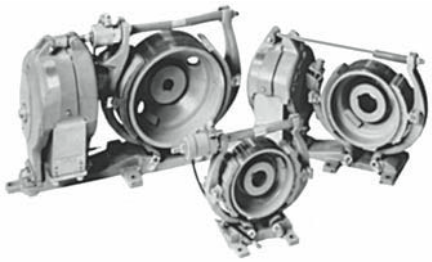
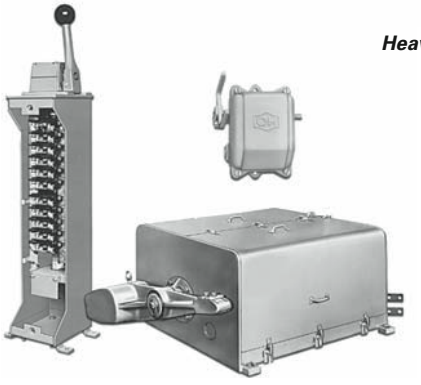
Crane Control

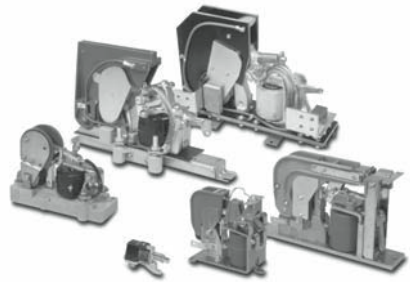
Contents



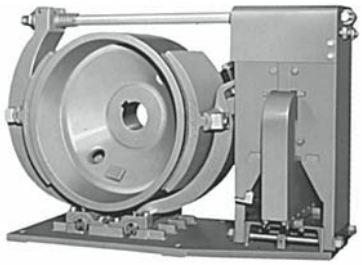
Heavy-Duty Brakes



Master and Limit Switch Family



Contactors and Relays



30" Size GH505 Magnetic Shoe Brake

Product Description

The GH505 Magnetic Brakes comprise a complete family of heavy-duty brakes for use on cranes, hoists and other machinery. They meet specifications of AISE Standard Nos. 6 and 11 and are available in seven sizes with torque ratings from 10 to 9000 lb.-ft.

The GH505 Magnetic Brake is electrically released and spring set — braking force is applied when power is removed from the coil.

Brake wheels are cast of ductile iron specially formulated to withstand the effects of frequent brake operation.

The dc magnetic coil used with the GH505 brakes is encapsulated and enclosed in a weatherproof stainless steel housing. It can be operated from an ac power source by using the optional GH515 Rectifier Panel.

GH505 Magnetic Brakes conform to AISE and NEMA® standards for heavy-duty shoe brakes. The brake assembly includes a base, a brake coil, two armatures, two shoe levers, plus a brake wheel for mounting on an appropriate rotating shaft. The brake coil is designed for operation with direct current power. When only alternating current power is available, a suitable power rectifier unit must be provided.

When the brake coil is energized, the armatures move together to compress a torque spring and move the shoes away from the wheel, thus releasing the brake. De-energizing the coil allows the torque spring to separate the armatures and press the shoes against the wheel. This brake design is therefore fail-safe in the event of power failure. Brake release and set times are .50 seconds or less.

GH505 brakes meet all pertinent specifications of NEMA Standard 2-220 and AISE Standards No. 6 and No. 11.

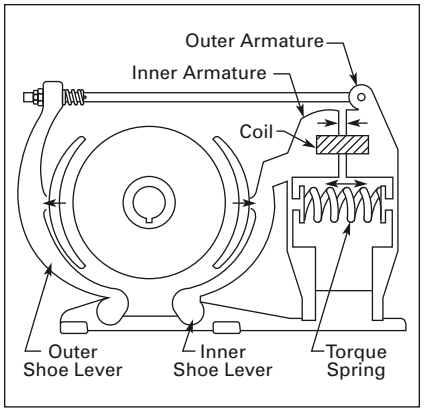


Figure 1. Energized Coil

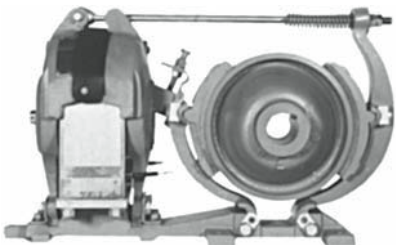
If brake release and set times are critical, consult Eaton for data and recommendations.

Eaton has the most simple, most easily understood design of any brake on the market. There are only 35 parts. This simplicity means maximum reliability in actual operation, as well as ease in installation and maintenance.

Cutler-Hammer® brakes by Eaton Corporation meet AISE/NEMA mounting dimensions and have the smallest overall dimension, so they can replace any AISE/NEMA brake of any manufacture and save space in the bargain. They are the heaviest brake available meeting AISE/NEMA dimensions. This higher strength through weight varies from 20 to 30 percent over some well known brands.

Note: The installation and use of Cutler-Hammer products by Eaton Corporation should be in accordance with the provisions of the U.S. National Electrical Code® and/or other local codes or industry standards that are pertinent to the particular end use. Installation or use not in accordance with these codes and standards could be hazardous to personnel and/or equipment.

Over the Wheel Design

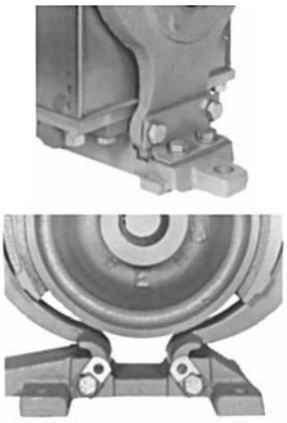


Eaton's Cutler-Hammer brakes effectively divide the braking force between the pull rod and lower pivots while transmitting the braking force to the outer shoe lever. Braking action is spread evenly over both shoes, providing maximum stopping power with minimum wear to the brake. What's more, this design eliminates complicated linkages which have additional stress and wear points.

It is the ultimate in design simplicity and the key to reliable performance. It reduces the number of required parts — only 10 major ones — thus keeping maintenance problems and downtime to a minimum. All parts are readily accessible and easily removable.

Double locking nuts on the pull rod hold the brake in adjustment, even when subjected to vibration and mechanical pounding.

Minimized Wear



Bearing wear is minimized at the shoe levers because of the large bearing area provided and the close tolerance fit of the levers into the sockets in the base.

An improved angle bracket eliminates frequent adjustment. Longer adjusting screws allow the brake to operate with fewer adjustments per time period.

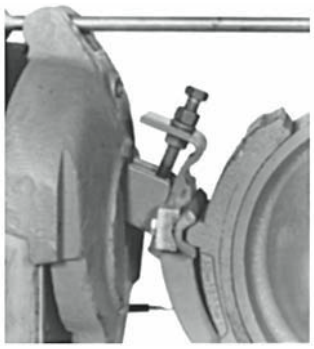
Encapsulated Coil

The coil is encapsulated for long service life and consistent reliability. A stainless steel housing provides complete environmental protection. And, because the coil can easily be reversed with the terminals facing either away from or towards the wheel, cable connections are certain to be simple. The single coil design provides greater reliability compared to dual coil designs.

Long-Life Brake Wheels

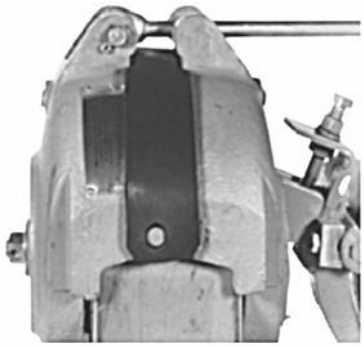
Brake wheels are made of ductile iron. Specially processed and particularly well suited for indoor or outdoor applications. The physical properties of ductile iron make it resistant to high temperatures associated with frequent braking operations. Scored wheel surfaces resulting from wheel particles lodging in the brake linings are eliminated.

One-Time Shoe Positioning



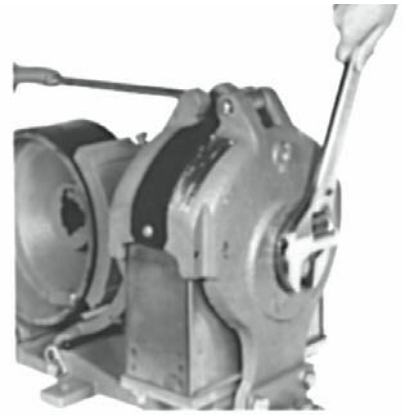
That is all it takes. Once properly positioned, the brake shoes need no further attention — ever. Cap screws and gripping blocks rigidly secure them to the brake shoe levers and prevent the shoes from tilting and "riding the wheel" when the brake is released. Self locking shoe clamp screws hold the brake in adjustment even when subjected to severe vibrations.

Shoe Adjustment Indicators



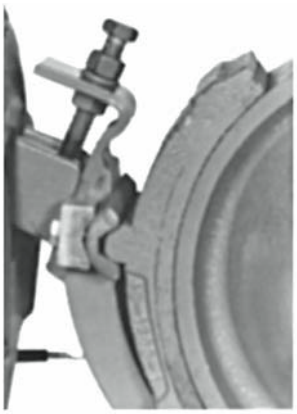
Eliminate guesswork in adjusting shoe travel to compensate for lining wear. It is so easy it can be done accurately even in the dark — no gauges, no rulers necessary. When the travel of the individually adjustable shoes is just right, sounding pins on the upper sides of the armature are flush with the surface of the bushing — you can tell with a touch when adjustment is perfect.

Easy Brake Torque Adjustment



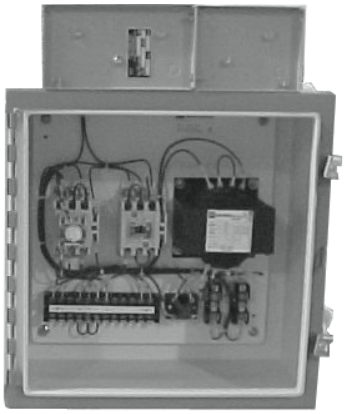
Adjustment is accomplished by turning the adjustment nut clockwise until a definite stop is encountered. This applies maximum brake torque quickly — and easily. To reduce torque, adjustment is counterclockwise. A special construction feature prevents overtightening of the spring, to eliminate overstress and any danger of stud breakage.

Asbestos-Free Shoe Linings



Eaton's Cutler-Hammer brake shoe linings are manufactured of improved, long-life, low-wear material. Either bonded or riveted brake shoes are available to match your operating conditions and relining capabilities.

Adaptable to ac Applications



Use of the Rectifier Panel provides the desirable fast speed and long life characteristics of dc braking on ac service. The panel is connected to the ac motor terminals to provide intermittent brake torque on installations where a continuous duty brake coil rating is required. For reduced voltage starting or drift point settings, the rectifier is connected directly to the ac power source.

Application Description

Magnetic brakes are used for both stopping and parking service on industrial machinery. These brakes are widely used on both hoist and travel motions of cranes and other moving machinery. They are also used as parking brakes for industrial process line equipment. Brakes are for use in both indoor and outdoor applications. Brakes can be released electrically by a separate operator's switch, or may be operated in conjunction with control of the related motor drive.

Brake System Selection

The number of brakes required for a mechanical drive is related to the number of drive motors required for that function. Normally, there is one brake per motor. However, for hoists and other machinery requiring a high degree of safety, two brakes per motor are sometimes specified.

Brake Size Selection

Selection of the correct brake size is based on the torque requirements of the application. When the brake is used on a motor shaft or extension thereof, the following formula can be used:

$$T = \frac{5252 \times hp}{r/min.}$$

Where T = Full load motor torque in lb.-ft.

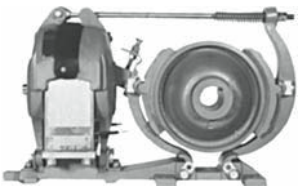
hp = Motor rated horsepower

r/min. = Rated speed of the motor shaft that brake wheel is mounted on (revolutions per minute)

Note: See **Table 4** on **Page 6** for typical motor frame torques.

The rated motor torque arrived at using this formula is adequate for most types of service. However, for hoist and other high inertia applications, refer to factory.

All brakes can be mechanically adjusted down to 50% of their maximum torque rating. Brake torque ratings are related to the type of coil chosen and the duty cycle of the brake application.



GH505 Magnetic Shoe Brake

Hoist Brake Selection

AISE Standard No. 6 and OSHA Regulations state that the hoist brake is to be selected based on the torque required to hoist rated crane load at the point where the brake is applied.

CMAA Specification No. 70 states that the hoist brake is to be selected based on motor full load torque at the point where the brake is applied.

All three standards require that a hoist drive handling hot metal be equipped with two brakes.

Table 1. Hoist Brake Selection

	Basis for Selection of Brake Torque	Brake Torque Rating			
		Hoist Drive with Single Brake		Hoist Drive with Two Brakes	
		With Control Braking ①	With Mechanical Load Brake	Handling Hot Metal	Not Handling Hot Metal
CMAA	Motor Full Load Torque	125%	100%	100%	100%
OSHA	Torque Required to Hoist Rated Load	125%	100%	100%	100%
AISE	Torque Required to Hoist Rated Load	150%	150%	125%	100%

① Control braking is dynamic lowering, countertorque or eddy current load brake.

Coil Selection

Series coils are normally used with series wound dc motors to reduce the amount of wiring from the control point to the brake, such as between a crane bridge and trolley. The dc motors are intermittent duty, rated one hour or 1/2 hour duty. The brake should be selected at the same duty rating as the motor. When the data is available, the coil should be chosen based on the actual full load current and duty cycle of the motor (rather than the rated full load motor current).

A coil selection chart for series coils is on **Page 20**. Brakes with series coils are designed to release at 40% of rated current and set at 10% of rated current.

Shunt coils are normally used in applications employing:

1. Travel motions,
2. Shunt or compound wound dc motors, or
3. An ac power supply.

If the application requires the brake to be released continuously (energized), brake size should be determined using the continuous duty torque ratings. However, if a coil protective circuit is employed, such as found in the GH515 Rectifier Panel, selection can be based on the intermittent duty ratings.

Shunt coils should be selected based on the dc voltage supply to the brake and on the duty cycle of the brake. A resistor wired in series with the shunt brake coil is used to obtain desired brake response time. This resistor is supplied either with the brake (in a package attached to brake pull rod) for user installation, or as a part of the optional Rectifier Panel. When shunt wound coils are used on a dc constant potential power system, a shunt brake relay is required. The relay along with the series resistor can be mounted on the related motor control panel.

See **Page 15** for obsolete coil cross references.

Wheel Selection

Wheels should be selected from the tables on **Pages 9** and **10**. Wheels are ductile iron machined for gear box or motor shaft mounting.

Enclosure Selection

When brakes are exposed to adverse environmental conditions, optional brake covers or enclosures should be considered.

The weather-resistant enclosure protects the wheel and brake shoes from rain, snow or sleet at any "normal" wind conditions.

The NEMA 4 enclosure protects the complete brake and wheel assembly from any type of moisture or dust impingement. To maintain watertightness, a shaft seal must be added by the factory or customer. Use of this enclosure affects the wheel centerline height dimension.

Approximate enclosure dimensions are shown on **Page 17**.

Features

- Seven AISE sizes available: 8, 10, 13, 16, 19, 23 and 30 inch.
- Torque ranges from 10 to 9000 lb.-ft.
- Ductile iron bases with steel armatures on sizes 8 thru 23 inch.
- Steel base with laminated steel armatures on 30 inch size.
- Partial wheel covers, weather resistant and NEMA 4-5 enclosures.
- DC series or shunt coils available, or coils for use with rectifier ac power.
- Simplest construction of any brake in the industry.
- Mechanical options and brake rectifier packages available.

Optional Features

- Riveted shoe linings (standard on 23" brakes).
- Special brake wheel dimensions.
- Weather-resistant enclosure.
- NEMA 4 watertight and dust-tight enclosure.
- Manual release — lever type, self return.
- Manual release — Screw type, maintained.
- Low torque rating for 8" brake.
- Brake release indication circuit.
- Visual torque measurement gauge.

Optional Manual Release Lever

Construction Features

Major structural parts, including the brake base, shoe levers, shoes and the brake wheel, are machined from ductile iron casings. The ductile iron used in the brake wheel is specially formulated to withstand the high temperatures normally resulting from frequent brake operation. Wheels can be machined to cover a variety of motor shaft or line shaft requirements.

Note: The 30" brake size only incorporates laminated steel armature members and a fabricated steel base. Brake linings are bonded to brake shoe lining inserts of sheet steel.

The inner and outer armatures are machined from cast steel to obtain optimum magnetic properties. The brake coil is strap or wire wound and epoxy filled for long service life and top reliability. A weatherproof stainless steel housing provides complete environmental protection and eliminates the possibility of magnetic dust or "kish" build-up. Standard coil leads extend about 4" from housing face and are supplied with suitable lugs. Coil terminals can be oriented to either face away from or toward the brake wheel. Coils are wound with Class B insulation.

The "over-the-wheel" design of GH505 brakes effectively divides the braking force between the pull rod and lower pivots while transmitting the braking force to the outer shoe lever. As a result, the braking action is spread evenly over both shoes, providing maximum stopping power with minimum wear to the brake.

Brake shoes and linings are available in either bonded or riveted construction. Linings are of a non-asbestos material having excellent wear and anti-fade characteristics. Brakes can be easily adjusted for lining wear.

The mechanical design of the brake eliminates all but one pivot pin — the pin connecting the pull rod to the outer armature. Bearing surfaces between the shoe levers and base, as well as armatures and base, are generally sized to minimize wear and help prevent "freezing" of the pivots.

All mounting and shaft height dimensions are in accordance with Association of Iron and Steel Engineers Standard No. 11. See **Page 12** for these dimensions.

Parking torque is easily adjusted over a 2:1 range using a standard wrench.

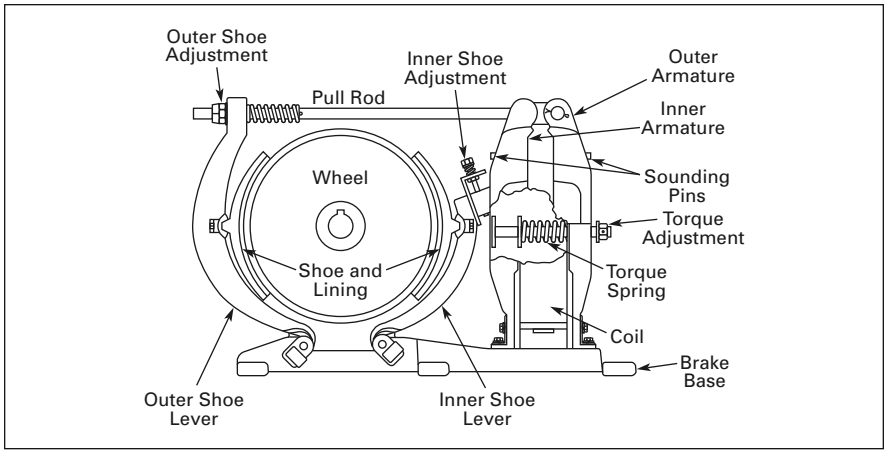


Figure 2. GH505 Brake Cutaway View

Standards and Certifications

- CMAA 4.9.
- AISE No. 6, 11.
- NEMA STD. 2-220.
- NEMA ICS 2-220.21.
- ASTM 80-55-06.

Technical Data and Specifications

- Sizes:
  - Available in 8, 10, 13, 16, 19, 23 and 30 inch
- Mounting:
  - Designed for floor mounting
  - Dimensions per AISE Standard No. 11
- Torque Ratings:
  - 10 lb.-ft. through 9000 lb.-ft.
  - Equal stopping and holding torque rating
- Operation:
  - Electrically released, spring set
  - Brake sets in case of power failure
- Torque Adjustment:
  - Brake mechanism adjustable over a 2:1 torque range (except for low torque 8" brakes)
- Ambient Temperature: 40∞C

Table 2. Specifications

Maximum Torque (lb-ft)				Brake Size Inches (mm)	Wheel Specifications	
Series Wound		Shunt Wound ①				
1/2 Hour	1 Hour	Intermittent	Continuous		WR^2 (lb.-ft.^{2})	Maximum r/min.
100	65	100	75	8 (203)	1.1	5000
200	130	200	150	10 (254)	3	4000
550	365	550	400	13 (330)	12	3180
1000	650	1000	750	16 (406)	36	2500
2000	1300	2000	1500	19 (483)	70	2110
4000	2600	4000	3000	23 (584)	210	1740
9000	6000	9000	6750	30 (762)	880	1340

① When brake is used with Eaton's Cutler-Hammer Rectifier Panel, intermittent duty torque ratings may be used as continuous.

Common Motor Data

Table 3. Series Wound dc Mill Motor Ratings

Motor Frame Size	1/2 Hour Ratings				1 Hour Ratings			
	hp	Torque	RPM	FLC	hp	Torque	RPM	FLC
602	10	80	675	44	7-1/2	50	800	31
603	13-1/2	115	620	57	10	70	725	41
604	19	180	560	77	15	120	650	59
606	33	340	515	129	25	230	575	95
608	45	500	470	175	35	320	525	131
610	65	770	445	248	50	525	500	184
612	100	1225	430	375	75	830	475	274
614	135	1735	400	500	100	1140	460	360
616	200	2630	400	730	150	1750	450	536
618	265	3810	385	955	200	2560	410	712
802A	6-1/2	45	750	29	5	30	900	21
802B	10	80	675	45	7-1/2	50	800	31
802C	13-1/2	105	675	57	10	65	800	41
803	19	160	620	77	15	110	725	59
804	26	235	580	98	20	160	650	75
806	39	410	500	145	30	275	575	112
808	65	760	450	246	50	500	525	184
810	90	1070	440	335	70	735	500	260
812	135	1690	420	500	100	1110	475	360
814	200	2625	400	730	150	1710	460	533
816	265	3480	400	955	200	2330	450	712
818	325	4740	360	1140	250	3000	410	900

Table 4. AC Wound Rotor Motors

Horse-power	Full Load Torque — ft.-lbs.		
	900 RPM	1200 RPM	1800 RPM
5	31	23	15
7-1/2	46	35	23
10	62	46	31
15	93	69	46
20	124	92	61
25	155	115	76
30	185	138	92
40	247	185	—
50	309	221	—
60	371	277	—
75	464	346	—
100	619	461	—
125	770	576	—
150	926	—	—

Options

Table 5. Optional Features

Option	Description	Ordering Instruction Change Catalog Number Listed in Product Selection Table on Page 19 as Noted Below	* Brake Size — Inches (mm)						
			8 (203)	10 (254)	13 (330)	16 (406)	19 (483)	23 (584)	30 (763)
Mechanical (7th digit of Catalog Number GH505AA**A**)	Riveted linings	Change 7th Digit from A to **B** Example: GH505AAA to GH505A**B**A					N/A	Std.	N/A
	Manual release (lever type)	Change 7th Digit from A to **C** Example: GH505AAA to GH505A**C**A							N/A
	Maintained manual release (screw type)	Change 7th Digit from A to **D** Example: GH505AAA to GH505A**D**A							N/A
	Low torque 8" GH505 brake 10 lb-ft	Change 7th Digit from A to **G** Example: GH505AAA to GH505A**G**A							
	Low torque 8" GH505 brake 25 lb-ft	Change 7th Digit from A to **H** Example: GH505AAA to GH505A**H**A							
	Brake release indication circuit	Change 7th Digit from A to **J** Example: GH505AAA to GH505A**J**A							N/A
	Visual torque measurement gauge	Change 7th Digit from A to **K** Example: GH505AAA to GH505A**K**A							N/A
	Soft stop	Change 7th Digit from A to **L** Example: GH505AAA to GH505A**L**A					N/A	N/A	N/A
	Special — Supply complete description	Change 7th Digit from A to **S** Example: GH505AAA to GH505A**S**A	Consult Factory						
Enclosure (8th digit of Catalog Number GH505AA**A**)	NEMA 4 Enclosure with options requiring engineering — Supply complete description	Change 8th Digit from A to **S** Example: GH505AAA to GH505AA**S** ■ Shaft seal ■ Terminal box ■ Space heater							 N/A N/A N/A

Industrial Torque Rating (7th Digit)

These magnetic shoe brakes are Type GH505 modified to provide higher maximum torque ratings. See **Table 27** on **Page 19** for product selection. They are designed primarily for use with adjustable voltage or adjustable frequency drive systems, operated by brake rectifier panels. Order brake rectifier panels from **Page 13**.

Table 6. GH505 Brake — Industrial Rating

Maximum Torque (lb.-ft.) ①		Brake Size Inches (mm)
Intermittent	Continuous	
120	90	8 (203)
240	180	10 (254)
660	495	13 (330)
1200	900	16 (406)
2400	1800	19 (483)
4800	3600	23 (584)

① When brake is used with Eaton's Cutler-Hammer Rectifier Panel, intermittent duty torque ratings may be used as continuous.

Soft Stop Feature (7th Digit)

Gradual Increase in Torque Application

- Reduces dangerous load swings on overhead cranes.
- Reduces gear wear caused by sudden stops of mechanical drive systems.

A Low-Cost Alternative to Hydraulic Brakes on Radio Controlled Cranes

Field Adjustable Full Torque Delay

- Simple adjustment requires no additional parts.
- Up to 6-second delay fits most applications.

Self-Contained System

- No hydraulic power assist package needed.
- Maintenance-free design.

Enclosures (8th Digit)

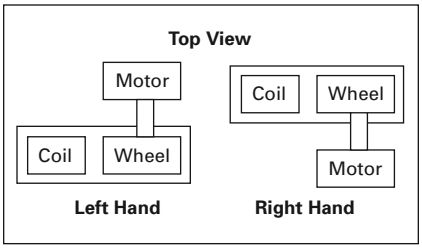


Figure 3. Brake Orientation

This is an illustration of Left and Right Hand enclosures. Enclosures must be mounted against end bell of motor — no gasket is supplied. Specify diameter of shaft at point it enters enclosure. Enclosure will be drilled to fit motor when requested — bolt hole configuration must be supplied.

Dimensions. . . . . **Pages 16, 17**
Discount Symbol **18CD-2**

* Consult Sales Office for Pricing

GH505 Brake Wheel for Straight Shaft with Keyway

Accessories

Brake Wheels

These brake wheels are manufactured in 7 AISE sizes from ductile iron conforming to ASTM 80-55-06. Steel wheels are also available. Stocked wheels are set up for mounting on mill and industrial motor shafts. Wheels with a pilot bore are also available for the OEM market.

Wheel Selection

Brake wheel selection is dependent on the dimensions of the shaft on which it will be mounted and on the location of the motor end bell and mounting feet with relation to the brake. Most commonly, these brake wheels are mounted on a motor shaft extension opposite the drive end shaft. Sometimes the brake will be located on the high speed shaft between the motor and gear box. Occasionally there will be a high speed shaft extension on the opposite side of the gear box where the brake can be located.

For dc mill motors, where the brake is to be located on the motor shaft extension opposite the drive end, standard wheel dimensions have been established (AISE Standard No. 11). On **Pages 9** – **10**, **Table 11** lists brake wheels where a "Standard" wheel has been set up for various motor frames.

If wheel requirements do not match motor frame listing availability, then two alternatives are open:

1. Choose the "Universal" wheel, which is a partially finished wheel. This wheel has the maximum amount of hub length and a pilot bore. The customer must machine the hub to the required length, and the required bore and keyway dimensions.
2. Order a "Special" brake wheel with all machining completed by Eaton's Cutler-Hammer. "C", "D", Bore, Taper (if required), and keyway dimensions must be specified. See brake wheel dimension drawing, **Figure 4** on **Page 11** for maximum and minimum dimensions. Note that wheel dimensions will always be "Special" when a NEMA 4 enclosure is required.

Specifications

- Standards:
  - CMAA 4.9, AISE No. 6, 11
  - ASTM 80-55-06
  - NEMA Standard 2-220
  - NEMA ICS 2-220.21
- Sizes:
  - 8, 10, 13, 16, 19, 23 and 30 inch
- Mounting:
  - Tapered or straight bore shafts
  - Keyed or pressure fit
- Construction:
  - Ductile iron standard with an option for steel
- Standard Wheels:
  - For mill and industrial frame motors

Energy Dissipation and Absorption Capability

Each brake has a maximum energy dissipation and energy absorption capability based on a 40∞C ambient temperature. Brake energy ratings are normally given in foot pounds per hour (ft.-lb./hr.) for repetitive brake operations or in foot pounds (ft.-lbs.) for one long stop as listed in **Table 7**.

Table 7. Energy Dissipation/Absorption

Brake Size Inches (mm)	Energy Dissipation Repetitive Operation (ft.-lb./hr.)	Energy Absorption One Long Stop (ft.-lbs.)
8 (203)	1,500,000	163,000
10 (254)	2,200,000	236,000
13 (330)	4,300,000	470,000
16 (406)	6,100,000	678,000
19 (482)	9,400,000	1,040,000
23 (584)	14,600,000	1,625,000
30 (762)	21,200,000	2,360,000

Table 8. Brake Wheel Inertias and Maximum Allowable Rotational Speeds

Brake Size	WR^2 (lb.-ft.^{2})	Maximum r/min.
8 (203)	1.1	5000
10 (254)	3	4000
13 (330)	12	3180
16 (406)	36	2500
19 (482)	70	2110
23 (584)	210	1740
30 (762)	880	1340

Table 9. Brake Wheel Catalog Numbering System

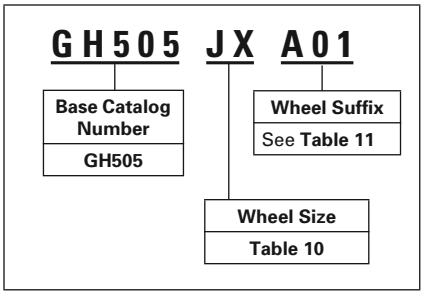


Table 10. Wheel Size Code Suffix

Size Inches (mm)	Code Number	Size Inches (mm)	Code Number
8 (203)	JX	19 (483)	NX
10 (254)	KX	23 (584)	PX
13 (330)	LX	30 (762)	RX
16 (406)	MX		

Table 11. Brake Wheel Selection Table

Motor Frame ①	Approximate Dimensions in Inches (mm)								Brake Wheel Suffix No.
	Wheel ②					Bore			
	A Wheel Dia.	B Wheel Face	C Hub Length	D Offset	E Inset	Size	Taper per ft. (mm per meter)	Keyway	
8" Brake Wheel (203 mm)									
402 - 602 - 802	8 (203)	3.25 (82.6)	3 (76.2)	4 (101.6)	2.63 (66.7)	1.75 (44.4)	1.25 (104.2)	.50 x .25 (12.7 x 6.4)	**A01**
AC1 - AC2 - AC4	8 (203)	3.25 (82.6)	3 (76.2)	4 (101.6)	2.63 (66.7)	1.75 (44.4)	1.25 (104.2)	.50 x .25 (12.7 x 6.4)	**A01**
603 - 604 - 803 - 804	8 (203)	3.25 (82.6)	3.5 (88.9)	4 (101.6)	2.13 (54.0)	2 (50.8)	1.25 (104.2)	.50 x .25 (12.7 x 6.4)	**A02**
AC8	8 (203)	3.25 (82.6)	4 (101.6)	4 (101.6)	1.63 (41.3)	2.50 (63.5)	1.25 (104.2)	.50 x .25 (12.7 x 6.4)	**A03**
Universal	8 (203)	3.25 (82.6)	6.88 (174.6)	5.25 (133.4)	0	.75 NOM (19.0)	—	—	**A04**
SW5 - 2W5	8 (203)	3.25 (82.6)	3 (76.2)	4.5 (114.3)	3.13 (79.4)	1.75 (44.4)	1.25 (104.2)	.50 x .25 (12.7 x 6.4)	**A05**
MC20	8 (203)	3.25 (82.6)	3.5 (88.9)	3 (76.2)	1.13 (28.6)	2 (50.8)	1.22 (101.6)	.50 x .22 (12.7 x 5.5)	**A06**
MC30	8 (203)	3.25 (82.6)	4 (101.6)	3 (76.2)	.63 (15.9)	2.50 (63.5)	1.22 (101.6)	.63 x .25 (15.9 x 6.4)	**A07**
MCS2 - MD402AE	8 (203)	3.25 (82.6)	3 (76.2)	2.75 (69.9)	1.38 (34.9)	1.75 (44.4)	1.25 (104.2)	.50 x .25 (12.7 x 6.4)	**A08**
K1	8 (203)	3.25 (82.6)	3.5 (88.9)	3 (76.2)	1.13 (28.6)	1.12-1.13 (28.5-28.6)	—	.31 x .13 (8.0 x 3.2)	**A09**
K2	8 (203)	3.25 (82.6)	4 (101.6)	3 (76.2)	.63 (15.9)	1.37-1.38 (34.9-34.92)	—	.38 x .13 (9.5 x 31.8)	**A10**
K3 - K4	8 (203)	3.25 (82.6)	4 (101.6)	3 (76.2)	.63 (15.9)	1.62-1.63 (41.25-41.28)	—	.44 x .16 (11.1 x 4.0)	**A11**
1811 - 1812	8 (203)	3.25 (82.6)	2 (50.8)	3.25 (82.6)	2.88 (73.0)	1.12-1.13 (28.5-28.6)	—	.25 x .13 (6.4 x 3.2)	**A12**
2111 - 2112	8 (203)	3.25 (82.6)	2.5 (63.5)	3.75 (95.3)	2.88 (73.0)	1.37-1.38 (34.90-34.92)	—	.31 x .16 (8.0 x 4.0)	**A13**
2510 - 2511	8 (203)	3.25 (82.6)	2.5 (63.5)	3.75 (95.3)	2.88 (73.0)	1.62-1.63 (41.2-41.3)	—	.38 x .19 (9.5 x 4.7)	**A14**
289 - 2810 - 2811	8 (203)	3.25 (82.6)	2.75 (69.9)	3.75 (95.3)	2.63 (66.7)	1.87-1.88 (47.6-47.63)	—	.50 x .25 (12.7 x 6.4)	**A15**
327 - 328	8 (203)	3.25 (82.6)	3 (76.2)	4 (101.6)	2.63 (66.7)	2.12-2.13 (53.9-54.0)	—	.50 x .25 (12.7 x 6.4)	**A16**
366	8 (203)	3.25 (82.6)	3 (76.2)	4 (101.6)	2.63 (66.7)	2.25 (57.12)	—	.50 x .25 (12.7 x 6.4)	**A17**
367 - 368 - 369 - 3610	8 (203)	3.25 (82.6)	3.5 (88.9)	4 (101.6)	2.13 (54.0)	2.25 (57.12)	—	.50 x .25 (12.7 x 6.4)	**A18**
10" Brake Wheel (254 mm)									
602 - 802 - AC1 - AC2 - AC4	10 (254)	3.75 (95.3)	3 (76.2)	4.25 (108.0)	3.13 (79.4)	1.75 (44.4)	1.25 (104.2)	.50 x .25 (12.7 x 6.4)	**B01**
603 - 604 - 803 - 804	10 (254)	3.75 (95.3)	3.5 (88.9)	4.25 (108.0)	2.63 (66.7)	2 (50.8)	1.25 (104.2)	.50 x .25 (12.7 x 6.4)	**B02**
606 - 806 - AC8 - AC12	10 (254)	3.75 (95.3)	4 (101.6)	4.25 (108.0)	2.13 (54.6)	2.50 (63.5)	1.25 (104.2)	.50 x .25 (12.7 x 6.4)	**B03**
608	10 (254)	3.75 (95.3)	4.5 (114.3)	4.25 (108.0)	1.63 (41.3)	3 (76.2)	1.25 (104.2)	.75 x .25 (19.1 x 6.4)	**B04**
Universal	10 (254)	3.75 (95.3)	7.75 (196.9)	6.25 (158.8)	.38 (9.5)	1 NOM (25.4)	—	—	**B05**
MD404AE - SW10	10 (254)	3.75 (95.3)	3.5 (88.9)	2.88 (73.0)	1.25 (31.8)	2 (50.8)	1.25 (104.2)	.50 x .25 (12.7 x 6.4)	**B06**
MD404AE2 - MCS4	10 (254)	3.75 (95.3)	3.5 (88.9)	3.88 (98.4)	2.25 (57.2)	2 (50.8)	1.25 (104.2)	.50 x .25 (12.7 x 6.4)	**B07**
K5	10 (254)	3.75 (95.3)	4 (101.6)	3.13 (79.4)	1 (25.4)	1.87 (47.6)	—	.50 x .19 (12.7 x 4.8)	**B08**
BW	10 (254)	3.75 (95.3)	3.5 (88.9)	2.5 (63.5)	.88 (22.2)	2.50 (63.5)	1.22 (101.6)	.63 x .19 (15.9 x 4.8)	**B09**
MD103	10 (254)	3.75 (95.3)	4.75 (120.7)	3.25 (82.6)	.38 (9.5)	2.50 (63.5)	1.25 (104.2)	.50 x .25 (12.7 x 6.4)	**B10**
—	10 (254)	3.75 (95.3)	3.5 (88.9)	4.25 (108.0)	2.63 (66.7)	1 NOM (25.4)	—	—	**B11**
327 - 328	10 (254)	3.75 (95.3)	3 (76.2)	4.25 (108.0)	3.13 (79.4)	2.12-2.13 (53.9-54.0)	—	.50 x .25 (12.7 x 6.4)	**B12**
366 - 367 - 368 - 369 - 3610	10 (254)	3.75 (95.3)	3 (76.2)	4 (101.6)	2.88 (73.0)	2.25 (57.1)	—	.50 x .25 (12.7 x 6.4)	**B13**
408 - 409	10 (254)	3.75 (95.3)	4.25 (108.0)	4.25 (108.0)	1.88 (47.6)	2.88 (73.0)	—	.75 x .38 (19.1 x 9.5)	**B14**
13" Brake Wheel (330 mm)									
603 - 604 - 803 -804	13 (330)	5.75 (146.1)	3.5 (88.9)	5 (127.0)	4.38 (111.1)	2 (50.8)	1.25 (104.2)	.50 x .25 (12.7 x 6.4)	**C01**
606 - 806 - AC8 - AC12	13 (330)	5.75 (146.1)	4 (101.6)	5 (127.0)	3.88 (98.4)	2.50 (63.5)	1.25 (104.2)	.50 x .25 (12.7 x 6.4)	**C02**
608 - 808	13 (330)	5.75 (146.1)	4.5 (114.3)	5.38 (136.7)	3.75 (95.3)	3 (76.2)	1.25 (104.2)	.75 x .25 (19.1 x 6.4)	**C03**
610 - 810 - AC18 - MC10	13 (330)	5.75 (146.1)	4.5 (114.3)	5.38 (136.7)	3.75 (95.3)	3.25 (82.5)	1.25 (104.2)	.75 x .25 (19.1 x 6.4)	**C04**
612 - 812 - AC25 - AC30	13 (330)	5.75 (146.1)	5 (127.0)	5.38 (136.7)	3.25 (82.6)	3.62-3.63 (91.95-92.08)	1.25 (104.2)	.75 x .25 (19.1 x 6.4)	**C05**
614	13 (330)	5.75 (146.1)	5 (127.0)	5.38 (136.7)	3.25 (82.6)	4.25 (107.9)	1.25 (104.2)	1 x .38 (25.4 x 9.5)	**C06**
Universal	13 (330)	5.75 (146.1)	8 (203.2)	6 (152.4)	.88 (22.2)	1 NOM (25.4)	—	—	**C07**
K6	13 (330)	5.75 (146.1)	4 (101.6)	4 (101.6)	2.88 (73.0)	2.12 (53.9)	—	.50 x .19 (12.7 x 4.8)	**C08**
K7	13 (330)	5.75 (146.1)	4 (101.6)	4 (101.6)	2.88 (73.0)	2.37 (60.3)	—	.63 x .25 (15.9 x 6.4)	**C09**
K8	13 (330)	5.75 (146.1)	4 (101.6)	4 (101.6)	2.88 (73.0)	2.62 (66.6)	—	.63 x .28 (15.9 x 7.1)	**C10**
MC40 - MC50	13 (330)	5.75 (146.1)	4.5 (114.3)	3.19 (81.0)	1.56 (40.0)	3 (76.2)	1.22 (101.6)	.63 x .28 (15.9 x 7.1)	**C11**
327 - 328	13 (330)	5.75 (146.1)	3.19 (81.0)	4.5 (114.3)	4.19 (106.3)	2.12-2.13 (53.9-54.0)	—	.50 x .25 (12.7 x 6.4)	**C12**
366 - 367 - 368 - 369 - 3610	13 (330)	5.75 (146.1)	4 (101.6)	5.5 (140.0)	4.38 (111.1)	2.25 (57.1)	—	.50 x .25 (12.7 x 6.4)	**C13**
408 - 409 - 4010	13 (330)	5.75 (146.1)	4.25 (108.0)	5 (127.0)	3.63 (92.1)	2.88 (73.0)	—	.75 x .38 (19.1 x 9.5)	**C14**
506 - 507 - 508	13 (330)	5.75 (146.1)	5 (127.0)	4.25 (108.0)	2.13 (54.0)	3.62-3.63 (92.05-92.08)	—	.88 x .44 (22.2 x 11.1)	**C15**

① 400 - 600 - 800 ac motor frames all per AISE specifications. See **Page 12** for dimensional compatibility.

② See dimensional drawing, **Figure 4** on **Page 11**.

Note: Dimensions shown are approximate and are not to be used for construction purposes.

Table 11. Brake Wheel Selection Table (Continued)

Motor Frame ①	Approximate Dimensions in Inches (mm)								Brake Wheel Suffix No.
	Wheel ②					Bore			
	A Wheel Dia.	B Wheel Face	C Hub Length	D Offset	E Inset	Size	Taper per ft. (mm per meter)	Keyway	
16" Brake Wheel (406 mm)									
606 - 806 - AC8 - AC12	16 (406)	6.75 (171.5)	4 (101.6)	6.5 (165.1)	5.88 (149.2)	2.50 (63.5)	1.25 (104.2)	.50 x .25 (12.7 x 6.4)	**D01**
608 - 808	16 (406)	6.75 (171.5)	4.5 (114.3)	6.5 (165.1	5.38 (136.5)	3 (76.2)	1.25 (104.2)	.75 x .25 (19.1 x 6.4)	**D02**
610 - 810 - AC18	16 (406)	6.75 (171.5)	4.5 (114.3)	6.5 (165.1)	5.38 (136.5)	3.25 (82.5)	1.25 (104.2)	.75 x .25 (19.1 x 6.4)	**D03**
612 - 812 - AC25 - AC30	16 (406)	6.75 (171.5)	5 (127.0)	6.5 (165.1)	4.88 (123.8)	3.62-3.63 (91.9-92.0)	1.25 (104.2)	.75 x .25 (19.1 x 6.4)	**D04**
614 - 814 - AC40 - AC50	16 (406)	6.75 (171.5)	5 (127.0)	6.5 (165.1)	4.88 (123.8)	4.25 (107.9)	1.25 (104.2)	1 x .38 (25.4 x 9.5)	**D05**
616 - 816	16 (406)	6.75 (171.5)	5.5 (140.0	6.5 (165.1)	4.38 (111.1)	4.62-4.63 (117.3-117.4)	1.25 (104.2)	1.25 x .38 (31.8-9.5)	**D06**
Universal	16 (406)	6.75 (171.5)	8.38 (212.9)	7.25 (184.2)	2.25 (57.2)	1.5 NOM (38.1)	—	—	**D07**
MS10 - MD410AE2	16 (406)	6.75 (171.5)	4.5 (114.3)	7 (177.8)	5.88 (149.2)	3.25 (82.5)	1.25 (104.2)	.75 x .25 (19.1 x 6.4)	**D08**
SW50 - MD412AE	16 (406)	6.75 (171.5)	5 (127.0)	4.25 (108.0)	2.63 (66.7)	3.62-3.63 (91.9-92.0)	1.25 (104.2)	.75 x .25 (19.1 x 6.4)	**D09**
MCS12 - MD412AE2	16 (406)	6.75 (171.5)	5 (127.0)	7.25 (184.4)	5.63 (142.9)	3.62-3.63 (91.9-92.0)	1.25 (104.2)	.75 x .25 (19.1 x 6.4)	**D10**
EW	16 (406)	6.75 (171.5)	5 (127.0)	5 (127.0)	3.38 (85.7)	4 (101.6)	1.219 (101.6)	1 x .38 (25.4 x 9.5)	**D11**
408 - 409 - 4010	16 (406)	6.75 (171.5)	4.38 (111.3)	6.5 (165.1)	5.50 (139.6)	2.88 (73.0)	—	.75 x .38 (19.1 x 9.5)	**D12**
506 - 507 - 508	16 (406)	6.75 (171.5)	4 (101.6)	5 (127.0)	4.38 (111.1)	3.63 (92.0)	—	.88 x .44 (22.2 x 11.1)	**D13**
587 - 588 - 589	16 (406)	6.75 (171.5)	5 (127.0)	5 (127.0)	3.38 (85.7)	4.13 (104.7)	—	1 x .50 (25.4 x 12.7)	**D14**
19" Brake Wheel (482 mm)									
608 - 808	19 (483)	8.75 (222.3)	4.5 (114.3)	7.5 (190.5)	7.38 (187.3)	3 (76.2)	1.25 (104.2)		**E01**
610 - 810 - AC18	19 (483)	8.75 (222.3)	4.5 (114.3)	7.5 (190.5)	7.38 (187.3)	3.25 (82.5)	1.25 (104.2)	.75 x .25 (19.1 x 6.4)	**E02**
612 - 812 - AC25 - AC30	19 (483)	8.75 (222.3)	5 (127.0)	7.5 (190.5)	6.88 (174.6)	3.62-3.63 (91.9-92.0)	1.25 (104.2)	.75 x .25 (19.1 x 6.4)	**E03**
614 - 814 - AC40 - AC50 - SW75S	19 (483)	8.75 (222.3)	5 (127.0)	7.5 (190.5)	6.88 (174.6)	4.25 (107.9)	1.25 (104.2)	.75 x .25 (19.1 x 6.4) 1 x .38 (25.4 x 9.5)	**E04**
MCS14 - MD414AE2	19 (483)	8.75 (222.3)	5 (127.0)	7.5 (190.5)	6.88 (174.6)	4.25 (107.9)	1.25 (104.2)	1 x .38 (25.4 x 9.5)	**E04**
616 - 816	19 (483)	8.75 (222.3)	5.5 (140.0)	7.5 (190.5)	6.38 (161.9)	4.62-4.63 (117.3-117.4)	1.25 (104.2)	1.25 x .38 (31.8 x 9.5)	**E05**
618 - 818	19 (483)	8.75 (222.3)	6 (152.4)	7.5 (190.5)	5.88 (149.2)	5 (127.0)	1.25 (104.2)	1.25 x .50 (31.8 x 12.7)	**E06**
620	19 (483)	8.75 (222.3)	6.75 (171.5)	7.5 (190.5)	5.13 (130.2)	5.87-5.88 (149.1-149.2)	1.25 (104.2)	1.25 x .50 (31.8 x 12.7)	**E07**
Universal	19 (483)	8.75 (222.3)	11 (279.4)	10 (254.0)	3.38 (85.7)	2.25 NOM (57.1)	—	—	**E08**
SW75 - MD414AE	19 (483)	8.75 (222.3)	5 (127.0)	4.5 (114.3)	3.88 (98.4)	4.25 (107.9)	1.25 (104.2)	1 x .38 (25.4 x 9.5)	**E09**
23" Brake Wheel (584 mm)									
612 - 812 - AC25 - AC30	23 (584)	11.25 (285.8)	5 (127.0)	8.25 (210.0)	8.88 (225.4)	3.62-3.63 (91.9-92.0)	1.25 (104.2)	.75 x .25 (9.5 x 6.4)	**F01**
614 - 814 - AC40 - AC50	23 (584)	11.25 (285.8)	5 (127.0)	8.25 (210.0)	8.88 (225.4)	4.25 (107.9)	1.25 (104.2)	1 x .38 (25.4 x 9.5)	**F02**
616 - 816	23 (584)	11.25 (285.8)	5.5 (140.0)	8.25 (210.0)	8.38 (212.7)	4.62-4.63 (117.3-117.4)	1.25 (104.2)	1.25 x .38 (31.8 x 9.5)	**F03**
618 - 818	23 (584)	11.25 (285.8)	6 (152.4)	8.75 (222.3)	8.38 (212.7)	5 (127.0)	1.25 (104.2)	1.25 x .50 (31.8 x 12.7)	**F04**
620 - 820	23 (584)	11.25 (285.8)	6.75 (171.5)	9.75 (247.7)	8.63 (219.1)	5.87-5.88 (149.1-149.2)	1.25 (104.2)	1.5 x .75 (38.1 x 19.1)	**F05**
622 - 822	23 (584)	11.25 (285.8)	7.25 (184.2)	9.75 (247.7)	8.13 (206.4)	6.25 (158.7)	1.25 (104.2)	1.5 x .75 (38.1 x 19.1)	**F06**
624 - 824	23 (584)	11.25 (285.8)	9.25 (235.0)	9.75 (247.7)	6.13 (155.6)	7 (177.7)	1.25 (104.2)	1.5 x .75 (38.1 x 19.1)	**F07**
Universal	23 (584)	11.25 (285.8)	12.5 (317.5)	11 (279.4)	4.13 (104.8)	2.5 NOM (63.5)	—	—	**F08**
SW150 - MD418AE2 - MCS18	23 (584)	11.25 (285.8)	8 (203.2)	4.75 (120.7)	4.38 (111.1)	5 (127.0)	1.25 (104.2)	1.25 x .63 (31.8 x 15.9)	**F09**
30" Brake Wheel (762 mm)									
616 - 816	30 (762)	14.25 (362.0)	5.5 (140.0)	10.25 (260.4)	11.88 (301.6)	4.62-4.63 (117.3-117.4)	1.25 (104.2)	1.25 x .38 (31.8 x 9.5)	**G01**
618 - 818	30 (762)	14.25 (362.0)	6 (152.4)	10.25 (260.4)	11.38 (288.9)	5 (127.0)	1.25 (104.2)	1.25 x .50 (31.8 x 12.7)	**G02**
620 - 820	30 (762)	14.25 (362.0)	6.75 (171.5)	10.25 (260.4)	10.63 (269.9)	5.87-5.88 (149.1-149.2)	1.25 (104.2)	1.5 x .75 (38.1 x 19.1)	**G03**
622 - 822	30 (762)	14.25 (362.0)	7.25 (184.2)	10.75 (273.1)	10.63 (269.9)	6.24-6.25 (158.5-158.7)	1.25 (104.2)	1.5 x .75 (38.1 x 19.1)	**G04**
624 - 824	30 (762)	14.25 (362.0)	9.25 (235.0)	10.75 (273.1)	8.63 (219.1)	7 (177.7)	1.25 (104.2)	1.5 x .75 (38.1 x 19.1)	**G05**

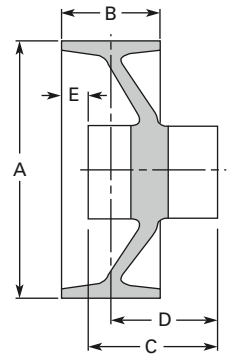
① 400 - 600 - 800 ac motor frames all per AISE specifications. See **Page 12** for dimensional compatibility.

② See dimensional drawing, **Figure 4** on **Page 11**.

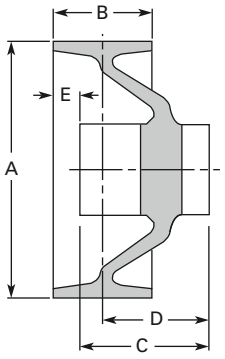
Table 12. Brake Wheels Only Product Selection
Incomplete Catalog Number — add standard wheel Suffix Number from **Table 11** on **Pages 9** and **10**

Wheel Size Inches (mm)	Catalog Number ①	*	
		Standard	Non-standard ②
8 (203) 10 (254) 13 (330) 16 (406) 19 (483)	**GH505JX_ _ _** **GH505KX_ _ _** **GH505LX_ _ _** **GH505MX_ _ _** **GH505NX_ _ _**		
23 (584) 30 (762)	**GH505PX_ _ _** **GH505RX_ _ _**		

① Listed Catalog Numbers are incomplete. Add Wheel Suffix Number from **Table 11** on **Pages 9** and **10**.
② For non-standard wheels, see ordering information at right.



13", 16", 23" and 30" Wheels



8", 10" and 19" Wheels

DRAWING KEY:
A= Wheel Diameter
B= Wheel Face
C= Hub Length
D = Offset
E= Inset

Figure 4. Brake Wheel Dimensions

Table 13. Brake Wheel Dimensions

Approximate Dimensions in Inches (mm)										Estimated Shipping Weight Lbs. (kg)
A	B	C Maximum	D		E		Minimum Bore		Maximum Bore	
			Minimum	Maximum	Minimum	Maximum	Tapered	Straight		
8 (203)	3.25 (83)	6.88 (175)	2.63 (67)	5.25 (133)	0	2.88 (73)	1.0 (25)	.88 (22)	2.63 (67)	25 (11)
10 (254)	3.75 (95)	7.75 (197)	3.5 (89)	6.25 (159)	.38 (10)	3.63 (92)	1.0 (25)	1.0 (25)	3.0 (76)	40 (18)
13 (330)	5.75 (146)	8.0 (203)	3.25 (83)	6.0 (152)	.88 (22)	4.38 (111)	1.0 (25)	1.0 (25)	4.25 (108)	90 (41)
16 (406)	6.75 (171)	7.25 (184)	3.63 (92)	7.25 (184)	2.25 (57)	5.5 (140)	1.0 (25)	1.0 (25)	4.25 (108)	135 (61)
19 (483)	8.75 (222)	11.0 (279)	5.38 (137)	10.0 (254)	3.38 (86)	7.25 (184)	3.0 (76)	2.37 (60)	5.5 (140)	215 (98)
23 (584)	11.25 (286)	12.5 (318)	5.38 (137)	11.0 (279)	4.25 (108)	9.38 (238)	3.0 (76)	2.88 (73)	6.38 (162)	350 (159)
30 (762)	14.25 (362)	18.0 (457)	5.88 (149)	12.75 (324)	0	13.5 (343)	5.0 (127)	4.5 (114)	7.0 (178)	1100 (499)

Note: 1/2 B + D Must Equal C + E.

Non-standard Wheels

Special wheels are available and are machined from ductile iron castings only. For wheels constructed of some other material consult factory. Supply complete dimensions — they must fall within the parameters shown in **Table 13**.

Order as GH505_ _ - Special

Insert two letter Wheel Size Suffix from **Table 10** on **Page 8**.

Wheel with Lockwasher Slot — Supply Complete Description of Slot and Wheel

To order insert letter **L** into the 8th position of Catalog Number and leave the 9th and 10th positions blank. Example: GH505JX**L**.

Table 14. Wheels with Lockwasher Slot

Adder			
Wheel Size Inches (mm)	*	Wheel Size Inches (mm)	*
8 (203) 10 (254) 13 (330) 16 (406)		19 (483) 23 (584) 30 (762) —	

Discount Symbol **18CD-2**
* Consult Sales Office for Pricing

Table 15. Brake Compatibility with 400, 600 and 800 Frame Mill Motors — Inches (mm)

Brake Size Wheel Diameter	Wheel Rim Width C	Motor Frame Size	Height Difference A	1st Hole to Brake Centerline Z	Hub Length D	Hub Extension E	Key Width F	Bore Diameter G
8 (203)	3.25 (83)	402	—	8.25 (210)	3.0 (76)	2.38 (60)	.5 (12.7)	1.75 (44)
		403	—	9.0 (229)	3.0 (76)	2.38 (60)	.5 (12.7)	2.0 (51)
		602	—	8.25 (210)	3.5 (89)	2.38 (60)	.5 (12.7)	1.75 (44)
		802A	.63 (16)	8.25 (210)	3.0 (76)	2.38 (60)	.5 (12.7)	1.75 (44)
		802B	.63 (16)	8.25 (210)	3.0 (76)	2.38 (60)	.5 (12.7)	1.75 (44)
10 (254)	3.75 (95)	404	—	9.75 (248)	3.5 (89)	2.38 (60)	.5 (12.7)	2.0 (51)
		406	—	9.75 (248)	4.0 (102)	2.38 (60)	.5 (12.7)	2.5 (64)
		603	—	9.25 (235)	3.5 (89)	2.38 (60)	.5 (12.7)	2.0 (51)
		604	—	9.75 (248)	3.5 (89)	2.38 (60)	.5 (12.7)	2.0 (51)
		802C	-.75 (-19)	8.50 (216)	3.0 (76)	2.38 (60)	.5 (12.7)	1.75 (44)
		803	.13 (3.2)	9.25 (235)	3.5 (89)	2.38 (60)	.5 (12.7)	2.0 (51)
13 (330)	5.75 (146)	408	—	11.0 (280)	4.5 (114)	2.50 (64)	.75 (19)	3.0 (76)
		410	—	11.63 (295)	4.5 (114)	2.50 (64)	.75 (19)	3.25 (83)
		606	—	10.50 (267)	4.0 (102)	2.13 (54)	.50 (12.7)	2.5 (64)
		608	—	11.0 (280)	4.5 (114)	2.50 (64)	.75 (19)	3.0 (76)
		804	-.88 (-22.2)	10.50 (267)	3.5 (89)	2.13 (54)	.50 (12.7)	2.0 (51)
		806	.13 (3.2)	10.50 (267)	4.0 (102)	2.50 (64)	.50 (12.7)	2.5 (64)
16 (406)	6.75 (171)	412	—	13.25 (337)	5.0 (127)	3.13 (79)	.75 (19)	3.63 (92)
		610	—	12.75 (324)	4.5 (114)	3.13 (79)	.75 (19)	3.25 (83)
		808	-.88 (-22.2)	12.13 (308)	4.5 (114)	3.13 (79)	.75 (19)	3.0 (76)
19 (483)	8.75 (222)	414	—	15.25 (387)	5.0 (127)	3.13 (79)	1.0 (25.4)	4.25 (108)
		416	—	16.50 (419)	5.5 (140)	3.13 (79)	1.25 (32)	4.63 (117)
		612	—	14.25 (362)	5.0 (127)	3.13 (79)	.75 (19)	3.63 (92)
		614	-1.0 (-25.4)	15.25 (387)	5.0 (127)	3.13 (79)	1.0 (25.4)	4.25 (108)
		810	.13 (3.2)	13.25 (337)	4.5 (114)	2.63 (67)	.75 (19)	3.25 (83)
		812		14.25 (362)	5.0 (127)	3.13 (79)	.75 (19)	3.63 (92)
23 (584)	11.25 (286)	418	—	17.25 (438)	5.5 (140)	3.13 (79)	1.25 (32)	5.0 (127)
		616	—	17.25 (438)	6.0 (152)	2.63 (67)	1.25 (32)	4.63 (117)
		618	—	17.25 (438)	6.0 (152)	3.13 (79)	1.25 (32)	5.0 (127)
		814	-1.13 (-29)	15.50 (394)	5.0 (127)	2.13 (54)	1.0 (25.4)	4.25 (108)
		816	.13 (3.2)	17.25 (438)	5.5 (140)	2.63 (67)	1.25 (32)	4.63 (117)

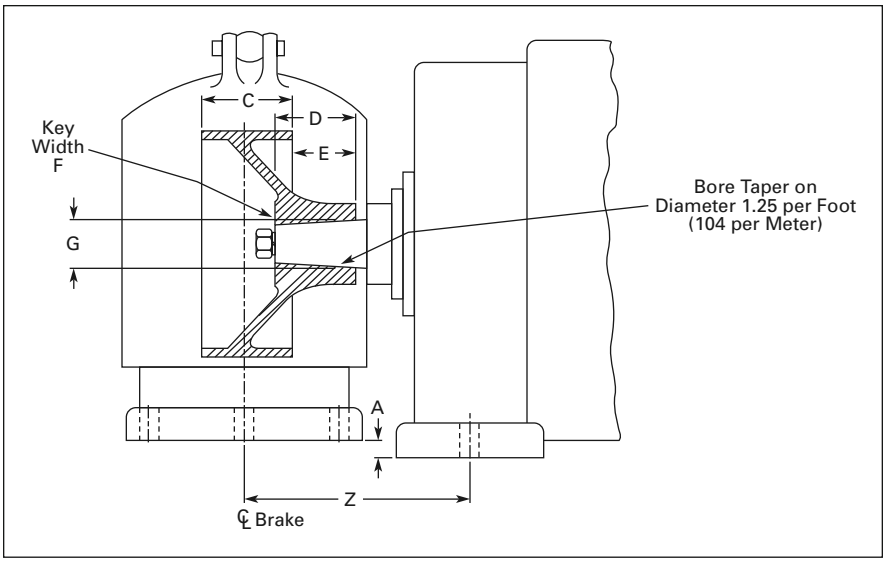
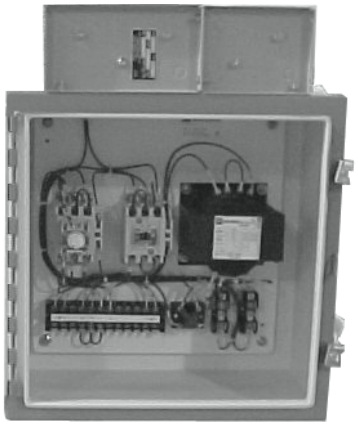


Figure 5. "Z" Dimension Drawing Reference

Note: Per AISE Standard No. 11 and NEMA 2-220, horizontal and vertical mounting tolerances shall be ± .063 inch (1.59 mm).



Rectifier Panel for ac Operation of Brake

Rectifier Panels

The universal brake rectifier panel is designed for application on Type GH505 brakes. It is sized to handle up to four 8 or 10 inch brakes, two 13 or 16 inch brakes, or one 19 or 23 inch brake. Resistor components are provided for any of these brake combinations. A brake coil protective circuit included in the design allows continuous duty brakes to be applied at intermittent duty torque ratings.

Specifications

- Input Voltage:
  - 230 V or 460 Vac 3-Phase, 60 Hz
- Output Voltage:
  - 208 Vdc
- Economized Voltage:
  - Approximately 30 Vdc
- Maximum Number of Brakes:
  - 4 – 8" or 10"
  - 2 – 13" or 16"
  - 1 – 19" and above
- Operation:
  - DC rectifier with forcing circuit
  - Full voltage applied to coil for pick-up, economized voltage applied for holding
- Enclosures:
  - NEMA 1/NEMA 3R and NEMA 4 with resistor penthouse

Table 16. Rectifier Panel Selection Table — Wall Mounted

Brake Size Inches (mm)	Maximum Quantity Brakes ①	NEMA 12 Enclosure			
		460 V Input	*	230 V Input	*
8 or 10 (203 or 254)	1 2 4	**GH515ED17-1** **GH515ED17-2** **GH515ED17-3**		**GH515ED20-1** **GH515ED20-2** **GH515ED20-3**	
13 or 16 (330 or 406)	1 2	**GH515ED17-4** **GH515ED17-5**		**GH515ED20-4** **GH515ED20-5**	
19 or 23 (483 or 584)	1	**GH515ED17-6**		**GH515ED20-6**	
30 (762)	1	**GH515ED17-7**		**GH515ED20-7**	

① All brakes must be used on the same motion or motor drive.

Table 17. Shunt Brake Coil Data for Brakes Used with GH515 Rectifier Panels

Size	Coil Part No.	Coil Ohms 20°C	Torque lb.-ft.	Coil Voltage	Series Ohms	Release Amps	Set Amps	Release Time Secs.	Set Time Secs.	Max. Coil Watts	Coil Suffix No.
8	9-872-18	44.4	100	29	350	4.69	.19	.22	.15	310	**2164**
10	9-871-7	44.6	200	29	350	4.67	.28	.25	.20	385	**2264**
13	9-875-7	29.1	550	30	225	7.15	.49	.30	.22	550	**2364**
16	9-890-1	24.5	1000	27	225	8.48	.50	.40	.25	710	**2464**
19	9-888-3	9.34	2000	23	100	22.30	1.36	.45	.30	1025	**2564**
23	9-889-1	11.0	4000	26	100	18.90	1.21	.50	.32	1400	**2664**

Dimensions..... **Page 14**
Discount Symbol..... **18CD-2**

* Consult Sales Office for Pricing

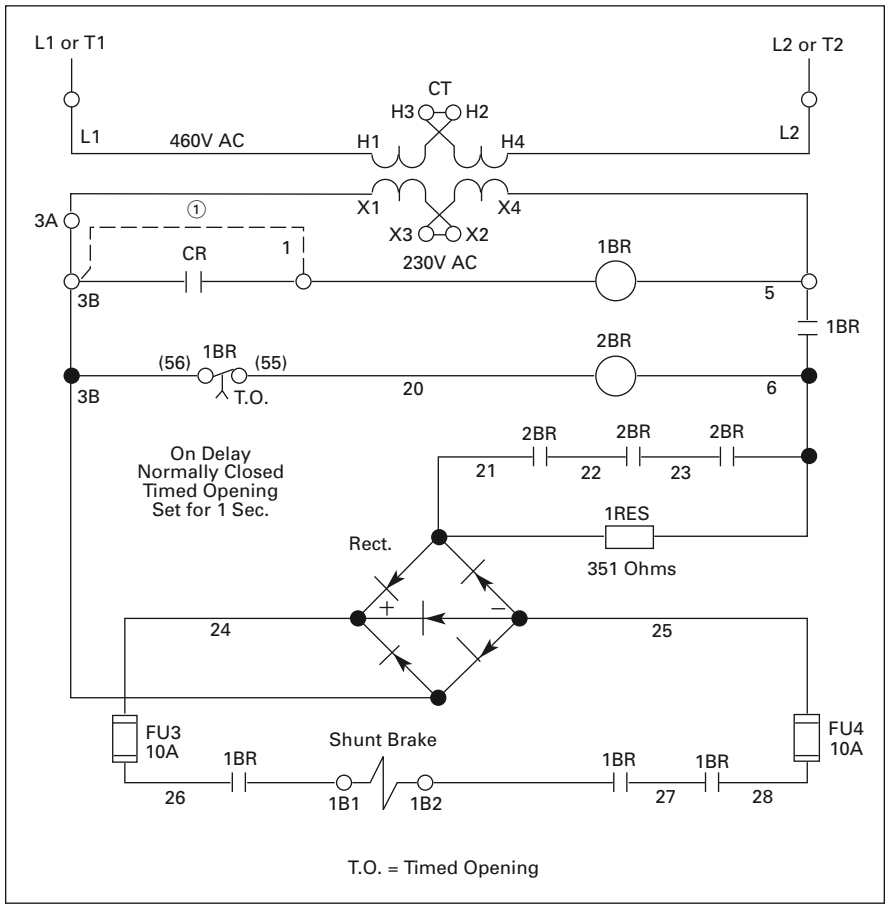


Figure 6. Elementary Diagram

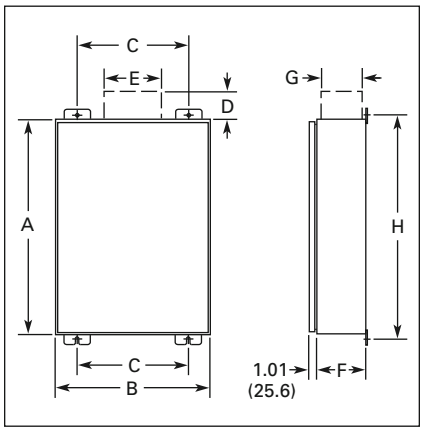


Figure 7. Approximate Dimensions

① Connect per dotted line if CR is omitted (T1 and T2 to motor terminals) (CR contact is mounted on motor controller).

Table 18. Approximate Dimensions and Shipping Weights

Brake Rectifier Panel Number	Dimensions in Inches (mm)								Ship. Wt. Lbs. (kg)
	A	B	C	D	E	F	G	H	
GH515ED17-1	20.00 (508)	20.00 (508)	14.00 (356)	9.00 (228)	14.00 (356)	10.00 (254)	10.00 (254)	21.25 (540)	130 (59)
GH515ED20-1	20.00 (508)	20.00 (508)	14.00 (356)	9.00 (228)	14.00 (356)	10.00 (254)	10.00 (254)	21.25 (540)	130 (59)
GH515ED17-2	20.00 (508)	20.00 (508)	14.00 (356)	5.00 (127)	14.00 (356)	10.00 (254)	10.00 (254)	21.25 (540)	130 (59)
GH515ED20-2	20.00 (508)	20.00 (508)	14.00 (356)	5.00 (127)	14.00 (356)	10.00 (254)	10.00 (254)	21.25 (540)	130 (59)
GH515ED17-3	20.00 (508)	20.00 (508)	14.00 (356)	5.00 (127)	14.00 (356)	10.00 (254)	10.00 (254)	21.25 (540)	130 (59)
GH515ED20-3	20.00 (508)	20.00 (508)	14.00 (356)	5.00 (127)	14.00 (356)	10.00 (254)	10.00 (254)	21.25 (540)	130 (59)
GH515ED17-4	20.00 (508)	20.00 (508)	14.00 (356)	5.00 (127)	14.00 (356)	10.00 (254)	10.00 (254)	21.25 (540)	130 (59)
GH515ED20-4	20.00 (508)	20.00 (508)	14.00 (356)	5.00 (127)	14.00 (356)	10.00 (254)	10.00 (254)	21.25 (540)	130 (59)
GH515ED17-5	20.00 (508)	20.00 (508)	14.00 (356)	9.00 (228)	14.00 (356)	10.00 (254)	10.00 (254)	21.25 (540)	130 (59)
GH515ED20-5	20.00 (508)	20.00 (508)	14.00 (356)	9.00 (228)	14.00 (356)	10.00 (254)	10.00 (254)	21.25 (540)	130 (59)
GH505ED17-6	20.00 (508)	20.00 (508)	14.00 (356)	5.00 (127)	14.00 (356)	10.00 (254)	10.00 (254)	21.25 (540)	130 (59)
GH515ED20-6	20.00 (508)	20.00 (508)	14.00 (356)	5.00 (127)	14.00 (356)	10.00 (254)	10.00 (254)	21.25 (540)	130 (59)

Renewal Parts

Table 19. Replacement Brake Shoes and Linings Selection Chart

Description	Brake Size						
	8 Inch	10 Inch	13 Inch	16 Inch	19 Inch	23 Inch	30 Inch
	Part Number	Part Number	Part Number	Part Number	Part Number	Part Number	Part Number
Shoe Lining ①	**48-1818**	**48-1818-2**	**48-1818-3**	**48-1818-4**	**48-1818-5**	**48-1818-6**	**48-1278-3**
Shoe with Bonded Lining ①	**48-1267-4**	**48-1268-4**	**48-603-7**	**48-554-7**	**48-1971**	—	—
Shoe with Riveted Lining ①	**48-1462-3**	**48-1463-3**	**48-603-8**	**48-554-8**	—	**48-633-4**	**48-1277-2**
Rivet (Quantity) ②	**13-4762** (8)	**13-4762** (8)	**13-4762** (12)	**13-4762** (18)	—	**13-4762** (30)	—

① Quantity 2 required for each brake.
② Quantity listed is per shoe.

Note: For prices, refer to Eaton's parts distributor or consult factory.

Table 20. Cross-Reference to New Coils

Old Part Number	Brake Size	Catalog Suffix Number	Replacement Part Number
9-827-1	16	**1402**	**9-884-1**
9-827-2	16	**1401**	**9-884-10**
9-827-3	16	**1405**	**9-884-5**
9-827-4	16	—	**9-884-4**
9-827-6	16	**1400**	**9-884-11**
9-827-7	16	**1404**	**9-884-9**
9-827-9	16	**1404**	**9-884-9**
9-827-10	16	—	**9-884-4**
9-827-11	16	—	**9-884-3**
9-840-1	13	**1302**	**9-883-10**
9-840-2	13	**1305**	**9-883-6**
9-840-3	13	**1302**	**9-883-10**
9-840-4	13	**1301**	**9-883-7**
9-840-5	13	**1304**	**9-883-2**
9-840-6	13	—	**9-883-4**
9-840-7	13	**1303**	**9-883-1**
9-841-1	19	**1507**	**9-885-25**
9-841-2	19	**1512**	**9-885-6**
9-841-3	19	—	**9-885-19**
9-841-4	19	**1503**	**9-885-17**
9-841-5	19	**1507**	**9-885-27**
9-841-6	19	**1503**	**9-885-17**
9-841-8	19	**1505**	**9-885-16**
9-841-9	19	**1504**	**9-885-24**
9-841-10	19	—	**9-885-21**
9-841-11	19	**1511**	**9-885-18**
9-841-12	19	**1508**	**9-885-8**
9-841-13	19	—	**9-885-10**
9-841-14	19	**1501**	**9-885-23**
9-841-15	19	**1501**	**9-885-23**
9-841-16	19	**1502**	**9-885-20**
9-844-2	10	**1210**	**9-2628-3**
9-844-3	10	**1207**	**9-2628-1**
9-844-4	10	**1208**	**9-2628-2**
9-845-1	23	**1604**	**9-886-5**
9-845-2	23	**1605**	**9-886-8**
9-845-3	23	—	**9-886-14**
9-845-4	23	**1601**	**9-886-10**
9-845-5	23	—	**9-886-13**
9-845-6	23	—	**9-886-14**
9-845-7	23	—	**9-886-13**
9-845-9	23	**1602**	**9-886-1**
9-845-10	23	**1603**	**9-886-4**
9-845-11	23	—	**9-886-13**
9-845-12	23	**1602**	**9-886-1**
9-845-13	23	**1601**	**9-886-10**
9-847-1	8	**2163**	**9-872-11**
9-847-2	8	**2164**	**9-872-18**
9-847-3	8	—	**9-872-12**
9-847-4	8	**1108**	**9-872-4**
9-847-5	8	**1111**	**9-872-7**
9-847-6	8	—	**9-872-16**
9-847-7	8	—	**9-872-1**
9-847-8	8	**1102**	**9-872-10**
9-847-9	8	**1112**	**9-872-8**
9-847-10	8	**1107**	**9-872-3**
9-847-11	8	—	**9-872-12**
9-847-12	8	**1113**	**9-872-13**
9-847-13	8	—	**9-872-21**
9-847-14	8	—	**9-872-14**
9-847-15	8	—	**9-872-22**
9-847-17	8	—	**9-872-1**

Old Part Number	Brake Size	Catalog Suffix Number	Replacement Part Number
9-864-1	10	**2263**	**9-871-8**
9-864-2	10	**2264**	**9-871-7**
9-864-3	10	**1204**	**9-871-4**
9-864-4	10	**1205**	**9-871-5**
9-864-6	10	—	**9-871-1**
9-864-7	10	—	**9-871-9**
9-864-8	10	**1203**	**9-871-3**
9-864-9	10	**1202**	**9-871-2**
9-864-10	10	—	**9-871-12**
9-864-11	10	—	**9-871-14**
9-864-12	10	—	**9-871-13**
9-864-13	10	—	**9-871-15**
9-865-1	13	**2363**	**9-875-12**
9-865-2	13	**2364**	**9-875-7**
9-865-4	13	—	**9-875-9**
9-865-5	13	—	**9-875-15**
9-865-6	13	**1308**	**9-875-1**
9-865-7	13	**1309**	**9-875-2**
9-865-8	13	**1308**	**9-875-1**
9-865-9	13	—	**9-875-4**
9-865-10	13	**1307**	**9-875-8**
9-865-12	13	—	**9-875-17**
9-865-13	13	—	**9-875-18**
9-865-14	13	—	**9-875-16**
9-865-16	13	—	**9-875-19**
9-865-17	13	—	**9-875-14**
9-866-1	16	**2463**	**9-890-2**
9-866-2	16	**2464**	**9-890-1**
9-866-3	16	—	**9-890-3**
9-867-1	19	**2563**	**9-888-1**
9-867-2	19	—	**9-888-3**
9-867-3	19	—	**9-888-2**
9-867-6	19	**2564**	**9-888-3**
9-868-1	23	**2663**	**9-889-5**
9-868-2	23	**2664**	**9-889-1**
9-868-3	23	—	**9-889-2**
9-868-4	23	—	**9-889-4**
9-882-1	8	**1114**	**9-872-20**
9-885-15	19	**1506**	**9-885-25**
9-1641-1	30	**1704**	**9-1641-8**
9-1641-2	30	**1705**	**9-1641-7**
9-1641-3	30	**1706**	**9-1641-6**
9-1641-4	30	**1703**	**9-1641-9**
9-1641-5	30	**1702**	**9-1641-10**
9-1955-1	10	**1240**	**9-2628-3**
9-1956-2	13	**1301**	**9-883-7**
9-1960-1	23	**1604**	**9-886-5**
9-1960-2	23	**1605**	**9-886-8**
9-1961-1	30	**1704**	**9-1641-8**
9-1961-2	30	**1705**	**9-1641-7**
9-1961-3	30	**1706**	**9-1641-6**
9-1964-1	8	**2163**	**9-872-11**
9-1964-2	8	**2164**	**9-872-18**
9-1967-1	10	**2263**	**9-871-8**
9-1967-2	10	**2264**	**9-871-7**
9-1969-1	13	**2363**	**9-875-12**
9-1969-2	13	**2364**	**9-875-7**
9-1971-1	16	**1402**	**9-884-1**
9-1971-2	16	**1401**	**9-884-10**
9-1973-1	19	**1505**	**9-885-16**
9-1973-2	19	**1503**	**9-885-17**

Sample Product Specification

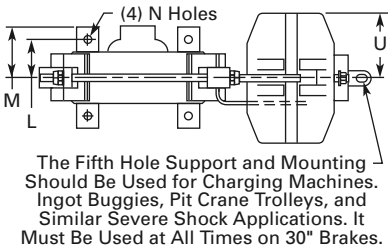
Magnetic brakes shall be heavy-duty, mill type, with mounting dimensions, wheel diameter, and torque ratings in accordance with AISE Standard No. 11 and NEMA Standards, Section ICS 2-220.21.

Brakes shall be spring set and electrically released, by means of a dc coil, encapsulated in a weather-resistant housing. Major brake structural parts (except 30" size) shall be ductile iron or steel castings. Brake shoes shall be fitted with either bonded or riveted non-asbestos linings. There shall be provisions for a simple check for lining wear and easy adjustment means. Torque shall be easily adjustable over a 2:1 torque range.

Brakes used with an ac power system will be provided with a separate brake rectifier panel designed to match the brake coil requirements.

Dimensions

Open Type



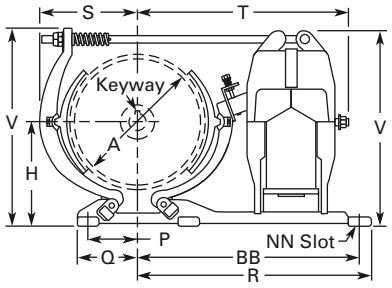


Figure 8. Brake Dimensions

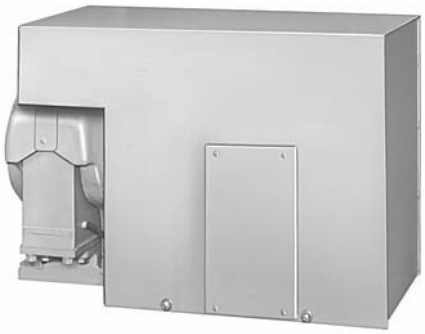
Table 21. Approximate Dimensions in Inches (mm) and Shipping Weights — GH505 Brakes — Open Type

A	BB	H	L	M	N	NN	P	Q	R	S	T	U	V	Ship. Wt. ① Lbs. (kg)
8 (203)	16.0 (406)	7.0 (178)	2.88 (73)	3.69 (94)	.69 (17)	.75 x .88 (19 x 22)	3.25 (83)	3.88 (98)	16.81 (427)	6.5 (165)	15.38 (391)	5.0 (127)	13.63 (346)	153 (69)
10 (254)	17.63 (448)	8.38 (213)	3.13 (79)	3.94 (100)	.69 (17)	.75 x .875 (19 x 22)	4.0 (102)	4.88 (124)	18.44 (468)	8.0 (203)	17.0 (432)	5.63 (143)	15.75 (400)	223 (101)
13 (330)	20.31 (516)	9.88 (251)	4.5 (114)	5.5 (140)	.81 (21)	.88 x 1.0 (22 x 25)	5.75 (146)	6.75 (171)	21.25 (540)	9.88 (251)	19.88 (505)	6.75 (171)	19 (483)	420 (191)
16 (406)	22.63 (575)	12.13 (308)	5.38 (137)	6.5 (165)	1.06 (27)	1.13 x 1.38 (29 x 35)	7.5 (191)	8.75 (222)	23.88 (606)	12.25 (311)	21.88 (556)	7.75 (197)	22.75 (578)	565 (257)
19 (483)	26.38 (670)	13.25 (337)	6.5 (165)	7.88 (200)	1.06 (27)	1.13 x 1.38 (29 x 35)	9.25 (235)	10.63 (270)	27.63 (702)	14.5 (368)	26.5 (673)	9.25 (235)	25.63 (651)	1005 (456)
23 (584)	30.25 (768)	15.88 (403)	8.0 (203)	9.5 (241)	1.31 (33)	1.38 x 1.63 (35 x 41)	11.75 (298)	13.25 (337)	31.75 (806)	18.13 (460)	30.38 (772)	10.5 (267)	30.38 (772)	1480 (672)
30 (762)	42.5 (1080)	20.75 (527)	9.5 (241)	11.25 (286)	1.56 (40)	1.56 x 1.56 (40 x 40)	15.0 (381)	17.0 (432)	44.5 (1130)	24.25 (616)	42.63 (1083)	10.75 (273)	40.38 (1026)	3000 (1362)

① Does not include wheel.

Brake Wheel Dimensions. . . . . **Page 11**

Weather-Resistant Enclosure



Brake shown set up for right-hand mounting. More apparent if facing plate were removed.

Note: See Enclosures on **Page 7** for definition of right-hand or left-hand mounting.

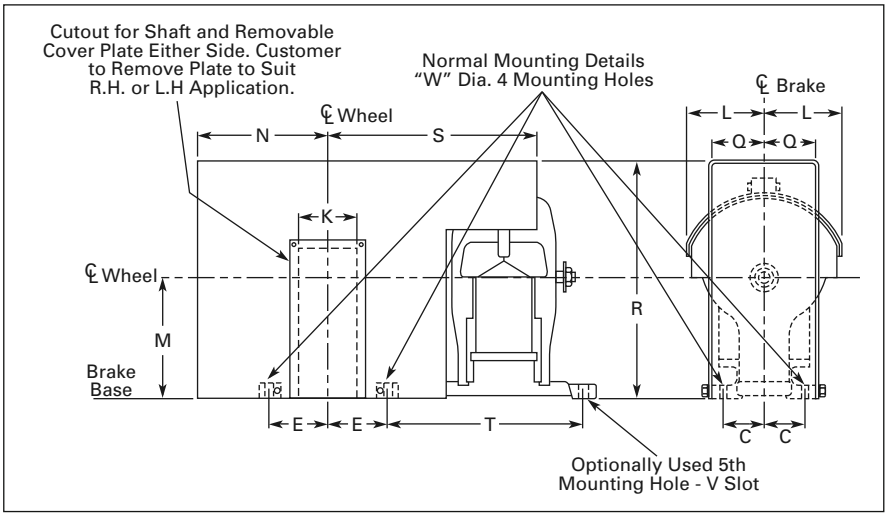
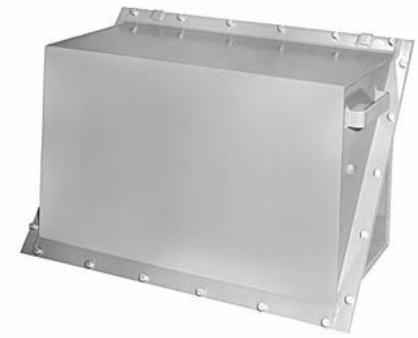


Figure 9. Weather-Resistant Enclosure Dimensions

Table 22. GH505 Magnetic Weather-Resistant Enclosure Dimensions in Inches (mm)

Brake Size Inches (mm)	Approximate Dimensions in Inches (mm)										
	C	E	K	L	M	N	Q	R	S	T	W
8 (203)	2.88 (73)	3.25 (83)	4.5 (114)	5.0 (127)	7.0 (178)	7.68 (195)	3.68 (93)	16.38 (416)	16.8 (427)	16.00 (406)	.69 (18)
10 (254)	3.12 (79)	4.0 (102)	5.25 (133)	5.6 (142)	8.38 (213)	9.18 (233)	3.94 (100)	18.62 (473)	18.4 (467)	17.62 (448)	.69 (18)
13 (330)	4.5 (114)	5.75 (146)	7.5 (191)	6.8 (173)	9.88 (251)	11.12 (282)	5.5 (140)	22.7 (577)	21.4 (544)	20.31 (516)	.81 (21)
16 (406)	5.38 (137)	7.5 (191)	7.5 (191)	7.8 (198)	12.13 (308)	13.5 (343)	6.5 (165)	26.5 (673)	24.0 (610)	22.62 (575)	1.06 (27)
19 (483)	6.5 (165)	9.25 (235)	9.0 (229)	9.3 (236)	13.25 (337)	15.75 (400)	7.9 (201)	29.3 (744)	27.6 (701)	26.37 (670)	1.06 (27)

NEMA 4 Enclosure



Brake shown set up for right-hand mounting. More apparent if facing plate were removed.

Note: See Enclosures on **Page 7** for definition of right-hand or left-hand mounting.

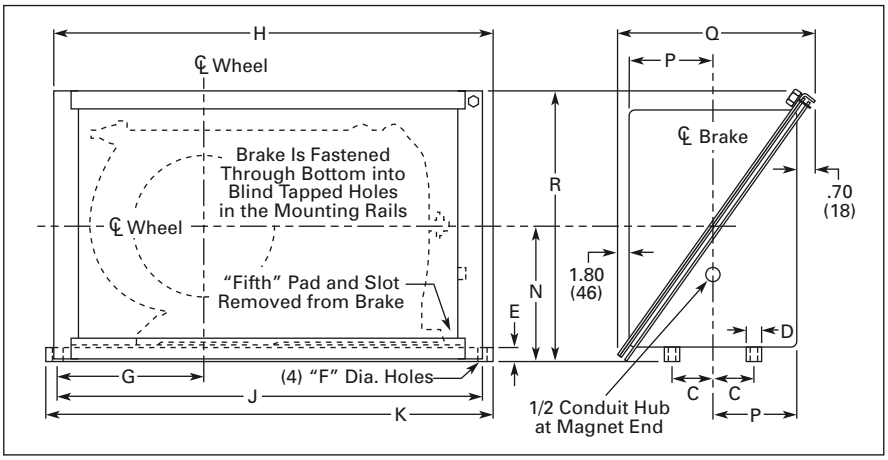


Figure 10. NEMA 4 Enclosure Dimensions in Inches (mm)

Table 23. GH505 Magnetic NEMA 4 Enclosure Dimensions in Inches (mm)

Brake Size Inches (mm	Approximate Dimensions in Inches (mm)											
	C	D	E	F	G	H	J	K	N	P	Q	R
8 (203)	2.88 (73)	1.5 (38)	1.5 (38)	.69 (18)	9.0 (229)	26.9 (683)	28.0 (711)	30.0 (762)	8.68 (220)	5.68 (144)	14.2 (361)	20.2 (513)
10 (254)	3.12 (79)	1.5 (38)	1.5 (38)	.69 (18)	10.62 (270)	29.9 (759)	31.0 (787)	33.0 (838)	10.06 (256)	6.32 (161)	15.3 (389)	22.7 (577)
13 (330)	4.5 (114)	1.5 (38)	1.5 (38)	.81 (21)	13.0 (330)	36.0 (914)	37.5 (953)	39.5 (1003)	11.56 (294)	7.44 (189)	18.0 (457)	26.2 (665)
16 (406)	5.38 (137)	3.0 (76)	2.0 (51)	1.06 (27)	15.62 (397)	40.5 (1029)	42.5 (1080)	45.0 (1143)	14.32 (364)	8.44 (214)	20.4 (518)	30.7 (780)
19 (483)	6.5 (165)	3.0 (76)	2.0 (51)	1.06 (27)	17.62 (448)	46.9 (1191)	49.0 (1245)	51.5 (1308)	15.44 (392)	9.94 (252)	23.0 (584)	34.0 (864)

Circuit Diagrams

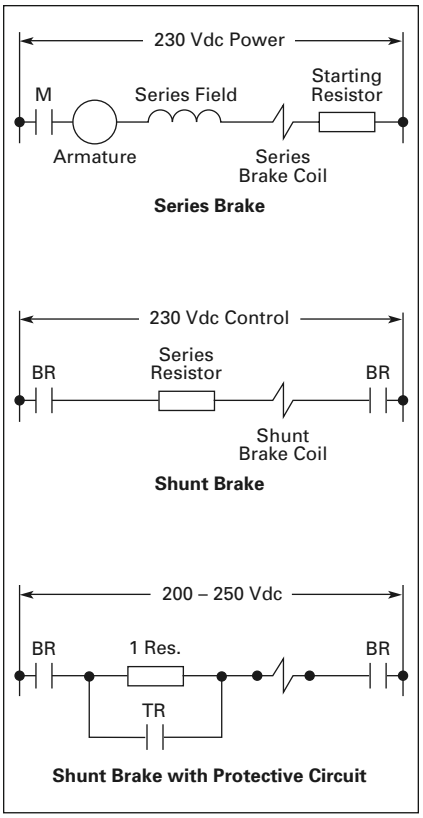


Figure 11. Elementary Diagrams for Standard Brake Circuits

Catalog Number Selection

Table 24. Brake Catalog Numbering System

GH505 A A A 1107 A01

Base Catalog Number
GH505 = Magnetic

Brake Size			
A	= 8"	**E**	= 19"
B	= 10"	**F**	= 23"
C	= 13"	**G**	= 30"
D	= 16"		

Mechanical Options	
A	= No mechanical options
B	= Riveted linings (standard on 19" and 23" brakes)
C	= Manual release (lever type)
D	= Maintained manual release (screw type)
N	= Industrial torque rating (see **Page 7**)
S	= Special, modified per customer application

Enclosure Options	
A	= Open type
C	= Weather-resistant
D	= NEMA 4 L.H. w/o shaft seal
E	= NEMA 4 R.H. w/o shaft seal
S	= NEMA 4 w/shaft seal (consult factory)

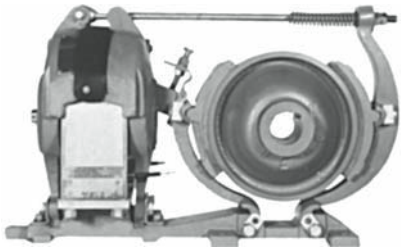
Coil Suffix
See **Pages 20 – 21**.

Wheel Suffix		
N	=	No Wheel
_ _ _ _	=	Select Wheel Suffix Code from **Table 11**.

Product Selection

When Ordering Specify

- Base Catalog Number of standard brake from table below. Add coil and brake wheel suffixes from appropriate tables on **Pages 9**, **10**, **20** and **21**.
- For special mechanical, enclosure, coil or wheel modifications, see Optional Feature listing on **Page 7**. Change the completed Catalog Number of the standard brake to describe the feature required.
- If required modification is not listed, order standard brake and supply complete description of change(s).
- Rectifier panels for brake operation from an ac power supply are listed on **Page 13**.



GH505 Magnetic Shoe Brake

Table 25. GH505 Magnetic Brakes — Add Coil and Wheel Suffix Numbers

Brake Size inches (mm)	Wheel	Open Type		Weather Resistant	
		Catalog Number ①	* ②③	Catalog Number ①	* ②③
8 (203)	w/ Wheel w/o Wheel	**GH505AAA_ _ _ _ _ _** **GH505AAA_ _ _ _N**		**GH505AAC_ _ _ _ _ _** **GH505AAC_ _ _ _N**	
10 (254)	w/ Wheel w/o Wheel	**GH505BAA_ _ _ _ _ _** **GH505BAA_ _ _ _N**		**GH505BAC_ _ _ _ _ _** **GH505BAC_ _ _ _N**	
13 (330)	w/ Wheel w/o Wheel	**GH505CAA_ _ _ _ _ _** **GH505CAA_ _ _ _N**		**GH505CAC_ _ _ _ _ _** **GH505CAC_ _ _ _N**	
16 (406)	w/ Wheel w/o Wheel	**GH505DAA_ _ _ _ _ _** **GH505DAA_ _ _ _N**		**GH505DAC_ _ _ _ _ _** **GH505DAC_ _ _ _N**	
19 (483)	w/ Wheel w/o Wheel	**GH505EAA_ _ _ _ _ _** **GH505EAA_ _ _ _N**		**GH505EAC_ _ _ _ _ _** **GH505EAC_ _ _ _N**	
23 (584)	w/ Wheel w/o Wheel	**GH505FAA_ _ _ _ _ _** **GH505FAA_ _ _ _N**		**GH505FAC_ _ _ _ _ _** **GH505FAC_ _ _ _N**	
30 (762)	w/ Wheel w/o Wheel	**GH505GAA_ _ _ _ _ _** **GH505GAA_ _ _ _N**		**GH505GAC_ _ _ _ _ _** **GH505GAC_ _ _ _N**	

① Listed Catalog Numbers are incomplete. Add Coil Suffix Number from **Pages 20**, **21** and Wheel Suffix Number (if required) from **Pages 9** and **10**.
② Prices shown for brakes with wheel include standard wheels only. These are identified in the Brake Wheel Selection Tables on **Pages 9** and **10**. See **Page 11** for non-standard wheel prices.
③ Prices listed do NOT include separate required series for shunt coils. For price addition, refer to **Table 30** on **Page 21**.

Table 26. NEMA 4 GH505 Magnetic Brakes — Add Coil Suffix

Brake Size inches (mm)	Wheel	NEMA 4 Watertight & Dust-Tight ⑥		
		Left Hand w/o Shaft Seal ⑦	Right Hand w/o Shaft Seal ⑦	* ④
		Catalog Number ⑤	Catalog Number ⑤	
8 (203)	w/ Wheel w/o Wheel	— **GH505AAD_ _ _ _N**	— **GH505AAE_ _ _ _N**	—
10 (254)	w/ Wheel w/o Wheel	— **GH505BAD_ _ _ _N**	— **GH505BAE_ _ _ _N**	—
13 (330)	w/ Wheel w/o Wheel	— **GH505CAD_ _ _ _N**	— **GH505CAE_ _ _ _N**	—
16 (406)	w/ Wheel w/o Wheel	— **GH505DAD_ _ _ _N**	— **GH505DAE_ _ _ _N**	—
19 (483)	w/ Wheel w/o Wheel	— **GH505EAD_ _ _ _N**	— **GH505EAE_ _ _ _N**	—
23 (584)	w/ Wheel w/o Wheel	— **GH505FAD_ _ _ _N**	— **GH505FAE_ _ _ _N**	—
30 (762)	w/ Wheel w/o Wheel	— **GH505GAD_ _ _ _N**	— **GH505GAE_ _ _ _N**	

④ Prices listed do NOT include separate required series for shunt coils. For price addition, refer to **Table 30** on **Page 21**.
⑤ Listed Catalog Numbers are incomplete. Add Coil Suffix Number from **Pages 20**, **21**.
⑥ For NEMA 4 enclosure with shaft seal, see ordering instructions under Options, **Page 7**. NEMA 4 enclosed brakes normally require special wheel.
⑦ See **Figure 3** on **Page 7** for illustration of Left and Right Hand enclosures. Enclosure must be mounted against end bell of motor — no gasket is supplied. Specify diameter of shaft at point it enters enclosure. Enclosure will be drilled to fit motor when requested — bolt hole configuration must be supplied.

Table 27. Industrial Torque Rating Brakes — Add Coil Suffix

Brake Size Inches (mm)	Open Type	
	Catalog Number ⑧⑨	*
8 (203)	**GH505ANA_ _ _ _N**	
10 (254)	**GH505BNA_ _ _ _N**	
13 (330)	**GH505CNA_ _ _ _N**	
16 (406)	**GH505DNA_ _ _ _N**	
19 (483)	**GH505ENA_ _ _ _N**	
23 (584)	**GH505FNA_ _ _ _N**	

⑧ Order brake wheels separately from **Page 11**.
⑨ Incomplete Catalog Number — add Shunt Coil Suffix Number from **Table 30** on **Page 21**.

Coil Selection **Pages 20, 21**
Brake Wheel Selection . . . . . **Pages 9, 10**
Discount Symbol **18CD-2**

* Consult Sales Office for Pricing

Coil Selection

If series wound dc mill motors are being used at their full nameplate current rating, Standard coils may be chosen from **Table 28**. If not, use **Table 29**.

Table 28. GH505 Series Coil Selection Chart — Standard Mill Motors

Frame Size	Coil Suffix Number — Brake Size — Inches (mm)							Frame Size	Coil Suffix Number — Brake Size — Inches (mm)						
	8 (203)	10 (254)	13 (330)	16 (406)	19 (483)	23 (584)	30 (762)		8 (203)	10 (254)	13 (330)	16 (406)	19 (483)	23 (584)	30 (762)
402, 802A	**1107**	—	—	—	—	—	—	612	—	—	—	—	**1505**	—	—
602, 802B	**1109**	—	—	—	—	—	—	614, 812	—	—	—	—	**1507**	**1601**	—
603, 802C	**1110**	**1204**	—	—	—	—	—	616, 814	—	—	—	—	**1508**	**1603**	—
604, 803	**1112**	**1206**	**1311**	—	—	—	—	618, 816	—	—	—	—	**1509**	**1605**	—
804	—	**1207**	**1302**	—	—	—	—	818	—	—	—	—	—	—	**1703**
606	—	**1208**	**1302**	**1400**	—	—	—	620	—	—	—	—	—	—	**1704**
806	—	**1209**	**1304**	**1400**	—	—	—	622	—	—	—	—	—	—	**1705**
608	—	**1210**	**1304**	**1401**	—	—	—	—	—	—	—	—	—	—	—
610, 808	—	—	**1305**	**1402**	**1504**	—	—	—	—	—	—	—	—	—	—
810	—	—	—	**1403**	**1505**	—	—	—	—	—	—	—	—	—	—

Table 29. GH505 Series Coil Selection Chart — By Load Current.
Select so that full load current falls near middle of coil ampere range listed below. ①

Brake Size Inches (mm)	Ampere Range — 1/2 Hour Duty Minimum	1/2 Hour Duty Maximum	1 Hour Duty Minimum	1 Hour Duty Maximum	Coil Suffix Number
8 (203)	7	8.75	6	7.2	**1101**
	8.5	10.85	7.2	9	**1102**
	10.5	13.4	8.8	11.1	**1103**
	13	17	10.5	14	**1104**
	16	21	13.5	17	**1105**
	18	24	15	20	**1106**
	22	31	19	25	**1107**
	28	39	24	32	**1108**
	37	49	31	41	**1109**
	41	59	35	49	**1110**
	55	77	46	64	**1111**
	62	91	52	75	**1112**
	88	122	74	101	**1113**
	150	169	127	139	**1114**
	173	185	146	154	**1115**
10 (254)	20	28	16	25.5	**1201**
	28	38	23	34	**1202**
	35	47	29	42	**1203**
	45	60	37	54	**1204**
	58	77	49	70	**1205**
	66	91	55	82	**1206**
	88	113	73	103	**1211**
	107	137	7	125	**1212**
	124	152	101	125	**1209**
	147	185	121	154	**1210**
13 (330)	19	26	15	20	**1307**
	29	40	23	32	**1308**
	35	50	28	39	**1309**
	44	64	35	49	**1310**
	61	87	48	67	**1311**
	71	102	56	79	**1312**
	84	135	66	107	**1301**
	92	149	72	117	**1302**
	93	129	7	102	**1313**
13 (Cont.)	123	205	96	162	**1303**
	135	229	105	181	**1304**
	193	336	150	264	**1305**
	336	564	262	445	**1306**
16 (406)	123	165	92	132	**1400**
	148	244	120	193	**1401**
	162	268	131	213	**1402**
	258	432	210	343	**1403**
	345	578	280	458	**1404**
	235	395	191	314	**1405**
19 (483)	102	138	84	111	**1501**
	127	173	105	139	**1502**
	178	252	146	202	**1503**
	225	326	185	262	**1504**
	250	361	205	289	**1511**
	260	375	214	302	**1505**
	338	490	277	394	**1506**
	375	550	308	448	**1507**
	450	660	371	530	**1512**
	520	777	427	622	**1508**
	750	1108	618	890	**1509**
	965	1400	793	1128	**1510**
23 (584)	390	508	311	415	**1601**
	459	618	366	503	**1602**
	600	804	479	656	**1603**
	651	868	518	710	**1604**
	866	1200	693	98	**1605**
	975	1360	778	1110	**1606**
30 (762)	450	615	360	470	**1701**
	720	935	531	717	**1702**
	958	1260	709	965	**1703**
	1280	1688	934	1293	**1704**
	1643	2180	1214	1675	**1705**
	2300	3040	1700	2325	**1706**

① Coil selection chart is for 230 V motors only. For other armature voltages, order special engineered coil and provide complete description. Coil Selection should be based on actual full load current and duty cycle of the motor rather than rated full load motor current.

Table 30. GH505 Shunt Coil Selection Chart

Brake Size Inches (mm)	Line Voltage	Duty Cycle	With Series Resistor ①		Shipped Without Resistor ①	Brake Size Inches (mm)	Line Voltage	Duty Cycle	With Series Resistor ①		Shipped Without Resistor ①
			Coil Suffix Number	Adder *	Coil Suffix Number				Coil Suffix Number	Adder *	Coil Suffix Number
8 (203)	230 Vdc 230 Vdc 208 Vdc	Intermittent Continuous Continuous	**2160** **2162** **—**		**2161** **2163** **2164** ②	16 (406)	230 Vdc 230 Vdc 208 Vdc	Intermittent Continuous Continuous	**2460** **2462** **—**		**2461** **2463** **2464** ②
10 (254)	230 Vdc 230 Vdc 208 Vdc	Intermittent Continuous Continuous	**2260** **2262** **—**		**2261** **2263** **2264** ②	19 (483)	230 Vdc 230 Vdc 208 Vdc	Intermittent Continuous Continuous	**2560** **2562** **—**		**2561** **2563** **2564** ②
13 (330)	230 Vdc 230 Vdc 208 Vdc	Intermittent Continuous Continuous	**2360** **2362** **—**		**2361** **2363** **2364** ②	23 (584)	230 Vdc 230 Vdc 208 Vdc	Intermittent Continuous Continuous	**2660** **2662** **—**		**2661** **2663** **2664** ②
						30 (762)	230 Vdc 230 Vdc	Intermittent Continuous	**2760** **2762**		**2761** **2763**

① Series resistor is shipped in package attached to brake pull rod. Coils shipped without series resistor still require a series resistor in the circuit. The resistor **MUST** be supplied separately.

② For use with GH515 Rectifier Panel. Required resistor is located on and supplied with panel.

Note: For multiple brake systems, shunt brake coils are normally connected in parallel.

Table 31. GH505 Shunt Coil Resistance and Series Resistor Resistance

Coil Suffix Numbers	Coil Ohms	Series ③ Resistor Ohms	Total Power (Watts)	Coil Suffix Numbers	Coil Ohms	Series ③ Resistor Ohms	Total Power (Watts)
2160	44.4	78.0	432	**2462**	38.0	52.0	588
2162	110.6	104.0	247	**2464**	24.5	④	—
2164	44.4	④	—	**2560**	14.9	21.0	1474
2260	44.6	66.0	478	**2562**	34.3	29.0	836
2262	102.2	94.0	270	**2564**	9.34	④	—
2264	44.6	④	—	**2660**	11.0	16.0	1959
2360	29.1	52.0	652	**2662**	28.8	38.0	792
2362	45.4	78.0	429	**2664**	11.0	④	—
2364	29.1	④	—	**2760**	3.71	9.0	4162
2460	24.5	38.0	846	**2762**	3.71	17.6	2482

③ Series resistor is shipped in package attached to brake pull rod. Coils shipped without series resistor still require a series resistor in the circuit. The resistor **MUST** be supplied separately.

④ Series resistor control on separate brake rectifier. Contact Eaton for data when using GH515 rectifier panel.

Discount Symbol **18CD-2**
* Consult Sales Office for Pricing

Product Description

The Type F Master Switch is a cam operated, vertical type control circuit master. Straight line operation of the handle is achieved by means of a right angle bevel gear assembly. A maximum of 16 circuits and 6 speed positions are available in the step type master. A maximum of 6 circuits and a directly coupled potentiometer are available in the stepless master. Master switches are furnished with a positive mechanical stop located in the operating head of the switch. Masters are available both as open devices for benchboard mounting, and NEMA 3 enclosed for wall or floor mounting. The joystick master provides for concurrent operation of two control motions with one operating handle.

Mounting brackets are screwed to the bottom of the case for floor type mounting. Tapped holes are provided on the rear of the case which may be used for relocating the mounting brackets for wall mounting.

Features

- Floor mounted, desk mounted and benchboard mounted versions.
- 6, 12 and 16 circuit versions.
- Spring return, off-point latch speed point detents, and handle pushbutton options available.
- Contacts rated 1.1 amperes inductive break at 250 Vdc, 10 amperes continuous.
- Stepless and step-type versions.
- Single motion and joystick.

Technical Data and Specifications

- Voltage: 250 V maximum.
- Current Rating:
  - Make:
    - dc, 30 amperes
  - Carry:
    - dc, 10 amperes
    - 115 Vac, 30 ampere make — 8 ampere break
  - Interrupt:
    - 115 Vdc inductive, 2.2 amperes
    - 230 Vdc inductive, 1.1 amperes
- Stepless Units:
  - Potentiometer or resolver unit
- Circuits:
  - 6, 12 or 16 circuit versions available
- Manual Operation.

Standards and Certifications

- OSHA 1910.179.
- NEMA ICS3-442.14.
- NEMA ICS2-125.21.02.
- CMAA 70-5.7.

Renewal Parts

Table 32. Type F Master Switch

Part Description	Part Number
Contact Block, Complete	**86-2601**
Stationary Contact	**23-3439**
Movable Contact	**23-3344**
Contact Kit	**6-202**

Note: For prices, refer to Eaton's parts distributor or call factory.

Dimensions

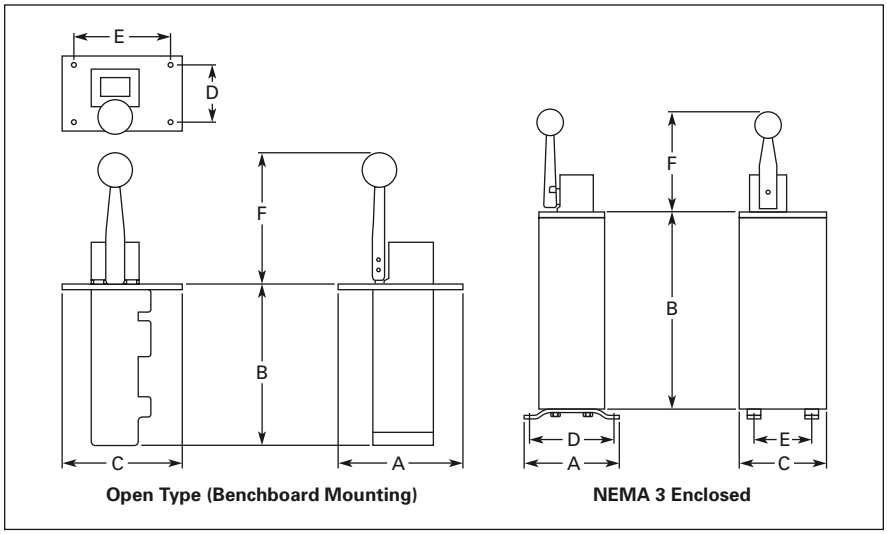


Figure 12. Approximate Dimensions in Inches (mm)

Note: Dimensions shown are approximate and are not to be used for construction purposes.

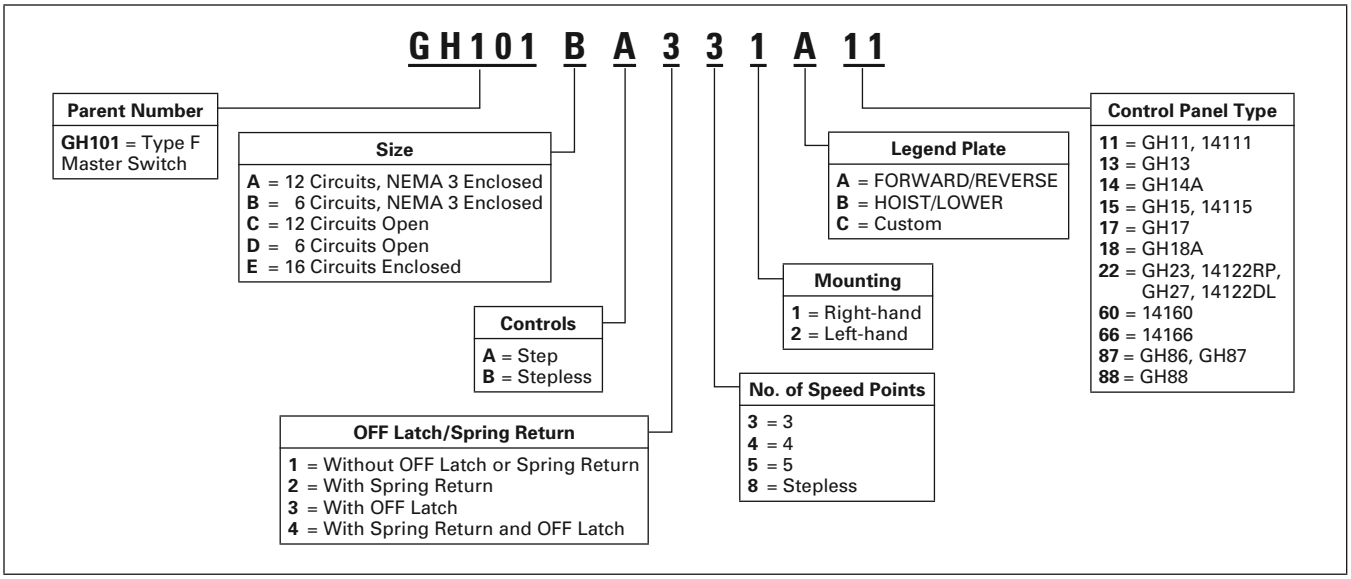
Table 33. Approximate Dimensions and Shipping Weights

Type	Number of Circuits	Dimensions in Inches (mm)						Ship. Wt. Lbs. (kg)
		Wide A	High B	Deep C	Mounting D	Mounting E	F	
NEMA 3 Enclosed								
Single Motion	6	6.88 (175)	15 (381)	6.62 (168)	6.0 (152)	4.62 (117)	7.94 (202)	34 (15)
	12	6.88 (175)	21.25 (540)	6.62 (168)	6.0 (152)	4.62 (117)	7.92 (202)	38 (17)
	16	6.88 (175)	25.5 (648)	6.62 (168)	6.0 (152)	4.62 (117)	7.94 (202)	44 (20)
Joystick	12	12 (305)	21.25 (540)	6.62 (168)	11 (279)	4.62(117)	12.5 (318)	50 (23)
Open Type (Benchboard Mounting)								
Open Motion	6	5 (127)	11.5 (292)	6.62 (168)	4 (102)	5.75 (146)	7.94 (202)	23 (10)
	12	5 (127)	18 (457)	6.62 (168)	4 (102)	5.75 (146)	7.94 (202)	25 (11)
Joystick	12	8 (203)	18 (457)	10 (254)	7.25 (184)	9 (229)	12.5 (318)	40 (18)

Note: The installation and use of Cutler-Hammer products by Eaton Corporation should be in accordance with the provisions of the U.S. National Electrical Code and/or other local codes or industry standards that are pertinent to the particular end use. Installation or use not in accordance with these codes and standards could be hazardous to personnel and/or equipment.

Catalog Number Selection — Standard Assembled Switches

Table 34. Assembled Switches Catalog Numbering System



Product Selection — Standard Switches for Use with Cutler-Hammer Control Panels

When Ordering Specify

- Complete GH101 Catalog Number, *OR*
- Complete description of master switch, including each contact closure sequence, *OR*
- Reference to previous Cutler-Hammer Catalog Number or factory serial number.

Table 35. Type GH101 Master Switches for Present Standard Eaton's Cutler-Hammer Crane Controllers ①

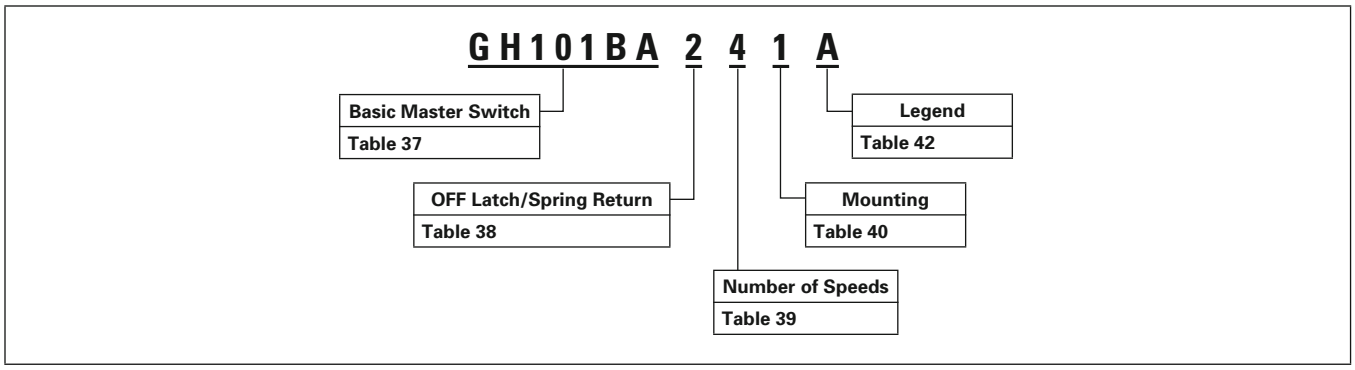
Application		NEMA 3 Enclosed					
Controller Type Number	Number of Speeds Each Direction	With OFF Latch		With Spring Return		Without OFF Latch or Spring Return	
		Catalog Number	*	Catalog Number	*	Catalog Number	*
GH11, 14111	5	**GH101AA351A11**		**GH101AA251A11**		**GH101AA151A11**	
GH15, 14115	5	**GH101AA351B15**		**GH101AA251B15**		**GH101AA151B15**	
GH23, 14122RP	3 4	**GH101BA331A22** **GH101BA341A22**		**GH101BA231A22** **GH101BA241A22**		**GH101BA131A22** **GH101BA141A22**	
GH27, 14122DL	3 4	**GH101BA331B22** **GH101AA341B22**		**GH101BA231B22** **GH101AA241B22**		**GH101BA131B22** **GH101AA141B22**	
14160	3 5	**GH101BA331A60** **GH101AA351A60**		**GH101BA231A60** **GH101AA251A60**		**GH101BA131A60** **GH101AA151A60**	
14166	5	**GH101AA351B66**		**GH101AA251B66**		**GH101AA151B66**	
GH13	5	**GH101AA351A13**		**GH101AA251A13**		**GH101AA151A13**	
GH17	5	**GH101AA351B17**		**GH101AA251B17**		**GH101AA151B17**	
GH86, GH87	Stepless	**GH101AB381A87**		**GH101AB281A87**		**GH101AB181A87**	
GH88	Stepless	**GH101AB381B88**		**GH101AB281B88**		**GH101AB181B88**	
GH14A	5	**GH101AA351A14**		**GH101AA251A14**		**GH101AA151A14**	
GH18A	5	**GH101AA351B18**		**GH101AA251B18**		**GH101AA151B18**	

① All Catalog Number listings are for right-hand mounting — NEMA Std. ICS3-442.14. For left-hand mounting, change 10th digit from "1" to "2". Example: GH101BA33**2**A11.

Discount Symbol **18CD-2**
* Consult Sales Office for Pricing

Catalog Number Selection — Custom Switches

Table 36. Custom Switches Catalog Numbering System



Note: Include description of contact closure sequence. Use worksheet on **Page 26** to describe contact sequence.

Product Selection — Custom Switches

When Ordering Specify

- Basic master switch Catalog Number and price from **Table 37**.
- Off latch or spring return from **Table 38**. Add Code Suffix Number to basic Catalog Number.
- Number of speeds from **Table 39**. Add Code Suffix Number to Catalog Number.
- Select right- or left-hand mounting from **Table 40**. Add Code Suffix Number to composite Catalog Number.
- Provide description of contact closure sequence as detailed in **Table 41**. Use Worksheet on **Page 26** to describe contact sequence, or provide closure sequence diagram.
- Determine legend plate required. See **Table 42**. Add Code Suffix Letter to basic Catalog Number.
- See example on **Page 27**.

Open Type Single Motion Stepless Master Switch, 6 Circuit, Left-Hand Mounting

NEMA 3 Enclosed Step-Type Single Motion Master Switch, 12 Circuits, Left-Hand Mounting

NEMA 3 Enclosed Joystick Master Switch, Stepless, 6 Circuits for Each Motion

Table 37. Basic Master Switch

Construction	Maximum Number of Circuits per Motion	Master Switch Type											
		Step Type						Stepless Type ①					
		Single Motion				Joystick		Single Motion				Joystick	
		Standard		With Handle Pushbutton				Standard		With Handle Pushbutton			
		Catalog Number	*	Catalog Number	*	Catalog Number	*	Catalog Number	*	Catalog Number	*	Catalog Number	*
Open Type	6	GH101DA		GH101DC		GH101DE		—		—		—	
	12	GH101CA		GH101CC		GH101CE		GH101CB		GH101CD		GH101CF	
NEMA 3 Enclosed	6	GH101BA		GH101BC		GH101BE		—		—		—	
	12	GH101AA		GH101AC		GH101AE		GH101AB		GH101AD		GH101AF	
	16	GH101EA		GH101EC		—		—		—		—	

① All stepless master switches require 12 circuit frame. They include a standard 4 watt, 1500 ohm potentiometer. Induction units are also available. Consult factory for details.

Table 38. OFF Latch or Spring Return Selection ②

Description	Code Suffix	Adder *
Without OFF latch, without spring return	**1**	
With spring return	**2**	
With OFF position latch	**3**	
With spring return and OFF position latch	**4**	
With reduced tension spring return	**5**	

② OFF position latch and left-hand mounting not available for joystick masters.

Table 39. Number of Speeds (Each Direction)

Description	Code Suffix	Adder *
3 Speed	**3**	
4 Speed	**4**	
5 Speed	**5**	
6 Speed	**6**	
Stepless	**8**	
Stepless with float option	**9**	
Non-symmetrical (specify)	**0**	

Table 40. Right- or Left-Hand Mounting ③④

Description	Code Suffix	Adder *
Right-hand mounting	**1**	
Left-hand mounting	**2**	

③ OFF position latch and left-hand mounting not available for joystick masters.

④ Mounting refers to which side of the operating head the lever is on. Left-hand mounting (shown above) has the lever closest to the left-hand side of the operator, i.e., on the right side of the head.

Table 41. Contact Closure Sequence

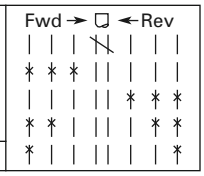
Provide description of contact closure sequencing using Worksheet on **Page 26** or advise reference to previous Cutler-Hammer Catalog Number or factory serial number. Example: GH101DA331A with 5 circuit units per diagram sketch at right.		
Adder per circuit *		

Table 42. Legend Plate Requirement

Description	Code Suffix	Adder *
FORWARD — REVERSE	**A**	
HOIST — LOWER	**B**	
All others (specify on order)	**C**	

Discount Symbol **18CD-2**
* Consult Sales Office for Pricing

Diagram Worksheet for Special Master Switches

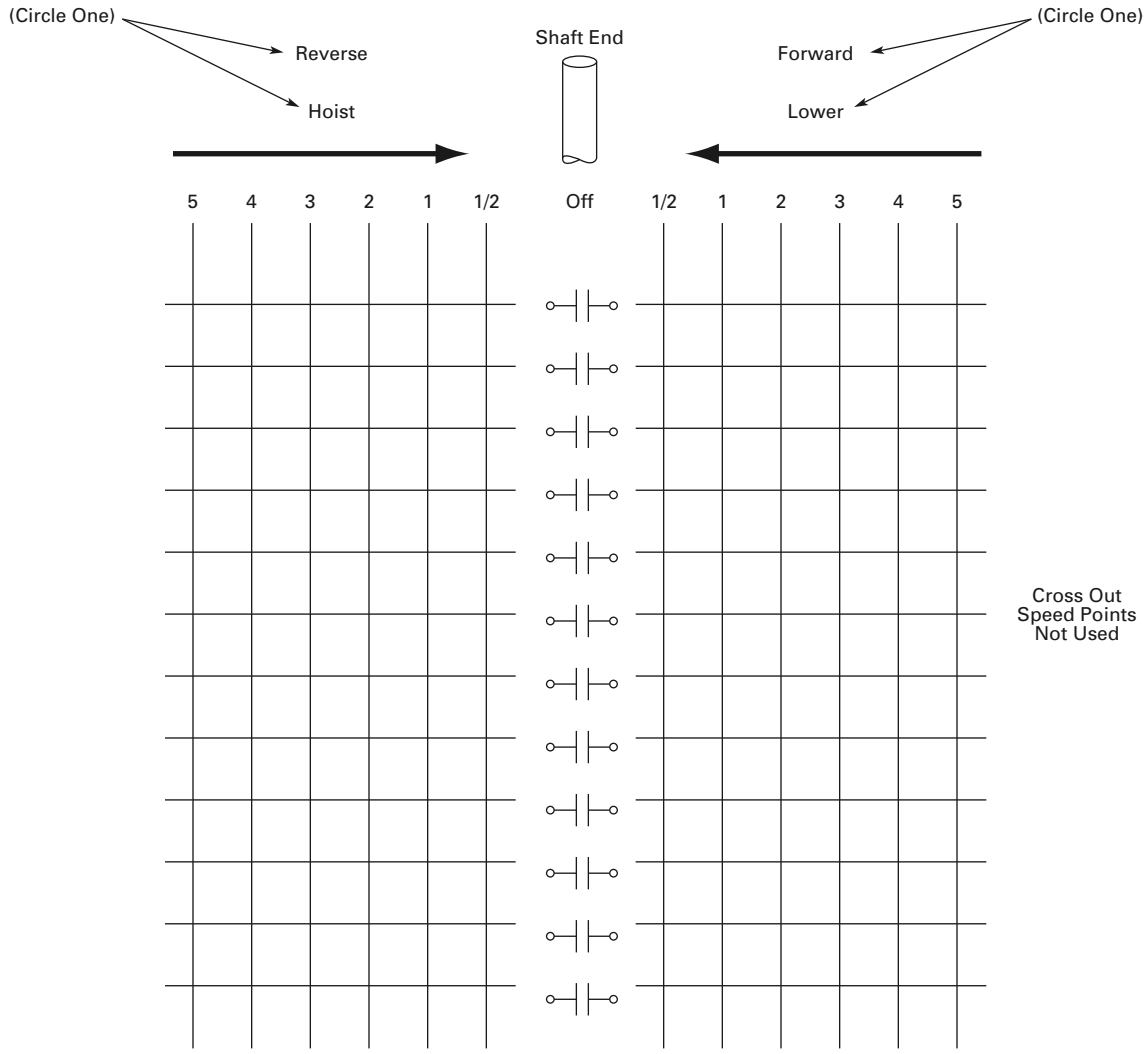


Figure 13. Contact Closure Sequence Diagram Worksheet

Custom Switch Ordering Example

To order/price a custom Type F Master Switch like the one illustrated at the right — NEMA 3 enclosed, 6 circuit spring return switch with cam arrangement as shown in **Table 41** on **Page 25** — proceed as follows: (Referenced tables will be found on **Page 25**.)

Table 43. Custom Switch Ordering Example

Description	Catalog Number	*
1. Select basic switch from **Table 37** — NEMA 3 enclosed, 6 circuit maximum, step type.	**GH101BA**	
2. For spring return, add Suffix Code **2** from **Table 38** to Catalog Number.	**GH101BA2**	
3. The contact sequence chart in **Table 41** shows 3 speed points. **Table 39** says that 3 speed points adds a Suffix Code **3** to the Catalog Number. The cams are symmetrical, 3 speeds in each direction.	**GH101BA23**	
4. For right-hand operation (lever closest to operator's right-hand), add Suffix Code **1** from **Table 40**.	**GH101BA231**	
5. Per sketch in **Table 41**, switch uses a total of 5 contacts.		
6. For FORWARD-REVERSE legend plate on top of enclosure (per sketch in **Table 41**), add Suffix Code **A** from **Table 42** to Catalog Number.	**GH101BA231A**	
	Total	

NEMA 3 Enclosed
6 Circuit Step Type Switch
Right-Hand Operation

Cross-Reference to Previous Products

Table 44. Type F Master Switch Cross-Reference to Previous Products

With Off Latch		With Spring Return	
Old	**New**	**Old**	**New**
14951H117	**GH101BA331A11**	14951W13	**GH101BA231A11**
14951H123	**GH101AA351A66**	14951W14	**GH101BA231A60**
14951H127	**GH101BA331A22**	14951W15	**GH101AA251A11**
14951H129	**GH101BA341A22**	14951W16	**GH101AA251A60**
14951H131	**GH101BA331B22**	14951W17	**GH101AA251B15**
14951H133	**GH101AA341B22**	14951W18	**GH101AA251A66**
14951H139	**GH101AA351B15**	14951W29	**GH101BA231B22**
14951H141	**GH101AA351A11**	14951W30	**GH101BA241B22**
14951H177	**GH101BA341B22**	14951W31	**GH101BA231A22**
14951H181	**GH101AA351B15**	14951W32	**GH101BA241A22**
14951H185	**GH101AA351A11**	—	**—**
14951W10	**GH101BA331A60**	—	**—**
14951W11	**GH101AA351A60**	—	**—**

Discount Symbol **18CD-2**
* Consult Sales Office for Pricing

Product Description

The Type C Master Switch is a cam operated control circuit master switch, six circuit maximum, which can be supplied a NEMA 1 sheet steel enclosure, or open type for benchboard mounting. Cams are directly driven by the operating handle. Switches with "universal" cams have "daisy petal" twist offs which can be broken away to obtain any desired operating sequence.

Standards and Certifications

- NEMA ICS3-442.14.
- CMAA 70-5.7.

Technical Data and Specifications

- Voltage: 250 V maximum.
- Current Rating:
  - .6 amperes at 250 Vdc, inductive
  - 5.0 amperes at 115 Vac
- Circuits:
  - 3 or 6 circuit maximum versions
- Manual Operation.
- Speed Points:
  - Up to 3 in each direction, cams field adjustable

Options

Table 45. Options

Description	Adder *
Spring return to OFF position Non-reverse operation Three-speed reversing on six-circuit switch Special cam arrangement Special legend plate	

Renewal Parts

Table 46. Type C Master Switch

Description	Part Number
3-Circuit Contact Block ①	**83-530-3**

① For 6-circuit switches order qty. 2.

Note: For prices, refer to Eaton's parts distributor or call factory.

Dimensions

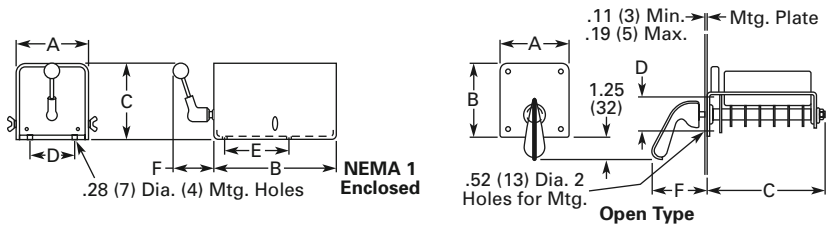


Figure 14. Approximate Dimensions in Inches (mm)

Table 47. Approximate Dimensions and Shipping Weights

Number of Circuits	Dimensions in Inches (mm)						Ship. Wt. Lbs. (kg)
	Wide A	High B	Deep C	Mounting D	Mounting E	Handle F	
Open Type							
3	4.19 (106)	4.5 (114)	4.5 (114)	2.13 (54)	—	2.56 (65)	6 (2.7)
6	4.19 (106)	4.5 (114)	7.13 (181)	2.13 (54)	—	2.56 (65)	8 (3.6)
NEMA 1 Enclosed							
3 or 6	5.47 (139)	8 (203)	4.78 (121)	2.75 (70)	4.38 (111)	2.63 (67)	11 (5)

Diagrams

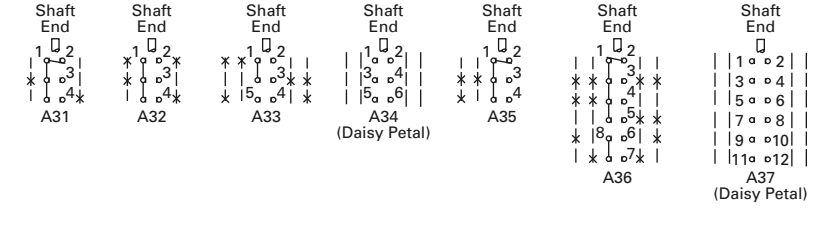


Figure 15. Contact Closure Sequence

Discount Symbol **18CD-2**
* Consult Sales Office for Pricing

Product Selection

When Ordering Specify

- Complete GH101 Catalog Number, *OR*
- Complete description of master switch, including each contact closure sequence, *OR*
- Reference to previous Cutler-Hammer Catalog Number or factory serial number.

Table 48. Type C Master Switch Product Selection

Number of Speeds Each Direction	Number of Circuits	Open Type		Enclosed	
		Catalog Number	*	NEMA 1	
				Catalog Number	*
1	3	**GH103HB111A31**		**GH103DA111A31**	
1	3	**GH103HB111A32**		**GH103DA111A32**	
2	3	**GH103HB121A33**		**GH103DA121A33**	
2	3	**GH103HB121A34**		**GH103DA121A34**	
2 (NR)	3	**GH103HB141A35**		**GH103DA141A35**	
2	6	**GH103GB121A36**		**GH103CA121A36**	
2	6	**GH103GB121A37**		**GH103CA121A37**	

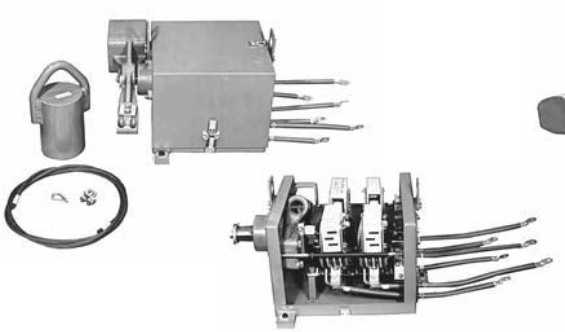
Note: See contact closure sequence in **Figure 15** on **Page 28**.

Cross-Reference to Previous Products

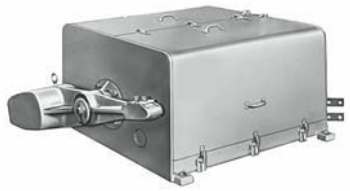
Table 49. Type C Master Switch Cross-Reference to Previous Products

Open Type	
Old	**New**
14951N3	**GH103HB111A31**
14951N4	**GH103HB111A32**
14951N5	**GH103HB121A33**
14951N6	**GH103HB121A34**
14951N7	**GH103HB141C35**
14951N8	**GH103GB121A36**
14951N9	**GH103GB121A37**

Discount Symbol **18CD-2**
* Consult Sales Office for Pricing



Type P50 Power Limit Switch with Lever, Cable, Fittings and Weight



Type P375, Single

Product Description

These Crane Power Limit Switches are mounted on the crane trolley to prevent overtravel of the crane hook when hoisting.

They act as a power circuit disconnect for the hoisting motor. On dc applications, a resistor is required with the limit switch to provide dynamic braking.

Features

- Single and duplex types.
- 50 hp to 500 hp range, ac or dc operation.
- Double-pole, double-throw power circuit contacts.
- NEMA 3 enclosed.
- Power resistors and lever options available.

Standards and Certifications

- OSHA 1910.179, 306.
- AISE Standard No. 6.
- NEMA ICS3-445, CMAA 70-5.9.

Technical Data and Specifications

- Types:
  - Single or Duplex
  - 2- or 3-pole
  - double throw
- Mounting:
  - Trolley deck mounting
  - Hanging horizontal mounting
  - Left-hand vertical mounting
  - Right-hand vertical mounting
- Ratings:
  - 5 to 500 hp at 230 Vdc
  - 5 to 400 hp at 460 Vac
- Operation:
  - Counterweighted lever is tripped by cable motion and reset by reset weight. Reset weight is actuated by hoist block mechanism
- Contacts:
  - Cadmium copper alloy contacts with positive wiping action operate in an arc chute. Contacts are interchangeable with Type C80 dc contactor contacts
- Enclosure:
  - NEMA 3R weather-resistant enclosure with U-shaped cover for easy access to mechanism

Options

Table 50. Options

Description	Adder *						
	P50 Single	P100		P200		P375, P500	
		Single	Duplex	Single	Duplex	Single	Duplex
Electrical Interlock ①							
Three-Pole Limit Switch		N/A	N/A	N/A	N/A	N/A	N/A

① To add electrical interlock, change 8th digit of Catalog Number from "A" to "**B**." Example: GH120SA**B**1111.

Table 51. Maximum Horsepower Ratings

Limit Switch Type	Maximum hp Crane Rating			
	dc		ac	
	230 V	550 V	230 V	460 V
P50	50	50	50	100
P100	100	100	100	200
P200	200	200	200	400
P375	375	600	—	—
P500	500	—	—	—

Renewal Parts

Table 52. Power Limit Switches

Incomplete Device Catalog Number	Contact Kit Part Number	Blowout Assembly (dc) Part Number
GH120	6-207	62-812-5
GH121	6-207-2	62-479
GH122	6-207-3	62-109-14
GH123	6-207-4	62-450
GH126	6-207-5	62-450

Note: For prices, refer to Eaton's parts distributor or call factory.

Discount Symbol **18CD-2**

* Consult Sales Office for Pricing

Dimensions

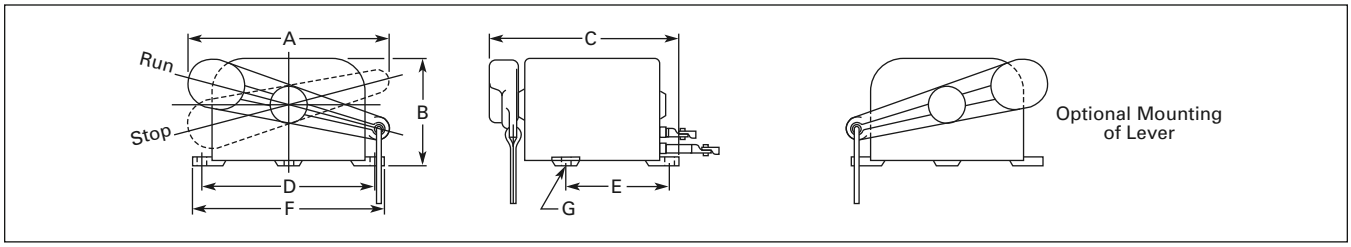


Figure 16. Approximate Dimensions

Table 53. Limit Switches

Type	Approximate Dimensions in Inches (mm)							Ship. Wt. Lbs. (kg)		
	Wide A	High B	Deep C	Mounting D	Mounting E	Overall F	Mtg. Hole G	Limit Switch Only	Lever	Reset Weight
P50 Single	17.5 (445)	10.75 (273)	18.5 (470)	14.0 (356)	12.25 (311)	15.13 (384)	.63 (16)	83 (38)	42 (19)	46 (21)
P100 Single	20.75 (527)	12.25 (311)	22.06 (560)	16.5 (419)	15.75 (400)	18.0 (457)	.75 (19)	148 (67)	79 (36)	80 (36)
P100 Duplex	20.75 (527)	12.25 (311)	30.56 (776)	16.5 (419)	24.25 (616)	18.0 (457)	.75 (19)	217 (98)	87 (39)	97 (44)
P200 Single	26.0 (660)	15.38 (391)	26.38 (670)	24.0 (610)	18.5 (470)	26.25 (667)	.94 (24)	315 (143)	103 (47)	108 (49)
P200 Duplex	28.56 (726)	15.38 (391)	38.88 (987)	24.0 (610)	30.5 (775)	26.25 (667)	.94 (24)	481 (218)	131 (59)	176 (80)
P375 Single	38.63 (981)	24.25 (616)	42.13 (1070)	36.25 (921)	23.25 (591)	38.25 (972)	.94 (24)	1028 (466)	230 (104)	240 (109)
P375 Duplex	38.63 (981)	24.25 (616)	60.13 (1527)	36.25 (921)	41.25 (1048)	38.25 (972)	.94 (24)	1467 (665)	383 (174)	506 (230)
P500 Single	38.63 (981)	24.25 (616)	42.13 (1070)	36.25 (921)	23.25 (591)	38.25 (972)	.94 (24)	1028 (466)	230 (104)	240 (109)
P500 Duplex	38.63 (981)	24.25 (616)	60.13 (1527)	36.25 (921)	41.25 (1048)	38.25 (972)	.94 (24)	1467 (665)	383 (174)	506 (230)

Table 54. Reset Weights

Reset Weight Lbs. (kg)	Used with Switch Type	Approximate Dimensions in Inches (mm)		
		Figure Number	Width B (Dia.)	Length A
46 (21)	P50 Single	1	5 (127)	10.5 (267)
80 (36)	P100 Single	1	6 (152)	12.5 (318)
97 (44)	P100 Duplex	1	6 (152)	14.62 (372)
108 (49)	P200 Single	1	6 (152)	16.0 (407)
176 (80)	P200 Duplex	1	7 (178)	19.25 (489)
240 (109)	P375 Single	2	8 (203)	15.5 (394)
240 (109)	P500 Single	2	8 (203)	15.5 (394)
506 (230)	P375 Duplex	2	10.5 (267)	19.5 (495)
506 (230)	P500 Duplex	2	10.5 (267)	19.5 (495)

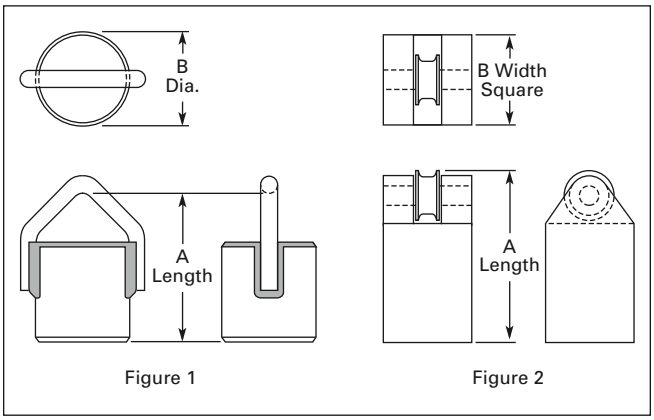


Figure 17. Reset Weight Outline

Mounting

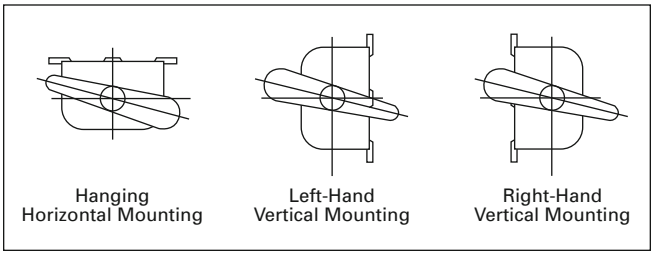


Figure 18. Alternate Mounting Positions — P50, P100 and P200 Only — P375 and P500 Horizontal Floor Mounting Only

Catalog Number Selection

Table 55. Power Limit Switch Catalog Numbering System

GH120 S A A 1 1 1 1

Parent Number		Type	Junction Box	Electrical Interlock	Voltage	Straight Lever with Clevis	Cable and Fittings	Reset Weight
GH120 = P50	**GH123** = P375	**S** = Single	**A** = Without	**A** = Without	**1** = 230 Vdc	**1** = Without	**0** = Without	**0** = Without
GH121 = P100	**GH126** = P500	**D** = Duplex	**B** = With	**B** = With	**4** = 460 Vac	**2** = With	**1** = With	**1** = With
GH122 = P200								

Product Selection

When Ordering Specify

- Catalog Number or complete description, including optional features, required.
- Voltage and horsepower, ac or dc.
- Catalog Number of resistor if dynamic braking is used (DC series motors only).

Table 56. Single and Duplex Limit Switches

Limit Switch Type	Description	NEMA 3 Enclosed					
		Single Type			Duplex Type ①		
		Catalog Number		*	Catalog Number		*
		230 Vdc	460 Vac		230 Vdc	460 Vac	
P50 (GH120)	Limit switch complete, with lever, cable, fittings and weight	**GH120SAA1111**	**GH120SAA4111**		—	—	—
	Limit switch with lever only	**GH120SAA1100**	**GH120SAA4100**				
	Limit switch without lever, cable, fittings or weight	**GH120SAA1000**	**GH120SAA4000**				
	Straight lever only	**GH120SC**	**GH120SC**				
	Cable and fittings only	**GH124AE**	**GH124AE**				
	Reset weight only	**GH120SF**	**GH120SF**				
P100 (GH121)	Limit switch complete, with lever, cable, fittings and weight	**GH121SAA1111**	**GH121SAA4111**		**GH121DAA1111**	**GH121DAA4111**	
	Limit switch with lever only	**GH121SAA1100**	**GH121SAA4100**		**GH121DAA1100**	**GH121DAA4100**	
	Limit switch without lever, cable, fittings or weight	**GH121SAA1000**	**GH121SAA4000**		**GH121DAA1000**	**GH121DAA4000**	
	Straight lever only	**GH121SC**	**GH121SC**		**GH121DC**	**GH121DC**	
	Cable and fittings only	**GH124AE**	**GH124AE**		**GH124AE**	**GH124AE**	
	Reset weight only	**GH121SF**	**GH121SF**		**GH121DF**	**GH121DF**	
P200 (GH122)	Limit switch complete, with lever, cable, fittings and weight	**GH122SAA1111**	**GH122SAA4111**		**GH122DAA1111**	**GH122DAA4111**	
	Limit switch with lever only	**GH122SAA1100**	**GH122SAA4100**		**GH122DAA1100**	**GH122DAA4100**	
	Limit switch without lever, cable, fittings or weight	**GH122SAA1000**	**GH122SAA4000**		**GH122DAA1000**	**GH122DAA4000**	
	Straight lever only	**GH122SC**	**GH122SC**		**GH122DC**	**GH122DC**	
	Cable and fittings only	**GH124AE**	**GH124AE**		**GH124AE**	**GH124AE**	
	Reset weight only	**GH122SF**	**GH122SF**		**GH122DF**	**GH122DF**	
P375 (GH123)	Limit switch complete, with lever, cable, fittings and weight	**GH123SAA1111**	—		**GH123DAA1111**	—	
	Limit switch with lever only	**GH123SAA1100**			**GH123DAA1100**		
	Limit switch without lever, cable, fittings or weight	**GH123SAA1000**			**GH123DAA1000**		
	Straight lever only	**GH123SC**			**GH123DC**		
	Cable and fittings only	**GH123SE**			**GH123DE**		
	Reset weight only	**GH123SF**			**GH123DF**		
P500 (GH126)	Limit switch complete, with lever, cable, fittings and weight	**GH126SAA1111**	—		**GH126DAA1111**	—	
	Limit switch with lever only	**GH126SAA1100**			**GH126DAA1100**		
	Limit switch without lever, cable, fittings or weight	**GH126SAA1000**			**GH126DAA1000**		
	Straight lever only	**GH123SC**			**GH123DC**		
	Cable and fittings only	**GH123SE**			**GH123DE**		
	Reset weight only	**GH123SF**			**GH123DF**		

① For two motors connected in parallel.

Table 57. Enclosed Power Limit Dynamic Braking Resistor

Horsepower Range @ 230 Vdc	Catalog Number	*	Horsepower Range @ 230 Vdc	Catalog Number	*
5 – 9	**GH125BAA**		91 – 125	**GH125BHA**	
10 – 12	**GH125BBA**		126 – 170	**GH125BJA**	
13 – 17	**GH125BCA**		171 – 225	**GH125BKA**	
18 – 28	**GH125BDA**		226 – 300	**GH125BLA**	
29 – 40	**GH125BEA**		301 – 375	**GH125BMA**	
41 – 59	**GH125BFA**		376 – 500	**GH125BNA**	
60 – 90	**GH125BGA**		—	**—**	

Cross-Reference to
Previous Products . . . . . **Page 34**
Dimensions . . . . . **Page 31**
Discount Symbol **18CD-2**

* Consult Sales Office for Pricing

Cross-Reference to Previous Products

Table 58. Catalog Number 14148 Single Type

Old	New		Old	New	
	230 Vdc	460 Vac		230 Vdc	460 Vac
14148H127	**GH123SAA1000**	**GH123SAA4000**	14148H181	**GH122SAA1111**	**GH122SAA4111**
14148H128	**GH123SE**	**GH123SE**	14148H183	**GH120SC**	**GH120SC**
14148H129	**GH123SF**	**GH123SF**	14148H184	**GH121SC**	**GH121SC**
14148H130	**GH123SC**	**GH123SC**	14148W2	**GH121SAA1111**	**GH121SAA4111**
14148H143	**GH120SAA1000**	**GH120SAA4000**	14148W4	**GH121SAA1000**	**GH121SAA4000**
14148H144	**GH124AE**	**GH124AE**	14148W6	**GH122SAA1111**	**GH122SAA4111**
14148H145	**GH120SF**	**GH120SF**	14148W8	**GH122SAA1000**	**GH122SAA4000**
14148H149	**GH120SAA1111**	**GH120SAA4111**	14148W10	**GH120SAA1111**	**GH120SAA4111**
14148H152	**GH123SAA1111**	**GH123SAA4111**	14148W11	**GH120SAA1000**	**GH120SAA4000**
14148H154	**GH121SAA1000**	**GH121SAA4000**	14148W14	**GH120SAA1100**	**GH120SAA4100**
14148H157	**GH121SF**	**GH121SF**	14148W16	**GH121SAA1100**	**GH121SAA4100**
14148H167	**GH122SAA1000**	**GH122SAA4000**	14148W18	**GH122SAA1100**	**GH122SAA4100**
14148H169	**GH122SF**	**GH122SF**	14148W20	**GH123SAA1100**	**GH123SAA4100**
14148H170	**GH122SC**	**GH122SC**	—	**—**	**—**
14148H179	**GH121SAA1111**	**GH121SAA4111**	—	**—**	**—**

Table 59. Catalog Number 14148 Duplex Type

Old	New		Old	New	
	230 Vdc	460 Vac		230 Vdc	460 Vac
14148H137	**GH123DAA1000**	**GH123DAA4000**	14148W3	**GH121DAA1111**	**GH121DAA4111**
14148H138	**GH123DE**	**GH123DE**	14148W5	**GH121DAA1000**	**GH121DAA4000**
14148H139	**GH123DF**	**GH123DF**	14148W7	**GH122DAA1111**	**GH122DAA4111**
14148H140	**GH123DC**	**GH123DC**	14148W9	**GH122DAA1000**	**GH122DAA4000**
14148H144	**GH122DE**	**GH122DE**	14148W17	**GH121DAA1100**	**GH121DAA4100**
14148H153	**GH123DAA1111**	**GH123DAA4111**	14148W19	**GH122DAA1100**	**GH122DAA4100**
14148H161	**GH121DAA1000**	**GH121DAA4000**	14148W21	**GH123DAA1100**	**GH123DAA4100**
14148H163	**GH121DF**	**GH121DF**	—	**—**	**—**
14148H173	**GH122DAA1000**	**GH122DAA4000**	—	**—**	**—**
14148H175	**GH122DF**	**GH122DF**	—	**—**	**—**
14148H176	**GH122DC**	**GH122DC**	—	**—**	**—**
14148H180	**GH121DAA1111**	**GH121DAA4111**	—	**—**	**—**
14148H182	**GH122DAA1111**	**GH122DAA4111**	—	**—**	**—**
14148H185	**GH121DC**	**GH121DC**	—	**—**	**—**

Limit Switch with Standard Duty Forked Lever

Product Description

These Heavy-Duty Control Limit Switches are designed for use with cranes, hoists, conveyors and similar types of moving machinery. They are supplied with three non-overlapping contacts — and with spring return or maintained lever operation. The spring return capability and circuit arrangement can readily be converted in the field. Standard spring return switches operate in one direction only (contacts change state when lever is moved in one direction from center). The spring return type is optionally available with lever operation in either direction (contacts change state when lever is moved in either direction).

Standards and Certifications

- NEMA ICS2-225.
- NEMA ICS2-125.21.02.

Technical Data and Specifications

- Voltage: 600 V maximum, ac or dc.
- Current Rating:
  - 1.25 A at 250 Vdc continuous, breaking ratings per **Table 60**
- Ambient Temperature:
  - 100°C maximum, operating
- Operation: Mechanical trip.
- Types of Operators:
  - Roller lever
  - Forks
  - Weighted levers
- Operating Speeds:
  - Roller lever — 460 FPM
  - Standard fork lever — 700 FPM
  - Heavy-duty fork lever — 340 FPM

Table 60. E84 Control Circuit Ratings

Maximum Current Amperes							
ac						dc Inductive	
120 V		240 V		480 V		125 V	250 V
Make	Break	Make	Break	Make	Break	Make	Break
60	6.0	30	3.0	15	1.5	2.2	1.1

Options

- Operation of spring return contacts in either direction — Contacts change state when lever is moved in either direction from center — Spring return to center. To order, add suffix **2** to listed Catalog Number.
  Example: E84AAN**2**
- For switch with overlapping circuits, order by description.

Renewal Parts

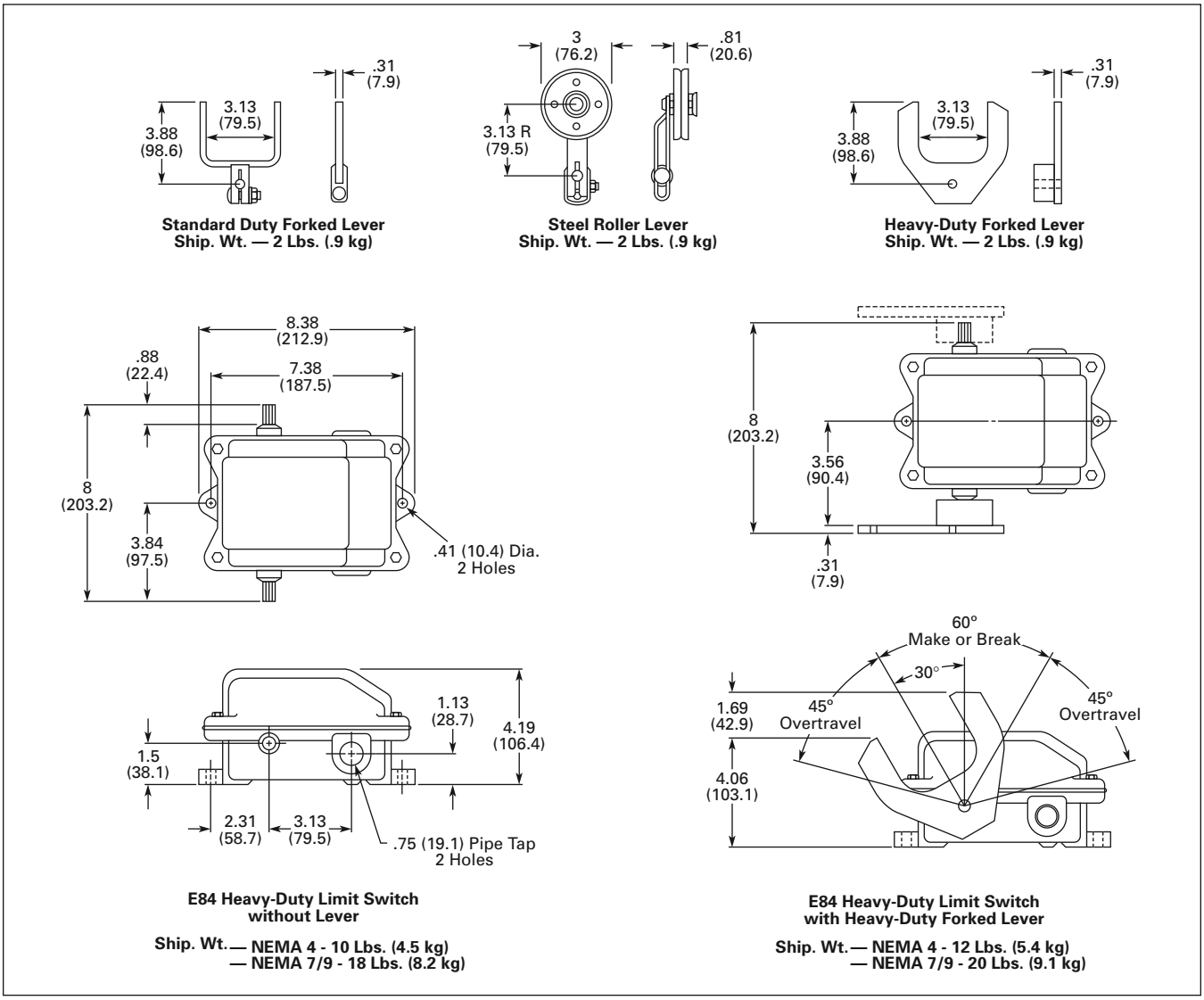
Table 61. Type E84 Renewal Parts

Description	Part Number
Contact Block Assembly	**83-530-5**

Note: For prices, refer to Eaton's parts distributor or consult factory.

Discount Symbol **18CD-4**
* Consult Sales Office for Pricing

Dimensions



Standard Duty Forked Lever
Ship. Wt. — 2 Lbs. (.9 kg)

Steel Roller Lever
Ship. Wt. — 2 Lbs. (.9 kg)

Heavy-Duty Forked Lever
Ship. Wt. — 2 Lbs. (.9 kg)

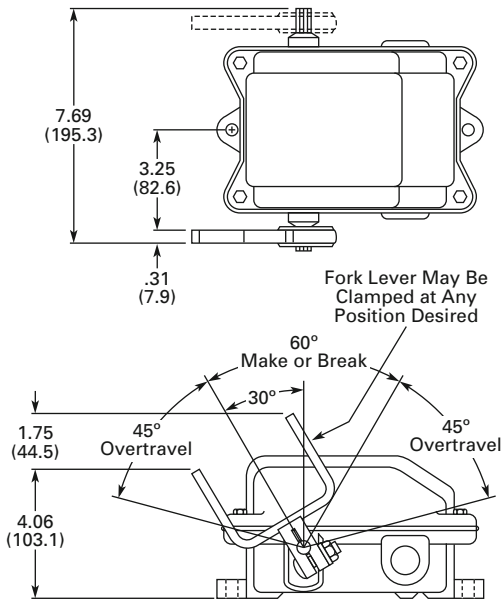
E84 Heavy-Duty Limit Switch without Lever

Ship. Wt. — NEMA 4 - 10 Lbs. (4.5 kg)
— NEMA 7/9 - 18 Lbs. (8.2 kg)

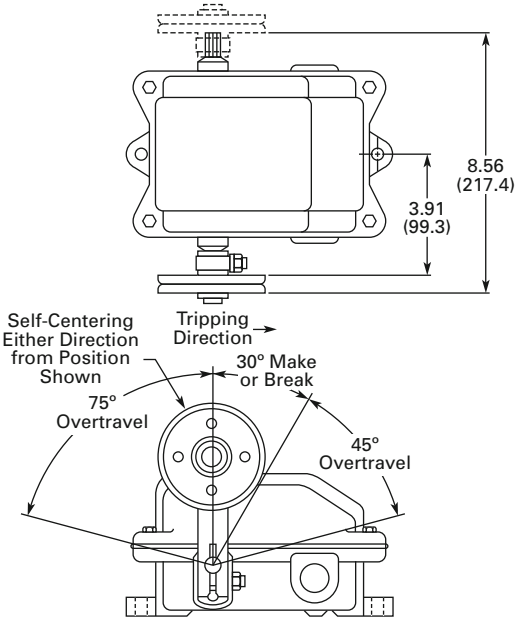
E84 Heavy-Duty Limit Switch with Heavy-Duty Forked Lever

Ship. Wt. — NEMA 4 - 12 Lbs. (5.4 kg)
— NEMA 7/9 - 20 Lbs. (9.1 kg)

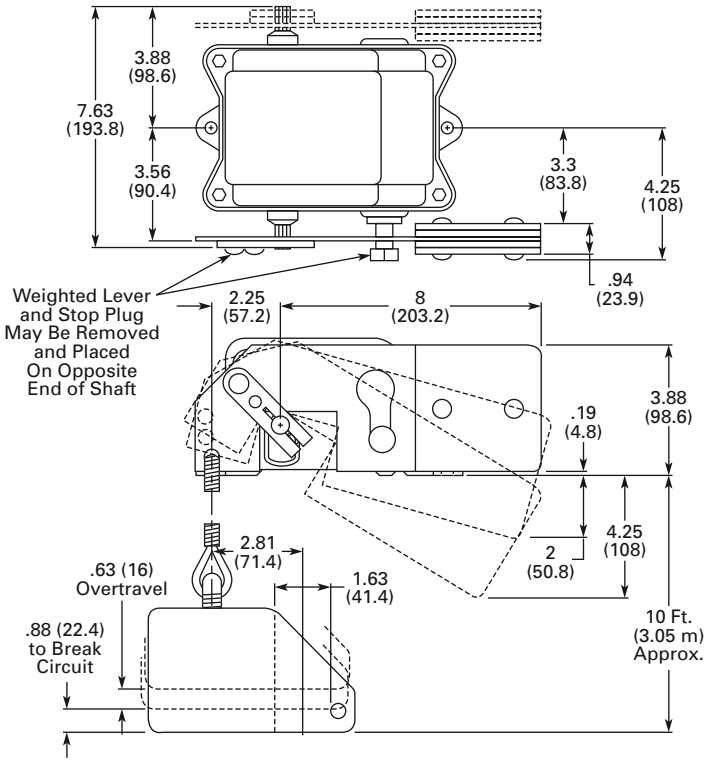
Figure 19. Approximate Dimensions in Inches (mm) and Shipping Weights



E84 Heavy-Duty Limit Switch with Standard Duty Forked Lever
Ship. Wt.— NEMA 4 - 12 Lbs. (5.4 kg)
— NEMA 7/9 - 20 Lbs. (9.1 kg)



E84 Heavy-Duty Limit Switch with Roller Lever
Ship. Wt.— NEMA 4 - 12 Lbs. (5.4 kg)
— NEMA 7/9 - 20 Lbs. (9.1 kg)



E84 Heavy-Duty Limit Switch with Weighted Lever
Ship. Wt.— NEMA 4 - 30 Lbs. (13.6 kg)
— NEMA 7/9 - 80 Lbs. (36.3 kg)
Switch - 6 Lbs. (2.7 kg); Lever - 5 Lbs. (2.3 kg);
Weight - 16 Lbs. (7.3 kg); Cable - 2 Lbs. (.9 kg)

Figure 20. Approximate Dimensions in Inches (mm) and Shipping Weights

Catalog Number Selection

Table 62. Type E84 Limit Switch Catalog Numbering System

E84 A A A 2

Parent Number
E84

Operation Type
A = Spring Return without Lever, NEMA 4
B = Maintained without Lever, NEMA 4
D = Spring Return without Lever, NEMA 7/9
E = Maintained without Lever, NEMA 7/9

Circuit Arrangement
A = 2NO-1NC
B = 1NO-2NC

Lever Type
A = Steel Roller
C = Standard Duty Forked
D = Heavy-Duty Forked
N = None

Mechanical Option
Blank = No Option
2 = Operation in Both Directions — Spring Return Switches Only

Product Selection

Lever Switches

When Ordering Specify

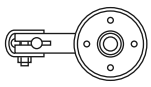
- Catalog Number of basic switch from **Table 63**.
- Catalog Number for lever from **Table 64**, or for switch with lever assembled, change the last digit of the basic switch Catalog Number from **N** to the Suffix Code listed in **Table 64**.
- Add Suffix Number of optional feature. See Options, **Page 35**.

Table 63. Basic Switch Selection — Lever Switches

Operator Type	Circuit Arrangement	Enclosure Type			
		NEMA 4 Cast Aluminum		NEMA 7/9 Cast Iron	
		Catalog Number	*	Catalog Number	*
Spring Return without Lever ①	2NO-1NC ②	**E84AAN**		**E84DAN**	
Maintained Position without Lever ③④	2NO-1NC ②	**E84BAN**		**E84EAN**	

① Contacts change state when lever is moved in one direction only. (See dimension drawings, **Pages 36 – 37**.)
② Circuits are non-overlapping. Field convertible to 2NC-1NO, 3NO or 3NC.
③ Field convertible from spring return type.
④ Suffix **2** option not available with maintained position switches.

Table 64. Operating Lever

Lever Type		Code Suffix Change Last Digit of Listed Catalog Number	Lever Only Catalog Number	*
Steel Roller		**A**	**E84XA**	
Standard Duty Forked		**C**	**E84XC**	
Heavy-Duty Forked		**D**	**E84XD**	

Cross-Reference to Previous Products . . . . . **Page 39**
Dimensions . . . . . **Pages 36, 37**
Discount Symbol **18CD-4**

* Consult Sales Office for Pricing

Hoist Service with Weighted Lever

Hoist Switches

When Ordering Specify

■ Catalog Number for basic switch from **Table 65**.

Table 65. Basic Switch Selection — Hoist Limit

Operator Type	Circuit Arrangement	Enclosure Type			
		NEMA 4 Cast Aluminum		NEMA 7/9 Cast Iron	
		Catalog Number	*	Catalog Number	*
Maintained Position with Weighted Lever Only	2NC-1NO ①	**E84CBF**		**E84FBF**	
Maintained Position with Weighted Lever, Cable and Reset Weight	2NC-1NO ①	**E84CBE**		**E84FBE**	

① Circuits are non-overlapping. Field convertible to 2NO-1NC, 3NO or 3NC.

Cross-Reference to Previous Product

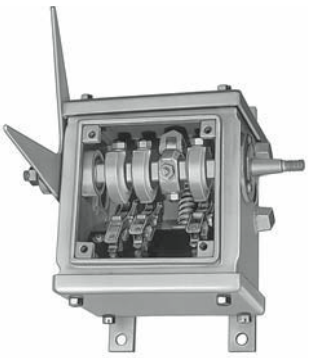
Table 66. Control Limit Switch Cross-Reference

Catalog Number			Catalog Number			Catalog Number		
Old	New		Old	New		Old	New	
	Limit Switch	Operating Lever		Limit Switch	Operating Lever		Limit Switch	Operating Lever
14977H10	**E84AAN**	**E84XA**	14977H27	**E84CBE**	**—**	14977H42	**—**	**E84XC**
14977H11	**E84AAN**	**E84XA**	14977H29	**E84BAN**	**E84XD**	14977H43	**—**	**E84XB**
14977H12	**E84AAN**	**E84XA**	14977H30	**E84BAN**	**E84XD**	14977ED12-2	**E84EAD** w/Overlap	**—**
14977H13	**E84ABA**	**—**	14977H31	**E84BAN**	**E84XD**	14977ED15-5	**E84FAE**	**—**
14977H14	**E84ABA**	**—**	14977H32	**E84EAN**	**E84XD**	14977ED18-1	**E84DAN**	**E84XA**
14977H15	**E84ABA**	**—**	14977H33	**E84AAN**	**—**	14977ED23-1	**E84DAN**	**E84XA**
14977H16	**E84AAN**	**E84XA**	14977H34	**E84AAN**	**—**	14977ED23-2	**E84DBA**	**—**
14977H17	**E84AAN**	**E84XA**	14977H35	**E84AAN**	**—**	14977ED26-1	**E84DAA2**	**—**
14977H18	**E84AAN**	**E84XA**	14977H36	**E84BAN**	**—**	14977ED26-2	**E84DBA2**	**—**
14977H19	**E84BAN**	**E84XC**	14977H37	**E84BAN**	**—**	14977ED26-3	**E84DAA2**	**—**
14977H20	**E84BAN**	**E84XC**	14977H38	**E84BAN**	**—**	14977ED27-2	**E84DBA** w/Overlap	**—**
14977H21	**E84BAN**	**E84XC**	14977H39	**E84EAN**	**—**	14977ED28-1	**E84EBD** w/Overlap	**—**
14977H25	**E84CBE**	**—**	14977H40	**—**	**E84XA**	—	**—**	**—**
14977H26	**E84CBE**	**—**	14977H41	**—**	**E84XD**	—	**—**	**—**

Dimensions..... **Pages 36, 37**
Discount Symbol..... **18CD-4**

* Consult Sales Office for Pricing

High Speed Limit Switches



High Speed Limit Switch with Cover Removed

Product Description

These rugged, heavy-duty limit switches are designed for use in high-speed applications such as crane trolleys, conveyors and similar types of moving machinery. Our High Speed Limit Switches are supplied with three non-overlapping contacts and maintained lever operation. Only the forked lever version is available.

Standards and Certifications

- CMAA 70-5.9.5.
- NEMA ICS2-215.07.
- NEMA ICS2-125.21.02.

Technical Data and Specifications

- Voltage: 600 V maximum, ac or dc.
- Current Rating:
  - 1.25 A at 250 Vdc continuous
- Ambient Temperature: 100°C maximum, operating.
- Operation: Mechanical trip.
- Operating Speeds:
  - 1200 feet per minute

Table 67. 14977 Control Circuit Ratings

Maximum Current Amperes							
ac						dc Inductive	
120 V		240 V		480 V		125 V	250 V
Make	Break	Make	Break	Make	Break	Make	Break
60	6.0	30	3.0	15	1.5	2.2	1.1

Dimensions

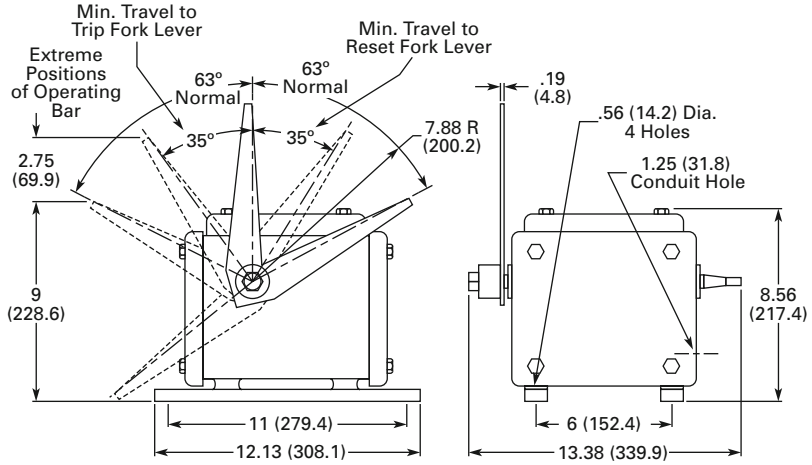


Figure 21. Approximate Dimensions in Inches (mm) and Shipping Weights

Product Selection

When Ordering Specify

- Catalog Number.

Table 68. Type 14977 Direct Acting Limit Switches

Type of Operating Lever	With or without Spring Return	Number of Circuits	NEMA Type Enclosure	Catalog Number	*
1NO-2NC Circuits (Without Overlap)					
Forked Lever 1200 ft./min. Maximum	Without	3	4	**14977H28**	

Discount Symbol **18CD-4**
* Consult Sales Office for Pricing

Lever May Be Installed on Either Side

Product Description

These heavy-duty Foot-Operated Limit Switches are designed for use in mill applications, on moving machinery, or in other heavy-duty applications. They can be used as STOP devices or master switch controls. They are supplied with three contacts without overlap.

Standards and Certifications

- NEMA ICS2-215.07.
- NEMA ICS2-125.21.02.

Technical Data and Specifications

- Voltage: 600 V maximum, ac or dc.
- Current Rating:
  - 1.25 A at 250 Vdc continuous, breaking ratings per **Table 69**.
- Ambient Temperature:
  - 100°C maximum, operating
- Operation: Mechanical, foot-operated.

Table 69. 14953 Control Circuit Ratings

Maximum Current Amperes							
ac						dc Inductive	
120 V		240 V		480 V		125 V	250 V
Make	Break	Make	Break	Make	Break	Make	Break
60	6.0	30	3.0	15	1.5	2.2	1.1

Renewal Parts

Table 70. 14953 Renewal Parts

Description	Part Number
Contact Block Assembly	**83-530-5**

Note: For prices, refer to Eaton's parts distributor or consult factory.

Dimensions

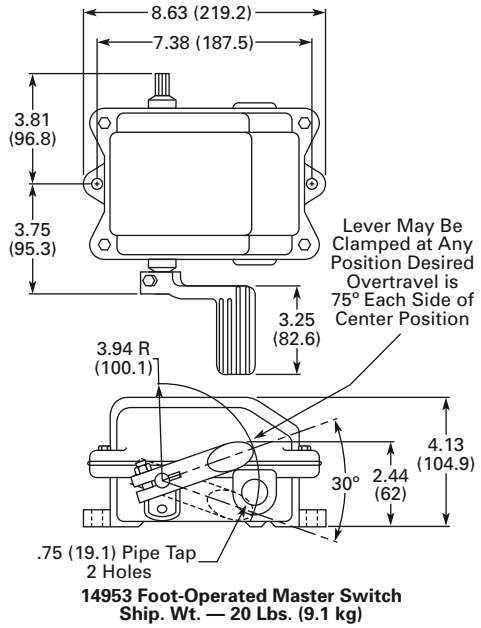


Figure 22. Approximate Dimensions in Inches (mm) and Shipping Weights

Product Selection

When Ordering Specify

- Catalog Number.

Table 71. Type 14953 Foot-Operated Switches

Contact Arrangement	NEMA Type Enclosure	Catalog Number	*
2NO-1NC	7 4	**14953H40** **14953H41**	

Discount Symbol **18CD-4**
* Consult Sales Office for Pricing

Cable-Operated Limit Switch

Product Description

The Cable-Operated Limit Switch is a latched-in type safety switch for use on rubber mills, calendars, tubers and Banburys. A slight movement of the trip lever moves the star wheel to the trip position to cause a quick, positive operation of the contact mechanism.

A manual reset lever is provided, attached directly to the operating shaft at the other side of the switch.

Both the trip and reset levers are arranged for rope operation and are mounted on a serrated shaft that permits mounting in any desired position.

Standards and Certifications

- NEMA ICS2-215.07.
- NEMA ICS2-125.21.02.

Technical Data and Specifications

- Voltage: 600 V maximum, ac or dc.
- Current Rating:
  - 1.25 A at 250 Vdc continuous, breaking ratings per **Table 72**.
- Ambient Temperature:
  - 100°C maximum, operating
- Operation: Mechanical trip.

Table 72. 14957 Control Circuit Ratings

Maximum Current Amperes							
ac						dc Inductive	
120 V		240 V		480 V		125 V	250 V
Make	Break	Make	Break	Make	Break	Make	Break
60	6.0	30	3.0	15	1.5	2.2	1.1

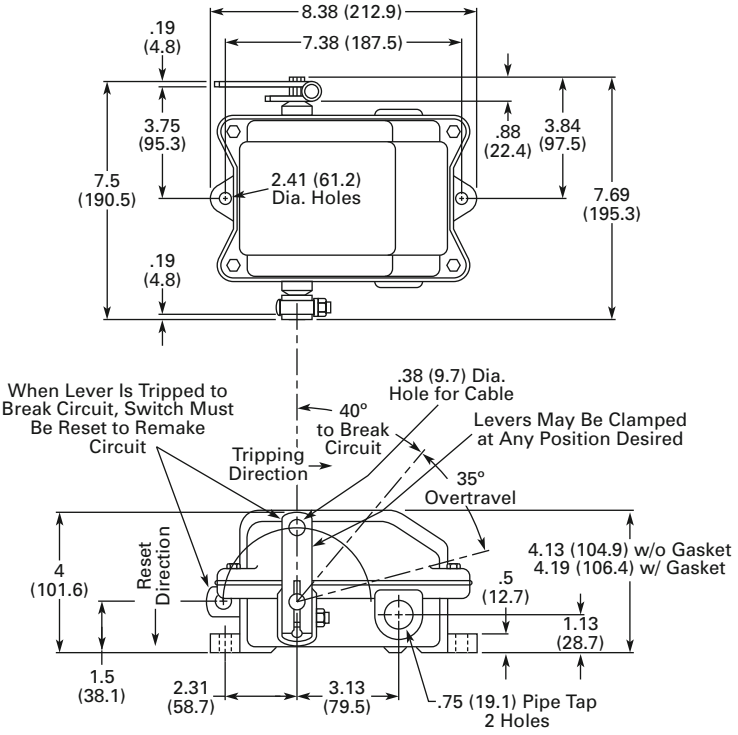
Renewal Parts

Table 73. 14957 Renewal Parts

Description	Part Number
Contact Block Assembly	**83-530-5**

Note: For prices, refer to Eaton's parts distributor or consult factory.

Dimensions



14957 Heavy-Duty Limit Switch
Cable Operated
Ship. Wt. — 20 Lbs. (9.1 kg)

Figure 23. Approximate Dimensions in Inches (mm) and Shipping Weights

Product Selection

When Ordering Specify

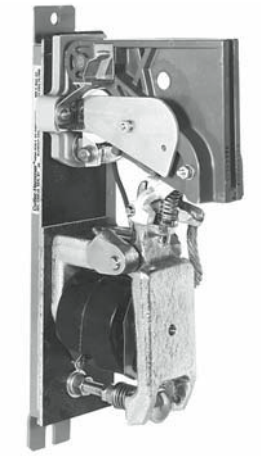
- Catalog Number.

Table 74. Type 14957 Cable-Operated Safety Switches

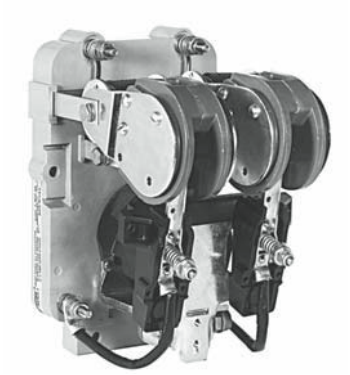
Number of Poles	Contact Arrangement	NEMA Type Enclosure	Catalog Number	*
3	2NC, 1NO without Overlap	12	**14957H9**	
3	2NC, 1NO without Overlap	7	**14957H8**	

Discount Symbol **18CD-4**

* Consult Sales Office for Pricing



Cat. No. C80FJ421N00
Size 4 — NC Contactor



Cat. No. C80DG221N00
Size 2 — 2 Pole Contactor

Product Description

These dc mill type contactors are designed for heavy industry service and are suitable for use on moving machinery. The contactors listed in this section are for surface mounting on steel panels and front-of-panel wiring. The power stud assembly is mounted on the side of the contactor, rather than as part of a separate mounting kit.

These contactors utilize dc coils. If control power is 120 Vac, the rectifier module listed on **Page 44** should be used in conjunction with a 100 V coil contactor.

Auxiliary contacts and mechanical interlocks for use with these contactors are listed on the following pages.

The contactors feature forged steel armature levers and magnet frames for superior physical strength. Self-lubricating bearings eliminate the need for lubricating the contactor. Hot-molded arc chute assemblies contain no asbestos and have better arc extinction characteristics for longer contact life. The short stroke armature results in a mechanical life of more than 20 million operations.

The arc chutes and magnetic blowout structures are designed to quickly absorb and dissipate the heat caused by arcing. In addition to increasing contact life, the molded arc chute offers advantages of improved mechanical life and cooling characteristics plus superior arc-tracking resistance. The arc chutes are hinged to provide front accessibility, easy inspection or replacement of contacts without removing any other contactor parts.

Construction of the pivot pin assembly provides positive pin locking so that the bearing pin remains stationary with respect to the operating movement of the forged armature.

A leaf spring attached to the unit base and the arc chute holds the chute in the "down" or functioning position. The addition of this assembly resists the violent vibrations encountered on open hearth charging machines and on a wide variety of crane applications.

Pre-drilled mounting holes are provided on the unit base to accommodate interlock mounting brackets. An interlock is merely attached to a bracket and the assembly is then bolted in the desired operating position on the contactor.

DC Drive Service Contactors

Eaton's Cutler-Hammer industrial type contactors modified for dc drive service are provided with silver faced contact tips, to provide optimum contact structure and minimum maintenance under continuous duty service. These contactors are designed for steel panel surface mounting.

Power studs are a part of the contact or assembly.

Standards and Certifications

- CMAA 5.6.6-2.
- NEMA ICS3-441, 442, 443.
- NEMA ICS2-331.23.
- NEMA ICS2-110.05.02.
- NEMA ICS2-125.21.02.

Technical Data and Specifications

- Current Range: 5 to 1800 amperes.
- Voltage: 600 Vdc.
- Operation: Magnetic.
- Mounting: Steel Panel.
- Mechanical Life: 20 million operations.
- Electrical Life: 500,000 operations.
- Interlock Ratings:
  - 10 amperes continuous
  - 2.2 amperes inductive breaking at 115 V
  - 1.1 amperes inductive breaking at 230 V
- Duty:
  - Continuous (for intermittent ratings consult factory)

Table 75. Coil Ampere Data

NEMA Size	No. of Poles	100 Vdc Coil	115 Vdc Coil	230 Vdc Coil
2	1NO 2NO	.288 .339	.263 .274	.125 .140
3	1NO 1NC	.268 .339	.235 .274	.112 .140
4	1NO 1NC	.268 .339	.235 .274	.112 .140
5	1NO 1NC	.433 .424	.391 .329	.187 .164
6	1NO 1NC	.450 1.832/ .597 ①	.365 1.337/ .485 ①	.200 .714/ .267 ①
6A	1NO	.450	.365	.200
8	1NO	.787 ②	.757 ②	.438 ②

① Inrush/sealed current.
② Coil used with series resistor.

Options

Other Options Available

- Silver Faced Contact Tips:
  - Can be supplied in place of standard contact tips

    Note: Use silver tips for non-arcing or long (8 hour) extended continuous current applications.
- Special Voltage Coils:
  - Coils with dc voltage ratings other than those listed are available
- 1800 Ampere Contactors:
  - Size 8 A (not a NEMA size) contactors are also available
- Consult factory for pricing.

Accessories

Auxiliary Contacts

Table 76. Mounting Kits for Auxiliary Contacts

Separate for Field Installation							Factory Installed	
For Size and Type of Contactor		Location of Auxiliary Contacts on Contactor and Number of Units Kit Will Mount		Maximum Number of Units Acceptable per Contactor	Mounting Kit Catalog Number	*	Suffix Code Letter for Factory Installation	Adder *
NEMA Size	Contactor Power Pole Configuration	Location	No. of Units					
2	1NO	Bottom — Right and Left	2	2	**10923H11**		**B**	
	1NO or 1NO Ltl	Side — Right or Left	1	1	**10923H12**		**A**	
	2NO	Bottom — Right and Left	1	2	**10923H14**		**B**	
		Side — Left	1	2	**10923H15**		**A**	
		Side — Right	1	2	**10923H16**		**A**	
	2NO-1NC	Side — Left	1	2	**10923H15**		**A**	
		Side — Right	1	2	**10923H16**		**A**	
3, 4 and 5	1NO	Bottom — Right and Left	2	2	**10923H19**		**B**	
		Bottom — Left Only	1	1	**10923H38**		**B**	
	1NO Ltl or 1NC	Bottom — Right	1	1	**10923H20**		**B**	
6, 6A, 8 and 8A	1NO	Bottom — Right and Left	2	2	**10923H19**		**B**	
		Bottom — Left Only	1	1	**10923H38**		**B**	
	1NO Ltl	Bottom — Right	1	1	**10923H20**		**B**	
	1NC	Bottom — Right	1	1	①		**—**	

① 10923H19 supplied with contactor as standard. No charge.

Table 77. Auxiliary Contacts — without Mounting Kit All Sizes Bottom Mounted

Separate for Field Installation			Factory Installed			
Contact Configuration	Catalog Number	*	Suffix Code LH Position	Adder *	Suffix Code RH Position	Adder *
None	**—**		**0**		**0**	
1NO	**10923H1**		**1**		**1**	
2NO	**10923H2**		**2**		**2**	
1NO-1NC	**10923H3**		**3**		**3**	
1NC	**10923H4**		**4**		**4**	
2NC	**10923H5**		**5**		**5**	

Table 78. Auxiliary Contacts — without Mounting Kit Size 2 Side Mount Only

Separate for Field Installation			Factory Installed			
Contact Configuration	Catalog Number	*	Suffix Code LH Position	Adder *	Suffix Code RH Position	Adder *
None	**—**		**0**		**0**	
1NO	**10923H6**		**1**		**1**	
2NO	**10923H7**		**2**		**2**	
1NO-1NC	**10923H8**		**3**		**3**	
1NC	**10923H9**		**4**		**4**	

Rectifiers

Table 79. Rectifier Module

Description	Contactor Size	Catalog Number	*
120 Vac Input 100 Vdc Output 3.5 Amps	All	**C81EB**	

Discount Symbol **18CD-4**

* Consult Sales Office for Pricing

Mounting Kits and Mechanical Interlocks

Table 80. Contactor Mounting Kits ① and Mechanical Interlocks

NEMA Size	No. of Poles	Type of Mounting	For Metal Panels	
			Catalog Number	*
Mounting Kits				
3, 4	1	Surface, Front-of-Panel Wiring Elevated, Front-of-Panel Wiring	**C81AEA11** **C81AEA13**	
5	1	Surface, Front-of-Panel Wiring Elevated, Front-of-Panel Wiring	**C81AGA11** **C81AGA13**	
6, 6A	1	Surface, Front-of-Panel Wiring Elevated, Front-of-Panel Wiring	**C81AJA11** **C81AJA13**	
8, 8A	1	Surface, Front-of-Panel Wiring Elevated, Front-of-Panel Wiring	**C81ALA11** **C81ALA13**	
Mechanical Interlocks				
2	1 2 3	Surface	**C81DDA11** **C81DDA12** **C81DDA13**	
3, 4	1	Surface Elevated	**C81DEA11** **C81DEA21**	
5	1	Surface Elevated	**C81DGA11** **C81DGA21**	
6, 6A	1	Surface Elevated	**C81DJA11** **C81DJA21**	
8, 8A	1	Surface Elevated	**C81DLA11** **C81DLA21**	

① Mounting kits include power studs and stud mounting, as well as contactor mounting hardware, but do not include lugs.

Renewal Parts

Table 81. Renewal Parts ②

Description		Size 2, 1-Pole, 2-Pole 3-Pole and Ltl 25 & 50 Ampere	Size 3, 1-Pole NO, NC and Ltl 100 Ampere	Size 4, 1-Pole NO, NC and Ltl 150 Ampere	Size 5, 1-Pole NO, NC and Ltl 300 Ampere	Size 6, 1-Pole NO, NC and Ltl 600 Ampere	Size 6A, 1-Pole NO, NC and Ltl 810 Ampere	Size 8, 1-Pole NO 1350 Ampere
		Part Number	Part Number	Part Number	Part Number	Part Number	Part Number	Part Number
Set of Contacts								
1-Pole Copper		**6-599**	**6-189**	**6-189**	**6-189-3**	**6-189-4**	**6-189-4**	**6-215**
1-Pole Silver		**—**	**6-189-5**	**6-189-5**	**6-189-7**	**6-189-8**	**6-189-8**	**6-215-2**
2-Pole Copper		**6-169-4**	**—**	**—**	**—**	**—**	**—**	**—**
3-Pole Copper		**6-169-5**	**—**	**—**	**—**	**—**	**—**	**—**
Arc Shield								
Right-Hand		**73-2676-2**	**62-791**	**62-791**	**62-793**	**62-840**	**62-840**	**62-804**
Left-Hand		**73-2676**	**62-791-2**	**62-791-2**	**62-793-2**	**62-840-2**	**62-840-2**	**62-804**
Coils								
1-Pole NO	100 V	**9-1549-18**	**9-1583-15**	**9-1583-15**	**9-1589-10**	**9-1688-8**	**9-1688-8**	**9-547-7** ④
	115 V	**9-1549-2**	**9-1583-2**	**9-1583-2**	**9-1589-2**	**9-1688-2**	**9-1688-2**	**9-547-7** ④
	230 V	**9-1549-1**	**9-1583-1**	**9-1583-1**	**9-1589-1**	**9-1688-1**	**9-1688-1**	**9-547-4** ④
1-Pole NC	110 V	**—**	**9-1585-18**	**9-1585-18**	**9-967-13**	**9-1717-4**	**—**	**—**
	115 V	**—**	**9-1585-2**	**9-1585-2**	**9-967-8**	**9-1717-1**	**—**	**—**
	230 V	**—**	**9-1585-1**	**9-1585-1**	**9-967-7**	**9-1717-2**	**—**	**—**
1-Pole Ltl ③	100 V	**9-1549-18**	**9-1583-15**	**9-1583-15**	**9-1589-10**	**9-1688-8**	**—**	**—**
	115 V	**9-1549-2**	**9-1583-2**	**9-1583-2**	**9-1589-2**	**9-1688-2**	**—**	**—**
	230 V	**9-1549-1**	**9-1583-1**	**9-1583-1**	**9-1589-1**	**9-1688-1**	**—**	**—**
2-Pole	100 V	**9-1585-18**	**—**	**—**	**—**	**—**	**—**	**—**
	115 V	**9-1585-2**	**—**	**—**	**—**	**—**	**—**	**—**
	230 V	**9-1585-1**	**—**	**—**	**—**	**—**	**—**	**—**
3-Pole	110 V	**9-1585-18**	**—**	**—**	**—**	**—**	**—**	**—**
	115 V	**9-1585-2**	**—**	**—**	**—**	**—**	**—**	**—**
	230 V	**9-1585-1**	**—**	**—**	**—**	**—**	**—**	**—**

② For prices refer to Eaton's parts distributor or call factory.
③ Magnet closing coil only. If holdout coil is required, give number stamped on coil or advise Bulletin or Serial Number of controller.
④ Series resistor used with coil for voltage shown.

Discount Symbol **18CD-4**
* Consult Sales Office for Pricing

Dimensions

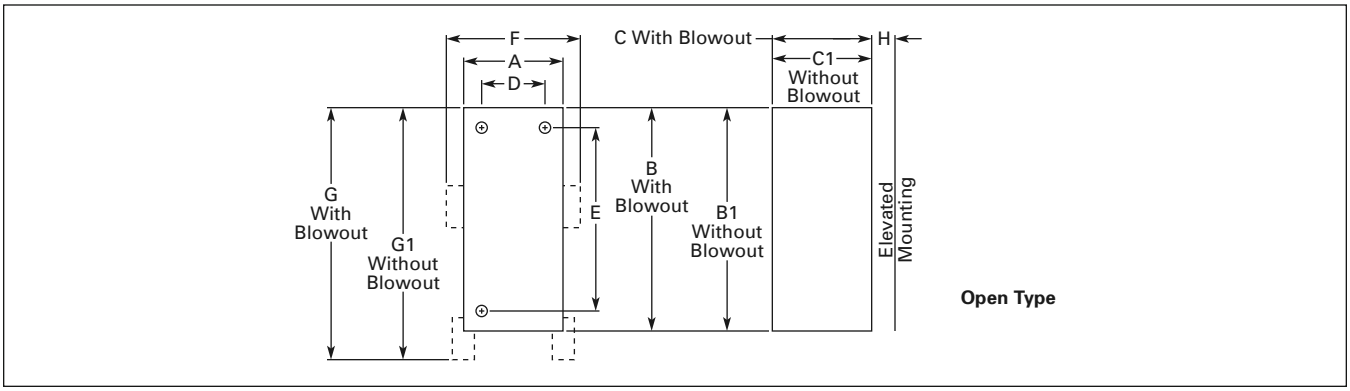


Figure 24. Approximate Dimensions and Shipping Weights

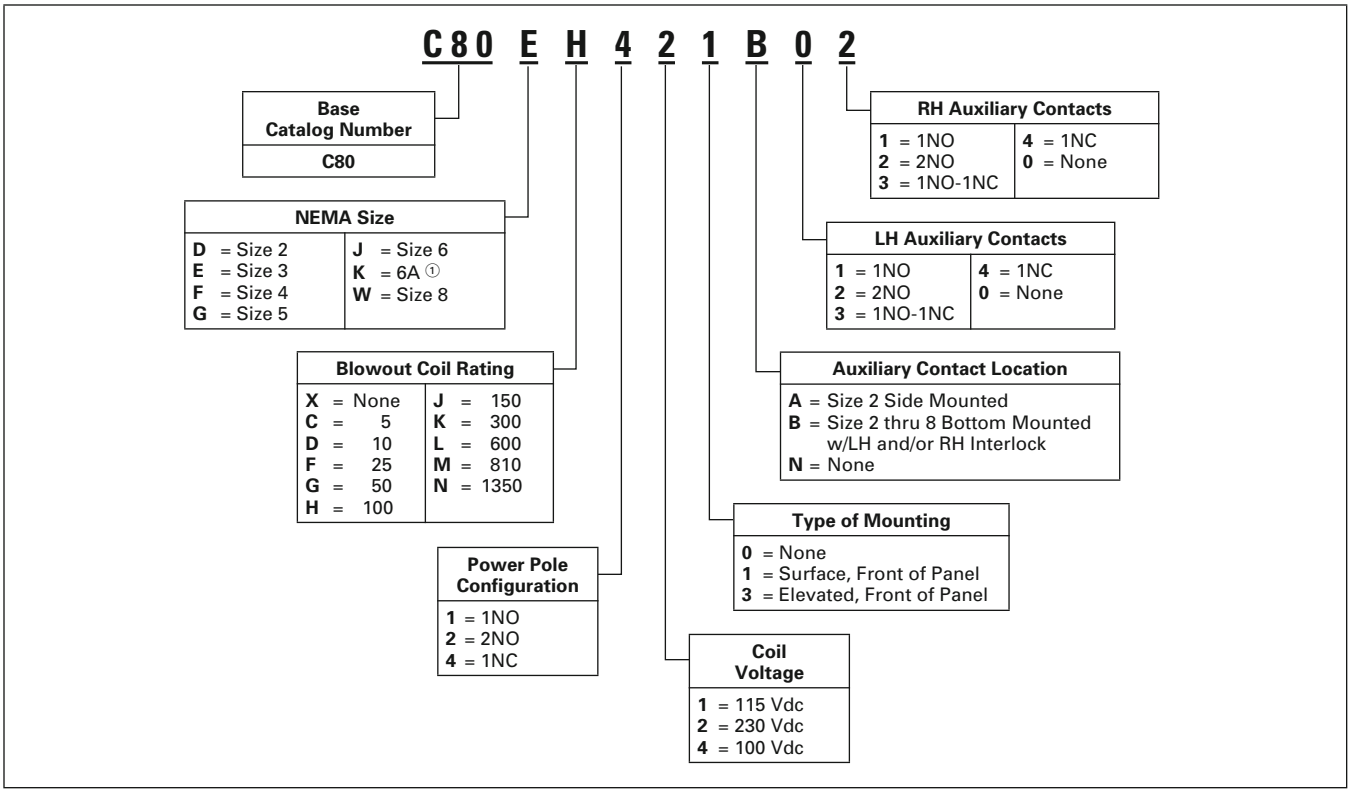
Table 82. Type C80

Size	Poles	Approximate Dimensions in Inches (mm)													Ship. Wt. Lbs. (kg)	Stud Size
		Wide	High		Deep		Mounting		With Auxiliary Contacts			H	Min. Arc Clearance			
		A	B	B1	C	C1	D	E	F	G	G1		250 V	600 V		
Open Type DC Contactors																
2	1NO	3 (76.2)	8.38 (212.9)	6.5 (165.1)	6 (152.4)	5.38 (136.7)	2.25 (57.2)	4.5 (114.3)	7.38 (187.5)	10.88 (276.4)	9.13 (231.9)	—	.59 (15.1)	.91 (23.0)	6 (2.7)	1/4-20
	2NO	5.75 (146.1)	8.88 (225.6)	8.88 (225.6)	6.88 (174.8)	6.5 (165.1)	5 (127.0)	4.63 (117.6)	10.13 (257.3)	11.38 (289.1)	11.38 (289.1)	—	1.19 (30.2)	2.19 (55.6)	10 (4.5)	
	2NO-1NC	5.75 (146.1)	12.63 (320.8)	12.63 (320.8)	6.88 (174.8)	6.5 (165.1)	5 (127.0)	8.38 (212.9)	10.13 (257.3)	—	—	—	1.19 (30.2)	2.19 (55.6)	13 (5.9)	
3, 4	1NO	4.25 (108.0)	12.13 (308.1)	12.13 (308.1)	7.25 (184.2)	6.38 (162.1)	—	11.25 (285.8)	4.5 (114.3)	12.13 (308.1)	12.13 (308.1)	1.63 (41.4)	2.75 ① (69.9)	3.75 ② (95.3)	11 (5)	3/8-16
	1NC	4.25 (108.0)	13.63 (346.2)	13.63 (346.2)	7.25 (184.2)	5.63 (143.0)	—	12.75 (323.9)	5 (127.0)	13.63 (346.2)	13.63 (346.2)	1.63 (41.4)	4.25 ① (108.0)	5.25 ② (133.4)	13 (5.9)	
5	1NO	5.13 (130.3)	16.88 (428.8)	16.88 (428.8)	10 (254.0)	8 (203.2)	1.25 (31.8)	16 (406.4)	5.13 (130.3)	16.88 (428.8)	16.88 (428.8)	1.88 (47.8)	3.5 (88.9)	4.5 (114.3)	26 (12)	1/2-13
	1NC	5.25 (133.4)	18.88 (479.6)	16.88 (428.8)	10 (254.0)	7.5 (190.5)	1.25 (31.8)	18 (457.2)	6.13 (155.7)	18.88 (479.6)	18.88 (479.6)	1.88 (47.8)	3 (76.2)	4 (101.6)	34 (15)	
6	1NO	7.13 (181.1)	18.75 (476.3)	16.88 (428.8)	12.25 (311.2)	9.5 (241.3)	1.25 (31.8)	17.5 (444.5)	7.13 (181.1)	18.75 (476.3)	18.75 (476.3)	1.88 (47.8)	5.5 (139.7)	5.5 (139.7)	43 (20)	3/4-12
	1NC	7.25 (184.2)	22.88 (581.2)	18.88 (479.6)	12.25 (311.2)	9.88 (251.0)	1.25 (31.8)	22 (558.8)	7.25 (184.2)	22.88 (581.2)	22.88 (581.2)	1.88 (47.8)	5.5 (139.7)	5.5 (139.7)	66 (30)	
6A	1NO	7.63 (193.8)	18.75 (476.3)	18.75 (476.3)	12.25 (311.2)	9.5 (241.3)	1.25 (31.8)	17.5 (444.5)	7.63 (193.8)	18.75 (476.3)	18.75 (476.3)	1.88 (47.8)	5.5 (139.7)	5.5 (139.7)	45 (20)	3/4-12
8, 8A	1NO	9.5 (241.3)	24 (609.6)	22.5 (571.5)	17 (431.8)	14.88 (378.0)	7 (177.8)	10 (254.0)	9.5 (241.3)	24 (609.6)	24 (609.6)	2 (50.8)	8 (203.2)	10 (254.0)	130 (59)	1/2 hole
Definite Purpose Contactors																
260A	1NO	4.25 (108.0)	12.13 (308.1)	12.13 (308.1)	7.25 (184.2)	6.38 (162.1)	—	11.25 (285.8)	4.5 (114.3)	12.13 (308.1)	12.13 (308.1)	1.63 (41.4)	2.5 (63.5)	3.5 (88.9)	11 (5)	3/8-16
	1NC	4.25 (108.0)	13.63 (346.2)	13.63 (346.2)	7.25 (184.2)	5.63 (143.0)	—	12.75 (323.9)	5 (127.0)	13.63 (346.2)	13.63 (346.2)	1.63 (41.4)	2.5 (63.5)	3.5 (88.9)	13 (5.9)	
480A	1NO	5.13 (130.3)	16.88 (428.8)	16.88 (428.8)	10 (254.0)	8 (203.2)	1.25 (31.8)	16 (406.4)	5.13 (130.3)	16.88 (428.8)	16.88 (428.8)	1.88 (47.8)	3 (76.2)	4 (101.6)	26 (12)	1/2-13
	1NC	5.25 (133.4)	18.88 (479.6)	16.88 (428.8)	10 (254.0)	7.5 (190.5)	1.25 (31.8)	18 (457.2)	6.13 (155.7)	18.88 (479.6)	18.88 (479.6)	1.88 (47.8)	3 (76.2)	4 (101.6)	34 (15)	
960A	1NO	7.63 (193.8)	18.75 (476.3)	18.75 (476.3)	12.25 (311.2)	9.5 (241.3)	1.25 (31.8)	17.5 (444.5)	7.63 (193.8)	18.75 (476.3)	18.75 (476.3)	1.88 (47.8)	5.5 (139.7)	5.5 (139.7)	45 (20)	3/4-12

① May be reduced to 2.5 (63.5) for Size 3.
② May be reduced to 3.5 (88.9) for Size 3.

Catalog Number Selection

Table 83. DC Contactor Catalog Numbering System



① Not an actual NEMA size.

Product Selection

When Ordering

- Select complete Catalog Number from **Tables 84**, **85** or **86** below. If contactor is to include factory assembled auxiliary contacts, change **N00** Suffix to correct Suffix letter and digits from **Tables 76** and **77** on **Page 44**.

Example: Catalog Number for elevated Size 3 NO contactor, 230 Vdc coil with 2NO auxiliary contact bottom mounted on RH side of contactor is C80EH123**B02**.

DC Contactors

Table 84. Surface Mounted DC Contactors w/o Auxiliary Contacts

NEMA Size	Number of Poles	Blowout Coil Ampere	Catalog Number			*
			100 Vdc Coil	115 Vdc Coil	230 Vdc Coil	
2	1NO	None	C80DX141N00	C80DX111N00	C80DX121N00	
		5	C80DC141N00	C80DC111N00	C80DC121N00	
		10	C80DD141N00	C80DD111N00	C80DD121N00	
		25	C80DF141N00	C80DF111N00	C80DF121N00	
		50	C80DG141N00	C80DG111N00	C80DG121N00	
	2NO	None	C80DX241N00	C80DX211N00	C80DX221N00	
		5	C80DC241N00	C80DC211N00	C80DC221N00	
		10	C80DD241N00	C80DD211N00	C80DD221N00	
		25	C80DF241N00	C80DF211N00	C80DF221N00	
		50	C80DG241N00	C80DG211N00	C80DG221N00	
3	1NO	100	C80EH141N00	C80EH111N00	C80EH121N00	
	1NC	100	C80EH441N00	C80EH411N00	C80EH421N00	
4	1NO	150	C80FJ141N00	C80FJ111N00	C80FJ121N00	
	1NC	150	C80FJ441N00	C80FJ411N00	C80FJ421N00	
5	1NO	300	C80GK141N00	G80GK111N00	C80GK121N00	
	1NC	300	C80GK441N00	C80GK411N00	C80GK421N00	
6	1NO	600	C80JL141N00	C80JL111N00	C80JL121N00	
	1NC	600	C80JL441N00	C80JL411N00	C80JL421N00	
6A ①	1NO	810	C80KM141N00	C80KM111N00	C80KM121N00	
8	1NO	1350	C80WN141N00	C80WN111N00	C80WN121N00	

① Not a NEMA size.

Table 85. Elevated Mounted DC Contactors w/o Auxiliary Contacts

NEMA Size	Number of Poles	Blowout Coil Ampere	Catalog Number			*
			100 Vdc Coil	115 Vdc Coil	230 Vdc Coil	
3	1NO	100	C80EH143N00	C80EH113N00	C80EH123N00	
	1NC	100	C80EH443N00	C80EH413N00	C80EH423N00	
4	1NO	150	C80FJ143N00	C80FJ113N00	C80FJ123N00	
	1NC	150	C80FJ443N00	C80FJ413N00	C80FJ423N00	
5	1NO	300	C80GK143N00	G80GK113N00	C80GK123N00	
	1NC	300	C80GK443N00	C80GK413N00	C80GK423N00	
6	1NO	600	C80JL143N00	C80JL113N00	C80JL123N00	
	1NC	600	C80JL443N00	C80JL413N00	C80JL423N00	
6A ②	1NO	810	C80KM143N00	C80KM113N00	C80KM123N00	
8	1NO	1350	C80WN143N00	C80WN113N00	C80WN123N00	

② Not a NEMA size.

DC Drive Service Contactors

Table 86. Surface Mounted DP Drive Service Contactors w/o Auxiliary Contacts

Number of Poles	Ampere Rating	Catalog Number 100 Vdc Coil	* ③
1NO	260	C80RK141N00	
1NC	260	C80RK441N00	
1NO	480	C80SL141N00	
1NC	480	C80SL441N00	
1NO	960	C80TM141N00	

③ Discount Symbol **18CD-4**.

Options. . . . . **Page 44**
Accessories . . . . . **Page 44**
Dimensions . . . . . **Page 46**
Cross-Reference to
Previous Numbers. . . . . **Pages 49 – 52**
Discount Symbol **18CD-1**

* Consult Sales Office for Pricing

Cross-Reference to Previous Numbers

Table 87. Old Catalog Numbering System

6002H452 B 103 C 3

Base Catalog Number
6002H452

Revision Code
A, B or **C**

Coil Voltage
100 = 100 Vdc
101 = 115 Vdc
103 = 230 Vdc
109 = 550 Vdc

Electrical Interlocks
See **Tables 88, 89** and **90.**

Mounting and Latch Options

Suffix Code	Type of Panel	Application
A	—	No Mounting Material
H	Metal	Elevated — Front Connected — Dead Back
C	Metal	Surface Mounted — Front Connected — Dead Back
D	Metal	Surface Mounted — Rear Connected
E	Insulated Material	Elevated — Front Connected
F	Insulated Material	Surface Mounted — Front Connected
G	Insulated Material	Surface Mounted — Rear Connected
–	—	Size 2 Only — without Latch
X	—	Size 2 Only — with Latch

Table 88. Electrical Interlock and/or Pneumatic Timing Interlock Assemblies

Description	Location		Mounting Plate	Circuit	Index Number	Number Required	Mounting Plate and Driver		Handling Suffix Number		
							Index Number	Number Required	Size 3	Size 4, 5 6 & 6A	Size 8 & 8A
NO (Normally Open) Contactors	Without Interlock		None	—	**—**	—	**—**	—	**1**	**1**	**1**
	Unit Electrical Interlocks Only										
	Bottom Mounted	LH & RH	Full	4NO	**10923H2A**	2	**10923H19A**	1	**3**	**3**	**3**
		LH	Full	2NO	**10923H2A**	1	**10923H38A**	1	**19**	**17**	**17**
	Unit Electrical Interlocks and Pneumatic Timing Interlocks ①										
	Bottom Mounted	LH RH	Full	2NO 1TC & 1TO	**10923H2A** **10923H25B** (ON Delay)	1 1	**10923H19A**	1	**13**	**11**	**—**
		LH RH	Full	2NO 1IO & 1IC	**10923H2A** **10923H26B** (OFF Delay)	1 1	**10923H19A**	1	**14**	**12**	**—**
	Pneumatic Timing Interlocks Only ①										
	Bottom Mounted	RH RH	Full Full	1TC & 1TO 1IO & 1IC	**10923H25B** **10923H26B** (ON Delay)	1 1	**10923H38A** **10923H38A**	1 1	**20** **21**	**18** **19**	**—** **19**

① Pneumatic interlocks are no longer available. Use C84 in-line timers as replacements. Consult factory for details.

Table 89. Size 2 DC Contactors, Unit Electrical Interlock and/or Pneumatic Timing Interlock

Description	Location		Mounting Plate	Circuit	Index Number	Number Required	Mounting Plate and Driver		Handling Suffix Number
							Index Number	Number Required	
Size 2 1NO (Normally Open) Contactor	Without Interlock	—	—	—	**—**	—	**—**	—	**1**
	Unit Electrical Interlocks Only								
	Bottom Mounted (Pre-wired)	LH	Full	2NO	**10923H2A**	1	**10923H11A**	1	**2**
		LH & RH	Full	4NO	**10923H2A**	2	**10923H11A**	1	**3**
		LH	Half	2NO	**10923H2A**	1	**10923H17A**	1	**4**
		RH	Half	2NO	**10923H2A**	1	**10923H17A**	1	**5**
	Side Mount	LH	—	2NO	**10923H7A**	1	**10923H12A**	1	**6**
		RH	—	2NO	**10923H7A**	1	**10923H12A**	1	**7**
		LH & RH	—	4NO	**10923H7A**	2	**10923H12A**	2	**8**
	Unit Electrical Interlocks and Pneumatic Timing Interlocks ①								
	Bottom Mounted Only	RH	Full	2NO	**10923H2A**	1	**10923H11A**	1	**15**
		LH	Full	1TC & 1TO	**10923H24B** (ON Delay)	1	**10923H11A**	1	**15**
		RH	Full	2NO	**10923H2A**	1	**10923H11A**	1	**16**
		LH	Full	1IO & 1IC	**10923H24B** (OFF Delay)	1	**10923H11A**	1	**16**
	Pneumatic Timing Interlocks Only ①								
		LH	Full	1TC & 1TO	**10923H24B** (ON Delay)	1	**10923H11A**	1	**17**
		LH	Full	1IO & 1IC	**10923H26B** (OFF Delay)	1	**10923H11A**	1	**18**
		LH	Full	1TC & 1TO	**10923H24B** (ON Delay)	1	**10923H17A**	1	**19**
		LH	Full	1IO & 1IC	**10923H26B** (OFF Delay)	1	**10923H17A**	1	**20**
Size 2 2NO (Normally Open) Contactor	Without Interlock	—	—	—	**—**	—	**—**	—	**1**
	Unit Electrical Interlocks								
	Bottom (Pre-wired)	LH	Full	2NO	**10923H2A**	1	**10923H14A**	1	**2**
		LH & RH	Full	4NO	**10923H2A**	2	**10923H14A**	1	**3**
	Side Mount	LH	—	2NO	**10923H7A**	1	**10923H15A**	1	**4**
		RH	—	2NO	**10923H7A**	1	**10923H16A**	1	**5**
		LH & RH	—	4NO	**10923H7A**	2	**10923H15A** **10923H16A**	1 1	**6**
Size 2 2NO-1NC Contactor	Without Interlock	None	—	—	**—**	—	**—**	—	**11**
	Unit Electrical Interlocks								
	Side Mount	LH	—	2NO	**10923H7A**	1	**10923H15A**	1	**2**
		RH	—	2NO	**10923H7A**	1	**10923H15A**	1	**3**
		LH & RH	—	4NO	**10923H7A**	2	**10923H15A** **10923H16A**	1 1	**4**

① Pneumatic interlocks are no longer available. Use C84 in-line timers as replacements. Consult factory for details.

Table 90. Electrical and/or Pneumatic Timing Interlock Assemblies

Description	Location		Mounting Plate	Circuit	Index Number	Number Required	Mounting Plate and Driver		Handling Suffix Number		
							Index Number	Number Required	Size 3 and 4	Size 5	Size 6 and 6A
NC (Normally Closed) dc Contactor	Without Interlock		None	—	**—**	—	**—**	—	**1**	**1**	**1**
	Unit Electrical Interlocks Only ②										
	Bottom	RH	Single	2NO	**10923H2A**	1	**10923H20A**	1	**2**	**2**	**2**
	Pneumatic Timing Interlocks Only ②										
	Bottom	RH	Single	1TC & 1TO	**10923H26B** (ON Delay)	1	**10923H30A**	1	**6**	**5**	—
		RH	Single	1IC & 1IC	**10923H31B** (OFF Delay)	1	**10923H30A**	1	**7**	**6**	—

② Pneumatic interlocks are no longer available. Use C84 in-line timers as replacements. Consult the factory for details.

Table 91. Old/New Catalog Number Cross-Reference

Old Number					Replacement Number ①
Description					Catalog Number
Catalog Number	Size	Contact Configuration	Blowout Coil Rating (Amperes)	Enclosure	
6002H331	1	1NO	None	Open	**C80DX121N00**
6002H332	1	1NO	1	Open	**C80DC121N00**
6002H333	1	1NO	2	Open	**C80DC121N00**
6002H334	1	1NO	5	Open	**C80DC121N00**
6002H335	1	1NO	10	Open	**C80DD121N00**
6002H336	1	1NO	25	Open	**C80DF121N00**
6002H337	2	1NO	None	Open	**C80DX121N00**
6002H338	2	1NO	5	Open	**C80DC121N00**
6002H339	2	1NO	10	Open	**C80DD121N00**
6002H340	2	1NO	15	Open	**C80DF121N00**
6002H341	2	1NO	25	Open	**C80DF121N00**
6002H342	2	1NO	50	Open	**C80DG121N00**
6002H343	1	2NO	1	Open	**C80DC221N00**
6002H344	1	2NO	2	Open	**C80DC221N00**
6002H345	1	2NO	5	Open	**C80DC221N00**
6002H346	1	2NO	10	Open	**C80DF221N00**
6002H347	1	2NO	25	Open	**C80DF221N00**
6002H348	2	2NO	5	Open	**C80DC221N00**
6002H349	2	2NO	10	Open	**C80DF221N00**
6002H350	2	2NO	15	Open	**C80DF221N00**
6002H351	2	2NO	25	Open	**C80DF221N00**
6002H352	2	2NO	50	Open	**C80DG221N00**
6002H353	2	2NO-1NC	5 (NO & NC)	Open	**6002H353-103**
6002H354	2	2NO-1NC	10 (NO & NC)	Open	**6002H354-103**
6002H355	2	2NO-1NC	15 (NO & NC)	Open	**6002H355-103**
6002H356	2	2NO-1NC	25 (NO & NC)	Open	**C80DGG32**
6002H357	2	2NO-1NC	50 (NO & NC)	Open	**C80DGG32**
6002H383	1	1NO	None	NEMA 1	Cancelled ②
6002H384	1	1NO	1	NEMA 1	Cancelled ②
6002H385	1	1NO	2	NEMA 1	Cancelled ②
6002H386	1	1NO	5	NEMA 1	Cancelled ②
6002H387	1	1NO	10	NEMA 1	Cancelled ②
6002H388	1	1NO	25	NEMA 1	Cancelled ②
6002H389	2	1NO	None	NEMA 1	Cancelled ②
6002H390	2	1NO	5	NEMA 1	Cancelled ②
6002H391	2	1NO	10	NEMA 1	Cancelled ②
6002H392	2	1NO	15	NEMA 1	Cancelled ②
6002H393	2	1NO	25	NEMA 1	Cancelled ②
6002H394	2	1NO	50	NEMA 1	Cancelled ②
6002H395	1	2NO	1	NEMA 1	Cancelled ②
6002H396	1	2NO	2	NEMA 1	Cancelled ②
6002H397	1	2NO	5	NEMA 1	Cancelled ②
6002H398	1	2NO	10	NEMA 1	Cancelled ②
6002H399	1	2NO	25	NEMA 1	Cancelled ②
6002H400	2	2NO	5	NEMA 1	Cancelled ②
6002H401	2	2NO	10	NEMA 1	Cancelled ②
6002H402	2	2NO	15	NEMA 1	Cancelled ②
6002H403	2	2NO	25	NEMA 1	Cancelled ②
6002H404	2	2NO	50	NEMA 1	Cancelled ②
6002H405	2	2NO-1NC	5 (NO & NC)	NEMA 1	Cancelled ②
6002H406	2	2NO-1NC	10 (NO & NC)	NEMA 1	Cancelled ②
6002H407	2	2NO-1NC	15 (NO & NC)	NEMA 1	Cancelled ②
6002H408	2	2NO-1NC	25 (NO & NC)	NEMA 1	Cancelled ②
6002H409	2	2NO-1NC	50 (NO & NC)	NEMA 1	Cancelled ②
6002H410	3	1NO	None	Open	**6002H410-103**
6002H411	3	1NO	5	Open	**6002H411-103**
6002H412	3	1NO	10	Open	**6002H412-103**
6002H413	3	1NO	25	Open	**6002H413-103**
6002H414	3	1NO	50	Open	**6002H414-103**
6002H415	3	1NO	100	Open	**C80EH121**
6002H416	3	1NO	None	NEMA 1	Cancelled ②
6002H417	3	1NO	5	NEMA 1	Cancelled ②
6002H418	3	1NO	10	NEMA 1	Cancelled ②

① Catalog Numbers and prices listed for C80 devices include surface mounting kit and 240 Vdc coil. For C80 and C81 prices, see **Pages 44, 45** and **48**.

Table 91. Old/New Catalog Number Cross-Reference (Continued)

Old Number					Replacement Number ①
Description					Catalog Number
Catalog Number	Size	Contact Configuration	Blowout Coil Rating (Amperes)	Enclosure	
6002H419	3	1NO	25	NEMA 1	Cancelled ②
6002H420	3	1NO	50	NEMA 1	Cancelled ②
6002H421	3	1NO	100	NEMA 1	Cancelled ②
6002H440	3	1NC	None	Open	**6002H440-103**
6002H441	3	1NC	5	Open	**6002H441-103**
6002H442	3	1NC	10	Open	**6002H442-103**
6002H443	3	1NC	25	Open	**6002H443-103**
6002H444	3	1NC	50	Open	**C80EH421N00**
6002H445	3	1NC	100	Open	**C80EH421N00**
6002H446	3	1NC	None	NEMA 1	Cancelled ②
6002H447	3	1NC	5	NEMA 1	Cancelled ②
6002H448	3	1NC	10	NEMA 1	Cancelled ②
6002H449	3	1NC	25	NEMA 1	Cancelled ②
6002H450	3	1NC	50	NEMA 1	Cancelled ②
6002H451	3	1NC	100	NEMA 1	Cancelled ②
6002H452	4	1NO	None	Open	**C80FX121N00**
6002H453	4	1NO	150	Open	**C80FJ121N00**
6002H454	4	1NO	None	NEMA 1	Cancelled ②
6002H455	4	1NO	150	NEMA 1	Cancelled ②
6002H456	4	1NC	None	Open	**C80FX421**
6002H457	4	1NC	150	Open	**C80FJ421N00**
6002H458	1	2NO	None	Open	**C80DX22N00**
6002H459	2	2NO	None	Open	**C80DX22N00**
6002H460	1	2NO	None	NEMA 1	Cancelled ②
6002H461	2	2NO	None	NEMA 1	Cancelled ②
6002H465	3	Contactor Mounting Kits			**C81AEA11**
6002H466	5	1 P, Surface, Front of Panel,			**C81AGA11**
6002H467	6 & 810 A	for Metal Panel			**C81AJA11**
6002H468	3 & 4	Contactor Mounting Kits			**C81AEA12**
6002H469	5	1 P, Surface, Rear of Panel,			**C81AGA12**
6002H470	6 & 810 A	for Metal Panel			**C81AJA12**
6002H471	3 & 4	Contactor Mounting Kits			**C81AEB13**
6002H472	5	1 P, Elevated, Front of Panel,			**C81AGB13**
6002H473	6 & 810 A	for Insulated Panel			**C81AJB13**
6002H474	3	Contactor Mounting Kits			**C81AEB11**
6002H475	5	1 P, Surface, Front of Panel,			**C81AGB11**
6002H476	6 & 810 A	for Insulated Panel			**C81AJB11**
6002H477	3 & 4	Contactor Mounting Kits			**C81AEB12**
6002H478	5	1 P, Surface, Rear of Panel,			**C81AGB12**
6002H479	6 & 810 A	for Insulated Panel			**C81AJB12**
6002H480	1	2NO-1NC	None	Open	Cancelled
6002H481	1	2NO-1NC	1 (NO & NC)	Open	Cancelled
6002H482	1	2NO-1NC	2 (NO & NC)	Open	Cancelled
6002H483	1	2NO-1NC	5 (NO & NC)	Open	**6002H353-103**
6002H484	1	2NO-1NC	10 (NO & NC)	Open	**6002H354-103**
6002H485	1	2NO-1NC	25 (NO & NC)	Open	**C80DGG32**
6002H486	1	2NO-1NC	None	NEMA 1	Cancelled ②
6002H487	1	2NO-1NC	1 (NO & NC)	NEMA 1	Cancelled ②
6002H488	1	2NO-1NC	2 (NO & NC)	NEMA 1	Cancelled ②
6002H489	1	2NO-1NC	5 (NO & NC)	NEMA 1	Cancelled ②
6002H490	1	2NO-1NC	10 (NO & NC)	NEMA 1	Cancelled ②
6002H491	1	2NO-1NC	25 (NO & NC)	NEMA 1	Cancelled ②
6002H492	1	2NO-1NC	1 (NO)	Open	Cancelled ②
6002H493	1	2NO-1NC	2 (NO)	Open	Cancelled ②
6002H494	1	2NO-1NC	5 (NO)	Open	**6002H502-103**
6002H495	1	2NO-1NC	10 (NO)	Open	**6002H503-103**
6002H496	1	2NO-1NC	25 (NO)	Open	**6002H505-103**
6002H497	1	2NO-1NC	1 (NO)	NEMA 1	Cancelled ②
6002H498	1	2NO-1NC	2 (NO)	NEMA 1	Cancelled ②
6002H499	1	2NO-1NC	5 (NO)	NEMA 1	Cancelled ②
6002H500	1	2NO-1NC	10 (NO)	NEMA 1	Cancelled ②
6002H501	1	2NO-1NC	25 (NO)	NEMA 1	Cancelled ②

② Enclosed contactors no longer available. Select equivalent open contactor. Enclosure by others.

Table 91. Old/New Catalog Number Cross-Reference (Continued)

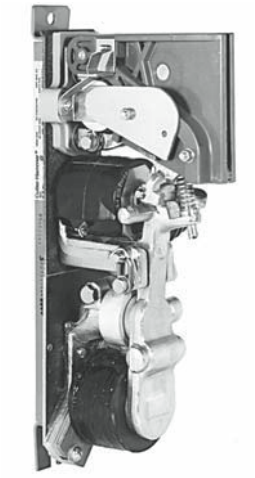
Old Number					Replacement Number ①
Description					Catalog Number
Catalog Number	Size	Contact Configuration	Blowout Coil Rating (Amperes)	Enclosure	
6002H502	2	2NO-1NC	5 (NO)	Open	**6002H502-103**
6002H503	2	2NO-1NC	10 (NO)	Open	**6002H503-103**
6002H504	2	2NO-1NC	15 (NO)	Open	**6002H504-103**
6002H505	2	2NO-1NC	25 (NO)	Open	**6002H505-103**
6002H506	2	2NO-1NC	50 (NO)	Open	**6002H506-103**
6002H507	2	2NO-1NC	5 (NO)	NEMA 1	Cancelled ②
6002H508	2	2NO-1NC	10 (NO)	NEMA 1	Cancelled ②
6002H509	2	2NO-1NC	15 (NO)	NEMA 1	Cancelled ②
6002H510	2	2NO-1NC	25 (NO)	NEMA 1	Cancelled ②
6002H511	2	2NO-1NC	50 (NO)	NEMA 1	Cancelled ②
6002H512	4	1NC	None	NEMA 1	Cancelled ②
6002H513	4	1NC	150	NEMA 1	Cancelled ②
6002H514	5	1NO	None	Open	**6002H514-103**
6002H515	5	1NO	300	Open	**C80GK121N00**
6002H516	5	1NO	None	NEMA 1	Cancelled ②
6002H517	5	1NO	300	NEMA 1	Cancelled ②
6002H518	5	1NC	None	Open	**6002H518-103**
6002H519	5	1NC	300	Open	**C80GK421N00**
6002H520	5	1NC	None	NEMA 1	Cancelled ②
6002H521	5	1NC	300	NEMA 1	Cancelled ②
6002H522	6	1NO	None	Open	**6002H522-103**
6002H523	6	1NO	600	Open	**C80JL121N00**
6002H524	6	1NO	None	NEMA 1	Cancelled ②
6002H525	6	1NO	600	NEMA 1	Cancelled ②
6002H630	4	Contactor Mtg. Kit, 1 P, Surface, Front of Panel, Metal Panel			Cancelled
6002H631	4	Contactor Mtg. Kit, 1 P, Surface, Front of Panel, Insul. Panel			Cancelled
6002H634	1 & 2	Mechanical Interlock, 1NO, Surf., Metal or Insul. Panel			**C81DDA11**
6002H635	1 & 2	Mech. Inter., 2NO or 2NO-1NC, Surface, Metal or Insul. Panel			**C81DDA12**
6002H636	3	Mech. Inter., 1NO, Surface, Metal			**C81DEA11**
6002H637	3	Mech. Inter., 1NO, Elev., Metal			**C81DEA21**
6002H638	3	Mech. Inter., 1NO, Surf., Insul.			Cancelled
6002H639	3	Mech. Inter., 1NO, Elev., Insul.			Cancelled
6002H640	4	Mech. Inter., 1NO, Surf., Metal			Cancelled
6002H641	4	Mech. Inter., 1NO, Elev., Metal			Cancelled
6002H642	4	Mech. Inter., 1NO, Surf., Insul.			Cancelled
6002H643	4	Mech. Inter., 1NO, Elev., Insul.			Cancelled
6002H644	5	Mech. Inter., 1NO, Surf., Metal			**C81DGA11**
6002H645	5	Mech. Inter., 1NO, Elev., Metal			**C81DGA21**
6002H646	5	Mech. Inter., 1NO, Surf., Insul.			Cancelled
6002H647	5	Mech. Inter., 1NO, Elev., Insul.			Cancelled
6002H648	6 & 810A	Mech. Inter., 1NO, Surf., Metal			**C81DJA11**
6002H649	6 & 810A	Mech. Inter., 1NO, Elev., Metal			**C81DJA21**
6002H650	6 & 810A	Mech. Inter., 1NO, Surf., Insul.			Cancelled
6002H651	6 & 810A	Mech. Inter., 1NO, Elev., Insul.			Cancelled
6002H652	Voltage Relay		None	Open	Cancelled
6002H653	Voltage Relay		1	Open	Cancelled
6002H654	Voltage Relay		2	Open	Cancelled
6002H655	Voltage Relay		5	Open	Cancelled
6002H656	Voltage Relay		10	Open	Cancelled
6002H657	Voltage Relay		15	Open	Cancelled
6002H658	Voltage Relay		25	Open	Cancelled
6002H659	Voltage Relay		50	Open	Cancelled
6002H668	6A	1NO	810	Open	**C80KM121N00**
6002H670	6	1NC	None	Open	**6002H670-103**
6002H671	6	1NC	600	Open	**C80JL421N00**
6002H672	6	1NC	None	NEMA 1	Cancelled ②
6002H673	6	1NC	600	NEMA 1	Cancelled ②
6002H701	4	2NO	None	Open	Cancelled

① Catalog Numbers listed for C80 devices include surface mounting kits and 240 Vdc coil. For C80 and C81 prices, see **Pages 44, 45** and **48**.

Table 91. Old/New Catalog Number Cross-Reference (Continued)

Old Number					Replacement Number ①
Description					Catalog Number
Catalog Number	Size	Contact Configuration	Blowout Coil Rating (Amperes)	Enclosure	
6002H702	4	2NO	5	Open	Cancelled
6002H703	4	2NO	10	Open	Cancelled
6002H704	4	2NO	25	Open	Cancelled
6002H705	4	2NO	50	Open	Cancelled
6002H706	4	2NO	100	Open	Cancelled
6002H707	4	2NO	150	Open	Cancelled
6002H708	5	2NO	None	Open	Cancelled
6002H709	5	2NO	300	Open	Cancelled
6002H719	4	2NO	None	NEMA 1	Cancelled
6002H720	4	2NO	5	NEMA 1	Cancelled
6002H721	4	2NO	10	NEMA 1	Cancelled
6002H722	4	2NO	25	NEMA 1	Cancelled
6002H723	4	2NO	50	NEMA 1	Cancelled
6002H724	4	2NO	100	NEMA 1	Cancelled
6002H725	4	2NO	150	NEMA 1	Cancelled
6002H726	5	2NO	None	NEMA 1	Cancelled
6002H727	5	2NO	300	NEMA 1	Cancelled
6002H729	4	Contactor Mounting Kits, 2-Pole Surface, Front of Panel, Metal			Cancelled
6002H730	4	Surface, Rear of Panel, Metal			Cancelled
6002H731	4	Elev., Front of Panel, Metal			Cancelled
6002H732	4	Surface, Rear of Panel, Insul.			Cancelled
6002H733	4	Contactor Mounting Kits, 2-Pole Surface, Rear of Panel, Insul.			Cancelled
6002H735	4	Surface, Front of Panel, Metal			Cancelled
6002H736	5	Surface, Rear of Panel, Metal			Cancelled
6002H737	5	Contactor Mounting Kits, 2-Pole Elev., Front of Panel, Insul.			Cancelled
6002H738	5	Surface, Front of Panel, Insul.			Cancelled
6002H739	5	Surface, Rear of Panel, Insul.			Cancelled
6002H740	3 & 4	Contactor Mounting Kits 1P, Elev., Front of Panel, Metal			**C81AEA13**
6002H741	4	2P, Elev., Front of Panel, Metal			Cancelled
6002H742	5	1P, Elev., Front of Panel, Metal			**C81AGA13**
6002H743	5	2P, Elev., Front of Panel, Metal			Cancelled
6002H744	6 & 810A	1P, Elev., Front of Panel, Metal			**C81AJA13**
6002H747	4	Mech. Inter., 2NO, All Mountings, Metal or Insul. Panel			Cancelled
6002H748	5				Cancelled
6002H749	8 & 8A	Mech. Inter., 1NO, Surf., Metal			**C81DLA11**
6002H750	8 & 8A	Mech. Inter., 1NO, Elev., Metal			**C81DLA21**
6002H751	8 & 8A	Mech. Inter., 1NO, Surf., Insul.			Cancelled
6002H752	8 & 8A	Mech. Inter., 1NO, Elev., Insul.			Cancelled
6002H753	8 & 8A	Contactor Mtg. Kits, 1-Pole Surface, Front of Panel, Insul.			Cancelled
6002H754	8 & 8A	Elev., Front of Panel, Insul.			Cancelled
6002H755	8 & 8A	Surface, Front of Panel, Metal			**C81ALA11**
6002H756	8 & 8A	Elev., Front of Panel, Metal			**C81ALA21**
6002H757	8	1NO	1350	Open	**C80WN121**
6002H758	8	1NO	None	Open	Cancelled
6002H759	8A	1NO	1800	Open	**6002H759-103**
6002H760	8A	1NO	None	Open	Cancelled

② Enclosed contactors no longer available. Select equivalent open contactor. Enclosure by others.



Cat. No. 6006H30
Size 3 dc Ltl Contactor

Product Description

DC Inductive Time Limit (Ltl) Contactors are mill type contactors used for acceleration and plugging functions.

The contactor uses two coils; one a normal closing coil, and the other a holdout coil. When the closing coil is energized, the contactor will not pick up until the magnetism of the holdout coil has decayed sufficiently to permit the contactor to close.

By connection of the holdout coil (H.O.) to various points in control circuits, the Ltl contactor can be used to control acceleration or plugging in hoist and travel panels.

The construction of the arc chute, blowout and power contacts of these contactors is the same as for C80 DC contactors. Contact tips, closing coils, arc chute assemblies, and interlocks are interchangeable between the two types of contactors. Refer to **Page 2** for a description of these features.

Course adjustment of the timing is accomplished by removing shims to vary the air gap of the holdout coil circuit. Fine adjustment is made with a knurled nut at the base of the holdout coil magnet core.

Standards and Certifications

- NEMA ICS3-441, 442, 443.
- NEMA ICS2-331.23.
- NEMA ICS2-110.05.02.
- NEMA ICS2-125.21.02.

Technical Data and Specifications

- Current Range: 5 to 810 amperes.
- Voltage: 600 Vdc.
- Operation:
  - Magnetic, double coil, inductive time limit
- Mounting:
  - Steel Panel with options for insulated panels
- Mechanical Life: 20 million operations.
- Electrical Life: 500,000 operations.
- Interlock Ratings:
  - 10 amperes continuous
  - 2.2 amperes inductive breaking at 115 V
  - 1.1 amperes inductive breaking at 230 V
- Duty:
  - Continuous (for intermittent ratings consult factory)

Table 92. Closing Coil Ampere Data

Size	115 Vdc Coil	230 Vdc Coil
2	.263	.125
3, 4	.235	.112
5	.391	.187
6, 6A	.365	.200

Accessories

See **Pages 44** and **45** for Ltl Contactor Accessories.

Renewal Parts

See **Page 45** for Ltl Renewal Parts.

Dimensions

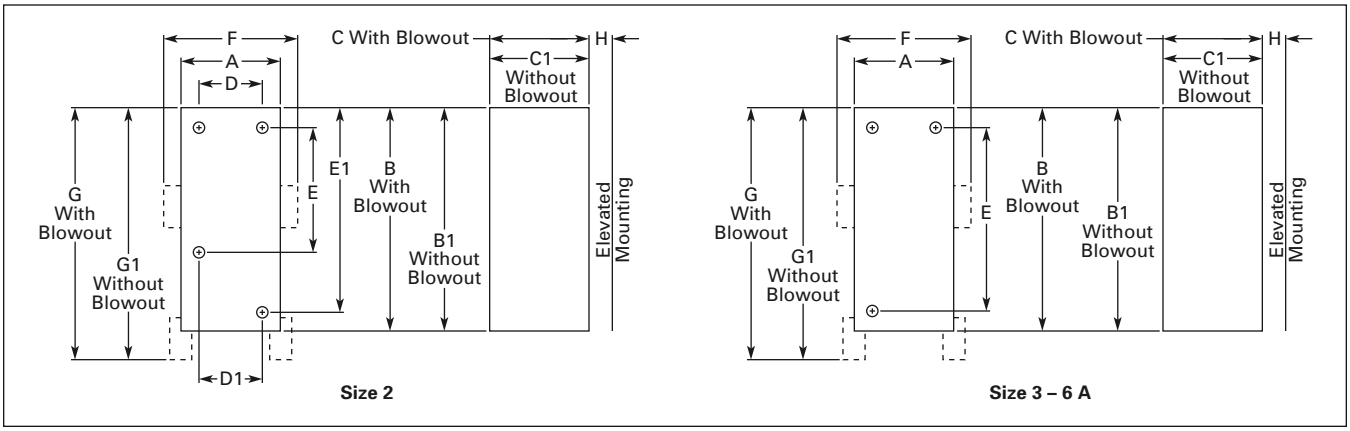


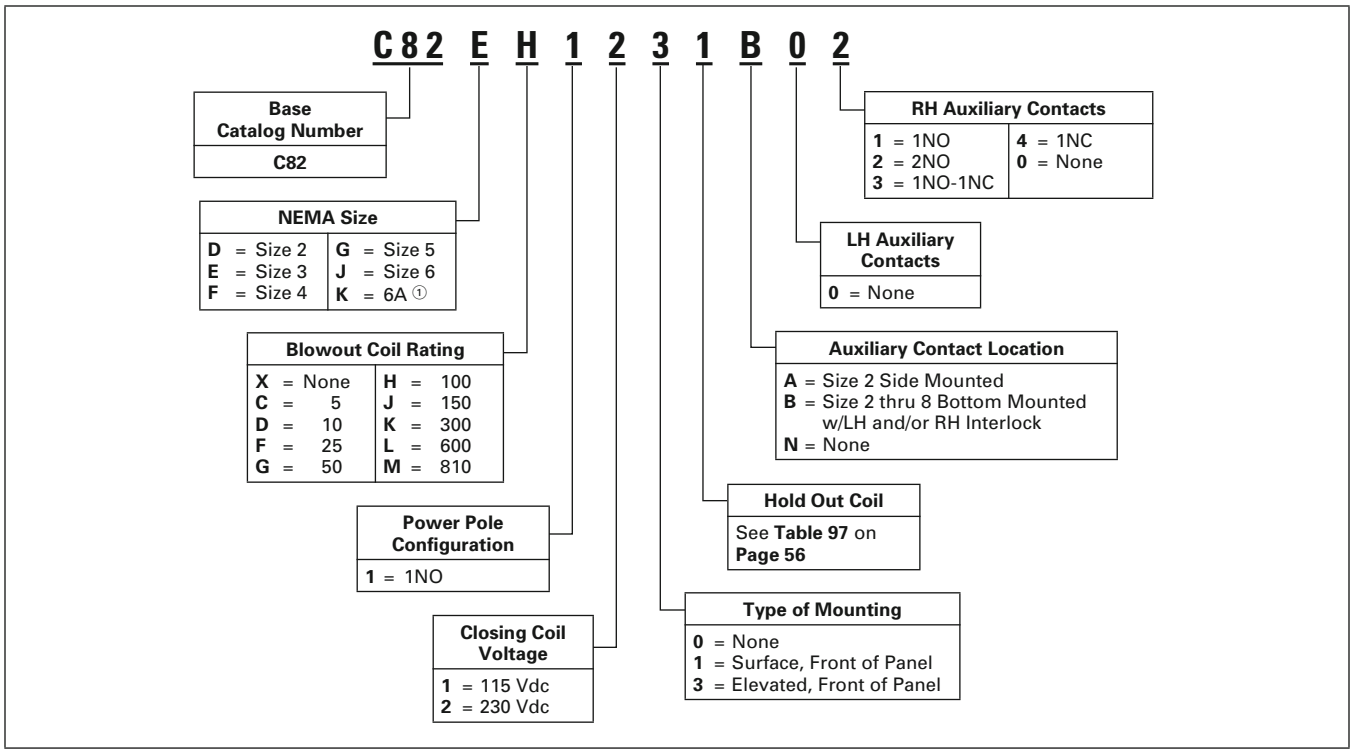
Figure 25. Approximate Dimensions in Inches (mm) and Shipping Weights

Table 93. Approximate Dimensions in Inches (mm) and Shipping Weights

Size	Dimensions in Inches (mm)															Ship. Wt. Lbs. (kg)
	Wide	High		Deep		Mounting				With Auxiliary Contacts			H	Minimum Arc Clearance		
	A	B	B1	C	C1	D	D1	E	E1	F	G	G1		230 V	600 V	
Open Type Ltl Contactors																
2	3.75 (95.3)	13.81 (350.8)	12 (304.8)	5.94 (150.9)	5.31 (134.9)	2.25 (57.2)	1.75 (44.5)	4.5 (114.3)	9.75 (247.7)	7.38 (187.5)	13.81 (350.8)	12 (304.8)	—	1.28 (32.5)	2.28 (57.9)	13 (5.9)
3	4.25 (108.0)	15.13 (384.3)	15.13 (384.3)	7.25 (184.2)	6.38 (162.1)	—	—	14.25 (362.0)	—	5.25 (133.4)	15.13 (384.3)	15.13 (384.3)	1.56 (39.6)	2.5 (63.5)	3.5 (88.9)	17 (7.7)
4	4.25 (108.0)	15.13 (384.3)	15.13 (384.3)	7.25 (184.2)	6.38 (162.1)	—	—	14.25 (362.0))	—	5.25 (133.4)	15.13 (384.3)	15.13 (384.3)	1.56 (39.6)	3 (76.2)	4 (101.6)	17 (7.7)
5	5.19 (131.8)	18.88 (479.6)	18.88 (479.6)	10 (254.0)	8 (203.2)	—	—	18 (457.2)	—	5.5 (139.7)	18.88 (479.6)	18.88 (479.6)	1.81 (46.0)	4.5 (114.3)	5.5 (139.7)	34 (15)
6, 6A	6.5 (165.1)	20.75 (527.1)	20.75 (527.1)	12.28 (311.9)	9.44 (239.8)	—	—	19.5 (495.3)	—	6.56 (166.6)	20.75 (527.1)	20.75 (527.1)	1.81 (46.0)	4.25 (108.0)	5.25 (133.4)	56 (25)

Catalog Number Selection

Table 94. DC Contactor Catalog Numbering System



① Not an actual NEMA size.

Product Selection

When Ordering Specify

- Catalog Number of contactor from **Table 97**, plus.
- Suffix Code Number for closing coil from **Table 95**.
- Suffix Code Number for contactor mounting option from **Table 96.**
- Suffix Code Number for hold out coil from **Table 98** (if hold out coil is not required, use "0").
- Suffix Code Letter for factory installed auxiliary contact if required from **Table 76** and **Table 77, Page 44**. If no auxiliary contact is required, the Suffix will be **N00**.

Table 95. Coil Voltage (Closing Coil)

Coil Voltage dc	Suffix Code Number
120 V	**1**
240 V	**2**

Table 96. Contactor Mounting Options

Contactor Size	Type of Mounting	Suffix Code Number
2	Surface Mounted — Front Connected	**1**
3 thru 6	None	**0**
3 thru 6A	Surface Mounted — Front Connected	**1**
3 thru 6A	Elevated Mounting — Front Connected	**3**

Table 97. DC Inductive Time Limit (Ltl) Contactors for Accelerating Plugging and Anti-Plugging Applications

NEMA Size	8 Hour Rating Amperes	Blowout Coil Ampere Rating 120-240-550 V	Open Type without Electrical Interlock	
			Catalog Number	*
Single Pole — Normally Open				
2	50	None 5 10	**C82DX1** **C82DC1** **C82DD1**	
		25 50	**C82DF1** **C82DG1**	
3	100	25 50 100	**C82EF1** **C82EG1** **C82EH1**	
4	150	150	**C82FJ**	
5	300	300	**C82GK1**	
6	600	600	**C82JL1**	
6A	810	810	**C82KM1**	
Rectifier and mounting for Ltl rectifier plugging			**6006H58**	

① Prices shown are for standard Ltl contactor with standard closing coil, standard mounting option, and standard holdout coil. If auxiliary contact is required, include list price adder from **Tables 76** and **77** on **Page 44**.

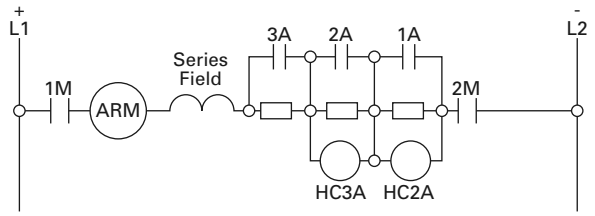
Example: Size 3 100 amp contactor with 230 Vdc closing coil, elevated mounting, with rectifier plugging type holdout coil, and RH bottom mounted 2NO auxiliary contact — Catalog Number C82EH1233B02.

Accessories . . . . . **Page 44**
Renewal Parts . . . . . **Page 45**
Cross-Reference
to Previous Numbers . . . . . **Pages 58, 59**
Discount Symbol **18CD-4**

* Consult Sales Office for Pricing

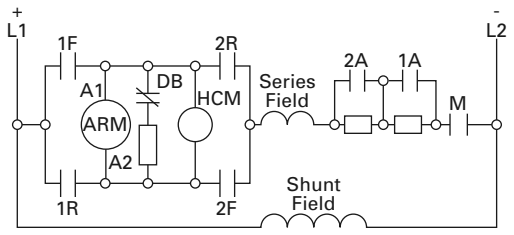
Table 98. Ltl Holdout Coil Suffix Number Selection

Suffix 1 — Ltl Acceleration on Starting Resistance



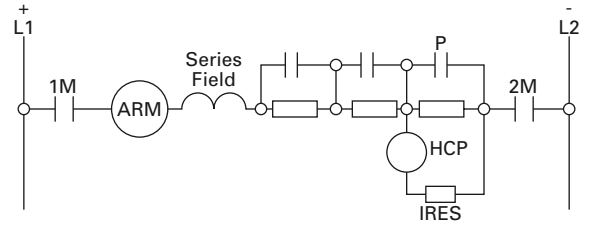
Description	Coil Number	Ohms
No Series Resistor Required	494-5	405

Suffix 2 — Non-plug Main



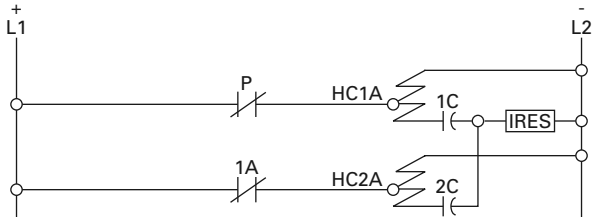
Description	Coil Number	Ohms
No Series Resistor Required	494-8	4060

Suffix 1 — Plug Voltage Lock Out Contactor



Description	Coil Number	Ohms
31 — 97V: 1 – 3000 Ohm 25W Unit 58 — 178V: 1 – 5000 Ohm 25W Unit	494-5	405

Suffix 3 — Capacitor Timed Acceleration

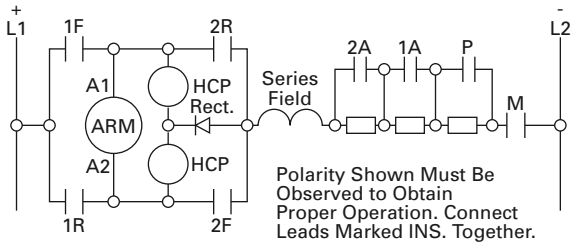


Description	Coil Number	Ohms
1 – 1000 Ohm 25W Unit 1 – 25 µf Capacitor Number 42-143	1083-1	100

Suffix 1 — Ltl Acceleration Across the Line

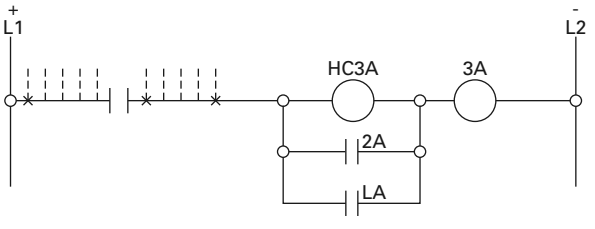
Description	Coil Number	Ohms
Intermittent Duty: No Resistor Required Continuous Duty: 1 – 1000 Ohm 100W Unit	494-5	405

Suffix 4 — Rectifier Plugging 250 V



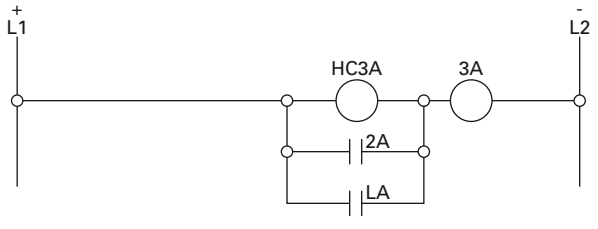
Description	Coil Number	Ohms
Also requires Rectifier No. 57-955-3	1553-3	950 ea. Winding

Suffix 2 — H.O. & Close Coil in Series X-Line Intermittent Duty



Description	Coil Number	Ohms
No Series Resistor Required	494-8	4060

Suffix 5 — H.O. & Close Coil in Series X-Line Continuous Duty



Description	Coil Number	Ohms
No Series Resistor Required	494-7	1520

Cross-Reference to Previous Numbers

DC Ltl Contactors — Old Catalog Number Selection

Table 99. Old Catalog Numbering System

6006H27 B 103 1 C 2

Base Contactor Number
6006H_ _
See Table 100

Revision Code
A, B or **C**

Coil Voltage
100 = 100 Vdc
101 = 115 Vdc
103 = 230 Vdc

Ltl Holdout Coil Suffix
Choose from **Table 98**, **Page 57**.

Electrical Interlocks
See **Table 101** on **Page 59**.

Mounting and Latch Options

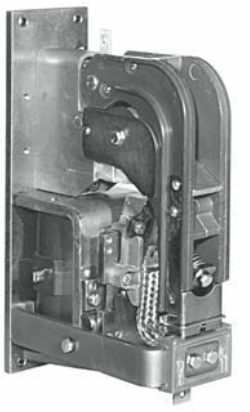
Suffix Code	Type of Panel	Application
A	—	No Mounting Material
H	Metal	Elevated — Front Connected — Dead Back
C	Metal	Surface Mounted — Front Connected — Dead Back
D	Metal	Surface Mounted — Rear Connected
E	Insulated Material	Elevated — Front Connected
F	Insulated Material	Surface Mounted — Front Connected
G	Insulated Material	Surface Mounted — Rear Connected
–	—	Size 2 Only — without Latch
X	—	Size 2 Only — with Latch

Table 100. Old/New Catalog Number Cross-Reference Ltl Contactors

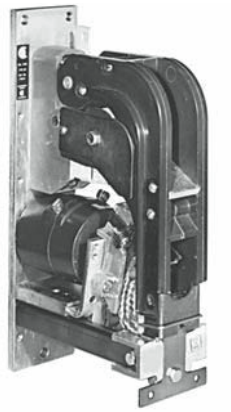
Old Number Description					Replacement Number
Catalog Number	Size	Contact Configuration	Blowout Coil Rating (Amperes)	Enclosure	Catalog Number
6006H14	1	1NO	1	Open	**C82DC1**
6006H15	1	1NO	2	Open	**C82DC1**
6006H16	1	1NO	5	Open	**C82DC1**
6006H17	1	1NO	10	Open	**C82DD1**
6006H18	1	1NO	25	Open	**C82DF1**
6006H19	2	1NO	—	Open	**C82DX1**
6006H20	2	1NO	5	Open	**C82DC1**
6006H21	2	1NO	10	Open	**C82DD1**
6006H22	2	1NO	15	Open	**C82DF1**
6006H23	2	1NO	25	Open	**C82DF1**
6006H24	2	1NO	30	Open	**C82DG1**
6006H25	3	1NO	—	Open	**C82EF1**
6006H26	3	1NO	5	Open	**C82EF1**
6006H27	3	1NO	10	Open	**C82EF1**
6006H28	3	1NO	25	Open	**C82EF1**
6006H29	3	1NO	50	Open	**C82EG1**
6006H30	3	1NO	100	Open	**C82EH1**
6006H31	4	1NO	—	Open	**C82FJ1**
6006H32	4	1NO	150	Open	**C82FJ1**
6006H33	1	1NO	—	Open	**C82DX1**
6006H54	5	1NO	—	Open	**C82GK1**
6006H55	5	1NO	300	Open	**C82GK1**
6006H59	6	1NO	—	Open	**C82JL1**
6006H60	6	1NO	600	Open	**C82JL1**
6006H63	6A	1NO	810	Open	**C82KM1**

Table 101. Unit Electrical Interlock Assemblies — Ltl Contactors

Description	Location		Mounting Plate	Circuit	Index Number	Number Required	Mounting Plate and Driver		Handling Suffix Number
							Index Number	Number Required	
Size 2 Contactors	Without Interlock				**—**	—	**—**	—	**1**
	Unit Electrical Interlocks								
	Side Mount	LH		2NO	**10923H7A**	1	**10923H12A**	1	**2**
		RH		2NO	**10923H7A**	1	**10923H12A**	1	**3**
		LH & RH		4NO	**10923H7A**	2	**10923H12A**	2	**4**
Size 3 – 6 Contactors	Without Interlock		None	—	**—**	—	**—**	—	**1**
	Unit Electrical Interlocks								
	Bottom	RH	Single	2NO	**10923H2A**	1	**10923H20A**	1	**2**



Type KS — NC Pole
150 Ampere



Type KD — NO Pole
100 Ampere

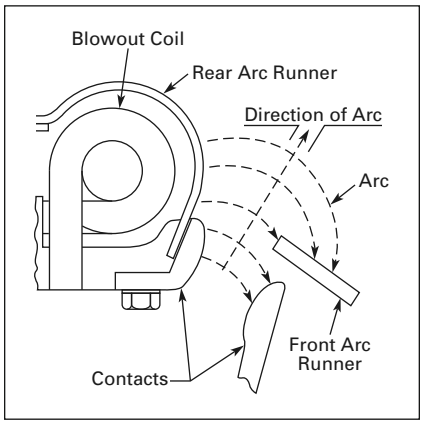


Figure 26. Blowout Coil Effect on Arc

Product Description

Bulletin 7400 Type KD (Normally Open Pole) and Type KS (Normally Closed Pole) contactors are designed for front-mounting directly on steel panels and require no special hardware or insulators. Electrical clearances are integrally designed into the devices by the use of hot-molded reinforced polyester insulators.

These dc mill type contactors are designed for heavy industry service and are suitable for use on moving machinery. The contactors listed in this section are for surface mounting on steel panels and front-of-panel wiring.

These contactors utilize dc coils. If control power is 120 Vac, the rectifier module listed on **Page 44** should be used in conjunction with a 95V coil contactor.

Auxiliary contacts and mechanical interlocks for use with these contactors are listed **Pages 61** and **62**.

The contactors feature forged steel armature levers and magnet frames for superior physical strength. Self-lubricating bearings eliminate the need for lubricating the contactor. New hot-molded arc chute assemblies contain no asbestos and have better arc extinction characteristics for longer contact life. The short stroke armature results in a mechanical life of more than 20 million operations.

The arc chutes and magnetic blowout structures are designed to quickly absorb and dissipate the heat caused by arcing. In addition to increasing contact life, the molded arc chute offers advantages of improved mechanical life and cooling characteristics plus superior arc-tracking resistance.

Long Life

Extended operating life for Type K contactors results from roll action of contacts, and the transfer of arc to front and rear arc runners. Arc shield and blowout structure guides and dissipates the hot arc and provides high interrupting capacity.

Type K 50 ampere contactors are designed with a unitized head assembly front mounted with only two screws. These assemblies are available with blowout coils rated 3, 7.5, 15, 25 and 50 amperes or without blowout, and are easily changed in the field.

Coils, head assemblies, contacts, arc shields and flexible connectors are identical for all 50 ampere contactors providing lower inventory of parts. They are also the same height as dc members of the PM Relay family — ideal for wireway panel mounting.

Type KS — Normally Closed Pole Contactors

Type KS contactors have similar design and construction features to Type KD normally open pole contactors with many parts duplicated. The Type KS contactor operates with a snappy positive action requiring no retarding coil, series resistor or tapped coil.

Knife-Edge Pivot Design

Type K contactors feature an exclusive shrouded knife-edge pivot which excludes dirt. On 100 ampere and larger sizes, a three-edge design provides reliable adjustment and rattleproof operation. Arm weight is supported by a vertical knife in the center, while horizontal knives at both sides ensure alignment.

Convenient Accessories

Mechanical interlocks and control circuit contacts are furnished in convenient kit form along with necessary hardware. No special drilling is required on panels or contactors.

A line of front wired, mill-type accessory devices including control, timing and overload relays are available and are compatible with Type K contactors.

Features

Thirty years of continual improvements bring long life, low maintenance, interchangeable parts and the ability to "take-it" in harsh industrial environments.

- Front connected for direct to steel mounting. Also suitable for insulated panel mounting with poke-through wiring where rear access is desirable.
- Solid steel backplate provides maximum strength and rigidity.
- Hot molded, reinforced polyester insulators have generous electrical clearances.
- Shrouded knife-edge pivot design excludes dirt.
- Encapsulated coil protects against electrical and mechanical abuse. Has saddle-type pressure terminals.
- Non-brittle, hot-molded arc shields are of tough polyester.
- Power terminals conveniently located with incoming power terminal at top of contactor; outgoing terminal at bottom.
- Designed for front mounting directly on steel panels and require no special hardware or insulators. Electrical clearances are integrally designed into the devices by the use of hot-molded, reinforced polyester insulators.

Standards and Certifications

- NEMA ICS3-441, 442, 443.
- NEMA ICS2-331.23.
- NEMA ICS2-110.05.02.
- NEMA ICS2-125.21.02.

Technical Data and Specifications

- Current Range: 5 to 900 amperes.
- Voltage: 600 Vdc.
- Operation: Magnetic.
- Mounting:
  - ❑ Steel panel with options for insulated panels
- Duty:
  - ❑ Continuous (for intermittent ratings consult factory)

Table 102. Auxiliary Contact Rating — 15 Amps Continuous

Volts dc	Interrupt Amperes	
	Resistive	Inductive
120	5.5	2.2
240	2.0	1.1
550	.66	.4

Accessories

Table 103. Coil Resistor Kit — for Size 2

Supply Volts	Catalog Number	Part Number ③	*
600 ①	KKD-354	A073-409354-0004	
550 ①	KKD-233	A073-409354-0003	
480 ①	KKD-231	A073-409354-0001	
350 ①	KKD-232	A073-409354-0002	
150 ②	KKD-235	A073-409354-0005	

① Use in series with 240 V coils. Mountable on contactor base. For other size contactors, refer to local representative.
② Use in series with 120 V coils.
③ Order by Part Number rather than Catalog Number.

Table 104. Control Circuit Contact Kits

Control Contact Arrangement	Catalog Number	Part Number	*
1NO	KKD-7	A074-177676-0004	
1NC	KKD-8	A074-177676-0005	
1NO-1NC	KKD-1	A074-177676-0001	
2NO	KKD-2	A074-177676-0002	
2NC	KKD-3	A074-177676-0003	

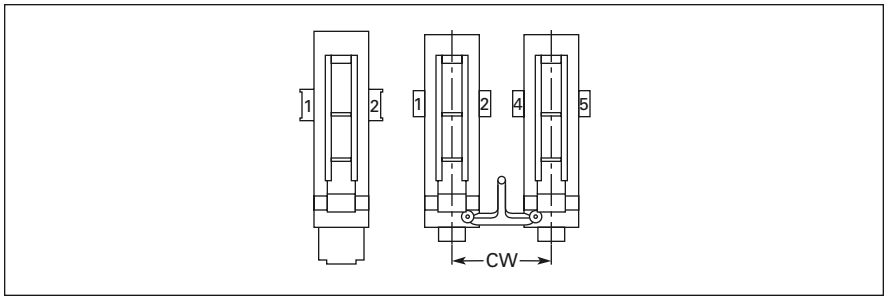


Figure 27. Control Circuit Contacts

Table 105. Control Circuit Contacts — Number & Locations

Contactor Ampere Rating	Power Poles	Per Contactor		When CW Equals Inches (mm)	Usable Locations
		Maximum Number of Blocks	Maximum Number NC Contacts		
50 50 50	1NO	2	2	3 (76) 4 (102) 5.5 (140)	1, 5 1, 2 or 4, 5 1, 2 and 4, 5
100, 150 100, 150 300	1NO	2	2	3.5 (89) 5 (127) 6 (152)	1, 5 1, 2 or 4, 5 1, 2 or 4, 5
50 50	2NO	2	2	5 (127) 9 (229)	1, 2 or 4, 5 1, 2 and 4, 5
100 150 300	1NC	1	2	Does Not Apply	1, 4 1, 4 1, 4

Discount Symbol **18CD4**
* Consult Sales Office for Pricing

Table 106. Mechanical Interlock Kits ①

NEMA Size	Contactor Amp Rating	Power Poles	Spacing Between Contactor Center Lines Inches (mm) ②	Catalog Number	Part Number	*
2	Up to 50 Amps	1 VS 1 1 VS 2	4.00 (101.6)	**KKD-214**	**A074-253077**	
		2 VS 2 2 VS 2	5.00 (127.0) 9.00 (228.6)	**KKD-215** **KKD-217**	**A074-253078** **A074-407281**	
3, 4, 5	100 VS 100 100 VS 150 150 VS 150	1 VS 1	3.50 (88.9)	**KKD-113**	**A074-244364**	
	100 VS 100 100 VS 150 150 VS 150	1 VS 1	5.00 (127.0)	**KKD-114**	**A074-253001**	
	300 VS 300	1 VS 1	6.00 (152.4)	**KKD-313**	**A074-250825**	

① Mechanical interlocks not available for use with normally closed pole contactors.
② Dimension CW in **Figure 27**.

Table 107. AC-DC Rectifier Kits ③ **— 50/60 Hertz**

Contactor		ac Volts	Contactor dc Coil Required	Catalog Number	*
NEMA Size	Power Poles				
2 thru 5	1NO, 1NC or 2NO	120	95V	**C81EB**	

③ For operating contactors from ac supply voltage. One kit per contactor. Mountable on contactor base. Suitable for use with control transformer sources to 3 kVA. For larger sources, a separate isolating transformer is required, 15 VA or larger for each contactor.

Table 108. Mounting Hardware Kits — for Control Circuit Contacts

NEMA Size	8 Hour Ampere Rating	Power Poles	Catalog Number	Part Number ④	*
2 2 2	50 50 50	1NO 1NC 2NO	**KKD-14** **KKD-14** **KKD-14**	**A074-266421** **A074-266421** **A074-266421**	
3 & 4 3 & 4	100 & 150 100 & 150	1NO 1NC	**KKD-10** **KKD-11**	**A074-272165-0001** **A074-272165-0002**	
5 5	300 300	1NO 1NC	**KKD-12** **KKD-13**	**A074-272165-0003** **A074-272165-0004**	

④ Order by Part Number rather than Catalog Number.

Discount Symbol **18CD-4**
* Consult Sales Office for Pricing

Renewal Parts

Table 109. Bulletin 7400-K, 7307-KC, 7311-KFL

Description	Catalog Number	Discount Schedule	Part Number	*
1NO-1NC Pole	**KKD-1**	18CD-4	**A074-177676-0001**	
2NO Poles	**KKD-2**	18CD-4	**A074-177676-0002**	
2NC Poles	**KKD-3**	18CD-4	**A074-177676-0003**	
1NO Pole	**KKD-7**	18CD-4	**A074-177676-0004**	
1NC Pole	**KKD-8**	18CD-4	**A074-177676-0005**	
Mounting Hardware for 100 A – 150 A KD	**KKD-10**	18CD-4	**A074-272165-0001**	
Mounting Hardware for 100 A – 150 A KD	**KKD-11**	18CD-4	**A074-272165-0002**	
Mounting Hardware for 300 A KD	**KKD-12**	18CD-4	**A074-272165-0003**	
Mounting Hardware for 300 A KS	**KKD-13**	18CD-4	**A074-272165-0004**	
Mounting Hardware and Operating Equipment	**KKD-14**	18CD-4	**A074-266421**	
Movable and Stationary Contacts for 50 A KD, KS	**KKD-50**	15CD-2	**A074-281986**	
Assembly Arc Shield for 50 A KD, KS	**KKD-51**	15CD-2	**A074-281987**	
50 A KD Contact Spring	**KKD-52**	15CD-2	**A074-281988**	
50 A KS Contact Spring	**KKD-53**	15CD-2	**A074-281989**	
50 A KD, KS Connector	**KKD-54**	15CD-2	**A074-281990**	
Movable and Stationary Contacts 100 A KD, KS	**KKD-100**	15CD-2	**A074-253067-0001**	
Assembly Arc Shield for 100 A, KD, KS	**KKD-101**	15CD-2	**A074-253067-0002**	
100 A KD Contact Spring	**KKD-102**	15CD-2	**A074-253067-0003**	
100 A KS Contact Spring	**KKD-103**	15CD-2	**A074-253067-0004**	
100 A KD, KS Connector	**KKD-104**	15CD-2	**A074-253067-0005**	
Mechanical Interlock 3-1/2" Spacing 100 A – 150 A KD	**KKD-113**	18CD-4	**A074-244364**	
Mechanical Interlock 5" Spacing 100 A – 150 A KD	**KKD-114**	18CD-4	**A074-253001**	
Movable and Stationary Contacts 150 A KD-KS	**KKD-150**	15CD-2	**A074-253068-0001**	
Arc Shield 150 A KD-KS	**KKD-151**	15CD-2	**A074-253068-0002**	
Contact Spring 150 A KD	**KKD-152**	15CD-2	**A074-253068-0003**	
Contact Spring 150 A KS	**KKD-153**	15CD-2	**A074-253068-0004**	
Connector 150 A KD-KS	**KKD-154**	15CD-2	**A074-253068-0005**	
Center Mounting Hardware 7307KC	**KKD-200**	15CD-2	**A073-409357**	
Mechanical Interlock 4" Spacing 50 A KD	**KKD-214**	18CD-4	**A074-253077**	
Mechanical Interlock 5" Spacing 50 A KD	**KKD-215**	18CD-4	**A074-253078**	
Mechanical Interlock 5-1/2" Spacing 50 A KD	**KKD-216**	18CD-4	**A074-407280**	
Mechanical Interlock 9" Spacing 50 A KD	**KKD-217**	18CD-4	**A074-407281**	
Coil Resistor Kit 480 V 50 A-KD and KS, 7307KC	**KKD-231**	18CD-4	**A074-409354-0001**	
Coil Resistor Kit 350 V 50 A-KD and KS, 7307KC	**KKD-232**	18CD-4	**A074-409354-0002**	
Coil Resistor Kit 550 V 50 A-KD and KS, 7307KC	**KKD-233**	18CD-4	**A074-409354-0003**	
Coil Resistor Kit 600 V 50 A-KD and KS, 7307KC	**KKD-234**	18CD-4	**A073-409354-0004**	
Coil Resistor Kit 150 V 50 A-KD and KS, 7307KC	**KKD-235**	18CD-4	**A073-409354-0005**	
Movable and Stationary Contact Kit 300 A KD and KS	**KKD-300**	15CD-2	**A074-253069-0001**	
Assembly Arc Shield 300 A KD and KS	**KKD-301**	15CD-2	**A074-253069-0002**	
Movable Contact Spring 300 A KD	**KKD-302**	15CD-2	**A074-253069-0003**	
Movable Contact Spring 300 A KS	**KKD-303**	15CD-2	**A074-253069-0004**	
Flexible Connector 300 A KD and KS	**KKD-304**	15CD-2	**A074-253069-0005**	
Mechanical Interlock 6" Spacing 300 A KD	**KKD-313**	18CD-4	**A074-250825**	
Head Assembly without Blowout 50 A KD-KS	**KKD-510**	15CD-2	**A074-281991**	
Head Assembly with 3 A Blowout 50 A KD-KS	**KKD-511**	15CD-2	**A074-281992**	
Head Assembly with 7-1/2 A	**KKD-512**	15CD-2	**A074-281993**	
Head Assembly with 15 A Blowout 50 A KD-KS	**KKD-513**	15CD-2	**A074-281994**	
Head Assembly with 25 A Blowout 50 A KD-KS	**KKD-514**	15CD-2	**A074-281995**	
Head Assembly with 50 A Blowout 50 A KD-KS	**KKD-515**	15CD-2	**A074-281996**	

Discount Symbol **18CD-4**
* Consult Sales Office for Pricing

Dimensions

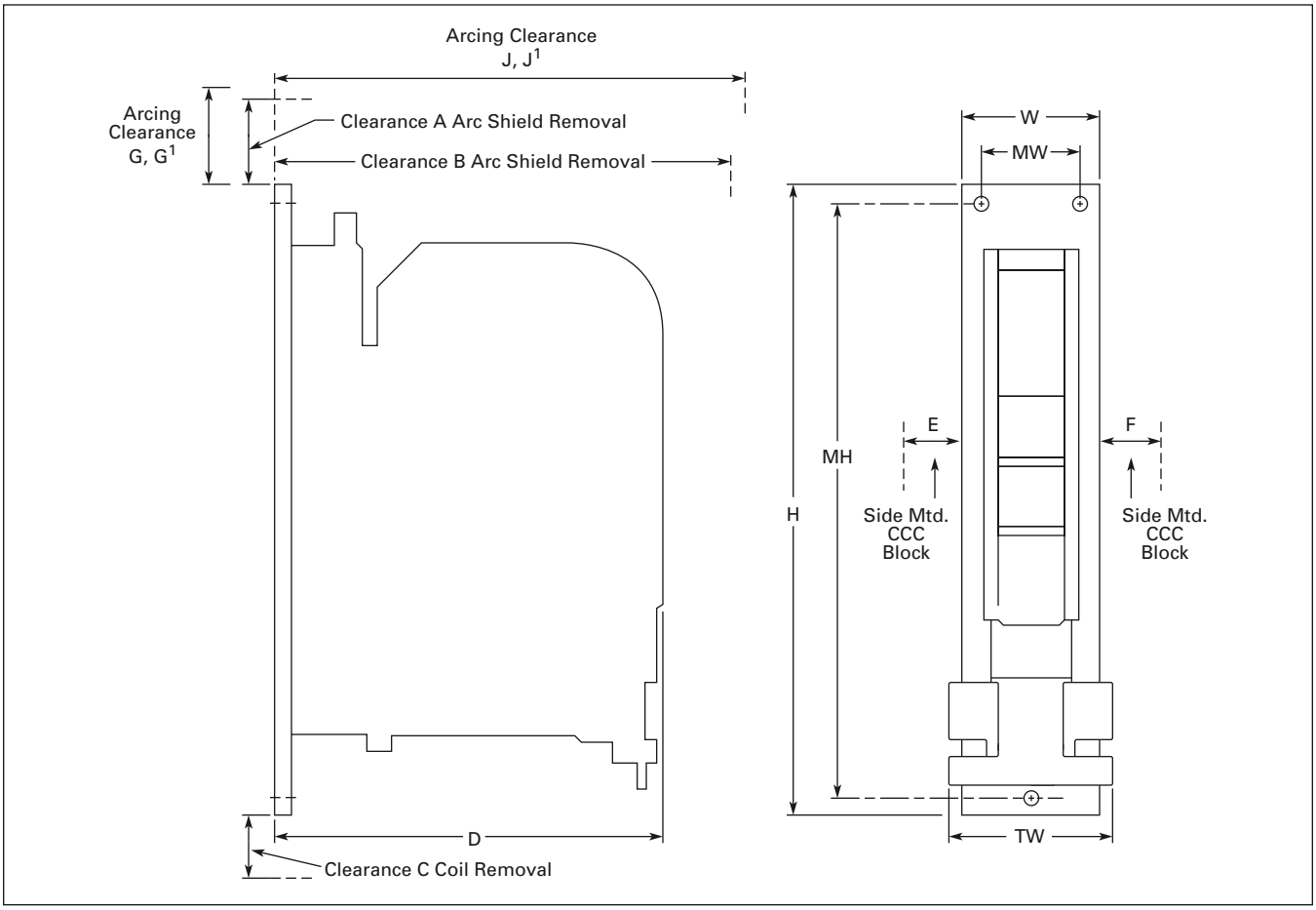


Figure 28. Approximate Dimensions and Weights

Table 110. Approximate Dimensions and Weights

Size Amps	Poles	Dimensions in Inches (mm)						Clearance Dimensions in Inches (mm)					Mtg. Hole Dia.	Ship. Wt. Lbs. (kg)
		H	W	D	MH	MW	TW	A	B	C	E	F		
50	1NO	6.12 (155.5)	2.50 (63.5)	6.25 (158.8)	5.50 (139.7)	2.00 (50.8)	2.50 (63.5)	.25 (6.35)	7.00 (177.8)	1.00 (25.4)	.93 (23.6)	.93 (23.6)	.20 (5.1)	6 (2.7)
50	2NO	6.12 (155.5)	4.25 (108.0)	6.25 (158.8)	5.50 (139.7)	2.00 (50.8)	4.25 (108.0)	.25 (6.35)	7.00 (177.8)	1.00 (25.4)	.93 (23.6)	.93 (23.6)	.20 (5.1)	10 (4.5)
100, 150	1NO	13.25 (336.6)	2.75 (69.9)	8.00 (203.2)	12.50 (317.5)	2.00 (50.8)	3.00 (76.2)	3.00 (76.20)	12.25 (311.2)	2.00 (50.8)	1.25 (31.8)	1.37 (34.8)	.34 (8.6)	11 (5.0)
300	1NO	16.75 (425.5)	4.00 (101.6)	11.25 (285.8)	15.75 (400.1)	3.00 (76.2)	4.00 (101.6)	4.50 (114.30)	16.75 (425.5)	3.50 (88.9)	1.00 (25.4)	1.37 (34.8)	.43 (10.9)	26 (12)
50	1NC	8.50 (215.9)	2.50 (63.5)	6.25 (158.8)	8.00 (203.2)	2.00 (50.8)	2.50 (63.5)	.25 (6.35)	7.00 (177.8)	.37 (9.4)	1.00 (25.4)	—	.20 (5.1)	10 (4.5)
100, 150	1NC	13.25 (336.6)	3.50 (88.9)	9.00 (228.6)	12.50 (317.5)	2.50 (63.5)	4.50 (114.3)	3.00 (76.20)	13.37 (339.6)	3.12 (79.3)	.87 (22.1)	—	.34 (8.6)	13 (5.9)
300	1NC	16.75 (425.5)	4.00 (101.6)	11.50 (292.1)	15.75 (400.1)	3.00 (76.2)	7.75 (196.9)	4.50 (114.30)	17.37 (441.2)	3.25 (82.6)	1.25 (31.8)	—	.43 (10.9)	34 (15)

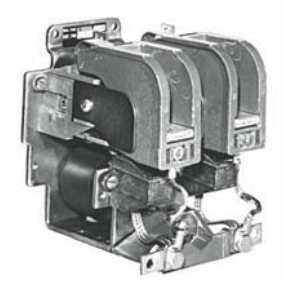
Table 111. Arcing Clearance in Inches (mm)

Size Amps	Poles	600 V		250 V	
		G	J	G[1]	J[1]
50	1NO	1.50 (38.1)	7.50 (190.5)	1.25 (31.8)	7.25 (184.2)
50	2NO	1.50 (38.1)	7.50 (190.5)	1.25 (31.8)	7.25 (184.2)
100	1NO	1.75 (44.5)	11.00 (279.4)	1.50 (38.1)	10.75 (273.0)
150	1NO	2.50 (63.5)	11.50 (292.1)	2.00 (50.8)	11.00 (279.4)
300	1NO	3.50 (88.9)	15.50 (393.7)	3.00 (76.2)	15.25 (387.4)
50	1NC	1.50 (38.1)	7.50 (190.5)	1.25 (31.8)	7.25 (184.2)
100	1NC	1.75 (44.5)	12.00 (304.8)	1.50 (38.1)	11.75 (298.5)
150	1NC	2.50 (63.5)	12.50 (317.5)	2.00 (50.8)	12.00 (304.8)
300	1NC	3.50 (88.9)	15.75 (400.0)	3.00 (76.2)	15.50 (393.7)

Product Selection

When Ordering Specify

- Catalog Number of contactor, plus dash (-) and Suffix Number from Coil Voltage table, **Table 113**. Example: A074-266407-**0240**.
- Catalog Number for auxiliary contact(s), if required, or any other required kit, see **Pages 61** and **62**.



Type KD — NO Pole 2-Pole 50 A

Table 112. Type KD & KS DC Contactors — 600 V

NEMA Size	8 Hour Open Rating (Amperes)	Power Poles	Blowout Rating (Amperes)	Catalog Number	Open Type	
					Part Number ①	*
2	50	1NO	None	**74U12A**	**A074-266407**	
		1NO	3	**74U12B**	**A074-266406**	
		1NO	7.5	**74U12C**	**A074-266405**	
		1NO	15	**74U12D**	**A074-266404**	
		1NO	25	**74U12E**	**A074-266403**	
		1NO	50	**74U12**	**A074-266402**	
		2NO	None	**74U22A**	**A074-266413**	
		2NO	3	**74U22B**	**A074-266412**	
		2NO	7.5	**74U22C**	**A074-266411**	
		2NO	15	**74U22D**	**A074-266410**	
		2NO	25	**74U22E**	**A074-266409**	
		2NO	50	**74U22**	**A074-266408**	
		1NC	25	**74U121E**	**A074-266416**	
		1NC	50	**74U121**	**A074-266415**	
3	100	1NO	100	**74U13**	**A074-253051**	
		1NC	100	**74U131**	**A074-253055**	
4	150	1NO	150	**74U14**	**A074-253053**	
		1NC	150	**74U141**	**A074-253057**	
5	300	1NO	300	**74U15**	**A074-253059**	
		1NC	300	**74U151**	**A074-253061**	

① Order contactors by Part Number rather than Catalog Number. Add Suffix for coil voltage.

Table 113. Coil Voltage Suffix

Volts	Contactor Size	Suffix	*
240	2, 3, 4, 5	**-0240**	
120	2, 3, 4, 5	**-0120**	
95	2	**-0095**	②
or other	3, 4	**-0095**	②
voltage	5	**-0095**	②
550	2	**-0240**	③
480	2	**-0240**	③
350	2	**-0240**	③

② Each contactor.

③ Separate resistor is required in series with the 240 V coil. Resistor is supplied separately (not factory mounted). Order separate item from **Table 103** on **Page 61**. For other size contactors refer to your local representative or factory.

Accessories . . . . . **Pages 61, 62**
Renewal Parts . . . . . **Page 63**
Discount Symbol **18CD-4**

* Consult Sales Office for Pricing

Static In-Line Timer

Product Description

These timing units are designed to be operated in series with dc contactor and/or relays coils to give acceleration timing. They are sized to handle coil current for up to a Size 8 contactor directly without need for interface relays. Timing begins when the input to the device is energized (Type E). The delay will occur with "make". Delay on "break" is not available.

These units are available with NO or NC contacts. They are completely solid-state so there are no moving parts to arc or fail.

Technical Data and Specifications

- Voltage: 230 Vdc.
- Timing Range: 0.05 to 180 seconds.
- Operation: Electronic.
- Output Current:
  - .75 ampere, steady state
  - 10 ampere inrush
  - 5 mA minimum
- Voltage Drop: 2.5V @ 1 ampere.
- Operating Temperature: -40 – 80°C.
- Storage Temperature: -40 – 85°C.
- Humidity: 95% relative.
- Mounting: Surface mount.
- Terminations:
  - 1/4" male quick connect terminals

Dimensions

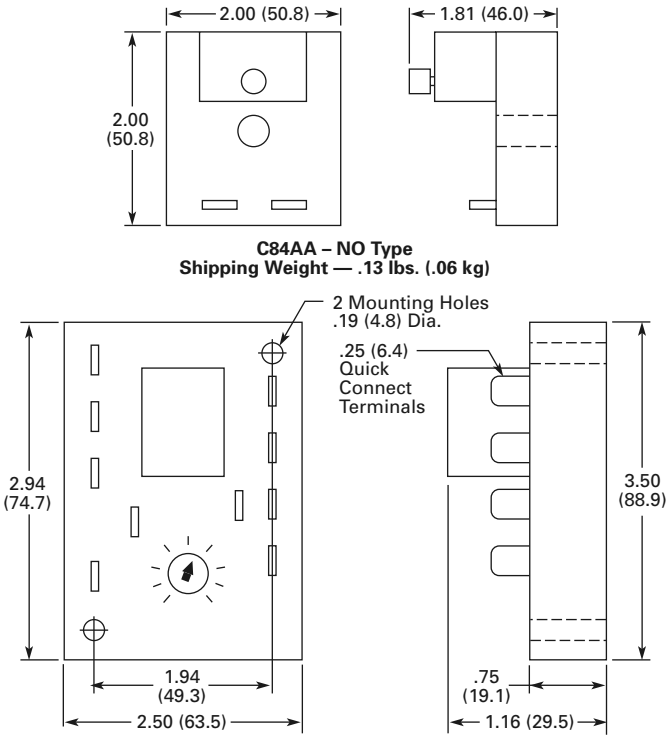


Figure 29. Approximate Dimensions in Inches (mm) and Shipping Weights

Wiring Diagrams

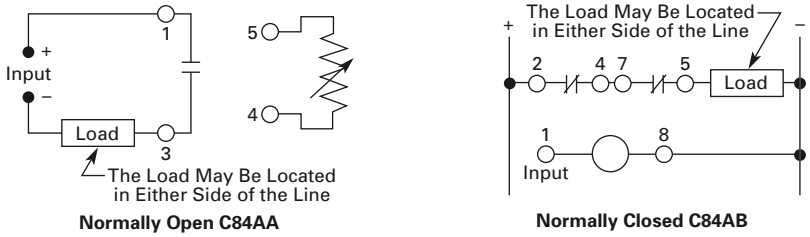


Figure 30. Wiring Diagrams

Product Selection

When Ordering Specify

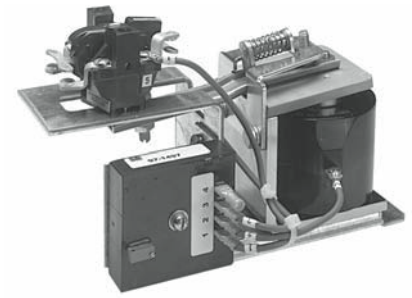
- Complete Catalog Number.

Table 114. Type C84 Static In-Line Timers

Timing Range	Catalog Number	*
NO Type, Adjustable Range		
.05 to 3.0 Seconds .5 to 60 Seconds 2.0 to 180 Seconds	**C84AA003** **C84AA060** **C84AA180**	
NC Type, Adjustable Range		
.1 to 5.0 Seconds	**C84AB005**	

Discount Symbol **18CD-4**

* Consult Sales Office for Pricing



Low Voltage Monitoring Relay

Product Description

The Low Voltage Monitoring Relay (LVMR) is designed specifically to address power loss during hoist lowering (regeneration) operation. The LVMR continuously monitors bus voltage and de-energizes the UV relay if the bus voltage falls below a value that will safely operate contactors and relays.

The LVMR distinguishes the difference between main power and regeneration power produced by a motor. It constantly monitors the dc bus voltage and sets the series brake automatically when it detects a power loss condition. When the voltage drops below the point where relays or contactors can reliably pick up and seal (as defined by the current NEMA standards), the hoist control panel will shut down and set the brake.

Installation

Installation requires mounting one device in your existing hoist panel and adding two wires.

- Remove the wire lead from the existing UV coil and the last protective interlock.
- Mount the LVMR as close as possible to the existing UV relay and reconnect the removed wire to the LVMR interlock at terminal 5.
- Add a wire from the other side of the LVMR interlock, terminal 6, to the original UV coil terminal. Using the supplied terminal lug, connect a wire from terminal 4 on the electronic module to L2 on the other side of the UV coil.

Technical Data and Specifications

- Voltage Input Range: 230 – 270 Vdc.
- Ambient Temperature Range:
  - 0 – 65°C
- Pickup Adjustment: 180 – 200 Vdc.
- Reaction Time: 40 milliseconds.
- Relay Contact Current Rating:
  - 1.1 amp dc inductive at 230 Vdc
- Number of Contacts: 2.

Dimensions

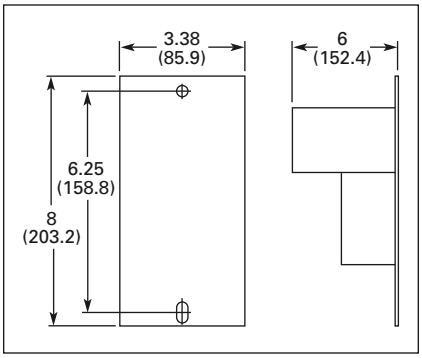


Figure 31. Approximate Dimensions in Inches (mm)

Wiring Diagram

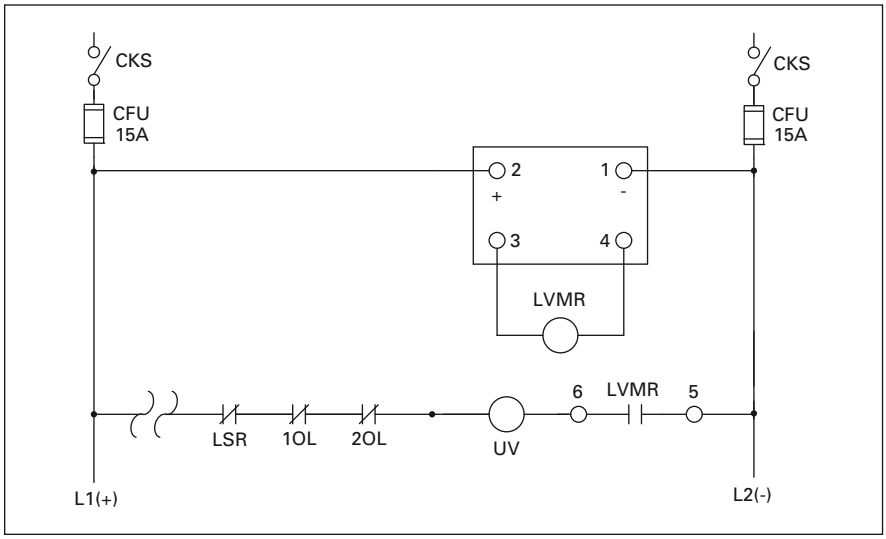


Figure 32. Low Voltage Monitoring Relay Diagram

Product Selection

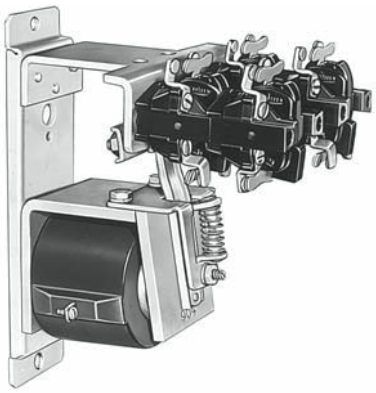
When Ordering Specify

- Complete Catalog Number.

Table 115. Low Voltage Monitoring Relay

Description	Catalog Number	*
Low Voltage Monitoring Relay	**6011ED5**	

Discount Symbol **18CD-4**
* Consult Sales Office for Pricing



8 Circuit Relay

Product Description

These dc Mill Type Relays are designed for heavy industry service and are suitable for use on moving machinery. They are arranged for steel panel mounting with front connections. Unit circuit blocks have two captive mounting screws and are interchangeable between relays. They are easily convertible from normally open to normally closed or vice versa. Contacts are of double break design.

Standards and Certifications

- NEMA ICS3-212.20.21.
- NEMA ICS2-125.21.02.

Technical Data and Specifications

- Voltage: 115, 230 Vdc.
- Operation: Magnetic.
- Mounting: Steel panel.
- Electrical Ratings:
  - 10 amperes continuous
  - 2.2 amperes inductive breaking at 115 V
  - 1.1 amperes inductive breaking at 230 V

Dimensions

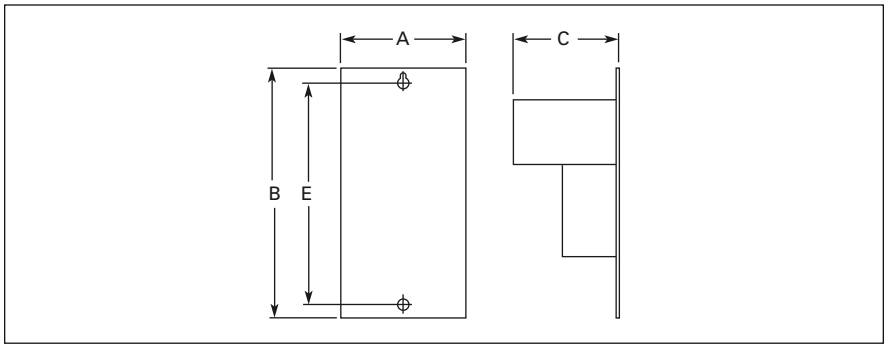


Figure 33. Approximate Dimensions in Inches (mm)

Table 116. Approximate Dimensions in Inches (mm)

Circuit Capacity of Relay	Number of Circuits	Wide A	High B	Deep C	Mounting E
4 Circuits	1 to 4	3.38 (85.9)	8.00 (203.2)	6.00 (152.4)	6.25 (158.8)
8 Circuits	1 to 4 5 to 8	5.00 (127.0) 5.00 (127.0)	8.38 (212.9) 8.38 (212.9)	5.75 (146.1) 7.38 (187.5)	7.75 (196.9) 7.75 (196.9)

Product Selection

When Ordering Specify

- Catalog Number of relay.
- Catalog Number of unit circuit block(s), if required.

Table 117. Relays — 230 Vdc Coil

Maximum Circuit Capacity of Relay Frame	Number of Circuits Assembled	Catalog Number ①	*
4 (2 Double Circuit Blocks)	0 4NO	**6011H23-103-1** **6011H23-103-15**	
8 (4 Double Circuit Blocks)	0 8NO	**6011H2-103-1** **6011H2-103-27**	

① To order 115 Vdc coil, substitute Suffix Number **101** for 103 in above listed Catalog Number. Example: 6011H23-**101**-1.

Table 118. Unit Circuit Blocks

Mounting Screws Included ②		
Circuit Arrangement	**Catalog Number**	*
1NO	**6011H4**	
1NC	**6011H5**	
1NO-1NC	**6011H6**	
2NO	**6011H7**	
2NC	**6011H8**	

② When mounting circuit blocks, DO NOT exceed maximum capacity of relay frame.

Discount Symbol **18CD-4**
* Consult Sales Office for Pricing

Cat. No. C304ANA301

Product Description

These overload relays are designed for use on dc power circuits to monitor dc motor loading. Inverse time and instantaneous versions are available, with either manual or automatic reset.

Inverse time limit trip relays are normally set to trip between 125% and 175% of full load motor current. The inverse time feature is provided by an oil dashpot.

Note: These inverse trip type overload relays are shipped with a neophrene plug in the dashpot to prevent mechanical damage during shipment. This plug must be removed for the relay to function properly.

Instantaneous trip type overload relays use a dry type dashpot and are normally set to trip between 200% and 300% of full load motor current.

Standards and Certifications

- NEMA ICS2-222.
- ANSI/IEEE Standard 100.
- NEMA Standard 5-24-1960.

Technical Data and Specifications

- Current Range: 1.5 – 6500 amperes.
- Voltage: Maximum 600 Vdc.
- Operation:
  - Magnetic with oil filled dashpot for time delay
- Mounting:
  - Steel panel or insulated panel
- Electrical Ratings:
  - 10 amperes continuous
  - 2.2 amperes inductive breaking at 115 V
  - 1.1 amperes inductive breaking at 230 V
- Reset: Manual or automatic.

Dimensions

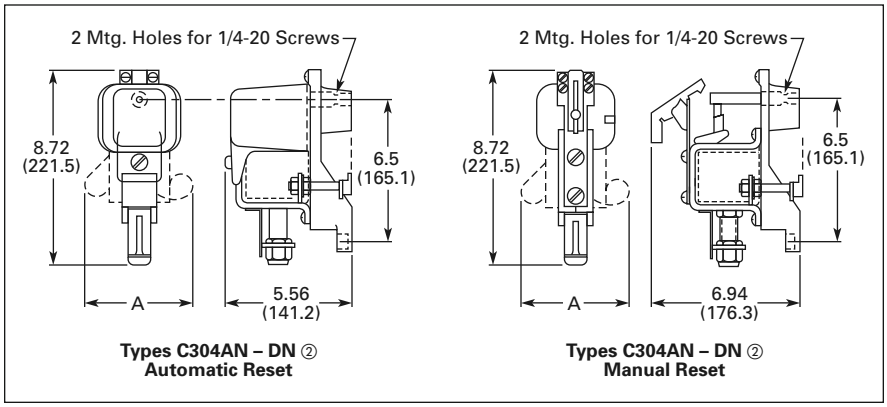


Figure 34. Approximate Dimensions in Inches (mm)

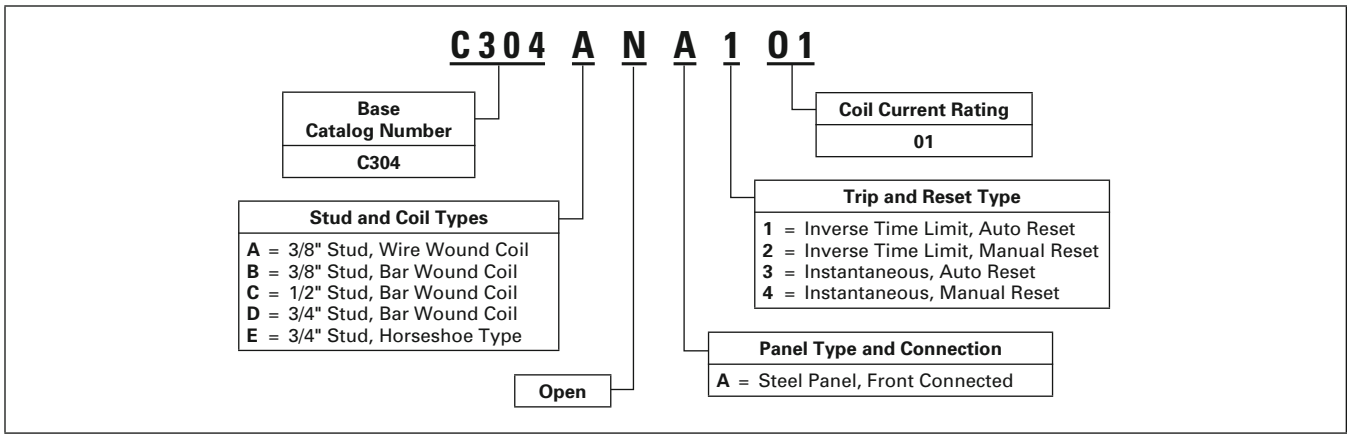
Table 119. Types C304AN – DN ①

Catalog Type	Dimensions in Inches (mm)
	A
C304AN	5.00 (127.0)
C304BN	5.38 (136.7)
C304CN	5.75 (146.1)
C304DN	6.75 (171.5)

① Type C304EN dimensions available upon request.

Catalog Number Selection

Table 120. DC Magnetic Overload Relay Catalog Numbering System



Product Selection

When Ordering Specify

■ Complete Catalog Number.

Table 121. Inverse Time Limit Trip Type — Automatic Reset ①

Motor Full Load Current Range Amperes	Calibration Plate Current Range Amperes	Catalog Number Steel Panel Front Connected	*
2.9 – 4.5	3.5 – 8.0	**C304ANA101**	
4.0 – 6.2	5.0 – 11.0	**C304ANA102**	
5.6 – 9.0	7.0 – 16.0	**C304ANA103**	
6.6 – 12.3	9.0 – 21.0	**C304ANA104**	
10.0 – 18.5	15.0 – 30.0	**C304ANA105**	
15.2 – 28.0	20.0 – 50.0	**C304ANA106**	
20.0 – 37.0	30.0 – 60.0	**C304ANA107**	
30.8 – 57.0	40.0 – 100.0	**C304ANA108**	
38. – 71.	50. – 125.	**C304BNA109**	
62. – 114.	80. – 200.	**C304BNA110**	
100. – 185.	150. – 300.	**C304BNA111**	
160. – 297.	200. – 500.	**C304CNA112**	
266. – 495.	350. – 850.	**C304CNA113**	
400. – 742.	500. – 1300.	**C304CNA114**	
470. – 874.	600. – 1500.	**C304DNA115**	
800. – 1485.	1000. – 2500.	**C304DNA116**	
1200. – 2285.	1500. – 3900.	**C304ENA117**	

① For relays with manual reset, change 8th digit of listed Catalog Number from 1 to **2**.
Example: C304ANA**2**01.

Discount Symbol **18CD-4**
* Consult Sales Office for Pricing

Table 122. Instantaneous Trip Type — Automatic Reset ①

Motor Full Load Current Range Amperes	Calibration Plate Current Range Amperes	Catalog Number Steel Panel Front Connected	*
1.5 – 2.6	3.5 – 8.0	**C304ANA301**	
2.3 – 4.0	5.0 – 11.0	**C304ANA302**	
3.1 – 5.3	7.0 – 16.0	**C304ANA303**	
4.2 – 7.2	9.0 – 21.0	**C304ANA304**	
6.2 – 10.8	15.0 – 30.0	**C304ANA305**	
9.5 – 16.6	20.0 – 50.0	**C304ANA306**	
12.5 – 21.0	30.0 – 60.0	**C304ANA307**	
19.0 – 33.0	40.0 – 100.0	**C304ANA308**	
24.0 – 41.0	50.0 – 125.0	**C304BNA309**	
39.0 – 67.0	80.0 – 200.0	**C304BNA310**	
63.0 – 108.0	150.0 – 300.0	**C304BNA311**	
100.0 – 173.0	200.0 – 500.0	**C304CNA312**	
166.0 – 289.0	350.0 – 850.0	**C304CNA313**	
250.0 – 433.0	500.0 – 1300.0	**C304CNA314**	
294.0 – 510.0	600.0 – 1500.0	**C304DNA315**	
500.0 – 866.0	1000.0 – 2500.0	**C304DNA316**	
750.0 – 1300.0	1500.0 – 3900.0	**C304ENA317**	
1250.0 – 2166.0	3800.0 – 6500.0	**C304ENA318**	

① For relays with manual reset, change 8th digit of listed Catalog Number from 3 to **4**.
Example: C304ANA**4**01.

Table 123. Stud and Coil Types

Catalog Type	Description	Dimension Drawing Number	
		Automatic Reset	Manual Reset
C304AN	3/8" Stud, Wire Wound Coil	B10-3949	B10-3951
C304BN	3/8" Stud, Bar Wound Coil	B10-3949	B10-3951
C304CN	1/2" Stud, Bar Wound Coil	B10-3949	B10-3951
C304DN	3/4" Stud, Bar Wound Coil	B10-3949	B10-3951
C304EN	3/4" Stud, Horseshoe Type	A10-4135	A10-4136

Discount Symbol **18CD-4**
* Consult Sales Office for Pricing

Cross-Reference to Previous Products

Table 124. DC Magnetic Overload Relays Cross-Reference

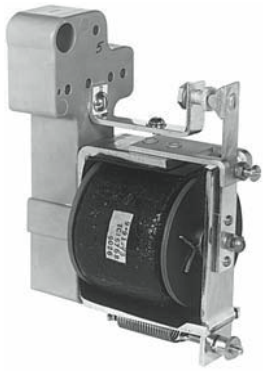
Old	New	Old	New	Old	New	Old	New
10165H1-2-32	**C304ANA102**	10165H2-3-34	**C304AND203**	10165H3-5-34	**C304AND306**	10165H4-4-32	**C304ANA405**
10165H1-2-34	**C304AND102**	10165H2-4-32	**C304ANA204**	10165H3-6-32	**C304ANA307**	10165H4-4-34	**C304AND405**
10165H1-3-32	**C304ANA103**	10165H2-4-34	**C304AND204**	10165H3-6-34	**C304AND307**	10165H4-5-32	**C304ANA406**
10165H1-3-34	**C304AND103**	10165H2-5-32	**C304ANA205**	10165H3-7-32	**C304ANA308**	10165H4-5-34	**C304AND406**
10165H1-4-32	**C304ANA104**	10165H2-5-34	**C304AND205**	10165H3-7-34	**C304AND308**	10165H4-6-32	**C304ANA407**
10165H1-4-34	**C304AND104**	10165H2-6-32	**C304ANA206**	10165H3-9-12	**C304BND311**	10165H4-6-34	**C304AND407**
10165H1-5-32	**C304ANA105**	10165H2-6-34	**C304AND206**	10165H3-9-19	**C304BNA311**	10165H4-7-32	**C304ANA408**
10165H1-5-34	**C304AND105**	10165H2-7-32	**C304ANA207**	10165H3-12-19	**C304CNA313**	10165H4-7-34	**C304AND408**
10165H1-6-32	**C304ANA106**	10165H2-7-34	**C304AND207**	10165H3-13-14	**C304CND313** ①	10165H4-9-12	**C304BND411**
10165H1-6-34	**C304AND106**	10165H2-8-32	**C304ANA208**	10165H3-13-20	**C304CNA313** ①	10165H4-9-19	**C304BNA411**
10165H1-7-32	**C304ANA107**	10165H2-8-34	**C304AND208**	10165H3-14-14	**C304CND314** ①	10165H4-13-14	**C304CND414** ①
10165H1-7-34	**C304AND107**	10165H2-9-12	**C304BND210**	10165H3-14-20	**C304CNA314** ①	10165H4-13-20	**C304CNA413** ①
10165H1-8-32	**C304ANA108**	10165H2-9-19	**C304BNA210**	10165H3-15-16	**C304DND315** ①	10165H4-14-14	**C304CND414** ①
10165H1-8-34	**C304AND108**	10165H2-10-12	**C304BND211**	10165H3-15-21	**C304DNA315** ①	10165H4-14-20	**C304CNA414** ①
10165H1-9-12	**C304BND110**	10165H2-10-19	**C304BNA211**	10165H3-16-16	**C304DND315** ①	10165H4-15-16	**C304DND415** ①
10165H1-9-19	**C304BNA110**	10165H2-12-14	**C304CND212**	10165H3-16-21	**C304DNA315** ①	10165H4-15-21	**C304DNA415** ①
10165H1-10-12	**C304BND111**	10165H2-12-20	**C304CNA212**	10165H3-17-23	**C304DNA316** ①	10165H4-16-16	**C304DND415** ①
10165H1-10-19	**C304BNA111**	10165H2-15-16	**C304DND215** ①	10165H3-17-25	**C304DND316** ①	10165H4-16-21	**C304DNA415** ①
10165H1-11-19	**C304CNA112**	10165H2-15-21	**C304DNA215** ①	10165H3-20-32	**C304ANA306**	10165H4-17-23	**C304DNA416** ①
10165H1-12-14	**C304CND112**	10165H2-27-16	**C304DND215** ①	10165H3-20-34	**C304AND306**	10165H4-17-25	**C304DND416** ①
10165H1-12-20	**C304CNA112**	10165H2-27-21	**C304DNA215** ①	10165H3-26-14	**C304CND313** ①	10165H4-20-32	**C304ANA406**
10165H1-15-16	**C304DND115** ①	10165H2-29-32	**C304ANA201**	10165H3-26-20	**C304CNA313** ①	10165H4-20-34	**C304AND406**
10165H1-15-21	**C304DNA115** ①	10165H2-29-34	**C304AND201**	10165H3-27-14	**C304CND314** ①	10165H4-26-14	**C304CND413** ①
10165H1-27-16	**C304DND115** ①	10165H2-37-12	**C304BND209**	10165H3-27-20	**C304CNA314** ①	10165H4-26-20	**C304CNA413** ①
10165H1-27-21	**C304DNA115** ①	10165H2-37-19	**C304BNA209**	10165H3-31-32	**C304ANA301**	10165H4-27-14	**C304CND414** ①
10165H1-29-32	**C304ANA101**	10165H2-42-16	**C304DND215** ①	10165H3-31-34	**C304AND301**	10165H4-27-20	**C304CNA414** ①
10165H1-29-34	**C304AND101**	10165H2-42-21	**C304DNA215** ①	10165H3-32-32	**C304ANA302**	10165H4-31-32	**C304ANA401**
10165H1-37-12	**C304BND109**	10165H2-43-16	**C304DND215** ①	10165H3-32-34	**C304AND302**	10165H4-31-34	**C304AND401**
10165H1-37-19	**C304BNA109**	10165H2-43-27	**C304DNA215** ①	10165H3-38-12	**C304BND310**	10165H4-32-32	**C304ANA402**
10165H1-42-16	**C304DND115** ①	10165H2-47-16	**C304DND215** ①	10165H3-38-19	**C304BNA310**	10165H4-32-34	**C304AND402**
10165H1-42-21	**C304DNA115** ①	10165H2-47-27	**C304DNA215** ①	10165H3-47-16	**C304DND316** ①	10165H3-38-12	**C304BND410**
10165H1-43-16	**C304DND115** ①	10165H2-48-16	**C304DND216** ①	10165H3-47-27	**C304DNA316** ①	10165H3-38-19	**C304BNA410**
10165H1-43-27	**C304DNA115** ①	10165H2-48-27	**C304DNA216** ①	10165H3-48-16	**C304DND316** ①	10165H4-47-16	**C304DND416** ①
10165H1-47-16	**C304DND115** ①	10165H3-2-32	**C304ANA303**	10165H3-48-27	**C304DNA316** ①	10165H4-47-27	**C304DNA416** ①
10165H1-47-27	**C304DNA115** ①	10165H3-2-34	**C304AND303**	10165H3-53-23	**C304DNA316** ①	10165H4-48-16	**C304DND416** ①
10165H1-48-16	**C304DND116** ①	10165H3-3-32	**C304ANA304**	10165H3-53-25	**C034DND316** ①	10165H4-48-27	**C304DNA416** ①
10165H1-48-27	**C304DNA116** ①	10165H3-3-34	**C304AND304**	10165H4-2-32	**C304ANA403**	10165H4-53-23	**C304DNA416** ①
10165H2-2-32	**C304ANA202**	10165H3-4-32	**C304ANA305**	10165H4-2-34	**C304AND403**	10165H4-53-25	**C304DND416** ①
10165H2-2-34	**C304AND202**	10165H3-4-34	**C304AND305**	10165H4-3-32	**C304ANA404**	—	**—**
10165H2-3-32	**C304ANA203**	10165H3-5-32	**C304ANA306**	10165H4-3-34	**C304AND404**	—	**—**

① New device has a wider calibration range than old device, but is a functional replacement.

Note: See **Pages 70** and **71** for prices.

Table 125. DC Magnetic Overload Relays Cross-Reference with Old Style Number

Old Catalog Number	Old Style Number	Replacement C304 Catalog Number	Old Catalog Number	Old Style Number	Replacement C304 Catalog Number
28UI2-2	A073-260365-4001	**C304ANA401**	28UI3-2	A073-260365-2001	**C304ANA301**
28UI2-3	A073-260365-4002	**C304ANA402**	28UI32	A073-260365-2002	**C304ANA302**
28UI2-5	A073-260365-4003	**C304ANA403**	28UI3-3	A073-260365-2003	**C304ANA303**
28UI2-6	A073-260365-4004	**C304ANA404**	28UI3-5	A073-260365-2004	**C304ANA304**
28UI2-8	A073-260365-4005	**C304ANA405**	28UI3-6	A073-260365-2005	**C304ANA305**
28UI2-13	A073-260365-4006	**C304ANA406**	28UI3-13	A073-260365-2006	**C304ANA306**
28UI2-20	A073-260365-4007	**C304ANA407**	28UI3-20	A073-260365-2007	**C304ANA307**
28UI2-22	A073-260365-4008	**C304ANA407**	28UI3-22	A073-260365-2008	**C304ANA307**
28UI2-35	A073-260365-4009	**C304ANA408**	28UI3-35	A073-260365-2009	**C304ANA308**
28UI2-55	A073-260365-4010	**C304BNA409**	28UI3-55	A073-260365-2010	**C304BNA309**
28UI2-68	A073-260365-4011	**C304BNA410**	28UI3-68	A073-260365-2011	**C304BNA310**
28UI2-100	A073-260365-4012	**C304BNA411**	28UI3-100	A073-260365-2012	**C304BNA311**
28UI2-110	A073-260365-4013	**C304BNA411**	28UI3-110	A073-260365-2013	**C304BNA311**
28UI2-160	A073-260365-4014	**C304CNA412**	28UI3-160	A073-260365-2014	**C304CNA312**
28UI2-220	A073-260365-4015	**C304CNA413**	28UI3-220	A073-260365-2015	**C304CNA313**
28UI2-285	A073-260365-4016	**C304CNA414**	28UI3-285	A073-260365-2016	**C304CNA314**
28UI2-500	A073-260365-4017	**C304CNA414**	28UI3-500	A073-260365-2017	**C304CNA314**
28UI2-600	A073-260365-4018	**C304DNA415**	28UI3-600	A073-260365-2018	**C304DNA315**
28UI2-900	A073-260365-4019	**C304DNA416**	28UI3-900	A073-260365-2019	**C304DNA316**
28UI2-1500	A073-281375-0004	**C304ENA417**	28UI3-1500	A073-281375-0002	**C304ENA317**
28UI2-2800	A073-281376-0004	**C304ENA418**	28UI3-2800	A073-281376-0002	**C304ENA318**
28UT2-2	A073-260365-3001	**C304ANA201**	28UT3-2	A073-260365-1001	**C304ANA101**
28UT2-3	A073-260365-3002	**C304ANA201**	28UT3-3	A073-260365-1002	**C304ANA101**
28UT2-5	A073-260365-3003	**C304ANA201**	28UT3-5	A073-260365-1003	**C304ANA101**
28UT2-6	A073-260365-3004	**C304ANA202**	28UT3-6	A073-260365-1004	**C304ANA102**
28UT2-8	A073-260365-3005	**C304ANA203**	28UT3-8	A073-260365-1005	**C304ANA103**
28UT2-13	A073-260365-3006	**C304ANA204**	28UT3-13	A073-260365-1006	**C304ANA104**
28UT2-20	A073-260365-3007	**C304ANA205**	28UT3-20	A073-260365-1007	**C304ANA105**
28UT2-22	A073-260365-3008	**C304ANA205**	28UT3-22	A073-260365-1008	**C304ANA105**
28UT2-35	A073-260365-3009	**C304ANA206**	28UT3-35	A073-260365-1009	**C304ANA106**
28UT2-55	A073-260365-3010	**C304ANA207**	28UT3-55	A073-260365-1010	**C304ANA107**
28UT2-68	A073-260365-3011	**C304ANA208**	28UT3-68	A073-260365-1011	**C304ANA108**
28UT2-100	A073-260365-3012	**C304BNA209**	28UT3-100	A073-260365-1012	**C304BNA109**
28UT2-110	A073-260365-3013	**C304BNA210**	28UT3-110	A073-260365-1013	**C304BNA110**
28UT2-160	A073-260365-3014	**C304BNA211**	28UT3-160	A073-260365-1014	**C304BNA111**
28UT2-220	A073-260365-3015	**C304CNA212**	28UT3-220	A073-260365-1015	**C304CNA112**
28UT2-285	A073-260365-3016	**C304CNA212**	28UT3-285	A073-260365-1016	**C304CNA112**
28UT2-500	A073-260365-3017	**C304CNA213**	28UT3-500	A073-260365-1017	**C304CNA113**
28UT2-600	A073-260365-3018	**C304CNA214**	28UT3-600	A073-260365-1018	**C304CNA114**
28UT2-900	A073-260365-3019	**C304DNA215**	28UT3-900	A073-260365-1019	**C304DNA115**
28UT2-1500	A073-281375-0003	**C304DNA216**	28UT3-1500	A073-281375-0001	**C304DNA116**
28UT2-2800	A073-281376-0003	**C304ENA217**	28UT3-2800	A073-281376-0001	**C304ENA117**



DC Field Loss Relay

Product Description

This family of motor field control relays consists of a relay with 1NO pole (#901) and a relay with 1NC pole (#902).

These relays are used on a large number of applications requiring either an NO or NC control contact. The opening and closing of the contact is responsive to changes in current through the coil. The relays are equipped with one or two coils, depending on the application. When the relays leave the factory, they are adjusted for average load conditions.

This adjustment is made up of two parts:

1. The adjustment of the differential, which is the difference between the opening and closing setting, and
2. The adjustment of the range or operating values.

Standards and Certifications

- NEMA Standard 5-24-1960.
- NEMA Standard 5-29-1960.
- NEMA Standard 1-5-1977.

Technical Data and Specifications

- Current Range: 5.6 – 1350 amperes.
- Voltage: Maximum 600 Vdc.
- Operation: Magnetic.
- Mounting:
  - Steel panel or insulated panel
- Contact Ratings:
  - 5 amperes at 240 V
  - 10 amperes at 120 V
- Duty: Continuous.
- Panel Space Required — without Studs for Coils:
  - Approximately 2.75 x 7.44" (69.9 x 189.0 mm)
- Approximate Weight:
  - Relay with one coil — 5 lb. (2.3 kg)
  - Relay with two coils, with B.O. — 6.5 lb. (3.0 kg)

Product Selection

When Ordering Specify

Field Loss Relays

- Maximum and minimum field amperes.
- Field ohms.

Accelerating and Decelerating Relays

- Motor horsepower.
- Motor full load amperes.
- Voltage.
- Maximum field current.
- Field accelerating or field decelerating relay.

Voltage Relays

- Desired pick-up voltage.
- Desired drop-out voltage.
- Maximum voltage seen by device.

OR

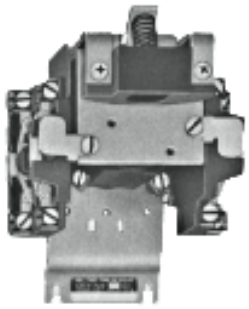
Supply complete Serial Number of controller where relay is used, plus diagram designation of relay required. Relays must be supplied with coils.

Table 126. Pricing

Relay Type	*
Single Coil Double Coil	
With Blowout Coil	

Discount Symbol **18CD-4**

* Consult Sales Office for Pricing



Basic 4-Contact Type KC Relay

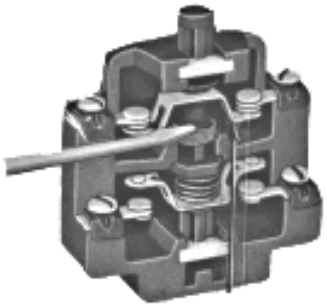
Product Description

The Type KC line of control relays complements the mill-type, front connected DC contactors (Bulletin 7400, Type K). Each device is completely assembled and ready for mounting on metal panels without additional insulators or special hardware.

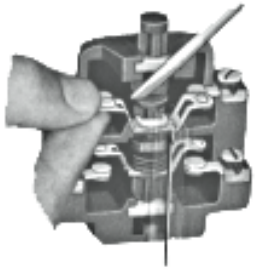
These dc mill type relays are designed for heavy industry service and are suitable for use on moving machinery. They are arranged for steel panel mounting with front connections. Unit circuit blocks have two captive mounting screws and are interchangeable between relays. They are easily convertible from normally open to normally closed or vice versa. Visible contacts are of double break design.

Contact Conversion

The fully visible contacts have NEMA ICS-2-125 heavy-duty interrupting ratings and are easily converted in the field using just a screwdriver as illustrated in **Figure 35**. Pressure terminals permit quick installation of up to two #12 wires, solid or stranded, per terminal. The molded operating coils provide maximum protection against moisture and mechanical abuse.



Slide Movable Contact Out



Flip Over and Insert Contact

Figure 35. Contact Conversion

Features

- Contacts are easily field convertible from NO to NC operation and vice versa.
- Melamine molded contact blocks feature wear-resistant nylon guides and stainless steel springs.
- Retained knife-edge design for reliable alignment.
- Contacts rated 15 amperes continuous.
- No adjustments to maintain — armature spring and air gap are fixed.
- Encapsulated coils feature pressure type saddle terminals.
- Basic relays are available with 2, 4, 6 or 8 contacts.
- All relays in the line have same mounting dimensions.

Standards and Certifications

- NEMA ICS3-212.20.21.
- NEMA ICS2-125.21.02.

Technical Data and Specifications

- Voltage: 600 Vdc maximum.
- Operation: Magnetic.
- Mounting: Steel panel.
- Electrical Ratings:
  - 15 amperes continuous
  - 2.2 amperes inductive breaking at 115 V
  - 1.1 amperes inductive breaking at 230 V

Accessories

Table 127. ac/dc Rectifier Kits ① — 50/60 Hertz

AC Supply Voltage	Relay Coil Required	Part Number	*
120	95 Vdc	**C81EB**	

① For operating relay from ac supply voltage.

Dimensions

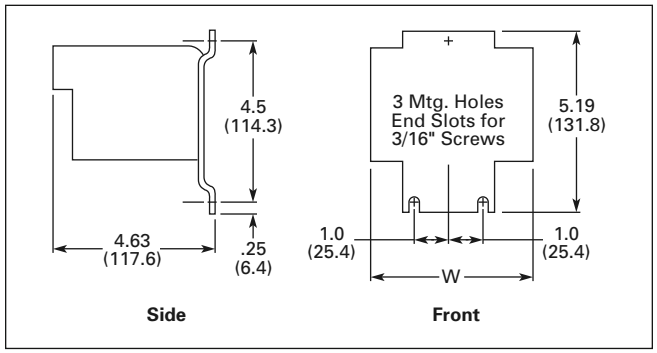


Figure 36. Approximate Dimensions in Inches (mm)

Table 128. Type KC

Part Number Series	"W" Approximate Dimensions in Inches (mm)
407251	2.88 (73.2)
407252	4.50 (114.3)
407253	7.50 (190.5)
407254	8.00 (203.2)

Product Selection

When Ordering Specify

■ Part Number of relay from **Table 129**.

Table 129. Type KC Heavy-Duty Mill Relays ②

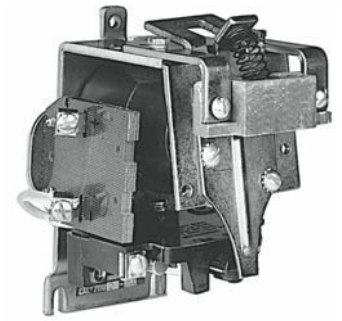
Number of Contacts	Contact Arrangement		Open Type Relay	
	NO	NC	Part Number	*
2	2	0	**A073-407251-0001**	
	1	1	**A073-407251-0002**	
	0	2	**A073-407251-0003**	
4	4	0	**A073-407252-0001**	
	3	1	**A073-407252-0002**	
	2	2	**A073-407252-0003**	
	1	3	**A073-407252-0004**	
	0	4	**A073-407252-0005**	
6 ③	6	0	**A073-407253-0001**	
	5	1	**A073-407253-0002**	
	4	2	**A073-407253-0003**	
	3	3	**A073-407253-0004**	
	2	4	**A073-407253-0005**	
8 ③	8	0	**A073-407254-0001**	
	7	1	**A073-407254-0002**	
	6	2	**A073-407254-0003**	
	5	3	**A073-407254-0004**	
	4	4	**A073-407254-0005**	

② Price includes assembled relay complete with operating coil rated 240 V. Consult factory for other voltage ratings.

③ The maximum number of NC contacts satisfactorily operated by the magnet is 4.

Discount Symbol **18CD-4**

* Consult Sales Office for Pricing



DC Plugging Relay

Product Description

Type KPR Plugging

The Type KPR Relay features a diode assembly mounted on the relay base and wired in series with the relay operating coil. The relay detects when a dc motor is being plugged. (Plugging is the sudden reversal of the polarity applied to a relay motor causing it to rapidly stop and reverse rotational direction.)

The coil circuit of the plugging relay is connected to parallel with the motor armature and monitors armature voltage. During normal dc motor operation, the diode is non-conducting and the relay is de-energized. During motor plugging, polarity reverses, causing the diode to conduct and operate the relay. The contacts of the relay cause motor circuit contactors and resistors to properly plug the motor.

Type KFL Field Loss

The Type KFL relays are no longer manufactured. The suggested replacement is the Type 901 single-pole normally open relay. Refer to **Page 74** for application and ordering information.

Standards and Certifications

- NEMA Standard 5-24-1960.
- NEMA Standard 5-29-1960.
- NEMA Standard 1-5-1977.

Technical Data and Specifications

- Voltage: Maximum 600 Vdc.
- Operation: Magnetic.
- Mounting:
  - Steel panel or insulated panel
- Contact Ratings:
  - 5 amperes at 240 V
  - 10 amperes at 120 V
- Duty: Continuous.

Dimensions

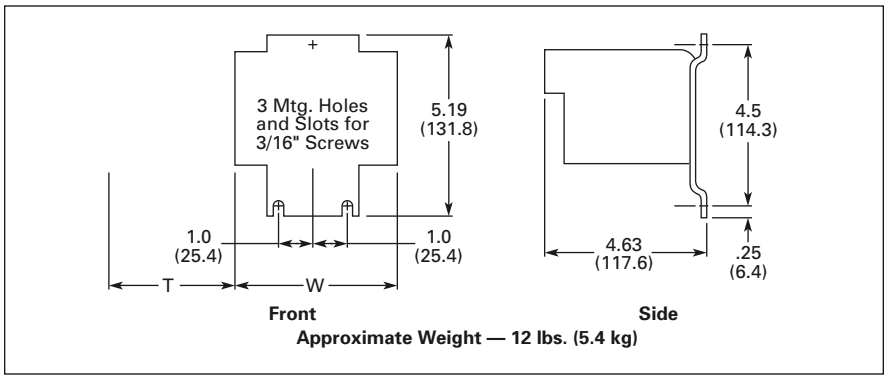


Figure 37. Approximate Dimensions in Inches (mm)

Table 130. Type KPR Plugging

Description	Approximate Dimensions in Inches (mm)	
	W	T
Type KPR-1 Relay	3.25 (82.6)	—
Type KPR-2 Relay	2.87 (72.9)	2.75 (69.9)

Product Selection

When Ordering Specify

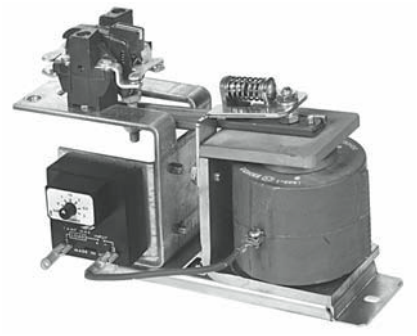
- Complete Catalog or Part Number

Table 131. Type KPR Plugging Relay (Open Type)

Motor Voltage	Relay Type	Catalog Number	*
240 Vdc 550 Vdc	KPR-1 KPR-1	**7311UD-240** **7311UD-550**	
240 Vdc 550 Vdc	KPR-2 ① KPR-2 ①	**7311UE-240** **7311UE-550**	

① KPR-2 relays are for 2-step or graduated plugging. Consult factory for application details.

Discount Symbol **18CD-4**
* Consult Sales Office for Pricing



Timing Relay Replacement

Product Description

The replacement Type 7313 heavy-duty DC relays provide adjustable ON-delay timing factory set to duplicate the time delay provided by the previous type CTH and VTH timers. These relays are supplied with equivalent pilot duty contact ratings and configuration.

Product Selection

Table 132. Challenger Bulletin 7313 VTH Timing Relay Data (Sorted by Old Part Number)

Contacts	Timing (Seconds)	Old Part Number	New Part Number	*
2NO	.25	A073-260931-1001	**7313ED1**	
2NO	.50	A073-260931-1002	**7313ED1**	
2NO	.75	A073-260931-1003	**7313ED1**	
2NO	1.0	A073-260931-1004	**7313ED1**	
2NO	2.0	A073-260931-1006	**7313ED1**	
2NO	3.0	A073-260931-1007	**7313ED1**	
2NO	4.0	A073-260931-1008	**7313ED2**	
2NO	6.0	A073-260931-1010	**7313ED2**	
2NO	10.0	A073-260931-1013	**7313ED2**	
1NO/1NC	.25	A073-260931-2001	**7313ED3**	
1NO/1NC	.50	A073-260931-2002	**7313ED3**	
1NO/1NC	.75	A073-260931-2003	**7313ED3**	
1NO/1NC	1.0	A073-260931-2004	**7313ED3**	
1NO/1NC	2.0	A073-260931-2006	**7313ED3**	
1NO/1NC	3.0	A073-260931-2007	**7313ED3**	
1NO/1NC	4.0	A073-260931-2008	**7313ED4**	
1NO/1NC	6.0	A073-260931-2010	**7313ED4**	
1NO/1NC	10.0	A073-260931-2013	**7313ED4**	
2NC	.25	A073-260931-3001	**7313ED5**	
2NC	.50	A073-260931-3002	**7313ED5**	
2NC	.75	A073-260931-3003	**7313ED5**	
2NC	1.0	A073-260931-3004	**7313ED5**	
2NC	2.0	A073-260931-3006	**7313ED5**	
2NC	3.0	A073-260931-3007	**7313ED5**	
2NC	4.0	A073-260931-3008	**7313ED6**	
2NC	6.0	A073-260931-3010	**7313ED6**	
2NC	10.0	A073-260931-3013	**7313ED6**	
4NO	.25	A073-260931-4001	**7313ED7**	
4NO	.50	A073-260931-4002	**7313ED7**	
4NO	.75	A073-260931-4003	**7313ED7**	
4NO	1.0	A073-260931-4004	**7313ED7**	
4NO	2.0	A073-260931-4006	**7313ED7**	
4NO	3.0	A073-260931-4007	**7313ED7**	
4NO	4.0	A073-260931-4008	**7313ED8**	
4NO	6.0	A073-260931-4010	**7313ED8**	
4NO	10.0	A073-260931-4013	**7313ED8**	
3NO/1NC	.25	A073-260931-5001	**7313ED9**	
3NO/1NC	.50	A073-260931-5002	**7313ED9**	
3NO/1NC	.75	A073-260931-5003	**7313ED9**	
3NO/1NC	1.0	A073-260931-5004	**7313ED9**	
3NO/1NC	2.0	A073-260931-5006	**7313ED9**	
3NO/1NC	3.0	A073-260931-5007	**7313ED9**	
3NO/1NC	4.0	A073-260931-5008	**7313ED10**	
3NO/1NC	6.0	A073-260931-5010	**7313ED10**	
3NO/1NC	10.0	A073-260931-5013	**7313ED10**	
2NO/2NC	.25	A073-260931-6001	**7313ED11**	
2NO/2NC	.50	A073-260931-6002	**7313ED11**	
2NO/2NC	.75	A073-260931-6003	**7313ED11**	
2NO/2NC	1.0	A073-260931-6004	**7313ED11**	
2NO/2NC	2.0	A073-260931-6006	**7313ED11**	
2NO/2NC	3.0	A073-260931-6007	**7313ED11**	
2NO/2NC	4.0	A073-260931-6008	**7313ED12**	
2NO/2NC	6.0	A073-260931-6010	**7313ED12**	
2NO/2NC	10.0	A073-260931-6013	**7313ED12**	

Discount Symbol **18CD-4**

* Consult Sales Office for Pricing

Table 133. Challenger Bulletin 7313 CTH Timing Relay Data (Sorted by Old Part Number)

Contacts	Timing (Seconds)	Old Part Number	New Part Number	*
2NO	.25	A073-260930-1001	**7313ED13**	
2NO	.50	A073-260930-1002	**7313ED13**	
2NO	.75	A073-260930-1003	**7313ED13**	
2NO	1.0	A073-260930-1004	**7313ED13**	
2NO	2.0	A073-260930-1006	**7313ED13**	
2NO	3.0	A073-260930-1007	**7313ED13**	
1NO/1NC	.25	A073-260930-2001	**7313ED14**	
1NO/1NC	.50	A073-260930-2002	**7313ED14**	
1NO/1NC	.75	A073-260930-2003	**7313ED14**	
1NO/1NC	1.0	A073-260930-2004	**7313ED14**	
1NO/1NC	2.0	A073-260930-2006	**7313ED14**	
1NO/1NC	3.0	A073-260930-2007	**7313ED14**	
2NO/2NC	.25	A073-260930-3001	**7313ED15**	
2NO/2NC	.50	A073-260930-3002	**7313ED15**	
2NO/2NC	.75	A073-260930-3003	**7313ED15**	
2NO/2NC	1.0	A073-260930-3004	**7313ED15**	
2NO/2NC	2.0	A073-260930-3006	**7313ED15**	
2NO/2NC	3.0	A073-260930-3007	**7313ED15**	

Discount Symbol **18CD-4**
* Consult Sales Office for Pricing

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