasts, CFLs, & Incandescents
- Push-button programmable without removing cover plate - adjustable time delays & operating modes
- Photocell standard (disabled by default) - prevents lights from initially turning on if sufficient daylight is present, but does not turn lights off. Photocell not available in Vacancy only versions.
- Integrated LampMaximizer minimum on time (patented) provides increased fluorescent lamp life - disabled by default
- Non-volatile settings memory
- Available in 5 colors (White, Ivory, Gray, Light Almond, and Black)
- Includes matching wall plate

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WSD Family

OPERATIONAL SETTINGS

NOTE: (*) Indicates factory default (unless otherwise marked)

2 = Occupancy Time Delay

Duration sensor keeps lights on after last occupancy detection.

1 30 sec **4** 7.5 min **7** 15.0 min **10** 30.0 min
2 2.5 min **5** 10.0 min* **8** 17.5 min
3 5.0 min **6** 12.5 min **9** 20.0 min

For additional time settings, contact technical support at 1.800.PASSIVE

3 = On Mode

Automatic On turns lights on when occupancy is detected. Manual On requires a button press to turn the lights on. Reduced Turn-On directs the sensor to initially only detect large motions, such as a person entering a room. Weaker signals, such as reflections from glass, are ignored. Once lights are on, the sensor returns to maximum sensitivity.

1 Automatic On **2** Manual On **3** Reduced Turn-On

Settings 1 & 3 not available on -VA (Vacancy only) sensors.

Notes on Default Settings
- *WSD (PDT) Series default: Automatic On*
- *Default for units with -SA, -VA, or -NL option: Manual On*
- *WSD (PDT) 2P Series default: Pole 1 Auto On, Pole 2 Manual*
- *Default for 2P units with -2SA option: Both poles Manual On*

4 = Switch Modes

These modes dictate switch functionality. Pressing the button in Override Off mode (setting 1) turns off and keeps lights off until pressed again. Disabling the Switch (setting 2) prevents the button from turning the lights on. (continued next column)

Predictive Mode (setting 3) determines if a user has left the room after the lights are switched off. It does this by monitoring the space for a period after the button is pressed (Predictive Grace Time), following a delay to allow exiting the room (Predictive Exit Time). If occupancy is detected during this period the device will disable Auto-On & hold the lights off until manually switched. If no occupancy is detected the sensor instantly reverts to Auto-On mode.

If Predictive Mode with Expiration (setting 4) is enabled, once the sensor has disabled Auto-On it will continue to monitor the space. When no occupancy is detected for a duration equal to the occupancy time delay, the sensor will revert to Auto-On mode.

1 Override Off **
2 Switch Disable
3 Predictive Mode
4 Predictive Mode with Expiration*

* *Default for WSD (PDT) units & Pole 1 of WSD (PDT) 2P units*
** *Default for units with -SA or -VA options, Pole 2 of WSD (PDT) 2P units, and both poles of 2P units with -2SA options*

5 = Photocell Set-Point

The ambient light level at which the sensor prevents the lights from initially turning on. Once on, the lights will remain on until the occupancy time delay expires and turns them off.

1 Disabled* **3** 0.5 fc **5** 2 fc **7** 8 fc **9** 32 fc
2 Auto Set-pt. **4** 1 fc **6** 4 fc **8** 16 fc **10** 64 fc

Note: Sensor will be changed to Automatic On mode if photocell is enabled. LED flashes while Auto-Setpoint mode is running. Photocell not present in -VA versions.

7 = LED Operation

Indicates behavior of device's LED.

1 Occupancy Indication* **3** Disabled

9 = Restore Factory Defaults

Returns all functions to original settings.

1 Maintain Current* **2** Restore Defaults

10 = Minimum On Time

Required initial time for lamps to be on after each switch on, regardless of occupancy status. Once met, lights resume following occupancy time delay.

1 0 min (disabled)* **3** 30 min **5** 60 min
2 15 min **4** 45 min

11 = Manual On Grace Period

Time period after lights automatically turn off that they can be reactivated by motion. (Manual On (Semi-Auto) mode only)

1 0 sec **2** Unused **3** 15 sec*

12 = Dual Technology (Microphonics™)

Relative responsiveness of Microphonics detection. Included in -PDT versions only.

1 Normal* **3** Medium **5** Phase Off
2 Off **4** Low (15-10-5 min)

13 = Microphone Grace Period

Time period after lights are automatically turned off that they can be voice reactivated. Included in -PDT versions only.

1 0 sec **3** 20 sec **5** 40 sec **7** 60 sec
2 10 sec* **4** 30 sec **6** 50 sec

15 = Predictive Exit Time

Time period after manually switching lights off for occupant to leave the space.

1 5 sec **3** 7 sec **5** 9 sec **7** 15 sec **9** 30 sec
2 6 sec **4** 8 sec **6** 10 sec* **8** 20 sec

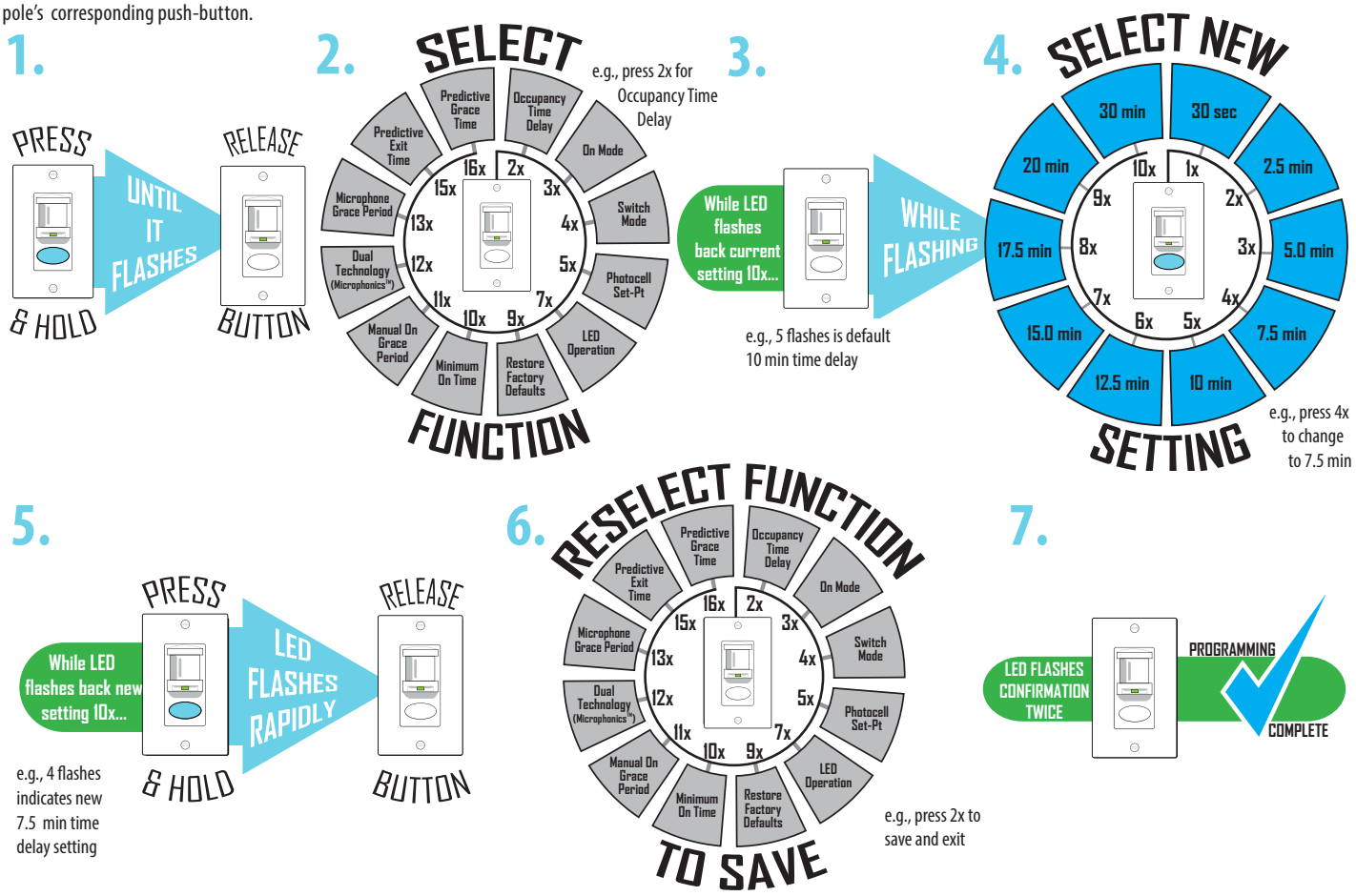
16 = Predictive Grace Time

Time period after Predictive Exit Time that sensor rescans the room for remaining occupants.

1 0 sec **3** 10 sec **5** 30 sec* **7** 50 sec
2 5 sec **4** 20 sec **6** 40 sec **8** 60 sec

PROGRAMMING INSTRUCTIONS

Operational settings can be changed via the push-button sequence outlined below (note the example used is for changing occupancy time delay). Programming for 2P units done with each pole's corresponding push-button.



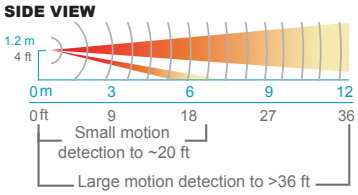
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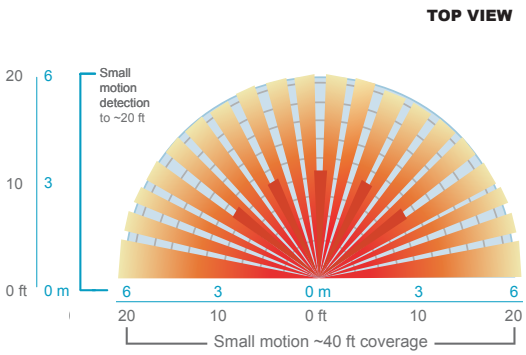
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WSD Family

COVERAGE PATTERN

- Small motion (e.g., hand movements) detection up to 20 ft (6.10 m), ~625 ft²
- Large motion (e.g., walking) detection greater than 36 ft (10.97 m), ~2025 ft²
- Wall-to-Wall coverage
- Passive Dual Technology (Microphonics) provides overlapping detection of human activity over the complete PIR coverage area. Advanced filtering is utilized to prevent non-occupant noises from keeping the lights on.

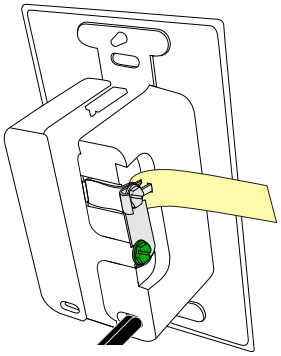




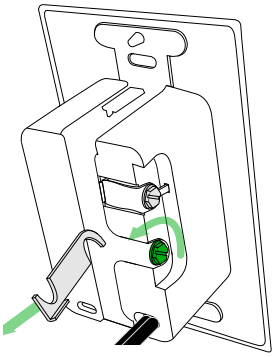
CONVERSION FROM GROUND ONLY (NO NEUTRAL) TO NEUTRAL WIRING

This product is pre-configured for wiring without a neutral; however, if connection to neutral is required by code, contractors can quickly and easily convert the unit in seconds.

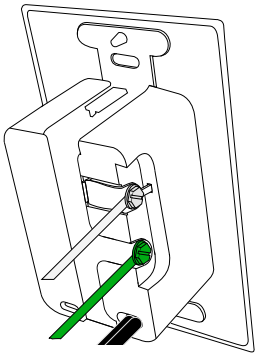
Step 1: Remove Yellow Label



Step 2: Loosen Screws and Remove Metal Link

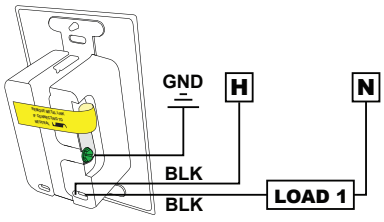


Step 3: Connect Neutral to Silver Screw and Ground to Green Screw

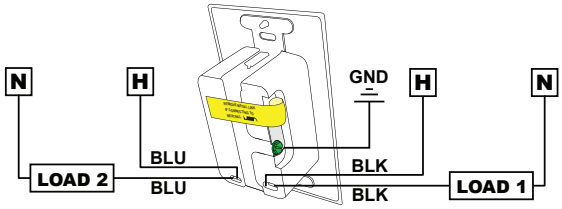


WIRING TO GROUND (NO NEUTRAL)

SINGLE RELAY



DUAL RELAY



WIRE COLOR KEY

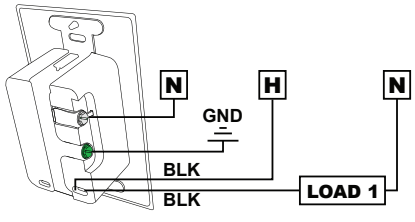
120/277 VAC WIRING

BLACK*	- Line 1 Input	*BLACK wires can be reversed
BLACK*	- Load 1 Output	
BLUE*	- Line 2 Input	*BLUE wires can be reversed
BLUE*	- Load 2 Output	

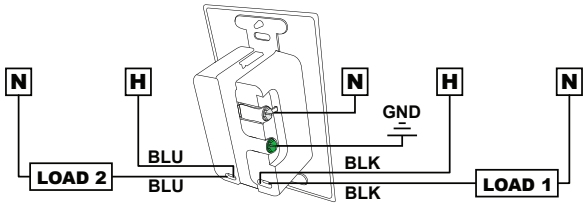
347 VAC WIRING (-347 Option)
Red wires replace Black wires.

WIRING TO NEUTRAL

SINGLE RELAY



DUAL RELAY



Notes:
- Unit will draw power from either line connection.
- Both poles' line connection must be same phase.

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WSD Family

SPECIFICATIONS

PHYSICAL SPECS
SIZE: 2.74"H x 1.68"W x 1.63"D (6.96 cm x 4.27 cm x 4.14 cm)
(not including ground strap)
WEIGHT: 5 oz
MOUNTING: Single Gang Switch Box
MOUNTING HEIGHT: 30-48 in (76.2-121.9 cm)
SILICONE FREE
ROHS COMPLIANT

ELECTRICAL SPECS
MAXIMUM LOAD / POLE (RELAY)
800 W @ 120 VAC
1200 W @ 277 VAC
1500 W @ 347 VAC
MINIMUM LOAD: None
MOTOR LOAD: 1/4 HP
FREQUENCY: 50/60 Hz (timers are 1.2x for 50 Hz)

ENVIRONMENTAL SPECS
OPERATING TEMP
Standard: 14º to 122º F (-10º to 50º C)
LT Option (PIR): -40º to 122º F (-40º to 50º C)
LT Option (PDT): -4º to 122º F (-20º to 50º C)
RELATIVE HUMIDITY:
Standard: 20 to 75% non-condensing
LT Option: 20 to 90% non-condensing
(electronics coated for corrosion resistance)

ORDERING LOGIC

SINGLE RELAY

(example: WSD PDT WH)

Series	Operating Mode[1]	Voltage	Color[3]	Temp/Humidity
WSD Passive Infrared (PIR)	**Blank** Auto On (default) or Vacancy	**Blank** 120/277 VAC	**WH** White	**Blank** Standard
WSD PDT Dual Technology (PIR / Microphonics)	**SA** Vacancy (default) or Auto-On	**347**[2] 347 VAC	**IV** Ivory	**LT** Low Temp
	VA Vacancy only		**GY** Gray	
			AL Lt. Almond	
			BK Black	

DUAL RELAY

(example: WSD PDT 2P WH LT)

Series	Operating Mode[1]	Voltage	Color[3]	Temp/Humidity
WSD 2P Passive Infrared (PIR)	**Blank** Pole 1-Auto On Pole 2-Vacancy (default)	**Blank** 120/277 VAC	**WH** White	**Blank** Standard
WSD PDT 2P Dual Technology (PIR / Microphonics)	**2SA** Both Poles Vacancy (defaut)	**347**[2] 347 VAC	**IV** Ivory	**LT** Low Temp
			GY Gray	
			AL Lt. Almond	
			BK Black	

Notes:
1 Operating Modes reprogrammable via push-button except for VA version
2 Wall plates included in white or ivory only for 347 VAC units
3 Matching wall plate provided for 120/277 VAC units

AcuityBrands.
Expanding the boundaries of lighting™

c UL US LISTED

TITLE 24
ASSEMBLED in U.S.A.
5 YEAR WARRANTY

Sheet#: TS-WSNB-001A

WARRANTY
5-year limited warranty. Complete warranty terms located at
www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

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EATON | Cutler-Hammer

Motor Control Centers — 2100 & *IT.*

Capabilities

Product Offering

- Voltage rating: 600 V
- Bus bracing: 65, 100 kAIC
- Main incoming options:
  - Molded case circuit breaker (through 2500 A)
  - Magnum™ DS power circuit breaker (fixed and drawout through 3200 A)
- Main lugs (through 3200 A)
- Main fused switches (through 1200 A)
- Horizontal bus options: 800, 1200, 1600, 2000, 2500, 3200 A
- Vertical bus options: 300, 600, 800, 1200 A — fully rated
- Control units:
  - NEMA® starters (FVNR, FVR) through Size 7
  - 2-Speed, autotransformer, and wye-delta
  - Reduced voltage soft starters through 1000 A
  - Adjustable frequency drives through 1100 hp
- Enclosure ratings:
  - NEMA 1A, 3R (non walk-in, walk-in, aisle), 12
- Power integrity options:
  - Automatic transfer switches
  - Main-tie-main configurations
  - TVSS protection
  - Active harmonic correction
  - Power factor correction capacitors
- Distribution options:
  - MCCB (plug-in through 400 A)
  - Power circuit breakers (fixed and drawout)
  - Fused switches (through 1200 A)
  - Panelboards — single- and three-phase
  - Dry-type transformers — single- and three-phase
- Communication options:
  - DeviceNet™
  - Modbus® RTU
  - Modbus TCP/IP

Standards

- UL® 845 NEMA ICS 3 Part 1 and NEC® Section 430 Part H

Customer Value

- **Improved Uptime**: Quick ship capability for new and aftermarket from eight service centers. Wide range of TVSS protection available.
- **Improved Maintainability**: Strong support for vintage products more than 80 years worth of support. Draw-out power circuit breaker option.
- **Increased Reliability**: Self aligning stabs for solid connection to vertical bus. Main-tie-main configurations for incoming power.
- **Increased Safety**: Shutter mechanism that automatically closes over open vertical bus connections. 24 Vdc technology for control.
- **Reduced Installation Cost**: Smallest footprint for highest featured products (soft-starters, IT. EM starters, drives). 21-inch true back-to-back design.

Industry Applications

- Project/commercial construction
- Waste/water treatment
- Industrial: automotive, manufacturing, petrochemical, oil & gas, pulp & paper, pharmaceutical
- Institutional: universities, hospitals
- Utility: power generation



Services & Programs

MCC Service Centers

- Nine strategic locations throughout the country: One main plant and eight service centers
- Complete motor control centers can be built within weeks or days
- Aftermarket parts and units
- Application engineering support
- Lead-times to meet any delivery requirement
- Unmatched speed, flexibility, control power leadership and service



Main Plant
2900 Doc Bennett Road
Fayetteville, NC 28306
Phone: (910) 483-2222

Atlanta Service Center
320 Thornton Road
Suite 104
Lithia Springs, GA 30122
Phone: (770) 739-6282

Chicago Service Center
90 E Rawls
Des Plaines, IL 60018
Phone: (847) 299-1911

Denver Service Center
14600 E 35th Place
Unit G
Aurora, CO 80011
Phone: (303) 373-2133

Hartford Service Center
35A International Drive
Windsor, CT 06095
Phone: (860) 683-4221

Houston Service Center
10810 W Little York Road
Houston, TX 77041
Phone: (713) 939-9696

Los Angles Service Center
12760 E Florence Ave
Santa Fe Springs, CA 90670
Phone: (562) 944-6413

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6024 SW Jean Rd
Bldg C-8
Lake Oswego, OR 97035
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www.EatonElectrical.com

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3.1 Panelboards and Lighting Control

Introduction

Panelboards and Lighting Controls



Contents

Description

Product Selection Guide

Product Selection Guide

Product Types



Type PRL1a

Bolt-On or Plug-On Circuit Breakers 240 Vac Maximum

Main lugs only
400A maximum

Main Circuit breaker
400A maximum

Branch circuit breakers
100A maximum,
Single-, two- and three-pole



Fusible Lighting Panelboard PRL1aF

240 and 480Y/277 Vac Maximum

Main lugs only
400A maximum

Branch overcurrent protective devices
30A maximum,
Single-, two and three-pole utilizing Class CC fuses



Type PRL1a-LX Column Type

Bolt-On Circuit Breakers 240 Vac Maximum

Main lugs only
225A maximum

Main circuit breaker
225A maximum

Branch circuit breakers
100A maximum,
Single-, two- and three-pole



Type PRL2a

Bolt-On Circuit Breakers 240 or 480Y/277 Vac; 125/250 Vdc Maximum

Main lugs only
400A maximum

Main circuit breaker
400A maximum

Branch circuit breakers
100A maximum,
Single-, two- and three-pole



Fusible Lighting Panelboard PRL2aF

240 and 480Y/277 Vac Maximum

Main lugs only
400A maximum

Branch overcurrent protective devices
30A maximum,
Single-, two- and three-pole utilizing Class CC fuses



Type PRL2a-LX, Column Type

Bolt-On Circuit Breakers 240 or 480Y/277 Vac; 125/250 Vdc Maximum

Main lugs only
225A maximum

Main circuit breaker
225A maximum

Branch circuit breakers
100A maximum,
Single-, two- and three-pole

Product Types, continued



Retrofit Panelboard
PRL-1R and PRL-2R

Bolt-On Circuit Breakers
480Y/277 Vac;
240 Vac, 480Y/277 Vac

Main lugs only
225A maximum

Main circuit breaker
225A maximum

Branch circuit breakers
100A maximum,
Single-, two and three-pole



Type PRL3a

Bolt-On Circuit Breakers
240, 480 or 600 Vac;
250 Vdc Maximum

Main lugs only
800A maximum

Main circuit breaker
600A maximum

Branch circuit breakers
225A maximum,
Single-, two- and three-pole



Type PRL3E

Bolt-On Circuit Breakers
240, 480Y/277 or 480 Vac;
250 Vdc Maximum

Main lugs only
600A maximum

Main circuit breaker
600A maximum

Branch circuit breakers
125A maximum,
Single-, two- and three-pole



Type PRL4

Circuit Breakers or Fusible Switches
240, 480 or 600 Vac; 600 Vdc Maximum

Main lugs only
1200A maximum

Main circuit breaker
1200A maximum

Main fusible switch
1200A maximum

Branch circuit breakers
1200A maximum,
Single-, two- and three-pole

Branch fusible switches
1200A maximum,
two- and three-pole



Type PRL5P

Plug-On Circuit Breakers
240, 480 or 600 Vac;
250 Vdc Maximum

Main lugs only
1200A maximum

Main circuit breaker
1200A maximum

Branch circuit breakers
1200A maximum,
Single-, two- and three-pole

Product Types, continued



Pow-R-Command

Bolt-On Circuit Breakers
240 or 480Y/277 Vac

Main lugs only
400A maximum

Main circuit breaker
400A maximum

Branch circuit breakers
225A maximum,
Single-, two- and three-pole

Integral power switching controls



Metering Service Section

Bolt-On Circuit Breaker or Fusible Switch 240, 480 or 600 Vac

Service entrance panels combining a main disconnect with a power company metering compartment
400–1200A



Elevator Control Panelboard

Bolt-On Fusible Switches
600 Vac Maximum

Controls for up to four elevators in a single Panelboard

Main lugs only
800A maximum

Branch overcurrent devices
15–200A fusible switches with Class J fuse clips maximum

Designed to meet specific sections of various codes impacting elevators

3.2 Panelboards and Lighting Control

EZ Box and EZ Trim

Type PRL1a Panelboard



Contents

Description	*Page*
EZ Box and EZ Trim	
Standards and Certifications	**V2-T3-5**
Product Selection	**V2-T3-6**

Product Description

Eaton's EZ box and EZ trim represents the first significant change in panelboard box and trim designs in more than a half-century. The EZ box and EZ trim have been designed for faster, more secure and safer installations. The new EZ box and EZ trim are provided standard for Eaton's Pow-R-Line 1a and Pow-R-Line 2a lighting panelboards, as well as the Pow-R-Line 3a and Pow-R-Line 3E mid-range panelboard.



Flange Detail

Features

- Virtually eliminates sharp edges
- Trim installs in seconds rather than minutes
- Door-in-door is standard
- Ability to adjust flush box to wall irregularities
- Trim installs without the need for tools
- No exposed hardware (because there is none)

The EZ box flanges are bent and painted, which virtually eliminates the sharp edges associated with traditional boxes. Additionally, all steel panelboard chassis parts are painted. This significantly reduces potential injury for material handlers and installers. Each flange is adjustable outward up to 3/4-inch (19.1 mm). This feature allows the installer to adjust flush box applications to be level and flat with the finished wall after the wall material is installed to help correct wall irregularities. The new box flange also provides the means for attaching the EZ trim.



Standalone Trim and Bottom Flange Hanger with Notch



Corner Flange Detail

Fast Installation

The EZ trim incorporates a groundbreaking design that installs in seconds, rather than minutes. The standard trim features include door-in-door construction; no exposed hardware and no tools are required for installation.

Each EZ trim includes hangers attached on the right side. The bottom trim hanger has a notch in its base. To install, the bottom hanger is inserted into the bottom right side box flange opening, resting the notch on the flange.



Trim Hanger Inserted Into Box Flange

The balance of the hangers are aligned with the other flange openings and pushed in. When all hangers are in the box flange, the trim is lifted up slightly to clear the notch on the bottom hanger, and the trim in self-supported on the EZ box.

The installation is completed by swinging the trim to the closed position, then lifting and pushing slightly to the right. The trim will drop into place totally secured. The multi-point catches on the left side of the trim will lock into the left side box flange openings.

To prevent the trim from being removed by non-authorized persons, a unique sliding means automatically latches in place when the trim door is closed. Along with a new lock, the EZ trim offers a high degree of door security.



Trim Hanging on Surface Mounted Box

Standards and Certifications

When used with Eaton's panelboard chassis, EZ boxes and EZ trims meet the following applicable industry standards:

- UL 50 listed
- NEMA Standard PB1
- Federal specifications
- National Electrical Code

Listed

Product Selection

Boxes and Trims Only—Type 1

3

Types PRL1a, PRL2a and PRL3a (400A Maximum)

Box Dimensions—Inches (mm)	Height	YS Box Catalog Number	LT Trim Catalog Number	EZ Box ① Catalog Number	EZ Trim ① Catalog Number
20.00 W x 5.75 D (508.0 W x 146.1 D)	36.00 (914.4)	**YS2036**	**LT2036S or F**	**EZB2036R**	**EZT2036S or F**
	42.00 (1066.8)	**YS2042**	**LT2042S or F**	**EZB2042R**	**EZT2042S or F**
	48.00 (1219.2)	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
	60.00 (1524.0)	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
	72.00 (1828.8)	**YS2072**	**LT2072S or F**	**EZB2072R**	**EZT2072S or F**
	90.00 (2286.0)	**YS2090**	**LT2090S or F**	**EZB2090R**	**EZT2090S or F**

Type PRL3a (600A)

Box Dimensions—Inches (mm)	Height	YS Box Catalog Number	LT Trim Catalog Number	EZ Box ① Catalog Number	EZ Trim ① Catalog Number
20.00 W x 5.75 D (508.0 W x 146.1 D)	36.00 (914.4)	**YS2036**	**LTV2036S or F**	**EZB2036R**	**EZTV2036S or F**
	48.00 (1219.2)	**YS2048**	**LTV2048S or F**	**EZB2048R**	**EZTV2048S or F**
	60.00 (1524.0)	**YS2060**	**LTV2060S or F**	**EZB2060R**	**EZTV2060S or F**
	72.00 (1828.8)	**YS2072**	**LTV2072S or F**	**EZB2072R**	**EZTV2072S or F**
	90.00 (2286.0)	**YS2090**	**LTV2090S or F**	**EZB2090R**	**EZTV2090S or F**

Type PRL3a (800A)

Box Dimensions—Inches (mm)	Height	YS Box Catalog Number	LT Trim Catalog Number
28.00 W x 5.75 D	36.00 (914.4)	**YS2836**	**LTV2836S or F**
	48.00 (1219.2)	**YS2848**	**LTV2848S or F**
	60.00 (1524.0)	**YS2860**	**LTV2860S or F**
	72.00 (1828.8)	**YS2872**	**LTV2872S or F**
	90.00 (2286.0)	**YS2890**	**LTV2890S or F**

Note

① EZ box must be used with EZ trim.

Pow-R-Line C Panelboards



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Type PRL1aF	**V2-T3-30**
Type PRL1a-LX	**V2-T3-34**
Type PRL2a	**V2-T3-38**
Type PRL2aF	**V2-T3-42**
Type PRL2a-LX	**V2-T3-46**
Retrofit Panelboard	**V2-T3-50**
Type PRL3a	**V2-T3-58**
Type PRL3E	**V2-T3-62**
Type PRL4	**V2-T3-66**
Type PRL4D	**V2-T3-76**
Type PRL5P	**V2-T3-86**

Product Description

Lighting and Distribution Panelboards

Eaton's assembled panelboards are designed for sequence phase connection of branch circuit devices. This allows complete flexibility of circuit arrangement (single-, two- or three-pole) to allow balance of the electrical load on each phase.

Sturdy, rigid chassis assembly ensures accurate alignment of interior with panel front; prevents flexing and minimizes possibility of loosening or damage to current carrying parts during and after installation.

Four-point in-and-out adjustment of panel interior is provided to meet critical depth dimensions on flush installations. This compensates for possible misalignment of box at installation.

Main lugs are mechanical solderless type and approved for copper or aluminum conductors.

Enclosures

Boxes are code-gauge galvanized steel, which include a painted box finished in ANSI-61 light gray to match the trim.

Standard panelboard cabinets are designed for indoor use. Alternate types are available for indoor and special purpose applications.

All enclosures are furnished in accordance with Underwriters Laboratories standards and include wiring gutters with proper wire bending space. Special cabinets can be provided at an additional charge.

The box dimensions shown are inside dimensions. For outside dimensions, add 1/4-inch (6.4 mm).

Standard panelboard boxes are supplied without knockouts (blank endwalls).

Fronts

Fronts (trims) for all panelboards are made of code-gauge steel and have a high durability ANSI-61 light gray finish applied by a baked-on polyester powder coating paint system.

The fronts for lighting and appliance branch circuit panelboards and small power distribution panelboards include a door with rounded corners and concealed hinges. A flush-type latch and lock assembly is included. All locks are keyed alike. These trims are available in both surface- and flush-mounted designs.



EZ Trim Features Standard Door-in-Door with No Exposed Hardware or Sharp Edges (no Tools are Required for Installation)



The Three-Piece Trim for Larger Power Distribution Panelboards Provides for Easy Handling and Installation

Fronts for power distribution panelboards utilize a unique breaker front cover design in which each device has a dedicated bolt-on steel cover. The individual covers form a single deadfront for the panelboard that is used in conjunction with two wiring gutter covers to complete the trim. A door is not finished as part of the standard offering on these panelboards but can be provided, for an additional charge, using a deeper than standard box.

Application Description

Panelboard Selection Factors

In selecting a panelboard, the following factors must be considered:

- Service (voltage and frequency)
- Interrupting capacity (fully or series rated)
- Ampere rating of main
- Ampere ratings of branches
- Environment

Panelboard Short-Circuit Rating

The short-circuit rating of Eaton's assembled panelboards are test verified by, and listed with, Underwriters Laboratories (UL). Generally, these ratings are that of the lowest interrupting rated device in the panel.

Certain exceptions to this rule exist where branch devices have been UL tested in combination with specific main devices having a higher interrupting rating. Where these defined main devices and branch breaker combinations are utilized, the series short-circuit rating of the assembled panelboard will be the same as the tested rating of the approved rated main device in series with the branches. Available main and branch breaker combinations are tabulated starting on **Page V2-T3-16**. All combinations shown are UL tested and listed.

These series ratings apply to panels having main devices, or main lug only panelboards fed remotely by the device listed in the series ratings chart as the main, for which UL listed tests were conducted.

Service Entrance Equipment

The National Electrical Code (NEC) requires that:

- A panel used as service entrance equipment must be located near the point where the supply conductors enter the building
- A panelboard having main lugs only shall have a maximum of six service disconnects to de-energize the entire panelboard from the supply conductors. Where more than six disconnects are required, a main service disconnect must be provided
- A disconnectable electrical bond must be provided between the neutral and ground
- A service entrance type UL label must be factory installed
- Ground fault protection of equipment shall be provided for each service disconnect rated 1000A or more if the electrical service is a solidly grounded wye system of more than 150V to ground, but not exceeding 600V phase-to-phase

Note: Service entrance panels must be identified as such on the order.

Panelboard Standards

In 2008, both the National Electrical Code (Article 408) and UL 67 were updated to remove the mandated 42-circuit limitation. Eaton offers panelboards with more than 42 circuits for those jurisdictions that have adopted the 2008 NEC or later.

For jurisdictions that have not adopted the 2008 or later version of the National Electrical Code, the 42-circuit limitation for Lighting and Appliance Branch Panelboards remains in place. Check with your local code officials to determine specific jurisdiction status.

Panelboard Installation

NEC requires that the operating handle of the topmost mounted device be no more than 6 feet 7 inches (2006.6 mm) above the finished floor and should be installed per NEC and manufacturer's instructions.

Additional boxes and fronts are required when the components required for one panelboard exceed the standard box dimensions.

Multi-Section Panelboards

When two or more separate enclosures are required, separate fronts for each box are standard. A common front can be furnished at additional charge.

Interconnecting Multi-Section Panelboards

When a panelboard, for connection to one feeder, must be furnished in more than one section (Box), each section must be furnished with main bus and terminals of the same rating, unless a main overcurrent device is provided in each section.

Sub-feed or through-feed provisions must also be included (and priced) to provide connection capability to the second section.

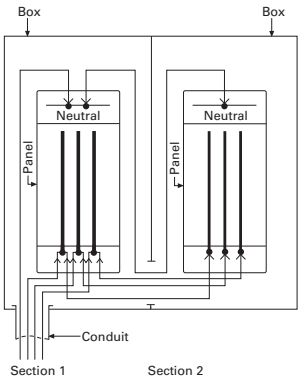
Note: Sub-feed or through-feed lugs cannot be used on any panelboard that is not protected by a single main overcurrent device either in the panelboard or immediately upstream, i.e., service entrance panelboards with main lugs only using the six disconnect rule.

Sub-Feed Lugs

Sub-feed lugs (see figure below) are one means of interconnecting multi-section panels. The sub-feed (second set of) lugs are mounted directly beside the main lugs. These are required in each section except the last panel in the lineup. The feeder cables are brought into the wiring gutter of the first section and connected to the main lugs. Another set of the same size cables are connected to the sub-feed lugs (Section 1) and are carried over to the main lugs of the adjacent panel. Cross connection cables are not furnished by Eaton. Sub-feed lugs are only available on main lug only panels.

Note: Sub-feed lugs may not be used on main lug only (six disconnect rule) service entrance panels.

Sub-Feed Lugs

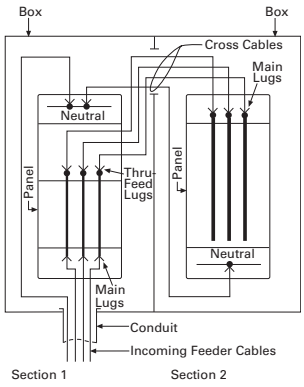


Through-Feed Lugs

Through-feed lugs (see figure below) are another method to interconnect multi-section panelboards. The incoming feeder cables are connected to the main lugs or main breaker at the bottom of panel (Section 1). Another set of lugs (through-feed) are located at the opposite end of the main bus. The interconnecting cables are connected to the through-feed lugs in Section 1 and are carried over to the main lugs in Section 2. The connection arrangement could be reversed, i.e., main lugs at top; through-feed lugs at bottom end of panel. Cross cables are not furnished by Eaton.

Note: Through-feed lugs may not be used on main lug only (six disconnect rule) service entrance panels.

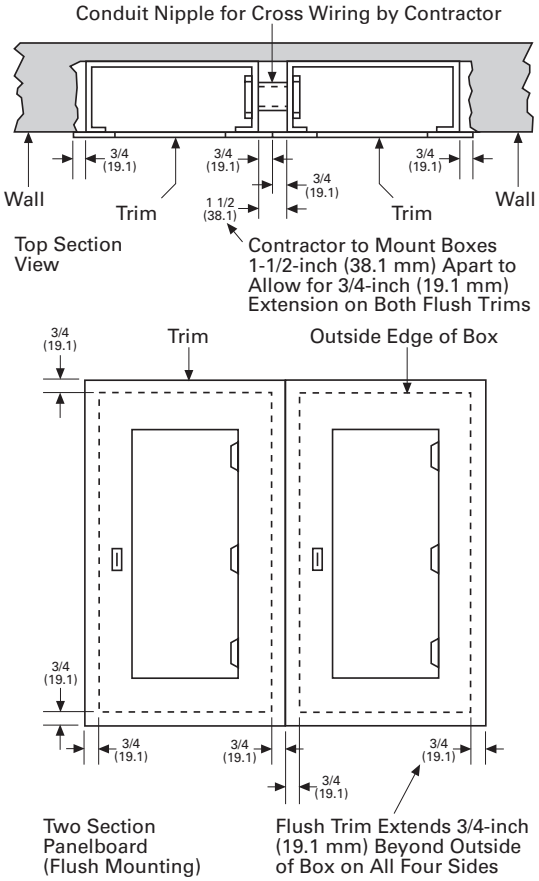
Through-Feed Lugs



Multiple Section Panelboard—Flush Mounted

Shown below is the standard method for flush mounting multiple section lighting and distribution panelboards using standard flush trims.

Multiple Section Panelboard Flush Mounted—Dimensions in Inches (mm)



Overcurrent Protection

The following requirements will be found in the NEC:

Each lighting and appliance branch circuit panelboard shall be individually protected on the supply side by not more than two main circuit breakers or two sets of fuses having a combined rating not greater than that on the panelboard.

3.3 Panelboards and Lighting Control

Pow-R-Line C Panelboards

Branch Circuit Loading for Lighting Panels

The size of mains and branches should be selected based on the following:

- Motor circuits: NEC Article 430
- Diversity factor
- Provision for future loading

Exception Number 1: Individual protection for a lighting panelboard is not required when the panelboard feeder has overcurrent protection not greater than that of the panelboard.

Exception Number 2: For existing installations, individual protection for lighting panelboards is not required where such panelboards are used as service equipment in supplying an individual residential occupancy and where any bus supplying 15 or 20A circuits is protected on the supply side by an overcurrent device.

Ambient Temperatures

The primary function of an overcurrent device is to protect the conductor and its insulation against overheating. In selecting the size of the devices and conductors, consideration should be given to the ambient temperature surrounding the conductors within and external to the panelboard. Cumulative heating within the panelboard may cause premature operation of the overcurrent protective devices.

Underwriters Laboratories test procedures are based, in part, on 80% loading of panelboard branch circuit devices. The NEC limits the loading of overcurrent devices in panelboards to 80% of rating where in normal operation the load will continue for three hours or more. Further derating may be required, depending on such factors as ambient temperature, duty cycle, frequency or altitude.

Exception: There is one exception to this rule in both UL and NEC. It applies to assemblies and overcurrent devices that have been listed for continuous duty at 100% of its rating.

Special Conditions

Standard panelboards, assembled with standard components, are adequate for most applications. However, special consideration should be given to those required for application under special conditions such as:

- Excessive vibration or shock
- Frequencies above 60 cycles
- Altitudes above 6600 feet (2011.7m)
- Damp environment (possible fungus growth)
- Compliance with federal, state and municipal electrical codes and standards

Seismic Considerations

The Uniform Building Code® and the International Building Code, as well as local and state building codes, place an emphasis on seismic building design requirements. Electrical distribution systems are treated as attachments to the building and therefore, fall into this category.

All Eaton panelboards are seismic qualified at the highest possible level, and have been tested in accordance with ANSI C37.81. This standard quantifies actual earthquake conditions, as well as equipment seismic capability.

Harmonic Currents

Standard panelboard neutrals are rated for 100% of the panelboard current. However, since harmonic currents can cause overheated neutrals, an option is provided for neutrals to be rated at 200% (1200A maximum neutral for 600A main bus) of the panelboard phase current.

Panelboards with the 200% rated neutral are UL listed as suitable for use with non-linear loads.

Prior to specifying the 200% rated neutral, Eaton recommends a harmonic survey be conducted of the distribution system, be it new or existing.

Surge Protective Devices

The quality of power feeding sensitive electronic loads is critical to the reliable operation of any facility. In modern offices, hospitals, and manufacturing facilities, the most frequent causes of microprocessor-based equipment downtime and damage are voltage transients and electrical noise.

Electrical loads and microprocessor-based equipment are highly susceptible to both high and low energy transients. High energy transients include lightning induced surges and power company switching. These high energy transients can destroy components instantly.

More frequently the electrical system experiences low energy transients and high frequency noise.

The effects of continual low energy transients and high frequency noise can cause erratic equipment performance or sudden failure of electronic circuit board components.

Eaton can provide protective and diagnostic systems integral to panelboards. The surge protective device (SPD) is integrated into the panelboards using a "zero lead length" direct bus bar connection.



Pow-R-Line 4

The SPD protects sensitive electronic equipment from the damaging effects of high and low energy transients, as well as high frequency noise.

Standards and Certifications

Eaton's panelboards are designed to meet the following applicable industry standards, except where noted:

- Underwriters Laboratories:
  - Panelboards: UL 67
  - Cabinets and Boxes: UL 50

Note: Only panelboards containing UL listed devices can be UL labeled.

- National Electrical Code
- NEMA Standards: PB 1
- Federal Specification W-P-115c:
  - Circuit Breakers—Type I Class I
  - Fusible Switch—Type II Class I

Listed

Technical Data and Specifications

Panelboard Selection Guide

Panelboard Type	Device Type	Maximum Voltage Rating AC	DC	Maximum Main Rating (Amperes) MLO	Main Device	Branch Circuits Ampere Range	Sub-Feed Breaker Maximum Amperes	AC Interrupting Capacity rms Symmetrical Amperes (kA) Fully Rated	Series Rated
PRL1a	Breaker	240	—	400	400	15–100	400	10–22	22–100
PRL1R	Breaker	240	—	225	225	15–100	—	10–22	22–100
PRL1aF	Fusible	240	—	400	400	15–30	400	200	—
PRL1a-LX	Breaker	240	—	225	225	15–100	—	10–22	22–100
PRL2a	Breaker	240	250	400	400	15–100	400	65	65–200
	Breaker	480Y/277	250	400	400	15–100	400	14	22–150
PRL2R	Breaker	240	—	225	225	15–100	—	10–22	22–200
	Breaker	480Y/277	—	225	225	15–100	—	14	22–100
PRL2aF	Fusible	480Y/277	—	400	400	15–30	400	200	—
PRL2a-LX	Breaker	240	250	225	225	15–100	—	65	65–200
	Breaker	480Y/277	250	225	225	15–100	—	14	22–150
PRL3a	Breaker	240	250	800	600	15–225	600	10–200	22–200
	Breaker	480	250	800	600	15–225	600	14–100	22–150
	Breaker	600	250	800	600	15–225	600	14–35	—
PRL3E	Breaker	240	250	600	600	15–125	400	25–100	100–200
	Breaker	480Y/277	250	600	600	15–125	400	18–65	65–100
	Breaker	480	250	600	600	15–125	400	18–65	65–100
PRL4B	Breaker	240	600	1200	1200	15–1200	—	10–200	22–200
	Breaker	480	600	1200	1200	15–1200	—	14–200	22–150
	Breaker	600	600	1200	1200	15–1200	—	14–200	—
PRL4D	Breaker	240	—	1200	1200 ①	600	—	65–200	—
	Breaker	480	—	1200	1200 ①	600	—	35–100	—
	Breaker	600	—	1200	1200 ①	600	—	18–50	—
PRL4F	Fusible	240	250	1200	1200	30–1200	—	100–200	—
	Fusible	600	250	1200	1200	30–1200	—	100–200	—
PRL5P	Breaker	240	250	1200	1200	15–1200	—	10–200	22–200
	Breaker	480	250	1200	1200	15–1200	—	14–200	22–150
	Breaker	600	250	1200	1200	15–1200	—	14–200	—
PRC100 PRC25	Breaker	240	—	400	400	15–225	—	10–65	22–100
	Breaker	480Y/277	—	400	400	15–225	—	14	65–100
Elevator Control	Fusible	240	—	800	800	15–200	—	200	—
	Fusible	480Y/277	—	800	800	15–200	—	200	—
	Fusible	480	—	800	800	15–200	—	200	—

Note

① Fixed mounted only.

Terminal Wire Ranges, Pressure-Type Al/Cu Terminals Except as Noted

Note: All terminal sizes are based on wire ampacities corresponding to those shown in NEC Table 310.16 under the 75°C insulation columns (75°C wire). The use of smaller size, (in circular mills), regardless of insulation temperature rating, is not permitted.

Where copper-aluminum terminals are supplied on designated panelboard types, best results are obtained if a suitable joint compound is applied when aluminum conductors are used.

Check Eaton's standard terminal sizes versus customer requirements. In particular, 400 and 800A breakers often require nonstandard lugs.

Optional 750 kcmil mechanical screw-type terminals are available upon request. Panelboard dimensions may be affected, refer to Eaton.

Standard Main Lug Terminals

	Wire Size Ranges for Ampere Capacity						
Panel Type	**100A**	**225A**	**250A**	**400A**	**600A**	**800A**	**1200A**
PRL1a	#12–1/0	#6–300 kcmil	—	(2) #4–500 kcmil	—	—	—
PRL2a	#12–1/0	#6–300 kcmil	—	(2) #4–500 kcmil	—	—	—
PRL1R	#12–1/0	#6–300 kcmil	—	(2) #4–500 kcmil	—	—	—
PRL2R	#12–1/0	#6–300 kcmil	—	(2) #4–500 kcmil	—	—	—
PRL1aF	#12–1/0	#6–300 kcmil	—	(2) #4–500 kcmil	—	—	—
PRL2aF	#12–1/0	#6–300 kcmil	—	(2) #4–500 kcmil	—	—	—
PRL3a	#12–1/0	—	#6–350 kcmil	(2) #4–500 kcmil	(2) #4–500 kcmil	(3) #4–500 kcmil	—
PRL3E	#12–1/0	—	#6–350 kcmil	(2) #4–500 kcmil	(2) #4–500 kcmil	—	—
PRL4	—	—	#4–500 kcmil	(2) #4–500 kcmil	(2) #4–500 kcmil	(3) #4–500 kcmil	(4) #4–500 kcmil
PRL1a-LX	#12–1/0	#6–300 kcmil	—	—	—	—	—
PRL2a-LX	#12–1/0	#6–300 kcmil	—	—	—	—	—
PRC100	#12–1/0	—	#6–350 kcmil	(2) #4–500 kcmil	—	—	—
PRC25	#12–1/0	#6–300 kcmil	—	(2) #4–500 kcmil	—	—	—
PRL5P	—	—	—	(1) #1/0–500 kcmil or (2) #1/0–250 kcmil	(2) #4–500 kcmil	(2) #2–500 kcmil or (3) #2–400 kcmil	(4) #4–750 kcmil
Elevator Control	—	—	#4–500 kcmil	(2) #4/0–500 kcmil	(2) #4/0–500 kcmil	(3) #4/0–500 kcmil	—

Standard Circuit Breaker Terminals

Breaker Type	Ampere Rating	Wire Range
BAB, QBHW, BABRSP, HQP, QPHW	15–70	#14–#4
	90–100	#8–1/0
EDB, EDS, ED, EDH, EDC	100–225	#4–4/0 or #6–300 kcmil
EGB, EGE, EGS, EGH	15–50	#14–3/0 AL/CU
	60–125	#6–3/0 AL/CU
EHD, FDB, FD, HFD, FDC, HFDDC ②	15–100	#14–1/0
	125–225	#4–4/0
FCL	15–100	#14–1/0
GHB, HGHB, GHQ, GHQRSP	15–20	#14–#10
	25–100	#10–1/0
EGB, EGS, EGH	15–50	#14–1/0
	60–125	#6–2/0
JD, HJD, JDC, HJDDC ②	70–250	#4–350 kcmil
DK	250–350	250–500 kcmil
	400	(2) 3/0–250 kcmil or (1) 3/0–500 kcmil
KD, HKD, KDC, HKDDC, ② CKD, CHKD	225	(1) #3–350 kcmil
	350	(2) 3/0–250 kcmil or
	400	(2) 3/0–250 kcmil or (1) 3/0–500 kcmil
LHH	150–400	#2–500 kcmil
	150–400	(2) #2–500 kcmil
	150–400	(1) 500–750 kcmil
LGE, LGH, LGC, LGU, LHH ①	250–400	(1) #2–500 kcmil
	500–600	(2) #2–500 kcmil
LD, HLD, LDC, HLDDC ② CLD, CHLD	300–500	(2) 250–350 kcmil
	600	(2) 400–500 kcmil
MDL, HMDL, HMDLDC ② CMDL, CHMDL	400–600	(2) #1–500 kcmil
	700–800	(3) 3/0–400 kcmil
ND, HND, CND, CHND, NDC, CNDC	800–1000	(3) 3/0–400 kcmil
	1200	(4) 4/0–500 kcmil
LCL	125–225	(1) #6–350 kcmil
	250–400	(1) #4–250 kcmil and (1) 3/0–600 kcmil
FB-P	15–100	#14–1/0
LA-P	70–225	#6–350 kcmil
	250–400	(1) #4–250 kcmil and (1) 3/0–600 kcmil
NB-P, NBDC ②	300–700	(2) #1–500 kcmil
	800	(3) 3/0–400 kcmil

FDPW Switch Terminals

Ampere Rating	Wire Range
30	#14–1/0
60	#14–1/0
100	#14–1/0
200	#4–300 kcmil
400	250–750 kcmil or (2) 3/0–250 kcmil
600	(2) #4–600 kcmil or (4) 3/0–250 kcmil
800	(3) 250–750 kcmil or (6) 3/0–250 kcmil
1200	(4) 250–750 kcmil or (8) 3/0–250 kcmil

Elevator Control Panel Feeder Terminals

Ampere Rating	Wire Range
30	#14–1/0
60	#14–1/0
100	#14–1/0
200	#4–300 kcmil

Notes

① LHH is 400A maximum.

② Suitable for DC applications only.

Selection Guide

Molded Case Circuit Breaker Ratings

Note: Circuit breakers equal or exceed Federal Specification W-C-375b requirements for the particular class associated with each circuit breaker type.

Breaker Type	Continuous Ampere Rating	Number of Poles	Maximum Voltage AC	UL Listed Interrupting Ratings—kA Symmetrical Amperes AC Rating Volts 120/240	240	277	480	600	DC Rating Volts ① 125	250
BAB ②③, HQP ②③	15–70	1	120	10	—	—	—	—	—	—
	15–100	2	120/240	10	—	—	—	—	—	—
	15–100	2, 3	240	—	10	—	—	—	—	—
BABRP, BABRSP ②	15–30	1	120	10	—	—	—	—	—	—
	15–30	2	120/240	10	—	—	—	—	—	—
QBGF, QBGFEP, QPGF, QPGFEP, QBAF, QBAG	15–40	1	120	10	—	—	—	—	—	—
	15–50	2	120/240	10	—	—	—	—	—	—
	15–20	1	120	10	—	—	—	—	—	—
	15–20	2	120/240	10	—	—	—	—	—	—
QBHW ②③, QPHW ②③	15–70	1	120	22	—	—	—	—	—	—
	15–100	2	120/240	22	—	—	—	—	—	—
	15–100	2, 3	240	—	22	—	—	—	—	—
QBHGF, QBHGFEP, QPHGF, QPHGFEP	15–30	1	120	22	—	—	—	—	—	—
	15–30	2	120/240	22	—	—	—	—	—	—
GQ, GHQ ②, GHQRSP, GHB ②③	15–20	1	277	65	—	14	—	—	—	—
	15–100 ④	1	277	65	—	14	—	—	14	—
	15–100 ④	2, 3	480Y/277	—	65	—	14	—	—	14
HGHB ②, GHBGFEP	15–30	1	277	65	—	25	—	—	—	—
	15–60	1	277	—	—	14	—	—	—	—
GHBS	15–30	1	277	65	—	14	—	—	—	—
	15–30	2	480Y/277	—	65	—	14	—	—	—
EHD ②③	15–100	1	277	—	—	14	—	—	10	—
	15–100	2, 3	480	—	18	—	14	—	—	10
EGB	15–125	1	277	35	35	18	—	—	10	—
	15–125	2, 3	480	—	35	—	18	—	—	10
EGS	15–125	1	277	100	—	35	—	—	35	—
	15–125	2, 3	480	—	100	—	35	—	—	35
EGH	15–125	1	277	200	—	65	—	—	42	—
	15–125	2, 3	480	—	200	—	65	—	—	42
FDB ⑤, FD ②③	15–150	2, 3	600	—	18	—	14	14	—	10
	15–150	1	277	—	—	35	—	—	10	—
	15–225	2, 3	600	—	65	—	35	18	—	10
HFD ②③	15–150	1	277	—	—	65	—	—	10	—
	15–225	2, 3	600	—	100	—	65	25	—	22

Notes

① DC ratings apply to substantially non-inductive circuits.
② 15 and 20A single-pole switching duty rated for fluorescent applications.
③ Single-, two- and three-pole HACR rated.
④ DC rated single-pole, 15–70A only.
⑤ Two- and three-pole HACR rated.

Selection Guide, continued

Molded Case Circuit Breaker Ratings, continued

Note: Circuit breakers equal or exceed Federal Specification W-C-375b requirements for the particular class associated with each circuit breaker type.

Breaker Type	Continuous Ampere Rating	Number of Poles	Volts AC	UL Listed Interrupting Ratings—kA Symmetrical Amperes AC Rating Volts 120/240	240	277	480	600	DC Rating Volts ① 125	250
FDC ②	15–225	2, 3	600	—	200	—	100	35	—	22
FCL	15–100	2, 3	480	—	200	—	150	—	—	—
EDB ②	100–225	2, 3	240	—	22	—	—	—	10	—
EDS ②	100–225	2, 3	240	—	42	—	—	—	10	—
ED ②	100–225	2, 3	240	—	65	—	—	—	10	—
EDH ②	100–225	2, 3	240	—	100	—	—	—	10	—
EDC ②	100–225	2, 3	240	—	200	—	—	—	10	—
EGB ②	15–125	1, 2, 3	240	—	25	—	18	—	—	—
EGE ②	15–125	1, 2, 3	240	—	—	—	—	18	—	—
EGS ②	15–125	1, 2, 3	240	—	85	—	35	22	—	—
EGH ②	15–125	1, 2, 3	240	—	100	—	65	25	—	—
JD ②	70–250	2, 3	600	—	65	—	35	18	—	10
HJD ②	70–250	2, 3	600	—	100	—	65	25	—	22
JDC ②	70–250	2, 3	600	—	200	—	100	35	—	22
DK	250–400	2, 3	240	—	65	—	—	—	—	10
KD, CKD ③	100–400	2, 3	600	—	65	—	35	25	—	10 ④
HKD, CHKD ③	100–400	2, 3	600	—	100	—	65	35	—	22 ④
LHH ⑤	150–400	2, 3	480	—	100	—	65	35	—	42
KDC	100–400	2, 3	600	—	200	—	100	65	—	22 ④
LCL ⑤	125–400	2, 3	600	—	200	—	200	100	—	—
LGE	250–600	3	600	—	65	—	35	18	—	22
LGC ⑤	250–600	2, 3	600	—	200	—	100	50	—	42
LGU ⑤	250–600	2, 3	600	—	200	—	150	65	—	50
LD ⑤, CLD ③⑤	300–600	2, 3	600	—	65	—	35	25	—	22 ④
LGH	250–600	3	600	—	100	—	65	35	—	22
HLD ⑤, CHLD ③⑤	300–600	2, 3	600	—	100	—	65	35	—	25 ④
LDC ⑤, CLDC ③⑤	300–600	2, 3	600	—	200	—	100	50	—	25 ④
MDL ⑤, CMDL ③⑤	400–800	2, 3	600	—	65	—	50	25	—	22 ④
HMDL ⑤, CHMDL ③⑤	400–800	2, 3	600	—	100	—	65	35	—	25 ④
ND ⑤, CND ③⑤	600–1200	2, 3	600	—	65	—	50	25	—	—
HND ⑤, CHND ③⑤	600–1200	2, 3	600	—	100	—	65	35	—	—
NDC ⑤, CNDC ③⑤	600–1200	2, 3	600	—	200	—	100	65	—	—
Integrally Fused, Current Limiting Circuit Breakers										
FB-P	15–100	2, 3	600	—	200	—	200	200	—	⑥
LA-P	70–400	2, 3	600	—	200	—	200	200	—	⑥
NB-P	300–800	2, 3	600	—	200	—	200	200	—	⑥

Notes

① DC ratings apply to substantially non-inductive circuits.
② Two- and three-pole HACR rated.
③ 100% rated circuit breaker.
④ DC rating not available with electronic trip.
⑤ Available with integral ground fault protection.
⑥ 100k based on NEMA test procedure.

Section 16442

Panelboards and Lighting Controls



Contents

Description

Product Selection Guide

Product Selection Guide

Product Types



Type PRL1a

Bolt-On or Plug-On Circuit Breakers 240 Vac Maximum

Main lugs only
400A maximum

Main Circuit breaker
400A maximum

Branch circuit breakers
100A maximum,
Single-, two- and three-pole



Fusible Lighting Panelboard PRL1aF

240 and 480Y/277 Vac Maximum

Main lugs only
400A maximum

Branch overcurrent protective devices
30A maximum,
Single-, two and three-pole utilizing Class CC fuses



Type PRL1a-LX Column Type

Bolt-On Circuit Breakers 240 Vac Maximum

Main lugs only
225A maximum

Main circuit breaker
225A maximum

Branch circuit breakers
100A maximum,
Single-, two- and three-pole



Type PRL2a

Bolt-On Circuit Breakers 240 or 480Y/277 Vac; 125/250 Vdc Maximum

Main lugs only
400A maximum

Main circuit breaker
400A maximum

Branch circuit breakers
100A maximum,
Single-, two- and three-pole



Fusible Lighting Panelboard PRL2aF

240 and 480Y/277 Vac Maximum

Main lugs only
400A maximum

Branch overcurrent protective devices
30A maximum,
Single-, two- and three-pole utilizing Class CC fuses



Type PRL2a-LX, Column Type

Bolt-On Circuit Breakers 240 or 480Y/277 Vac; 125/250 Vdc Maximum

Main lugs only
225A maximum

Main circuit breaker
225A maximum

Branch circuit breakers
100A maximum,
Single-, two- and three-pole

Product Types, continued



Retrofit Panelboard
PRL-1R and PRL-2R

Bolt-On Circuit Breakers
480Y/277 Vac;
240 Vac, 480Y/277 Vac

Main lugs only
225A maximum

Main circuit breaker
225A maximum

Branch circuit breakers
100A maximum,
Single-, two and three-pole



Type PRL3a

Bolt-On Circuit Breakers
240, 480 or 600 Vac;
250 Vdc Maximum

Main lugs only
800A maximum

Main circuit breaker
600A maximum

Branch circuit breakers
225A maximum,
Single-, two- and three-pole



Type PRL3E

Bolt-On Circuit Breakers
240, 480Y/277 or 480 Vac;
250 Vdc Maximum

Main lugs only
600A maximum

Main circuit breaker
600A maximum

Branch circuit breakers
125A maximum,
Single-, two- and three-pole



Type PRL4

Circuit Breakers or Fusible Switches
240, 480 or 600 Vac; 600 Vdc Maximum

Main lugs only
1200A maximum

Main circuit breaker
1200A maximum

Main fusible switch
1200A maximum

Branch circuit breakers
1200A maximum,
Single-, two- and three-pole

Branch fusible switches
1200A maximum,
two- and three-pole



Type PRL5P

Plug-On Circuit Breakers
240, 480 or 600 Vac;
250 Vdc Maximum

Main lugs only
1200A maximum

Main circuit breaker
1200A maximum

Branch circuit breakers
1200A maximum,
Single-, two- and three-pole

Product Types, continued



Pow-R-Command

Bolt-On Circuit Breakers
240 or 480Y/277 Vac

Main lugs only
400A maximum

Main circuit breaker
400A maximum

Branch circuit breakers
225A maximum,
Single-, two- and three-pole

Integral power switching controls



Metering Service Section

Bolt-On Circuit Breaker or Fusible Switch 240, 480 or 600 Vac

Service entrance panels combining a main disconnect with a power company metering compartment
400–1200A



Elevator Control Panelboard

Bolt-On Fusible Switches
600 Vac Maximum

Controls for up to four elevators in a single Panelboard

Main lugs only
800A maximum

Branch overcurrent devices
15–200A fusible switches with Class J fuse clips maximum

Designed to meet specific sections of various codes impacting elevators

3

Type PRL1a Panelboard



Contents

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EZ Box and EZ Trim	
Standards and Certifications	**V2-T3-5**
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Product Description

Eaton's EZ box and EZ trim represents the first significant change in panelboard box and trim designs in more than a half-century. The EZ box and EZ trim have been designed for faster, more secure and safer installations. The new EZ box and EZ trim are provided standard for Eaton's Pow-R-Line 1a and Pow-R-Line 2a lighting panelboards, as well as the Pow-R-Line 3a and Pow-R-Line 3E mid-range panelboard.



Flange Detail

Features

- Virtually eliminates sharp edges
- Trim installs in seconds rather than minutes
- Door-in-door is standard
- Ability to adjust flush box to wall irregularities
- Trim installs without the need for tools
- No exposed hardware (because there is none)

The EZ box flanges are bent and painted, which virtually eliminates the sharp edges associated with traditional boxes. Additionally, all steel panelboard chassis parts are painted. This significantly reduces potential injury for material handlers and installers. Each flange is adjustable outward up to 3/4-inch (19.1 mm). This feature allows the installer to adjust flush box applications to be level and flat with the finished wall after the wall material is installed to help correct wall irregularities. The new box flange also provides the means for attaching the EZ trim.



Standalone Trim and Bottom Flange Hanger with Notch



Corner Flange Detail

Fast Installation

The EZ trim incorporates a groundbreaking design that installs in seconds, rather than minutes. The standard trim features include door-in-door construction; no exposed hardware and no tools are required for installation.

Each EZ trim includes hangers attached on the right side. The bottom trim hanger has a notch in its base. To install, the bottom hanger is inserted into the bottom right side box flange opening, resting the notch on the flange.



Trim Hanger Inserted Into Box Flange

The balance of the hangers are aligned with the other flange openings and pushed in. When all hangers are in the box flange, the trim is lifted up slightly to clear the notch on the bottom hanger, and the trim in self-supported on the EZ box.

The installation is completed by swinging the trim to the closed position, then lifting and pushing slightly to the right. The trim will drop into place totally secured. The multi-point catches on the left side of the trim will lock into the left side box flange openings.

To prevent the trim from being removed by non-authorized persons, a unique sliding means automatically latches in place when the trim door is closed. Along with a new lock, the EZ trim offers a high degree of door security.



Trim Hanging on Surface Mounted Box

Standards and Certifications

When used with Eaton's panelboard chassis, EZ boxes and EZ trims meet the following applicable industry standards:

- UL 50 listed
- NEMA Standard PB1
- Federal specifications
- National Electrical Code

Listed

Product Selection

Boxes and Trims Only—Type 1

3

Types PRL1a, PRL2a and PRL3a (400A Maximum)

Box Dimensions—Inches (mm)	Height	YS Box Catalog Number	LT Trim Catalog Number	EZ Box ① Catalog Number	EZ Trim ① Catalog Number
20.00 W x 5.75 D (508.0 W x 146.1 D)	36.00 (914.4)	**YS2036**	**LT2036S or F**	**EZB2036R**	**EZT2036S or F**
	42.00 (1066.8)	**YS2042**	**LT2042S or F**	**EZB2042R**	**EZT2042S or F**
	48.00 (1219.2)	**YS2048**	**LT2048S or F**	**EZB2048R**	**EZT2048S or F**
	60.00 (1524.0)	**YS2060**	**LT2060S or F**	**EZB2060R**	**EZT2060S or F**
	72.00 (1828.8)	**YS2072**	**LT2072S or F**	**EZB2072R**	**EZT2072S or F**
	90.00 (2286.0)	**YS2090**	**LT2090S or F**	**EZB2090R**	**EZT2090S or F**

Type PRL3a (600A)

Box Dimensions—Inches (mm)	Height	YS Box Catalog Number	LT Trim Catalog Number	EZ Box ① Catalog Number	EZ Trim ① Catalog Number
20.00 W x 5.75 D (508.0 W x 146.1 D)	36.00 (914.4)	**YS2036**	**LTV2036S or F**	**EZB2036R**	**EZTV2036S or F**
	48.00 (1219.2)	**YS2048**	**LTV2048S or F**	**EZB2048R**	**EZTV2048S or F**
	60.00 (1524.0)	**YS2060**	**LTV2060S or F**	**EZB2060R**	**EZTV2060S or F**
	72.00 (1828.8)	**YS2072**	**LTV2072S or F**	**EZB2072R**	**EZTV2072S or F**
	90.00 (2286.0)	**YS2090**	**LTV2090S or F**	**EZB2090R**	**EZTV2090S or F**

Type PRL3a (800A)

Box Dimensions—Inches (mm)	Height	YS Box Catalog Number	LT Trim Catalog Number
28.00 W x 5.75 D	36.00 (914.4)	**YS2836**	**LTV2836S or F**
	48.00 (1219.2)	**YS2848**	**LTV2848S or F**
	60.00 (1524.0)	**YS2860**	**LTV2860S or F**
	72.00 (1828.8)	**YS2872**	**LTV2872S or F**
	90.00 (2286.0)	**YS2890**	**LTV2890S or F**

Note

① EZ box must be used with EZ trim.

Pow-R-Line C Panelboards



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Type PRL2aF	**V2-T3-42**
Type PRL2a-LX	**V2-T3-46**
Retrofit Panelboard	**V2-T3-50**
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Type PRL3E	**V2-T3-62**
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Product Description

Lighting and Distribution Panelboards

Eaton's assembled panelboards are designed for sequence phase connection of branch circuit devices. This allows complete flexibility of circuit arrangement (single-, two- or three-pole) to allow balance of the electrical load on each phase.

Sturdy, rigid chassis assembly ensures accurate alignment of interior with panel front; prevents flexing and minimizes possibility of loosening or damage to current carrying parts during and after installation.

Four-point in-and-out adjustment of panel interior is provided to meet critical depth dimensions on flush installations. This compensates for possible misalignment of box at installation.

Main lugs are mechanical solderless type and approved for copper or aluminum conductors.

Enclosures

Boxes are code-gauge galvanized steel, which include a painted box finished in ANSI-61 light gray to match the trim.

Standard panelboard cabinets are designed for indoor use. Alternate types are available for indoor and special purpose applications.

All enclosures are furnished in accordance with Underwriters Laboratories standards and include wiring gutters with proper wire bending space. Special cabinets can be provided at an additional charge.

The box dimensions shown are inside dimensions. For outside dimensions, add 1/4-inch (6.4 mm).

Standard panelboard boxes are supplied without knockouts (blank endwalls).

Fronts

Fronts (trims) for all panelboards are made of code-gauge steel and have a high durability ANSI-61 light gray finish applied by a baked-on polyester powder coating paint system.

The fronts for lighting and appliance branch circuit panelboards and small power distribution panelboards include a door with rounded corners and concealed hinges. A flush-type latch and lock assembly is included. All locks are keyed alike. These trims are available in both surface- and flush-mounted designs.



EZ Trim Features Standard Door-in-Door with No Exposed Hardware or Sharp Edges (no Tools are Required for Installation)



The Three-Piece Trim for Larger Power Distribution Panelboards Provides for Easy Handling and Installation

Fronts for power distribution panelboards utilize a unique breaker front cover design in which each device has a dedicated bolt-on steel cover. The individual covers form a single deadfront for the panelboard that is used in conjunction with two wiring gutter covers to complete the trim. A door is not finished as part of the standard offering on these panelboards but can be provided, for an additional charge, using a deeper than standard box.

Application Description

Panelboard Selection Factors

In selecting a panelboard, the following factors must be considered:

- Service (voltage and frequency)
- Interrupting capacity (fully or series rated)
- Ampere rating of main
- Ampere ratings of branches
- Environment

Panelboard Short-Circuit Rating

The short-circuit rating of Eaton's assembled panelboards are test verified by, and listed with, Underwriters Laboratories (UL). Generally, these ratings are that of the lowest interrupting rated device in the panel.

Certain exceptions to this rule exist where branch devices have been UL tested in combination with specific main devices having a higher interrupting rating. Where these defined main devices and branch breaker combinations are utilized, the series short-circuit rating of the assembled panelboard will be the same as the tested rating of the approved rated main device in series with the branches. Available main and branch breaker combinations are tabulated starting on **Page V2-T3-16**. All combinations shown are UL tested and listed.

These series ratings apply to panels having main devices, or main lug only panelboards fed remotely by the device listed in the series ratings chart as the main, for which UL listed tests were conducted.

Service Entrance Equipment

The National Electrical Code (NEC) requires that:

- A panel used as service entrance equipment must be located near the point where the supply conductors enter the building
- A panelboard having main lugs only shall have a maximum of six service disconnects to de-energize the entire panelboard from the supply conductors. Where more than six disconnects are required, a main service disconnect must be provided
- A disconnectable electrical bond must be provided between the neutral and ground
- A service entrance type UL label must be factory installed
- Ground fault protection of equipment shall be provided for each service disconnect rated 1000A or more if the electrical service is a solidly grounded wye system of more than 150V to ground, but not exceeding 600V phase-to-phase

Note: Service entrance panels must be identified as such on the order.

Panelboard Standards

In 2008, both the National Electrical Code (Article 408) and UL 67 were updated to remove the mandated 42-circuit limitation. Eaton offers panelboards with more than 42 circuits for those jurisdictions that have adopted the 2008 NEC or later.

For jurisdictions that have not adopted the 2008 or later version of the National Electrical Code, the 42-circuit limitation for Lighting and Appliance Branch Panelboards remains in place. Check with your local code officials to determine specific jurisdiction status.

Panelboard Installation

NEC requires that the operating handle of the topmost mounted device be no more than 6 feet 7 inches (2006.6 mm) above the finished floor and should be installed per NEC and manufacturer's instructions.

Additional boxes and fronts are required when the components required for one panelboard exceed the standard box dimensions.

Multi-Section Panelboards

When two or more separate enclosures are required, separate fronts for each box are standard. A common front can be furnished at additional charge.

Interconnecting Multi-Section Panelboards

When a panelboard, for connection to one feeder, must be furnished in more than one section (Box), each section must be furnished with main bus and terminals of the same rating, unless a main overcurrent device is provided in each section.

Sub-feed or through-feed provisions must also be included (and priced) to provide connection capability to the second section.

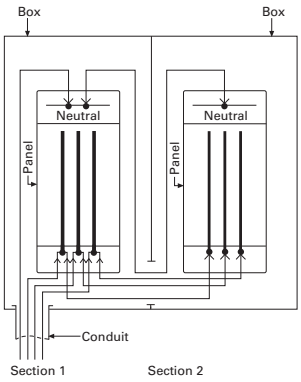
Note: Sub-feed or through-feed lugs cannot be used on any panelboard that is not protected by a single main overcurrent device either in the panelboard or immediately upstream, i.e., service entrance panelboards with main lugs only using the six disconnect rule.

Sub-Feed Lugs

Sub-feed lugs (see figure below) are one means of interconnecting multi-section panels. The sub-feed (second set of) lugs are mounted directly beside the main lugs. These are required in each section except the last panel in the lineup. The feeder cables are brought into the wiring gutter of the first section and connected to the main lugs. Another set of the same size cables are connected to the sub-feed lugs (Section 1) and are carried over to the main lugs of the adjacent panel. Cross connection cables are not furnished by Eaton. Sub-feed lugs are only available on main lug only panels.

Note: Sub-feed lugs may not be used on main lug only (six disconnect rule) service entrance panels.

Sub-Feed Lugs

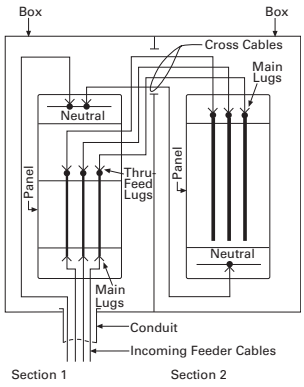


Through-Feed Lugs

Through-feed lugs (see figure below) are another method to interconnect multi-section panelboards. The incoming feeder cables are connected to the main lugs or main breaker at the bottom of panel (Section 1). Another set of lugs (through-feed) are located at the opposite end of the main bus. The interconnecting cables are connected to the through-feed lugs in Section 1 and are carried over to the main lugs in Section 2. The connection arrangement could be reversed, i.e., main lugs at top; through-feed lugs at bottom end of panel. Cross cables are not furnished by Eaton.

Note: Through-feed lugs may not be used on main lug only (six disconnect rule) service entrance panels.

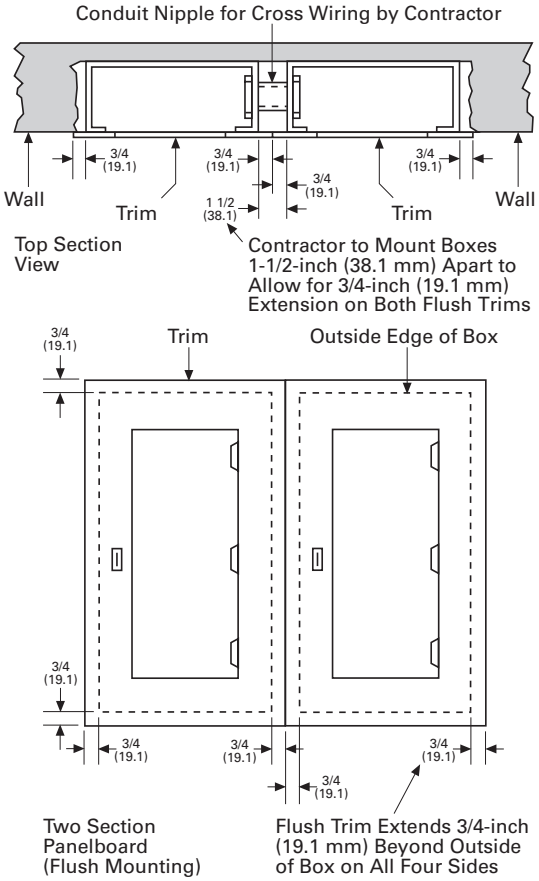
Through-Feed Lugs



Multiple Section Panelboard—Flush Mounted

Shown below is the standard method for flush mounting multiple section lighting and distribution panelboards using standard flush trims.

Multiple Section Panelboard Flush Mounted—Dimensions in Inches (mm)



Overcurrent Protection

The following requirements will be found in the NEC:

Each lighting and appliance branch circuit panelboard shall be individually protected on the supply side by not more than two main circuit breakers or two sets of fuses having a combined rating not greater than that on the panelboard.

Branch Circuit Loading for Lighting Panels

The size of mains and branches should be selected based on the following:

- Motor circuits: NEC Article 430
- Diversity factor
- Provision for future loading

Exception Number 1: Individual protection for a lighting panelboard is not required when the panelboard feeder has overcurrent protection not greater than that of the panelboard.

Exception Number 2: For existing installations, individual protection for lighting panelboards is not required where such panelboards are used as service equipment in supplying an individual residential occupancy and where any bus supplying 15 or 20A circuits is protected on the supply side by an overcurrent device.

Ambient Temperatures

The primary function of an overcurrent device is to protect the conductor and its insulation against overheating. In selecting the size of the devices and conductors, consideration should be given to the ambient temperature surrounding the conductors within and external to the panelboard. Cumulative heating within the panelboard may cause premature operation of the overcurrent protective devices.

Underwriters Laboratories test procedures are based, in part, on 80% loading of panelboard branch circuit devices. The NEC limits the loading of overcurrent devices in panelboards to 80% of rating where in normal operation the load will continue for three hours or more. Further derating may be required, depending on such factors as ambient temperature, duty cycle, frequency or altitude.

Exception: There is one exception to this rule in both UL and NEC. It applies to assemblies and overcurrent devices that have been listed for continuous duty at 100% of its rating.

Special Conditions

Standard panelboards, assembled with standard components, are adequate for most applications. However, special consideration should be given to those required for application under special conditions such as:

- Excessive vibration or shock
- Frequencies above 60 cycles
- Altitudes above 6600 feet (2011.7m)
- Damp environment (possible fungus growth)
- Compliance with federal, state and municipal electrical codes and standards

Seismic Considerations

The Uniform Building Code® and the International Building Code, as well as local and state building codes, place an emphasis on seismic building design requirements. Electrical distribution systems are treated as attachments to the building and therefore, fall into this category.

All Eaton panelboards are seismic qualified at the highest possible level, and have been tested in accordance with ANSI C37.81. This standard quantifies actual earthquake conditions, as well as equipment seismic capability.

Harmonic Currents

Standard panelboard neutrals are rated for 100% of the panelboard current. However, since harmonic currents can cause overheated neutrals, an option is provided for neutrals to be rated at 200% (1200A maximum neutral for 600A main bus) of the panelboard phase current.

Panelboards with the 200% rated neutral are UL listed as suitable for use with non-linear loads.

Prior to specifying the 200% rated neutral, Eaton recommends a harmonic survey be conducted of the distribution system, be it new or existing.

Surge Protective Devices

The quality of power feeding sensitive electronic loads is critical to the reliable operation of any facility. In modern offices, hospitals, and manufacturing facilities, the most frequent causes of microprocessor-based equipment downtime and damage are voltage transients and electrical noise.

Electrical loads and microprocessor-based equipment are highly susceptible to both high and low energy transients. High energy transients include lightning induced surges and power company switching. These high energy transients can destroy components instantly.

More frequently the electrical system experiences low energy transients and high frequency noise.

The effects of continual low energy transients and high frequency noise can cause erratic equipment performance or sudden failure of electronic circuit board components.

Eaton can provide protective and diagnostic systems integral to panelboards. The surge protective device (SPD) is integrated into the panelboards using a "zero lead length" direct bus bar connection.



Pow-R-Line 4

The SPD protects sensitive electronic equipment from the damaging effects of high and low energy transients, as well as high frequency noise.

Standards and Certifications

Eaton's panelboards are designed to meet the following applicable industry standards, except where noted:

- Underwriters Laboratories:
  - Panelboards: UL 67
  - Cabinets and Boxes: UL 50

Note: Only panelboards containing UL listed devices can be UL labeled.

- National Electrical Code
- NEMA Standards: PB 1
- Federal Specification W-P-115c:
  - Circuit Breakers—Type I Class I
  - Fusible Switch—Type II Class I

UL Listed

Technical Data and Specifications

Panelboard Selection Guide

Panelboard Type	Device Type	Maximum Voltage Rating AC	DC	Maximum Main Rating (Amperes) MLO	Main Device	Branch Circuits Ampere Range	Sub-Feed Breaker Maximum Amperes	AC Interrupting Capacity rms Symmetrical Amperes (kA) Fully Rated	Series Rated
PRL1a	Breaker	240	—	400	400	15–100	400	10–22	22–100
PRL1R	Breaker	240	—	225	225	15–100	—	10–22	22–100
PRL1aF	Fusible	240	—	400	400	15–30	400	200	—
PRL1a-LX	Breaker	240	—	225	225	15–100	—	10–22	22–100
PRL2a	Breaker	240	250	400	400	15–100	400	65	65–200
	Breaker	480Y/277	250	400	400	15–100	400	14	22–150
PRL2R	Breaker	240	—	225	225	15–100	—	10–22	22–200
	Breaker	480Y/277	—	225	225	15–100	—	14	22–100
PRL2aF	Fusible	480Y/277	—	400	400	15–30	400	200	—
PRL2a-LX	Breaker	240	250	225	225	15–100	—	65	65–200
	Breaker	480Y/277	250	225	225	15–100	—	14	22–150
PRL3a	Breaker	240	250	800	600	15–225	600	10–200	22–200
	Breaker	480	250	800	600	15–225	600	14–100	22–150
	Breaker	600	250	800	600	15–225	600	14–35	—
PRL3E	Breaker	240	250	600	600	15–125	400	25–100	100–200
	Breaker	480Y/277	250	600	600	15–125	400	18–65	65–100
	Breaker	480	250	600	600	15–125	400	18–65	65–100
PRL4B	Breaker	240	600	1200	1200	15–1200	—	10–200	22–200
	Breaker	480	600	1200	1200	15–1200	—	14–200	22–150
	Breaker	600	600	1200	1200	15–1200	—	14–200	—
PRL4D	Breaker	240	—	1200	1200 ①	600	—	65–200	—
	Breaker	480	—	1200	1200 ①	600	—	35–100	—
	Breaker	600	—	1200	1200 ①	600	—	18–50	—
PRL4F	Fusible	240	250	1200	1200	30–1200	—	100–200	—
	Fusible	600	250	1200	1200	30–1200	—	100–200	—
PRL5P	Breaker	240	250	1200	1200	15–1200	—	10–200	22–200
	Breaker	480	250	1200	1200	15–1200	—	14–200	22–150
	Breaker	600	250	1200	1200	15–1200	—	14–200	—
PRC100 PRC25	Breaker	240	—	400	400	15–225	—	10–65	22–100
	Breaker	480Y/277	—	400	400	15–225	—	14	65–100
Elevator Control	Fusible	240	—	800	800	15–200	—	200	—
	Fusible	480Y/277	—	800	800	15–200	—	200	—
	Fusible	480	—	800	800	15–200	—	200	—

Note

① Fixed mounted only.

Terminal Wire Ranges, Pressure-Type Al/Cu Terminals Except as Noted

Note: All terminal sizes are based on wire ampacities corresponding to those shown in NEC Table 310.16 under the 75°C insulation columns (75°C wire). The use of smaller size, (in circular mills), regardless of insulation temperature rating, is not permitted.

Where copper-aluminum terminals are supplied on designated panelboard types, best results are obtained if a suitable joint compound is applied when aluminum conductors are used.

Check Eaton's standard terminal sizes versus customer requirements. In particular, 400 and 800A breakers often require nonstandard lugs.

Optional 750 kcmil mechanical screw-type terminals are available upon request. Panelboard dimensions may be affected, refer to Eaton.

Standard Main Lug Terminals

	Wire Size Ranges for Ampere Capacity						
Panel Type	**100A**	**225A**	**250A**	**400A**	**600A**	**800A**	**1200A**
PRL1a	#12–1/0	#6–300 kcmil	—	(2) #4–500 kcmil	—	—	—
PRL2a	#12–1/0	#6–300 kcmil	—	(2) #4–500 kcmil	—	—	—
PRL1R	#12–1/0	#6–300 kcmil	—	(2) #4–500 kcmil	—	—	—
PRL2R	#12–1/0	#6–300 kcmil	—	(2) #4–500 kcmil	—	—	—
PRL1aF	#12–1/0	#6–300 kcmil	—	(2) #4–500 kcmil	—	—	—
PRL2aF	#12–1/0	#6–300 kcmil	—	(2) #4–500 kcmil	—	—	—
PRL3a	#12–1/0	—	#6–350 kcmil	(2) #4–500 kcmil	(2) #4–500 kcmil	(3) #4–500 kcmil	—
PRL3E	#12–1/0	—	#6–350 kcmil	(2) #4–500 kcmil	(2) #4–500 kcmil	—	—
PRL4	—	—	#4–500 kcmil	(2) #4–500 kcmil	(2) #4–500 kcmil	(3) #4–500 kcmil	(4) #4–500 kcmil
PRL1a-LX	#12–1/0	#6–300 kcmil	—	—	—	—	—
PRL2a-LX	#12–1/0	#6–300 kcmil	—	—	—	—	—
PRC100	#12–1/0	—	#6–350 kcmil	(2) #4–500 kcmil	—	—	—
PRC25	#12–1/0	#6–300 kcmil	—	(2) #4–500 kcmil	—	—	—
PRL5P	—	—	—	(1) #1/0–500 kcmil or (2) #1/0–250 kcmil	(2) #4–500 kcmil	(2) #2–500 kcmil or (3) #2–400 kcmil	(4) #4–750 kcmil
Elevator Control	—	—	#4–500 kcmil	(2) #4/0–500 kcmil	(2) #4/0–500 kcmil	(3) #4/0–500 kcmil	—

Standard Circuit Breaker Terminals

Breaker Type	Ampere Rating	Wire Range
BAB, QBHW, BABRSP, HQP, QPHW	15–70	#14–#4
	90–100	#8–1/0
EDB, EDS, ED, EDH, EDC	100–225	#4–4/0 or #6–300 kcmil
EGB, EGE, EGS, EGH	15–50	#14–3/0 AL/CU
	60–125	#6–3/0 AL/CU
EHD, FDB, FD, HFD, FDC, HFDDC ②	15–100	#14–1/0
	125–225	#4–4/0
FCL	15–100	#14–1/0
GHB, HGHB, GHQ, GHQRSP	15–20	#14–#10
	25–100	#10–1/0
EGB, EGS, EGH	15–50	#14–1/0
	60–125	#6–2/0
JD, HJD, JDC, HJDDC ②	70–250	#4–350 kcmil
DK	250–350	250–500 kcmil
	400	(2) 3/0–250 kcmil or (1) 3/0–500 kcmil
KD, HKD, KDC, HKDDC, ② CKD, CHKD	225	(1) #3–350 kcmil
	350	(2) 3/0–250 kcmil or
	400	(2) 3/0–250 kcmil or (1) 3/0–500 kcmil
LHH	150–400	#2–500 kcmil
	150–400	(2) #2–500 kcmil
	150–400	(1) 500–750 kcmil
LGE, LGH, LGC, LGU, LHH ①	250–400	(1) #2–500 kcmil
	500–600	(2) #2–500 kcmil
LD, HLD, LDC, HLDDC ② CLD, CHLD	300–500	(2) 250–350 kcmil
	600	(2) 400–500 kcmil
MDL, HMDL, HMDLDC ② CMDL, CHMDL	400–600	(2) #1–500 kcmil
	700–800	(3) 3/0–400 kcmil
ND, HND, CND, CHND, NDC, CNDC	800–1000	(3) 3/0–400 kcmil
	1200	(4) 4/0–500 kcmil
LCL	125–225	(1) #6–350 kcmil
	250–400	(1) #4–250 kcmil and (1) 3/0–600 kcmil
FB-P	15–100	#14–1/0
LA-P	70–225	#6–350 kcmil
	250–400	(1) #4–250 kcmil and (1) 3/0–600 kcmil
NB-P, NBDC ②	300–700	(2) #1–500 kcmil
	800	(3) 3/0–400 kcmil

FDPW Switch Terminals

Ampere Rating	Wire Range
30	#14–1/0
60	#14–1/0
100	#14–1/0
200	#4–300 kcmil
400	250–750 kcmil or (2) 3/0–250 kcmil
600	(2) #4–600 kcmil or (4) 3/0–250 kcmil
800	(3) 250–750 kcmil or (6) 3/0–250 kcmil
1200	(4) 250–750 kcmil or (8) 3/0–250 kcmil

Elevator Control Panel Feeder Terminals

Ampere Rating	Wire Range
30	#14–1/0
60	#14–1/0
100	#14–1/0
200	#4–300 kcmil

Notes

① LHH is 400A maximum.

② Suitable for DC applications only.

Selection Guide

Molded Case Circuit Breaker Ratings

Note: Circuit breakers equal or exceed Federal Specification W-C-375b requirements for the particular class associated with each circuit breaker type.

Breaker Type	Continuous Ampere Rating	Number of Poles	Maximum Voltage AC	UL Listed Interrupting Ratings—kA Symmetrical Amperes AC Rating Volts 120/240	240	277	480	600	DC Rating Volts ① 125	250
BAB ②③, HQP ②③	15–70	1	120	10	—	—	—	—	—	—
	15–100	2	120/240	10	—	—	—	—	—	—
	15–100	2, 3	240	—	10	—	—	—	—	—
BABRP, BABRSP ②	15–30	1	120	10	—	—	—	—	—	—
	15–30	2	120/240	10	—	—	—	—	—	—
QBGF, QBGFEP, QPGF, QPGFEP, QBAF, QBAG	15–40	1	120	10	—	—	—	—	—	—
	15–50	2	120/240	10	—	—	—	—	—	—
	15–20	1	120	10	—	—	—	—	—	—
	15–20	2	120/240	10	—	—	—	—	—	—
QBHW ②③, QPHW ②③	15–70	1	120	22	—	—	—	—	—	—
	15–100	2	120/240	22	—	—	—	—	—	—
	15–100	2, 3	240	—	22	—	—	—	—	—
QBHGF, QBHGFEP, QPHGF, QPHGFEP	15–30	1	120	22	—	—	—	—	—	—
	15–30	2	120/240	22	—	—	—	—	—	—
GQ, GHQ ②, GHQRSP, GHB ②③	15–20	1	277	65	—	14	—	—	—	—
	15–100 ④	1	277	65	—	14	—	—	14	—
	15–100 ④	2, 3	480Y/277	—	65	—	14	—	—	14
HGHB ②, GHBGFEP	15–30	1	277	65	—	25	—	—	—	—
	15–60	1	277	—	—	14	—	—	—	—
GHBS	15–30	1	277	65	—	14	—	—	—	—
	15–30	2	480Y/277	—	65	—	14	—	—	—
EHD ②③	15–100	1	277	—	—	14	—	—	10	—
	15–100	2, 3	480	—	18	—	14	—	—	10
EGB	15–125	1	277	35	35	18	—	—	10	—
	15–125	2, 3	480	—	35	—	18	—	—	10
EGS	15–125	1	277	100	—	35	—	—	35	—
	15–125	2, 3	480	—	100	—	35	—	—	35
EGH	15–125	1	277	200	—	65	—	—	42	—
	15–125	2, 3	480	—	200	—	65	—	—	42
FDB ⑤, FD ②③	15–150	2, 3	600	—	18	—	14	14	—	10
	15–150	1	277	—	—	35	—	—	10	—
	15–225	2, 3	600	—	65	—	35	18	—	10
HFD ②③	15–150	1	277	—	—	65	—	—	10	—
	15–225	2, 3	600	—	100	—	65	25	—	22

Notes

① DC ratings apply to substantially non-inductive circuits.
② 15 and 20A single-pole switching duty rated for fluorescent applications.
③ Single-, two- and three-pole HACR rated.
④ DC rated single-pole, 15–70A only.
⑤ Two- and three-pole HACR rated.

Selection Guide, continued

Molded Case Circuit Breaker Ratings, continued

Note: Circuit breakers equal or exceed Federal Specification W-C-375b requirements for the particular class associated with each circuit breaker type.

Breaker Type	Continuous Ampere Rating	Number of Poles	Volts AC	UL Listed Interrupting Ratings—kA Symmetrical Amperes AC Rating Volts 120/240	240	277	480	600	DC Rating Volts ① 125	250
FDC ②	15–225	2, 3	600	—	200	—	100	35	—	22
FCL	15–100	2, 3	480	—	200	—	150	—	—	—
EDB ②	100–225	2, 3	240	—	22	—	—	—	10	—
EDS ②	100–225	2, 3	240	—	42	—	—	—	10	—
ED ②	100–225	2, 3	240	—	65	—	—	—	10	—
EDH ②	100–225	2, 3	240	—	100	—	—	—	10	—
EDC ②	100–225	2, 3	240	—	200	—	—	—	10	—
EGB ②	15–125	1, 2, 3	240	—	25	—	18	—	—	—
EGE ②	15–125	1, 2, 3	240	—	—	—	—	18	—	—
EGS ②	15–125	1, 2, 3	240	—	85	—	35	22	—	—
EGH ②	15–125	1, 2, 3	240	—	100	—	65	25	—	—
JD ②	70–250	2, 3	600	—	65	—	35	18	—	10
HJD ②	70–250	2, 3	600	—	100	—	65	25	—	22
JDC ②	70–250	2, 3	600	—	200	—	100	35	—	22
DK	250–400	2, 3	240	—	65	—	—	—	—	10
KD, CKD ③	100–400	2, 3	600	—	65	—	35	25	—	10 ④
HKD, CHKD ③	100–400	2, 3	600	—	100	—	65	35	—	22 ④
LHH ⑤	150–400	2, 3	480	—	100	—	65	35	—	42
KDC	100–400	2, 3	600	—	200	—	100	65	—	22 ④
LCL ⑤	125–400	2, 3	600	—	200	—	200	100	—	—
LGE	250–600	3	600	—	65	—	35	18	—	22
LGC ⑤	250–600	2, 3	600	—	200	—	100	50	—	42
LGU ⑤	250–600	2, 3	600	—	200	—	150	65	—	50
LD ⑤, CLD ③⑤	300–600	2, 3	600	—	65	—	35	25	—	22 ④
LGH	250–600	3	600	—	100	—	65	35	—	22
HLD ⑤, CHLD ③⑤	300–600	2, 3	600	—	100	—	65	35	—	25 ④
LDC ⑤, CLDC ③⑤	300–600	2, 3	600	—	200	—	100	50	—	25 ④
MDL ⑤, CMDL ③⑤	400–800	2, 3	600	—	65	—	50	25	—	22 ④
HMDL ⑤, CHMDL ③⑤	400–800	2, 3	600	—	100	—	65	35	—	25 ④
ND ⑤, CND ③⑤	600–1200	2, 3	600	—	65	—	50	25	—	—
HND ⑤, CHND ③⑤	600–1200	2, 3	600	—	100	—	65	35	—	—
NDC ⑤, CNDC ③⑤	600–1200	2, 3	600	—	200	—	100	65	—	—
Integrally Fused, Current Limiting Circuit Breakers										
FB-P	15–100	2, 3	600	—	200	—	200	200	—	⑥
LA-P	70–400	2, 3	600	—	200	—	200	200	—	⑥
NB-P	300–800	2, 3	600	—	200	—	200	200	—	⑥

Notes

① DC ratings apply to substantially non-inductive circuits.
② Two- and three-pole HACR rated.
③ 100% rated circuit breaker.
④ DC rating not available with electronic trip.
⑤ Available with integral ground fault protection.
⑥ 100k based on NEMA test procedure.

Switching Devices—Low Voltage

Contents

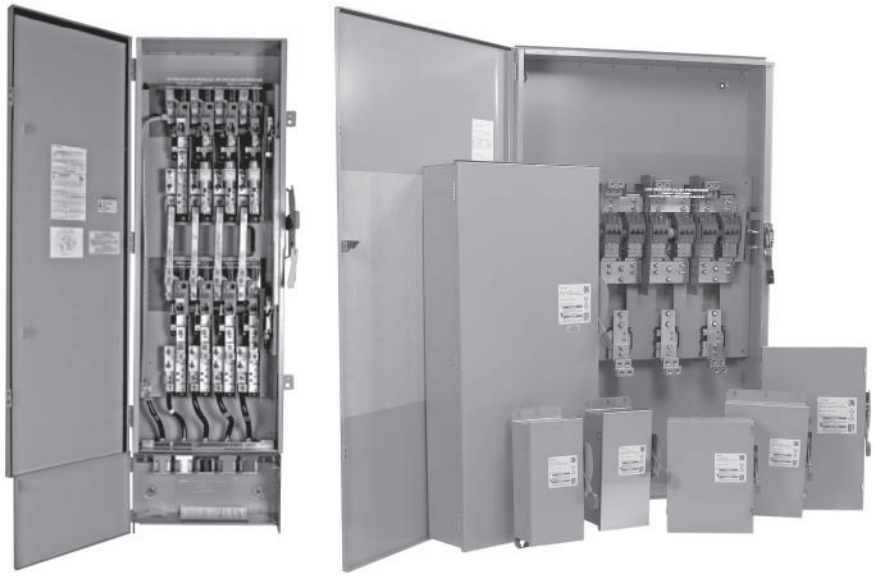
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Specifications

See Eaton's *Product Specification Guide*, available on CD or on the Web.

CSI Format:	1995	2010
Safety Switches	**Section 16441A**	**Section 26 28 16.16**
Auxiliary Power Heavy-Duty Safety Switch	**Section 16441B**	**Section 26 28 16.23**
Elevator Control Switch	**Section 16445**	**Section 26 28 16.17**
Quick-Connect Double-Throw	**Section 16441C**	**Section 26 28 16.26**



Quick-Connect Double-Throw Safety Switches

Safety Switches


General-Duty


Heavy-Duty


EnviroLine


Double-Throw


Rotary

Safety switches have a number of applications from service entrance to branch circuit protection. They are also horsepower rated for use as motor circuit switches. The Application Guide **Table 28.0-1**, below, summarizes major differences and similarities between the heavy-duty and general-duty type of Eaton's safety switches.

Individual catalog pages and selection tables provide more specific information as to number of poles, voltage, specifications and horsepower ratings.

K-Series Switch Design

Note: K-Series design available where the letter K appears in the catalog number.

The efficient K-Series design uses double-break, rotary blade action for high performance and reliability. Here are some of the characteristics of the K-Series type of switch:

- High visibility handle and nameplate for indication of switch position—ON or OFF
- Clear line terminal shields—on heavy-duty switches only
- Unique Control Pole option—allows the addition of a late-make/early-break, 15A switched pole for disconnecting control power circuits
- Generous wiring room—meeting or exceeding NEC® wire bending space
- Built-in fuse pullers in NEMA® 4X and 12 enclosed switches through 200A
- Side-hinged NEMA 3R enclosure doors
- Tangential knockouts in heavy-duty NEMA 1 and 3R enclosures through 200A
- Type 304 or 316 stainless steel enclosures for UL® NEMA 4X applications—dust-tight, watertight and corrosion-resistant
- NEMA 12 enclosures for 30–800A switches also rated for NEMA 3R use when a factory provided drain hole is opened
- Rated for 60°C/75°C wire connection

Table 28.0-1. Safety Switch Application Guide—See Catalog Selection Tables for Specific Ratings

Application/ Features	General-Duty Safety Switches	Heavy-Duty Safety Switches
Type of facility	Residential, commercial, light industrial	Commercial, institutional, industrial
Maximum voltages	240 Vac—250 Vdc in larger sizes	600 Vac—250 Vdc and 600 Vdc
Short-circuit rating for non-fused switches	10,000 rms symmetrical amperes	10,000 rms symmetrical amperes. Higher combination ratings available with upstream Eaton molded-case circuit breakers and fuses.
Short-circuit rating with standard fuse clips	With Class H fuse clips—10,000 rms symmetrical amperes	Switches with Class H Fuse Clips—10,000 rms amperes 800–1200A switches with Class L fusing—200,000 rms
Short-circuit rating with fuse options	Class R fuse adaptation and 400–600A switches with T or J fuse adaptation—100,000 rms amperes	Switches with Class R or Class J fusing and 200–800A switches with Class T fuse adaptation—200,000A at 480V and 100,000 rms symmetrical amperes at 600V
Ampere sizes	30, 60, 100, 200, 400, 600	30, 60, 100, 200, 400, 600, 800, 1200
Maximum horsepower ratings	200 hp at 240 Vac	250 hp at 240V, 500 hp at 480 and 600 Vac
UL (NEMA) enclosure types	Type 1—general purpose indoor use Type 3R—rainproof and sleet-resistant	Type 1 indoor, 3R outdoor Type 4 watertight and dust-tight Type 4X watertight, dust-tight and corrosion-resistant Type 12 indoor falling dust, dirt and liquids Type 12/3R convertible to outdoor use Type 7/9 hazardous (classified) locations
Terminals	Box lug (screw pressure) for Al/Cu wire	Box lug (screw pressure) for Al/Cu wire
Electrical interlock—snap-switch type	Field-installed kit, 200–600A sizes	Field- or factory-installed for all sizes
Control pole interlock	Field-installed kit, 400–600A sizes	Field-installed for K-Series switches
Fuse pullers	Not available	Standard in Type 4X and 12 enclosed switches through 200A field-installed for all other 30–200A switches

General-Duty



General-Duty (Plug Fuse)



General-Duty (Cartridge Fuse)

For residential and commercial applications. Suitable for light-duty motor circuits and service entrance.

- 240 Vac
- 30–600A
- For short-circuit ratings, see Technical Data
- Suitable for service entrance applications unless otherwise noted
- Fusible and non-fusible switches are 100% load break and load make rated
- The continuous load current of fusible switches is not to exceed 80% of the rating of fuses employed in other than motor circuits. Non-fusible switches are 100% fully rated
- 200–600A features K-Series design
- Horsepower rated
- Ample wire bending space provides for easier installation
- With Class R fuses, switches may be used on systems capable of delivering 100,000A rms symmetrical

Note: Plug fuse switches are not service entrance rated.

Heavy-Duty

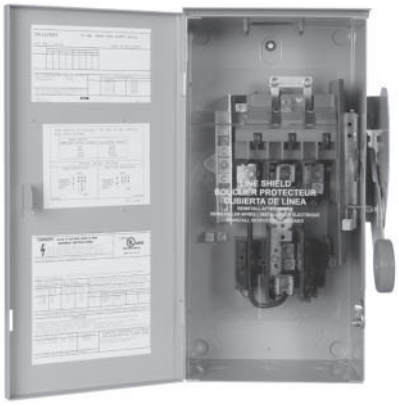


Heavy-Duty

For heavy commercial and industrial applications where reliable performance and service continuity are critical.

- 600 Vac, 600 Vdc maximum
- 30–1200A
- For short-circuit ratings, see Technical Data
- Horsepower rated
- Fusible and non-fusible switches are 100% load break and load make rated
- The continuous load current of fusible switches is not to exceed 80% of the rating of fuses employed in other than motor circuits. Non-fusible switches are 100% fully rated
- Suitable for service entrance applications unless otherwise noted
- Visible double break rotary blade mechanism. Two points of contact provide a positive open and close, easier operation, and also help to prevent contact burning for longer contact life
- Triple padlocking capability. Personnel safety feature because the large hasp can accommodate up to three 3/8-inch (9.5 mm) shank locks. Cabinet door can be further padlocked at the top and bottom
- Interlocking mechanism. Door cannot be opened when the handle is in the ON position. Built-in defeater mechanism provides for user access when necessary
- De-ionizing arc chutes. Arc chutes confine and suppress the arcs produced by contacts under load

Heavy-Duty—Solar Photovoltaic Switch



Heavy-Duty—Solar Photovoltaic Switch

Marked as suitable for NEC 690 PV applications up to 600 Vdc.

- UL 98 listed
- All switches are single-pole and suitable for switching one circuit
- Clear polycarbonate deadfront to guard against accidental contact with live parts
- Suitable for positive and negative grounded systems—100% load break rated with current flowing in either direction
- NEC 690.17—compliant labeling warning that the switch terminals may be energized in the open position
- NEC 690.14.(C) two required "PV System Disconnect" labels included
- Isolated ground terminals (neutral) for grounded conductors
- Ground lug for equipment grounding conductor
- NEMA 3R, 12 and 4X stainless enclosures
- Fusible and non-fusible configurations—Class R fuse clips standard
- Fuse clips are located on the center pole to ensure that both fuse clips are de-energized—meets NEC Article 690.16, which requires isolation of the fuse from all potential supply sources

Safety Switch Selection Guide

Table 28.0-3. Safety Switch Selection Guide

Type		Fuse Type		Fuse Class	Ampere Rating	Number of Poles	Enclosure Types							
							NEMA 1	NEMA 3R	NEMA 12	NEMA 4 Painted Steel	NEMA 4X Stainless Steel	NEMA 4X Non-Metallic	NEMA 4X 316 Grade Stainless Steel	NEMA 7/9
General-duty	Single-throw max. 240 Vac horsepower rated	Fusible	Plug	—	30	1 and 2	Yes	Yes	—	—	—	—	—	—
			Cartridge	H	30–600	2 and 3	Yes	Yes	—	—	—	—	—	—
		Non-fusible		—	30–600	2 and 3	Yes	Yes	—	—	—	—	—	—
Heavy-duty	Single-throw max. 600 Vac horsepower rated	Fusible	Cartridge	H L	30–600 800–1200	2, 3 and 4	Yes up to 1200A	Yes up to 1200A	Yes ① up to 1200A	Yes 400–1200A	Yes up to 1200A	Yes up to 200A	Yes up to 1200A	Yes ② up to 100A
		Non-fusible		—	30–1200	2, 3 and 4	Yes	Yes	Yes ① up to 1200A	Yes 400–1200A	Yes up to 1200A	Yes up to 200A	Yes up to 1200A	Yes up to 100A
Six-pole motor circuit	Single-throw max. 600 Vac	Fusible	Cartridge	H	30–200	6	—	Yes	Yes ①	—	Yes	—	Yes	—
		Non-fusible		—	30–200	6	—	Yes	Yes ①	—	Yes	—	—	—
Double-throw	Max. 600 Vac horsepower rated	Fusible	Cartridge	H T (600V) T (240V) L	30–200 400 600 800–1200	2 and 3	Yes up to 600A	Yes up to 400A	—	—	—	—	—	—
		Non-fusible		—	30–1200	2, 3, 4 and 6	Yes	Yes	Yes up to 400A	—	Yes up to 400A	—	—	—
Rotary switches	Max. 600 Vac	Non-fusible		—	16–125	3, 4	Yes	Yes ①	Yes ①	—	Yes	Yes	—	—
Auxiliary power heavy-duty	Max. 600 Vac horsepower rated	Fusible	Cartridge	H	30–200	3	—	Yes	—	—	—	—	—	—
		Non-fusible		—	30–200	3	—	Yes	—	—	—	—	—	—
Elevator control switch	Max. 600 Vac horsepower rated	Fusible	Cartridge	J	30–200	3	Yes	Yes	Yes	Yes	—	—	—	—

① NEMA Type 12 enclosures (30–800A) can be field modified to meet NEMA 3R rainproof requirements when a factory provided drain screw is removed.
② Class J clips provided.

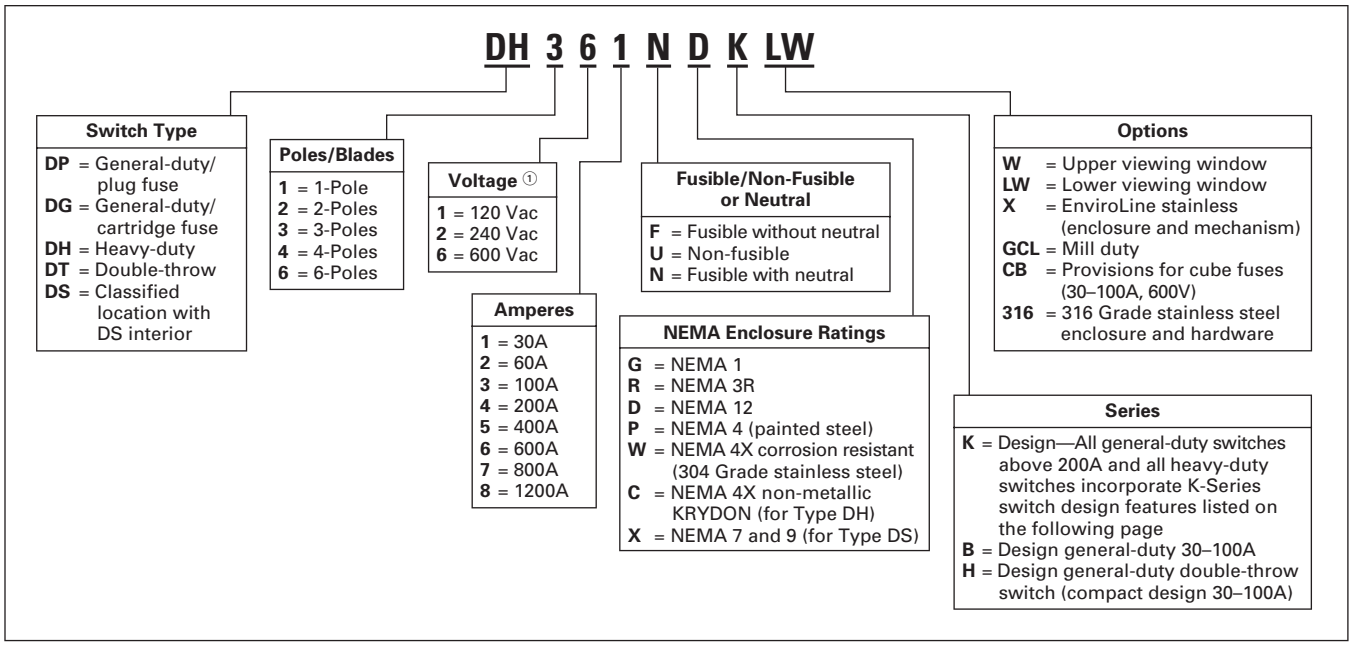
Table 28.0-4. EnviroLine Safety Switch Selection Guide

EnviroLine	Fuse Type		Fuse Class	Ampere Rating	Number of Poles	Enclosure Types					
						NEMA 1	NEMA 3R	NEMA 12	NEMA 4 Painted Steel	NEMA 4X Stainless Steel	NEMA 4X Non-Metallic
Stainless enclosure with stainless mechanism	Fusible	Cartridge	H	30–400	2 and 3	—	—	—	—	Yes	—
	Non-fusible	—	—	30–400	3	—	—	—	—	Yes	—
Viewing window upper or lower ③④	Fusible	Cartridge	H L	30–600 800	3	—	—	Yes ⑤	Yes	Yes	—
	Non-fusible	—	—	30–800	3	—	—	Yes ⑤	Yes	Yes	—
Welding receptacle	Fusible	Cartridge	H	30–100	3	—	—	Yes	—	Yes	—
	Non-fusible	—	—	60	3	—	—	Yes	—	Yes	—
Non-metallic	Fusible	Cartridge	H	30–200	3	—	—	—	—	—	Yes
	Non-fusible	—	—	30–200	3	—	—	—	—	—	Yes

③ 800A upper window switches are not UL listed.
④ Lower window switches are available through 600A.
⑤ NEMA Type 12 enclosures (30–800A) can be field modified to meet NEMA 3R rainproof requirements when a factory provided drain screw is removed.

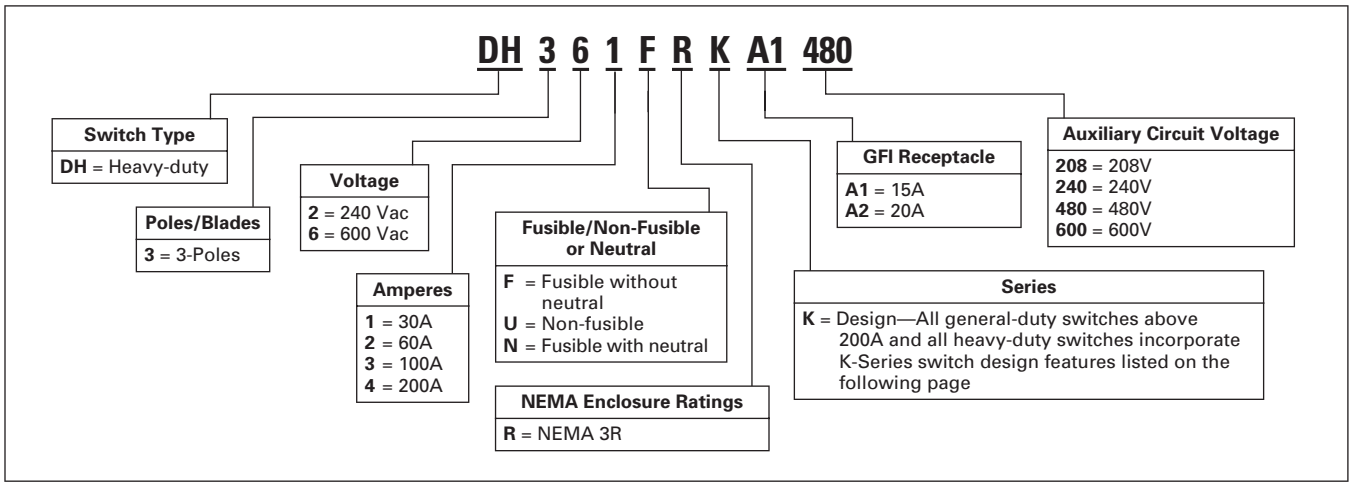
Catalog Numbering System

Table 28.0-5. Safety Switch Catalog Numbering System



① For DC ratings, check individual switch ratings.

Table 28.0-6. Auxiliary Power Heavy-Duty Safety Switch Catalog Numbering System



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Table 28.0-7. Quick-Connect Safety Switch Catalog Numbering System

DT 3 6 5 N U R K _ LC

Switch Type
DT = Heavy-duty double-throw
DH = Heavy-duty single-throw

Poles
2 = 2 poles
3 = 3 poles
4 = 4 poles

Maximum Voltage
2 = 240 Vac
6 = 600 Vac

Switch Ampacity
3 = 100A
4 = 200A
5 = 400A
6 = 600A
7 = 800A

Upper Switch ①
U = Non-fusible
F = Fusible
N = Fusible with solid neutral
SN = Fusible with switched neutral

Lower Switch ①②
U = Non-fusible
F = Fusible
N = Fusible with solid neutral
SN = Fusible with switched neutral

Series
K = K

Enclosure
G = NEMA 1
R = NEMA 3R

Neutral ③
Blank = No neutral or included with switch designation
N = Solid neutral
SN = Switched neutral

Receptacle Type
LC = Cam-Lok
LCR = Cam-Lok reverse pin
LP = Posi-Lok
PLR = Posi-Lok reverse pin

① When upper and lower switches are the same, the switch configuration is consolidated in one letter (e.g.,"U" not "UU"). Also, a switch with a neutral will have either a solid neutral or a switched neutral, not both. Lastly, a switched neutral pole is never fused.
② Heavy-duty single-throw switches will not have a lower switch option.
③ This field is only used when a switch is completely non-fused.

Table 28.0-8. Elevator Control Switch Catalog Numbering System

ES 1 T2 R2 G F1 R N

Switch Type
ES = Elevator control switch

Amperes
1 = 30A
2 = 60A
3 = 100A
4 = 200A
5 = 400A

Industrial Control Transformer ④
T2 = 208V
T3 = 240V
T1 = 480V
T4 = 600V

Fire Safety Interface Relay (3PDT, 10 A, 120 V)
R2 = 24 Vdc coil
R1 = 120 Vac coil

Pilot Light "ON"
G = Green
R = Red
W = White

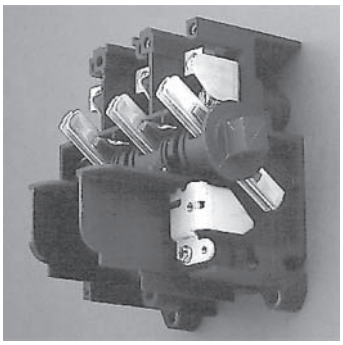
Fire Alarm Voltage Monitoring Relay ⑤
F1 = Single-pole
F3 = Three-pole

Enclosure Options ⑥
R = NEMA 3R
D = NEMA 12
W = NEMA 4X stainless

Isolated Full Capacity Neutral Lug
N = Neutral lug

④ 100 VA with primary and secondary fusing (120V secondary).
⑤ To monitor shunt trip voltage.
⑥ NEMA 1 standard with no suffix designation required.
Note: All modules are three-pole, 600V and contain a key to test switch and mechanically interlocked auxiliary contact as standard.

All General-Duty Switches Above 100A and All Heavy-Duty Switches Incorporate These K-Series Switch Design Features



Visible Double Break Rotary Blade Mechanism

Two points of contact provide a positive open and close, easier operation, and also help prevent contact burning for longer contact life.



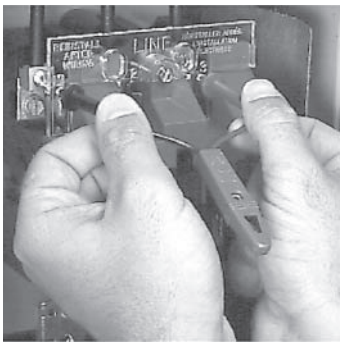
Clearly Visible Handle

The position (ON or OFF) can be clearly seen from a distance and the length provides for easy operation.



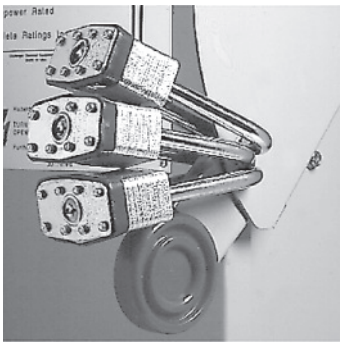
Interlocking Mechanism

Door cannot be opened when the handle is in the ON position. Front side operable defeater mechanism provides for user access when necessary.



Clear Line Shield

Protects against accidental contact with energized parts. Probe holes enable the user to test if the line side is energized without removing the shield.
Not provided on general-duty switches.



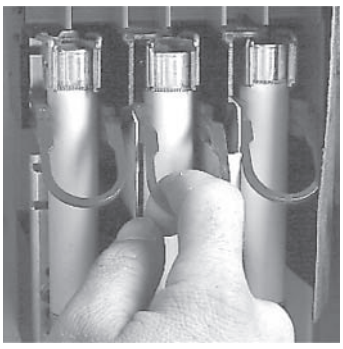
Triple Padlocking Capability

Personnel safety feature because the large hasp can accommodate up to three 3/8-inch (9.5 mm) shank locks.



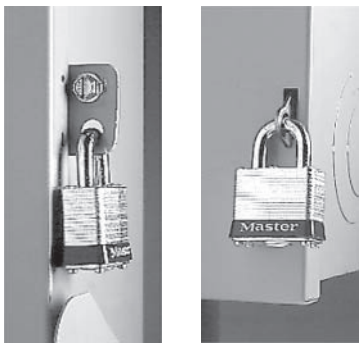
Tangential Knockouts

An ample number are provided on the top, bottom and sides of both NEMA Types 1 and 3R enclosures through 200A.



Built-in Fuse Pullers (NEMA 12 and 4X 30–200A Only)

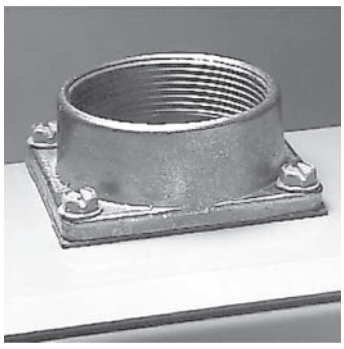
Provide easy removal of fuses.



Additional Locking Capability

Cabinet door can be further padlocked at the top and bottom as applicable.

Note: Size of hasp in inches (mm):
30–100A—0.344 (8.7) 0.250 shank
200–1200A—0.50 (12.7) 0.375 shank



Bolt-On Hub Kits

For switches in a NEMA Type 3R, 12, 4 or 4X enclosure.

Accessories, Hubs, Lug Data


DH030NK


DS16CP


DS200EK1


DS200GK


DS22JK


DS36CL


DS56CK


DS30FP


DS12FK

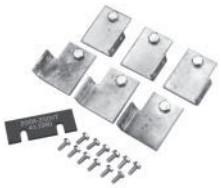

DS426TK

Table 28.0-9. Safety Switches—Accessories

Description	Catalog Number
Neutral Kits/Ground Kits	
30A DG	**DG030NB**
60–100A DG	**DG100NB**
200A DG, DH (NEMA 1, 3R enclosures)	**DG200NK**
30–60A DH	**DH030NK**
100A DH	**DH100NK**
200A DH (NEMA 4X, 12 enclosures)	**DH200NK**
400A DG, DH	**DS400NK**
600A DG, DH	**DS600NK**
400–600A Fusible DT, 800–1200A DH	**DS800NK**
30–100A DT	**DT100NK**
200A DT	**DT200NK**
400A Non-fusible DT	**DT400NK**
600A Non-fusible DT	**DT600NK**
800A DT	**DT800NK**
1200A DT	**DT1200NK**
Ground Lug Kits	
30–100A DG	**DG030GB**
30–100A DH, DT ①	**DS100GK**
200A DG, DH, DT	**DS200GK**
400–600A DG, 400–1200A DH, 400–1200A DT	**DS468GK**
Switching Neutral Bonding Kits	
30–100A DT, three-pole, four-pole	**DT100BK**
200A DT, three-pole, four-pole	**DT200BK**
400A DT, three-pole, four-pole	**DT400BK**
600A DT, three-pole, four-pole	**DT600BK**
800A DT, three-pole, four-pole	**DT800BK**
Control Pole Kit	
400–600A DG, 30–1200A DH, 30–800A DT	**DS16CP**
Auxiliary Contact Kits	
All switches (except 30–100A DG) 1NO/1NC	**DS200EK1**
All switches (except 30–100A DG) 2NO/2NC	**DS200EK2**
Copper Lug Kits	
30A DH, DT ②	**DS16CL**
60A DH, DT ②	**DS26CL**
100A DH, DT ②	**DS36CL**
200A DH ②	**DS46CL**
400A DH (NEMA 4, 4X, 12 enclosures) ③	**DS56CL**
600–800A DH (NEMA 4, 4X, 12 enclosures) ③	**DS66CL**
Crimp Lug Pad Kit (NEMA 4, 4X, 12 Enclosures)	
400–600A DH ②	**DS56CK**
800A DH ③	**DS76CK**
400–800A neutral DH ④	**DS800CNK**

① Ground bar kit is not listed on device publications.
② Order one kit for three poles.
③ Order one kit for each pole.
④ Order one kit per switch.

Note: Accessories are not applicable to NEMA 7/9 switches.

Description	Catalog Number
Fuse Puller Kits	
30–60A DH ②	**DS30FP**
30–60A DH ⑤	**DS60FP**
100A DH ②	**DS100FP**
200A DH ②	**DS200FP**
"J" Fuse Adapter Kits	
60A 240V DH ②	**DS22JK**
60A DT and receptacle switches ②	**DS26JK**
400A 600V DT ⑥	**DT400JK**
600A 240–600V DH only ③	**DS600JK**
"R" Fuse Adapter Kits ②	
30A DG	**DG030RB**
100A DG	**DG100RB**
30A 240V DH, DT	**DS12FK**
30A 600V DH, DT, 60A 240V DH, DT, 60A DG	**DS16FK**
60A 600V DH, DT	**DS26FK**
100A 240–600V DH, DT	**DS36FK**
200A 240–600V DH, DT, 200A DG	**DS46FK**
400A 240–600V DH, 240V DT, 400A DG	**DS56FK**
600A 240–600V DH, 600A DG	**DS66FK**
"T" Fuse Adapter Kits	
200A 240V DH ②	**DS426TK**
200A 600V DH ②	**DS466TK**
400A 240V DG, DH ③	**DS526TK**
400A 600V DH ③	**DS566TK**
600A 240V DG, DH ③	**DS626TK**
600A 600V DH ③	**DS666TK**
800A 240V DH ③	**DS726TK**
800A 600V DH ③	**DS766TK**
800–1200A 600V DH DT	
Hookstick handle	**DH800HSH**
Lubricating grease for safety switch blades and contacts (Each kit contains three 30 cc tubes of lubricating grease.)	**DSLUBEKIT**
Auxiliary Contacts for:	
16–25A three-, four-pole rotary switches, includes holder and contact (1NO/1NC)	**CMAC**
30–40A three-pole rotary switches, includes holder and contact (1NO)	**CRAC3** ⑦
60–125A three-pole rotary switches, includes holder and contact (1NO)	**CWAC3** ⑦
30–40A four-pole rotary switches, includes holder and contact (1NO)	**CRAC4** ⑦
30–125A three-, four-pole, contact only (1NC)	**CRAA** ⑦
30–125A three-, four-pole, contact only (1NO)	**CRAB** ⑦

⑤ Receptacle switches.
⑥ Order one kit for six poles.
⑦ The mechanism is reversed on these contacts.

Hubs



DS075H1

Table 28.0-10. Plate Type Hubs for NEMA Type 3R Enclosures (Up to 200A)

Group 1 General-Duty, Heavy-Duty, Double-Throw Through 100A			Group 2 General-Duty, Heavy-Duty, Double-Throw—200A		
Conduit Size		Catalog Number	Conduit Size		Catalog Number
Inches	mm		Inches	mm	
3/4	19.1	**DS075H1**	2	50.8	**DS200H2**
1	25.4	**DS100H1**	2-1/2	63.5	**DS250H2**
1-1/4	31.8	**DS125H1**	3	76.2	**DS300H2**
1-1/2	38.1	**DS150H1**	—	—	**—**
2	50.8	**DS200H1**	—	—	**—**

Note: Catalog Number **DS900AK** Adapter Kit—Permits Installation of Group 1 Hubs on 200A Type General-Duty, Heavy-Duty and Double-Throw Switches.

Table 28.0-11. Myers Type Hubs
NEMA Type 3R (400A and Above)
NEMA Types 4, 4X (Stainless Steel), 12

Conduit Size		Catalog Number
Inches	mm	
1/2	12.7	**DS050MH**
3/4	19.1	**DS075MH**
1	25.4	**DS100MH**
1-1/4	31.8	**DS125MH**
1-1/2	38.1	**DS150MH**
2	50.8	**DS200MH**
2-1/2	63.5	**DS250MH**
3	76.2	**DS300MH**
3-1/2	88.9	**DS350MH**
4	101.6	**DS400MH**
5	127.0	**DS500MH**

Note: Contact the Flex Center at 1-888-329-9272 for information on hubs for non-metallic NEMA 4X switches.

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Table 28.0-12. Standard Lug Capacities

Ampere Rating	Minimum Wire Size	Maximum Wire Size	Wire Type
30A DP	#14	#10	Cu **OR**
	#12	#10	Al
30A DG	#14	#6	Cu/Al
30A DH, DT	#14	#2	Cu/Al
60A DG	#14	#1/0	Cu/Al
60A DH, DT	#14	#2	Cu/Al
100A DG ①	#14	#1/0	Cu/Al
100A DH, DT	#14	#1/0	Cu/Al
200A DG, DT	#6	250 kcmil	Cu/Al
200A DH Type 1 and 3R	#6	250 kcmil	Cu/Al
200A DH Type 4 and 12	#6	300 kcmil	Cu/Al
400A DG, DH, DT	(2) #1/0	(2) 300 kcmil	Cu/Al **OR**
	(1) #1/0	(1) 750 kcmil	Cu/Al
600A DG	(1) #2	(1) 600 kcmil	Cu/Al **AND**
600A DH	(1) #1/0	(1) 750 kcmil	Cu/Al
600A DT (Fusible)			
600A DT (Non-fusible)	(2) #250	(2) 500 kcmil	Cu/Al
800A DH	(4) #1/0	(4) 750 kcmil	Cu/Al
800A DT	(3) #250	(3) 500 kcmil	Cu/Al
1200A DH, DT	(4) #1/0	(4) 750 kcmil	Cu/Al
Copper-Bodied Lugs			
30A Cu	#14	#6	Cu
60A Cu	#14	#4	Cu
100A Cu	#6	#1/0	Cu
200A Cu	#6	250 kcmil	Cu
400A Cu	#1/0	500 kcmil	Cu
600A Cu	(2) #1/0	(2) 500 kcmil	Cu

① The maximum size aluminum or copper-clad aluminum wire allowable for applications where the conductor enters or leaves the enclosure through the wall opposite its terminal is #1 gauge.

Note: Although certain lug capacities are larger than required, only minimum wire bending space is provided per the requirements noted in NEC Tables 373.6 (a) and (b) for respective ampere ratings.

Table 28.0-13. Available Lug Capacities of the Double-Throw Switch Assembly with Cam-Lok or Posi-Lok Receptacles

Double Throw Switch Size—Cam-Lok or Posi-Lok Receptacles	Service Terminal Openings	Load Terminal Openings	Switched Neutral Pole Load Terminal Openings	Solid Neutral Terminal Openings	Ground Terminal Openings	Receptacle Bypass Terminal
100	(1) 1/0–14 AWG Cu/Al	(1) 1/0–14 AWG Cu/Al	(1) 1/0–14 AWG Cu/Al	(2) 1/0–14 AWG, (1) 2–14 AWG Cu/Al	(3) 2–14 AWG Cu/Al	(1) 10–32 Screw mounting
200	(1) 300 kcmil–6 AWG Cu/Al	(1) 250 kcmil–6 AWG Cu/Al	(1) 250 kcmil–6 AWG Cu/Al	(2) 250 kcmil–6 AWG, (1) 1/0–14 AWG, (1) 2–14 AWG Cu/Al	(3) 2–14 AWG Cu/Al	(2) 1/4 Studs, 1.75-inch spacing
400	(1) 750 kcmil–1/0 or (2) 300 kcmil–1/0 Cu/Al	(1) 750 kcmil–1/0 or (2) 300 kcmil–1/0 Cu/Al	(1) 750 kcmil–1/0 or (2) 300 kcmil–1/0 Cu/Al	(6) 500 kcmil, (6) 250 kcmil–6 AWG Cu/Al	(4) 250 kcmil–6 AWG Cu/Al	(2) 1/2-13 UNC studs, 1.75-inch spacing
600	(4) 750 kcmil–3/0 Cu/Al	(4) 500–250 kcmil Cu/Al	(4) 500–250 kcmil Cu/Al	(6) 500–250 kcmil, (4) 250 kcmil–6 AWG Cu/Al	(4) 250 kcmil–6 AWG Cu/Al	(2) 1/2-13 UNC studs, 1.75-inch spacing
800	(4) 750 kcmil–3/0 Cu/Al	(4) 500–250 kcmil Cu/Al	(4) 500–250 kcmil Cu/Al	(6) 500–250 kcmil, (4) 250 kcmil–6 AWG Cu/Al	(4) 250 kcmil–6 AWG Cu/Al	(2) 1/2-13 UNC studs, 1.75-inch spacing

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Table 28.0-14. Quick-Connect Double-Throw Standard Receptacles and Corresponding Connection Plugs (Part Numbers are Cooper Crouse-Hinds)

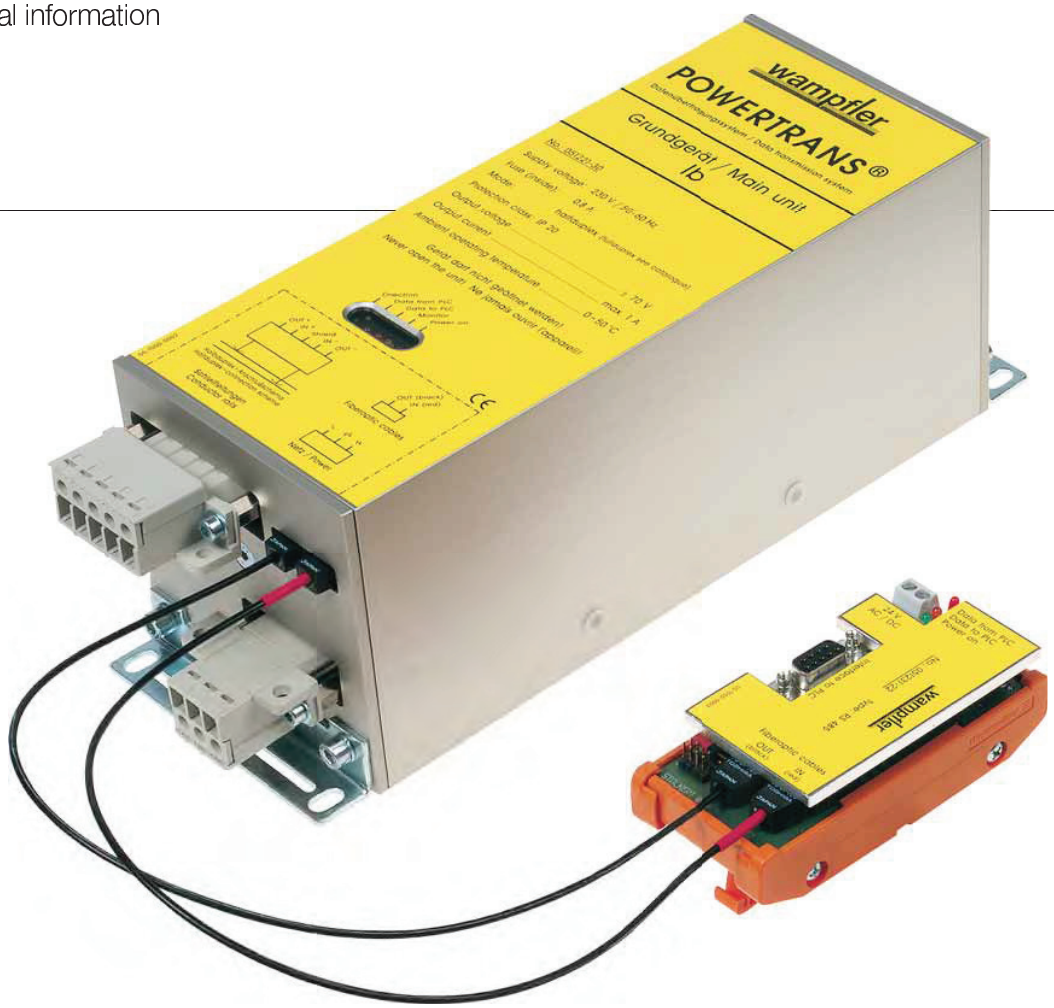
Double Throw Switch Size—Cam-Lok or Posi-Lok Receptacles		Cam-Lok Connectors		Posi-Lok Connectors	
		Receptacle	Plug	Receptacle Panel	Plug
100	Ground (green) Neutral (white) A Phase (black) B Phase (red) C Phase (blue)	E1016-1635S E1016-1636S E1016-1600S E1016-1602S E1016-1612S	E-Z1016-8366 E-Z1016-8367 E-Z1016-8387 E-Z1016-8389 E-Z1016-8393	Two-pole, three-wire with solid neutral or three-pole, three-wire with switched neutral pole (two-phase and single neutral pole): E0200-1696 / three-pole, three-wire (no neutral): E0200-1686 / three-pole, four-wire with solid neutral or four-pole, four-wire with switched neutral pole (three-phase and single neutral pole): E0200-1687	E0200-281 E0200-282 E0200-283 E0200-284 E0200-285
200	Ground (green) Neutral (white) A Phase (black) B Phase (red) C Phase (blue)	E1016-1635S E1016-1636S E1016-1600S E1016-1602S E1016-1612S	E-Z1016-8366 E-Z1016-8367 E-Z1016-8387 E-Z1016-8389 E-Z1016-8393	Two-pole, three-wire with solid neutral or three-pole, three-wire with switched neutral pole (two-phase and single neutral pole): E0200-1696 / three-pole, three-wire (no neutral): E0200-1686 / three-pole, four-wire with solid neutral or four-pole, four-wire with switched neutral pole (three-phase and single neutral pole): E0200-1687	E0200-281 E0200-282 E0200-283 E0200-284 E0200-285
400	Ground (green) Neutral (white) A Phase (black) B Phase (red) C Phase (blue)	E1016-1635S E1016-1636S E1016-1600S E1016-1602S E1016-1612S	E-Z1016-8366 E-Z1016-8367 E-Z1016-8387 E-Z1016-8389 E-Z1016-8393	Two-pole, three-wire with solid neutral or three-pole, three-wire with switched neutral pole (two-phase and single neutral pole): E0400-1696 / three-pole, three-wire (no neutral): E0400-1686 / three-pole, four-wire with solid neutral or four-pole, four-wire with switched neutral pole (three-phase and single neutral pole): E0400-1687	E0400-281 E0400-282 E0400-283 E0400-284 E0400-285
600	Ground (green) Neutral (white) A Phase (black) B Phase (red) C Phase (blue)	(2) E1016-1635S (2) E1016-1636S (2) E1016-1600S (2) E1016-1602S (2) E1016-1612S	(2) E-Z1016-8366 (2) E-Z1016-8367 (2) E-Z1016-8387 (2) E-Z1016-8389 (2) E-Z1016-8393	Two-pole, three-wire with solid neutral or three-pole, three-wire with switched neutral pole (two-phase and single neutral pole): (2) E0400-1696 / three-pole, three-wire (no neutral): (2) E0400-1686 / three-pole, four-wire with solid neutral or four-pole, four-wire with switched neutral pole (three-phase and single neutral pole): (2) E0400-1687	(2) E0400-281 (2) E0400-282 (2) E0400-283 (2) E0400-284 (2) E0400-285
800	Ground (green) Neutral (white) A Phase (black) B Phase (red) C Phase (blue)	(2) E1016-1635S (2) E1016-1636S (2) E1016-1600S (2) E1016-1602S (2) E1016-1612S	(2) E-Z1016-8366 (2) E-Z1016-8367 (2) E-Z1016-8387 (2) E-Z1016-8389 (2) E-Z1016-8393	Two-pole, three-wire with solid neutral or three-pole, three-wire with switched neutral pole (two-phase and single neutral pole): (2) E0400-1696 / three-pole, three-wire (no neutral): (2) E0400-1686 / three-pole, four-wire with solid neutral or four-pole, four-wire with switched neutral pole (three-phase and single neutral pole): (2) E0200-1687	(2) E0400-281 (2) E0400-282 (2) E0400-283 (2) E0400-284 (2) E0400-285

Note: Switches are not supplied with the mating plugs. Eaton will supply the plug if cord sets are ordered.

Technical Data Sheet

Data Transmission Systems POWERTRANS® Ib (RS485, DH+) Program 0512

Fundamentals
System components
Project, assembly and starting operation
General information

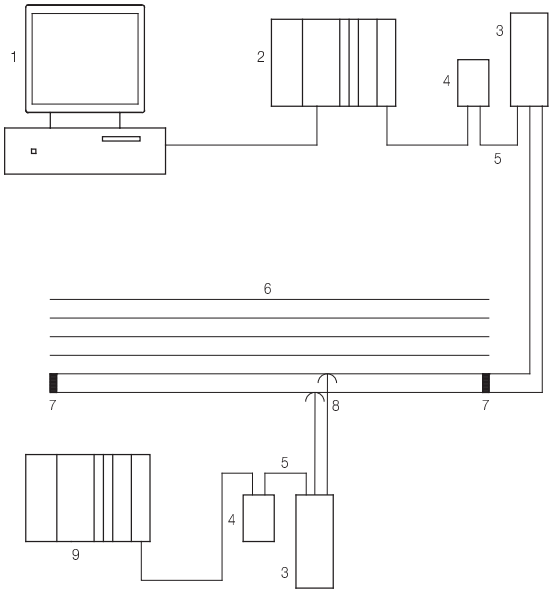


KAT0512-0001b-E

wampfler
solutions for a moving world

Fundamentals

Range of Application: Data Transmission System for Mobile Consumers



1. Stock control computers
2. Automation computers (PLC)
3. POWERTRANS® Ib basic unit
4. POWERTRANS® Ib interface
5. POWERTRANS® Ib pair of optical fibers
6. Wampfler conductor rail
7. Wampfler terminator / conductor rail
8. Wampfler double current collector
9. Decentralized peripheral unit

POWERTRANS® Ib systems are used for
Conductor rails in
- High storage warehouses
- Crane systems
- Hoists
- Transport systems
- Hand-operated overhead conveyor systems
- Handling systems

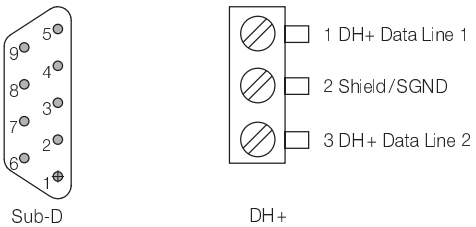
Slip ring bodies in
- Rotary cranes, excavators
- Water treatment works
- Amusement rides
- Manipulators
- Packing machines

Cables for
- Cable reels
- Control cables
- Crane systems

Voltages or currents of the data signals on Bus systems are often too low to achieve a reliable and trouble-free data transmission. Sliding contact surfaces tend to form oxide layers and may cause short-time interruptions in contaminated environments. To achieve low and constant contact resistance between contact surfaces and current collector, POWERTRANS® Ib increases the power level of the data signals. In connection with double current collectors this allows a safe and reliable data transmission.
The increase of the signal level also produces a strong insensibility to inductive and capacitive interference from neighboring conductors to the Bus system (e.g. on cable reels, festoons or longer supplies).
The transparent data transmission prevents relevant retardation times or long-time transmission records.
Reference systems with system connection to various automation computers with standard interfaces RS 485, RS 422, RS 232 and DH+ are in operation.

Operational Principle

Connecting sockets



Interface Connections

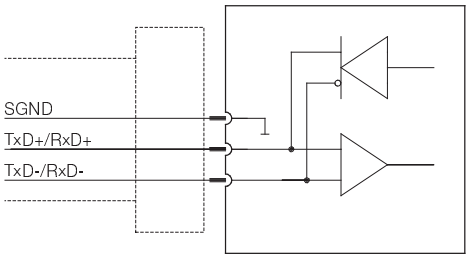
PIN	Sub-D			
	RS 485	RS 422	RS 232	DH+
1	-	-	-	Data Line 1
2	-	Rxd-P	-	SGND
3	Rxd/Txd-P	Txd-P	Txd	Data Line 2
4	-		+12 V	-
5	SGND	SGND	SGND	-
6	+U	+U	-	-
7	-	Rxd-N	-	-
8	Rxd/Txd-N	Txd-N	Rxd	-
9	-	-	-	-

On POWERTRANS Ib the interface is connected to the compact basic unit by optical fibers. If the existing interface is changed, this presents the advantage that only the interface will have to be replaced. Moreover the basic unit can be removed from the interface, which is often placed near a PLC.
The PLC signals are electrically disconnected from sending and receiving by means of Opto-coupling components.
Each unit (basic unit, interface and pair of optical fibers) includes a sender and a receiver.
The sender increases the signal level of the interface signal from unit A to ±70 V (potential-free) for connection to the corresponding transmission medium. The receiver of unit B reduces the signal level back to the appropriate interface level.
The units support different serial data forms, such as RS 485, RS 422, RS 232 oder DH+.
All entries and/or exits are short circuit resistant.
For max. cable lengths use two-wire twisted and shielded cables according to the specifications of the PLC manufacturer.
A 9-pole Sub-D or DH+-clamp provides for the coupling of different interface signals.
In general the transmission rate should be as low as possible, depending on the application. The specific determination of response times and repeating times during programming of the Bus system by the operator additionally supports a safe transmission of data.

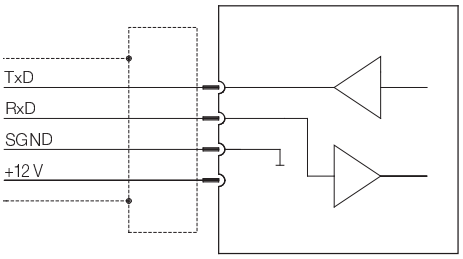
Fundamentals

Typical Data Interfaces of the POWERTRANS® Ib Unit

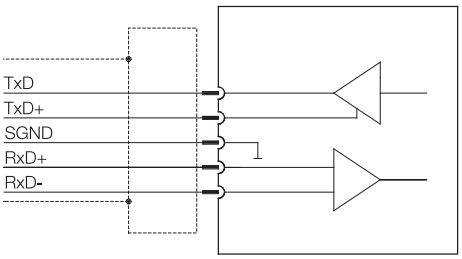
RS485



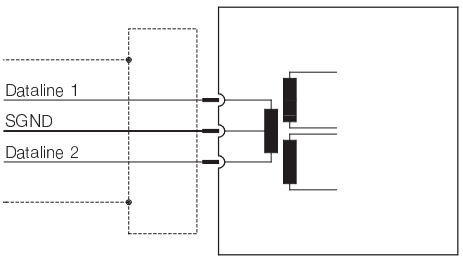
RS232



RS422



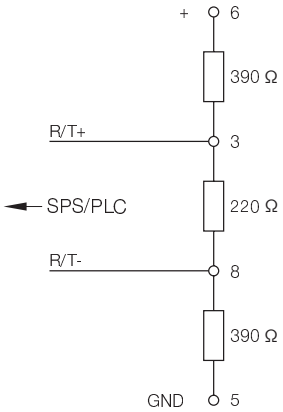
DH+



Terminators for Conductor Rails and Cables

Terminators help to reduce signal distortions that appear on conductor rails, slip rings and cables. The dimensions of the terminators are determined by the corresponding surge impedance of the transmission medium and are adjusted to the customer's specific line system. The Wampfler engineers will be pleased to help you.
The terminators can be mounted by choice in a plastic case or on a cooling body for switchboard applications.
The POWERTRANS® Ib units should be installed as close as possible to the feeding point of the transmission length (e.g. conductor rail).
For further information regarding assembly and electric connection of the POWERTRANS® Ib units please see the corresponding mounting instructions MV0512-0002-E.

Bus Terminators of the Bus Cable



Bus terminators for RS485, e.g. Profibus

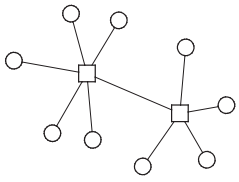
Bus terminators of the bus cable have to be installed according to the manufacturer's instructions for the installed control. There is no bus resistor on the interface.
The application of converters (e.g. RS232 on RS485) requires bus terminators at the interfaces.

Definition

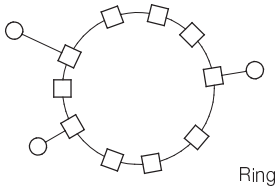
General

POWERTRANS®	Registered trade mark by Wampfler AG
Terminator/conductor rail	Resistance at conductor rail and/or cables to suppress signal reflections on cables
Bit	Binary digit. One bit is the smallest unit that is able to contain some meaningful information
Bus	Common data transmission line for the exchange of information
Data out	Data to PLC respectively personal computer (PC) active
Data in	Data from PLC respectively personal computer (PC) active
Data interface	Interchange point between 2 units with standard values for the physical cables Signal significance and process of the signal exchange Standard examples: RS 485, RS 422, RS 232, DH+
Duplex	Half duplex ⇨ Data transmission in only one direction (send or receive) on 2 cables Full duplex ⇨ Send and receive data transmission on 4 (2+2) cables in both directions (at the same time)
Master	Controlling unit within one segment
Opto coupler	Component for the galvanic separation of electric circuits
Records	Definition of the data formats and control procedures for the communication between the units.
Point to point connection	Direct connection between 2 units for the exchange of information
Sequential	Interdependent sequence of orders
Slave	Controlled unit within one segment
PLC (SPS)	Programmable Logic Control
Signal-to-noise ratio	Difference between intelligence signal and fault signal level
Sub-D-socket	Standard plug and socket connection
Transparent transmission	Signals to be transmitted are only increased in their amplitude, with no relevant time delay
Central Bus control	A Master automation unit controls the Bus access (data exchange process) of the connected Slave automation units

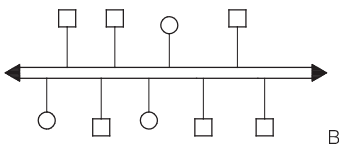
Bus Structure: Connecting Structures of Information Processing Systems



Star wiring



Ring wiring



Bus wiring

□ = Central unit
○ = Participating unit

System Components

POWERTRANS® -Set 230 V / RS485



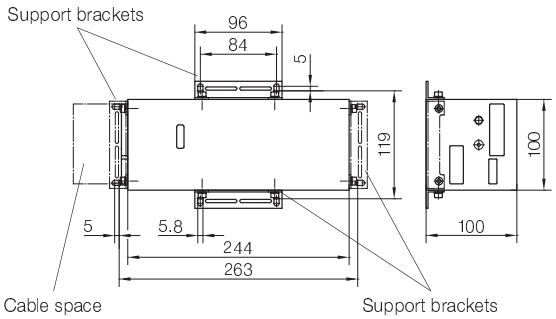
POWERTRANS® -Set composed of:
- 1 x Basic unit 230 V (051221-30)
- 1 x Interface-module RS485 (051221-22)
- 1 x Pair of optical fibres cable 0,4 m (051222-4004)

Delivery incl. Mounting angle and Instruction manual

Supply voltage	Type of operation	Protect. type	Order No.	Weight [kg]
230 V - 50/60 Hz	Halfduplex	IP20	**3032433**	3.5

POWERTRANS® Ib Basic Unit for Interfaces RS485/422/232, DH+

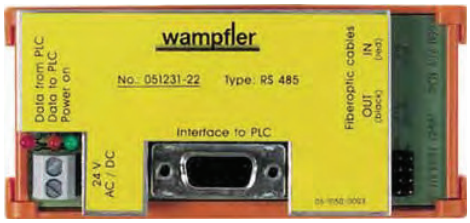


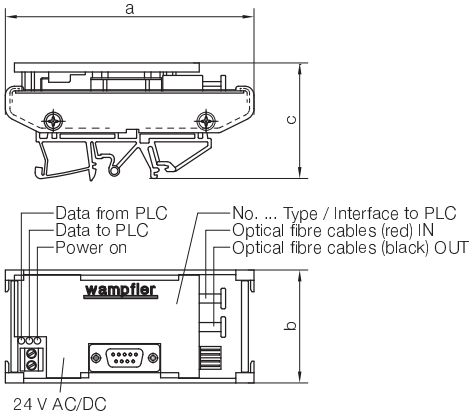


Delivery
Support brackets for front or longside installation enclosed.

Supply voltage	Type of operation	Protect. type	Order No.	Weight [kg]
230 V - 50/60 Hz	Half duplex	IP20	**051221-30**	3.2
115 V - 50/60 Hz			**051221-31**	

POWERTRANS® Ib Interface for Switchboard Assembly on Support Rail TS35





Interface/ standard	Supply voltage	Protection type	Order No.	Dimension [mm] a	b	c	Weight [kg]
RS485	24 V AC/DC	IP20	**051231-22**	109	50	50	0.15
RS422			On inquiry				
RS232							
DH+			**051231-20**	112	75	45	

System Components

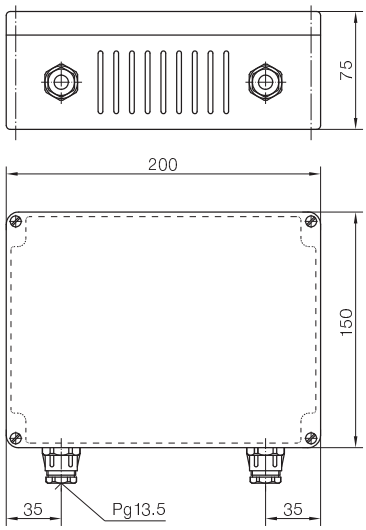
POWERTRANS® Ib Pair of Optical Fibers



Length [m]	Order No.	Length [m]	Order No.	Length [m]	Order No.	Length [m]	Order No.
0.4	**051222-4004**	20	**051222-4200**	50	**051222-4500**	80	**051222-4800**
5.0	**051222-4050**	30	**051222-4300**	60	**051222-4600**	90	**051222-4900**
10.0	**051222-4100**	40	**051222-4400**	70	**051222-4700**		-

Terminator/Conductor Rail – in a Case

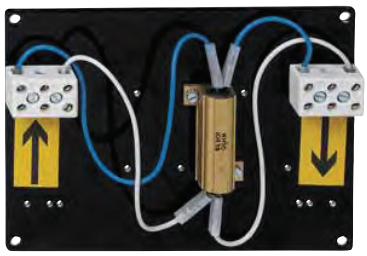


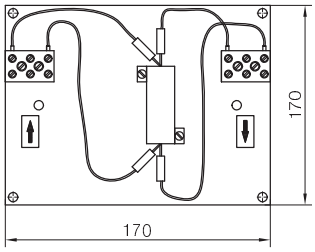


Resistance value [Ω]	Order No.	Weight [kg]
150	**051213-2201**	0.5
330//330	**051213-2203**	
470//470	**051213-2204**	

Type on mounting plate

Connectors/Conductor Rail – without Case for Switchboard Installation



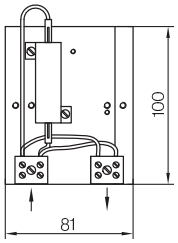


Resistance value [Ω]	Order No.	Weight [kg]
150	**051213-2101**	0.25
330//330	**051213-2103**	
470//470	**051213-2104**	

Type on mounting plate

Terminator/Conductor Rail – without Case for Switchboard Installation on Support Rail TS35





Resistance value [Ω]	Order No.	Weight [kg]
150	**051213-2112**	0.25

Type on cooling body

System Components

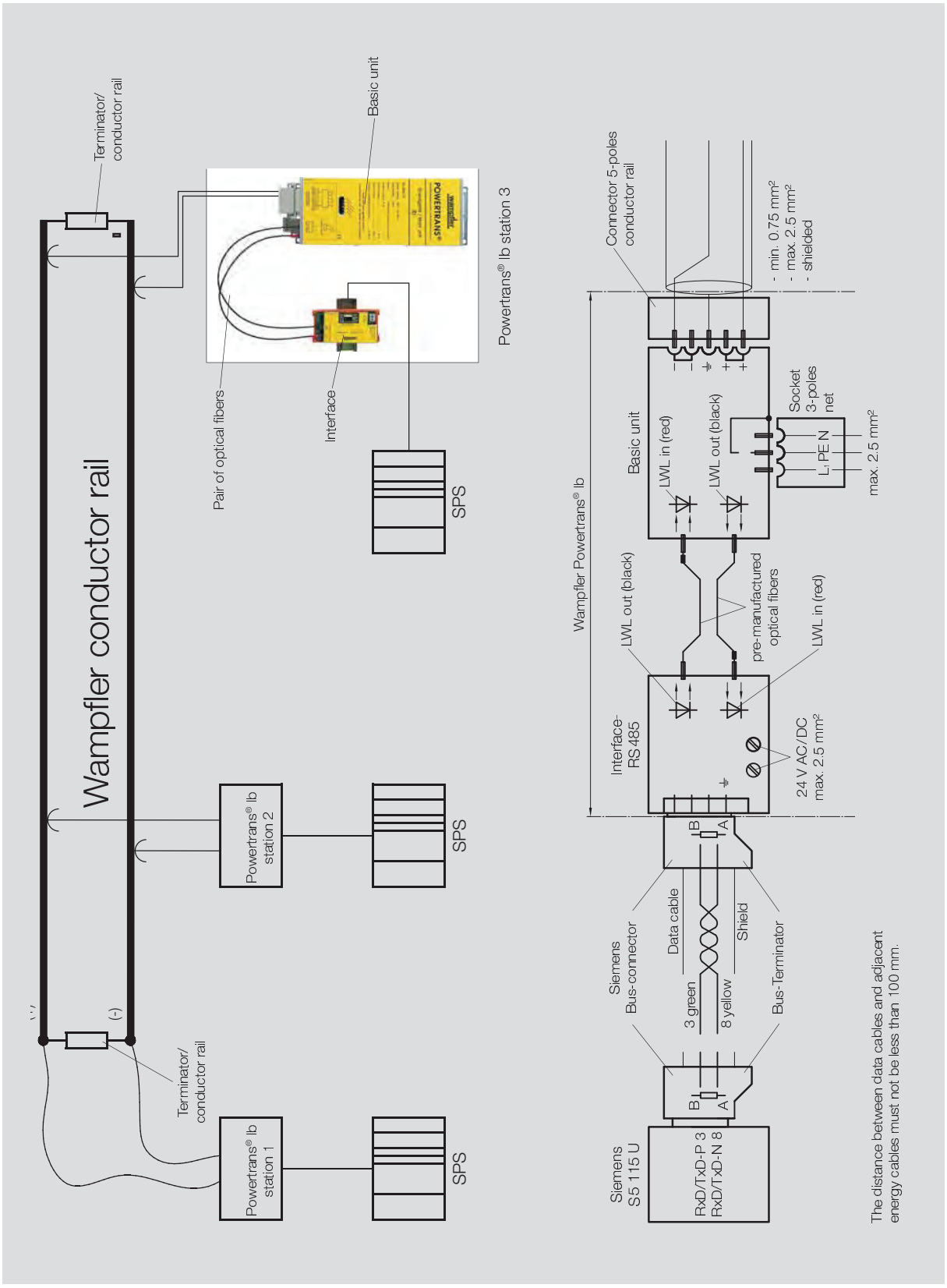
Technical Data

Designation	Dimensions	Remarks
Possible data interfaces	RS 485 (Profibus), RS 422, RS 232, DH+, etc.	Installation for support rails TS 35
Transmission rate	type 187.5 Kbit accordant to Profibus DP 12 Mbit Bus at a cable length of l > 1000 m (wireloop)	Up to 1.5 Mbit, acc. to the system config 1000 m wire loop is equivalent to 500 m conductor rail length
Time response	no relev. time delay/real time	
Length of the system segments	typ. <400 m, depending on the transmission rate	Longer lengths on inquiry
Data exchange	by 2 poles half duplex operation	Projecting for 4 poles Full duplex operation on inquiry
Driver		
• No-load voltage	±70 V potential-free	Connecting cross section 0.75 – 2.5 mm², shielded
• Short-circuit current	0.1 to 1 A	
Receiver		
• Input resistance	typ. 15 kΩ	
• Sensitivity	typ. 4 mA	
Bus unit per segment	Up to 15	
Opto coupler	Isulation 3 kV, 5 mm creep distance	

Operating data		
Basic unit		
• Supply voltage	230 V AC, ±10%, 50/60 Hz	Standard type.; connecting cross section. max. 2.5 mm²
	115 V AC, ±10%, 50/60 Hz	Special type.; connecting cross section. max. 2.5 mm²
• Power absorption	typ. 50 VA, 9 VA stand-by	
• Max. ambient temperature	0°C to +50°C	
• Protection type	IP20	Higher protection type up to IP65 carried out in the switchboard
Interface		
• Supply voltage	24 V AC/DC, ±10%	Connecting cross section max. 2.5 mm²
• Power absorption	2 VA	

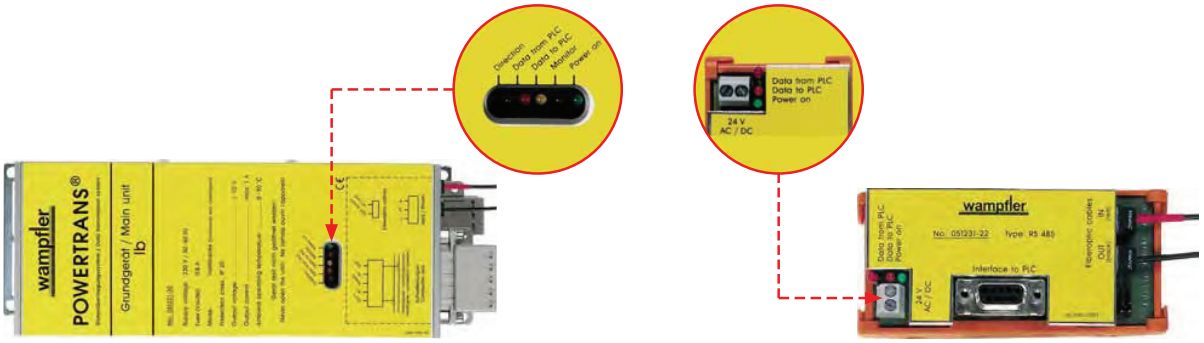
Project, Assembly and Starting Operation

Standard Connection Diagram: Application Example for Half Duplex (2 poles)



Project, Assembly and Starting Operation

Indicators / (LED)



Basic unit Interface

Indicator / LED (Standard)		
●	Power	Signifies voltage supply
●	Monitor	(not connected)
●	Data to PLC	Signifies data out: Data from POWERTRANS® Ib to PLC active
●	Data from PLC	Signifies data in: Data from PLC to POWERTRANS® Ib active
●	Direction	Signifies the data flow Red shines ➪data flow from conductor rail to POWERTRANS® Ib Red does not shine ➪data flow from POWERTRANS® Ib to conductor rail LED flashes in standard operation

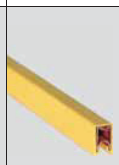
Depending on the data transmission rate the LEDs will flash or shine permanently.

Indicator / LED in Case of Disturbance

LED at				Cause
"Master"		"Slave"		
Interface	Basic unit	Interface	Basic unit	
○○●	●●○○●	○●○○●	●○●	Conductor rail on one or several Powertrans 1b-units with polarity reversal
●○●	○○○○●	○○○○●	○●●	Optical fiber at the "Master"-Powertrans with polarity reversal
○●●	●●○○●	○●○○●	●●●	Optical fiber at the "Slave"-Powertrans with polarity reversal
●○●	●●○○●	○○○○●	●●●	Supply line to the conductor rail interrupted on one or several participating units
●○●	●●○○●	●●○○●	●●●	Optical fiber "OUT" at the "Master" basic unit interrupted
●●●	○○○○●	○○○○●	●●●	Optical fiber "IN" at the "Master" basic unit interrupted
○○●	●●○○●	○●○○●	●○●	Optical fiber "OUT" at the "Slave" basic unit interrupted
○○●	●●○○●	○●○○●	●●●	Optical fiber "IN" at the "Slave" basic unit interrupted
○○●	○○○○●	○○○○●	●●●	Connection of Master-PLC at Powertrans interrupted
●○●	●●○○●	○●○○●	●●●	Connection of Slave-PLC at Powertrans interrupted

Program Overview

Conductor Rails

System Designs		Single Pole Insulated Conductor Rail				Multipole Conductor Rail	Enclosed Conductor Rail
Conductor Rail System		**Progr. 0811**	**Progr. 0815**	**Progr. 0812**	**Progr. 0813**	**Progr. 0831**	**Progr. 0842**
							
Nominal Current[1]	**[A]**	10-100	100	25-400	200-1250	10-125[3]	35-140[4]
Voltage Grade	**[V]**	500	500	660	660	500	600
Support Spacing	**[m]**	0.4-1.0	0.5	1.5	2.5	1	2
Rail Length[2]	**[mm]**	4000	4000	4000	5000	4000	4000
Outside-Dimensions	**[mm]**	14.7 x 15.5	9.6 x 15.2	18 x 26	32 x 42	3-pol.: 26 x 62 4-pol.: 26 x 80 5-pol.: 26 x 98	5-pol.: 7-pol.: 56 x 90

1) At 100% duty cycle and 35°C; 2) Standard; 3) 140 A at 80% duty cycle; 4) 160 A at 80% duty cycle

General Hints

We reserve the right to carry out any modification of the product at any time in the course of technical progress without prior notice.
All our equipment is in accordance with CE.
Our general terms of business are effective. We shall send them to you on request.
Reprint, even of extracts, is only permitted with our approval.

Energy Supply Systems

SINGLE POLE INSULATED CONDUCTOR RAIL



811

10 -100 amps

wampfler

solutions for a moving world

KAT0811-0001e-E

TECHNICAL DATA PROGRAMME 811

Conductor rail system	PROGRAMME 811		
Conductor rail	Galvanized Steel	Copper	Datametal
Type	**081112**	**081116**	**081118**
Nominal current [A] at 100 % DC and 35° C	32	100	10
D.C. resistance at +35° C [Ω/m]	0,005506	0,000743	0,029313
at +20° C [Ω/m]	0,005122	0,000703	0,029200
Impedance at 20 mm rail spacing			
and +35° C [Ω/m]	0,005507	0,000750	0,029314
and +20° C [Ω/m]	0,005124	0,000709	0,029202
Moment of Inertia I_x [cm⁴]	0,024	0,024	0,024
I_y [cm⁴]	0,048	0,048	0,048
Moment of resistance W_x [cm³]	0,048	0,048	0,048
W_y [cm³]	0,076	0,076	0,076
Voltage grade [V]	500 within hand range 660 out of hand range		
Support spacing [m]	between 0,4 and 1,0 (depending on application)		
Rail length [mm]	4000		
Outside dimensions [mm]	14,7 x 15,5		
Traveling speed [m/min]	600 max.		
Expansion joint	not required up to 100 m installation length		
Permissible ambient temperature	−10° C ... +55° C (Standard insulation) −10° C ... +85° C (high temperature insulation)		} other temperatures on request
Protection against direct contact	DIN 57470 part 1 / VDE 0470 part 1 and DIN 57100 part 410 5.2.1/5.3 / VDE 0100 part 410 and DIN/VDE 0100 part 726 4.2		
Breakdown voltage	DIN 53481	22,4 kV (Standard insulation cover) 50 kV (high temperature insulation cover)	

AMBIENT TEMPERATURE

Duty Cycle	100 %	80 %	60 %	40 %	20 %
Permissible ambient temperature for standard insulation	55° C	57,5° C	60° C	62,5° C	65° C
Permissible ambient temperature for high temperature insulation	85° C	92,5° C	100° C	107,5° C	110° C

SELECTION OF CONDUCTOR RAIL

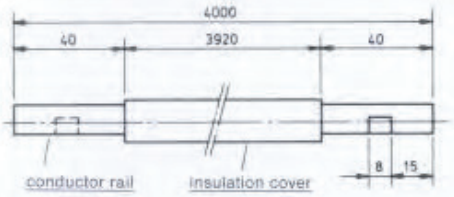
The conductor rail must be selected, so that the total current does not exceed the listed ampere rating. The voltage drop on the conductor rail should normally not exceed 2.5 % of normal supply voltage. For installations in extreme ambient conditions please consult factory.

Formulae for the calculation of voltage drop:

AC three phase	$\Delta u = (\sqrt{3} \times I \times I_g \times Z)$ [V]	Δu	= Total drop	[V]
AC single phase	$\Delta u = (2 \times I \times I_g \times Z)$ [V]	I_g	= Total load	[A]
DC	$\Delta u = (2 \times I \times I_g \times R)$ [V]	R	= Conductor resistance	[Ω/m]
		Z	= Conductor impedance	[Ω/m]
		I	= feeder length	[m]

PARTS OF THE CONDUCTOR RAIL SYSTEM

1. INSULATED CONDUCTOR RAILS (see technical explanation)





M 1:1

The earth conductor insulation cover is marked **yellow-green on both sides.**

Standard insulation suitable from –10° C to +55° C ambient temperature (other temperatures on request).
High temperature insulation suitable from –10° C to +85° C ambient temperature (other temperatures on request).

1.1 Steel Rail 081112 galvanized 32 Amps

Type	Order-no phase conductor	Order-no earth conductor	Length [m]	Weight [kg]
Steel Rail 32 Amps with standard insulation	081112–4x11	081112–4x12	4	1,180
Steel Rail 32 Amps with high temperature insulation	081112–4x21	081112–4x22	4	1,180

1.2 Copper Rail 081116 100 Amps

Type	Order-no phase conductor	Order-no earth conductor	Length [m]	Weight [kg]
Copper Rail 100 Amps with standard insulation	081116–4x11	081116–4x12	4	1,280
Copper Rail 100 Amps with high temperature insulation	081116–4x21	081116–4x22	4	1,280

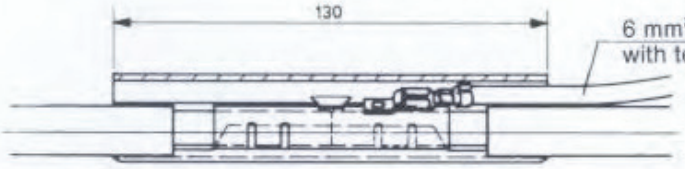
1.3 Datametal Rail 081118 10 Amps

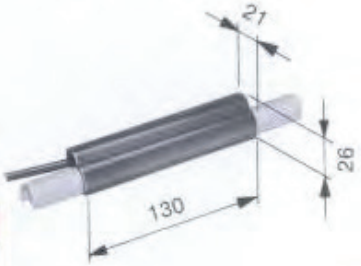
Type	Order-no phase conductor	Order-no earth conductor	Length [m]	Weight [kg]
Datametal Rail 10 Amps with standard insulation	081118–4x11	081118–4x12	4	1,200
Datametal Rail 10 Amps with high temperature insulation	081118–4x21	081118–4x22	4	1,200

4. POWER FEEDS (see technical explanation)

4.1 Power Feed 081151 and 081156

max. 35 Amps
for phase and control conductor





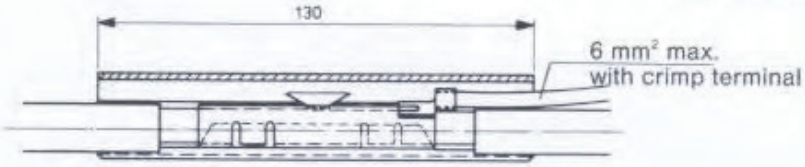
Type	Order-no	Weight [kg]
Power Feed 6 mm² with insulation cover, one-part, for steel and datametal rail	081151 – 21	0,050
Power Feed 6 mm² with insulation cover, one-part, for copper rail	081151 – 61	0,052
Power Feed 6 mm² with insulation cover, two-part, for steel and datametal rail	081156 – 21	0,050
Power Feed 6 mm² with insulation cover, two part, for copper rail	081156 – 61	0,052

connection with insulated terminal lug (see section 12.1 and 12.2)

Max. cable outside diameter 9 mm.

4.2 Power Feed 081151 and 081156

max. 45 Amps
for phase, control and earth conductor





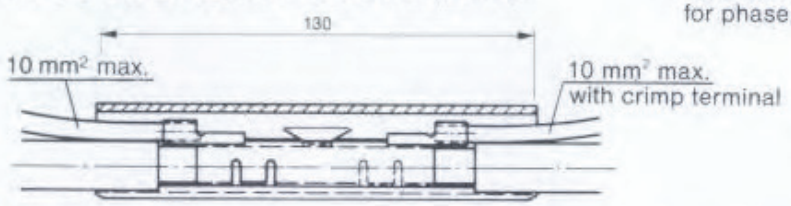
Type	Order-no	Weight [kg]
Power Feed 6 mm² with insulation cover, one-part, for steel and datametal rail	081151 – 22	0,050
Power Feed 6 mm² with insulation cover, one-part, for copper rail	081151 – 62	0,052
Power Feed 6 mm² with insulation cover, two-part, for steel and datametal rail	081156 – 22	0,050
Power Feed 6 mm² with insulation cover, two-part, for copper rail	081156 – 62	0,052

connection of the cable with crimping tool

Max. cable outside diameter 9 mm.

4.3 Power Feed 081155 and 081157

max. 100 Amps
for phase, control and earth conductor





Type	Order-no	Weight [kg]
Power Feed 2 x 10 mm² with insulation cover one-part	081155 – 62	0,070
Power Feed 2 x 10 mm² with insulation cover two-part	081157 – 62	0,070

connection of the cable with crimping tool

Max. cable outside diameter 9 mm.

6. ANCHOR CLAMPS (see technical explanation)

6.1 Anchor Clamp 081153 F

Use of the power feed clamp 081153 E as an anchor clamp preferably for installations **with insulating sections** using isolating piece 081193.



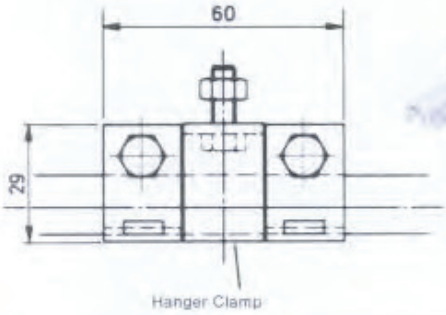


Type	Order-no	Weight [kg]
Anchor Clamp	081153 F	0,010

Please note: If the power feed clamp is used as an anchor clamp no hole must be punched into the insulation cover because the screw of the power feed clamp must clamp the insulation cover.

6.2 Anchor Clamp 081131 and 081132

Only for installations **without isolating sections.**

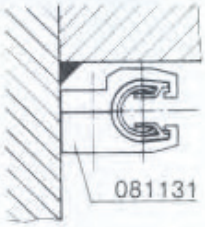








Anchor clamp with recess 081131
for lack of space in corners

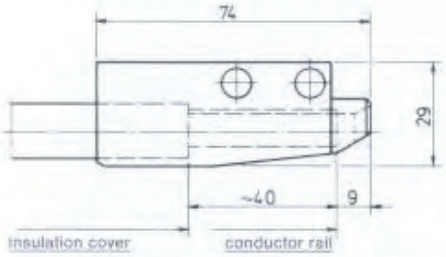


Type	Order-no	Weight [kg]
Anchor Clamp with recess	081131	0,010
Anchor Clamp without recess	081132	0,014

---

7. END CAPS FOR RAIL ENDS AND TRANSFER POINTS (see technical explanation)

7.1 End Cap 081173



Short type
without mounting bolts
for ends and interruptions.



To compensate for misalignment of horizontal and vertical deflections of max. ± 1 mm

Type	Order-no	Weight [kg]
End Cap 1-pole	081173 – 20 x 1 x 0	0,020

8. HANGER CLAMP (see technical explanation)

Advantages of
wampfler rail holder are:

- easy snap-in installation of the conductor rails
- free thermal expansion because of free axial movement of the conductor rails
- installation on beams or **wampfler** support arms as well as on **wampfler** C-rails

Please note: For installation of hanger clamps 081145 on **wampfler** support arms 020185/ 020186 a washer R 6.6 DIN 440-St must be used
(see sketch – 'system arrangement' – page 35)

with steel nut

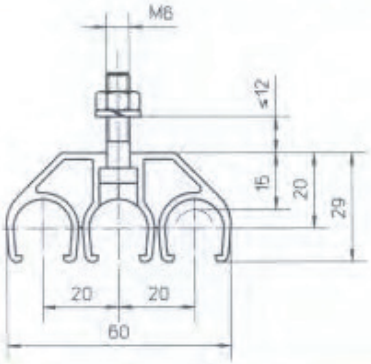


for support arm installation



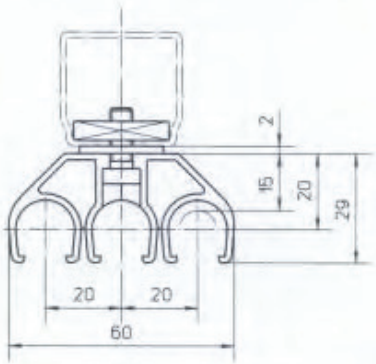
8.1 Hanger Clamp 3 pole

Hanger Clamp 081143 – 1 x 3 x 20



Type	Order-no	Weight [kg]
Hanger Clamp 3-pole	081143 – 1x3x20	0,030

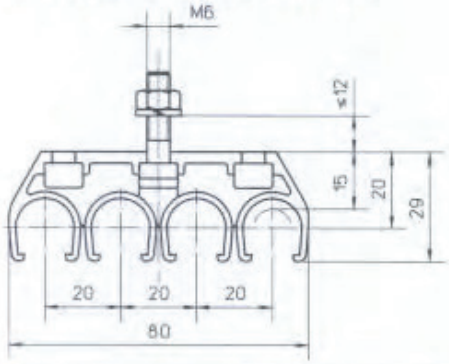
Hanger Clamp 081145 – 1 x 3 x 20



Type	Order-no	Weight [kg]
Hanger Clamp 3-pole	081145 – 1x3x20	0,060

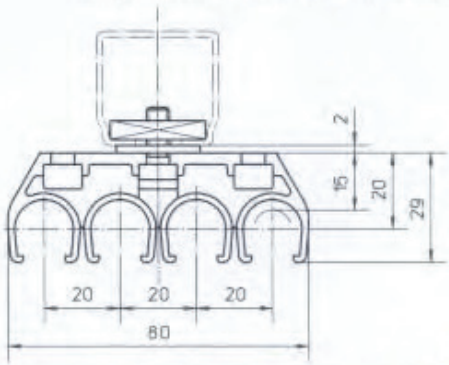
8.2 Hanger Clamp 4 pole

Hanger Clamp 081143 – 1x4x20



Type	Order-no	Weight [kg]
Hanger Clamp 4-pole	081143 – 1x4x20	0,035

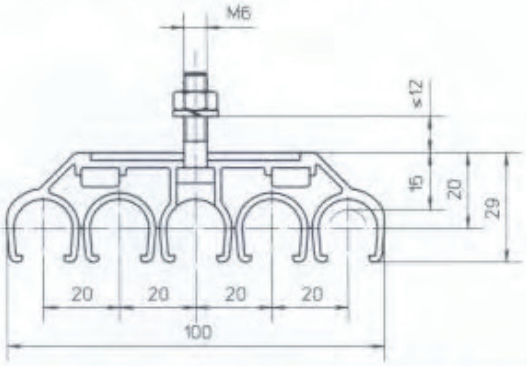
Hanger Clamp 081145 – 1x4x20



Type	Order-no	Weight [kg]
Hanger Clamp 4-pole	081145 – 1x4x20	0,065

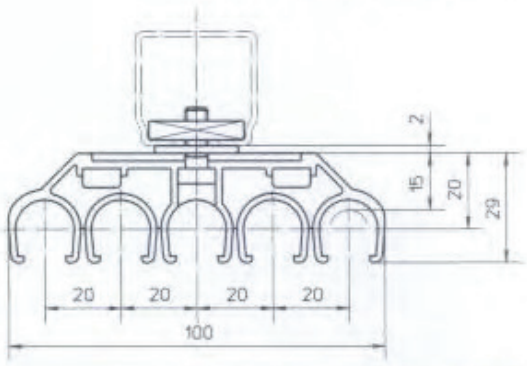
8.3 Hanger Clamp 5 pole

Hanger Clamp 081143 – 1 x 5 x 20



Type	Order-no	Weight [kg]
Hanger Clamp 5-pole	081143 – 1x5x20	0,040

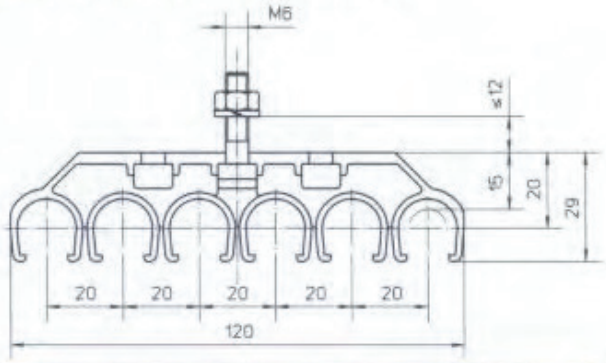
Hanger Clamp 081145 – 1 x 5 x 20



Type	Order-no	Weight [kg]
Hanger Clamp 5-pole	081145 – 1x5x20	0,070

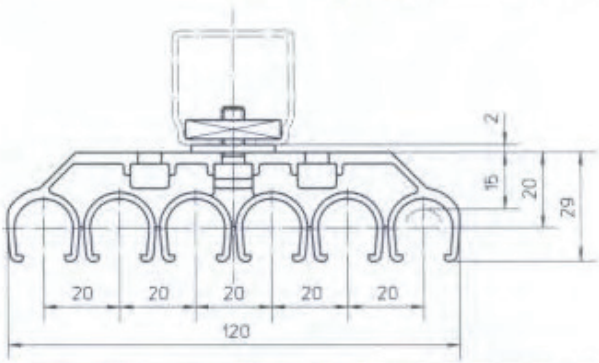
8.4 Hanger Clamp 6 pole

Hanger Clamp 081143 – 1 x 6 x 20



Type	Order-no	Weight [kg]
Hanger Clamp 6-pole	081143 – 1x6x20	0,045

Hanger Clamp 081145 – 1 x 6 x 20

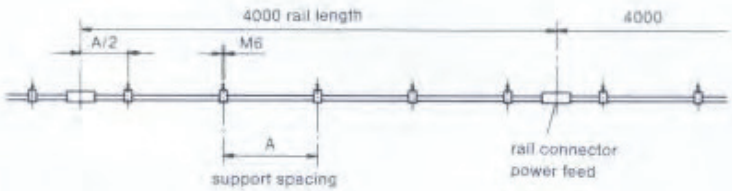


Type	Order-no	Weight [kg]
Hanger Clamp 6-pole	081145 – 1x6x20	0,075

8.5 Support Spacing

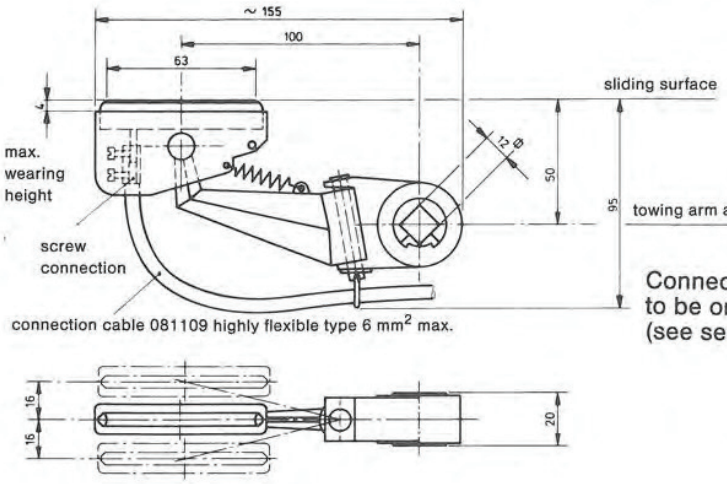
Table 1

Conductor Rail	max. Support Spacing „A' [m]		
	el. overhead mono rails	crane installations	curved installations
Steel Rail	0,8	1,0	0,4
Copper Rail	0,5	0,8	0,4
Datametal Rail	0,8	1,0	0,4



10.3 Current Collector 081101

Short type with 63 mm shoe length
16 Amps and 55 Amps



Visual difference –
the earth collector is
marked yellow and green.



Connection cable
to be ordered separately
(see section 10.5)

Contact pressure: 7,5 N
Movement in direction of contact: ± 20 mm
Lateral movement: ± 16 mm

Shoe material:
16 Amps – carbon
55 Amps – copper graphite carbon

Standard Current Collector:

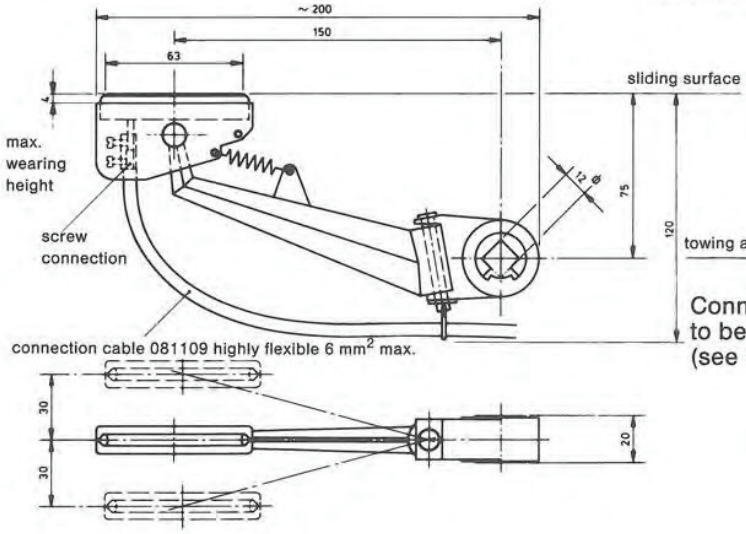
Type	Order-no	Weight [kg]
Current Collector 55 Amps, phase	081101 – 0021	0,100
Current Collector 55 Amps, earth	081101 – 0022	0,100
Current Collector 16 Amps, phase	081101 – 0041	0,090
Current Collector 16 Amps, earth	081101 – 0042	0,090

Current Collector for transfer operation:
(with distance pieces, see section 10.8)

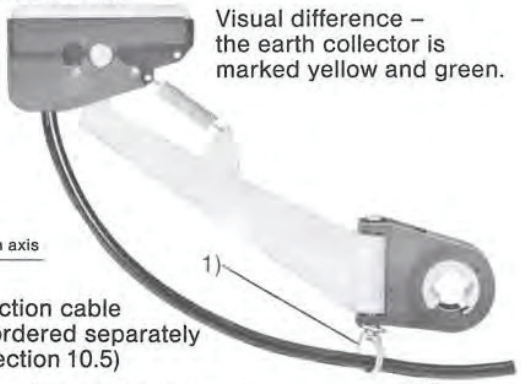
Type	Order-no	Weight [kg]
Current Collector 55 Amps, phase	081101 – 3021	0,105
Current Collector 55 Amps, earth	081101 – 3022	0,105
Current Collector 16 Amps, phase	081101 – 3041	0,095
Current Collector 16 Amps, earth	081101 – 3042	0,095

10.4 Current Collector 081102

Long type with 63 mm shoe length
16 Amps and 55 Amps



Visual difference –
the earth collector is
marked yellow and green.



Connection cable
to be ordered separately
(see section 10.5)

Contact pressure: 5 N
Movement in direction of contact: ± 30 mm
Lateral movement: ± 30 mm

Shoe material:
16 Amps – carbon
55 Amps – copper graphite carbon

Standard Current Collector:

Type	Order-no	Weight [kg]
Current Collector 55 Amps, phase	081102 – 0021	0,140
Current Collector 55 Amps, earth	081102 – 0022	0,140
Current Collector 16 Amps, phase	081102 – 0041	0,130
Current Collector 16 Amps, earth	081102 – 0042	0,130

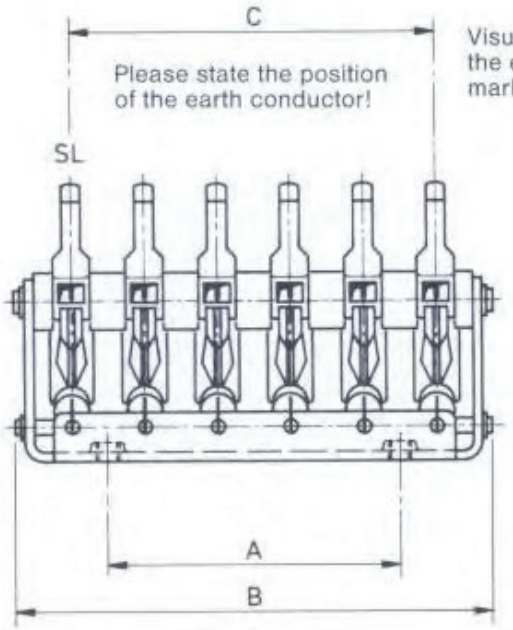
Current Collector for transfer operation:
(with distance pieces, see section 10.8)

Type	Order-no	Weight [kg]
Current Collector 55 Amps, phase	081102 – 3021	0,145
Current Collector 55 Amps, earth	081102 – 3022	0,145
Current Collector 16 Amps, phase	081102 – 3041	0,135
Current Collector 16 Amps, earth	081102 – 3042	0,135

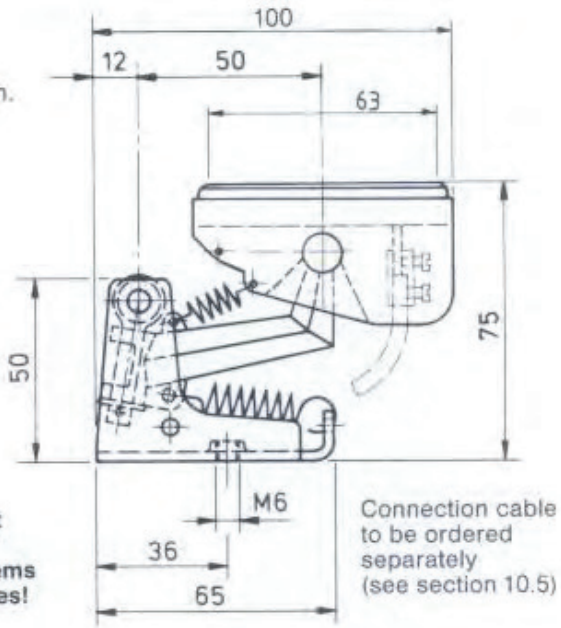
1) = New configuration with cable tie and clip-in bolt

10.11 Current Collector Unit 081106

3-, 4-, 5-, 6-pole for electrical overhead mono rails
16 Amps and 55 Amps, **63 mm shoe length**



Visual difference – the earth collector is marked yellow and green.



This collector unit is not suitable for operation in systems with pick-up guides!

Connection cable to be ordered separately (see section 10.5)

Shoe material:
16 Amps – carbon
55 Amps – copper graphite carbon

Number of poles	„A" [mm]	„B" [mm]	„C" [mm]
5	60	111	80
6	80	131	100

Contact pressure:	6 N
Movement in direction of contact:	± 10 mm
Lateral movement:	± 10 mm

Standard Current Collector Unit:

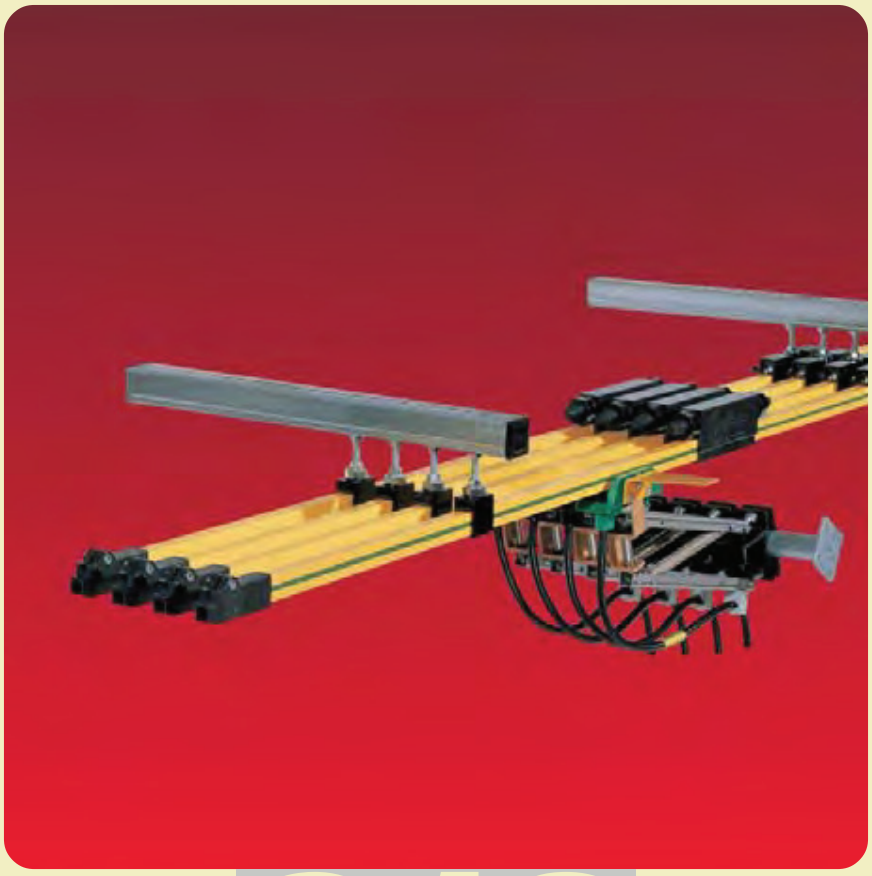
Type	Amps	Order-no reversing operation	Order-no towing operation	Weight [kg]
Current Collector Unit 5-pole	55	081106 – 5002	081106 – 5022	0,530
	16	081106 – 5004	081106 – 5024	0,480
Current Collector Unit 6-pole	55	081106 – 6002	081106 – 6022	0,630
	16	081106 – 6004	081106 – 6024	0,570

Current Collector Unit distance pieces:

Type	Amps	Order-no reversing operation	Order-no towing operation	Weight [kg]
Current Collector Unit 5-pole	55	081106 – 5302	081106 – 5322	0,555
	16	081106 – 5304	081106 – 5324	0,505
Current Collector Unit 6-pole	55	081106 – 6302	081106 – 6322	0,660
	16	081106 – 6304	081106 – 6324	0,600

Energy Supply Systems

SINGLE POLE INSULATED CONDUCTOR RAIL



812

25 - 400 amps

wampfler

solutions for a moving world

KAT0812-0001d-E

REGULATIONS

The design of the system is based on the following regulations:

Standard	Title	Date of issue
IEC 60204-1 EN 60204-1	Safety of machinery - electrical equipment of machines - Part 1	11/1998
IEC 60664-1 HD 625.1	Isolation coordination for equipment within low-voltage systems - Part 1	11/2003
IEC 60364-5-54 HD 384.5.54	Electrical installations up to 1000 V; Selection and erection of electrical equipment; Earthing	06/2002
IEC 60529 EN 60529	Degrees of protection provided by enclosures (IP code)	09/2000
IEC 60243-1 EN 60243-1	Electrical strength of insulating materials - Test methods - Part 1	03/1999
IEC 60112 EN 60112	Method to the determination of the proof and the comparative tracking indices of solid insulating materials	11/2003

Following harmonized standards have been applied:

Standard	Title	Date of issue
DIN 43670	Aluminium bus bars; design for continuous current	12/1975
DIN 43671	Copper bus bars; design for continuous current	12/1975

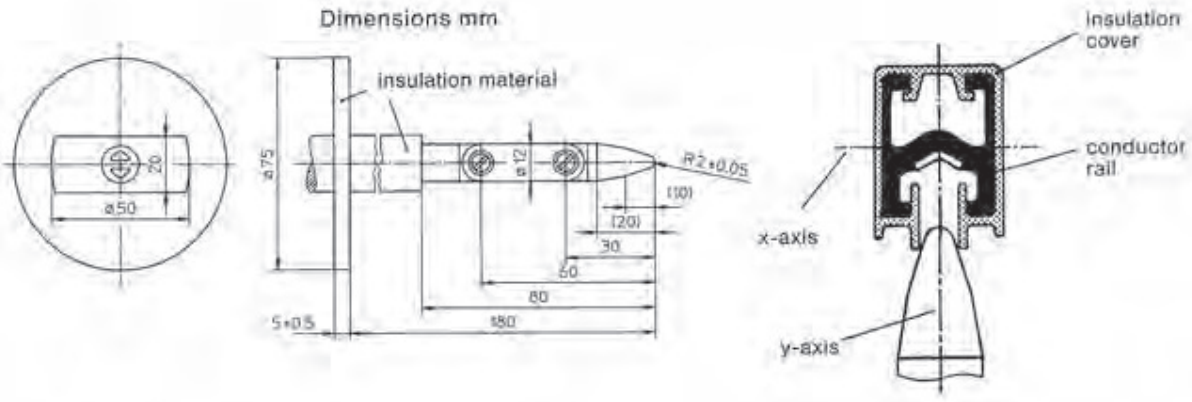
Combustibility of insulation cover at 1.5 mm and 3 mm thickness	to UL 94	Standard insulation V - 0	High temperature insulation V - 0

Chemical resistance

The materials of the conductor rail system are weather-resisting and have a very good chemical resistance. For special applications please contact us.
Use solvents and contact sprays with utmost caution.

TEST INSTRUMENTS AND PROCEDURE TO DIN EN 60529 / VDE 0470 PART 1

IEC-TESTFINGER



Test of protection against direct contact by IEC-testfinger

TECHNICAL DATA PROGRAM 812

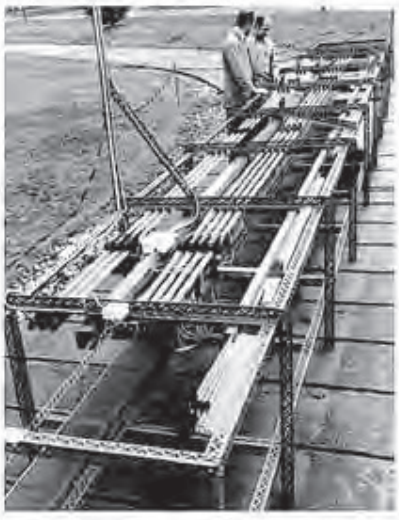
Conductor rail system		Program 812					
Conductor rail		Galvanized Steel		Stainless steel contact insert	Copper		Stainless Steel
Type		081211	081212	081214	081215	081216	081217
Nominal current at 100% DC and 35°C	[A]	80	140	320	250	400	25
D.C. resistance at +35°C	[Ω/m]	0,002184	0,00147	0,000282	0,000298	0,000178	0,011636
at +20°C	[Ω/m]	0,002061	0,00138	0,000267	0,000278	0,000168	0,011590
Impendance at 50 mm rail spacing and +35°C	[Ω/m]	0,002190	0,00149	0,000306	0,000321	0,000217	0,011637
and +20°C	[Ω/m]	0,002060	0,00139	0,000297	0,000307	0,000209	0,011600
Moment of Inertia	I_x [cm⁴]	0,232	0,340	0,307	0,232	0,340	0,232
	I_y [cm⁴]	0,251	0,390	0,281	0,251	0,390	0,251
Moment of resistance	W_x [cm³]	0,207	0,310	0,240	0,207	0,310	0,207
	W_y [cm³]	0,322	0,500	0,373	0,322	0,500	0,322
Voltage grade[1]	[V]	660 [1]					
Support spacing	[m]	1,5					
Rail length	[mm]	4000					
Outside dimensions	[mm]	18x26					
Travelling speed	[m/min]	600 max.					
Expansion joint		not required up to 200 m installation length					
Permissible ambient temperature		-30°C . . . +55°C (Standard insulation) [2] -30° C . . . +85°C (high temperature insulation) [2]					
Protection against direct contact		DIN 57470 part 1 / VDE 0470 part 1 and DIN 57100 part 410 5.2.115.3 / VDE 0100 part 410 and DIN/VDE 0100 part 726 4.2					
Breakdown voltage		DIN 53481 20,16 kV (Standard insulation cover) 45,00 kV (High temperature insulation cover)					

1) If installations are exposed to dirt, high humidity or conductive dust additional insulators have to be used.
2) Other temperatures on request

Special insulators are available for installations over 1000 V. Please contact us.
Conductor rail heating systems for low temperature application on request



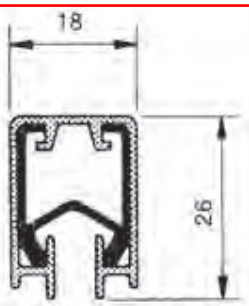
Conductor rail system tested for short-circuit strength at the research institute of high voltage and high amperage technology in Mannheim. Test procedure shot with a high-speed camera (3000 pictures/sec.).



Test installation at SIEMENS for the transmission of data and telephone signals.

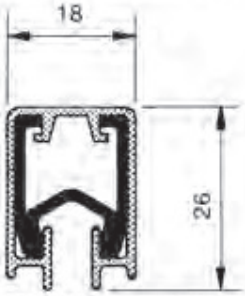
INSULATED CONDUCTOR RAILS

COPPER RAIL
with insulation cover
Standard length 4 m
other lengths on request



Copper Rail 081215 [1)]
250 Amps

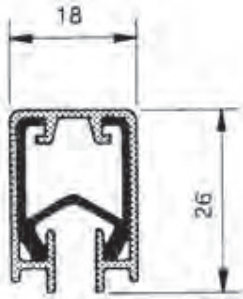
Type	Order-no phase conductor	Order-no earth conductor	Length [m]	Weight [kg]
Copper Rail with **standard insulation**	081215 - 4 x 11	081215 - 4 x 12	4	2,700
Copper Rail with **high temperature insulation**	081215 - 4 x 21	081215 - 4 x 22		



Copper Rail 081216 [1)]
400 Amps

Type	Order-no phase conductor	Order-no earth conductor	Length [m]	Weight [kg]
Copper Rail with **standard insulation**	081216 - 4 x 11	081216 - 4 x 12	4	4,100
Copper Rail with **high temperature insulation**	081216 - 4 x 21	081216 - 4 x 22		

STAINLESS STEEL RAIL
with insulation cover
Standard length 4 m
to be used in aggressive environmental conditions
e.g. galvanizing and pickling plants etc.



Stainless Steel Rail 081217 [1)]
25 Amps

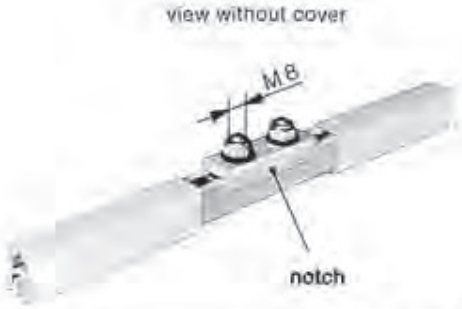
Type	Order-no phase conductor	Order-no earth conductor	Length [m]	Weight [kg]
Stainless Steel Rail with **standard insulation**	081217 - 4 x 11	081217 - 4 x 12	4	2,500
Stainless Steel Rail with **high temperature insulation**	081217 - 4 x 21	081217 - 4 x 22		

*1) The earth insulation cover is marked **yellow-green** on both sides.*

Standard insulation suitable from **-30°C to + 55°C** ambient temperature
High temperature insulation suitable from **-30°C to + 85°C** ambient temperature
} other temperatures on request

RAIL CONNECTOR 081221



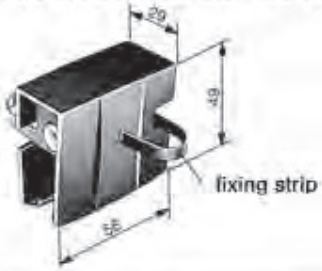


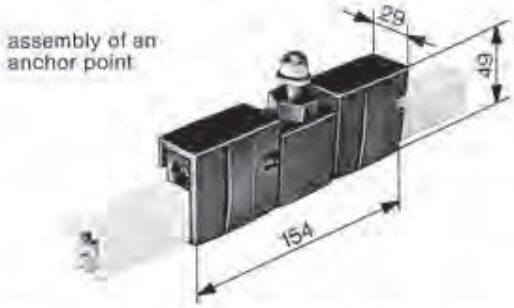
Type	Order-no hardware galvanized	Order-no hardware stainless steel	Weight [kg]
Rail Connector for steel and aluminium rail	081221-2	081221-4	0,140
Rail Connector for copper rail	081221-3	081221-5	0,150
Rail Connector for stainless steel rail	- - -	081221-6	0,180

Installation hint:

The rail connector joins adjacent conductor lengths. To guarantee proper current transfer at the joint all contact surfaces should be cleaned and covered with a thin layer of **wampfler** conductive grease. The conductor rails are pushed into the connector and centrally positioned using the notch in the connector. By tightening the screws both conductor rail sections are joined together **(screw tightening torque: hardware galvanized Md = max. 11.3 Nm / hardware stainless steel Md = max. 9.75 Nm).** Now the insulation covers which are always 80 mm shorter than the conductor rail profile are pushed towards the connector. Both halves of the connector cover are fitted to the rail and snapped together enclosing the rail joint. The joint is now protected against direct contact. Both halves of the connector cover can also be secured by self tapping screws through the external lugs.

ANCHOR CLAMP 081231





Type	Order-no	Weight [kg]
Anchor Clamp	081231-2	0,050

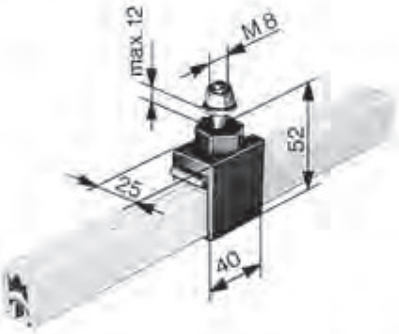
For each anchor point two anchor clamps have to be ordered!

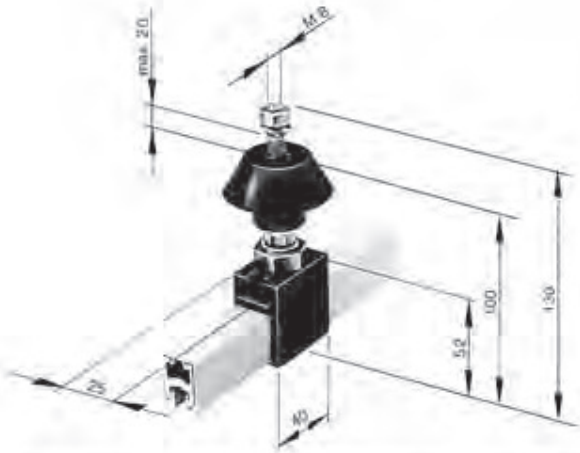
To guarantee the expansion of the rail in a predetermined direction the conductor rail must be fixed at one point. The anchor point should preferably be at the centre of the system. Installations of more than 200 m length have anchor points installed as diagram 3 (see section 'expansion joint').

Installation hint:

For each anchor point two anchor clamps must be fitted on either side of a hanger clamp. The anchor clamp is pushed on to the conductor rail section. By fully tightening the screws the anchor clamp is wedged onto the insulation cover and conductor rail. The fixing strips of the clamping wedges can be cut off after assembly.

HANGER CLAMP 081241
with steel nut



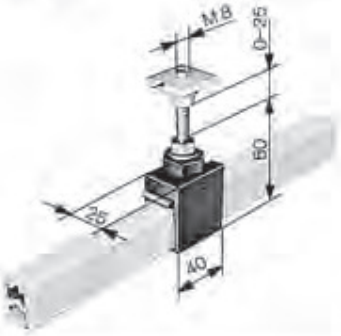


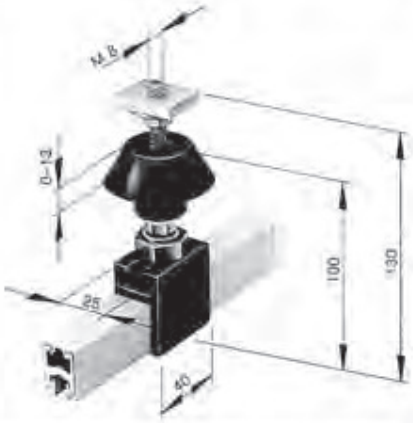
Type	Order-no hardware galvanized	Order-no hardware stainless steel	Weight [kg]
Insulated Hanger Clamp without insulator	081241 – 01	081241 – 02	0,050
Insulated Hanger Clamp with insulator*	081241 – 11	081241 – 12	0,115

* Please note the application conditions in chapter 'insulators'.

Installation hint:
The hanger clamps are fitted to **wampfler** or purpose made support brackets. Suspension distance 1.5 m. The nuts are tightened to a **torque of Md = max. 8 Nm**. Please note that the hanger clamp remains turnable. The conductor rails are clipped into the hanger clamps.

HANGER CLAMP 081243
for C-rail support arm





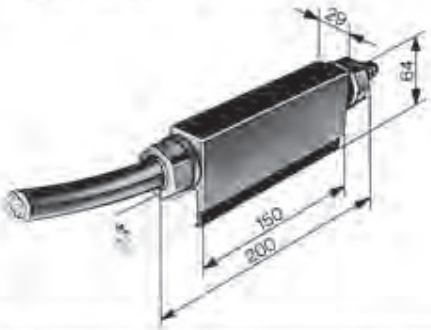
Type	Order-no hardware galvanized	Order-no hardware stainless steel	Weight [kg]
Insulated Hanger Clamp without insulator	081243 – 01	081243 – 02	0,095
Insulated Hanger Clamp with insulator*	081243 – 11	081243 – 12	0,160

* Please note the application conditions in chapter 'insulators'.

This hanger clamp is used for C-rail support arm installation. The hanger clamp can be adjusted in height and positioned at any point along the support arm.

Installation hint: see hanger clamp 081241

POWER FEED 081251



Cable lugs to be ordered separately

Max. cable diameter 17,5 mm.



Type	Order-no hardware galvanized	Order-no hardware stainless steel	Weight [kg]
Power Feed for steel and aluminium rail	081251-2	081251-4	0,210
Power Feed for copper rail	081251-3	081251-5	0,220
Power Feed for stainless steel rail	- - -	081251-6	0,250

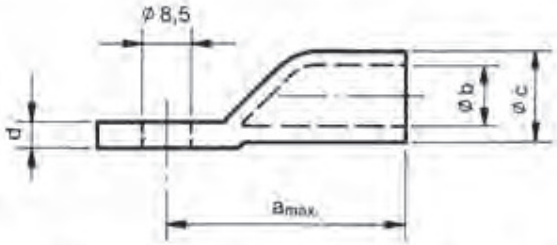
Installation hint:

The power supply is connected to the rail by the power feed. The power feed can be installed within a conductor rail section or at any rail joint. It should be installed as near as possible to the source of the incoming power. If a power feed is required within a conductor rail section, the insulation cover must be separated and 40 mm cut off on either side. Please note that a space of 200 mm must be available between power feed and hanger clamp for the expansion of the conductor rail due to temperature variation. To guarantee proper current transfer the contact surfaces should be cleaned and covered with a thin layer of **wampfler** conductive grease.
The power feed clamp is pushed into the rail. The supply cables are connected to the power feed clamp bolt and by tightening these bolts the power feed clamp is fastened to the rail electrically/mechanically **(torque: hardware galvanized Md = max. 11.3 Nm / hardware stainless steel Md = max. 9.75 Nm).** Both halves of the power feed cover are hooked to the rail in such a way that the internal snap lock of the cover is positioned between the bolts. The cover halves are clipped together and are joined with the cable sleeves and nuts already fitted on to the cables. If the power feed is used at a rail joint follow the procedure detailed for the rail connectors.

CABLE LUG 080051
for feeder cable



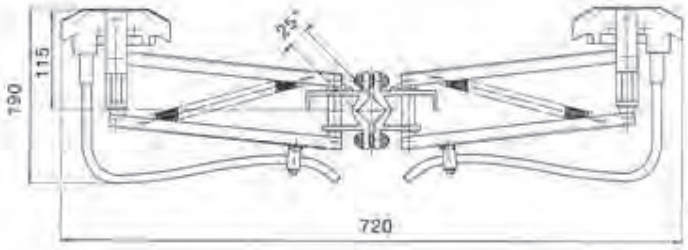
material: copper, tinned



Type	Order-no	Cross section [mm²]	a [mm]	b [mm]	c [mm]	d [mm]	Weight kg/1000
Cable Lug	080051-06	6	23,5	3,5	6,6	1,5	6,000
	080051-10	10	26,8	4,5	7,0	1,5	7,000
	080051-16	16	32,0	5,5	8,5	2,2	11,000
	080051-25	25	32,5	7,0	10,0	2,6	14,000
	080051-35	35	34,0	8,5	12,0	3,5	20,000
	080051-50	50	40,0	10,0	14,0	3,9	32,000
	080051-70	70	47,0	12,0	16,6	4,6	51,000
	080051-95	95	51,0	13,5	18,0	4,6	60,000

DOUBLE CURRENT COLLECTOR 200 AMPS
Parallel arm type

081205 – 2 x 01 ... 081208 – 2 x 01
081205 – 2 x 11 ... 081208 – 2 x 11
081205 – 2 x 02 ... 081208 – 2 x 02
081205 – 2 x 12 ... 081208 – 2 x 12





TECHNICAL DATA:

Max. current load for straight and curved installations (bending radius > 1800 mm)	– 200 Amps (for aluminium rails in stationary position at 100 % DC: 100 Amps)
Max. current load for curved installations (bending radius from 1000 mm – 1800 mm)	– 80 Amps (with special collector shoe 081001 – 15) (for aluminium rails in stationary position at 100 % DC: 40 Amps)
Max. travelling speed	– 600 m/min; for higher speeds please consult factory
Contact pressure	– 20 N
Lateral movement	– ± 100 mm
Movement in direction of contact	– **± 50 mm**
Connecting cable	– 16 mm², 1,5 m long, highly flexible; longer cables on request
Distance between towing arm axis and conductor rail sliding surface	– **115 mm**

Installation hint:

Please note that the centre line of the current collectors corresponds to the centre line of the conductor rail. The distance between towing arm and conductor rail must be set according to the dimensions shown (see installation examples).

The connecting cables must be highly flexible to guarantee full operational flexibility and must be fixed with the cable clamp so that no tensional stress can be transmitted to the collector head.

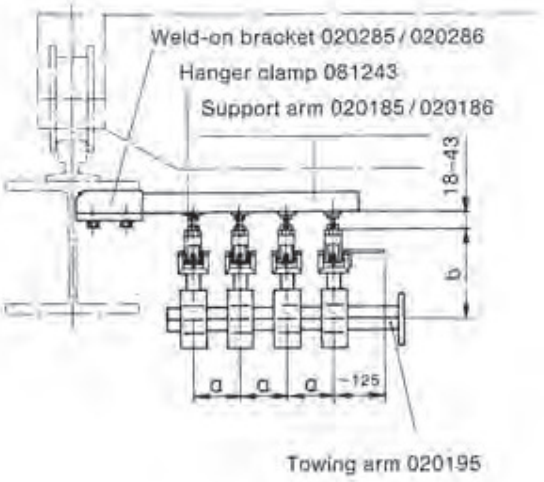
Type	Order-no phase conductor hardware galvanized	phase conductor hardware stainless steel	earth conductor hardware galvanized	earth conductor hardware stainless steel	Weight [kg]
Current Collector 200 Amps vertical operation	081205 – 2 x 01	081205 – 2 x 11	081205 – 2 x 02	081205 – 2 x 12	2,300
Current Collector 200 Amps vertical operation for transfer points*	081206 – 2 x 01	081206 – 2 x 11	081206 – 2 x 02	081206 – 2 x 12	2,520
Current Collector 200 Amps horizontal operation	081207 – 2 x 01	081207 – 2 x 11	081207 – 2 x 02	081207 – 2 x 12	2,370
Current Collector 200 Amps horizontal operation for transfer points*	081208 – 2 x 01	081208 – 2 x 11	081208 – 2 x 02	081208 – 2 x 12	2,530

* Current collectors for transfer points are used if the conductor rail system is separated by interlocks, crossing beams etc. These current collectors are equipped with a self-centering device. For these applications pick-up guides have to be used.

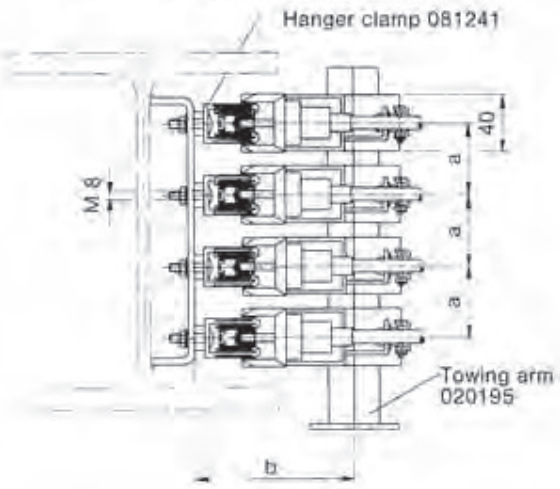
INSTALLATION EXAMPLES

STANDARD INSTALLATION OF CURRENT COLLECTORS

Vertical operation of current collectors

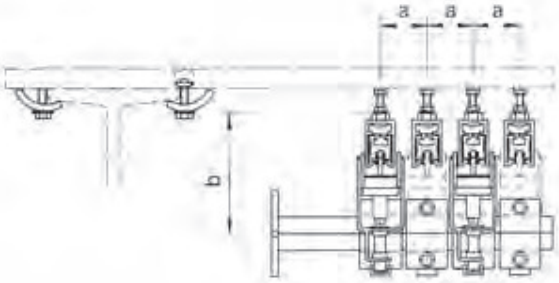


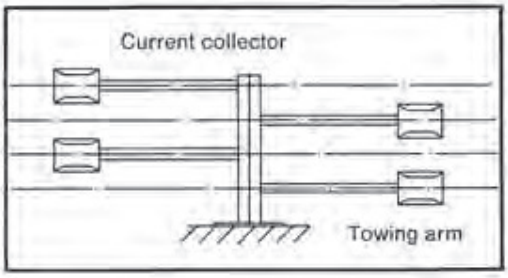
Horizontal operation of current collectors



STAGGERED INSTALLATION OF CURRENT COLLECTORS

Horizontal and vertical operation of current collectors





For installations **without transfer points** the current collectors for vertical and horizontal operation can be staggered. In this way the centre distance between two conductor rails is reduced by 10 mm. If current collectors are installed staggered please note that the minimum distance a = 40 mm must be followed at any point of the system and the current collectors are perfectly guided parallely to the conductor rails.

Centre distance between two conductor rails	Standard spacing of current collectors	Staggered spacing of current collectors	Spacing of current collectors for systems with pick-up guides multipole*
Minimum distance a [mm]	50	40	50

* see installation hint for pick-up guides

Current collector	b [mm]	Movement in direction of contact [mm]
Spring arm type	135	± 25
Parallel arm type	150	± 50

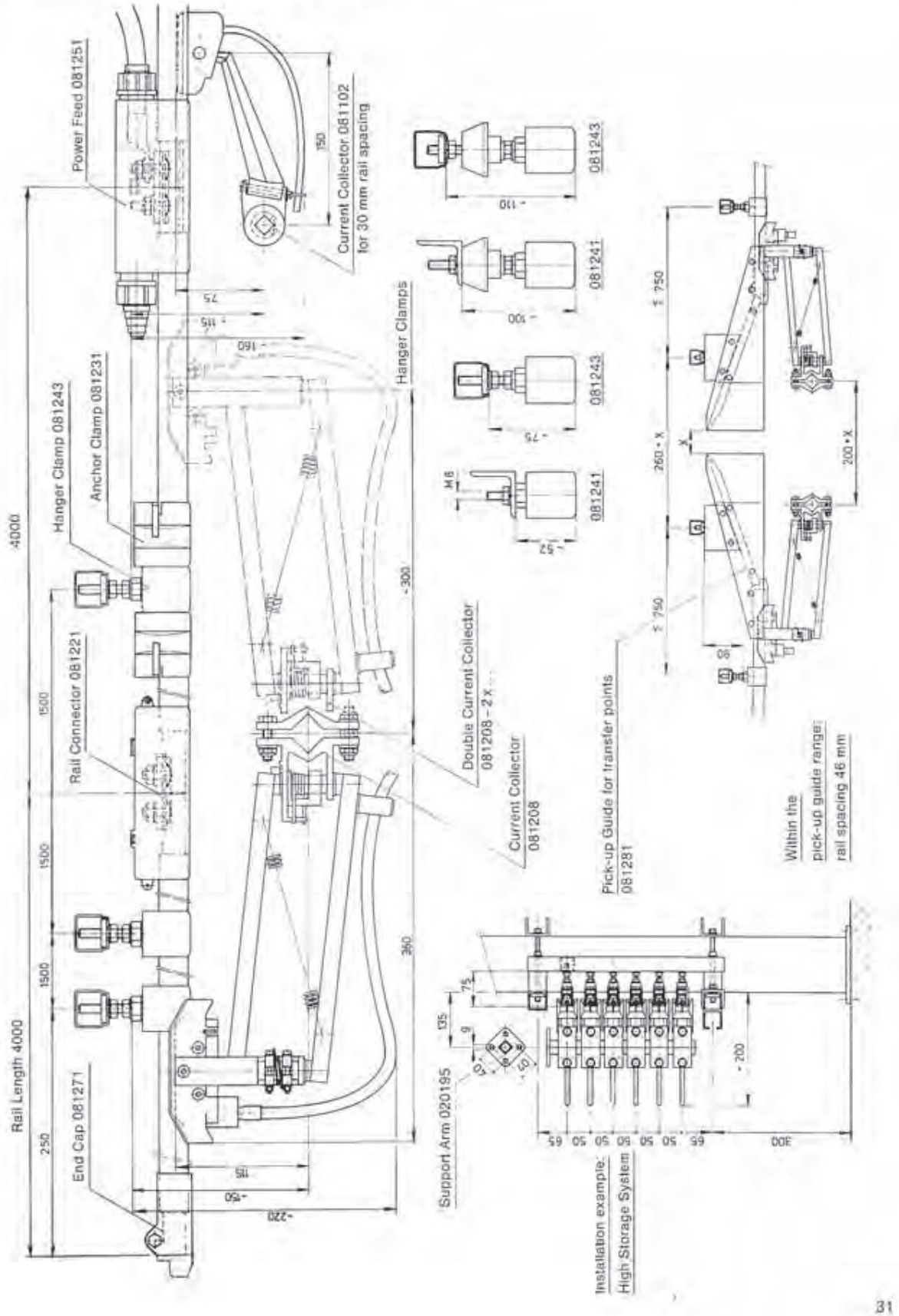
Installation hint:

Please note that the centre line of the current collector is mounted to the centre line of the conductor rail. The distance between towing arm and conductor rail must be set according to the dimension indicated in above table and sketches.

SYSTEM ARRANGEMENT

PROGRAMME 812

with current collector parallel arm type



Distribution switchboards



The broadest offering in the industry

Powering Business Worldwide







Industry-leading Eaton switchboards

Eaton's electrical group offers the widest selection of switchboard types in the industry, and this is only the start.

Our switchboards are built from the ground up based on customer input and needs. From the simplest 800A switchboard to Web-enabled, Eaton switchboards offer flexibility in designs to accommodate any power distribution need you have.

Our flexible designs are only as good as the people and service that bring the products to you. Eaton has uniquely positioned manufacturing centers of excellence throughout the United States.

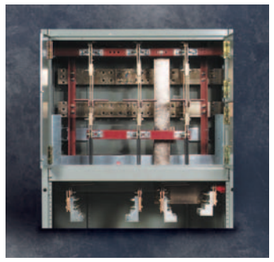
Our 18 facilities, strategically located near our customers, provide more than just switchboards and panelboards. They are *your* personal plants. These Regional Manufacturing Facilities have the capability of much larger facilities. They understand your needs and your markets... because they are right there. Our goal, and the goal of our outstanding sales team, is to exceed your expectations.

From emergency shipments to large projects, from new construction to aftermarket and renovation, we have the experience and expertise to help you.

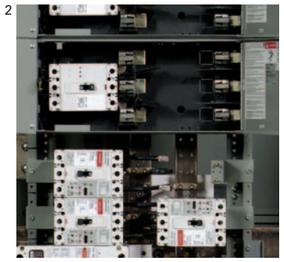
As you review the products in this brochure, remember that this is only a sampling of our capabilities. To learn more, we invite you to contact your local sales office or plant, and to come visit us.

Distribution switchboards

1



2



1. **Utility Metering Compartments**
   Available to meet standard or specific requirements. Units can be arranged for hot or cold sequence.
2. **Single Chassis Design**
   Provides device flexibility, accommodating both circuit breaker and fusible switches.
3. **Pow-R-Line C Switchboards**
   Group-mounted distribution switchboards.

Pow-R-Line C switchboards

Eaton's distribution switchboards combine a space-saving design with modular construction and increased systems ratings to provide economical and dependable electrical system distribution and protection.

Features

- 6000A maximum main bus rating
- 600 Vac and below
- Front or rear accessible
- Indoor or outdoor enclosures
- ANSI-61 gray powder coat paint finish
- Microprocessor-based metering, monitoring and communication devices
- Utility metering provisions
- Surge protective devices (SPD)
- Ground fault protection
- Busway and transformer connections
- Integrated panelboards (IFS™)
- 65 kAIC standard bus bracing; optional 100 or 200 kAIC
- Aluminum or optional copper bus
- Meets NEMA® Standard PB-2 and UL® 891
- Seismically qualified

3



Main devices

- Magnum™ DS power circuit breakers, 800–5000A
- Molded-case circuit breakers, 400–2500A, fixed mounted
- Pringle® bolted pressure contact switches, 800–5000A
- Fusible switches, 400–1200A

Group-mounted distribution devices

- Molded-case circuit breakers, 15–2000A
- Fusible switches, 30–1200A

Metering and monitoring devices

A wide range of metering options for power measurement and power quality is available. Along with local display, these meters can provide Web-enabled monitoring of Eaton switchboards and other equipment via an open communications architecture. The Power Xpert® Gateway enables third-party equipment to communicate across this same system.

4



5



4. **Eaton Molded-Case Circuit Breakers**
   225A, electronic trip frame (left); 600A, electronic trip frame (middle); and 2500A, electronic trip frame (right).
5. **Magnum DS Power Circuit Breakers**

6



7



8



9



6. **Electronic Trip Unit System**
   Advanced technology options offer superior protection, energy management and communications.
7. **Surge Protective Device**
   Integrally mounted with overcurrent feeder.
8. **Metering and Monitoring Devices**
   Power Xpert Gateway (front) and IQ 250 Meter (back).
9. **Eaton's Power Xpert Communications System, Programming and Monitoring**
   Accomplished remotely from a personal computer via the Web.

Electronic trip unit system

Eaton electronic trip units provide enhanced accuracy and reliability for protection and optimum system coordination.

Surge protective devices

Eaton's surge protective devices (SPDs) protect sensitive electronic equipment from the damaging effects of high and low energy transients, as well as high-frequency noise.

The SPD, combined with our innovative connection, yields the industry's lowest let-through voltage.

Wide range of surge ratings

Surge current ratings from 100 to 400 kA per phase provide a range of cost-effective facility-wide protection solutions. Products are third-party tested to verify published surge current ratings.

SPD mounted within the enclosure eliminates extra wiring and the need for outboard wall space:

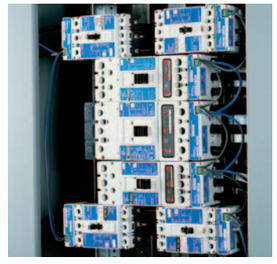
- UL 1449 Listed high-performance suppression system and parallel hybrid filter technology
- Diagnostic system
- Integral circuit breaker disconnect

IQ Energy Sentinels

Cost-effective submetering throughout the electrical system

These devices monitor power and energy readings down to the smaller loads. They measure watts, peak demand and watt-hours within a one-percent accuracy level.

The device mounts directly on F-, J- or K-Frame feeder breakers without requiring additional panel height. A universal sentinel is available where breaker mounting is not feasible and for the larger frame breakers.



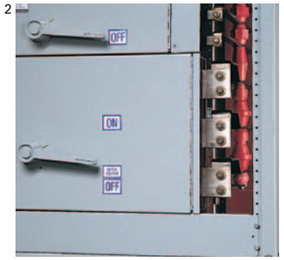


IQ Energy Sentinels
Power and energy information from IQ Sentinels can be communicated to a PC, a panel-mounted central energy display (CED), or even existing building management or distribution control systems.

1



2



1. **Branch Circuit Breakers**
   Shown in single- and tandem-mounted construction.
2. **Fusible Switches**
   Branch fusible switches in single-unit construction.
3. **Pow-R-Line *i* Switchboards**
   Compartmentalized design for increased device isolation.
4. **Barriered Construction**
   Overcurrent devices isolated from bus.

5



5. **Laser Cut and Power Coat Finish**
   Laser cut panelboard trims with a high-quality baked-on powder coat finish provides a high-quality appearance.
6. **Benefits of IFS**
   IFS can be integrated with service equipment where panelboards are needed in the electrical distribution equipment room. IFS lowers installation time and saves space.

Pow-R-Line *i* switchboards

Pow-R-Line *i* distribution switchboards are engineered in a compartmentalized design for applications where a greater degree of component isolation is required. A wide variety of configurations is possible, including utility metering, customer metering, main devices, branch devices, accessories and enclosures.

Significant safety features

- Individual compartments for branch devices help eliminate possible contact with the main bus and reduce fault propagation
- Three-section construction with each barriered from the other:
  - *Device section*—each device is mounted in its own compartment
  - *Busbar section*—contains both horizontal and vertical busses
  - *Rear cable compartment*—completely isolated from the busbars
- Insulated runbacks, so that power is taken from the protective device by the runback through a full-height glass-polyester barrier to the rear cable compartment, virtually eliminating the possibility of accidental contact with the main busses during installation or maintenance

Construction features

- Full family of metering and protective devices available
- Custom-built utility metering compartments
- Individually mounted main devices

3



- Compartmentalized feeder devices
- Meets NEMA Standard PB-2 and UL 891
- Rear accessible
- 65 kAIC standard bus bracing; optional 100 and 200 kAIC
- Aluminum or optional copper busbar
- ANSI-61 gray powder coat paint finish
- Indoor and outdoor enclosures
- Seismically qualified

4



A wide selection of branch devices

Circuit breakers

Branch circuit breakers range from 150A to 1200A

Fusible switches

Branch fusible switches are available from 100A to 1200A frames

Integrated facility systems (IFS)

Eaton is the industry leader in integrated switchboards with more than 100,000 IFS sections delivered to customers. Eaton's Integrated Facility Systems™ (IFS) switchboards can reduce the overall space requirement over traditional panelboard and transformer installations. Because IFS is factory assembled and wired between major components, there are fewer pieces to handle and install, thus reducing installation time.

IFS is ideal for both new construction and renovation. Each IFS switchboard is custom designed to meet customer requirements. Specific requirements for panelboard configurations, as well as transformers and other equipment, can be customized into IFS switchboards. Eaton's experience and capabilities ensure that your IFS is configured to your exacting standards and delivered on time from one of Eaton's 18 assembly plants.

6



Standard panelboard and transformer configurations can ship in as few as two weeks. These include IFS sections with 480Y/277 Vac lighting panelboards with a feeder to a NEMA TP1 transformer feeding one or more 208Y/120 Vac panelboard(s). All breakers are installed to your drawings and factory wired between the transformer feeder device and the 208 Vac lighting panelboard.

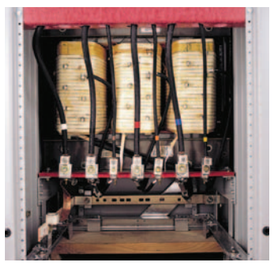
Features

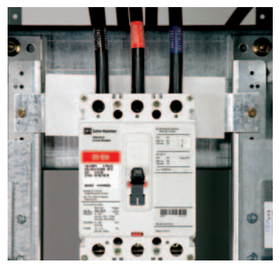
- Single - and three-phase
- 600 Vac maximum
- Integrated lighting panelboards
- Integrated power panels
- Lighting control
- Dry-type distribution transformers
- Breakers and fusible devices
- Provisions for customer-installed equipment
- Special heights and depths
- Metering
- UL 891 Listed and meets NEMA PB-2 standards
- Seismically qualified
- Designs for raised floors
- Indoor and outdoor enclosures
- Automatic transfer switches



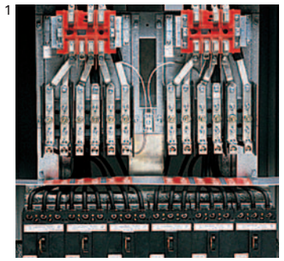


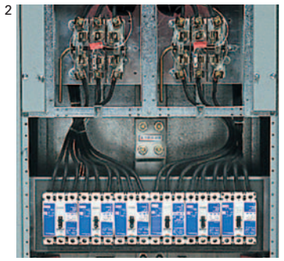
IFS Space-Saving Capabilities
An IFS switchboard can significantly reduce the size of an electrical room. Replacing traditional panelboards and transformers with IFS can free up valuable space for the owner. Ideal for facility electrical upgrades where space is limited.

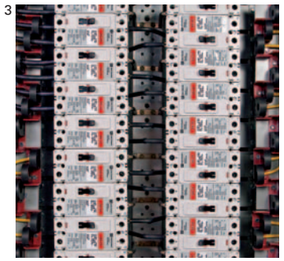




Factory Installed Wiring
Transformers are pre-wired in Eaton's assembly facility from the primary side feeder (when in the same switchboard) to the secondary overcurrent device. All wiring is marked "Factory Installed" using industry convention colored wire markings. All factory cabling is in accordance with the National Electrical Code® using the same standards as field wiring.

1 

2 

3 

1. **WWCMS Construction**
   Assembly includes meter socket and test block per EUSERC requirements, pre-wired to tenant disconnect.
2. **WCMS Construction**
   Typical 200A seven-jaw sockets with manual lever bypass connected to circuit breaker disconnects in hot sequence arrangement.
3. **IQ Multipoint Energy Submeter II Tenant Mains and Sensors**

Commercial metering switchboards

Eaton offers a number of options for commercial metering switchboards. These include assemblies that meet utility requirements for bulb type watt-hour meters and electronic tenant metering switchboards.

Features

- Free-standing switchboard construction
- Factory-assembled complete with interconnections from incoming mains to the meter and to the tenant main
- UL 891 Listed and meets NEC and NEMA PB-1 standards
- Seismically qualified
- Indoor and outdoor enclosures

Utility type watt-hour meter switchboards

- Available with different meter socket configurations:
  - EUSERC- approved designs through 200A
  - Lever bypass meter sockets through 400A
- Choice of fusible or circuit breaker tenant mains
- Hot or cold sequences metering provisions

4 

Electronic tenant metering

- Ideal for third-party metering of tenants
- Capabilities to read meters remotely
- Revenue-grade accuracy
- Monitor tenants and loads from 30A through 400A
- Choice of two metering solutions:
  - Eaton IQ Multipoint Energy Submeter II
  - Quadlogic
- Software and communications packages
- Secured remote access

4. **Type WCMS (left) and Type WWCMS (right)**
   Reliable multiple circuit distribution and metering for commercial applications.

5 

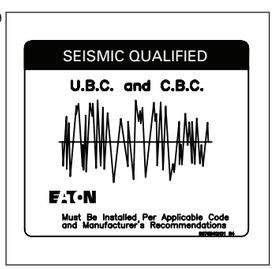
6 

5. **IQ Multipoint Energy Submeter II Tenant Metering Switchboard**
6. **Eaton's Electronic Tenant Metering with Quadlogic Meters**

7 

7. **Quadlogic with Integrated Communications, Load Profiling, Time-of-Use Data**
8. **Pow-R-Line C Instant Switchboards**
   Preassembled and available from stock.
9. **Seismic Qualification**

8 

9 

Pow-R-Line C instant switchboards

Instant switchboards include EUSERC utility metering provisions and a fused main switch with optional distribution panelboard.

Construction features

- Completely enclosed with front, rear and side covers
- Manufactured of code-gauge steel with ANSI-61 gray powder coat paint finish
- Indoor and outdoor enclosures
- Outdoor units include front hinged padlockable door
- UL Listed and meets EUSERC, NEC and NEMA standards
- Seismically qualified

Service ratings

- 120/240 Vac (singe-phase, three-wire)
- 208Y/120 or 240/120 Vac (three-phase, four-wire)
- 480Y/277 Vac (three-phase, four-wire)

Metering compartment

- Meets EUSERC standards
- Barriered hot sequence CT provisions
- Provisions for meter socket with test block provision
- Hinged sealable compartment doors
- Standard section includes two 15-inch-high doors (one for socket, one blank)

Main switch

- 400A, 600A or 800A main overcurrent devices
- Load lugs or connection to panelboard
- Hinged cover with interlock

Distribution panelboard

- Factory installed
- Provisions for bolt-on circuit breakers

Eaton switchboards

Quality construction

Parts are manufactured to exacting specifications to ensure precision construction of stable, rigid structures

Seismic qualification

Eaton switchboards are seismically tested and qualified to exceed requirements of the Uniform Building Code® (UBC), the California Building Code (CBC) and the International Building Code (IBC)

Quality assurance

Final testing helps ensure that each switchboard performs in accordance with UL standards and customer specifications

All switchboards are backed by Eaton's commitment to quality, safety and reliability.

1



1. Receptacles Sub-Assembly
Receptacles are color-coded for Phase A, B and C, neutral and ground.

Roll-up generator Quick Connect switchboard

Product description

The Eaton generator Quick Connect switchboard is an engineered assembly designed to allow safe and fast connection of a mobile generator to your facility's electrical system or a portable load bank.

Through inclusion of cam-type receptacles, standard mechanical lugs, dedicated generator-service disconnect and a manual key-interlock transfer scheme, you can quickly and safely supply backup power to parts of your electrical power system that are not currently covered by your power system, or you can back up existing generators.

Loads connected to the generator quick connect switchboard can immediately be safely transitioned to an alternative power source, made possible by the generator quick-connect switchboard.

Specifications

- UL 891 Listed switchboard
- 480 Vac and below
- Sizes 400A–4000A
- Indoor and outdoor enclosures
- Key interlocked main overcurrent devices
- Quick-connects to speed and simplify generator connections

Benefits of the generator Quick Connect switchboard

Speed of connection

The owner does not have to do any of the following that are common roll-up generator power situations:

- No making additional field modifications to an internal switchboard in order to connect the generator cables after the initial installation
- No modifying the building's physical structure to accommodate generator cables (e.g., drilling holes in walls)
- No running cables through doorways or windows and through hallways or up stairs

Safer and more reliable

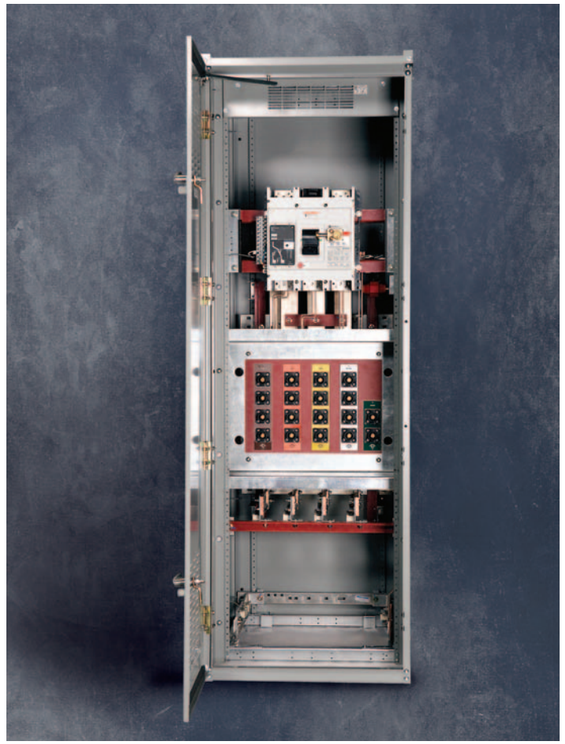
Reduction of the potential for safety problems associated with connecting the mobile generator to the facility's electrical system under lost-power conditions

- A permanent connection point for mobile power, not a temporary connection
- Installed under normal circumstances, not during a possibly chaotic lost power situation
- Tested as part of the installation, providing assurance when needed
- Eliminates the safety hazards of generator cables run through doorways and up stairways; building doors and/or windows remain closed for security and safety reasons

As part of the larger assembly, there are several sub-assemblies that provide greater function and benefit to facilities

- Generator Service Disconnect—
  A UL Listed circuit breaker interlocked with the service disconnect. The generator disconnect can be rated up to 4000A continuous and may include ground fault protection, shunt trips, alarms, single-phase protection and auxiliary contacts. Such options can allow for integration into a larger control system to accomplish load shedding while the facility is under backup power

1



2. Generator Quick Connect Switchboard
2000A Quick Connect switchboard with key interlocked main and generator connections.

- Cam-Type Receptacle Sub-Assembly—
  Designed to work with the cam-type plugs commonly found on mobile generator cables. Includes color-coding for easy phase connector identification to help ensure proper field connection of the generator
- Permanent Operation Instructions—
  Affixed to each generator quick-connect switchboard. Through the inclusion of these simple instructions, operation of the mechanisms can be performed by any authorized personnel
- Generator Connection Lugs—
  In addition to the cam-type receptacles, a set of standard mechanical lugs is provided with the generator quick-connect Switchboard to allow an alternate method of connecting generator cables
- Bus Connection Sub-Assembly—
  All connection methods described previously are connected together using only factory stamped and formed bus. Bus connection, as opposed to cable, provides a more robust and smaller construction

3



4



5



6



3. Customized, Design-Build and Retrofit Solutions

4. Panelboards and Enclosed Breakers Up to 1200A

5. Switchboards Up to 6000A

6. Emergency Quick Ship and Pickup

7. Satellite Plants

7



Satellite manufacturing facilities

Best service in the industry

Eaton's switchboards are custom-built to your requirements using world-class manufacturing techniques. Eaton is the only electrical manufacturer that not only uses huge manufacturing plants to meet the needs of our customers, but also has 16 smaller Satellite Business Centers across the country to cater to your individual needs. We're probably right in your backyard!

Located at strategic locations throughout the United States, these facilities manufacture and deliver standard or custom Eaton branded assembled switchboards, as well as panelboards and enclosed circuit breakers, when and where you need them. And when you have an emergency, they can have your equipment ready in just hours! Highly trained and experienced personnel will manage your order and ensure that you receive on-time delivery of high-quality equipment that meets your specifications.

Speedy delivery

- Panelboards—from one to five days
- Switchboards—between five and 10 days
- Assembled enclosed circuit breakers—from one to 10 days

For more information

For more information, contact your Eaton representative or authorized distributor.

Eaton's Electrical Sector is a global leader in power distribution, power quality, control and automation, and monitoring products. When combined with Eaton's full-scale engineering services, these products provide customer-driven PowerChain™ solutions to serve the power system needs of the data center, industrial, institutional, public sector, utility, commercial, residential, IT, mission critical, alternative energy and OEM markets worldwide.

PowerChain solutions help enterprises achieve sustainable and competitive advantages through proactive management of the power system as a strategic, integrated asset throughout its life cycle, resulting in enhanced safety, greater reliability and energy efficiency. For more information, visit www.eaton.com/electrical.

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December 2010

Powering Business Worldwide

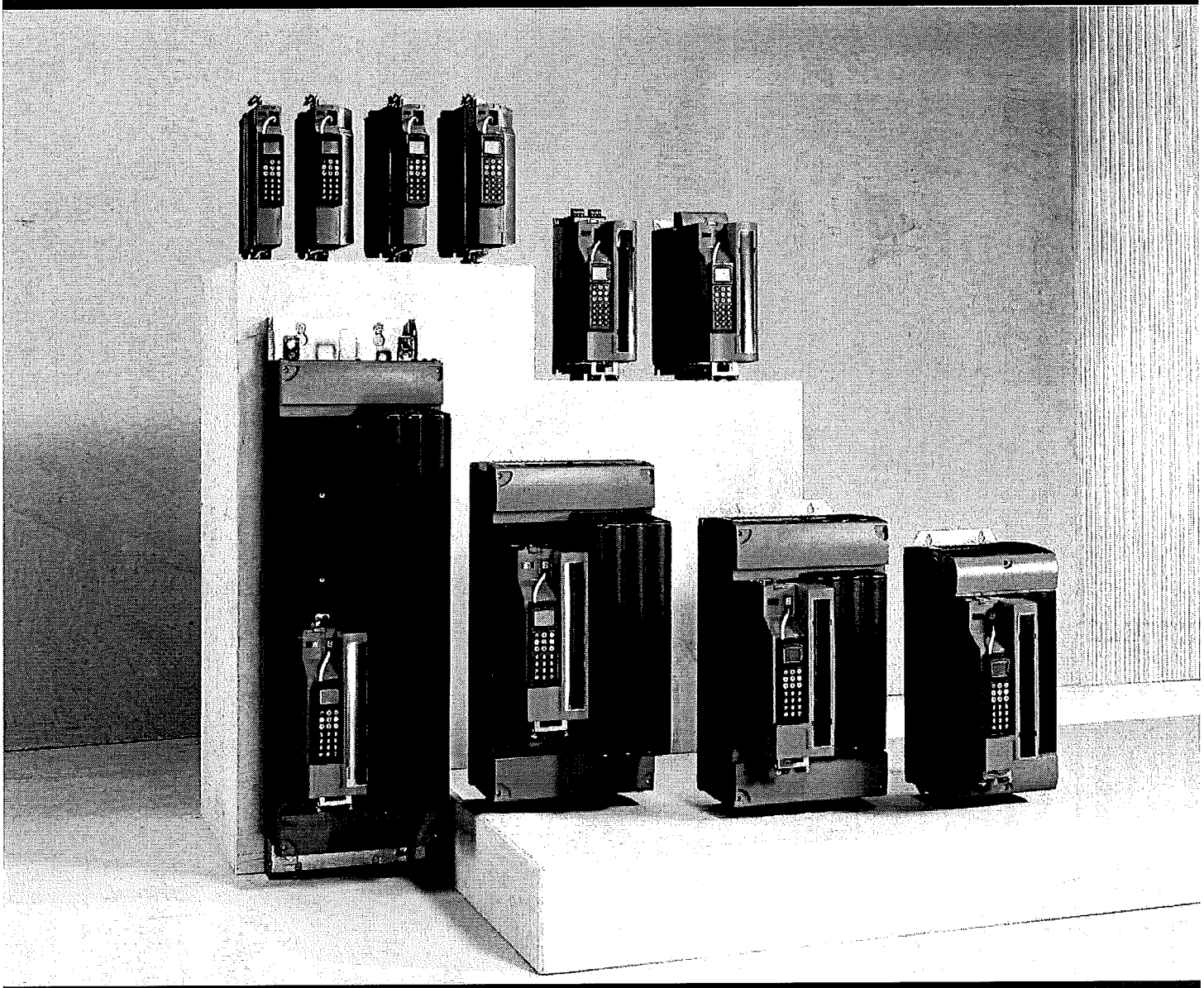
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Drive Electronics \ Drive Automation \ System Integration \ Services

SEW EURODRIVE



MOVIDRIVE® MDX60B / 61B

Edition 04/2008

11697016 / EN

Catalog

Use	Required option	Option slot
Encoder option		
Asynchronous AC motor with encoder feedback (HIPERFACE®, sin/cos, TTL)	HIPERFACE® encoder card DEH11B	1
Asynchronous or synchronous servomotor with HIPERFACE® encoder		
SSI encoder interface	Absolute encoder card DEH21B	
Synchronous servomotor with resolver	Resolver card type DER11B	
Communication options (fieldbus, control)		
User-programmable MOVI-PLC® controller	MOVI-PLC® *basic* DHP11B controller	2 (3 only if slot 2 is occupied)
Additional RS485 interface (only in combination with option DHP11B)	DHP11B + OST11B	• DHP11B in 2, OST11B in 1 • If 1 is occupied: DHP11B + OST11B in 3
User-programmable MOVI-PLC® controller	MOVI-PLC® *advanced* controller DHE41B	2 (3 only if slot 2 is occupied)
	MOVI-PLC® *advanced* controller DHF41B	3
Additional analog and binary inputs/outputs are required	Input/output card type DIO11B	2 (3 only if slot 2 is occupied)
Integration into a PROFIBUS system	PROFIBUS interface type DFP21B	2
Integration into a PROFIBUS system with PROFIsafe	Fieldbus interface type DFS11B	
Integration into an INTERBUS system	INTERBUS interface type DFI11B / DFI21B	
Integration into an Ethernet system	Ethernet interface type DFE11B, DFE12B, DFE13B, DFE32B; DFE33B	
Integration into an Ethernet system with PROFIsafe	Fieldbus interface type DFS21B	
Integration into an EtherCAT system	EtherCAT interface type DFE24B	
Integration into a DeviceNet system	DeviceNet interface type DFD11B	
Integration into a CANopen system	CANopen interface type DFC11B	
Expansion option		
SSI encoder interface	DIP11B absolute encoder card	3
Phase-synchronous operation	Synchronous operation card DRS11B	
Safety module	DCS21B option (only in conjunction with DFS12B/22B option) / DCS31B	

The units at a glance

MOVIDRIVE® MDX60/61B for 3 × AC 380 ... 500 V supply voltage (400/500 V units):

Recommended motor power (VFC)		Contin. output current (CFC)	MOVIDRIVE® type		Size (techn. data)
			MDX60B not option-capable	MDX61B option-capable	
0.55 kW (0.74 HP)	0.75 kW (1.0 HP)	AC 2.0 A	0005-5A3-4-..	0005-5A3-4-..	0 (→ Page 34)
0.75 kW (1.0 HP)	1.1 kW (1.5 HP)	AC 2.4 A	0008-5A3-4-..	0008-5A3-4-..	
1.1 kW (1.5 HP)	1.5 kW (2.0 HP)	AC 3.1 A	0011-5A3-4-..	0011-5A3-4-..	
1.5 kW (2.0 HP)	2.2 kW (3.0 HP)	AC 4.0 A	0014-5A3-4-..	0014-5A3-4-..	
1.5 kW (2.0 HP)	2.2 kW (3.0 HP)	AC 4.0 A	–	0015-5A3-4-..	1 (→ Page 36)
2.2 kW (3.0 HP)	3.0 kW (4.0 HP)	AC 5.5 A	–	0022-5A3-4-..	
3.0 kW (4.0 HP)	4.0 kW (5.4 HP)	AC 7.0 A	–	0030-5A3-4-..	
4.0 kW (5.4 HP)	5.5 kW (7.4 HP)	AC 9.5 A	–	0040-5A3-4-..	
5.5 kW (7.4 HP)	7.5 kW (10 HP)	AC 12.5 A	–	0055-5A3-4-..	2S, 2 (→ Page 37)
7.5 kW (10 HP)	11 kW (15 HP)	AC 16 A	–	0075-5A3-4-..	
11 kW (15 HP)	15 kW (20 HP)	AC 24 A	–	0110-5A3-4-..	
15 kW (20 HP)	22 kW (30 HP)	AC 32 A	–	0150-503-4-..	3 (→ Page 38)
22 kW (30 HP)	30 kW (40 HP)	AC 46 A	–	0220-503-4-..	
30 kW (40 HP)	37 kW (50 HP)	AC 60 A	–	0300-503-4-..	
37 kW (50 HP)	45 kW (60 HP)	AC 73 A	–	0370-503-4-..	4 (→ Page 39)
45 kW (60 HP)	55 kW (74 HP)	AC 89 A	–	0450-503-4-..	
55 kW (74 HP)	75 kW (100 HP)	AC 105 A	–	0550-503-4-..	5 (→ Page 40)
75 kW (100 HP)	90 kW (120 HP)	AC 130 A	–	0750-503-4-..	
90 kW (120 HP)	110 kW 148 HP)	AC 170 A	–	0900-503-4-..	6 (→ Page 41)
110 kW (148 HP)	132 kW (177 HP)	AC 200 A	–	1100-503-4-..	
132 kW (177 HP)	160 kW (215 HP)	AC 250 A	–	1320-503-4-..	

MOVIDRIVE® MDX60/61B for 3 × AC 200 ... 240 V supply voltage (230 V units):

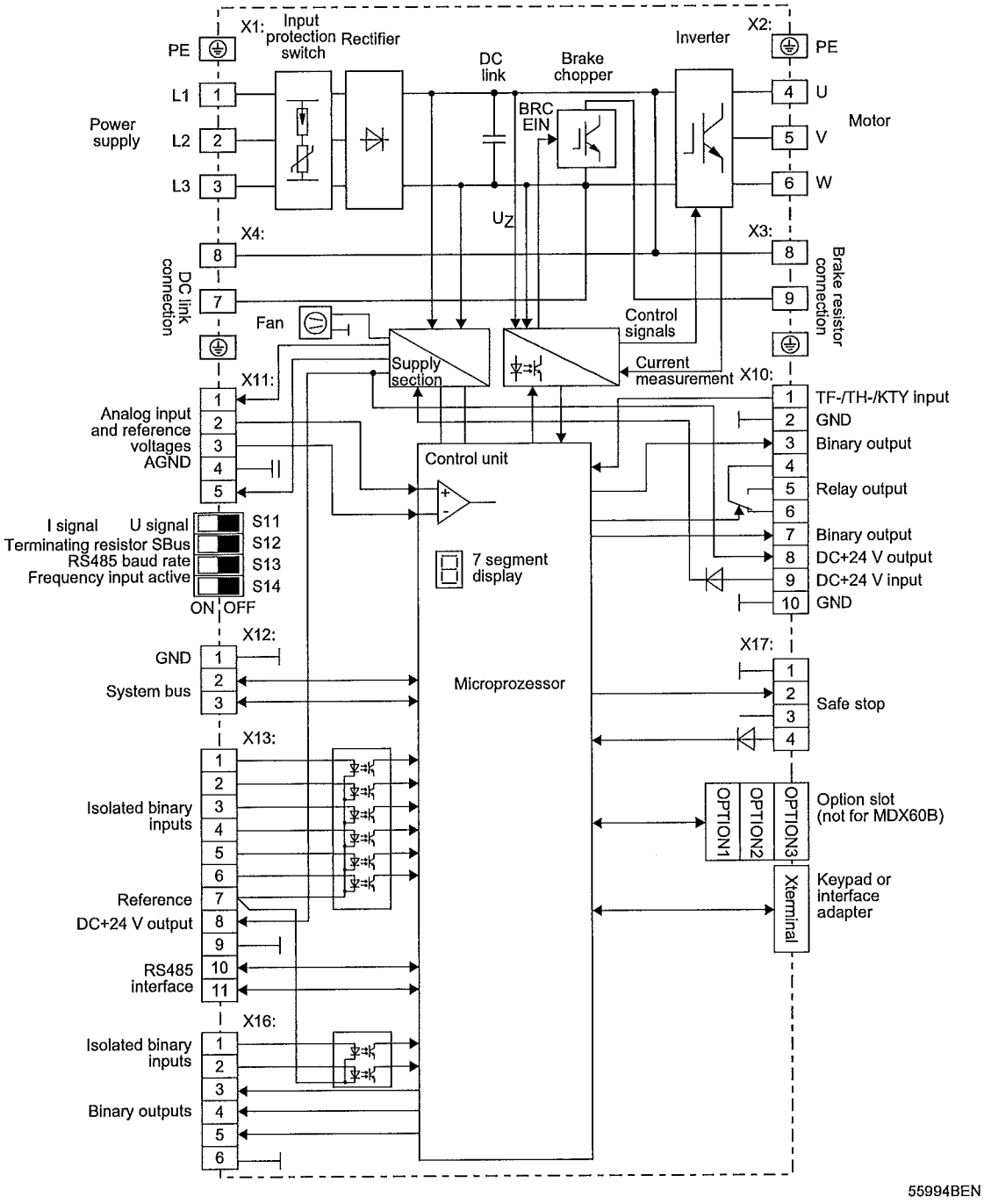
Recommended motor power (VFC)		Contin. output current (CFC)	MOVIDRIVE® type MDX61B option-capable	Size (technical data)
1.5 kW (2.0 HP)	2.2 kW (3.0 HP)	AC 7.3 A	0015-2A3-4-..	1 (→ Page 42)
2.2 kW (3.0 HP)	3.7 kW (5.0 HP)	AC 8.6 A	0022-2A3-4-..	
3.7 kW (5.0 HP)	5.0 kW (7.0 HP)	AC 14.5 A	0037-2A3-4-..	
5.5 kW (7.4 HP)	7.5 kW (10 HP)	AC 22 A	0055-2A3-4-..	2 (→ Page 43)
7.5 kW (10 HP)	11 kW (15 HP)	AC 29 A	0075-2A3-4-..	
11 kW (15 HP)	15 kW (20 HP)	AC 42 A	0110-203-4-..	3 (→ Page 44)
15 kW (20 HP)	22 kW (30 HP)	AC 54 A	0150-203-4-..	
22 kW (30 HP)	30 kW (40 HP)	AC 80 A	0220-203-4-..	4 (→ Page 45)
30 kW (40 HP)	37 kW (50 HP)	AC 95 A	0300-203-4-..	

MOVIDRIVE® MDR60A regenerative power supply units for 400/500 V units:

MOVIDRIVE® MDR60A regenerative power supply units		Size (technical data)	MOVIDRIVE®MDX60B/61B...-5_3
0370-503-00	I_{supply} = AC 66 A, I_{ZK} = DC 70 A	3, 4, 6 (→ page 60)	0005 ... 0370
0750-503-00	I_{supply} = AC 117 A, I_{ZK} = DC 141 A		0005 ... 0750
1320-503-00	I_{supply} = AC 260 A, I_{ZK} = DC 340 A		0005 ... 1320

Block circuit diagram

The following block circuit diagram shows the basic structure and theory of operation of MOVIDRIVE® MDX60B/61B drive inverters.



55994BEN

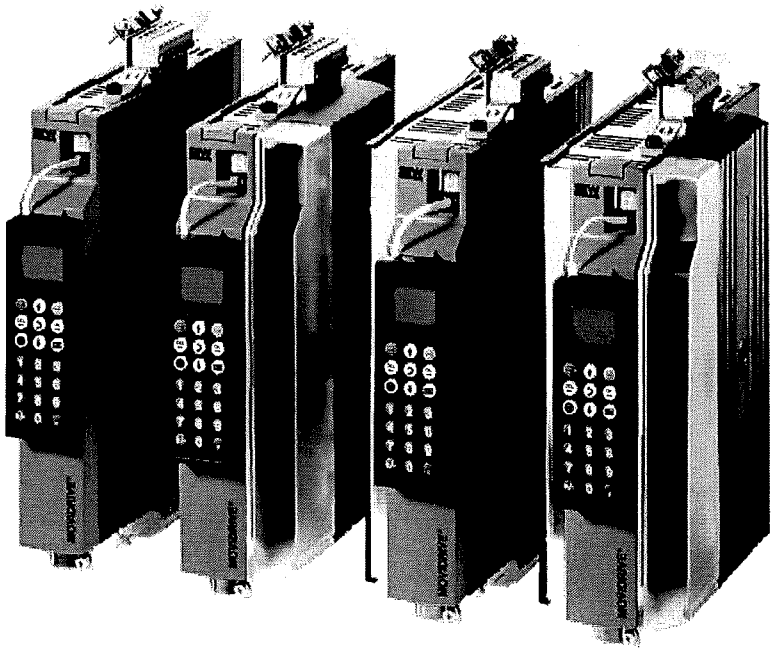
2.2 General technical data

The following table lists the technical data applicable to all MOVIDRIVE® MDX60B/61B inverters, regardless of their type, version, size and performance.

MOVIDRIVE® MDX60B/61B	All sizes
Interference resistance	Complies with EN 61800-3
Interference emission with EMC compliant installation	Sizes 0 to 6 meet EN 61800-3 Sizes 0 to 5: According to limit value class C1 to EN 61800-3 with a corresponding line filter Sizes 0, 1, and 2 in accordance with limit value class C2 to EN 61800-3 without additional measures Size 6 in accordance with limit value class C2 to EN 61800-3 with corresponding line filter
Ambient temperature ϑ_U	0 °C...+50 °C at I_D = 100 % I_N and f_{PWM} = 4 kHz 0 °C...+40 °C at I_D = 125 % I_N and f_{PWM} = 4 kHz 0 °C...+40 °C at I_D = 100 % I_N and f_{PWM} = 8 kHz
I_N reduction Ambient temperature	2.5 % I_N per K between 40 °C - 50 °C 3 % I_N per K at 50 °C - 60 °C
Climate class	EN 60721-3-3, class 3K3
Storage temperature[1] ϑ_L	–25 °C...+70 °C (EN 60721-3-3, class 3K3) DBG keypad: –20 °C...+60 °C
Cooling type (DIN 41751)	Forced cooling (temperature-controlled fan, response threshold 45 °C)
Enclosure EN 60529 (NEMA1) **Sizes 0 to 3** **Sizes 4 to 6**	 IP20 IP00 (power connections) IP10 (power connections) with • fitted plexiglass cover supplied as standard and • shrink tubing (not included in scope of delivery)
Operating mode	Continuous operation with 50% overload capacity (size 0: 100 %)
Overvoltage category	III according to IEC 60664-1 (VDE 0110-1)
Pollution class	2 according to IEC 60664-1 (VDE 0110-1)
Installation altitude h	Up to h ≤ 1000 m (3281 ft) without restrictions. At h ≥ 1000 m (3281 ft), the following restrictions apply: • from 1,000 m (3281 ft) to max. 4000 m (13120 ft): – I_N reduction by 1% per 100 m (328 ft) • from 2000 m (6562 ft) to max. 4000 m (13120 ft): – AC -230 V units: U_N reduction by AC 3 V per 100 m (328 ft) – AC -500 V units: U_N reduction by AC 6 V per 100 m (328 ft) Over 2000 m (6562 ft) only overvoltage class 2, external measures are required for overvoltage class 3. Overvoltage classes according to DIN VDE 0110-1.

1) In case of long-term storage, the unit must be connected to the mains voltage for at least 5 minutes, otherwise the unit's service life may be reduced.

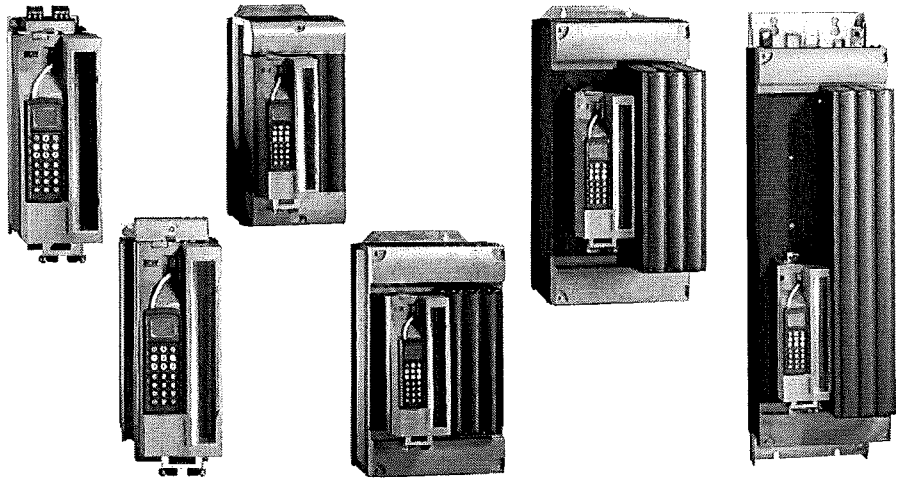
MOVIDRIVE®
MDX60B/61B
series, size 0



51485AXX

Figure 6: MOVIDRIVE® MDX60/61B series, size 0

MOVIDRIVE®
MDX61B series,
sizes 1 to 6



52159AXX

Figure 7: MOVIDRIVE® MDX61B series, sizes 1 to 6

Sizes 2S, 2 (AC 400/500 V units)

MOVIDRIVE® MDX61B		0055-5A3-4-0_	0075-5A3-4-0_	0110-5A3-4-0_
Size		2S		2
INPUT				
Rated supply voltage (to EN 50160)	V_{supply}	3 × AC 380 V - 500 V		
Supply frequency	f_{supply}	50 Hz ... 60 Hz ±5 %		
Rated supply current[1] (at V_{supply} = 3 × AC 400 V)	I_{supply} 100% 125 %	AC 11.3 A AC 14.1 A	AC 14.4 A AC 18.0 A	AC 21.6 A AC 27.0 A
OUTPUT				
Apparent output power[2] (at V_{supply} = 3 × AC 380...500 V)	S_N	8.7 kVA	11.2 kVA	16.8 kVA
Rated output current[1] (at V_{supply} = 3 × AC 400 V)	I_N	AC 12.5 A	AC 16 A	AC 24 A
Continuous output current (= 125 % I_N) (at V_{supply} = 3 × AC 400 V with f_{PWM} = 4 kHz)	I_D	AC 15.6 A	AC 20 A	AC 30 A
Continuous output current (= 100 % I_N) (at V_{supply} = 3 × AC 400 V with f_{PWM} = 8 kHz)	I_D	AC 12.5 A	AC 16 A	AC 24 A
Current limitation	I_{max}	Motor and regenerative 150 % I_N, duration depending on capacity utilization		
Internal current limitation		I_{max} = 0...150 % adjustable		
Minimum permitted braking resistor value (4Q operation)	R_{BRmin}	47 Ω		22 Ω
Output voltage	U_A	Max. V_{mains}		
PWM frequency	f_{PWM}	Can be set: 4 / 8 / 12 / 16 kHz		
Speed range/resolution	n_A / Δn_A	–6000 ... 0 ... +6000 min^{-1} / 0.2 min^{-1} across the entire range		
GENERAL INFORMATION				
Power loss at S_N[2]	P_{Vmax}	220 W	290 W	400 W
Cooling air consumption		80 m^3/h		
Weight		6.6 kg (15 lb)		
Dimensions	W × H × D	105 mm × 335 mm × 294 mm (4.13 in ×13.2 in × 11.6 in)		135 mm × 315 mm × 285 mm (5.31 in × 12.4 in × 11.2 in)
Cross section of unit terminals X1, X2, X3, X4		Terminal blocks 4 mm^2 conductor end sleeves DIN 46228		M4 screw and washer assembly with terminal clip 4 mm^2 conductor end sleeve DIN 46228 6 mm^2 crimp cable lug DIN 46234
Tightening torque		1.5 Nm		

1) The system and output currents must be reduced by 20 % from the nominal values for V_{supply} = 3 × AC 500 V.
2) The performance data applies to f_{PWM} = 4 kHz.

MDX61B Standard version Design with coated printed circuit boards	0055-5A3-4-00 0055-5A3-4-00/L	0075-5A3-4-00 0075-5A3-4-00/L	0110-5A3-4-00 0110-5A3-4-00/L
Part number	827 961 6 1840 017 5	827 962 4 1840 018 3	827 963 2 1840 019 1
MDX61B Application version Design with coated printed circuit boards	0055-5A3-4-0T	0075-5A3-4-0T	0110-5A3-4-0T
Part number	827 979 9 1840 035 3	827 980 2 1840 036 1	827 981 0 1840 038 8
Constant load Recommended motor power P_{Mot}	5.5 kW (7.4 HP)	7.5 kW (10 HP)	11 kW (15 HP)
Variable torque load or constant load without overload Recommended motor power P_{Mot}	7.5 kW (10 HP)	11 kW (15 HP)	15 kW (20 HP)
Recommended motor power	→ section "Motor selection"		

2.4 MOVIDRIVE® MDX61B...-2_3 (AC 230 V units)

Size 1 (AC 230 V units)

MOVIDRIVE® MDX61B		0015-2A3-4-0_	0022-2A3-4-0_	0037-2A3-4-0_
INPUT				
Rated supply voltage (to EN 50160)	V_{supply}	3 × AC 200 V - 240 V		
Supply frequency	f_{supply}	50 Hz ... 60 Hz ± 5 %		
Rated supply current (at V_{supply} = 3 × AC 230 V)	I_{supply} 100% 125 %	AC 6.7 A AC 8.4 A	AC 7.8 A AC 9.8 A	AC 12.9 A AC 16.1 A
OUTPUT				
Apparent output power[1] (at V_{supply} = 3 × AC 230..0.240 V)	S_N	2.7 kVA	3.4 kVA	5.8 kVA
Rated output current (at V_{supply} = 3 × AC 230 V)	I_N	AC 7.3 A	AC 8.6 A	AC 14.5 A
Continuous output current (= 125 % I_N) (at V_{supply} = 3 × AC 230 V with f_{PWM} = 4 kHz)	I_D	AC 9.1 A	AC 10.8 A	AC 18.1 A
Continuous output current (= 100 % I_N) (at V_{supply} = 3 × AC 230 V with f_{PWM} = 8 kHz)	I_D	AC 7.3 A	AC 8.6 A	AC 14.5 A
Current limitation	I_{max}	Motor and regenerative 150 % I_N, duration depending on capacity utilization		
Internal current limitation		I_{max} = 0...150 % adjustable		
Minimum permitted braking resistor value (4Q operation)	R_{BRmin}	27 Ω		
Output voltage	U_A	Max. V_{supply}		
PWM frequency	f_{PWM}	Can be set: 4 / 8 / 12 / 16 kHz		
Speed range/resolution	n_A / Δn_A	–6000 ... 0 ... +6000 min^{-1} / 0.2 min^{-1} across the entire range		
GENERAL INFORMATION				
Power loss at S_N[1]	P_{Vmax}	110 W	126 W	210 W
Cooling air consumption		40 m^3/h		
Weight		2.8 kg (6.2 lb)		
Dimensions	W × H × D	105 mm × 314 mm × 234 mm (4.13 in × 312.4 in × 9.21 iin)		
Cross section of unit terminals X1, X2, X3, X4		Separable terminal block 4 mm^2 conductor end sleeve DIN 46228		
Tightening torque		0.6 Nm		

1) The performance data applies to f_{PWM} = 4 kHz.

MDX61B Standard version		0015-2A3-4-00	0022-2A3-4-00	0037-2A3-4-00
Part number		827 994 2	827 995 0	827 996 9
MDX61B Application version		0015-2A3-4-0T	0022-2A3-4-0T	0037-2A3-4-0T
Part number		828 003 7	828 004 5	828 005 3
Constant load Recommended motor power	P_{Mot}	1.5 kW (2.0 HP)	2.2 kW (3.0 HP)	3.7 kW (5.0 HP)
Variable torque load or constant load without overload Recommended motor power	P_{Mot}	2.2 kW (3.0 HP)	3.7 kW (5.0 HP)	5.0 kW (6.7 HP)
Recommended motor power		→ section "Motor selection"		

Size 1

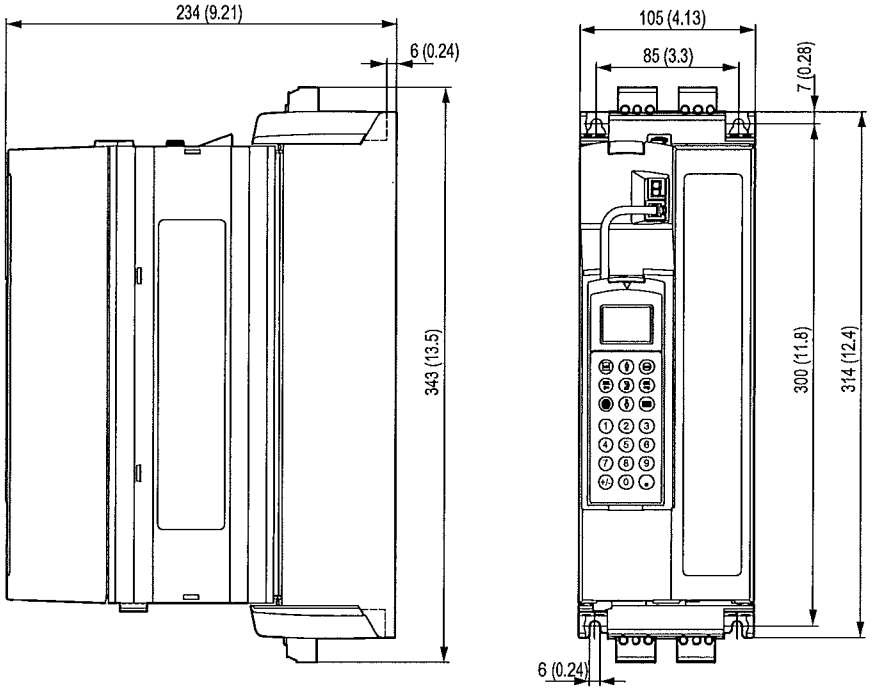


Figure 14: Dimensions for MDX61B size 1, dimensions in mm (in)

BSize 2S

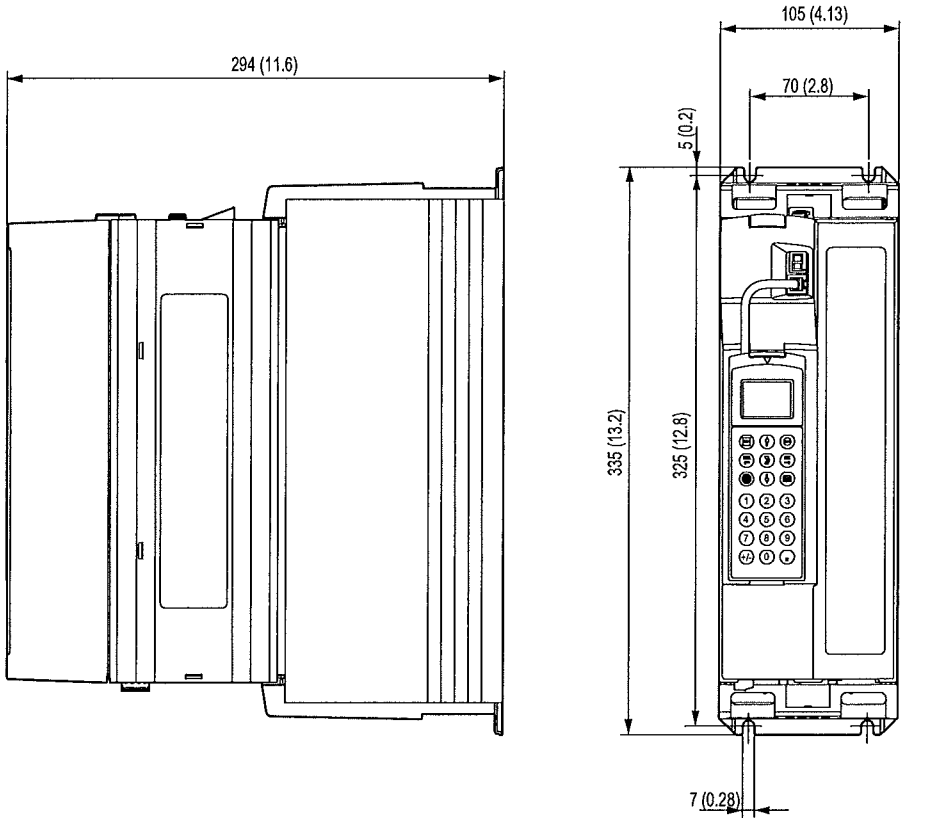


Figure 15: Dimensions for MDX61B size 2S, dimensions in mm (in)

ABB Standard Drives

ACS550, 0.75 - 550 Hp

Technical Catalog



Ratings, Types and Voltages

Type code

This is the unique reference number that clearly indentifies the drive by mounting configuration, power rating and voltage. Once you have selected the type code, the frame size can be used to determine the drives dimensions, shown on the next page.

Voltages

The ACS550 is available in three voltage ranges:

2 = 208 - 240V

4 = 380 - 480V

6 = 500 - 600V

Notes

1 I_{2N}: continuous base current with 110% overload for 1 minute / 10 minutes.

2 I_{2hd}: continuous base current with 150% overload for 1 minute / 10 minutes.

3 180% I_{hd} continuous base current available for 2 seconds / 1 minute.

4 The rated current of the ACS550 must be greater than or equal to the rated motor current to achieve the rated motor power given in the table.

5 All -U1 models come with a conduit box and advanced control panel as standard.

6 Horsepower is based on NEMA motor ratings for most 4-pole motors (1800 rpm). Check motor nameplate current for compatibility.

7 All 230V product can be operated on 230V single-phase power, using a de-rate of the output current of 50%.

8 All -U2 models come standard with US conduit openings, top entry / top exit, common mode filter for drives larger than 200 HP, fused disconnect and extended enclosure with advanced control panel.

Type Code UL Type 1 NEMA 1 (5,8)	Nominal Ratings				Frame Size
	Normal Duty (CT) (110% I_{2N})		Heavy Duty (CT) (150% I_{2hd})		
	I_{2N} A (1,7)	P_N HP (4,6)	I_{2hd} A (2,3,7)	P_{hd} HP (4,6)	
ACS550-U1-04A6-2	4.6	1.0	3.5	0.75	R1
ACS550-U1-06A6-2	6.6	1.5	4.6	1.0	R1
ACS550-U1-07A5-2	7.5	2.0	6.6	1.5	R1
ACS550-U1-012A-2	11.8	3.0	7.5	2	R1
ACS550-U1-017A-2	16.7	5.0	11.8	3	R1
ACS550-U1-024A-2	24.2	7.5	16.7	5	R2
ACS550-U1-031A-2	30.8	10	24.2	7.5	R2
ACS550-U1-046A-2	46.2	15	30.8	10	R3
ACS550-U1-059A-2	59.4	20	46.2	15	R3
ACS550-U1-075A-2	74.8	25	59.4	20	R4
ACS550-U1-088A-2	88	30	74.8	25	R4
ACS550-U1-114A-2	114	40	88	30	R4
ACS550-U1-143A-2	143	50	114	40	R6
ACS550-U1-178A-2	178	60	150	50	R6
ACS550-U1-221A-2	221	75	178	60	R6
ACS550-U1-248A-2	248	100	192	75	R6
ACS550-U1-03A3-4	3.3	1.5	2.4	1	R1
ACS550-U1-04A1-4	4.1	2	3.3	1.5	R1
ACS550-U1-06A9-4	6.9	3	5.4	2	R1
ACS550-U1-08A8-4	8.8	5	6.9	3	R1
ACS550-U1-012A-4	11.9	7.5	8.8	5	R1
ACS550-U1-015A-4	15.4	10	11.9	7.5	R2
ACS550-U1-023A-4	23	15	15.4	10	R2
ACS550-U1-031A-4	31	20	23	15	R3
ACS550-U1-038A-4	38	25	31	20	R3
ACS550-U1-045A-4	44	30	38	25	R3
ACS550-U1-059A-4	59	40	44	30	R4
ACS550-U1-072A-4	72	50	59	40	R4
ACS550-U1-078A-4	77	60	65	50	R4
ACS550-U1-097A-4	96	75	77	60	R4
ACS550-U1-125A-4	124	100	96	75	R5
ACS550-U1-157A-4	157	125	124	100	R6
ACS550-U1-180A-4	180	150	156	125	R6
ACS550-U1-246A-4	245	200	192	150	R6
ACS550-U2-316A-4	316	250	240	200	R8
ACS550-U2-368A-4	368	300	302	250	R8
ACS550-U2-414A-4	414	350	368	300	R8
ACS550-U2-486A-4	486	400	414	350	R8
ACS550-U2-526A-4	526	450	477	400	R8
ACS550-U2-602A-4	602	500	515	450	R8
ACS550-U2-645A-4	645	550	590	500	R8
ACS550-U1-02A7-6	2.7	2	2.4	1.5	R2
ACS550-U1-03A9-6	3.9	3	2.7	2.0	R2
ACS550-U1-06A1-6	6.1	5	3.9	3.0	R2
ACS550-U1-09A0-6	9	7.5	6.1	5.0	R2
ACS550-U1-011A-6	11	10	9	7.5	R2
ACS550-U1-017A-6	17	15	11	10	R2
ACS550-U1-022A-6	22	20	17	15	R3
ACS550-U1-027A-6	27	25	22	20	R3
ACS550-U1-032A-6	32	30	27	25	R4
ACS550-U1-041A-6	41	40	32	30	R4
ACS550-U1-052A-6	52	50	41	40	R4
ACS550-U1-062A-6	62	60	52	50	R4
ACS550-U1-077A-6	77	75	62	60	R6
ACS550-U1-099A-6	99	100	77	75	R6
ACS550-U1-125A-6	125	125	99	100	R6
ACS550-U1-144A-6	144	150	125	125	R6

Construction

"U1" within the type code indicates the drive mounting configuration. U1 models are wall-mounted, while "U2" models are free-standing with an extended enclosure and fused disconnect. Choose the correct one for your needs from the table below:

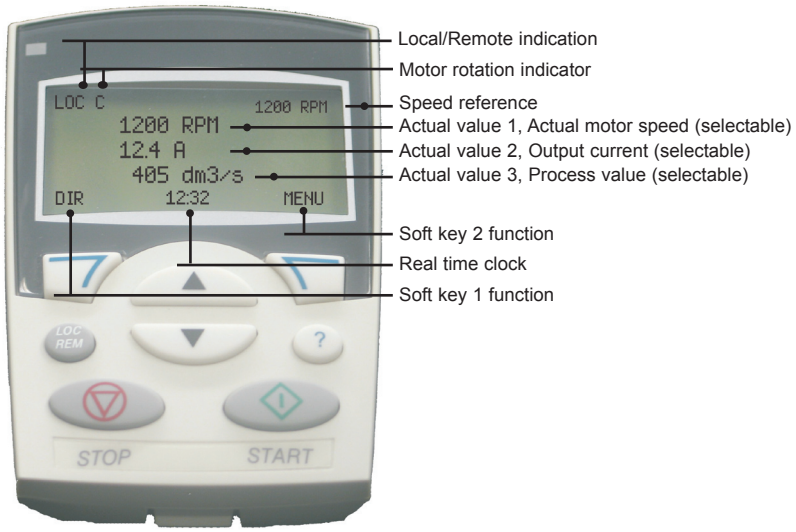
U1	U2
■ Wall mounted, frame size R1-R6 ■ 0.75 - 200 HP ■ UL Type 1 (IP21) NEMA 1 or UL Type 12 (IP54) NEMA 12 ■ Built-in EMC filter ■ Standard software ■ Built-in Modbus RTU interface ■ Cable connection box ■ Brake chopper in frame sizes R1-R2 ■ Advanced control panel ■ Swinging choke (Frames R1-R4) ■ AC Reactor (Frames R5-R8)	■ Free standing, frame size R8 ■ 250 - 550Hp ■ UL Type 1 (IP21) NEMA 1 ■ Standard software ■ Built-in Modbus RTU interface ■ Free-standing with extended enclosure and fused disconnect ■ Advanced control panel ■ AC Reactor (Frame R8)

Advanced Control Panel

For easy drive programming, a detachable, multilingual alphanumeric advanced control panel is delivered as standard. The control panel has various assistants and built-in help functions to guide the user. It includes a real time clock, which can be used during fault logging and in controlling the drive, such as start/stop and maintenance reminders. The control panel can be used for copying parameters for back up or for downloading to another drive. A large graphical display and soft keys make it extremely easy to navigate.



Name	Function
Start	Initiates operation of drive
Stop	Ceases operation of drive
Up	Changes parameters and their value/ increases reference
Down	Changes parameters and their value/ decreases reference
Loc/Rem	Changes drive state from local control to remote control (I/O or other external source)
HELP	Built-in "Help" button
Soft key 1	Function changes according to state of panel
Soft key 2	Function changes according to state of panel



Options

Control Interfaces

How to select options

The options shown below are available for use with the ACS550. Each item has a 4-digit option code, which is shown in the table below. This code is added to the end of the type code above using a '+'. Ordering options using the plus option code provides a factory installed option, while using the field kit code provides a field installable kit (-KIT).

Available options

Plus Option Code	Description	Field Kit Code
Protection class		
+B055	UL Type 12 (IP54) NEMA 12	
Slot 1 Options		
+L511	Relay Output Extension	OREL-01-KIT
+L502	Pulse Encoder Interface	OTAC-01-KIT
Slot 2 Options		
+L512	115/230V Digital Input Interface	OHDI-01-KIT
+K451	DeviceNet	RDNA-01-KIT
+K454	Profibus-DP	RPBA-01-KIT
+K462	ControlNet	RCNA-01-KIT
+K466	EtherNet/IP and Modbus/TCP	RETA-01-KIT
+K457	CANopen	RCAN-01-KIT
+K467	PROFINET and Modbus/TCP	RETA-02-KIT

NOTE:
- Only one option can be installed in each option slot.
- Embedded Modbus RTU

Panel Mounting Kit (OPMP-01)

The panel mounting kit, OPMP-01, enables mounting of control panels on cabinet doors. This kit includes a 10 ft (3 m) extension cable, a gasket, mounting screws and a mounting template.



ACS/H-CP-EXT: permits permanent mounting of panel to external surface of NEMA 1 or NEMA 12 enclosures.

ACS/H-CP-EXT-IP66: permits permanent mounting of panel to external surface of NEMA 4X enclosures.

DriveWindow Light 2 (3AFE64532871)

DriveWindow Light 2 is a PC software used for rapid commissioning, operating and programming of drives. It has features for programming, monitoring, troubleshooting and maintenance.

It is also a set-up and control tool which is Win98, WinNT, Win2000 and WinXP compatible.

DriveWindow Light 2 operates both off- and on-line. No additional PC hardware is required. It uses the PC's RS-232 port. It is also compatible with drive types ACS350, ACS800, DCS400 and DCS800.

DriveWindow Light 2 features

- Graphical start-up wizards
- Off- and on-line viewing and changing of drive parameters
- Backup and restore parameters. In a fault situation, the parameters can be reloaded resulting in time savings
- Graphical monitoring of actual signal values
- I/O mapping table
- Control of the drive

DrivePM

DrivePM (Parameter Manager) is a software tool designed to create, edit and copy parameter sets included with a Flash-Drop. For each parameter, and parameter group, the user can change the default or hide the parameter or entire group. FlashDrop does not require the drive to have power applied. FlashDrop is also compatible with the ACS150 and ACS350.

FlashDrop MFDT-01

FlashDrop is a powerful palm-sized tool for fast and easy parameter selecting and setting. This tool can be used to download parameters to a drive in less than three seconds. Using this tool, it is possible to hide selected parameters to protect the machine. Only parameters needed in the application are shown. FlashDrop does not require the drive to be powered. The MFDT-01 includes Drive PM (Drive Parameter Manager) software tool to create, edit and copy parameter sets.



FlashDrop (MFDT-01)

Options

Plug-in Options

Relay Output Extension Module (+L511)

This plug-in option offers three additional relay outputs. They can be used to actuate motor starters for pumps using a lead-lag alternation scheme with the built-in Pump-Fan Macro. All relays can be programmed to on/off by using the advanced control panel's clock. Alternatively, fieldbus adapters can be used to control any external components in the system.

Pulse Encoder Interface (+L502)

The Pulse Encoder Interface module offers a differential or single ended interface for a digital pulse encoder connection. The module is capable of operating from either a 15 or 24 VDC signal with a maximum frequency of 200kHz.

115/230V Digital Input Interface (+L512)

The 115/230V Digital Input Interface module offers six (6) 115V or three (3) 230V rated relays mounted on a common board used to drive DI1 through DI6 of the ACS550. The 115/230V must be provided by the user. The module cannot be used in conjunction with any fieldbus module as it occupies the same option slot.

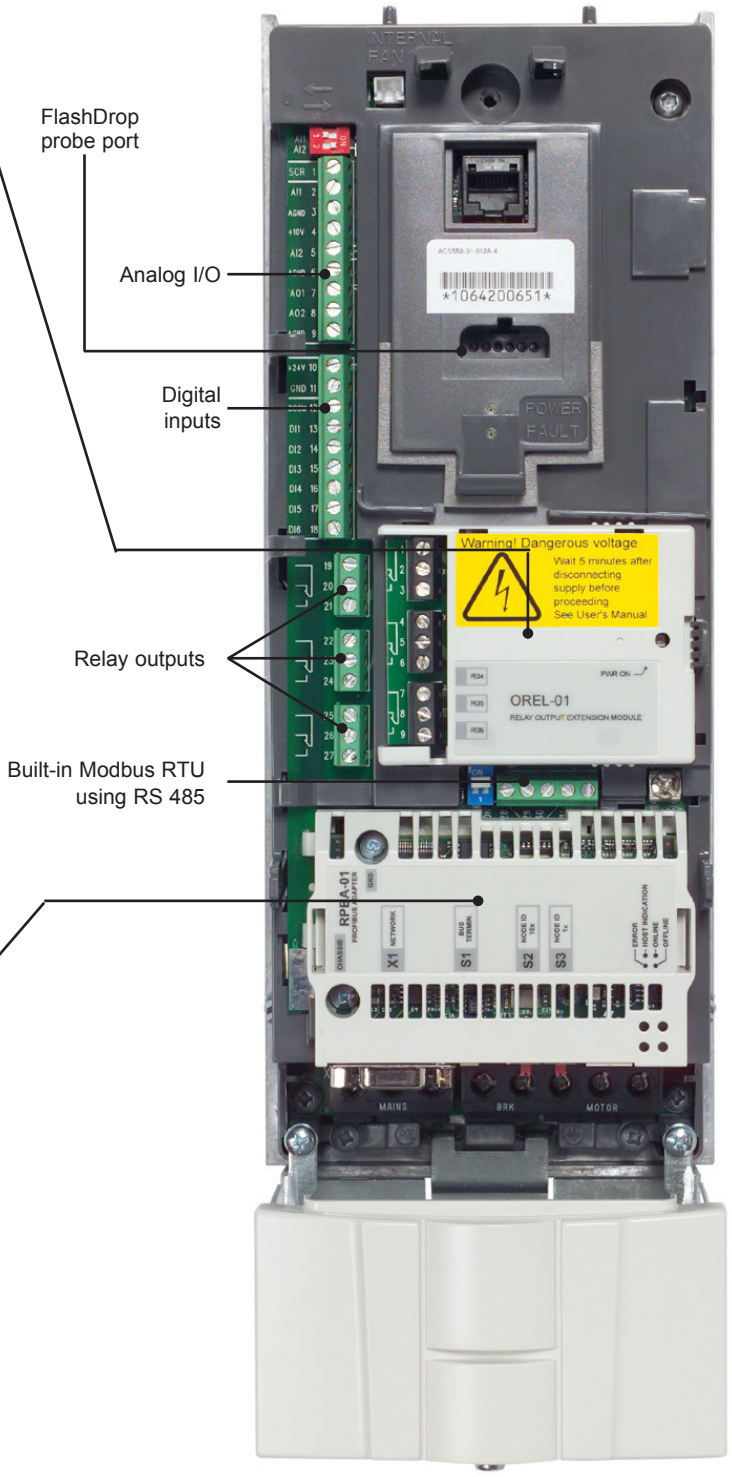
Plug-in Feldbus Modules

The plug-in fieldbus options bring connectivity to major automation systems. A single twisted pair avoids large amounts of conventional cabling, thereby reducing cost and increasing system reliability.

The ACS550 supports the following fieldbus options:

- CANopen
- ControlNet™
- DeviceNet™
- Embedded Modbus ® RTU
- EtherNet/IP™ Modbus/TCP ®
- Profibus-DP ®
- PROFINET IO ®

NOTE:
- Only one option can be installed in each option slot.



Options

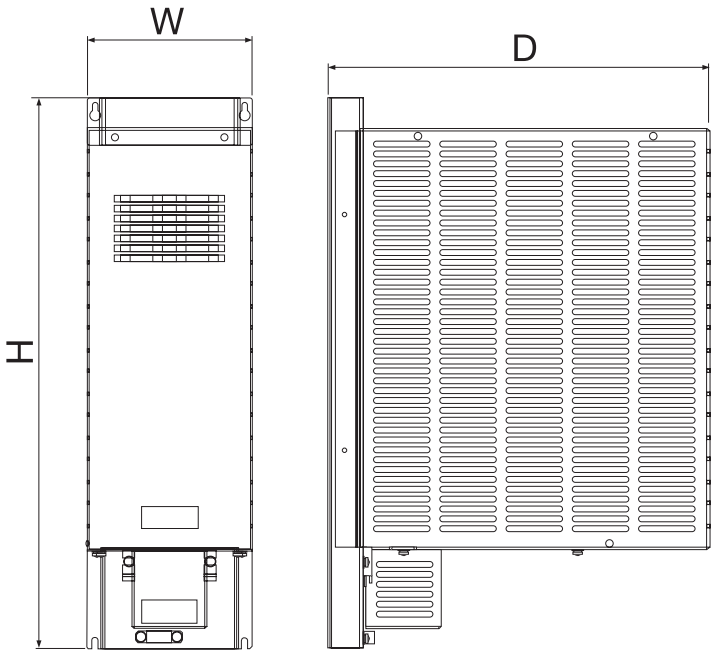
External Options

Brake Units and Choppers

Frame sizes R1 to R2 are delivered with integrated brake choppers as standard. Other units can use the compact sized brake units which include a brake chopper and resistor. For more information, please refer to the ACS-BRK Brake Units *Installation and Start-up Guide (3AUA0000004067) or ACS550 Price List (ACS550-PNPL01U-EN).*

Brake units technical data

Frequency Converter Input Voltage	Resis-tor Ohms	Continuous Output W	Max. Output 20/sec W	Brake Unit Type Code
200 - 240VAC 380 - 480VAC	32	2000	4500 12000	ACS-BRK-C
200 - 240VAC 380 - 480VAC	10.5	7000	14000 42000	ACS-BRK-D



Dimensions

Width (W) mm / in	Height (H) mm / in	Depth (D) mm / in	Weight (W) kg / lbs.	Brake Unit Type Code
150 / 5.9	500 / 19.7	347 / 13.7	7.5 / 16.5	ACS-BRK-C
270 / 10.6	600 / 23.6	450 / 17.7	20.5 / 45.1	ACS-BRK-D

Flange Mounting Kits

Flange Mounting Kits for the ACS550 drives allow mounting of the drive with the heatsink external to a 3rd party enclosure. Use of the flange kit requires removal of the drive cover, reducing protection to IP00. The flange kit can be used with 3rd party UL Type 1 & 12 (NEMA 1 & 12) enclosures. R5 and R6 kits provide NEMA 1 & 12 protection only.

Flange Mounting Kits

Frame Size	Field Kit Code
R1	FMK-A-R1
R2	FMK-A-R2
R3	FMK-A-R3
R4	FMK-A-R4
R5	AC8-FLNGMT-R5
R6	AC8-FLNGMT-R6

Technical Data

Cooling

Cooling Air Flow 208 - 240V Units

Type Code	Frame Size	W	BTU/Hr	m^3/h	ft^3/min
-04A6-2	R1	55	189	44	26
-06A6-2	R1	73	249	44	26
-07A5-2	R1	81	276	44	26
-012A-2	R1	118	404	44	26
-017A-2	R1	161	551	44	26
-024A-2	R2	227	776	88	52
-031A-2	R2	285	973	88	52
-046A-2	R3	420	1434	134	79
-059A-2	R3	536	1829	134	79
-075A-2	R4	671	2290	280	165
-088A-2	R4	786	2685	280	165
-114A-2	R4	1014	3463	280	165
-143A-2	R6	1268	4331	405	238
-178A-2	R6	1575	5379	405	238
-221A-2	R6	1952	6666	405	238
-248A-2	R6	2189	7474	405	238

Cooling Air Flow 500 - 600V Units

Type Code	Frame Size	W	BTU/Hr	m^3/h	ft^3/min
-02A7-6	R2	46	157	88	52
-03A9-6	R2	68	232	88	52
-06A1-6	R2	124	423	88	52
-09A0-6	R2	170	581	88	52
-011A-6	R2	232	792	88	52
-017A-6	R2	337	1150	88	52
-022A-6	R3	457	1560	134	79
-027A-6	R3	562	1918	134	79
-032A-6	R4	667	2276	280	165
-041A-6	R4	907	3096	280	165
-052A-6	R4	1120	3820	280	165
-062A-6	R4	1295	4420	280	165
-077A-6	R6	1504	5136	405	238
-099A-6	R6	1821	6219	405	238
-125A-6	R6	2442	8339	405	238
-144A-6	R6	2813	9607	405	238

Cooling Air Flow 380 - 480V Units

Type Code	Frame Size	W	BTU/Hr	m^3/h	ft^3/min
-03A3-4	R1	40	137	44	26
-04A1-4	R1	52	178	44	26
-06A9-4	R1	97	331	44	26
-08A8-4	R1	127	434	44	26
-012A-4	R1	172	587	44	26
-015A-4	R2	232	792	88	52
-023A-4	R2	337	1151	88	52
-031A-4	R3	457	1561	134	79
-038A-4	R3	562	1919	134	79
-045A-4	R3	667	2278	134	79
-059A-4	R4	907	3098	280	165
-072A-4	R4	1120	3825	280	165
-078A-4	R4	1300	4300	280	165
-097A-4	R4	1440	4918	280	165
-125A-4	R5	1940	6625	350	205
-157A-4	R6	2310	7889	405	238
-180A-4	R6	2810	9897	405	238
-246A-4	R6	3850	13148	540	318
-316A-4	R8	4550	15539	1220	718
-368A-4	R8	6850	23394	1220	718
-414A-4	R8	7400	25000	1220	718
-486A-4	R8	7850	26809	1220	718
-526A-4	R8	7600	25955	1220	718
-602A-4	R8	8100	27663	1220	718
-645A-4	R8	9100	31078	1220	718

ACS550 are configured with cooling air fans. The cooling air must be free from corrosive materials with a maximum ambient temperature of 40°C (50°C with derating).

Free space requirements

Enclosure Type	Space above mm / in	Space below mm / in	Space on left and right mm / in
U1 - Wall Mount	200 / 7.9	200 / 7.9	0
U2 - Floor Mount	200 / 7.9	0	0

Technical Specification

Input power connection

Voltage and power range	3-phase, 208 to 240 V, +10/-15%, 0.75 - 100Hp 3-phase, 380 to 480 V, +10/-15%, 1 - 550Hp 3-phase, 500 to 600V, +10/-15%, 1.5 - 150Hp
Frequency	48 to 63 Hz
Power factor	0.98

Motor connection

Voltage	3-phase, from 0 to U_{SUPPLY}
Frequency	0 to 500 Hz
Continuous loading capability (constant torque at a max ambient temperature of 40°c)	Rated output current I_{2N}
Overload capacity (at a max. ambient temperature of 40°c)	At normal use 1.1 x I_{2N} for 1 minute every 10 minutes At heavy-duty use 1.5 x I_{2hd} for 1 minute every 10 minutes Always 1.8 x I_{2hd} for 2 seconds every 60 seconds
Switching frequency	
Standard	Default 4 kHz
Selectable	0.75 - 150Hp: 1 kHz, 4 kHz, 8 kHz, 12 kHz up to 550Hp: 1 kHz, 4 kHz
Acceleration time	0.1 to 1800 s
Deceleration time	0.1 to 1800 s

Environmental limits

Ambient temperature	-15 to 40°C (5 to 104°F) 40 to 50°C (104 to 122°F) No frost allowed f_{switch} 4 kHz, P_N and I_2 derated to 90%
Altitude	
Output current	Rated current available at 0 to 1000 m (3300 ft) reduced by 1% per 100 m over 1000 m (3300 ft) to 2000 m (6600 ft)
Relative humidity	lower than 95% (without condensation)
Protection class	UL Type 1 or 12 (NEMA 1 or NEMA 12)
Enclosure color	NCS 1502-Y, RAL 9002, PMS 420 C
Contamination levels	IEC 721-3-3 No conductive dust allowed
Transportation	Class 1C2 (chemical gases), Class 1S2 (solid particles)
Storage	Class 2C2 (chemical gases), Class 2S2 (solid particles)
Operation	Class 3C2 (chemical gases), Class 3S2 (solid particles)

Motor Control

Speed Control	
Open Loop	20% of motor nominal slip
Closed Loop	0.1% of motor nominal speed
Open Loop	< 1% s with 100% torque step
Closed Loop	0.5% s with 100% torque step
Motor Control	
Open Loop	<10ms with nominal torque
Closed Loop	<10ms with nominal torque
Open Loop	±5% with nominal torque
Closed Loop	±2% with nominal torque

Programmable control connections

Two analog inputs	
Voltage signal	0 (2) to 10 V, R_{in} > 312 kΩ single-ended
Current signal	0 (4) to 20 mA, R_{in} = 100 Ω single-ended
Potentiometer reference value	10 V ±2% max. 10 mA, R < 10 kΩ
Maximum delay	12...32 ms
Resolution	0.1%
Accuracy	±1%
Two analog outputs	0 (4) to 20 mA, load < 500 Ω
Accuracy	±3%
Auxiliary voltage	24 V DC ±10%, max. 250 mA
Six digital inputs	12 V... 24 V DC with internal or external supply, PNP and NPN
Input impedance	2.4 kΩ
Maximum delay	5 ms ± 1ms
Three relay outputs	
Maximum switching voltage	250 V AC/30 V DC
Maximum switching current	6 A/30 V DC; 1500 V A/230 V AC
Maximum continuous current	2 A rms
Serial communication	
RS 485	Built-in Modbus RTU protocol

Product compliance

240V products:	UL, cUL, CSA, CE, C-TICK, and GOST-R approvals
480V products:	UL, cUL, CSA, CE, C-TICK, and GOST-R approvals
600V products:	UL, cUL, CSA, C-TICK, and GOST-R approvals

Low Voltage Directive 73/23/EEC with supplements

Machinery Directive 98/37/EC

EMC Directive 89/336/EEC with supplements

Quality assurance system ISO 9001 and Environmental system ISO 14001

EMC according to EN61800-3

1st environment restricted distribution for frame sizes R3, R4 with 75 m motor cables and for frame sizes R1, R2, R5, R6 with 100 m motor cables.

2nd environment unrestricted distribution for frame sizes R1 - R4 with 300 m cable and for frame sizes R5 - R8 with 100 m motor cables as standard.

These cable lengths are for EMC purposes only. For long motor cable lengths, external EMC filters are available on request.

EMC standards in general

EN 61800-3/A11 (2000), product standard	EN 61800-3 (2004), product standard	EN 55011, product family standard for industrial, scientific and medical (ISM) equipment
1st Environment, unrestricted distribution	Category C1	Group 1 Class B
1st Environment, restricted distribution	Category C2	Group 1 Class A
2nd Environment, unrestricted distribution	Category C3	Group 2 Class A
2nd Environment, restricted distribution	Category C4	Not Applicable

Fieldbus Control

Gateway to your process



ABB AC drives have the connectivity to major automation systems. This is achieved with a dedicated gateway concept between the fieldbus systems and ABB drives.

The fieldbus gateway is a snap-on module that can be easily mounted inside the drive. As a result of the wide range of fieldbus gateways, your choice for an automation system becomes independent of your decision to use first-class ABB AC drives.

Manufacturing Flexibility

Drive control

The drive Control Word (16 bit) provides a wide variety of functions from Start, Stop and Reset to Ramp Generator control. Typical setpoint values like Speed, Torque and Position can be transmitted to the drive with 15 bit accuracy.

Drive monitoring

A set of drive parameters and/or actual signals, like torque, speed, position, current etc., can be selected for cyclic data transfer providing fast data for operators and the manufacturing process.

Drive diagnostics

Accurate and reliable diagnostic information can be obtained via the drive Alarm, Limit and Fault Words reducing the down time of the drive and therefore, also the down time of the manufacturing process.

Drive parameter handling

Total integration of the drives in the production process is achieved by single parameter read/write up to complete parameter set-up or download.

Easy to expand

Serial communication simplifies the latest trend of modular machine design enabling expansion of the installation at a later stage with low effort.

Reduced Installation and Engineering Effort

Cabling

Substituting the large amount of conventional Drive Control cabling with a single twisted pair reduces costs and increases system reliability.

Design

The use of Fieldbus Control reduces engineering time at installation due to the modular structure of the hardware and software.

Commissioning and assembly

The modular machine configuration allows pre-commissioning of single machine sections and provides easy and fast assembly of the complete installation.

Currently Available Gateways

- CANopen
- ControlNet™
- DeviceNet™
- Embedded Modbus® RTU
- Modbus/TCP®
- EtherNet/IP™
- Profibus-DP®
- PROFINET IO®

ABB ACS550 Packaged Drives

ACS550 Packaged Drive

ACS550-PC and PD packaged drives combine ACS550 AC drives with the disconnect arrangement of your choice in one coordinated, easy to install package. Packages are available with an input disconnect switch and fast acting, current limiting fuses (ACS550-PD) or an input circuit breaker (ACS550-PC). Units with a circuit breaker disconnect at and above ratings of 30 HP at 208/240V and 75 HP at 480 & 600V are also equipped with fast acting, drive input fuses to limit damage to the drive and provide for the possibility of drive repair in the unlikely event that a short circuit or ground fault should develop within the input power structure of the drive.

Disconnects are externally operable and interlocked with the enclosure door. The cover mounted disconnect operating handle may be padlocked in the off position with up to three padlocks. The multilingual, alphanumeric drive control panel is provided on the cover of NEMA 1 and NEMA 12 enclosed devices, and on the drive within NEMA 3R enclosed units.

Vertical Wall Mount Enclosures

NEMA 1 and NEMA 12 enclosed ACS550-PC and PD Drives with Disconnect through 25 HP at 208/240V and 60 HP at 480 and 600V are provided in vertical wall mount enclosures. This unique construction provides a minimum footprint advantageous for use in overcrowded electrical rooms or mezzanines, or for direct mounting on machines or columns. Input and output conduit entry is at the bottom of the enclosure.



Oversized Wall Mounting Enclosures

For NEMA 1 and NEMA 12 enclosed ACS550-PC and PD Drives with Disconnect from 30 to 100 HP at 208/240V, 75 to 200 HP at 480 & 600V, wall mounting enclosures are sized to accommodate the field addition of components that users frequently desire to include at these higher horsepower ratings. A removable conduit plate is provided at the top of the enclosure.



Free Standing Packages

From 250 HP to 550 HP at 480V, ACS550-PC enclosures will accommodate the field installation of additional components. Where additional enclosure panel space is required, an auxiliary enclosure section is available. A molded case circuit breaker provides the disconnect means function while fast acting, current limiting drive input fuses provide short circuit protection. A removable conduit mounting plate is provided at the top of the enclosure.



NEMA 3R Enclosures

For outdoor applications, the ACS550 Drive with Disconnect is available in NEMA 3R enclosures up to 100 HP at 208/240V and 200 HP at 480 & 600V. Construction is sheet steel with a tough powder coat paint finish for corrosion resistance. A 100 watt, thermostatically controlled space heater and thermostatic control of the force ventilated cooling system are provided as standard.

Ratings, Types and Voltages

System Voltage	Base Drive Type Code	Frame Size	Nominal Ratings				Base Drive NEMA 1 Dim Ref UX1	Base Drive NEMA 12 Dim Ref UX12	Bypass NEMA 1 Dim Ref CX1	Bypass NEMA 12 Dim Ref CX12	Bypass NEMA 3R Dim Ref CX3R	Input Disconnect NEMA 1 Dim Ref PX1	Input Disconnect NEMA 12 Dim Ref PX12	Input Disconnect NEMA 3R Dim Ref PX3R
			Normal Duty		Heavy Duty									
			I_{2N} A	P_N HP	I_{2hd} A	P_{hd} HP								
208/240 V	ACS550-XX-04A6-2	R1	4.6	1	3.5	0.75	1	1	1	1	1	1	1	1
	ACS550-XX-06A6-2	R1	6.6	1.5	4.6	1	1	1	1	1	1	1	1	1
	ACS550-XX-07A5-2	R1	7.5	2	6.6	1.5	1	1	1	1	1	1	1	1
	ACS550-XX-012A-4	R1	11.8	3	7.5	2	1	1	1	1	1	1	1	1
	ACS550-XX-017-A2	R1	16.7	5	11.8	3	1	1	1	1	1	1	1	1
	ACS550-XX-024A-2	R2	24.2	7.5	16.7	5	2	2	3	3	3	2	2	2
	ACS550-XX-031A-2	R2	30.8	10	24.2	7.5	2	2	3	3	3	2	2	2
	ACS550-XX-046A-2	R3	46.2	15	30.8	10	3	3	4	5	5	3	3	3
	ACS550-XX-059A-2	R3	59.4	20	46.2	15	3	3	4	5	5	3	3	3
	ACS550-XX-075A-2	R4	74.8	25	59.4	20	4	4	6	6	6	4	4	4
	ACS550-XX-088A-2	R4	88	30	74.8	25	4	4	9	7	7	5	5	4
	ACS550-XX-114A-2	R4	114	40	88	30	4	4	9	7	7	5	5	4
	ACS550-XX-143A-2	R6	143	50	114	40	6	6	10	10	10	6	6	6
	ACS550-XX-178A-2	R6	178	60	150	50	6	6	10	10	10	6	6	6
	ACS550-XX-221A-2	R6	221	75	178	60	6	6	11	10	10	6	6	6
	ACS550-XX-248A-2	R6	248	100	192	75	6	6	11	10	10	6	6	6
480V	ACS550-XX-03A3-4	R1	3.3	1.5	2.4	1	1	1	1	1	1	1	1	1
	ACS550-XX-04A1-4	R1	4.1	2	3.3	1.5	1	1	1	1	1	1	1	1
	ACS550-XX-06A9-4	R1	6.9	3	5.4	2	1	1	1	1	1	1	1	1
	ACS550-XX-08A8-4	R1	8.8	5	6.9	3	1	1	1	1	1	1	1	1
	ACS550-XX-012A-4	R1	11.9	7.5	8.8	5	1	1	1	1	1	1	1	1
	ACS550-XX-015A-4	R2	15.4	10	11.9	7.5	2	2	2	2	2	2	2	2
	ACS550-XX-023A-4	R2	23	15	15.4	10	2	2	2	2	2	2	2	2
	ACS550-XX-031A-4	R3	31	20	23	15	3	3	4	4	4	3	3	3
	ACS550-XX-038A-4	R3	38	25	31	20	3	3	4	4	4	3	3	3
	ACS550-XX-045A-4	R3	44	30	38	25	3	3	4	5	5	3	3	3.5
	ACS550-XX-059A-4	R4	59	40	44	30	4	4	5	6	6	4	4	4
	ACS550-XX-072A-4	R4	72	50	59	40	4	4	5	6	6	4	4	4
	ACS550-XX-078A-4	R4	77	60	65	50	4	4	5	6	6	4	4	4
	ACS550-XX-097A-4	R4	96	75	77	60	4	4	6	7	7	5	5	4.5
	ACS550-XX-125A-4	R5	124	100	96	75	5	5	7	8	8	5	5	5
	ACS550-XX-157A-4	R6	157	125	124	100	6	6	10	9	9	6	6	6
	ACS550-XX-180A-4	R6	180	150	156	125	6	6	10	9	9	6	6	6
	ACS550-XX-246A-4	R6	245	200	192	150	6	6	11	10	10	6	6	6
	ACS550-XX-316A-4	R8	316	250	240	200	8		12	11		8	8	
	ACS550-XX-368A-4	R8	368	300	302	250	8		13	12		8	8	
	ACS550-XX-414A-4	R8	414	350	368	300	8		13	12		8	8	
	ACS550-XX-486A-4	R8	486	400	414	350	8		13	12		8	8	
	ACS550-XX-526A-4	R8	526	450	477	400	8						8	
	ACS550-XX-602A-4	R8	602	500	515	450	8						8	
	ACS550-XX-645A-4	R8	645	550	590	500	8						8	
600V	ACS550-XX-02A7-6	R2	2.7	2	2.4	1.5	2	2	2	2	2	2	2	2
	ACS550-XX-03A9-6	R2	3.9	3	2.7	2	2	2	2	2	2	2	2	2
	ACS550-XX-06A1-6	R2	6.1	5	3.9	3	2	2	2	2	2	2	2	2
	ACS550-XX-09A0-6	R2	9	7.5	6.1	5	2	2	2	2	2	2	2	2
	ACS550-XX-011A-6	R2	11	10	9	7.5	2	2	2	2	2	2	2	2
	ACS550-XX-017A-6	R2	17	15	11	10	2	2	2	2	2	2	2	2
	ACS550-XX-022A-6	R3	22	20	17	15	3	3	4	4	4	3	3	3
	ACS550-XX-027A-6	R3	27	25	22	20	3	3	4	4	4	3	3	3
	ACS550-XX-032A-6	R4	32	30	27	25	4	4	5	6	6	4	4	4
	ACS550-XX-041A-6	R4	41	40	32	30	4	4	5	6	6	4	4	4
	ACS550-XX-052A-6	R4	52	50	41	40	4	4	5	6	6	4	4	4
	ACS550-XX-062A-6	R4	62	60	52	50	4	4	5	6	6	4	4	4
	ACS550-XX-077A-6	R6	77	75	62	60	6	6	8	9	9	6	6	6
	ACS550-XX-099A-6	R6	99	100	77	75	6	6	8	9	9	6	6	6
	ACS550-XX-125A-6	R6	125	125	99	100	6	6	10	9	9	6	6	6
	ACS550-XX-144A-6	R6	144	150	125	125	6	6	10	9	9	6	6	6

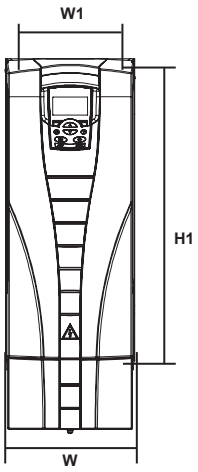
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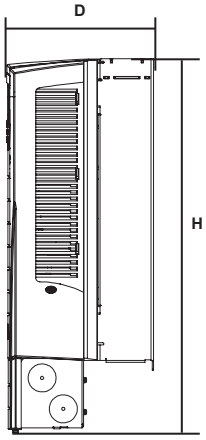
xx = contruction designations:

U1 = Base Drive - Wall mount
U2 = Base Drive - Floor mount
PD = Packaged Drive with Switch and Fuse
PC = Packaged Drive with Circuit Breaker
CC = Packaged Drive with Bypass

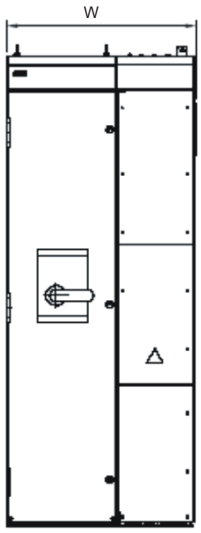
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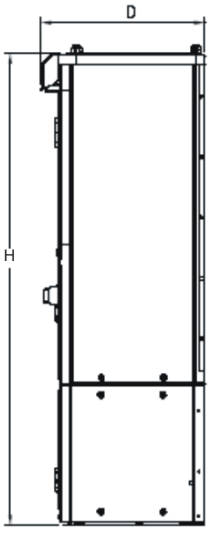
ACS550-Ux, NEMA 1/UL Type 1 R1 through R8 Frame Sizes





Wall Mount (UX1-1 - UX1-6)





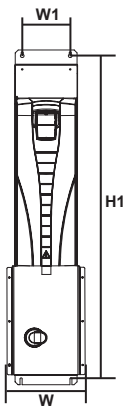
Floor Mount (UX1-7 - UX1-8)

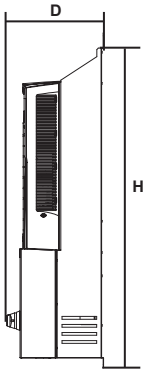
Dimension Reference	Base Drive Frame	NEMA 1 Mounting Dimensions inches		NEMA 1 Dimensions and Weights inches lbs			
		H1	W1	Height (H)	Width (W)	Depth (D)	Weight
UX1-1	R1	12.5	3.9	14.5	4.9	8.3	14.3
UX1-2	R2	16.4	3.9	18.5	4.9	8.7	19.8
UX1-3	R3	18.6	6.3	23.0	8.0	9.1	35.0
UX1-4	R4	22.8	6.3	27.1	8.0	10.3	53.0
UX1-5	R5	23.2	9.4	29.0	10.4	11.3	75.0
UX1-6	R6	26.6	10.4	34.6	11.8	15.8	152.0*
UX1-7	R7	Free Standing	Free Standing	59.2	24.0	19.5	430.0
UX1-8	R8	Free Standing	Free Standing	83.9	31.5	23.0	827.0

Note:
* NEMA 1 246A-4 weighs 180 lbs.

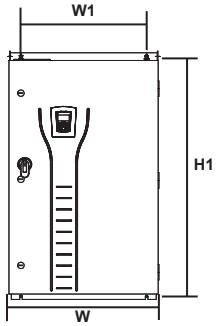
Dimensions

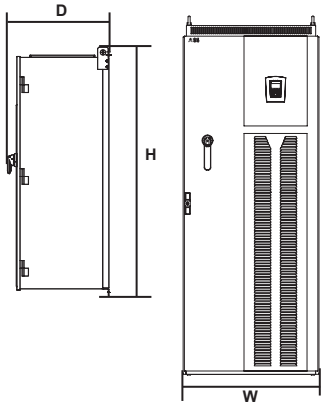
ACS550-Px UL Type 1 / NEMA 1 R1 through R8 Frame Size



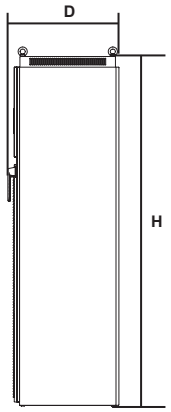


Wall Mount (PX1-1 - PX1-4)





Wall Mount (PX1-5 - PX1-6)



Floor Mount (PX1-8)

Dimension Reference	NEMA 1 Mounting Dimensions inches		NEMA 1 Dimensions and Weights inches lbs			
	H1	W1	Height (H)	Width (W)	Depth (D)	Weight
PX1-1	28.0	3.9	28.7	7.8	11.2	32
PX1-2	32.0	3.9	32.6	7.8	11.6	42
PX1-3	38.7	6.3	39.9	10.2	11.9	75
PX1-4	44.0	6.3	45.2	10.3	13.1	95
PX1-5	46.3	23.6	47.7	28.1	19.0	266
PX1-6	46.3	23.6	47.7	28.1	19.0	360
PX1-8	Free Standing	Free Standing	83.7	31.7	25.9	793