

DUCT-O-BAR[®] **Figure 8 Electrical Conductor Systems**

For Overhead Cranes, Trolleys, Monorails, Hoists, Conveyors, Automatic Stacker-Retrieval Systems... any Application that Requires a Reliable, Safe, and Economical Moving Power System.

- 90 AMP Rolled Galvanized Steel
- 110 AMP Rolled Galvanized Steel
- 250 AMP Rolled Stainless Steel Copper Laminated
- 250 AMP Rolled Copper Steel Laminated
- 350 AMP Rolled Electrolytic Copper



MAKE CERTAIN POWER SUPPLY IS DISCONNECTED BEFORE INSTALLING, REPAIRING, OR WORKING IN THE PROXIMITY OF ANY ELECTRICAL SYSTEM. ONLY QUALIFIED ELECTRICAL PERSONNEL SHOULD INSTALL OR REPAIR THESE PRODUCTS.





Approved in Canada

Conductor Bar Selection

Determining Ampere Load

LISTED

File # F29805

Contr. 678L

The conductor selected must be large enough to carry the necessary ampere load safely without undue heating. To compute the ampere load, proceed as follows:

- 1. List the horsepower of all motors used in the application.
- Determine the voltage and type of current that will feed the conductor. For example: 230 VDC 2 wire; 460 VAC 3 phase; etc.
- 3. Refer to the Horsepower Conversion Table on page 3 and convert the horsepower to amperes.
- 4. Prepare the ampere load figure that will be used to size the conductors as follows:

List the full load ampere rating of each motor used on the crane or monorail unit. Determine the duty cycle from the following paragraphs and apply the corresponding factor.

Light Duty — **Class A and B Crane Service** Standby or infrequent use. Up to two motors started at a time. Two to five lifts per hour. Use a factor of 90% of the calculated ampere load.

Average Duty — Class C Crane Service Moderate use during the work day. Five to ten lifts per hour. Not over 50% of the lift at rated capacity. Use a factor of 100% of the calculated ampere load.

Determining Voltage Drop

According to CMAA, the voltage drop to the unit motors shall not be more than 3% from the power taps to the load at the farthest point on the conductor run. To determine the voltage drop use the appropriate formula in the following table.

Current Type	Formula
AC 3 phase 60 cycle	V = L x I x Z x 1.73
AC 1 or 2 phase 60 cycle	V = L x I x Z x 2
DC 2 wire system	V = L x I x R x 2

- V = Voltage drop
- L = Distance from power feed to end of conductor
- I = Total amperes drawn as calculated from conversion charts
- Z = AC impedance
- R = DC resistance

Heavy Duty — Class D Crane Service

Used continually during the work day and usually for more than one shift. Loads of 50% of rated capacity or more handled constantly during the work period. Use a factor of 110% of the calculated ampere load.

Severe Duty — **Class E and F Crane Service** Used continually for two or more work shifts a day for loads approaching 100% of capacity. Use a factor of 120% of the calculated ampere load. Due to the mechanical considerations on severe duty use, contact the factory engineering group when selecting the conductor system for this application.

5. If the conductors are to be located where the ambient air temperature is unusually high, the current carrying capacity of the conductor is reduced. Multiply the current capacity of the selected conductor by the derating factor in the following table.

Temperature Derating Table

Ambient Air Temperature	Derating Factor
100°F	95%
130°F	75%
160°F*	50%

* At this ambient temperature it will be neccessary to use the higher rated conductor cover, XHT rated at 280°F. Use of XHT cover at 160°F allows for full ampacity at that temperature.

See Conductor Engineering Data Table on page 4 for values of Z and R.

Divide voltage drop by system voltage to get the percent of voltage drop.

Maximum voltage drops that are 3% of various supply voltages are as follows:

Supply Voltage	Voltage Drop (V)
460 VAC	13.8
230 VAC or VDC	6.9
575 VAC	17.2

Volts lost that are equal to or less than the above values when using the formulas above will help in selecting the correct conductor.



Conductor Selection Example

Given a 300 foot runway, power fed at the center, using 460 volt, 3 phase, 60 cycle power supplied to a bridge crane — there is a 40 h.p. hoist motor, a 20 h.p. bridge motor, and a 5 h.p. trolley motor. The operation is **Average Duty**. Ambient temperature varies from 50°F in winter to 90°F in summer on this **Indoor** installation.

Step 1 — Determining Ampere Load

See National Electric Code article 610-14(e) for determining motor loads where there are multiple motors on a single crane. Then from the Horse Power Conversion Table 460V column (right):

> 40 h.p. hoist motor — 52 amps @ 100% = 52 amps 20 h.p. bridge motor — 27 amps @ 50% = 13.5 amps 5 h.p. trolley motor — 7.6 amps @ 50% = 3.8 amps

The total current load is 69.3 amperes.

With Average Duty cycle, the current load is factored at 100%. Normal ambient conditions of 50°F to 90°F require no temperature derating. Selecting a 90 amp conductor caused a voltage drop of 4.3% using the formula. Since this is unsatisfactory, use a 110 amp conductor (FE-908) for Step 2.

Step 2 — Determining Voltage Drop

Use the AC 3 phase formula on page two.

 $V = L \times I \times Z \times 1.73$ where:

- L = 150 ft. (Distance to the end of the runway from the center power feed.)
- I = 69.3 amperes
- Z = .0008 for 110 amp conductor (From the Conductor Engineering Data Table, page 4.)
- 1.73 = 3 phase constant

V = 150 x 69.3 x .0008 x 1.73 = 14.4 volts

14.4/460 = 3.1%

Since this voltage drop only occurs at the farthest end when two or more motors are started simultaneously, exceeding the 3% voltage drop goal by only 0.1% will not cause a problem.

Ampere Load Calculations for Multiple Units

For information about sizing ampere loads for multiple cranes on the same runway, see Article 610-14 (e) of the National Electrical Code for the demand factors. This article also covers additional loads on the bridge cranes other than motor loads.

Induction Type Squirrel Cage and Wound Rotor Motors

The Horsepower Conversion Table is taken from the 1996 NEC Article 430. The values are for motors running at usual speeds with normal torque characteristics. Motors built for especially low speeds or high torques may require more running current, and multi-speed motors will have

Horsepower Conversion Table

3	Phase AC Amp	Direct Current Amperes		
h.p.	230V	460V	575V	230V
1/2	2	1	.8	2.7
3/4	2.8	1.4	1.1	3.8
1	3.6	1.8	1.4	4.7
1-1/2	5.2	2.6	2.1	6.6
2	6.8	3.4	2.7	8.5
3	9.6	4.8	3.9	12.2
5	15.2	7.6	6.1	20
7-1/2	22	11	9	29
10	28	14	11	38
15	42	21	17	55
20	54	27	22	72
25	68	34	27	89
30	80	40	32	106
40	104	52	41	140
50	130	65	52	173
60	154	77	62	206
75	192	96	77	255
100	248	124	99	341
125	312	156	125	425
150	360	180	144	506
200	480	240	192	675

full-load current varying with speed. In these cases, use the higher nameplate current rating.

The voltages listed are rated motor voltages. The current listed shall be permitted for system voltage ranges of 110 to 120, 220 to 240, 440 to 480, and 550 to 600 volts. Motors rated at 208 VAC should increase the 230 volt column figures by 10%.

For motors that are wound for single or double phase operation, use the nameplate rating. For older slip ring motors or models that have secondary windings be sure to obtain both primary and secondary current ratings. Secondary windings may also need separate conductors or cables when updating the electrification.



Conductor Engineering Data Table

		Weight per Ampere Ratir		e Rating	Coefficient of	Resistance Factor		
Conductor Bar No.	Description	10' section lbs.	Continuous	Intermittent*	Linear Expansion per °F	AC (z) ohms/ft.	DC (R) ohms/ft.	Circular Mills
				105				
FE-758	Galvanized Steel	4.5	90	135	.000007	.0011	.00072	130,000
FE-908	Galvanized Steel	6.5	110	165	.000007	.0008	.0005	189,000
FE-1608	Stainless/Copper Laminate	6.5	250	350	.000008	.000144	.0001	188,000
FE-2008	Copper/Steel Laminate	6.25	250	350	.000008	.000142	.0001	189,000
FE-3008	Rolled Copper	6.75	350	530	.000009	.000085	.000058	188,000

* Intermittent Service Rating is determined for one minute on, one minute off operation.

Miscellaneous Applications

Curves

Duct-O-Bars[®] except the Totally Enclosed System, can be bent to form curved sections without damaging the insulating cover or conductor. Bends with a five-foot radius or greater can be done in the field by using a fly wheel, monorail beam, or similar object to bend the conductor to approximately the necessary radius. Hangers used on curved sections must be placed at intervals of 2-1/2 feet maximium — and closer if required. Use B-100 cross bolt clamp type hangers and P-Series collectors.

The minimum spacing between conductors on curves is three inches.

For curves of five-foot radius or more, use five-inch collector shoes. For curves of less than five-foot radius use three-inch collector shoes; also consult the factory for additional information.

Discontinuous Circuits

On discontinuous circuits a pickup guide assembly must be installed to ensure that the self-centering type collectors engage and disengage the conductor bar. The pickup guide (FE-2JNN3 is illustrated) must have its own support point.



Interlocks, Switches, or Fixed Gaps

The maximum fixed gap occurring at interlocks is one-inch when using 100 amp P-Series collectors and 1/2 inch when using 40 amp collectors. Use transfer caps as shown to ensure that the collector brushes transfer evenly and smoothly. Also round both ends of the contact brushes to facilitate the transfer. Use clamp type hangers only. When both interlocks and curves of less than a four-foot radius are encountered, the tandem 40 amp collector is recommended.



Other Special Applications

Consult the factory for recommendations on applications such as de-icing systems, totally enclosed systems, and other systems not covered here.



Expansion Gaps

Expansion gaps should be placed at intervals determined by 1) the expansion rate of the metal in the conductor selected, and 2) the variation in temperature that will occur at the conductor location over a full year of operation.

1. Steel Conductor Systems

Given that steel conductors expand 1" for every 120' of runway with a temperature change of 100°F over a full year of operation, put the length of the runway and the maximum temperature change for the system to be used into the following formula:

Total Steel Expansion (inches) = X/120' x Y/100°F

where X is the runway length and Y is the 12 month temperature variation.

Example: A 450' long steel conductor (X) installed in a building with an indoor temperature change of $40^{\circ}F(Y)$.

Total Expansion = $450'/120' \times 40^{\circ}F/100^{\circ}F = 1.5"$. (See Section 3.)

2. Copper Conductor Systems

Given that copper conductors expand 1" for every 100' of runway over a 100°F temperature change at the conductor over a full year of operation, put the length of the runway and the maximum temperature change for the system to be used into the following formula:

Total Copper Expansion (inches) = $X/100^{\circ}$ x $Y/100^{\circ}$ F.



Conductor Assembly Selection

Duct-O-Wire[®] Figure 8 Conductor Bars are furnished as assemblies consisting of a ten-foot long conductor bar rated at 600 volts, an insulating cover, splice cover, and connector pins or joint clamps as applicable.

The insulating cover must be appropriate for the environment — indoor, outdoor, or high temperature — in which the conductor is to operate.

Indoor systems are for use in ambient temperatures up to 160°F. They have an Orange PVC Insulating Cover. They are not recommended for outdoor use in direct sunlight.

Outdoor systems are for use in direct sunlight and ambient temperatures up to 160°F. They have a Gray PVC Insulating Cover with an ultraviolet additive.

High temperature systems are for use in ambient temperatures up to 280°F. They have a Yellow Polycarbonate Insulating Cover.

From the table to the right, you can select the basic (FE) conductor assembly with the appropriate bar and insulating cover for your application.

For information on other conductor assemblies, see page 12.

Example: A 300' long copper conductor system (X) installed outdoors with an anticipated temperature fluctuation of 80°F (Y).

Total Expansion = $300'/100' \times 80^{\circ}F/100^{\circ}F = 2.4"$. (See Section 3.)

3. Determine the Number of Expansion Gap Assemblies After calculating the actual expansion of the runway conductor system, use the following rule of thumb to pick the number of expansion gap assemblies:

- **a.** Under 1" of expansion, use no expansion assemblies. Install one anchor clamp set at the center of the conductor run.
- **b.** From 1" to 2" of expansion, use one expansion assembly in the center of the conductor run.
- **c.** From 2" to 4" of expansion, use two expansion assemblies. Locate them at 1/3 of the runway length in from each end.
- **d.** For systems with more than 4" of expansion, use one expansion gap assembly for each 2" of expansion.

4. Anchors

Anchor clamps are required at midpoint on all systems without expansion gaps and halfway between gaps and from gaps to the end of systems with multiple gaps. See the *Figure 8 Installation Instructions* on anchor locations.

The maximum gap opening for all ten foot Figure 8 expansion gap assemblies is 1-3/4 inches.

Expansion assemblies are also required at building expansion joints.

Basic Figure 8 (FE) Conductor Assemblies

10 ft. L	engths	Assembly Catalog No.				
Conductor Bar No.	Weight Pounds	Indoor Use	Outdoor Use	High Temp. Use		
FE-758	4.5	FE-758-2	FE-758-2-SC	FE-758-2XHT		
FE-908	6.5	FE-908-2	FE-908-2-SC	FE-908-2XHT		
FE-1608	6.5	FE-1608-2	FE-1608-2-SC	FE-1608-2XHT		
FE-2008	6.25	FE-2008-2	FE-2008-2-SC	FE-2008-2XHT		
FE-3008	6.75	FE-3008-2	FE-3008-2-SC	FE-3008-2XHT		





Typical Conductor Mounting

Note: $-S \rightarrow$ indicates minimum conductor spacing.

Standard Vertical Mounted Conductors (Bottom Entry)

3-Phase System • Bottom Contact • 5 Ft. Maximum Support Spacing



Monorail Application

Install two conductors on one side of the beam and one conductor on the opposite side to balance the collector spring forces, particularly on light weight hoists.





Lateral Mounted Conductors (Side Entry)

4 Ft. Maximum Support Spacing. Use only Lateral (L) Model Collectors.

- Single Collectors - Staggered and PS-Series Collectors. Collectors Adjacent or when Pickup Guides are used. Insulated Hangers also require 3" spacing.

Duct-O-Bar[®] Figure 8 (FE) Components

	Catalog Number	Weight Pounds	Description
Hole Spacing: 1-1/2*			Angle Brackets for Web Mounting
			Brackets are galvanized 12 gage rolled steel channel. Hangers are priced separately, but will be factory installed at no charge when hanger locations are shown on sketch.
	B-100-BR1A	1.00	Bracket — 11-1/4" long.
	B-100-BR7A	1.42	Bracket — 15-3/4" long.
	B-100-BR7B	1.70	Bracket with gusset support — 15-3/4" long.
	B-100-BR13A	1.71	Bracket — 20-1/4" long. Do not use with tandem collectors.
	B-100-BR13B	2.04	Bracket with gusset support — 20-1/4" long.
B-100-BR-EXT	B-100-BR-EXT	.31	Bracket Extension for Ground Bar Bracket — 4th bar extension to be used with prepunched brackets shown above.
	B-100-BR-EXT-XL	.27	Bracket — 4th bar extension to be used with angle iron.



	Catalog Number	Weight Pounds	Description
Hole Spacing: 1-1/2 " Typical Hole Dia.: 7/16"			Straight Brackets for Top Flange Mounting Brackets are galvanized 12 gage rolled steel channel. Hangers are priced separately, but will be factory installed at no charge when hanger
	B-100-BR3A B-100-BR4A	1.20 1.82	locations are shown on sketch. Bracket — 18" long. Bracket with two Mounting Clamps and hardware — 18" long.
	B-100-BR5A B-100-BR6A	1.41 2.03	Bracket — 21" long. Bracket with two Mounting Clamps and hardware — 21" long.
B B B B Canned LBeam	B-100-BR9A B-100-BR10A	1.60 2.22	Bracket — 24" long. Bracket with two Mounting Clamps and hardware — 24" long.
	B-100-BR-10 B-100-TMC-U	.31 1.54	Universal Mounting Clamps with hardware. For 5/8" to 1-5/16" thick Beam Flanges. Capped I-Beam Bracket with hardware
"J" Bolts: 3/8-16 x 5" Due to "J" Bolt Thread Length	B-100-BR6A-J	1.76	18" long. Capped I-Beam Bracket with hardware. 21" long.
The Minimum C-Channel Flange Length is 2.648" (C9 X 20)	B-100-BR10A-J	1.95	Capped I-Beam Bracket with hardware. 24" long.
Hole Spacing: 1-1/2 " Typical Hole Dia.: 7/16" Mounting Plate Hole Spacing: 3-3/8" Mounting Bolts: 1/2-13 x 2"	B-100-BRCT1 B-100-BRCT2 B-100-BRCT3 B-100-BRCT4 B-100-BRCT5 B-100-BRCT6 B-100-BRCT7 B-100-BRCT7 B-100-BRCT9 B-100-BRCT10 B-100-BRCT11	1.2 1.3 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3	Straight Brackets w/ Mounting Plate for Web Mounting Brackets are primed 12 gage rolled steel channel with mounting plate and hardware. Hangers are priced separately, but will be factory installed at no charge when hanger locations are shown on sketch. Bracket — 2 holes — 3-3/4" long. Bracket — 2 holes — 5-1/4" long. Bracket — 4 holes — 6-3/4" long. Bracket — 4 holes — 6-3/4" long. Bracket — 5 holes — 8-1/4" long. Bracket — 6 holes — 9-3/4" long. Bracket — 7 holes — 11-1/4" long. Bracket — 8 holes — 12-3/4" long. Bracket — 9 holes — 14-1/4" long. Bracket — 10 holes — 15-3/4" long. Bracket — 11 holes — 17-1/4" long. Bracket — 12 holes — 18-3/4" long.
Typical Hole Dia.: 7/16" Bolts: 3/8-16 x 1-1/2"			Conductors Brackets are powder coated 10 gage steel. Hangers are priced separately, but will be factory installed at no charge when hanger locations are shown on sketch.
0 Mounting Holes	B-100-BRZ3	1.64	Z-Bracket — $1-1/2$ " or 3" hanger spacing, 6" mounting hole spacing $OAL = 7-1/2$ "
Hanger Holes	B-100-BRZ4	1.82	Z-Bracket w/ hardware — 1-1/2" or 3" hanger spacing, 6" mounting hole spacing. O.A.L. — 7-1/2"
Hanger 6" Holes	B-100-BRZ5 B-100-BRZ6	2.32 2.50	Z-Bracket — 1-1/2" or 3" hanger spacing, 9" mounting hole spacing. O.A.L. — 10-1/2". Z-Bracket w/ hardware —1-1/2" or 3" hanger spacing, 9" mounting hole spacing. O A L — 10-1/2"
	B-100-BRZ7	3.50	Z-Bracket — 3" hanger spacing, 9" mounting hole spacing, O.A.L. — 10-1/2".
B-100-BRZ3 thru B-100-BRZ6 have a 3" stand off as shown above. B-100-BRZ7 and B-100-BRZ8 have a 6" stand off as shown above.	B-100-BRZ8	3.68	Z-Bracket w/ hardware — 3" hanger spacing, 9" mounting hole spacing. O.A.L. — 10-1/2".



	Catalog Number	Weight Pounds	Description
FE-908-2PFThreads: 3/8-16Threads: 3/8'-16Tighten to 150 in-lb	FE-908-2PF FE-908-2PFS FE-908-2SF FE-908-2SFE	.10 .10 .11 .11	 Snap-In Type Hanger Assemblies These hangers are not recommended for curves, switches or short runs unless separate anchors are used. Refer to the Figure 8 Installation Instructions. Nylon Insulating Hanger. Nylon Insulating Hanger with Stainless Steel Hardware. DO NOT USE nylon hangers in temperatures higher than 130°F. Zinc Plated Steel Hanger. Epoxy Coated Steel Hanger.
Threads: 3/8"-16 Tighten to 150 in-lb	FE-908-2SFG FE-908-2SFFG FE-908-2SFSG	.20 .20 .20	Snap-In Type Spring Hanger and Insulator Assemblies for Outdoor, Wet and Dirty Applications Zinc Plated Steel Hanger with Insulator. Epoxy Coated Steel Hanger with Insulator. Stainless Steel Hanger with Insulator and Stainless Steel Hardware.
Threads: 3/8"-16 Tighten to 150 in-lb SEE INSTALLATION INSTRUCTIONS FOR CROSS BOLT VALUE.	B-100-2FF B-100-2FFE	.19 .19	Clamp Type Hanger Assemblies for All Conductor Systems Zinc Plated Steel Hanger. Epoxy Coated Steel Hanger. For special environments.
Threads: 3/8*-16 Tighten to 150 in-lb SEE INSTALLATION INSTRUCTIONS FOR CROSS BOLT VALUE.	B-100-2FG B-100-2FFG B-100-2FSG	.30 .30 .30	Clamp Type Hanger and Insulator Assemblies for Outdoor, Wet and Dirty Applications. Zinc Plated Steel Hanger with Insulator. Epoxy Coated Steel Hanger with Insulator. Stainless Steel Hanger with Stainless Steel Hardware.
Threads: 3/8"-16 Tighten to 150 in-lb SEE INSTALLATION INSTRUCTIONS FOR CROSS BOLT VALUE. B-100-2F3	B-100-2F3 B-100-2F4 B-100-2F4-3	.59 1.25 1.50	Clamp Type Special Hanger Assemblies Zinc Plated Steel Triple Hanger Assembly. 1-1/2" centers. For indoor dry applications only. Staggered Collectors. Quad Hanger Bracket on 1.5 inch centers. Quad Hanger Bracket on 3.0 inch centers.
Threads: 3/8"-16 Centers: 1-1/2" Tighten to 150 in-lb FE-908-2SF3	FE-908-2PF3 FE-908-2SF3 FE-908-2SF4 FE-908-2PF3-3 FE-908-2SF3-3 FE-908-2SF4-3	.55 .57 .80 .72 .76 1.09	Snap-In Type Special Hanger Assemblies Plastic Triple Hanger Assembly. Zinc Plated Steel Triple Hanger Assembly. Zinc Plated Steel Four-Gang Hanger Assembly. Plastic Triple Hanger Assembly mounted on 3" centers. Zinc Plated Triple Hanger Assembly mounted on on 3" centers. Zinc Plated Four-Gang Hanger Assembly mounted on 3" centers.
Tighten to 150 in-lb	B-100-1G B-100-1G-SS	.15 .15	Mushroom Insulators with Hardware 30% Glass-filled Nylon — 400°F rated. 30% Glass-filled Nylon with Stainless Steel Hardware — 400°F rated.



	Catalog Number	Weight Pounds	Description
	FE-908-2CP FE-1158-2CP FE-2008-2CP FE-3008-2CP FE-758-GCTP	.25 .26 .63 1.10 .14	 Power Feeds with Insulating Case 90 Amp Rated — Steel. For FE-758-2 systems. Will accept up to # 4 AWG cable. 110 Amp Rated — Copper. For FE-908-2 systems. Will accept up to # 2 AWG cable. 250 Amp Rated — Bronze. For FE-1608-2 and FE-2008-2 systems. Will accept up to # 1/0 AWG cable. 350 Amp Rated — Cast Bronze. For FE-3008-2 systems. Will accept up to # 3/0 cable. End Power Feeds 40 Amp Rated. For all systems with FE-758 conductor bar.
Image: A connector pins are included with the hardware package.	FE-758-2H10 FE-758-2H10-SC FE-758-2H10-SC FE-908-2H10 FE-908-2H10-SC FE-1608-2H10 FE-1608-2H10 FE-1608-2H10-SC FE-1608-2H10-SC FE-2008-2H10 FE-2008-2H10-SC FE-2008-2H10-SC	7.0 7.0 7.0 9.0 9.0 10.5 10.5 10.5 10.0 10.0 10.0	 FE-1608, FE-2008, and FE-3008 conductor bar. FE-1608, FE-2008, and FE-3008 conductor bar. Each assembly consists of a ten-foot conductor bar, insulating cover, connector pins for one end, guide assembly, two power feeds with a jumper cable and hanger set. Refer to the Figure 8 Installation Instructions. For Indoor System FE-758-2. For Outdoor System FE-758-2.SC. For High Temperature System FE-758-2XHT. For Indoor System FE-908-2. For Outdoor System FE-908-2. For Outdoor System FE-908-2. For Outdoor System FE-1608-2. For Indoor System FE-1608-2. For Outdoor System FE-1608-2. For Outdoor System FE-1608-2. For Outdoor System FE-1608-2. For Outdoor System FE-2008-2. For High Temperature System FE-1608-2.XHT.
	FE-3008-2H10 FE-3008-2H10-SC FE-3008-2H10XT	12.5 12.5 12.5 3.86	For Indoor System FE-3008-2. For Outdoor System FE-3008-2-SC. For High Temperature System FE-3008-2XHT. Special Application Components Pickup Guide Assembly — 3" wide. Includes clamps and two foot section of system conductor. Specify conductor system.



	Catalog Number	Weight Pounds	Description
	FE-758-GCT	.08	Special Application Components (cont.) Transfer Cap. For FE-758 Bar only.
	FE-758-GCTL	.08	Transfer Cap. For FE-758 Bar only. Cut at 45° for left hand curves.
	FE-758-GCTR	.08	Transfer Cap. For FE-758 Bar only. Cut at 45° for right hand curves.
FE-758-GCT	FE-908-GCT	.08	Transfer Cap. For FE-908, FE-1608, FE-2008, and FE-3008 Bar.
FE-908-IP	FE-908-GCTL	.08	Transfer Cap. For FE-908, FE-1608, FE-2008, and FE-3008 Bar. Cut at 45° for left hand curves.
	FE-908-GCTR	.08	Transfer Cap. For FE-908, FE-1608, FE-2008, and FE-3008 Bar. Cut at 45° for right hand curves.
	FE-908-IP	.02	Isolating Piece — 1" long. For all bars.
FE-908-IS	FE-908-IS	.19	Isolating Piece — 8" long. For all bars.
	B-100-TG	1.81	Transfer Guide Assembly with epoxy coated Hangers. For use with isolating pieces.
B-100-TG			Collector Mounting Post
FC-TB1	FC-TB1	3.50	Mounting Post with Hardware — 18" long. Mounting plate is 4" square with 3" hole spacing for C-Series and P-Series Collectors. (Contact factory for spacial lengths or finishes)
Bolts: 3/8 - 16 x 1-1/2"	FC-TB1-SS	3.38	Stainless Steel Mounting Post with Stainless Steel Hardware — 18" long.
Maximum O.A.L.: 12-1/4"			C-Series Collector Assemblies
			continuous run systems. They feature steel pivot points for good tracking capability.
	C-40-V3	1.41	40 Amp Collector — single shoe. Vertical mount.
	C-40-L3	2.35	with steel counter weight. O.A.L. — 15"
	C-100-V5	1.00	mount.
C-100-V5	C-100-L5	2.90	100 Amp Collector — single shoe. Lateral mount with steel counter weights. O.A.L. — 16"
Maximum O A I · 15-1/4*			P-Series Collector Assemblies
			curved runs and transfers. The pantograph design provides virtually constant spring
			pressure for the entire stroke range. Lateral Mount Collectors are provided with spring
			balance. Conductor Bars must be spaced at least 3 inches apart. To order bronze collectors with stainless steel hardware, add "BR" to the estelog number. Coll factory for prices
	P-40-V3	2.10	40 Amp Collector — single shoe. Vertical mount.
	P-40-L3	2.16	40 Amp Collector — single shoe. Lateral mount.
	P-40-53-5CD P-100-V5	2.38	40 Amp Collector — single shoe. Self-centering. 100 Amp Collector — single shoe. Vertical mount
	P-100-L5	2.41	100 Amp Collector — single shoe. Lateral mount.
P-100-V5	P-100-S5-SCD	2.63	100 Amp Collector — single shoe. Self-centering.



	Catalog Number	Weight Pounds	Description
			P-Series Collector Assemblies (cont.)
	P-80-VT3	3.71	80 Amp Collector — double shoe. Vertical mount.
Maximum O.A.L 27	P-80-LT3	3.91	80 Amp Collector — double shoe. Lateral mount.
	P-80-ST3-SCD	4.35	80 Amp Collector — double shoe. Self-centering.
	P-200-VT5	4.20	200 Amp Collector — double shoe. Vertical mount.
P-200-VT5	P-200-LT5	4.40	200 Amp Collector — double shoe. Lateral mount.
	P-200-ST5-SCD	4.84	200 Amp Collector — double shoe. Self- centering.
PS-40-V3			PS-Series Collector Assemblies <i>PS-Series Collectors can be used on 1-1/2 inch</i> <i>centers and are able to use smaller brackets.</i> <i>PS-Series Collectors are not recommended for</i> <i>lateral systems or applications that require</i> <i>pick-up guides.</i>
	PS-40-V3	1.32	40 Amp Vertical Collector.
	PS-100-V5	1.55	100 Amp Vertical Collector.
PS-200-VT5	PS-80-VT3	2.32	80 Amp Tandem Vertical Collector.
	PS-200-VT5	2.80	200 Amp Tandem Vertical Collector.
			Additional Components
FE-1GC	B-100-2L	.03	Spring Cover Clip — Zinc Plated Steel. Used only to ensure alignment of the cover on laterally mounted systems. Place over bar cover midway between hangers.
B-100-2L	B-100-2FEA	.30	Clamp Hanger Set — 2 pieces. Clamps both sides of hanger.
	FE-1GC	.04	Flexible PVC End Cap. For all Figure 8 conductor bars.
FE-2ER-EX	FE-908-A	.02	Nylon Anchor Pin. For drilled anchoring. Two required, one on each side of the hanger.
FE-908-1M	FE-908-1M	2.88	Connector Tool. One tool usually ordered for each new system. Used to pull two sections of bar together.
	FE-908-1MB	.10	Replacement Connector Tool Pins — Pair.
B-100-2FEA	FE-2ER-EX	.05	Splice Cover — Standard black. Use this part number when ordering extra splice covers.
			Conductor Bar Shoes/Brushes Contact the factory for application.
C - 100 - B5	C-40-B3 C-100-B5 C-40-B3-SCC C-100-B5-SCC SFE-40-B3 SFE-100-B5 EC-100-B5X	.13 .21 .13 .21 .12 .20 .37	 3" Contact Shoe 5" Contact Shoe 3" Contact Shoe for Self Centering Collectors. 5" Contact Shoe for Self Centering Collectors. 3" Side Entry Contact Shoe. 5" Side Entry Contact Shoe. 5" Contact Shoe for Totally Enclosed Systems.
<u>C - 40 - B3-SC</u>			Conductor Bar Cleaning Accessories Contact the factory for application.
	C-40-B3-SC	.13	3" Cleaning Shoe with Carborundum Insert.
<u>C - 100 - B5-SC</u>	C-100-B5-SC C-100-CT	.21 .14	5" Cleaning Shoe with Carborundum Insert. Cleaning Brush — Stainless Steel Bristle
C-100-CT			

DUCT-O-BAR[®] Special Application Conductors

All Duct-O-Wire[®] Figure 8 conductor systems can be sized electrically by using the general and technical information contained in this brochure. For applications with special mechanical or environmental considerations, refer to the table below for the proper Duct-O-Bar[®] System to use.

Conductor System	Application or Usage	*Technical or Installation Bulletin
Heated (HFE)	To prevent ice build-up problems such as outdoor yard cranes or indoor frozen food storage.	FE-2014INST and HFE Supplement*
Side Contact (SFE)	Monorails and some underhung units which require special mounting hanger brackets to fit the manufacturer's tracks. Not recommended for outdoor use, wet, or dirty environments.	SFE-97INST*
Totally Enclosed (EFE)	Prevents airborn contaminants from collecting on conductor surfaces.	EFE-95INST*
8-Bar (8-BAR)	When contour cover shape is specified or requested.	8-95INST*

*Refer to www.ductowire.com for the lastest editions to the Technical or Installation brochures.



Duct-O-Wire[®] representatives and distributors are located throughout the U.S. and Canada. Call the factory for the representative or distributor closest to you.

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DUCT-O-BAR[®] HD Series Conductor Systems 500, 1000 & 1500 Ampere Sizes

High amperage systems of heavy duty conductor bars for large cranes and mobile equipment where strength, reliability and safety are required.

- Lightweight aluminum conductor with stainless steel contact surface
- High strength bolted joints
- Inverted "V" contact surface to ensure positive collector tracking
- Full support hanger clamps
- Low maintenance long life



MAKE CERTAIN POWER SUPPLY IS DISCONNECTED BEFORE INSTALLING, REPAIRING, OR WORKING IN THE PROXIMITY OF ANY ELECTRICAL SYSTEM. ONLY QUALIFIED ELECTRICAL PERSONNEL SHOULD INSTALL OR REPAIR THESE PRODUCTS.

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Conductor Bar Selection

Determining Ampere Load

The conductor selected must be large enough to carry the necessary ampere load safely without undue heating. To compute the ampere load, proceed as follows:

- 1. List the horsepower of all motors used in the application.
- Determine the voltage and type of current that will feed the conductor. For example: 230 VDC 2 wire; 460 VAC 3 phase; etc.
- 3. Refer to the Horsepower Conversion Table and convert the horsepower to amperes.
- 4. Prepare the ampere load figure that will be used to size the conductors as follows:

List the full load ampere rating of each motor used on the crane or monorail unit. Determine the duty cycle from the following paragraphs and apply the corresponding factor.

Average Duty — Class C Crane Service

Moderate use during the work day. Five to ten lifts per hour. Not over 50% of the lift at rated capacity. Use a factor of 100% of the calculated ampere load.

Heavy Duty — Class D Crane Service

Used continually during the work day and usually for more than one shift. Loads of 50% of rated capacity or more handled constantly during the work period. Use a factor of 110% of the calculated ampere load.

Severe Duty — Class E and F Crane Service

Handles loads approaching 100% of the capacity all during the work period and for more than one shift. This includes large, heavy duty units such as bucket cranes, magnet lift cranes, cement or steel handling cranes. Use a factor of 120% of the calculated ampere load.

Horsepower Conversion Table

3	Phase AC Amp	Direct Current Amperes		
h.p.	230V	460V	575V	230V
1/2	2	1	.8	2.7
3/4	2.8	1.4	1.1	3.8
1	3.6	1.8	1.4	4.7
1-1/2	5.2	2.6	2.1	6.6
2	6.8	3.4	2.7	8.5
3	9.6	4.8	3.9	12.2
5	15.2	7.6	6.1	20
7-1/2	22	11	9	29
10	28	14	11	38
15	42	21	17	55
20	54	27	22	72
25	68	34	27	89
30	80	40	32	106
40	104	52	41	140
50	130	65	52	173
60	154	77	62	206
75	192	96	77	255
100	248	124	99	341
125	312	156	125	425
150	360	180	144	506
200	480	240	192	675

Induction Type Squirrel Cage and Wound Rotor Motors

The Horsepower Conversion Table is taken from the 1996 NEC Article 430. The values are for motors running at usual speeds with normal torque characteristics. Motors built for especially low speeds or high torques may require more running current, and multi-speed motors will have full-load current varying with speed. In these cases, use the higher current rating from the nameplate.

The voltages listed are rated motor voltages. The current listed shall be permitted for system voltage ranges of 110

to 120, 220 to 240, 440 to 480, and 550 to 600 volts. Motors rated at 208 VAC should increase the 230 volt column figures by 10%.

For motors that are wound for single or double phase operation, use the nameplate rating. For older slip ring motors or models that have secondary windings be sure to obtain both primary and secondary current ratings. Secondary windings may also need separate conductors or cables when updating the electrification.



Single vs. Multiple Cranes -

The procedures used to size single cranes are different from those used to size multiple cranes.

Single Units

- 1. For one motor, use 100% of the motor nameplate full load ampere rating.
- 2. For multiple motors on a single crane, the minimum ampacity of the power supply conductors shall be 100% of the nameplate full-load ampere rating of the largest motor or group of motors for any single crane motion plus 50% of the nameplate full-load amp rating of the remaining motors.

Multiple Units

1. For multiple cranes supplied by a common conductor, first estimate the individual unit amp load as in Step 2 of Single Units. Then multiply the total amp load of all units by the following table.

Determining Voltage Drop —

After categorizing the units and totaling the electrical load, we are ready to size the conductor and calculate the voltage drop to confirm the proper selection. Use the following problem illustration to assist in selecting and sizing the proper HD conductor for your system.

For example, use a crane runway of 800 feet in length, two cranes on the runway, each with motors rated at 100 h.p. for the hoist, 10 h.p. on the trolley and two 10 h.p. motors on the bridge. The operation is heavy duty and the ambient temperature reaches 100°F in the summer. The supply voltage is 460 VAC, 3 phase 60 cycle. The units are radio controlled from the floor.

The total amperage load for each unit is:

- (1) 100 h.p. hoist @ 124 amp x 100% 124.0 amps
- (1) 10 h.p. trolley @ 14 amp x 50% 7.0 amps

(2) 10 h.p. bridge @ 14 amp x 50% ______14.0 amps

145.0 amps

The total amp load for each unit is 145. The runway load for two cranes is then reduced by the Demand Factor from the table above.

145 + 145 = 290 x 0.95 = 275.5 amps.

According to CMAA, the voltage drop to the unit motors shall not be more than 3% from the power taps to the load at the farthest point on the conductor run. To determine the voltage drop use the appropriate formula in the following table. 2. Additional loads such as heating, lighting, or air conditioning for cabs of large overhead cranes shall be provided for by adding the amperage load of this material to the motor load.

Number of Cranes	Demand Factor
2	0.95
3	0.91
4	0.87
5	0.84
6	0.81
7	0.78

Demand Factors

- L = Distance in feet from power feed to end of conductor
- I = Total amperes drawn as determined by the Horsepower Conversion Table on page 2.
- Z = AC impedance from the Conductor Engineering Data Table below
- R = DC resistancefrom the Conductor Engineering Data Table below

Current Type	Formula
AC 3 phase 60 cycle	V = L x I x Z x 1.73
DC 2 wire system	V = L x I x R x 2

Based on the amp load, select the HD-500-3 conductor to use in the voltage drop calculation. From the AC 3 phase formula, we have the distance (L) = 400 ft., the total amp draw (I) = 275.5 amps, and the ac impedance value (Z) = 0.000070.

Putting these values into the formula, $V = L \times I \times Z \times 1.73$, the voltage drop (V) is:

V = 400 x 275.5 x 0.000070 x 1.73 = 13.34

To obtain the *percentage* of voltage drop, divide the voltage drop figure (13.34) by the supply voltage.

 $13.34 \div 460 = 0.029 \text{ or } 2.9\%$



This is within the CMAA recommended 3% voltage drop standard for crane runway conductors. The table below indicates the maximum voltage drop values that result in a 3% voltage drop to voltage supply ratio. When selecting a conductor, the voltage drop should be equal or less than the values shown.

Ambient Temperature Adjustment

If the conductors are to be located where the ambient air temperature is unusually high, the current carrying capacity of the conductor is reduced. For those cases, multiply the current capacity of the selected conductor by the derating factor in the following table.

Maximum Allowable Voltage Drop

Supply Voltage	Voltage Drop (V)
460 VAC	13.8
230 VAC or VDC	6.9
575 VAC	17.2

Temperature Derating Table

Ambient Air Temperature	Derating Factor
100°F	95%
130°F	75%
160°F*	50%

* At this ambient temperature it will be neccessary to use the higher rated conductor cover, XHT rated at 280°F.

Conductor Engineering Data Table

		Woight	Continuous	Coofficient of	Resistance		
Conductor Bar Number	Description	per 20 ft. section (lbs.)	Current Rating (AC)	Linear Expansion per °F	AC (Z) Ohms/ft.	DC (R) Ohms/ft.	МСМ
HD-500-3	Extruded Aluminum with stainless steel cap	12.6	500	.000013	.000070	.000044	425.3
HD-1000-3	Extruded Aluminum with stainless steel cap	33.0	1000	.000013	.000040	.000014	1311.4
HD-1500-3	Extruded Aluminum with stainless steel cap	43.8	1500	.000013	.000030	.000009	1916.2

Collector Sizing

In systems using high amperage conductors, there are many installations which have multiple crane bridges. Experience has shown that individual crane bridges vary in horse power rating and current draw. Therefore, it is very important to size the collectors for the individual crane bridges when multiple units are encountered.

Other factors to consider when selecting collectors include the Class of Service of the cranes, whether there are units which have magnet lifts, and whether electronic controls are used in the crane operation.

Cranes which are used in Class D, E, or F service will have heavier service requirements than those used in standby or standard operation. The mechanical wear on collectors is much greater when heavier loads, more lifts per hour, or multiple shifts are involved. For these situations, collectors with greater shoe wear and adequate current draw should be selected. Whenever a crane is used with a magnet lift, the Crane Manufacturer's Association of America (CMAA) recommends that tandem collectors be used for safety reasons. No magnet load should ever be in danger of being dropped due to a skip in the runway electrification.

Since most electronic control systems run on lower voltages than the crane power circuit, and are subject to loss of signal due to corrosion or build-up of deposits on the conductors, control manufacturers recommend the use of tandem collectors for electronic circuits as well.

If the application calls for continuous use of the largest motor or motors when the unit is stationary, such as the hoisting motion on large loaders, there is the possibility of overheating the conductors. Contact the factory regarding derating of the collectors.



Expansion Gaps

Expansion gaps should be placed at intervals determined by 1) the expansion rate of the metal in the conductor, 2) the variation in ambient temperature which can occur at the conductor location over a full year of operation, and 3) the location of building expansion joints.

The HD conductor material is aluminum with a stainless steel cap on the running surface. Aluminum is the primary metal for calculating the total expansion. The expansion rate for aluminum is: 1.56"/100 ft./100°F.

The formula used to calculate the total conductor expansion is:

Total expansion (inches) = 1.56 x X/100' x Y/100°F,

where X is the runway length in feet and Y is the total temperature variation in °F.

1. System Located Indoors

Calculate the expansion for a system that is 800 ft. in length, with an indoor temperature variation of 50°F.

Total Expansion = $1.56 \times 800'/100' \times 50^{\circ}F/100^{\circ}F = 6.24"$.

2. System Located Outdoors

Calculate the expansion for a system that is 950 ft. in length with an outdoor temperature variation of 110°F.

Total Expansion = 1.56 x 950'/100' x 110°F/100°F = 16.3"

3. Determine the Number of Expansion Gap Assemblies After calculating the actual expansion of the runway

conductor system, use the following rule of thumb to pick the number of expansion gap assemblies:

- A. Under 3" of expansion, use no expansion assemblies, but do install one anchor clamp assembly at the center of each conductor run.
- B. From 3" to 6" of expansion, use one expansion assembly in the center of the conductor run.
- C. From 6" to 9" of expansion, use two expansion assemblies in each conductor run. Locate them at 1/3 of the runway length in from each end.
- D. For systems with more than 9" of expansion, use one expansion assembly for each 3" of expansion.

4. Anchors

Anchor clamps or anchor pins are required at midpoint on all systems without expansion gaps and halfway between gaps and from gaps to the ends of systems with multiple gaps. See the *HD Installation Instructions* on anchor locations. *If anchors are not correctly placed and used, the expansion gap settings will be lost.*

The maximum gap setting for HD-500 systems is 3.5", and there are two 1.75" gaps to set. The maximum gap setting for the HD-1000 and HD-1500 systems is 3.25", and there is one gap to set.

See the HD Installation bulletins for specific instructions.







HD-1000 Schematic Diagram



Installation Dimensions — 500 Amp



Typical System Installation - 500 Amp

Basic HD Conductors — 500 Amp

20-East Longths	Assembly Catalog Number			
Weight (Lbs)	Indoor Use Outdoor Use Outdoor Use 160°F Max.		High Temperature Use 280°F Max.	
12.6	HD-500-3	HD-500-3-SC	HD-500-3XHT	

Collectors for 500 Amp Conductors



HDP-250-V6 Pantograph Collector, Single Shoe

28 14'

HDP-500-VT6 Pantograph Tandem Collector

HDP Series Pantograph Collector Assemblies

Catalog No.	Lbs.	Description
HDP-250-V6	3.0	250 amp Single Shoe-Vertical Mount
HDP-250-V6-SC	3.0	250 amp Collector w/ Self Cleaning Shoe
HDP-250-L6	3.2	250 amp Single Shoe-Lateral Mount
HDP-150-CT	2.2	Sweeper Shoe for HD-500
LEGEND:		

BR-BRONZE SC-SELF CLEANING SHOE

HDP Series Pantograph Collector Assemblies

Catalog No.	Lbs.	Description
HDP-500-VT6	5.6	500 amp Double Shoe-Vertical Mount
HDP-500-VT6-SC	5.6	500 amp Vertical w/ Self Cleaning Shoe
HDP-500-VT6-BR	10.6	500 amp Double Shoe-Vertical, Bronze
HDP-500-VT6-BR-SC	10.6	500 amp Vertical w/ Cleaning, Bronze
HDP-500-LT6	5.7	500 amp Double Shoe-Lateral Mount
HDP-250-VT6 W/CT	4.7	250 amp Single Shoe w/ Sweeper Shoe

For special pigtail lengths, contact the factory.



Installation Dimensions — 1000 & 1500 Amp



HD-1000-3 & HD-1500-3 Systems Support Spacing Requirements



Typical System Installation 1000 & 1500 Amp

Basic HD Conductors — 1000 & 1500 Amp

20 Fact Langtha	Assembly Catalog Number			
20-Foot Lengths Weight (Lbs)	Indoor Use 160°F Max.	Outdoor Use 160°F with UV Additive	High Temperature Use 280°F Max.	
33.0	HD-1000-3	HD-1000-3-SC	HD-1000-3XHT	
43.8	HD-1500-3	HD-1500-3-SC	HD-1500-3XHT	

Collectors for 1000 & 1500 Amp Conductors



HD-300-PC Pantograph Collector, Single Shoe

HD Series Pantograph Collector Assemblies

Catalog No.	Lbs.	Description
HD-300-PC	6.9	300 amp Single Shoe-Vertical Mount
HD-300-PC-SC	6.9	300 amp Collector w/ Self Cleaning Shoe
HD-300-PC-CT	3.5	Sweeper Shoe for HD-1000/1500

LEGEND: SS-STAINLESS STEEL SC-SELF CLEANING SHOE

For special pigtail lengths, contact the factory.



HD-600-TPC Pantograph Collector, Double Shoe

HD Series Pantograph Collector Assemblies

Catalog No.	Lbs.	Description
HD-600-TPC	13.6	600 amp Double Shoe-Vertical Mount
HD-600-TPC-SC	13.6	600 amp Vertical w/ Self Cleaning Shoe
HD-600-TPC-SS-SC	14.0	600 amp w/SS Arms& Cleaning Shoe
HD-900-TPC	14.8	900 amp Double Shoe-Vertical Mount
HD-900-TPC-SC	14.8	900 amp Vertical w/ Self Cleaning Shoe



HD-500 Systems	Catalog Number	Weight Pounds	Description
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	B-100-BR7B B-100-BR13B HD-T1BR-B1-500 HD-T1BR-W1-500	1.18 1.57 4.78 4.78	Angle Brackets for Web Mounting Bracket with gusset support, 14-1/4" long. Bracket with gusset support, 20-1/4" long. Welded Angle Iron Brackets 3/16" x 1-1/2" x 24". Number of hanger holes determined by conductor runs. Minimum web height 10". Bracket drawings available. Bracket with red primer, 8" vertical leg drilled for two 5/8" bolts spaced 3" apart. Bracket without primer or mounting holes.
FE-908-2SF TIGHTEN TO 150 in-lb HD-500-2SFG TIGHTEN TO 150 in-lb	FE-908-2SF FE-908-2SFE FE-908-2SFS HD-500-2SFG HD-500-2SFFG HD-500-2SFSG HD-500-2SFFGS	.11 .11 .11 .20 .20 .20 .20 .20	Snap-In Hanger Assemblies Zinc plated steel hanger. Epoxy coated steel hanger. Stainless steel hanger with stainless steel hardware. Zinc plated Hanger with insulator for HD-500. Epoxy coated steel hanger with insulator. Stainless steel hanger with insulator. Epoxy coated steel hanger w/SS insulator.
HD-500-2FFE TIGHTEN TO 150 in-lb HD-500-2FFG TIGHTEN TO 150 in-lb	HD-500-2FFE HD-500-2FFG	.24 .32	Cross Bolt Hanger Assemblies Epoxy coated steel hanger. Epoxy coated steel hanger with insulator.
	HD-500-2FEA	.36	Anchor Clamp Assemblies Clamps on both sides of a hanger at selected locations. Two-piece epoxy coated anchor set. Two sets are included with each expansion assembly.
	HD-500-1D	.37	Bolted Joint Assembly Installs at the junction of two conductors. The grooved header bar with four bolts provides perfect alignment and strong holding power. Estimate joint covers for all joints except when using a power feed.
	HD-500-3ER	.37	Joint/Power Feed Cover Use the joint cover with each bolted joint assembly. A cover is supplied with each power feed assembly. There are knockouts at each end for cable entry.



HD-500 Systems	Catalog Number	Weight Pounds	Description
	HD-500-3CP	.84	Power Feed Assembly with Cover Takes the place of a bolted joint at a selected power feed location. The part number includes an HD-500-3ER cover. Each lug holds up to a 1/0 power cable.
FC-TB1	FC-TB1 FC-TB1-ADJ-1	3.25 16.1	Collector Mounting Post Mounting Post with Hardware — 18" long. Mounting plate is 4" square with 3" hole spacing for HDP-Series Collectors. Contact factory for special lengths or finishes. Adjustable Tow Arm for Top Running Cranes.
Bolts: 3/8 - 16 x 1-1/2"	HD-500-3GC	.05	End Cover Flexible PVC End Cover, black. For all HD-500-3 conductors.
	HD-500-SBC HD-500-SBC-2	.70 .90	Split Bolt Connector Split Bolt Connector for 4/0 Mainline. Split Bolt Connector for 500 MCM Mainline.
	HD-500-3H10 HD-500-3H10-SC HD-500-3H10XT	12.0 12.0 12.0	Expansion Gap Assembly Each assembly consists of a ten-foot conductor bar, insulating cover, guide assembly, two gap openings, four power feeds and jumper cables. Anchor sets and instructions are included with the assembly. Expansion section, orange PVC cover. Same with gray PVC outdoor cover. Same with yellow polycarbonate high temperature cover. Rated to 280°F.
	HD-500-3IS10 HD-500-3IS10-SC HD-500-3IS10-XT	10.0 10.0 10.0	Isolating Section Assembly Each assembly consists of a ten-foot section of conductor with two air gaps bridged with phenolic gap pieces and a power feed for the center section. Center section is longer than a tandem collector to prevent bridging power across the isolation gap. Isolating section, orange PVC cover. Same with gray PVC outdoor cover. Same with yellow polycarbonate high temperature cover. Rated to 280°F.
Fort	EJC	1.2	Electric Joint Compound 1 pint size. Estimate one for each 500 ft. of 3 phase conductor run.



HD-1000 & 1500 Systems	Catalog Number	Weight Pounds	Description
	HD-T1BR-B-1000 HD-T1BR-W-1000	7.0	Welded Angle Iron Brackets 3/16" x 2" angle iron material. Number of hanger holes determined by conductor runs. Bracket drawings available. Minimum web height 10". 24" Bracket with red primer, 8" vertical leg drilled for two 5/8" bolts spaced 3" apart. Same as above without primer or mounting holes.
	HD-T1BR-B-27 HD-T1BR-W-27	7.6 7.6	27" Bracket with red primer, 8" vertical leg drilled for two 5/8" bolts spaced 3" apart. Same as above without primer or mounting holes.
	HD-1000-2F HD-1000-2FE HD-1000-2FG HD-1000-2FGE HD-1000-2FSG	.84 .86 1.24 1.26 1.26	Bolted Hanger Assemblies All hangers have 5/8" mounting bolts. Zinc plated steel hanger. Epoxy coated steel hanger. Zinc plated steel hanger with insulator. Epoxy coated steel hanger with insulator. Stainless steel hanger with insulator.
	HD-1000-2FEA HD-1000-2FGEA HD-1000-2FSGEA	.86 1.26 1.26	Anchor Clamp Assemblies All anchors have 5/8" mounting bolts. Anchors are bracket mounted and replace hangers at designated locations. Epoxy coated, no spacers on cross-bolts. Epoxy coated with insulator, no spacers. Epoxy coated stainless steel hanger with insulator.
	HD-1000-3D	1.98	Bolted Joint Assembly Grooved header bar and six bolts provides for perfect alignment and strong holding power. For both HD-1000 and HD-1500 systems. Estimate joint covers separately.
	HD-1000-3ER HD-1500-3ER	1.3 1.43	Joint/Power Feed Cover Use with HD-1000 systems. Use with HD-1500 systems.
	HD-1000-3CP HD-1500-3CP	4.62 4.55	Power Feed Assembly with Cover <i>Takes the place of a bolted joint at a selected power feed location.The part number includes an HD-1000-3ER or HD-1500-3ER cover.</i> Two 350 mcm cable lugs for HD-1000 systems. Two 500 mcm cable lugs for HD-1500 systems.



HD-1000 & 1500 Systems	Catalog Number	Weight Pounds	Description
FC-TB1 Bolts: 3/8 - 16 x 1-1/2"	FC-TB1 FC-TB1-ADJ-1	3.25 16.1	Collector Mounting Post Mounting post with hardware — 18" long. Mounting plate is 4" square with 3" hole spacing for HDP-Series and HD-Series Collectors. Contact factory for special lengths or finishes. Adjustable Tow Arm for Top Running Cranes.
	HD-1000-3GC HD-1500-3GC	.14 .16	End Cover <i>Flexible PVC, black.</i> Cover for HD-1000 systems. Cover for HD-1500 systems.
	HD-1000-3H10 HD-1000-3H10-SC HD-1500-3H10 HD-1500-3H10-SC	38.5 38.5 44.0 44.0	Expansion Gap Assemblies — 10 Foot Section Each assembly consists of 10 feet of conductor, insulating cover, guide assembly, gap opening, power feeds and jumper cables. Assembly with orange cover for HD-1000. Assembly with sun cover for HD-1000. Assembly with orange cover for HD-1500. Assembly with sun cover for HD-1500.
	HD-1000-3IS10 HD-1000-3IS10SC HD-1500-3IS10 HD-1500-3IS10SC	20.0 20.0 20.0 20.0	Isolation Assemblies — 10 Foot Section Each assembly consists of 10 feet of conductor, insulating cover, phenolic insulated gap pieces, and a power feed for the center section. Assembly with orange cover for HD-1000. Assembly with sun cover for HD-1000. Assembly with orange cover for HD-1500. Assembly with sun cover for HD-1500.
FARS	EJC	1.2	Electric Joint Compound 1 pint size. Estimate one for each 260 feet of 3 phase conductor run.

Expansion Gap Dimensions for Hanger and Bracket Locations



HD-500-3H10





Heated Conductor Systems for De-Icing Control

Ice build-up on outdoor overhead cranes can cause the collectors to skip out of the conductor. To prevent this from happening, Duct-O-Wire provides a thermostatically controlled heater cable system that is engineered for each specific application.

The heater cable is installed in the various conductors, and the circuit and cable size are formulated specifically to match the system length. The heater cable is constructed in such a way that individual conductor sections can be replaced without removing the entire heater cable. Duct-O-Wire maintains drawings of all heated systems in case replacement sections are needed to fit the original system. Records are also vital in case of additions to the system or revisions to the heater cable circuit become necessary.

Contact the Duct-O-Wire sales department for details and pricing of the heated systems.



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