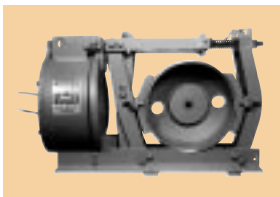
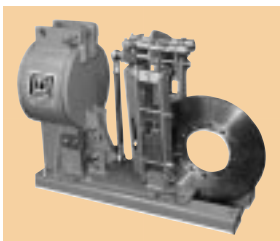


Crane Control

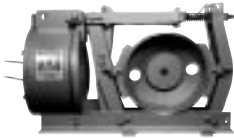


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CLASS 5010 WB DRUM BRAKES (PAGES 13-24)



- AISE rated and suitable for all crane classes
- Spring set electrically released, DC drum type
- Used to hold drive stationary when motor is off
- Available in 8" through 30" wheel diameters
- Torque ratings 100 through 9000 ft-lb
- Corrosion resistant pins are standard on all brake sizes
- Grease fittings are standard on 19", 23", and 30" brake sizes
- Available with brake rectifier controller for AC operation
- Available with optional self-adjuster

CLASS 5015 CALIPER DISC BRAKES (PAGES 25-34)



- AISE rated and suitable for all crane classes
- Meet AISE mounting dimensions
- Available in 14" through 29" disc diameters
- Torque ratings 200 through 4000 ft-lb
- Available with brake rectifier controller for AC operation
- Features automatic wear compensation
- Easy to adjust; Easy to maintain
- Securely mounted, easily replaced long life friction pads

CLASS 5060 ADJUSTABLE TORQUE DRUM BRAKES (PAGES 35-42)



- AISE rated and suitable for all crane classes
- Used on bridge and trolley drives
- Provide fixed holding torque for parking
- Provide electrically controlled adjustable torque for stopping
- Available in 10", 13" and 16" wheel diameters with corresponding parking torque ratings of 200, 550, and 1000 ft-lb

DC MOTOR CONTROLLERS

DC crane control panels are motor controllers that provide multi-speed control of DC series wound motors used on crane hoist, bridge and trolley drives. In addition, magnetic holding brakes, adjustable torque brakes, power limit switches, power resistors, master switches, manual-magnetic disconnect switches and lifting magnet controls may also be required.



CLASS 6121 CONTROLLERS (PAGES 43-64)

- Reversing dynamic lowering control for hoist drives
- Reversing plugging control for bridge and trolley drives
- Meet requirements of NEMA Service Classification I
- 5 speed points standard
- Large number of panel modifications available
- Available in NEMA contactor Sizes 3 through 8, single and multiple motors
- Uses Class 7004 Type M LINE-ARC® contactors and Class 7001 Type ST-1 static timers and Type K relays



CLASS 6131 CONTROLLERS (PAGES 65-72)

- Reversing dynamic lowering control for hoist drives
- Reversing plugging control for bridge and trolley drives
- Exceed requirements of NEMA Service Classification II
- 4 speed points standard, 5 speed points available
- Limited panel modifications available
- Available in NEMA contactor Sizes 1 through 4, single motors only
- Uses Class 7004 Type M LINE-ARC® contactors and Class 7001 Type ST-1 static timers and Type K relays

DC MILL AUXILIARY CONTROL

DC mill auxiliary controllers are recommended for use with DC series, shunt, or compound wound motors. They are frequently used on steel mill auxiliary drives such as screwdowns, tables, sideguards, shears, and similar applications.

The following five basic control types are available:

- Reversing Plugging (RP) Control
- Reversing Plugging Dynamic Braking (RPD) Control
- Non-Reversing (NR) Control
- Non-Reversing Dynamic Braking (NRD) Control
- Reversing Non-Plugging Dynamic Braking (RNPD) Control

NOTE: Consult factory for price and delivery.

RECTIFIED DC CONSTANT POTENTIAL HWR HOIST CONTROL

HWR hoist control is recommended for use with DC series motors on AC powered cranes requiring the speed range, accuracy and dependability of a DC powered crane hoist controller.

NOTE: Consult factory for price and delivery.

AC MAGNETIC MOTOR CONTROLLERS

AC crane controllers are motor controllers that provide multi-speed control of AC wound rotor motors used on crane hoist, bridge and trolley drives. In addition, magnetic holding brakes, adjustable torque brakes, power limit switches, power resistors, master switches, manual-magnetic disconnect switches and lifting magnet controls may also be required.

- For control of AC wound rotor motors
- Meet requirements of NEMA Service Classification I
- Recommended for CMAA Service Classifications D, E, and F
- Use Class 8503 Type M clapper type contactors
- Use Class 8501 Type SZF static frequency acceleration relays for plugging
- Use Class 7001 Type ST1 static acceleration timers

CLASS 6420 EDDYMAG® HOIST CONTROL

- Requires eddy current electric load brake
- Provides slow hoisting and lowering speeds for all loads
- Stepped control

CLASS 6421 AC DYNAMIC LOWERING HOIST CONTROL

- Uses single-phase motor connection for dynamic lowering
- Suitable for applications not requiring slow lowering speeds



CLASS 6422 CONTRA-TORQUE™ HOIST CONTROL

- Provides slow hoisting and lowering speeds for overhauling loads only
- Recommended for magnet and bucket cranes

CLASS 6426 REVERSING PLUGGING BRIDGE OR TROLLEY CONTROL

- Provides accurate plugging control with Class 8501 Type SZF frequency relay



CLASS 6440 AC MANUAL MAGNETIC DISCONNECT SWITCH

- Meets OSHA requirements for AC crane disconnect switch
- Available in continuous ampere ratings of 150 to 600 A
- Operated remotely by push button or by handle on the enclosure
- Cam operator prevents contactor from closing when handle is in off position

NOTE: Consult factory for price and delivery on AC crane control.



CLASS 6140 DC MANUAL MAGNETIC DISCONNECT SWITCH (PAGES 73-76)

- Meets OSHA requirements for DC crane disconnect switch
- Available in continuous ampere ratings of 150 to 2700 A
- Operated remotely by push button or by handle on the enclosure
- Cam operator prevents contactor from closing when handle is in off position



CLASS 6170 YOUNGSTOWN® HOIST POWER LIMIT SWITCH (PAGES 77-84)

- Limits upper travel of hoist
- Interrupts motor power directly
- Available in ratings to 500 HP at 230 VDC

CLASS 6715 TAB-WELD® RESISTORS (PAGES 85-90)

- Used in motor circuits to control acceleration and speed
- Available in continuous ampere ratings of 13 to 500 A
- Applicable where environmental conditions of vibration and dirt are severe

NOTE: For additional information on complete sets of resistors used with DC crane control, see the DC motor controllers in sections 6121 and 6131. For complete sets of AC resistors, consult factory.



CLASS 6815 LIFTING MAGNET CONTROLLERS (PAGES 91-98)

- For use with steel mill and scrap yard magnets
- Automatic discharge control provides quick, clean release of magnet load
- Designed for push button or master switch operation
- Use Class 7004 Type M LINE-ARC® contactors

Type A Magnet Controller (Pages 92-94)

- For 31 to 130 Ampere generator-powered magnets

Type M Magnet Controller (Pages 95-98)

- For 15 to 175 Ampere magnets
- For use with rectifier or generator power source on AC or DC cranes

NOTE: For lifting magnet circuit disconnect switches and rectifier power supply: Consult factory for price and delivery.





CLASS 7001 TYPE K DC RELAYS (PAGES 99-105)

- Mill duty construction
- Designed for steel base mounting
- 10 Ampere continuous rating for Types KG, KE and KI
- 25 Ampere continuous rating for Type KF
- 600 VDC maximum



CLASS 7001 TYPE ST DC STATIC TIMER (PAGE 106)

- Three time-delay settings
- Encapsulated DC timing relay consisting of solid-state circuit components



CLASS 7001 TYPE SSI DC ACCELERATION MODULE (PAGES 107-108)

- Time delay depends on motor current
- Single module provides up to 4 steps of acceleration control
- No power connections required
- Indicating light monitors module operation



CLASS 7004 TYPE M LINE-ARC[®] DC CONTACTORS (PAGES 109-116)

- Mill duty construction
- Front connected
- High strength glass polyester insulating base for steel base mounting
- LINE-ARC[®] method of arc extinction
- Available in continuous ampere ratings of 25 to 1350 A

DC REDUCED VOLTAGE STARTERS (PAGES 117-126)

Class 7135 – Constant Speed, Non-Reversing

Class 7136 – Adjustable Speed, Non-Reversing

Class 7145 – Constant Speed, Reversing

Class 7146 – Adjustable Speed, Reversing

- Designed to meet NEMA standards
- Rugged mill duty components
- Time limit acceleration



CLASS 8501 TYPE SZF FREQUENCY RELAY (PAGES 127-130)

- User programmable
- Frequency set points for relay pick-up and drop-out
- Output relay contact is user programmable as normally open or normally closed
- Indicating light monitors output contact status



CLASS 8503 TYPE M LINE-ARC[®] AC CONTACTORS (PAGES 131-137)

- Mill duty construction
- Front connected
- High strength glass polyester insulating base for steel base mounting
- LINE-ARC[®] method of arc extinction
- DC operating coil
- Available in continuous ampere ratings of 50 to 600 A





CLASS 9004 MASTER SWITCHES AND PUSH BUTTON STATION (PAGES 139-144)

- Used to operate multi-speed motor controllers
- Master switches available in two different types
 - Type CM for desk mounting (see photo above, left)
 - Type VM for floor or console mounting (see photo below, left)
- Pendant push button station available for floor operated cranes



XKM HEAVY DUTY MASTER SWITCH

- Mill duty, cast metal construction
- Capable of two motion or single motion in straight line, cross pattern or joystick operation permitting control of two movements simultaneously
- Provides single or multi-axis control with standard or long handle lengths
- Flexible cam arrangement may be changed in the field

NOTE: Consult factory for price and delivery.



CLASS 9055 MAGNETIC AC & DC CURRENT OVERLOAD RELAYS (PAGES 145-150)

Type AO – Inverse time delay

Type NO – Instantaneous trip



CLASS 9998 COILS & REPLACEMENT PARTS KITS (PAGES 151-156)

- DC coils for Type K relays and Type M contactors
- Copper and silver contact tip kits



CLASS 9999 USER MODIFICATION KITS (PAGES 157-161)

- Electrical interlocks, mechanical interlocks, arc suppressors, tie bars and power lugs for Type M contactors
- Control circuit contacts for Type K relays



SALES, MARKETING AND TECHNICAL INFORMATION

- CALL (803) 695-7800 or (888) 411-8326
- FAX (803) 695-7826

Crane Control Selection Guide

CONSULT SCHNEIDER AUTOMATION (RALEIGH) FOR THE FOLLOWING:

CLASS 6310 COLLISION AVOIDANCE SYSTEM



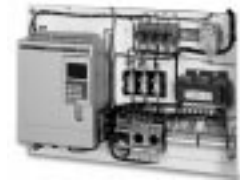
- Solution incorporating an ultrasonic sensor and packaged controls to provide collision avoidance protection
- Up to a 50 ft range of operation
- 2 set points (slow down & stop)
- Works with AC & DC cranes (constant potential, VFDs etc.)
- Easily retrofitted
- Very durable, stands up in harsh environments

CLASS 6320 CRANE-PAK™ AC MOTOR CONTROL



- Pre-engineered AC motor control solutions incorporating AC VFDs
- 1/2 through 400 HP
- Up through CMAA Class "F" Service
- For Bridge, Trolley and Hoist (with mechanical load brakes) applications
- Closed Loop Flux Vector available for critical traverse applications and hoists without mechanical load brakes
- Custom options available

CLASS 6395 ENCLOSED DC DRIVE SOLUTION



- Pre-engineered DC motor control solutions incorporating DC digital variable voltage drives
- 35 - 750 HP used on any DC shunt wound motor (180 - 500 VDC)
- Completely built and tested in NEMA 12 enclosure with standard list of features
- Custom options available



Crane Control Application Data



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SQUARE D
GROUPE SCHNEIDER

Crane Control Application Data

AC Motor Data

The following typical motor data is based on the information in AISE Standard No. 1A, AC Mill Motor Standards and NEMA Standards for Wound Rotor Motor Secondary Data. Motor primary currents are based on data published by several motor manufacturers.

This information may be used to select the proper crane controllers and crane accessories.

AISE Standard AC Mill Motors

AISE Motor Frame Size	Wound Rotor 85° C Rise Totally Enclosed Non-Ventilated					
	1 Hour Horsepower Rating	Full Load Torque (ft-lb)	Synch. Speed (RPM)	Primary Current at 460 VAC (A)	Secondary Voltage (V)	Secondary Current (A)
AC 1	5	23	1200	8	140	19
AC 2	10	46	1200	15	195	26.5
AC 4	20	92	1200	30	265	38
AC 8	40	184	1200	55	250	75
AC 12	60	276	1200	76	300	92
AC 18	90	540	900	149	260	162
AC 25	125	750	900	172	305	190
AC 30	150	895	900	215	340	207
AC 40	200	1490	720	291	275	335
AC 50	250	1857	720	365	310	375

Wound Rotor Motors with NEMA Secondary Values

1 Hour Horsepower Rating	Full Load Torque (ft-lb)	Synch. Speed (RPM)	Primary Current At 460 VAC (A)	Secondary Voltage (V)	Secondary Current (A)
5	15	1800	7.9	140	19
	23	1200	8.9		
	31	900	10.9		
7-1/2	23	1800	11.0	165	23
	35	1200	13.2		
	46	900	13.7		
10	31	1800	13.8	195	26.5
	46	1200	16.6		
	62	900	16.1		
15	46	1800	20.1	240	32.5
	69	1200	22.0		
	93	900	26.0		
20	61	1800	25	265	38
	92	1200	28		
	124	900	32		
25	76	1800	32	220	60
	115	1200	34		
	155	900	38		
30	92	1800	38	240	65
	138	1200	40		
	185	900	46		
40	185	1200	55	315	60
	247	900	61		
50	221	1200	69	350	67
	309	900	76		
60	277	1200	78	375	74
	371	900	88		
75	346	1200	97	385	90
	464	900	116		
100	461	1200	129	360	130
	619	900	130		
125	576	1200	159	385	150
	770	900	160		
150	926	900	195	380	185

Crane Control Application Data DC Motor Data

The following typical motor data is based on the information published in the AISE Standard No. 1, DC Mill Motor Standards.

This information may be used to select the proper crane controllers and crane accessories:

1. NEMA standards require that crane controllers be selected on the intermittent motor rating (30-minute or 1-hour rating) at which the motor is applied.
2. AISE standards require that hoist controllers be selected based on the 30 minute rating of the hoist motors.
3. AISE standards require that bridge and trolley controllers be selected based on the 1 hour rating of bridge and trolley motors.

DC Motor Data AISE frame 600 and 800 motors

Motor Frame Size		Series Wound Totally Enclosed Motors				
		Horsepower Rating		Full Load Ratings		
600 Series	800 Series	30-Minute	1-Hour	Torque (ft-lb)	Speed (RPM)	Amperes at 230 VDC
602	802A	6-1/2	...	45	750	29
		...	5	30	900	21
		10	...	80	675	44
603	802B	...	7-1/2	50	800	31
		10	...	80	675	45
		...	7-1/2	50	800	31
604	802C	13-1/2	...	115	620	57
		...	10	70	725	41
		13-1/2	...	105	675	57
606	803	...	10	65	800	41
		19	...	180	560	77
		...	15	120	650	59
608	804	19	...	160	620	77
		...	15	110	725	59
		26	...	235	580	98
610	806	...	20	160	650	75
		33	...	340	515	129
		...	25	230	575	95
612	808	39	...	410	500	145
		...	30	275	575	112
		45	...	500	470	175
614	810	...	35	320	525	131
		65	...	770	445	248
		...	50	525	500	184
616	812	65	...	760	450	246
		...	50	500	525	184
		90	...	1070	440	335
618	814	...	70	735	500	260
		100	...	1225	430	375
		...	75	830	475	274
620	816	135	...	1735	400	500
		...	100	1140	460	360
		135	...	1690	420	500
622	818	...	100	1110	475	360
		200	...	2630	400	730
		...	150	1750	450	536
624	820	200	...	2625	400	730
		...	150	1710	460	533
		265	...	3810	385	955
626	822	...	200	2560	410	712
		265	...	3480	400	955
		...	200	2330	450	712
628	824	325	...	4740	360	1140
		...	250	3200	410	900
		360	...	5570	340	1260
630	826	...	275	3700	370	970
		390	...	6025	340	1430
		...	300	4260	370	1080
632	828	500	...	8480	310	1800
		...	375	5790	340	1330
		500	...	8470	310	1890
634	830	...	375	5790	340	1370
		650	...	11550	300	2370
		...	500	8210	320	1800

APPLICATION DATA



Crane Control Application Data

General

CLASS A (STANDBY OR INFREQUENT SERVICE)

This service class covers cranes which may be used in installations such as powerhouses, public utilities, turbine rooms, motor rooms and transformer stations where precise handling of equipment at slow speeds with long, idle periods between lifts are required. Capacity loads may be handled for initial installation of equipment and for infrequent maintenance.

CLASS B (LIGHT SERVICE)

This service covers cranes which may be used in repair shops, light assembly operations, service buildings, light warehousing, etc., where service requirements are light and the speed is slow. Loads may vary from no load to occasional full rated loads with two to five lifts per hour, averaging ten feet per lift.

CLASS C (MODERATE SERVICE)

This service covers cranes which may be used in machine shops or papermill machine rooms, etc., where service requirements are moderate. In this type of service the crane will handle loads which average 50 percent of the rated capacity with 5 to 10 lifts per hour, averaging 15 feet, not over 50 percent of the lifts at rated capacity.

CLASS D (HEAVY SERVICE)

This service covers cranes which may be used in heavy machine shops, foundries, fabricating plants, steel warehouses, container yards, lumber mills, etc., and standard duty bucket and magnet operations where heavy duty production is required. In this type of service, loads approaching 50 percent of the rated capacity will be handled constantly during the working period. High speeds are desirable for this type of service with 10 to 20 lifts per hour averaging 15 feet, not over 65 percent of the lifts at rated capacity.

CLASS E (SEVERE)

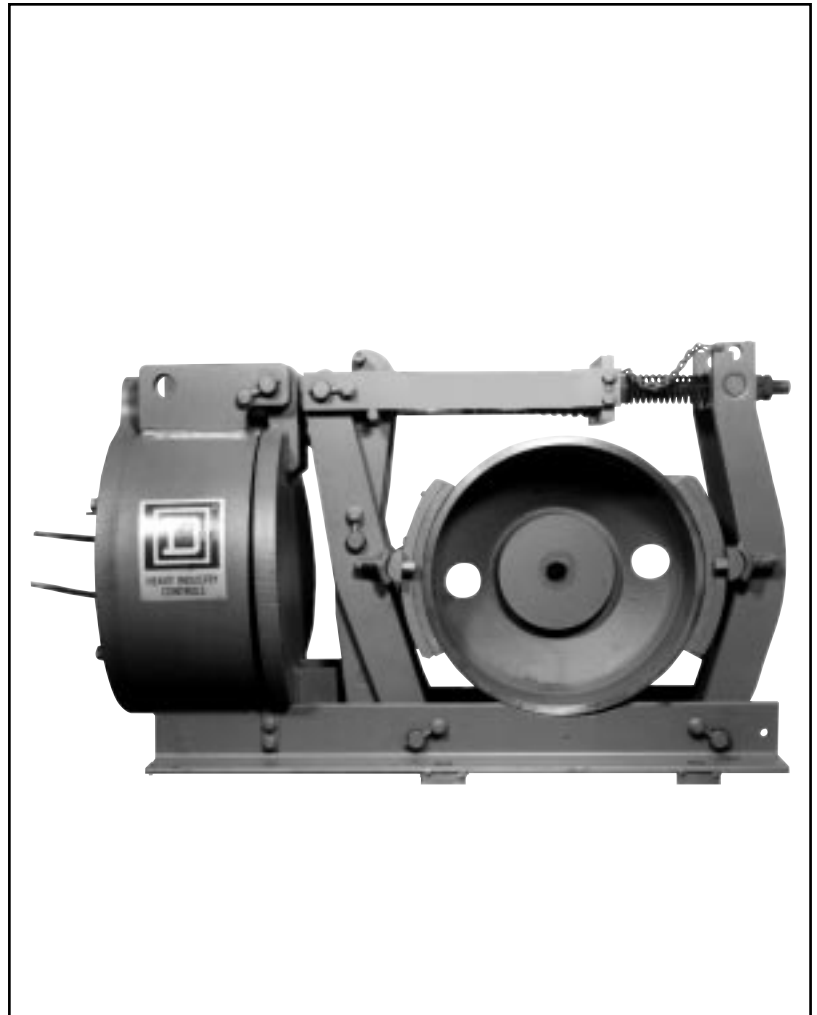
This type of service requires a crane capable of handling loads approaching a rated capacity throughout its life. Applications may include magnet, bucket, magnet/bucket combination cranes for scrap yards, cement mills, lumber mills, fertilizer plants, container handling, etc., with twenty or more lifts per hour at or near the rated capacity.

CLASS F (CONTINUOUS SEVERE SERVICE)

This type of service requires a crane capable of handling loads approaching rated capacity continuously under severe service conditions throughout its life. Applications may include custom designed specialty cranes essential to performing the critical work tasks affecting the total production facility. These cranes must provide the highest reliability with special attention to ease of maintenance features.



Crane Control Class 5010



CLASS 5010

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SQUARE D
GROUPE SCHNEIDER

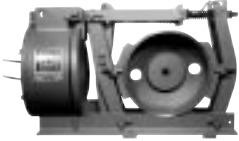
Crane Control Class 5010

DC Magnetic Drum Brakes

GENERAL INFORMATION

CLASS 5010 DC MAGNETIC DRUM BRAKES

Class 5010 brakes are spring set, electrically released, drum type friction brakes which are used with either AC or DC motors.



Class 5010
Type F1325
13" Brake

- Spring set, electrically released, drum type friction brakes
- Designed to meet AISE-NEMA standards
- Corrosion resistant pins are standard on all brake sizes
- Grease fittings are standard on 19", 23" and 30" brake sizes
- Optional self-adjuster compensates for lining wear

Series Brakes

- Used as holding brakes on DC series motor drives
- Used on crane hoists, mill drives and transfer cars
- Brake operating coil connected in series with motor armature
- Brake releases and sets in response to motor current



Class 5010
Type F3004
30" Brake

Standard Shunt Brakes

- Used as holding or stopping brakes on DC reversing drives such as crane bridges or trolleys and mill auxiliary drives
- Brake coil and protective resistor rated for line voltage

High Speed Shunt Brakes

- Used as stopping brakes on DC reversing drives
- Quicker set and release times than the standard shunt brakes
- Brake coil and protective resistor rated for line voltage, relay controls the amount of resistance in circuit

Rectifier Operated Brakes

- DC shunt brake designed to operate from a brake rectifier controller
- Used as holding or stopping brake on AC applications such as cranes, conveyors, or movable bridges
- Provides high speed operation similar to DC high speed shunt brake



Crane Control Class 5010 DC Magnetic Drum Brakes

PRICING AND ORDERING INFORMATION

Series Brakes

Brake Size	Maximum Torque (ft-lb)		Maximum HP Rating at 230 VDC ■		Type	Price With Standard Wheel	Price Without Standard Wheel
	1/2 Hour	1 Hour	1/2 Hour	1 Hour			
8	100	65	4.5+ 6 7 10 13 17	3.5+ 4.5 5.5 8 10.5 14	F0809 F0808 F0807 F0806 F0805 F0804	\$ 4410.	\$ 3728.
10	200	130	7+ 11 14 23 30	5+ 8 11 18 23	F1028 F1027 F1026 F1025 F1024	5409.	4397.
13	550	365	19+ 30 39 49 63	15+ 24 31 40 50	F1326 F1325 F1324 F1323 F1329	6687.	5579.
16	1000	650	47+ 60 77 96 122	36+ 46 59 76 95	F1624 F1625 F1623 F1622 F1621	9263.	7620.
19	2000	1300	78+ 97 120 155 178	59+ 76 90 116 134	F1908 F1907 F1906 F1905 F1904	13893.	11421.
23	4000	2600	160+ 180 206 235 320 365	127+ 142 162 185 252 290	F2324 F2336 F2323 F2335 F2322 F2321	20711.	16560.
30	9000	6000	300+ 380 410 505 580	230+ 290 315 390 445	F3005 F3004 F3003 F3002 F3001	44397.	36545.

■ Other coils are available if required, consult factory for information.

+ If desired horsepower rating is lower than 85 percent of the lowest value listed, consult factory for correct type number.

CLASS 5010



Crane Control Class 5010 DC Magnetic Drum Brakes

PRICING AND ORDERING INFORMATION

Shunt Brakes †

Brake Size	Maximum Torque (ft-lb)		Type	Price With Standard Wheel	Price Without Standard Wheel
	1 Hour	8 Hour			
8	100	75	F0857	\$ 4410.	\$ 3728.
10	200	150	F1077	5409.	4397.
13	550	400	F1375	6687.	5579.
16	1000	750	F1674	9263.	7620.
19	2000	1500	F1959	13893.	11421.
23	4000	3000	F2374	20711.	16560.
30	9000	6750	F3051	44397.	36545.

† Must be used with resistor for standard DC shunt brake applications or with resistor and relay for high speed shunt brake applications.

Resistors for Standard DC Shunt Brakes

VDC	Brake Size	1-Hour Service ▲		8-Hour Service ■	
		Open Type		Open Type	
		Type	Price	Type	Price
230	8	RO125	Included In Brake Price	RO126	Included In Brake Price
	10	RO105		RO128	
	13	RO106		RO111	
	16	RO106		RO109	
	19	RO132		RO146	
	23	RO136		RO138	

▲ 1-hour service is used when the brake sets every time the master switch is moved to the off point.

■ 8-hour service is when the brake stays released for extended times. For example, the brake may stay released during an entire 8-hour shift while the crane is powered up.

Resistors For High-Speed Shunt Brakes

VDC	Brake Size ◆	Open Type	
		Type	Price
230	16	RO126	Included In Brake Price
	19	RO148	
	23	RO116	
	30	RO57	

◆ For resistors for smaller brake sizes, consult factory.

Relays For High-Speed Shunt Brakes

VDC	Brake Size ◆	Class 7001 Type KFO01	
		Form	Price
230	16	F16	\$ 513.
	19	F19	513.
	23	F23	513.
	30	F30	720. ◆◆

◆ For relays for smaller brake sizes, consult factory.

◆◆ Price includes one Class 7004 Type MXDO1 contactor and one Class 9001 Type KIO11 relay.

CP9A

Discount
Schedule



PRICING AND ORDERING INFORMATION

Brake Rectifier Controllers



**Class 5010
Type QW110
Brake Rectifier Controller**

Brake rectifier controllers are designed to convert AC line power to DC for use with a rectifier operated brake. A high speed forcing circuit provides optimum operation of the brake. The standard controller includes:

- 1 460/230 to 120 V fused transformer
- 1 Class 8502 Type S 3-pole contactor
- 1 Full wave rectifier
- 1 Dropping resistor
- 1 Class 7001 Type K DC relay

Brake Rectifier Controllers ¹

VAC 60 Hz	Brake Size (Wheel dia. in inches)	Outdoor Enclosure NEMA Type 3R			
		For Single Brake		For Two Brakes in Series	
		Type	Price	Type	Price
230 – 460	8	QW108	\$ 2940.	QW208	\$ 3588.
	10	QW110	2940.	QW210	3588.
	13	QW113	2940.	QW213	4308.
	16	QW116	3660.	QW216	5544.
	19	QW119	3660.	QW219	5544.
	23	QW123	3660.	QW223	5544.

¹ For 30" applications, consult factory.

Rectifier Operated Brakes ^{▲1}

Brake Size	Maximum Torque (ft-lb) (Any Duty)	Single Brake	Two Brakes in Series	Price With Standard Wheel (Each)	Price Without Standard Wheel (Each)
		Type	Type		
8	100	F0853	F0851	\$ 4410.	\$ 3728.
10	200	F1072	F1070	5409.	4397.
13	550	F1370	F1385	6687.	5579.
16	1000	F1670	F1686	9263.	7620.
19	2000	F1954	F1951	13893.	11421.
23	4000	F2383	F2384	20711.	16560.

[▲] Must be used with rectifier controller.

¹ For 30" applications, consult factory.

Brake Modifications ^p

Form	8	10	13	16	19	23	30
B – Conduit Connection Box	\$ 174.	\$ 224.	\$ 228.	\$ 239.	\$ 411.	\$ 552.	\$ 792.
H – Half Torque Spring	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.	...
R1 – Manual Release Lever On Right Side [★]	300.	360.	405.	540.	1020.	1080.	...
R2 – Manual Release Lever On Left Side [★]	300.	360.	405.	540.	1020.	1080.	...
S – Self Adjuster	290.	456.	540.	636.	995.	1445.	...
M – Grease Fittings ^φ	642.	642.	642.	642.	Std.	Std.	Std.
E1 - NEMA 3R Enclosure With Right Hand Slot [■]	594.	831.	972.	1706.	2033.	2405.	...
E2 - NEMA 3R Enclosure With Left Hand Slot [■]	594.	831.	972.	1706.	2033.	2405.	...
E3 - NEMA 3R Enclosure With Double Slots [■]	594.	831.	972.	1706.	2033.	2405.	...

^φ Form M is recommended for brakes used outdoors or used indoors in presence of high humidity, condensation, or corrosive gases.

[★] Right or left side of brake is defined by viewing brake from behind coil.

^p Additional modifications are available. Consult factory.

[■] Form M is recommended for use with Forms E1, E2, and E3.

CP9A Discount
Schedule



Crane Control Class 5010

DC Magnetic Drum Brakes

ORDERING INFORMATION

Ordering Information Required:

1. For DC magnetic brake:
 - a. Class
 - b. Type
 - c. With or without wheel
 - d. Modifications: specify form letters
 - e. Torque setting if different from maximum
 - f. Voltage if different from standard
2. For DC brake when Class and Type cannot be specified:
 - a. Series, shunt, or rectifier operated
 - b. Motor HP & voltage
 - c. Motor application (hoist, bridge, trolley, etc.)
 - d. Modifications
 - e. With or without wheel
3. For resistor for standard shunt brake (if required) or
For resistor or relay for high speed shunt brake (if required):
 - a. Class
 - b. Type
4. For brake rectifier controller (if required):
 - a. Class
 - b. Type
 - c. Voltage and frequency (specify V80 for 230 VAC, or V81 for 460 VAC)
 - d. Brake size
5. For brake wheel purchased with brake:

Supply the dimensions required for ordering wheels.
6. For brake wheels only:

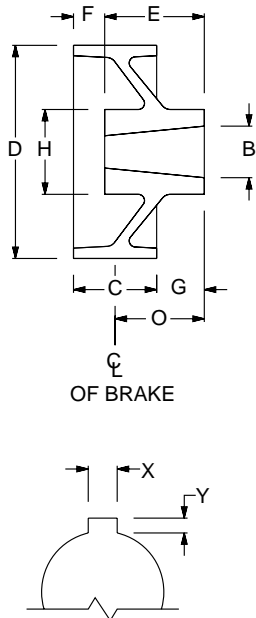
When purchased separately, the brake wheel is considered to be a replacement part. Furnish the original Square D brake wheel part number or the dimensions required for ordering wheels.



APPLICATION DATA AND PRICING INFORMATION

Approximate Dimensions—Ductile Iron Brake Wheels

Standard Semi-Finished Wheel Dimensions ▲



D	Wheel Dimensions inches (mm)						Machining Limitations inches (mm)		
	C	E	F	G	H	O	F	O	M ★
							Max.	Min.	
8	3.25 (83)	3.0 (76)	2.6 (66)	2.4 (61)	3.25 (83)	4.05 (103)	2.7 (69)	2.6 (66)	0.38 (10)
	3.25 (83)	6.9 (175)	0.2 (5)	3.9 (99)	3.25 (83)	5.55 (141)	2.7 (69)	2.6 (66)	0.38 (10)
	3.25 (83)	5.6 (142)	0.8 (20)	3.1 (79)	3.7 (94)	4.75 (121)	2.6 (66)	2.4 (61)	0.38 (10)
10	3.75 (95)	3.5 (89)	2.6 (66)	2.4 (61)	4.0 (102)	4.25 (108)	3.1 (79)	2.8 (71)	0.50 (13)
	3.75 (95)	6.3 (160)	1.5 (38)	4.0 (102)	4.0 (102)	5.85 (149)	3.1 (79)	2.8 (71)	0.50 (13)
	3.75 (95)	6.0 (152)	1.5 (38)	3.8 (97)	4.7 (119)	5.65 (144)	2.8 (71)	2.5 (64)	0.50 (13)
13	5.75 (146)	4.5 (114)	3.7 (94)	2.5 (64)	5.5 (140)	5.35 (136)	4.5 (114)	3.4 (86)	0.63 (16)
	5.75 (146)	8.6 (218)	0.9 (23)	3.8 (97)	5.5 (140)	6.65 (169)	4.5 (114)	3.4 (86)	0.63 (16)
	5.75 (146)	5.5 (140)	3.0 (76)	2.8 (71)	6.5 (165)	5.65 (144)	4.1 (104)	3.0 (76)	0.63 (16)
16	6.75 (171)	4.5 (114)	5.4 (137)	3.1 (79)	5.5 (140)	6.45 (164)	6.0 (152)	5.4 (137)	0.63 (16)
	6.75 (171)	8.5 (216)	2.9 (74)	4.6 (117)	5.5 (140)	7.95 (202)	6.0 (152)	5.4 (137)	0.63 (16)
	6.75 (171)	5.8 (147)	4.1 (104)	3.1 (79)	6.5 (165)	6.45 (164)	5.4 (137)	4.9 (124)	0.63 (16)
19	8.75 (222)	5.0 (127)	6.9 (175)	3.1 (79)	6.6 (168)	7.45 (189)	7.0 (178)	6.0 (152)	0.75 (19)
	8.75 (222)	7.8 (198)	5.0 (127)	4.0 (102)	6.6 (168)	8.35 (212)	7.0 (178)	6.0 (152)	0.75 (19)
	8.75 (222)	9.3 (236)	3.5 (89)	4.0 (102)	9.0 (229)	8.35 (212)	6.1 (155)	4.9 (124)	0.75 (19)
23	11.25 (222)	6.0 (152)	8.4 (213)	3.1 (79)	8.0 (203)	8.7 (221)	8.8 (224)	6.9 (175)	1.0 (25)
	11.25 (222)	9.2 (234)	5.3 (135)	3.2 (81)	8.0 (203)	8.8 (224)	8.8 (224)	6.9 (175)	1.0 (25)
	11.25 (222)	10.2 (259)	5.4 (137)	4.2 (107)	10.0 (254)	15.6 (396)	8.1 (206)	6.2 (157)	1.0 (25)
30	14.25 (362)	7.3 (185)	10.6 (269)	3.6 (91)	12.5 (318)	10.7 (272)	10.5 (267)	9.4 (239)	1.38 (35)
	14.25 (362)	10.1 (257)	7.8 (198)	3.6 (91)	12.5 (318)	10.7 (272)	10.5 (267)	9.4 (239)	1.38 (35)

▲ An extra charge may be made for special wheels which cannot be machined from the standard semi-finished wheels detailed above. Consult factory for pricing.
★ Minimum material required over keyway.

Dimensions Required for Ordering Wheels:

BASIC WHEEL DIMENSIONS:

D = _____
E = _____
F = _____

BORE DIMENSIONS:

B = _____
T = Bore Taper (Indicate One):
_____ Straight
_____ Tapered 1.25"/Ft.
_____ Tapered 1.219"/Ft.

KEYWAY DIMENSIONS:

X = Width = _____
Y = Depth = _____
Ymax = 1/2 X

Notes:

- For semi-finished wheel (solid hub: no bore or keyway):
 - State "Semi-finished wheel is required" on order.
 - Supply D, E & F dims. ONLY.
- For any set of wheel dimensions $E + F = 1/2C + O$
- Formula for maximum bore: $B_{max} = H - 2(M + Y)$
- Pilot bore = 1"

Replacement Ductile Iron Brake Wheels

AISE Standard

Brake Wheels designed for use with Class 5010 and 5060 Magnetic Brakes

Brake Size (Wheel diameter in inches)	List Price Finished Wheel	List Price Semi-Finished Wheel
8	\$ 1662.	\$ 1496.
10	1939.	1745.
13	2493.	2244.
16	3324.	2992.
19	4986.	4487.
23	9056.	8150.
30	12188.	10969.

CP9C Discount Schedule



CLASS 5010

Crane Control Class 5010

Application Data

General Information

Brake Type	Connection	Brake Coil Duty Rating	Typically Used As	Minimum Current or Voltage Required for Release at Maximum Rated Torque
Series	In series with 1/2 Hr. rated series motor	1/2-Hr. Duty Equivalent to 1 Min. On/2 Min. Off	Holding brake	40% of full load motor current brake will remain released down to 10% of full load motor current
	In series with 1 Hr. rated series motor	1-Hr. Duty Equivalent to 1 Min. On/1 Min. Off		
Standard shunt	Across line voltage with resistor in series with coil	1-Hr. Duty Equivalent to 1 Min. On/1 Min. Off	Holding or stopping brake	80% of nominal line voltage
		8-Hr. continuous duty	Holding brake	
High-speed shunt	Across line voltage with protective relay and resistor in series with coil	Any duty	Stopping brake	80% of nominal line voltage
AC rectifier operated shunt	Used with brake rectifier	Any duty	Stopping brake or holding brake	80% of nominal line voltage

Ratings, Weight and Wheel Data

Brake Size (Wheel dia. in inches)	Maximum Torque Ratings (ft-lb)					WR ² of Wheel (ft-lb ²)	Thickness of Molded Brake Block Inches (mm)	Approx. Net Weight lbs (kg)		Maximum Allowable Speed (RPM)
	Series-Wound Brake		Shunt-Wound Brakes					Brake Only	Wheel Only	
	1/2 Hour Rating	1 Hour Rating	1 Hour Rating	8 Hour Rating	High Speed and Rectifier Operated					
8	100	65	100	75	100	1	0.270 (6.9)	135 (61.2)	17 (7.7)	5000
10	200	130	200	150	200	2.7	0.332 (8.4)	205 (93.0)	25 (11.3)	4000
13	550	365	550	400	550	10	0.460 (11.7)	420 (190.5)	60 (27.2)	3300
16	1000	650	1000	750	1000	30	0.560 (14.2)	630 (285.8)	110 (49.9)	2600
19	2000	1300	2000	1500	2000	72	0.625 (15.9)	1025 (464.9)	175 (79.4)	2300
23	4000	2600	4000	3000	4000	176	0.750 (19.1)	2100 (952.6)	300 (136.1)	1900
30	9000	6000	9000	6750	9000	600	0.750 (19.1)	3050 (1383.5)	765 (347.0)	1600

CLASS 5010



BRAKE TORQUE SELECTION

Brakes are selected by the amount of brake torque required for the particular application. Generally, the full load torque of the motor is used as a basis for determining the brake torque required. This can be calculated by using the following formula for both AC or DC motors:

$$\text{Torque} = \frac{\text{Rated HP} \times 5252}{\text{Rated RPM}}$$

Depending on the characteristics of the drive, the brake torque required may be more or less than the full load torque of the motor.

Once the required brake torque is determined, choose a brake size from the rating table below that has a maximum torque rating of not less than the brake torque required. In addition, if the running speed of the motor is over 600 rpm and the brake service is severe, do not exceed 90% of the maximum rated torque.

The brake torque for all of the brakes listed can be accurately adjusted down to 50% of their maximum ratings. For applications other than crane hoist drives where the required torque setting is less than 50% of the maximum rating, the brake can be supplied with a 50% torque spring. For this option consult your local Square D Field Office.

HOIST BRAKE SELECTION

AISE Technical Report No. 6, CMAA Specification No. 70, 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.

All three standards require that a hoist drive handling hot metal be equipped with more than one brake.

Basis for Selection of Brake Torque		Brake Torque Rating			
		Hoist Drive with Single Brake		Hoist Drive with Two or More Brakes♦	
		With Control Braking ■	With Mechanical Load Brake	Handling Hot Metal	Not Handling Hot Metal
CMAA	Torque Required to Hoist Rated Load	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%

- Control braking is dynamic lowering, countertorque or eddy current load brake.
- ♦ Failure of any one brake will not cause the remaining torque to fall below levels shown.

Bridge and Trolley Brake Selection

The three standards provide guidelines for the application of brakes to bridge and trolley drives.

Application	Interpretation	Recommendation
Cab-Operated Cranes with the cab located on the Bridge	Bridge A bridge brake of the stopping or holding type is required. Trolley A trolley brake of the stopping or holding type is required.	OSHA defines a brake as "a device used for retarding or stopping motion by friction or power means". "A drag brake is a brake which provides retarding force without external control". "A holding brake is a brake that automatically prevents motion when power is off". AISE and OSHA specify that stopping brakes be selected to (1) stop the drive within a distance in feet equal to ten percent of full load speed in feet per minute when traveling at full speed with full load. (2) stop the drive from full load free running speed to zero speed at a deceleration rate equal to the acceleration rate for the drive.
Cab-Operated Cranes with the cab located on the Trolley	Bridge A bridge brake of the holding type is required. Trolley A trolley brake of the stopping or holding type is required.	
Floor, Remote and Pulpit-Operated Cranes	Bridge A bridge brake of the stopping or holding type or non-coasting mechanical bridge drive is required. Trolley A trolley brake is not required but one may be used to eliminate creep with the power off.	

CLASS 5010



Crane Control Class 5010

Application Data

Bridge And Trolley Brake Selection

Application	Brake Torque Ratings ●			
	Bridge		Trolley	
	AISE	CMAA	AISE	CMAA
Cab-operated cranes with the cab located on the bridge	See Below	100%	50%	50%
Cab-operated cranes with the cab located on the trolley	100%	75%	–	100%
Floor, Remote, and Pulpit-operated cranes	100%	50%	50%	50%

● Ratings are based on motor full load torque.

OSHA does not specify brake torque rating in percent of motor full load torque for bridge and trolley drives. Usually the limiting factor for selection of the brake size is the thermal capability of the brake wheel for the frequency of operation required by the service. Similarly, for cab-operated cranes with the cab located on the bridge, AISE requires a brake of the stopping type for the bridge. The brake must be capable of stopping the bridge from full speed in a distance in feet not greater than 10% of the full load speed in fpm. Also the thermal capacity must be adequate for the duty. For cab-operated cranes with the cab located on the trolley, AISE requires a brake of the stopping type for the trolley. It must be sized similar to the bridge brake.

Brake Selection–Thermal Capability

In addition to being selected to meet the torque requirements of the particular application, the DC magnetic brake used for stopping must be selected to prevent overheating of the brake wheel when operated on the anticipated duty cycle.

To calculate how often a stop can be made from full speed without overheating the brake wheel:

$$\frac{(kl) \times (CWL) \times (SL)^2}{(B) \times (M)} = \text{Seconds}$$

(M) = Number of motors

CWU = Crane weight (tons)

CWL = Crane weight loaded (tons) = (CWU + CL)

(SL) = Free-running speed loaded (FPM)

(B) = Number of brakes per motor

CL = Crane Load (tons)

(SU) = Free-running speed unloaded (FPM)

(kl) = Constant (see table)

A stop can be made from full speed this often without overheating the brake wheel. Four times as many stops can be made from half speed in this time interval. For unloaded crane conditions (CWL) and (SL) are replaced by (CWU) and (SU).

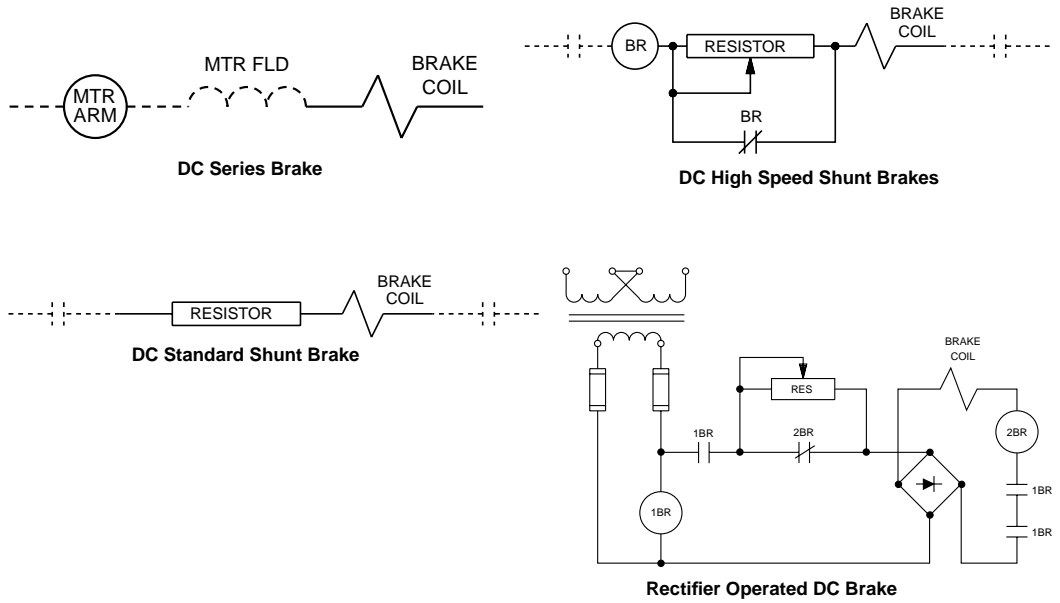
Brake Size (Wheel dia. in inches)	(kl)
8	26.50×10^{-6}
10	15.90×10^{-6}
13	9.34×10^{-6}
16	6.10×10^{-6}
19	4.30×10^{-6}
23	3.00×10^{-6}
30	1.76×10^{-6}



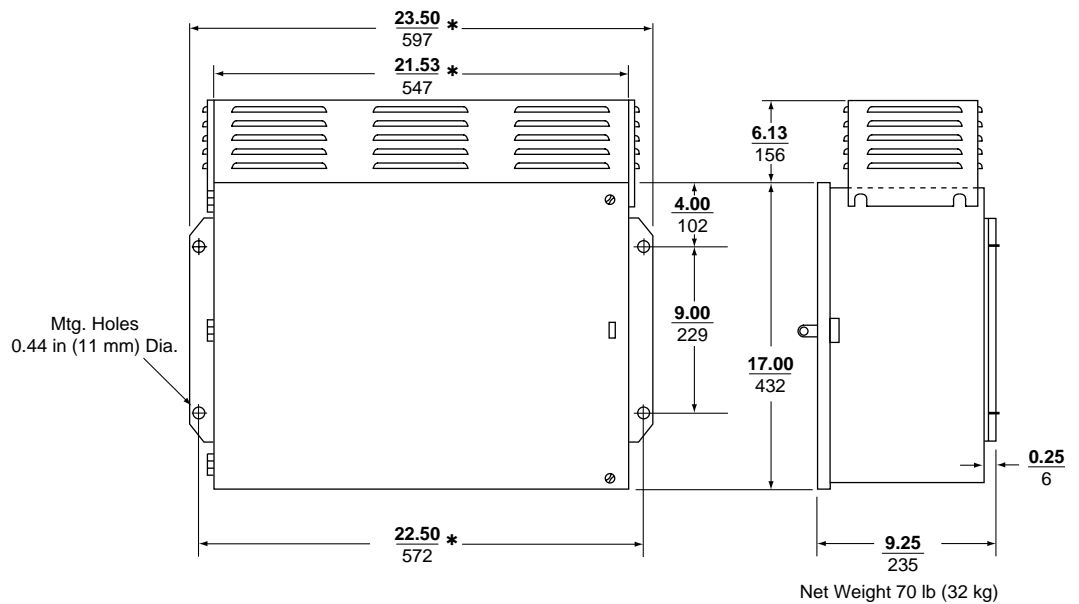
Crane Control Class 5010

Approximate Dimensions and Weights

Elementary Wiring Diagrams for Standard Brake Circuits



BRAKE RECTIFIER CONTROLLER (For Types QW108 through QW223)



Dual Dimensions $\frac{\text{inches}}{\text{mm}}$

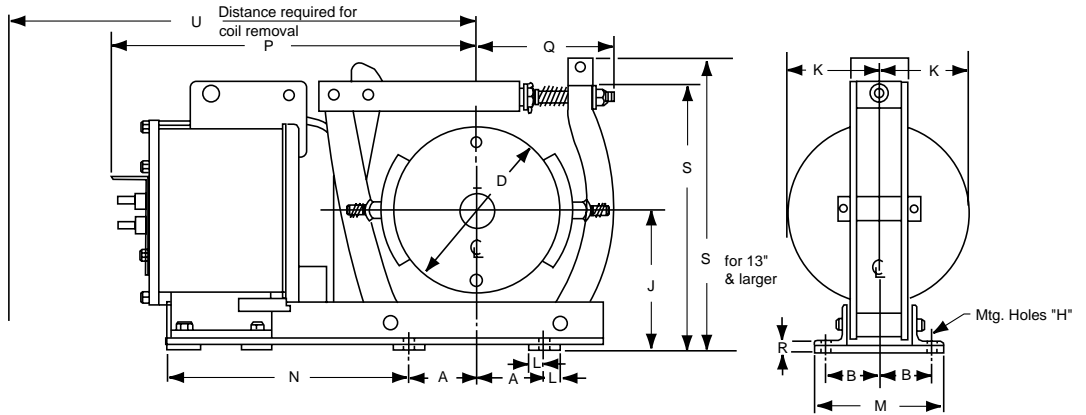
CLASS 5010



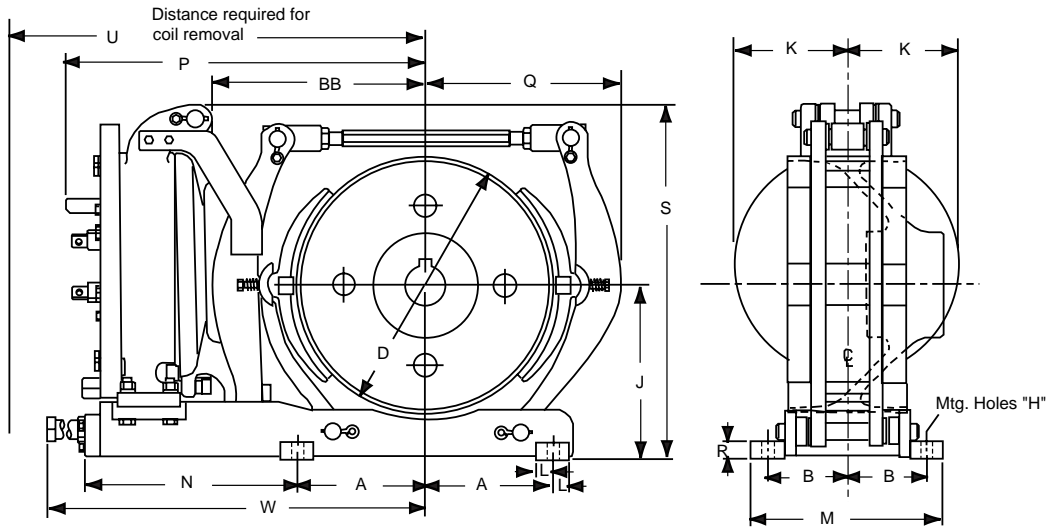
Crane Control Class 5010

Approximate Dimensions

8-INCH THROUGH 23-INCH



30-INCH



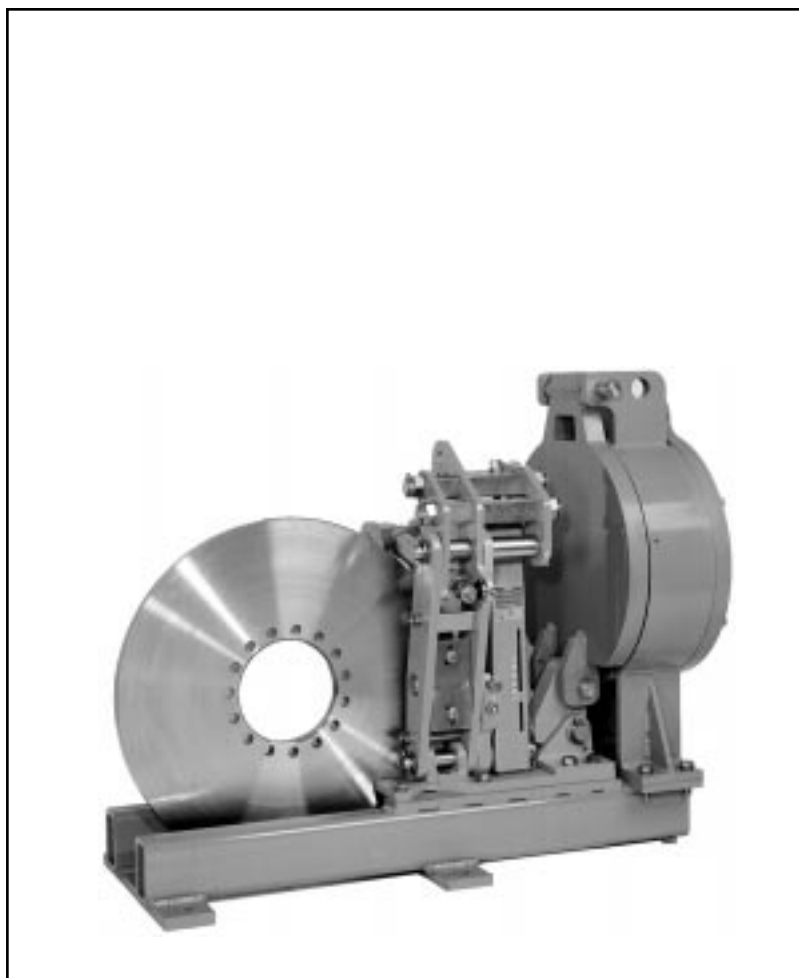
Brake Size	A	B	D	H	J	K	L	M	N	P	Q	R	S	U	W	BB
8	3.25 83	2.87 73	8.00 204	.69 17	7.00 178	4.75 121	.875 22	7.56 192	11.30 287	17.65 448	7.25 184	.56 14	13.81 351	24.0 610	...	...
10	4.00 101	3.12 79	10.00 254	.69 17	8.37 213	5.50 140	1.00 25	7.88 200	14.12 359	20.72 526	8.42 219	.63 16	16.20 411	28.8 732	...	...
13	5.75 146	4.50 114	13.00 330	.81 21	9.88 251	7.00 178	1.00 25	10.50 267	15.25 387	23.6 599	11.25 286	.91 23	20.00 508	32.9 836	...	...
16	7.50 191	5.37 137	16.00 406	1.06 27	12.12 308	8.00 203	1.50 38	13.00 330	17.06 433	27.16 690	12.96 329	1.25 32	25.50 648	36.4 925	...	...
19	9.25 235	6.50 165	19.00 483	1.06 27	13.25 337	9.25 235	1.75 44	16.50 419	20.06 510	33.25 845	16.50 419	1.12 28	28.50 724	44.4 1128	...	...
23	11.75 298	8.00 203	23.00 584	1.31 33	15.87 403	11.00 279	1.25 32	19.00 483	19.25 489	35.1 892	19.50 495	1.25 32	34.87 886	42.0 1067	...	...
30	15.00 381	9.50 241	30.00 762	1.56 40	20.75 527	13.38 340	2.00 51	23.00 584	25.00 635	41.9 1064	23.5 597	2.00 51	42.5 1207	47.5 1207	44.63 1134	24.50 622

Dual Dimensions: $\frac{\text{in}}{\text{mm}}$

CLASS 5010



Crane Control Class 5015



CLASS 5015

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SQUARE D
GROUPE SCHNEIDER

Crane Control Class 5015

DC Magnetic Caliper Disc Brakes

GENERAL INFORMATION

CLASS 5015 DC MAGNETIC CALIPER DISC BRAKES

Class 5015 caliper disc brakes are spring set, electrically released, caliper type friction brakes which are used with either AC or DC motors.

- AISE rated and suitable for all crane classes
- Meet AISE mounting dimensions
- Feature automatic wear compensation
- Easy to adjust and maintain



Class 5015
Type CD2924
29" Brake

Series Brakes

- Used as holding brakes on DC series motor drives
- Used on crane hoists, mill drives and transfer cars
- Brake operating coil connected in series with motor armature
- Brake releases and sets in response to motor current

Standard Shunt Brakes

- Used as holding or stopping brakes on DC reversing drives such as crane bridges or trolleys and mill auxiliary drives
- Brake coil and protective resistor rated for line voltage

High Speed Shunt Brakes

- Used as stopping brakes on DC reversing drives
- Quicker set and release times than the standard shunt brakes
- Brake coil and protective resistor rated for line voltage, relay controls the amount of resistance in circuit

Rectifier Operated Brakes

- DC shunt brake designed to operate from a brake rectifier controller
- Used as holding or stopping brake on AC applications such as cranes, conveyors, or movable bridges
- Provides high speed operation similar to DC high speed shunt brake



Class 5015
Type CD1477
14" Brake



Crane Control Class 5015 DC Magnetic Caliper Disc Brakes

PRICING AND ORDERING INFORMATION

Series Brakes

Brake Size (Disc Dia. in inches)	Maximum Torque (ft-lb)		Maximum HP Rating at 230 VDC ■		Type	Price With Hub and Disc	Price Without Hub and Disc
	1/2 Hour	1 Hour	1/2 Hour	1 Hour			
14	200	130	7+ 11 14 23 30	5+ 8 11 18 23	CD1428 CD1427 CD1426 CD1425 CD1424	\$7302.	\$5936.
17	550	365	19+ 30 39 49 63	15+ 24 31 40 50	CD1726 CD1725 CD1724 CD1723 CD1729	9027.	7532.
21	1000	650	47+ 60 77 96 122	36+ 46 59 76 95	CD2124 CD2125 CD2123 CD2122 CD2121	12505.	10287.
24	2000	1300	78+ 97 120 155 178	59+ 76 90 116 134	CD2408 CD2407 CD2406 CD2405 CD2404	18756.	15418.
29	4000	2600	160+ 180 206 235 320 365	127+ 142 162 185 252 290	CD2924 CD2936 CD2923 CD2935 CD2922 CD2921	27960.	22356.

■ Other coils are available if required, consult factory for information.

+ If desired horsepower rating is lower than 85 percent of the lowest value listed, consult factory for correct type number.

CP9A

 Discount
Schedule


Crane Control Class 5015

DC Magnetic Caliper Disc Brakes

PRICING AND ORDERING INFORMATION

Shunt Brakes †

Brake Size (Disc Dia. in inches)	Maximum Torque (ft-lb)		Type	Price With Hub and Disc	Price Without Hub and Disc
	1 Hour	8 Hour			
14	200	150	CD1477	\$ 7302.	\$5936.
17	550	400	CD1775	9027.	7532.
21	1000	750	CD2174	12505.	10287.
24	2000	1500	CD2459	18756.	15418.
29	4000	3000	CD2974	27960.	22356.

† Must be used with resistor for standard DC shunt brake applications or with resistor and relay for high speed shunt brake applications.

Resistors for Standard DC Shunt Brakes

VDC	Brake Size (Disc dia. in inches)	1-Hour Service ▲		8-Hour Service ■	
		Open Type		Open Type	
		Type	Price	Type	Price
230	14	RO105	Included In Brake Price	RO128	Included In Brake Price
	17	RO106		RO111	
	21	RO106		RO109	
	24	RO132		RO146	
	29	RO136		RO138	

▲ 1-hour service is used when the brake sets every time the master switch is moved to the off point.

■ 8-hour service is when the brake stays released for extended times. For example, the brake may stay released during an entire 8-hour shift while the crane is powered up.

Resistors For High-Speed Shunt Brakes

VDC	Brake Size ♦ (Disc dia. in inches)	Open Type	
		Type	Price
230	21	RO126	Included In Brake Price
	24	RO148	
	29	RO116	

Relays For High-Speed Shunt Brakes

VDC	Brake Size ♦ (Disc dia. in inches)	Class 7001 Type KFO-01	
		Form	Price
230	21	F16	\$ 513.
	24	F19	513.
	29	F23	513.

♦ For smaller brake sizes, consult factory.

Crane Control Class 5015 DC Magnetic Caliper Disc Brakes

PRICING AND ORDERING INFORMATION

Brake Rectifier Controllers



**Class 5010
Type QW110
Brake Rectifier Controller**

Brake rectifier controllers are designed to convert AC line power to DC for use with a rectifier operated brake. A high speed forcing circuit provides optimum operation of the brake. The standard controller includes:

- 1 460/230 to 120 V fused transformer
- 1 Class 8502 Type S 3-pole contactor
- 1 Full wave rectifier
- 1 Dropping resistor
- 1 Class 7001 Type K DC relay

Brake Rectifier Controllers ¹

VAC 60 Hz	Brake Size (Disc dia. in inches)	Outdoor Enclosure NEMA Type 3R			
		For Single Brake		For Two Brakes in Series	
		Type	Price	Type	Price
230 – 460	14	QW110	\$ 2940.	QW210	\$ 3588.
	17	QW113	2940.	QW213	4308.
	21	QW116	3660.	QW216	5544.
	24	QW119	3660.	QW219	5544.
	29	QW123	3660.	QW223	5544.

¹ Class 5010

Rectifier Operated Brakes ▲

Brake Size (Disc Dia. in Inches)	Maximum Torque (ft-lb) (Any Duty)	Single Brake	Two Brakes in Series	Price With Hub and Disc (Each)	Price Without Hub and Disc (Each)
		Type	Type		
14	200	CD1472	CD1470	\$ 7302.	\$ 5936.
17	550	CD1770	CD1785	9027.	7532.
21	1000	CD2170	CD2186	12505.	10287.
24	2000	CD2454	CD2451	18756.	15418.
29	4000	CD2983	CD2984	27960.	22356.

▲ Must be used with rectifier controller.

Brake Modifications ◆

Form	14	17	21	24	29
B – Conduit Connection Box	\$ 224.	\$ 224.	\$ 239.	\$ 411.	\$ 552.
R – Manual Release Lever	405.	405.	540.	1020.	1080.
NEMA 3R Enclosure	456.	540.	636.	995.	1445.

◆ Consult factory for additional modifications.

CLASS 5015



Crane Control Class 5015

DC Magnetic Caliper Disc Brakes

ORDERING INFORMATION

Ordering Information Required:

1. For DC magnetic brake:
 - a. Class
 - b. Type
 - c. With or without hub and disc
 - d. Modifications: specify Forms
 - e. Torque setting if different from maximum
 - f. Voltage if different from standard
2. For DC brake when Class and Type cannot be specified:
 - a. Series, shunt, or rectifier operated
 - b. Motor HP & voltage
 - c. Motor application (hoist, bridge, trolley, etc.)
 - d. Modifications
 - e. With or without hub and disc
3. For resistor for standard shunt brake (if required) or
For resistor or relay for high speed shunt brake (if required):
 - a. Class
 - b. Type
4. For brake rectifier controller (if required):
 - a. Class
 - b. Type
 - c. Voltage and frequency
 - d. Brake size
5. For brake hub and disc purchased with brake:

Supply the dimensions required for ordering hub and disc as listed on page 31.
6. For disc only:

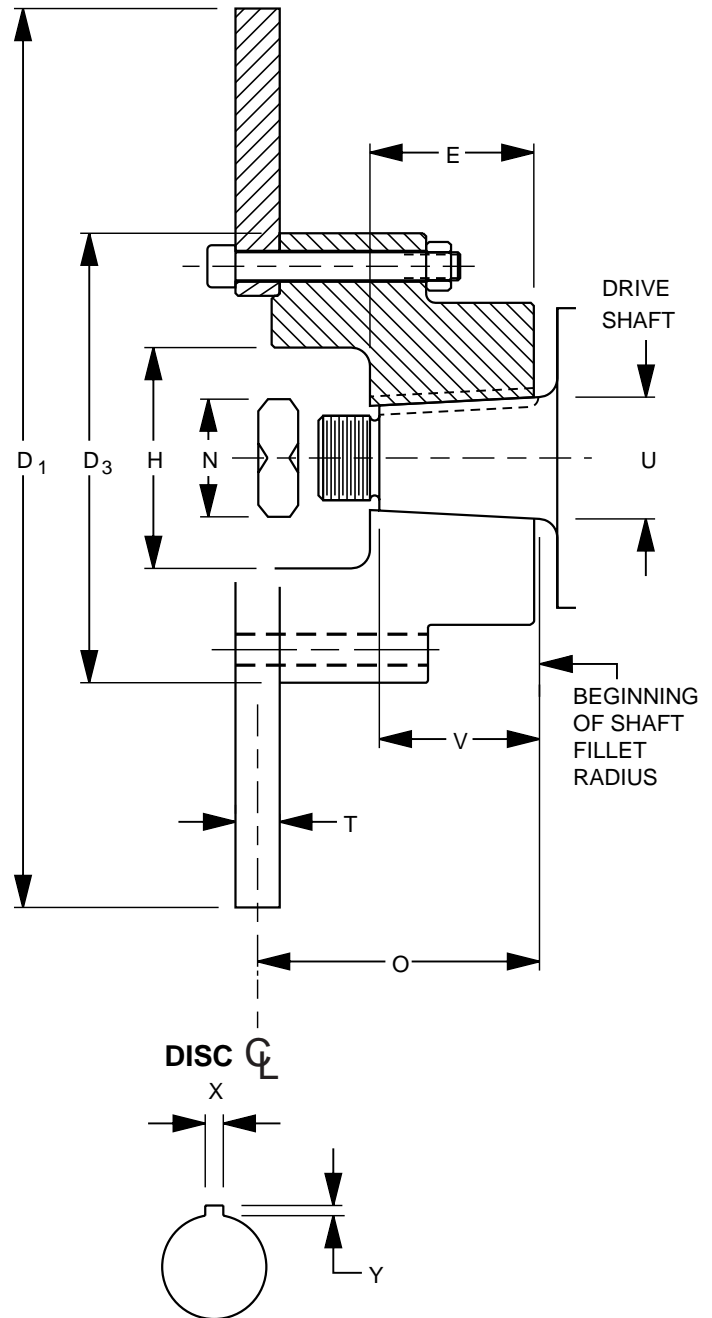
When purchased separately, the disc is considered to be a replacement part. Furnish the original Square D part number or the dimensions required for ordering as listed on page 31.



Crane Control Class 5015 DC Magnetic Caliper Disc Brakes

APPLICATION DATA

STANDARD DIMENSIONS						
D ₁	MOTOR FRAME	T	E	D ₃	H	O
14"	602/802	0.79 20	3.00 76	6.50 165	4.00 102	4.25 108
	603, 604/803, 804	0.79 20	3.50 89	6.50 165	4.00 102	4.25 108
	606/806	0.79 20	4.00 102	6.50 165	-	4.25 108
	608/808	0.79 20	4.50 114	6.50 165	-	4.25 108
17"	603, 604/803, 804	0.79 20	3.50 89	9.00 229	4.00 102	5.00 127
	606/806	0.79 20	4.00 102	9.00 229	4.50 114	5.00 127
	608, 610/808, 810	0.79 20	4.12 105	9.00 229	6.00 152	5.00 127
	612, 614/812, 814	0.79 20	4.62 117	9.00 229	-	5.00 127
21"	606/806	1.18 30	3.88 99	9.00 229	4.38 111	6.38 162
	608, 610/808, 810	1.18 30	4.38 111	9.00 229	5.25 133	6.38 162
	612, 614/812, 814	1.18 30	4.38 111	9.00 229	6.00 152	6.38 162
	616/816	1.18 30	4.88 124	9.00 229	6.25 159	6.38 162
24"	608/808	1.18 30	4.38 111	12.00 305	5.25 133	7.38 187
	610/810	1.18 30	4.38 111	12.00 305	6.00 152	7.38 187
	612/812	1.18 30	4.88 124	12.00 305	6.25 159	7.38 187
	614/814	1.18 30	4.88 124	12.00 305	6.75 171	7.38 187
	616/816	1.18 30	5.38 137	12.00 305	7.38 187	7.38 187
	618/818	1.18 30	5.88 149	12.00 305	8.25 210	7.38 187
29"	620/820	1.18 30	6.62 168	12.00 305	8.00 203	7.38 187
	612/812	1.18 30	5.00 127	14.00 356	6.25 159	8.25 210
	614/814	1.18 30	5.00 127	14.00 356	6.44 164	8.25 210
	616, 618/816, 818	1.18 30	5.25 133	14.00 356	9.75 248	8.25 210
	620/820	1.18 30	5.50 140	14.00 356	8.50 216	8.25 210
	622/822	1.18 30	5.75 146	14.00 356	9.75 248	8.25 210
624/824	1.18 30	7.75 197	14.00 356	8.50 216	8.25 210	



KEYWAY DETAIL

Dimensions Required For Ordering Hubs

DISC DIAMETER:		HUB DIMENSIONS:		SHAFT DIMENSIONS:		SHAFT TAPER:		KEYWAY:	
D ₁		O		V		IN/FT DIA.		X	
		N▲		U		STRAIGHT:		Y	
						DIA:			

▲ Dimension across nut flats.



**Crane Control Class 5015
DC Magnetic Caliper Disc Brakes**

PRICING INFORMATION AND APPLICATION DATA

REPLACEMENT DISCS

Discs designed for use with Class 5015 Magnetic Caliper Disc Brakes

Brake Size (Disc diameter in inches)	List Price (Disc only)
14	\$ 2140.
17	2430.
21	3930.
24	5205.
29	7435.

APPLICATION DATA

Ratings, Weight and Disc Data

Brake Size (Disc diameter in inches)	Maximum Torque Ratings (ft-lb)					WR ² of Disc (ft-lb ²)	Thickness of Friction Pad in Inches (mm)	Approx. Net Weight Lbs (kg)		Max. Allowable Speed (RPM)
	Series-Wound Brakes		Shunt-Wound Brakes					Brake (with coil only)	Disc with Hub	
	1/2 Hour Rating	1 Hour Rating	1 Hour Rating	8 Hour Rating	High Speed and Rectifier Operated					
14	200	130	200	150	200	6.4	0.393 (10)	333 (151.0)	51 (23.1)	2100
17	550	365	550	400	550	15.4	0.393 (10)	501 (227.3)	91 (41.3)	1725
21	1000	650	1000	750	1000	48.3	0.453 (11)	1055 (478.5)	169 (76.7)	1390
24	2000	1300	2000	1500	2000	92.3	0.59 (15)	1350 (612.4)	279 (126.6)	1215
29	4000	2600	4000	3000	4000	198.0	0.59 (15)	1741 (789.7)	427 (193.7)	1000

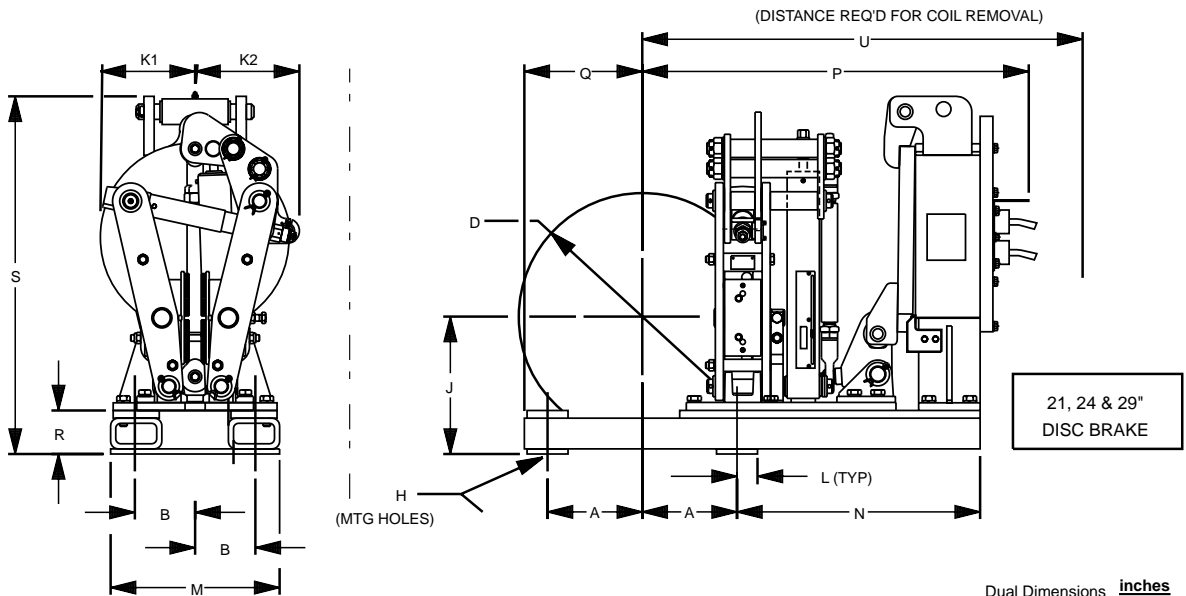
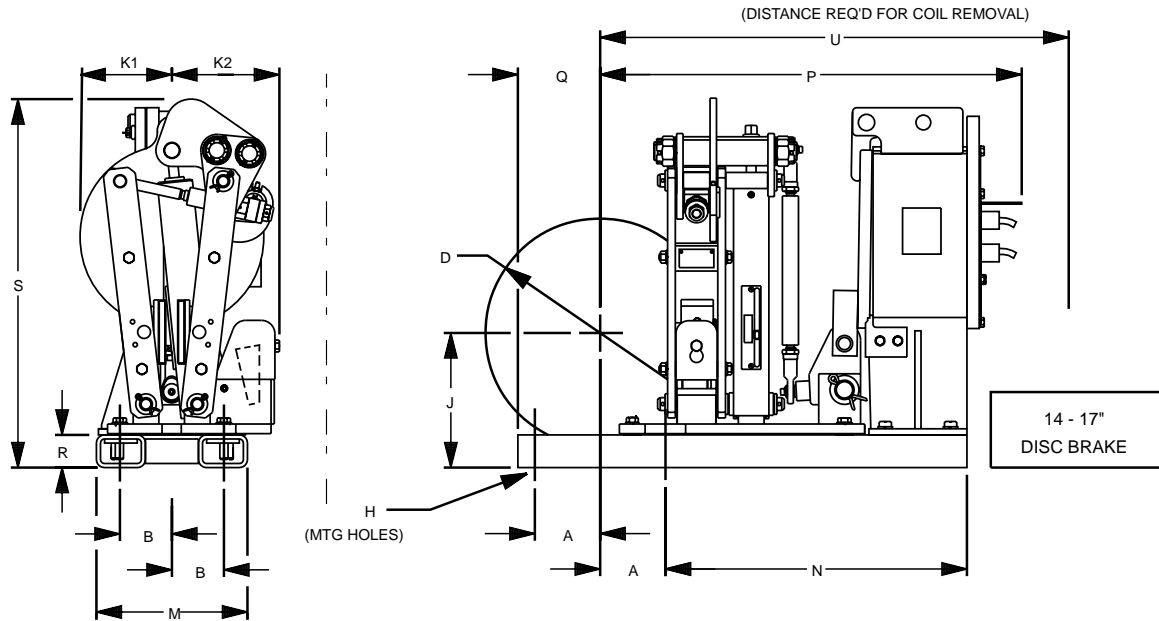
NOTE: For additional brake application information, refer to 5010 Application Data Section.

CLASS 5015

CP9C Discount Schedule

Crane Control Class 5015 DC Magnetic Caliper Disc Brakes

APPROXIMATE DIMENSIONS



Dual Dimensions inches
mm

DISC DIA	A	B	D	H	J	K1	K2	L	M	N	P	Q	R	S	U
14"	4.00 102	3.13 79	14.00 356	0.687 17	8.38 213	5.6 142	6.6 168	-	9.2 235	18.5 470	25.8 655	5.0 127	2.0 51	22.7 576	33.9 861
17"	5.75 146	4.50 114	17.00 432	0.812 21	9.88 251	7.0 178	7.0 178	-	11.0 279	18.7 475	28.1 714	6.55 166	3.5 89	26.5 673	37.4 950
21"	7.50 191	5.38 136	21.00 533	1.06 27	12.13 308	9.0 229	10.1 256	1.5 38	13.5 343	23.6 600	34.5 876	9.5 241	3.0 76	32.1 815	43.7 1110
24"	9.25 235	6.50 165	24.00 610	1.31 33	13.25 336	9.3 235	10.1 256	2.0 51	16.5 419	23.9 607	37.9 963	11.3 287	4.3 108	34.9 886	49.1 1247
29"	11.75 298	8.00 203	29.00 737	1.31 33	15.88 403	11.0 279	11.0 279	2.0 51	19.5 495	22.5 572	39.9 1013	14.3 362	1.0 25	41.9 1064	46.8 1188



CLASS 5015

Crane Control Class 5015
DC Magnetic Caliper Disc Brakes

CLASS 5015

Crane Control Class 5060



CONTENTS

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Pricing and Ordering Information36
Application Data and Wiring Diagrams38
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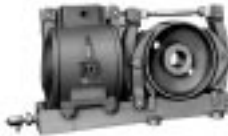


SQUARE D
GROUPE SCHNEIDER

Crane Control Class 5060 Adjustable Torque Drum Brakes



Class 5060
Type A1001
10" Brake



Class 5060
Type A1301
13" Brake



Class 9002
Type AT4
Foot Switch



Class 9002
Type AW21
Foot Switch

PRICING AND ORDERING INFORMATION

Adjustable torque brakes are dual purpose drum type friction brakes. They combine an electrically released, spring set holding brake feature and an electrically operated adjustable torque stopping feature. They can be used with AC or DC motors.

- All electrically controlled
- Smooth, controlled stopping feature
- Spring set parking feature

A complete adjustable torque brake system consists of:

- 1 – Or more adjustable torque brakes
- 1 – Enclosed controller
- 1 – Push button station
- 1 – Foot switch

Adjustable Torque Brakes

Brake Size (Wheel dia. in inches)	For Simplex Brake System (One Brake)	For Duplex Brake System (Two Brakes)	For Quadraplex Brake System (Four Brakes)	Price Per Brake With Standard Wheel	Price Per Brake Without Standard Wheel
	Type	Type	Type		
10	A1001	A1001	A1001	\$ 9894.	\$ 9012.
13	A1301	A1301	A1304	14159.	12849.
16	A1601	A1601	A1601	15938.	14081.

DC Controllers for Adjustable Torque Brakes

VDC	Brake Size (Wheel dia. in inches)	For Simplex Brake System		For Duplex Brake System		For Quadraplex Brake System	
		Outdoor Enclosure NEMA Type 3R		Outdoor Enclosure NEMA Type 3R		Outdoor Enclosure NEMA Type 3R	
		CONTROLLER		CONTROLLER		CONTROLLER	
		Type	Price	Type	Price	Type	Price
230	10	ADW101	\$ 4728.	ADW102	\$ 4728.	ADW104	\$ 7419.
	13	ADW131	4968.	ADW132	4968.	ADW134	7419.
	16	ADW161	5841.	ADW162	5841.	ADW164	7419.

AC Controllers for Adjustable Torque Brakes - consult factory

Set-Release Push Button Stations

Class	Type	Price ▲
9001	KYK38	\$ 204.

▲ CP1

Foot Switches

Class	Type	Price
9002	AW21 ▲	\$ 442.
9002	AT4 ★	1026.

▲ CP1

★ CP9A

Pressure Required To Operate Foot Switch For Maximum Service Torque

Class 9002	Type AW21	10 lb
Class 9002	Type AT4	20 lb

CP1 CP9A Discount Schedule



ORDERING INFORMATION

Ordering Information Required:

1. For adjustable torque brake:
 - a. Class
 - b. Type
 - c. Torque if different from standard
2. For brake controller:
 - a. Class
 - b. Type
 - c. Information on system – cab, pendant and radio operation
3. For push button station and foot switch (if required):
 - a. Class
 - b. Type
4. For brake wheel purchased with brake:

Supply the dimensions required for ordering wheels in the Class 5010 catalog sheets.
5. For brake wheels only:

When purchased separately, the brake wheel is considered to be a replacement part. Furnish the original Square D brake wheel part number or the dimensions required for ordering wheels in the Class 5010 catalog sheets.



Crane Control Class 5060

Adjustable Torque Drum Brakes

APPLICATION DATA

Brake Selection–Thermal Capability

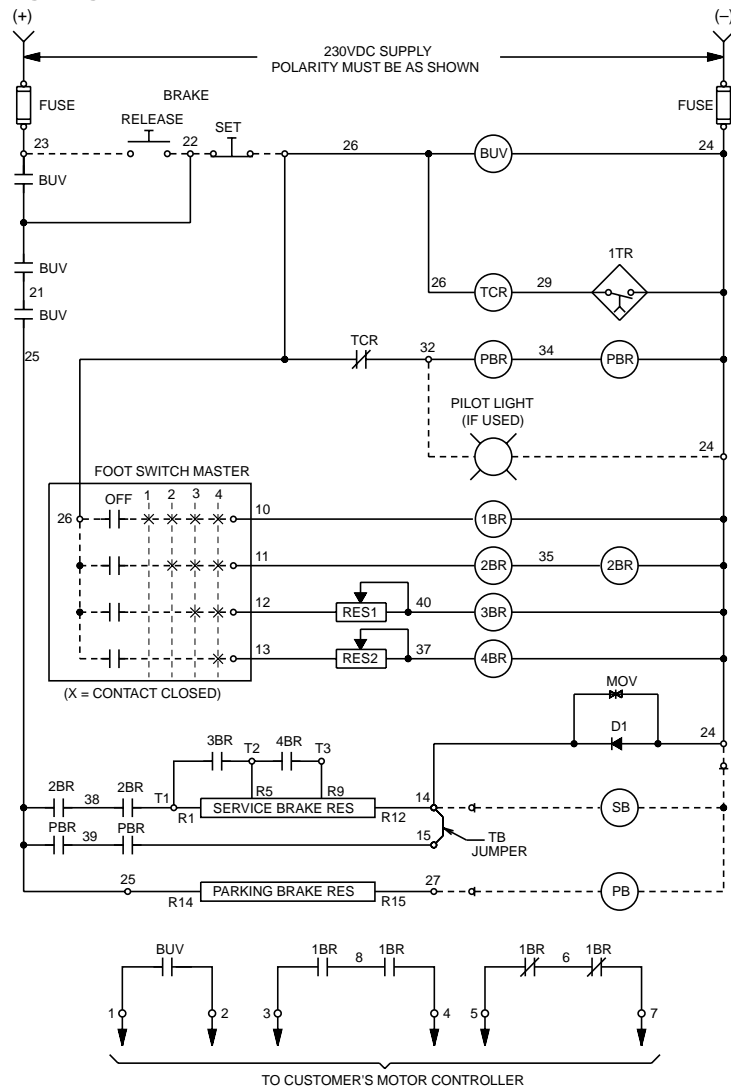
In addition to being selected to meet the torque requirements of the particular application, the brake system must be selected to prevent overheating of the brake wheel when operated on the anticipated duty cycle.

To calculate how often a stop can be made from full speed without overheating the brake wheel, see application data on page 22.

Torque Ratings and Wheel Data

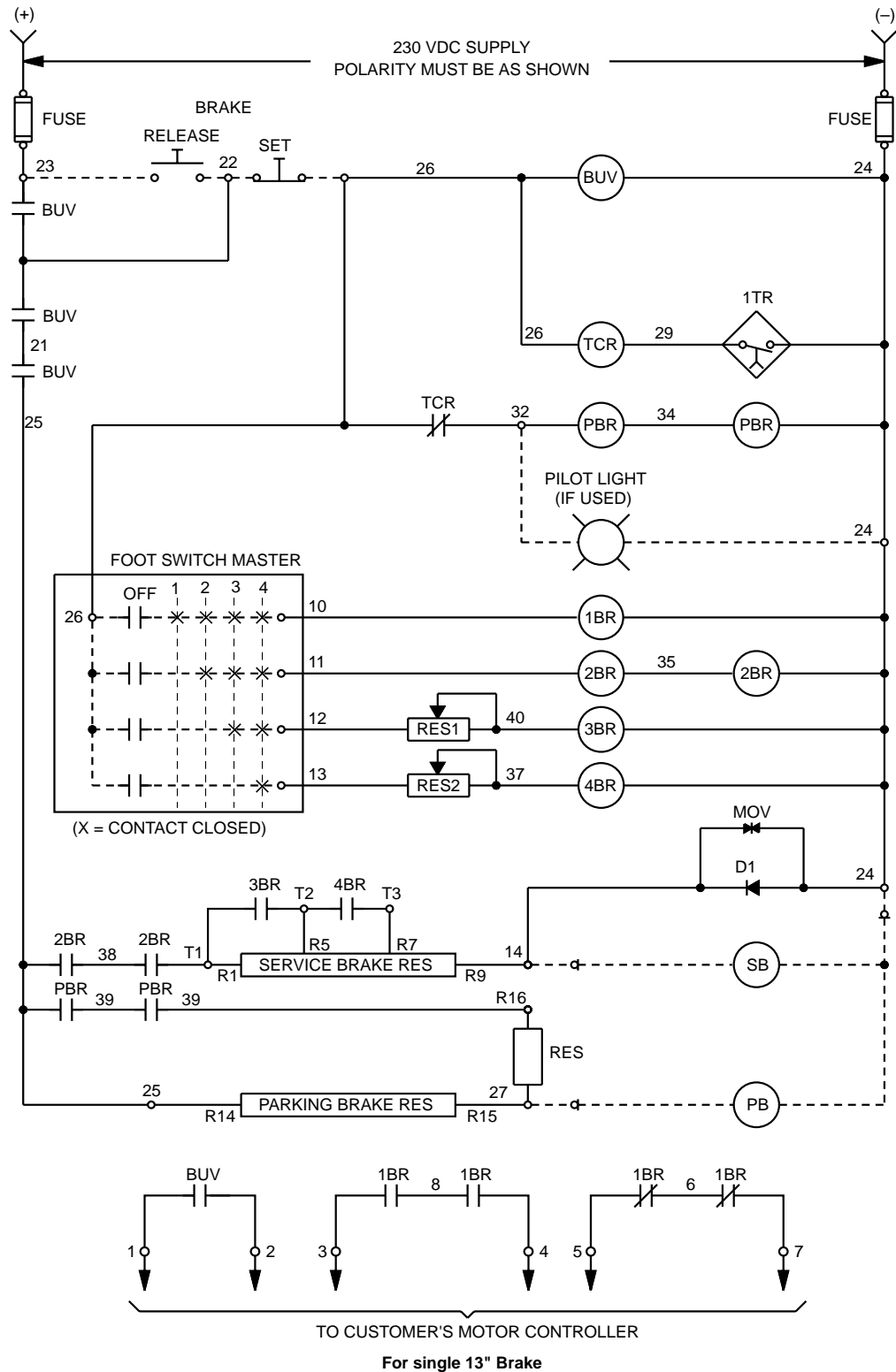
Brake Size (Wheel Dia. in Inches)	Parking Torque (ft-lb)		Service Torque (ft-lb)			WR ² of Wheel (ft-lb ²)	Maximum Allowable Speed (RPM)
	Minimum	Maximum	Minimum	Maximum	Standard		
10	50	200	20	300	20-100-220	2.7	4000
13	150	550	50	850	50-290-540	10	3300
16	250	1000	100	1500	100-470-1000	30	2600

Elementary Wiring Diagrams for DC Controllers



For single 10" and 16" Brake

ELEMENTARY WIRING DIAGRAMS FOR DC CONTROLLERS



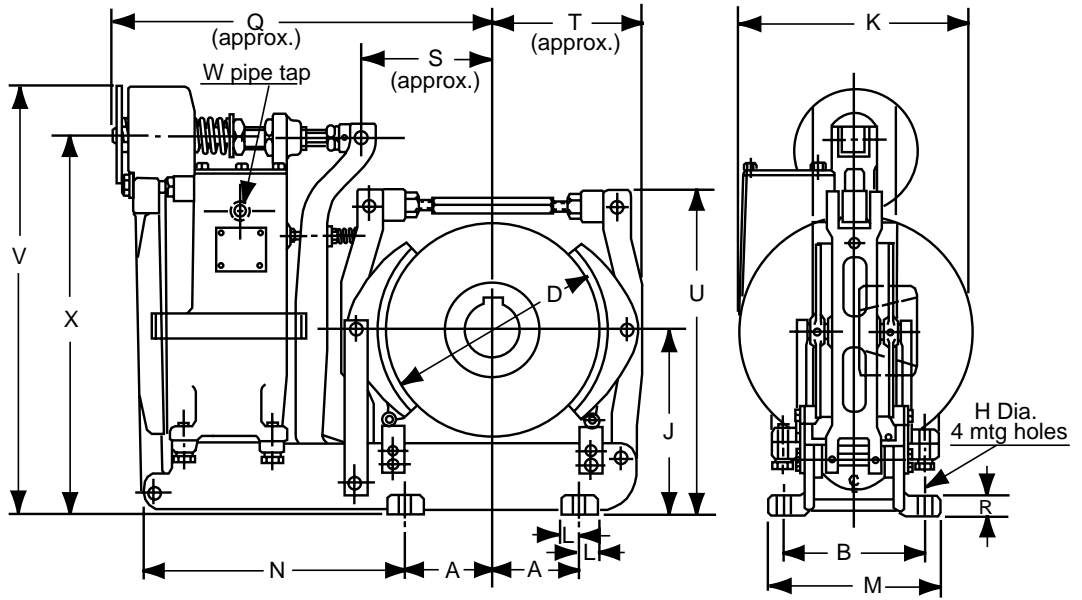
CLASS 5060



Crane Control Class 5060 Adjustable Torque Drum Brakes

APPROXIMATE DIMENSIONS AND WEIGHTS

10" and 16" Adjustable Torque Brake



Dual Dimensions $\frac{\text{inches}}{\text{mm}}$

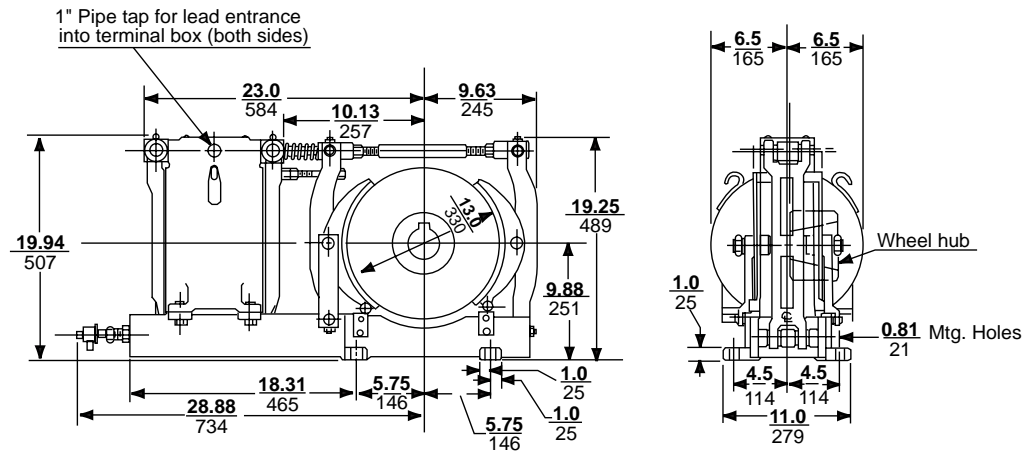
Brake Size (Wheel dia. in inches)	A	B	D	H	J	K	L	M	N	Q	R	S	T	U	V	W	X	Weight lbs (kg)	
	Wheel Only	Brake Only																	
10	4 102	6.25 159	10 250	0.69 17	8.38 213	10.75 273	0.88 22	8 203	12.19 310	17.88 454	0.75 19	6 152	7.06 179	14.63 372	19.94 506	0.75 19	17.19 437	25 (11.3)	250 (112.5)
16	7.5 191	10.75 273	16 406	1.06 27	12.13 308	15.25 387	1.13 29	13 330	19.13 486	25.38 645	1.25 32	11.25 286	12.25 311	22.38 568	27.13 689	1 25	23.38 594	110 (49.5)	640 (288.0)



Crane Control Class 5060 Adjustable Torque Drum Brakes

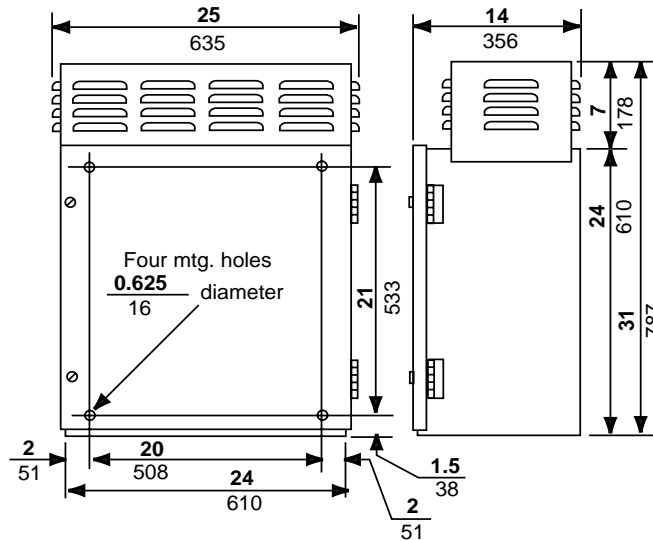
APPROXIMATE DIMENSIONS AND WEIGHTS

13" Adjustable Torque Brake



Weight of wheel only – 60 lb (27 kg)
Weight of brake only – 570 lb (259 kg)

Adjustable Torque Brake Control Panel Simplex and Duplex •



Weight – 430 lb (196 kg)

• Consult factory for quadruplex controller dimensions

Dual Dimensions $\frac{\text{inches}}{\text{mm}}$

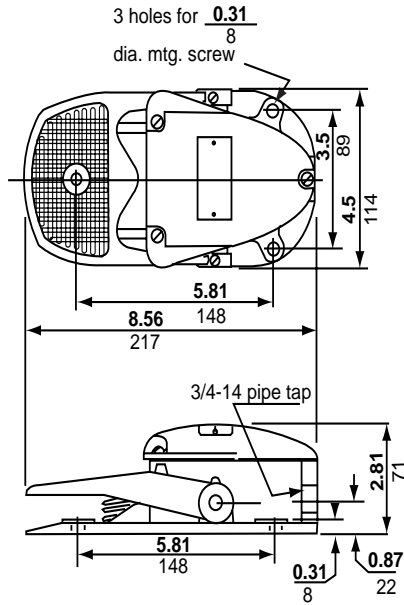
CLASS 5060



**Crane Control Class 5060
Adjustable Torque Drum Brakes**

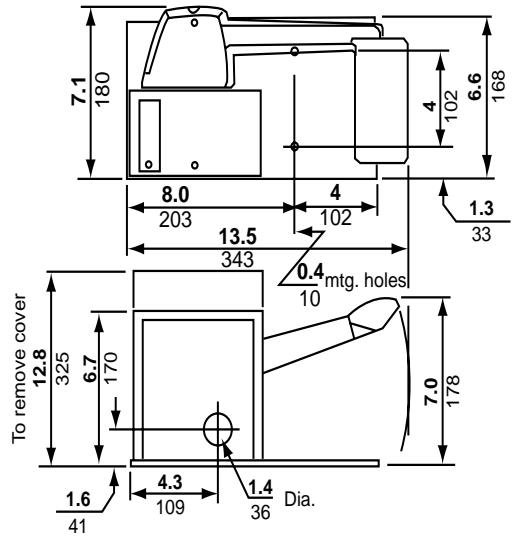
APPROXIMATE DIMENSIONS AND WEIGHTS

AW21 Foot Switch



Weight – 5 lb (2 kg)

AT4 Foot Switch



Weight – 18 lb (8 kg)

Dual Dimensions $\frac{\text{inches}}{\text{mm}}$



Crane Control Class 6121

CLASS 6121



CATALOG CONTENTS

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Controller Modifications and Application Data48
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Application Data56
Dimensions and Weights58
Rectified DC Constant Potential HWR Hoist Control60
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Crane Control Class 6121

FRONTLINE® DC Crane Control

CLASS 6121



CLASS 6121 Type EGH3
Hoist Controller

GENERAL INFORMATION AND PRICING

Hoist Service

Class 6121 reversing dynamic lowering controllers are recommended for use with DC series motors on crane hoist drives without mechanical load brakes. These controllers are frequently used on such special mill equipment as charging machines, forging manipulators, etc. All controllers are arranged for use with series brakes.

- Mill Duty Class 7004 Type M LINE-ARC® contactors & Class 7001 Type K relays
- Class 7001 Type ST-1 static acceleration timer

The standard single motor reversing dynamic lowering controller consists of:

- 1 Two pole fused control circuit knife switch (CSW)
- 1 Two pole unfused main line knife switch with padlock clip (LSW)
- 4 Type M single pole contactors with mechanical interlocks for hoisting and lowering circuits (H, 1L, 2L, 3L)
- 1 Type M single pole negative line contactor (M)
- 4 or 5 Type M single pole acceleration contactors (1A, 2A, 3A, 4A, 5A)
- 3 or 4 Type ST-1 static acceleration timers (1AR, 2AR, 3AR, 4AR)
- 1 Type KE voltage relay for acceleration lowering (VR)
- 1 Type KE limit switch relay (LSR)
- 1 Type M single pole spring-closed dynamic lowering contactor (DB)
- 1 Undervoltage relay (UV)
- 2 Magnetic overload relays (one instantaneous and one inverse time) (1OL, 2OL)

The duplex controller consists of the equipment for a single motor controller with the exception that all contactors are double pole devices and the following equipment is added:

- 1 Two pole main line knife switch with padlock clip (2LSW)
- 1 Type KE limit switch relay (2LSR)
- 2 Magnetic overload relays (one instantaneous and one inverse time) (21OL, 22OL)

VDC	Max. HP Crane Rating	Contactors NEMA Size	No. of Speed Points	Open Type		General Purpose Enclosure NEMA Type 1 Gasketed		Outdoor Enclosure NEMA Type 3R		Industrial Enclosure NEMA Type 12 ▲	
				Controller Type	Price	Controller Type	Price	Controller Type	Price	Controller Type	Price
Single Motor Control ★											
230	35	3	5	EOH3	\$ 10536.	ESH3	\$ 14172.	EWH3	\$ 14892.	EAH3	\$ 16536.
	55	4	5	FOH3	12672.	FSH3	16308.	FWH3	17028.	FAH3	18672.
	110	5	5	GOH3	17244.	GSH3	21330.	GWH3	22050.	GAH3	24144.
	150	5A †	5 n	GAOH3	19831.	GASH3	24530.	GAWH3	25358.	GAAH3	27766.
	225	6	6	HOH3	28318.	HSH3	33754.	HWH3	34474.	HAH3	37918.
	275	6A †	6	HAOH3	33960.	HASH3	39369.	HAWH3	40116.	HAAH3	43560.
	500	8	6	KOH3	64086.	KSH3	71232.	KWH3	71952.	KAH3	77106.
Duplex Motor Control (2 Motors Connected In Parallel) ★											
230	220 (2-110)	5	5	GOH4	\$ 34476.	GSH4	\$ 42648.	GWH4	\$ 44088.	GAH4	\$ 48276.
	300 (2-150)	5A †	5 n	GAOH4	39662.	GASH4	49060.	GAWH4	50716.	GAAH4	55532.
	450 (2-225)	6	6	HOH4	56636.	HSH4	67508.	HWH4	68948.	HAH4	75836.
	550 (2-275)	6A †	6	HAOH4	67920.	HASH4	78792.	HAWH4	80232.	HAAH4	87120.
	1000 (2-500)	8	6	KOH4	128160.	KSH4	142152.	KWH4	143892.	KAH4	154200.

▲ Non-ventilated NEMA Type 12 enclosures are not recommended for CMAA Service Classifications E and F and for applications which have frequent jogging and inching operations because a corrosive atmosphere, detrimental to the component parts, can develop. For these applications, NEMA 1 Gasketed enclosures are recommended.

★ For explanation and pricing of multi-motor controls, refer to multi-motor drives section of application data.

† Not a NEMA Size/Rating.

n NEMA standards require 6 speed points above 110HP. Add 1 speed point if required.

Ordering Information Required:

1. Class
2. Type
3. Motor Horsepower at 230 VDC
4. Motor Duty Rating
5. Controller Modifications:
Specify Form Numbers
6. Resistor Service Classification
7. Master Switch Class, Type and Form

CP9A Discount
Schedule



PRICING INFORMATION AND APPLICATION DATA

Hoist Service

A complete set of motor control equipment consists of a controller, separately mounted TAB-WELD® resistors, and a master switch. The following tables are for selecting the resistors and master switches used with Class 6121 Hoist controllers.

TAB-WELD® Resistor Selection Table ★ †



**Class 6715
TAB-WELD® Resistor**

Maximum HP Rating Single Motor ■	Price		Price Additions
	NEMA Class ●		Teaser Field Resistor ▲
	162-DL	172-DL	
5	\$ 2928.	\$ 2928.	\$ 1830.
7-1/2	2520.	2520.	1230.
10	2082.	2196.	1230.
15	2220.	2418.	630.
20	2370.	2976.	630.
25	2520.	3528.	630.
30	2928.	4098.	630.
35	3360.	4704.	630.
40	3756.	5256.	630.
45	4182.	5856.	1020.
50	4602.	6444.	1020.
60	5394.	7554.	1020.
65	5838.	8172.	1020.
70	6234.	8730.	1230.
75	6660.	9324.	1230.
90	7872.	11022.	1230.
100	8712.	12198.	1230.
135	11592.	16230.	2010.
150	12816.	17940.	2010.
200	16944.	23724.	2520.
250	21564.	30192.	3510.
275	23610.	33054.	3990.
300	25650.	35910.	3990.
325	27762.	38868.	4380.
375	31878.	44634.	4380.
500	43125.	60384.	7620.



**Class 9004
Type CG12
Master Switch**



**Class 9004
Type VG12
Master Switch**

- ★ It is recommended that hoist resistors be selected based on the 1/2 hour motor horsepower rating unless specified otherwise.
- † For resistors mounted in racks – refer to Class 6715.
- Duplex controllers require two sets of resistors, one set for each motor.
- Class 162 is recommended for standard crane duty.
Class 172 is recommended for severe crane duty.
Consult factory for other NEMA Classes.
For explanation of NEMA Resistor Classifications – refer to Class 6715 Application Data.
- ▲ Teaser field resistor limits no load hoisting speed to 250% of motor rated speed. No modification of the controller is required.

Master Switch Selection Table

Class 9004 VM or CM NEMA 1 Enclosed						
Drive	Speed Points	Control Type	VM		CM	
			Type	Price	Type	Price
Hoist	5	W	VG12	\$ 1850.	CG12	\$ 2142.
	6	W	VG16	2879.	CG16	3110.

Modifications

Description	Optional Feature Form Letter	Price Addition	
		VM	CM
Spring Return to Off Point	S	\$ 296.	\$ 296.

Accessories

Brakes see Class 5010 or 5015
 Manual-Magnetic Disconnect Switch see Class 6140
 YOUNGSTOWN® Power Limit Switch see Class 6170

CP9A Discount Schedule



Crane Control Class 6121

FRONTLINE® DC Crane Control

CLASS 6121



Class 6121 Type EGR3
Bridge Controller

GENERAL INFORMATION AND PRICING

Bridge or Trolley Service

Class 6121 reversing plugging controllers are recommended for use with DC series motors on crane travel drives. These controllers are frequently used on such special mill equipment as charging machines, forging manipulators, etc. All controllers are arranged for use with series brakes. Shunt brakes can be used when a brake relay is added to the controller.

- Mill Duty Class 7004 Type M LINE-ARC® contactors & Class 7001 Type K relays
- Class 7001 Type ST-1 static acceleration timers

The standard single motor reversing dynamic lowering control consists of:

- 1 Two pole fused control circuit knife switch (CSW)
- 1 Two pole unfused main line knife switch with padlock clip (LSW)
- 4 Type M single pole directional contactors with mechanical interlocks (1F, 2F, 1R, 2R)
- 1 Type M single pole negative line contactor (M)
- 4 or 5 Type M single pole acceleration contactors (including one for plugging) (1A, 2A, 3A, P)
- 3 or 4 Type ST-1 static acceleration timers (1AR, 2AR, 3AR, 4AR)
- 1 Type KP rectifier-plugging relay (PR)
- 1 Undervoltage relay (UV)
- 2 Magnetic overload relays (one instantaneous and one inverse time) (1OL, 2OL)

The duplex controller consists of the equipment for a single motor controller with the exception that all contactors are double pole devices and the following equipment is added:

- 1 Two pole main line knife switch with padlock clip (2LSW)
- 1 Type KP rectifier-plugging relay (2PR)
- 2 Magnetic overload relays (one instantaneous and one inverse time) (21OL, 22OL)

VDC	Max. HP Crane Rating ●	Contactors NEMA Size	No. of Speed Points	Open Type		General Purpose Enclosure NEMA Type 1 Gasketed		Rainproof and Sleet-Resistant Enclosure NEMA Type 3R		Industrial Enclosure NEMA Type 12 ▲	
				Controller Type	Price	Controller Type	Price	Controller Type	Price	Controller Type	Price
Single Motor Control ★											
230	35	3	5	EOR3	\$ 9780.	ESR3	\$ 13416.	EWR3	\$ 14136.	EAR3	\$ 15780.
	55	4	5	FOR3	11568.	FSR3	15204.	FWR3	15924.	FAR3	17568.
	110	5	5	GOR3	15768.	GSR3	19854.	GWR3	20574.	GAR3	22668.
	150	5A †	5 n	GAOR3	18133.	GASR3	22832.	GAWR3	23660.	GAAR3	26068.
	225	6	6	HOR3	25920.	HSR3	31356.	HWR3	32076.	HAR3	35520.
Duplex Motor Control (2 Motors Connected in Parallel) ★											
230	70 (2-35)	3	5	EOR4	\$ 19560.	ESR4	\$ 26832.	EWR4	\$ 28272.	EAR4	\$ 31560.
	110 (2-55)	4	5	FOR4	23136.	FSR4	30408.	FWR4	31848.	FAR4	35136.
	220 (2-110)	5	5	GOR4	31536.	GSR4	39708.	GWR4	41148.	GAR4	45336.
	300 (2-150)	5A †	5 n	GAOR4	36266.	GASR4	45664.	GAWR4	47320.	GAAR4	52136.
	450 (2-225)	6	6	HOR4	51840.	HSR4	62712.	HWR4	64152.	HAR4	71040.

▲ Non-ventilated NEMA Type 12 enclosures are not recommended for CMAA Service Classifications E and F and for applications which have frequent jogging and inching operations because a corrosive atmosphere, detrimental to the component parts, can develop. For these applications, NEMA 1 Gasketed enclosures are recommended.

★ For explanation and pricing of multi-motor controls refer to multi-motor drives section of application data.

† Not a NEMA Size/Rating.

n NEMA standards require 6 speed points above 110HP. Add 1 speed point if required.

● For higher horsepower, consult factory.

Ordering Information Required:

1. Class
2. Type
3. Motor Horsepower at 230 VDC
4. Motor Duty Rating
5. Controller Modifications:
Specify Form Numbers
6. Resistor Service Classification
7. Master Switch Class, Type and Form

CP9A Discount Schedule



Crane Control Class 6121 Pricing Information and Application Data

CLASS 6121

BRIDGE OR TROLLEY SERVICE

A complete set of motor control equipment consists of a controller, separately mounted TAB-WELD® resistors, and a master switch. The following tables are for selecting the resistors and master switches used with Class 6121 Bridge or Trolley controllers.



**Class 6715
TAB-WELD® Resistor**

TAB-WELD® Resistor Selection Table ★ †

Maximum HP Rating Single Motor ■	Price		Price Additions
	Without Armature Shunt		Continuous Duty Slowdown Resistor ▲
	NEMA Class ●		
	162-P	172-P	
5	\$ 954.	\$ 954.	\$ 870.
7-1/2	954.	954.	990.
10	954.	1280.	1110.
15	1268.	1280.	1350.
20	1268.	1374.	1920.
25	1268.	1638.	2265.
30	1308.	1896.	2460.
35	1482.	2148.	2670.
40	1650.	2394.	2970.
45	1842.	2670.	3270.
50	1980.	2874.	3600.
60	2394.	3474.	3930.
65	2574.	3732.	4560.
70	2772.	4020.	6450.
75	2928.	4248.	6810.
90	3492.	5064.	7710.
100	3846.	5574.	8040.
135	5136.	7446.	...
150	5676.	8232.	...
200	7500.	10878.	...



**Class 9004
Type CG12
Master Switch**

- ★ It is recommended that bridge or trolley resistors be selected based on the 1 hour motor horsepower rating unless specified otherwise.
- † For resistors mounted in racks, refer to Class 6715.
- Duplex controllers require two sets of resistors, one set for each motor.
- Class 162 is recommended for standard crane duty.
Class 172 is recommended for severe crane duty.
For explanation of NEMA Resistor Classifications, refer to Class 6715 Application Data.
Consult factory for other NEMA Classes.
- ▲ Slowdown resistors are designed to limit Bridge drives to approximately 50% of their present free running speed. Complete motor nameplate data plus the free running current drawn by the motor must be provided to design the slowdown resistors.

Master Switch Selection Table

Class 9004 VM or CM NEMA 1 Enclosed						
Drive	Speed Points	Control Type	VM		CM	
			Type	Price	Type	Price
Bridge or Trolley	5	U	VG9	\$ 1586.	CG8	\$ 1820.
	6	U	VG9	1586.	...	...
	6	U	...	...	CG12	2142.



**Class 9004
Type VG12
Master Switch**

Modifications

Description	Optional Feature Form Letter	Price Addition	
		VM	CM
Spring Return to Off Point	S	\$ 296.	\$ 296.

Accessories

- Brakes see Class 5010 or 5015
- Adjustable Torque Brakes see Class 5060
- Manual-Magnetic Disconnect Switch see Class 6140

CP9A Discount Schedule



Crane Control Class 6121

Pricing Information and Application Data

CLASS 6121

Controller Modifications

Form	Description	Price ■						
		Maximum HP Rating — Single Motor						
		35	55	110	150	225	275	500
B1 ▲	Shunt Brake Relay	\$ 1104.	\$ 1104.	\$ 1104.	\$ 1104.	\$ 1104.	...	...
B3 ▲	Shunt Brake Relay	1104.	1104.	1104.	1104.	1104.	...	...
B4 ▲	Shunt Brake Relay	1104.	1104.	1104.	...	...	...	...
B9 ▲●	Service Dynamic Braking	◆	◆	◆	◆	◆	◆	◆
B10 ▲●	Emergency Dynamic Braking, Single Point	◆	◆	◆	◆	◆	◆	◆
B11 ▲●	Emergency Dynamic Braking, Auto Deceleration							
D1	Substitute Main Line Knife Switch with DC Rated Fuses for Unused Main Line Knife Switch	1880.	2185.	2515.	2725.	3975.	4440.	◆
D7 ★	Series Brake Transfer Knife Switches	2136.	3468.	4896.	4898.	9024.	9845.	11264.
E19	Low Headroom	◆	◆	◆	◆	...	...	...
G8	Power Terminal Board (Includes Power Lugs)	◆	◆	◆	◆	◆	◆	◆
G15	Ammeter Shunt, 100MV	312.	420.	1008.	1075.	1620.	1620.	2376.
G16	Miniature Ammeter Panel Mounted	300.	300.	300.	300.	300.	300.	300.
G22	Cabinet Inspection Light and Toggle Switch	750.	750.	750.	750.	750.	750.	750.
H18	Cabinet Space Heater Controlled by Interlock from M Contactor	660.	660.	660.	660.	660.	660.	660.
M3 †	Additional Acceleration Point	1164.	1368.	1824.	2048.	2778.	3240.	5436.
M4	Second Plugging Step	1464.	1668.	2124.	2348.	3078.	...	...
M24	Substitute Type SSI Time Current Acceleration Module for Type ST-1 Static Acceleration Timers	1050.	1050.	1050.	1050.	1050.	1050.	1050.
M52 ▲●	Armature Shunt Contactor (Controls Slowdown for Floor/Cab Operation)	702.	906.	1362.	1562.	2316.	...	...
R1 □	Auto-Stop Rectifier Circuit	830.	830.	940.	940.	1245.	1245.	1245.
Y17	Arc Suppressors (Required on Pendant and Radio Operated Controllers)	1080.	1080.	1080.	1080.	1080.	1080.	1080.

- For Duplex Controllers multiply all prices by two with the exceptions of forms, D7, B10, B11.
- ★ For Duplex Controllers using Series Brakes.
- Does not include resistor prices.
- ▲ For Bridge and Trolley controllers only. See Application Data for explanation of form number.
- For Hoist Controllers only. See Application Data for explanation of form number.
- † Additional master switch contacts will be required. See Catalog 9004 for correct master switch and price.
- ◆ Consult factory for price and delivery.

Application Data

Multi-Motor Drives

Two motors connected in series – The armatures and fields of each motor are connected in series and treated as a single motor. If the voltage rating of each motor is 230 VDC and the supply voltage is 230 VDC, the horsepower rating is equal to the rating of one motor. If the voltage rating of each motor is 115 VDC and the supply voltage is 230 VDC, the horsepower rating is equal to the sum of the ratings of both motors. Controller and resistor pricing is based on the horsepower rating. A single set of motor power resistors is required.

Two motors connected in parallel (Duplex) – One set of control equipment and power resistors is required for each motor. Controller modification prices are double those shown for a single motor scheme.

Four motors connected in parallel (Quadruplex) – It is necessary to double the duplex controller price given for two motors in parallel. Four sets of motor power resistors are required.

Four motors connected in series-parallel – Two sets of series motors with their armatures and fields connected in series are connected in parallel. Controllers and modifications for this connection should be priced based on two motors in parallel. Two sets of motor power resistors are required.

CP9A Discount Schedule



Special Panel Construction

Several types of factory assembled and unitized constructions are available. Consult factory for price and delivery.

Standard controllers come equipped with the components listed. Special features to be added to standard controllers are identified by Form number. Most of these modifications are self-explanatory. Others, however, require some additional explanation.

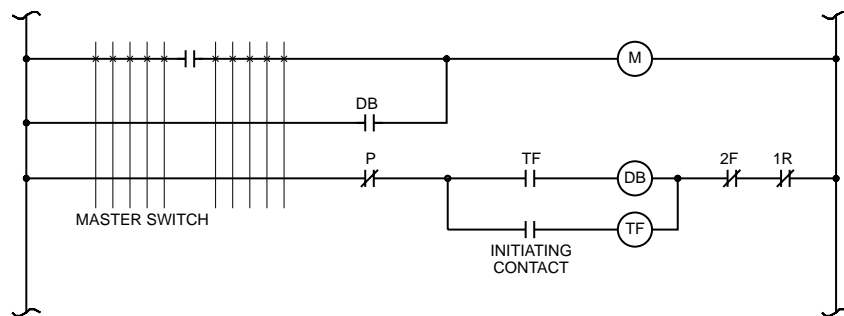
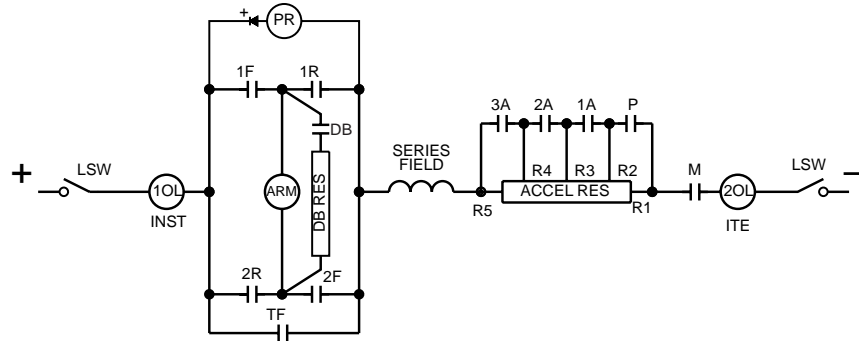
Forms B1, B3, and B4 cover various shunt brake relay applications. These modifications are for Bridge and Trolley controllers only and in each case a double-pole, 25-ampere brake relay is supplied. The three modifications differ from each other in the way the relay is wired and controlled. Each is as follows:

B1: Relay connected in parallel with main (M) contactor coil. With this arrangement, the shunt brake will set whenever the master switch is moved to the off point.

B3: Relay controlled from external push button, foot switch, etc. This arrangement allows the shunt brake to be manually applied by the crane operator whenever necessary.

B4: Relay connected in parallel with undervoltage relay. The arrangement allows the shunt brake to set only when the main disconnect for the crane is opened or upon power failure.

Form B9, Service dynamic braking, is used for decelerating travel drives under normal operation. Service dynamic braking is occasionally used in place of plugging on a travel drive. The common arrangement is to use an initiating switch in conjunction with the electric adjustable torque or hydraulic brake pedal such that initial depression of the brake pedal provides service dynamic braking and further depression actuates the adjustable torque or hydraulic brake. Service dynamic braking assists the adjustable torque or hydraulic brake.



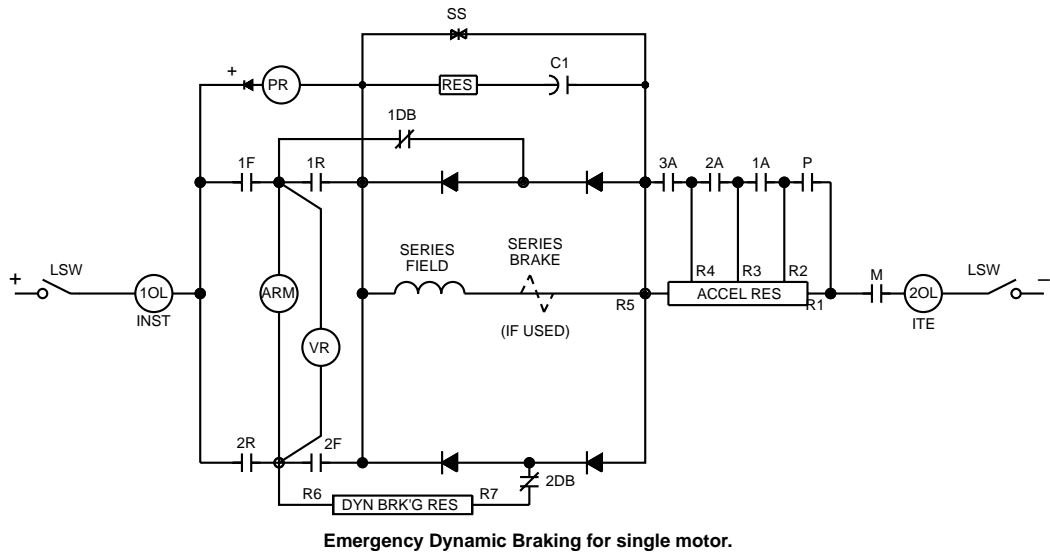
Service Dynamic Braking for single series motor

Form B10 covers emergency dynamic braking. Emergency dynamic braking is used to decelerate crane travel drives, such as high speed bridge drives and manned trolleys and is automatically applied upon power failure or when an overload relay trips. Emergency dynamic braking provides a simple, reliable means for braking to a stop bridge drives of cranes, or manned trolleys of ore and coal bridges, etc. Emergency dynamic braking is applied in about 1/5 the time required to set a shunt brake. The motors are converted to self-excited generators to provide retarding torque. Braking is not dependent on an outside source of power. The circuits for single step emergency dynamic braking are shown for the various motor connections.

Crane Control Class 6121 Controller Modifications

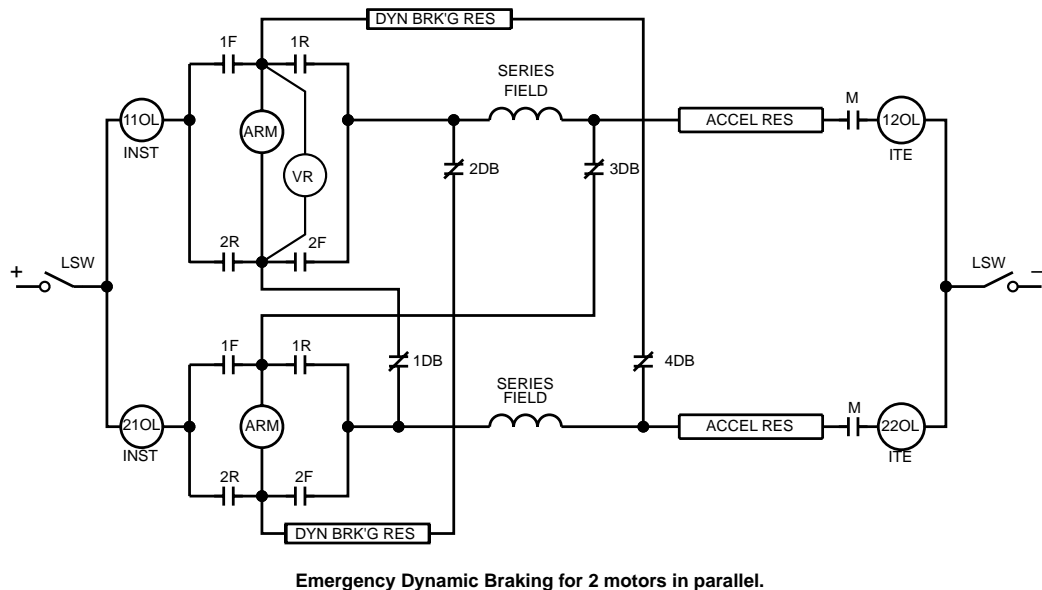
CLASS 6121

Emergency Dynamic Braking For A Single Motor – The motor is connected as self-excited generator by using a silicon rectifier bridge around the motor series field. Braking is equally effective in each direction.



Emergency Dynamic Braking For Two Motors Connected In Series – The same circuit as for a single motor is used. The armatures and fields of the two motors are permanently connected in series and are treated as a single motor.

Emergency Dynamic Braking For Two Motors Connected In Parallel – The circuit shows the simple arrangement whereby the fields and the armatures of the two series motors are cross-connected to insure self-excitation for positive emergency dynamic braking from either direction of travel. Two sets of double-pole dynamic braking contactors are used.

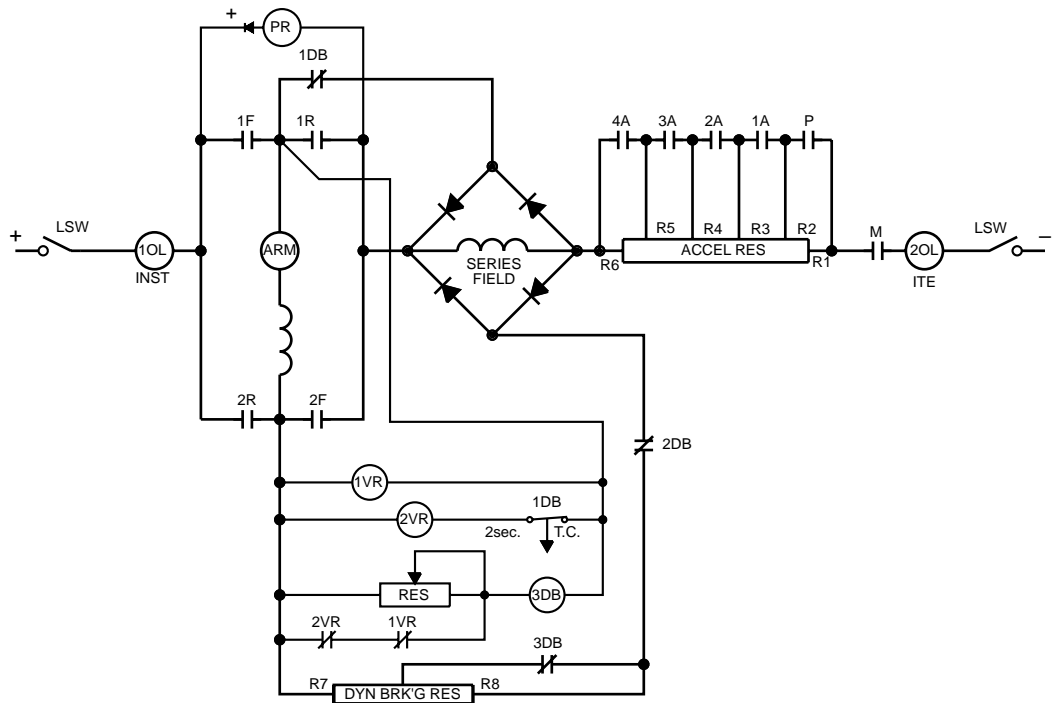


Emergency Dynamic Braking For Four Motor Drives – For four motors connected in parallel, two sets of cross-connected motors are connected in parallel to provide dynamic braking for all four motors. For this motor connection, the controller modification is priced by doubling the price given for two motors in parallel.

When four motors are connected in series parallel, that is, when two sets of motors with their armatures and fields connected in series are connected in parallel, emergency dynamic braking should be priced based on the controller modification for two motors connected in parallel.

Form B11 covers graduated emergency dynamic braking with automatic deceleration. The automatic deceleration provides a faster stop than single step deceleration from high speed without wheel slippage.

Graduated Emergency Dynamic Braking With Automatic Deceleration For A Single Motor – An additional voltage relay (2VR) and a spring closed contactor (3DB) with its main contacts shorting out a portion of the dynamic braking resistor are added to the circuit for single step emergency dynamic braking. The two voltage relays (1VR and 2VR) are used to insure proper operation of the 3DB contactor. The generated armature voltage keeps the 3DB contactor energized until the motor speed is decreased sufficiently to provide a smooth deceleration. When the 3DB contactor closes, the value of the dynamic braking resistance is decreased, and increased braking torque is provided to stop the drive.



Graduated Emergency Dynamic Braking With Automatic Deceleration For A Single Motor.

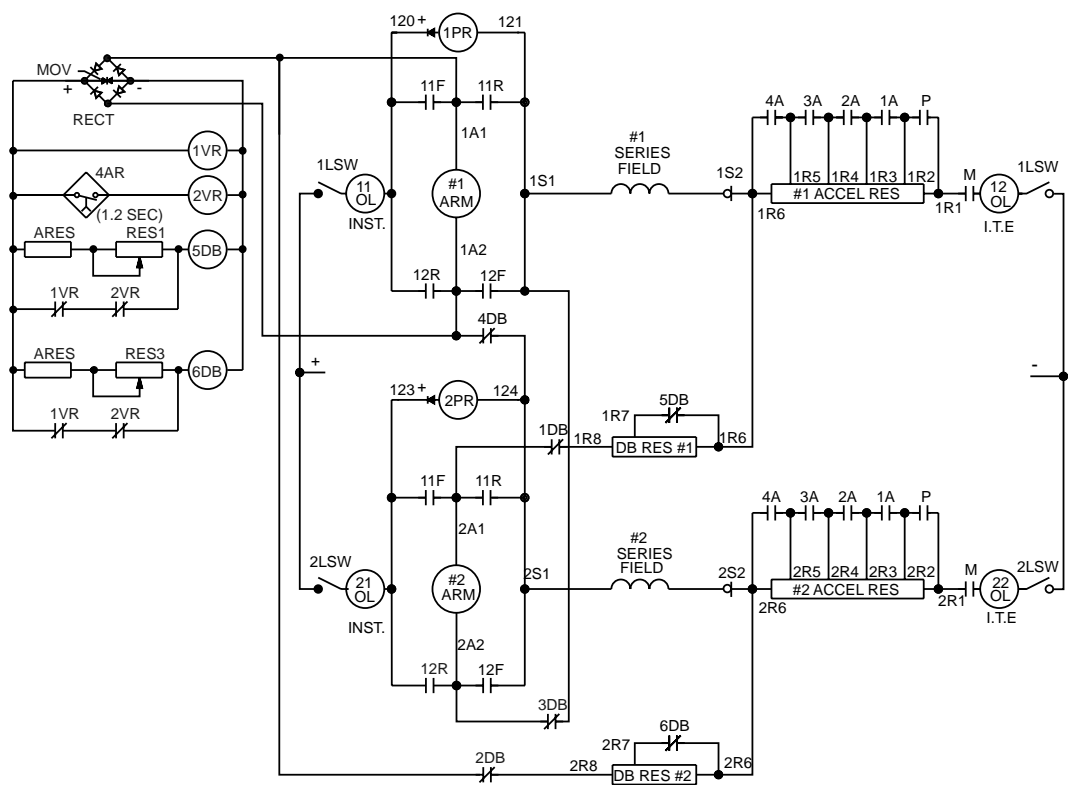
Crane Control Class 6121 Controller Modifications

Graduated Emergency Dynamic Braking With Automatic Deceleration For Multi-Motor Drives –
For two motors connected in series, the fields of each motor are connected in series inside the rectifier bridge and are treated as a single motor.

The circuit for two motors connected in parallel is essentially the same as that for two motors in parallel with single step dynamic braking except for the addition of two voltage relays, 1VR and 2VR, and two normally closed contactors, 5DB and 6DB. The voltage relays and the normally closed contactors are operated based on the generated armature voltage of one motor, but control the braking of both motors. The two contactors are adjusted to reclose together as the motors decelerate. This reclosure shorts out part of the dynamic braking resistor, maintaining deceleration torque.

For Quadruplex connections where four motors are connected in parallel, it is necessary to double the controller modification price shown for two motors in parallel.

For four motors used in a series-parallel connection, graduated emergency dynamic braking should be priced based on the controller modification price for two motors connected in parallel.



Graduated Emergency Dynamic Braking For Two Motors in Parallel

Form D7 lists series brake transfer knife switches for use on duplex controllers. For single motor operation, these knife switches connect both series brakes in series with one motor to permit operating the drive without having to manually release one brake.

Form M4 lists a second plugging step. An additional plugging relay (2PR) and an additional plugging contactor (2P) are supplied. A second plugging step is recommended for heavy cranes, such as ladle crane bridge drives or high speed cranes such as ore bridge trolleys or high speed bridge drives. Two steps of plugging provide faster slowdown without spinning the wheels.

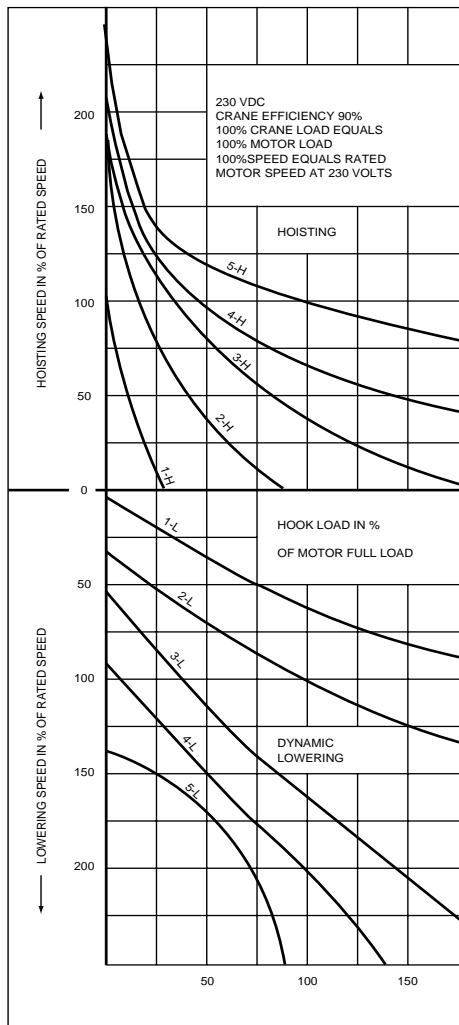
Form M24 provides time delay acceleration proportional to motor current.

Form M52 is an armature shunt contactor for use on Bridge and Trolley controllers only. This modification consists of a single pole normally open contactor of equal NEMA Size to the contactors in the basic controller. The operation is as follows:

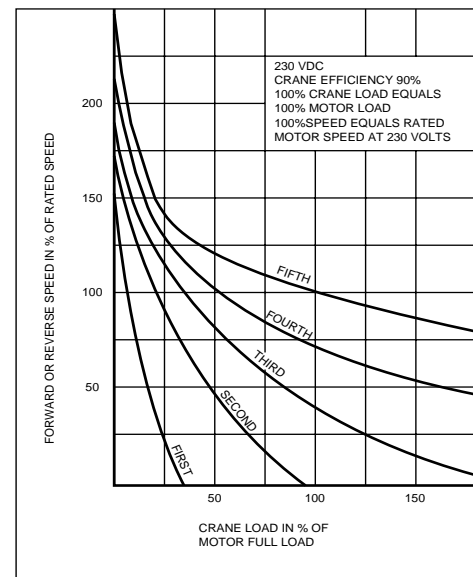
The contactor is arranged to provide slowdown of bridge drives during floor operation of cab/floor operated cranes. A customer supplied contact, maintained closed during floor operation, initiates the slowdown. This modification is to be used with NEMA Class 162P or Class 172P accelerating resistors plus a continuous duty bridge slowdown resistor.

Form R1 Auto-Stop Rectifier circuit is used on hoist applications. The series DC brake is set by returning the master switch to the off position during normal running conditions. In a power failure situation the brake will set if the controller is in hoist mode. If however, the standard controller is in lower mode, regenerative power from the DC motor will keep the series brake open and allow the load to be safely lowered. With the Auto-Stop Rectifier circuit modification, the series brake will work as usual in normal running conditions. In a power failure situation, the brake will automatically set in both hoist and lowering modes.

Crane Hook Speed vs. Load Performance for Class 6121 Dynamic Lowering Hoist



Crane Travel Speed vs. Load Performance for Class 6121 Reversing Plugging

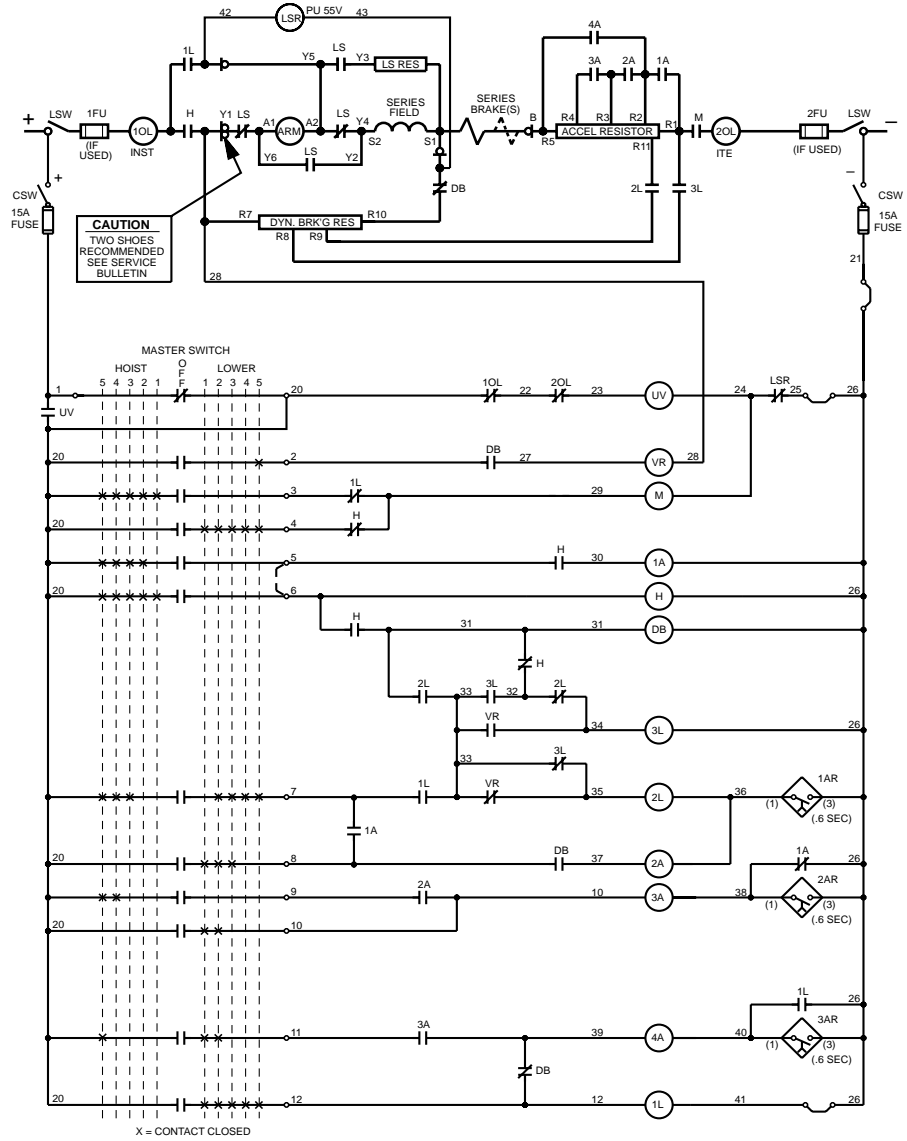


Crane Control Class 6121

Wiring Diagrams

ELEMENTARY WIRING DIAGRAM FOR HOIST CONTROL

CLASS 6121



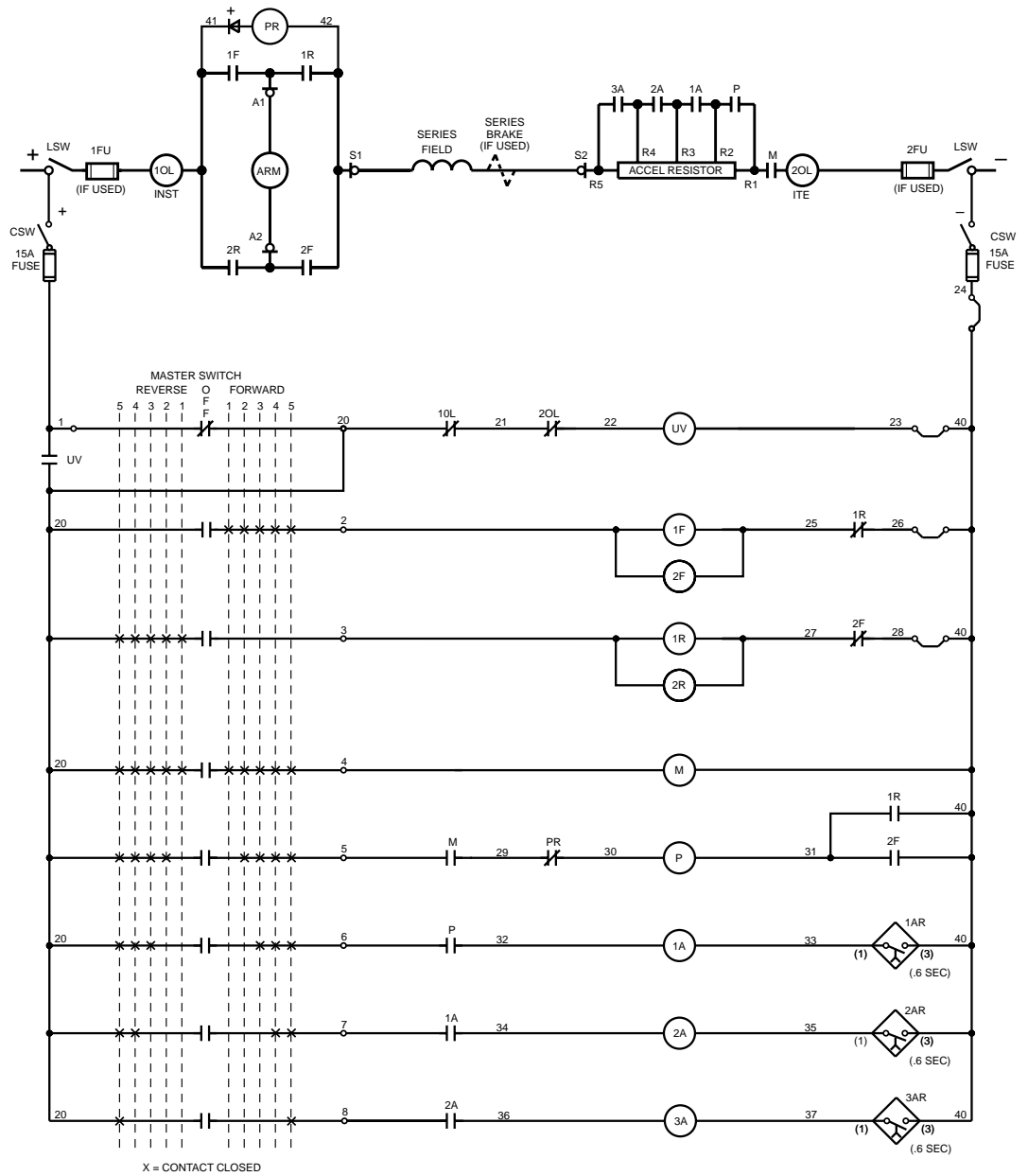
CONTACTOR SEQUENCE
X=POWER TIPS CLOSED

DEVICE	HOIST				LOWER			
	1	2	3	4	1	2	3	4
M	X	X	X	X	X	X	X	X
H	X	X	X	X	X	X	X	X
DB	X	X	X	X	X	X	X	X
1L					X	X	X	X
2L					X	X	X	X
3L					X	X	X	X
1A	X	X	X	X				
2A	X	X	X	X				
3A	X	X	X	X				
4A	X	X	X	X				

CONTACTORS 1A & 1L, 3L & H, H & 2L ARE MECHANICALLY INTERLOCKED.

ELEMENTARY WIRING DIAGRAM FOR BRIDGE OR TROLLEY CONTROL

CLASS 6121



CONTACTOR SEQUENCE		REVERSE					O	FORWARD				
DEVICE		5	4	3	2	1	F	1	2	3	4	5
1F								X	X	X	X	X
2F								X	X	X	X	X
1R		X	X	X	X	X						
2R		X	X	X	X	X						
M		X	X	X	X	X		X	X	X	X	X
P		X	X	X	X	X		X	X	X	X	X
1A		X	X	X	X	X		X	X	X	X	X
2A		X	X	X	X	X		X	X	X	X	X
3A		X	X	X	X	X		X	X	X	X	X

CONTACTORS 1R & 1F & 2R & 2F
ARE MECHANICALLY INTERLOCKED.



Crane Control Class 6121

Application Data

CLASS 6121

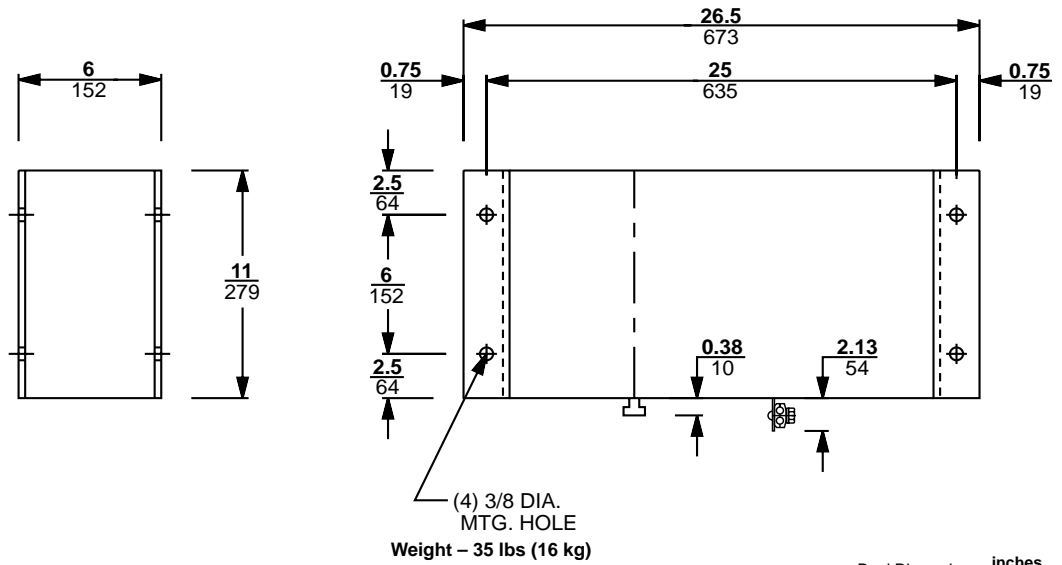
APPROXIMATE NUMBER OF SEPARATELY MOUNTED STANDARD CLASS 6715 TAB-WELD® RESISTOR SECTIONS FURNISHED WITH CLASS 6121 CONTROLLERS

This tabulation is based on Square D resistor designs for use with Class 6121 controllers only. This tabulation is for typical drive loading and may vary for any specific application.

Maximum HP Rating Single Motor (230V)	Hoist ▲			Bridge Or Trolley		
	162-DL	172-DL	Teaser Field	Without Armature Shunt		Continuous Duty Slowdown Resistor ●
				162-P	172-P	
5	5	5	3	1	1	1
7-1/2	4	4	2	1	1	1
10	3	3	2	1	2	1
15	3	3	1	2	2	2
20	3	4	1	2	3	3
25	4	6	1	2	3	4
30	5	7	1	3	3	4
35	6	8	1	3	4	5
40	6	10	1	3	4	5
45	8	11	2	4	5	6
50	8	11	2	4	6	6
60	10	15	2	4	6	7
65	11	15	2	4	6	8
70	11	14	2	5	7	11
75	10	17	2	6	7	11
90	13	17	2	6	9	13
100	16	19	2	6	9	13
135	20	30	4	9	12	...
150	21	28	4	10	12	...
200	28	38	5	13	19	...
250	34	44	7	16	21	...
275	43	53	8	18	24	...
300	43	53	8	19	26	...
325	43	56	8	20	28	...
375	48	62	8	23	32	...
500	75	97	14	32	44	...

- ▲ Does not include YOUNGSTOWN® power limit switch resistor. Refer to Class 6170.
- Does not include acceleration resistor.

Standard Class 6715 TAB-WELD® Resistor Section



INCREASE IN STANDARD PANEL WIDTH FOR COMMONLY USED MODIFICATIONS

The table below may be used to determine what increase in width in inches (mm), if any, results when modifications are added to a standard Class 6121 controller. The dimensions apply only to individual modifications or combination of modifications for which they are shown.

Controller Modifications

Form	Description		Maximum HP Crane Rating per Motor (230V)					
			35	55	110	225	275	500
B1 ●	Shunt brake relay		0	0	0	0	...	...
B3 ●	Shunt brake relay		0	0	0	0	...	...
B4 ●	Shunt brake relay		0	0	0	0	...	...
B9 ●	Service dynamic braking		▲	▲	▲	▲	...	...
B10 ●	Emergency dynamic braking, single point	Single motor Two motors in parallel Two motors in series	▲	▲	▲	▲	...	...
B11 ●	Emergency dynamic braking, auto deceleration							
D1	Substitute fused main line knife switch for unfused main line knife switch		0	0	0	0	...	▲
G15	Ammeter shunt, 100MV		0	0	0	0	0	0
G16	Miniature ammeter, panel mounted		0	0	0	0	0	0
H18	Cabinet space heater		0	0	0	0	0	0
M3	Additional acceleration point (hoist)		6 (152)	6 (152)	7 (178)	0	9 (229)	21 (533)
M3 ●	Additional acceleration point (bridge or trolley)		0	0	0	0	...	...
M4 ●	Second plugging step		0	0	0	0	...	...
M24	Type SSI time current acceleration module instead of Type ST static timers		0	0	0	0	0	0
M52 ●	Armature shunt contactor (Controls slowdown for floor/cab operation)		0	0	0	0	...	...
R1 ◆	Auto-Stop Rectifier circuit		6 (152)	6 (152)	7 (178)	0	9 (229)	21 (533)
Y17	Arc suppressors (Required on pendant and radio operated controllers)		0	0	0	0	0	0

- For bridge & trolley controllers only.
- ▲ Consult factory.
- ◆ For hoist controllers only.

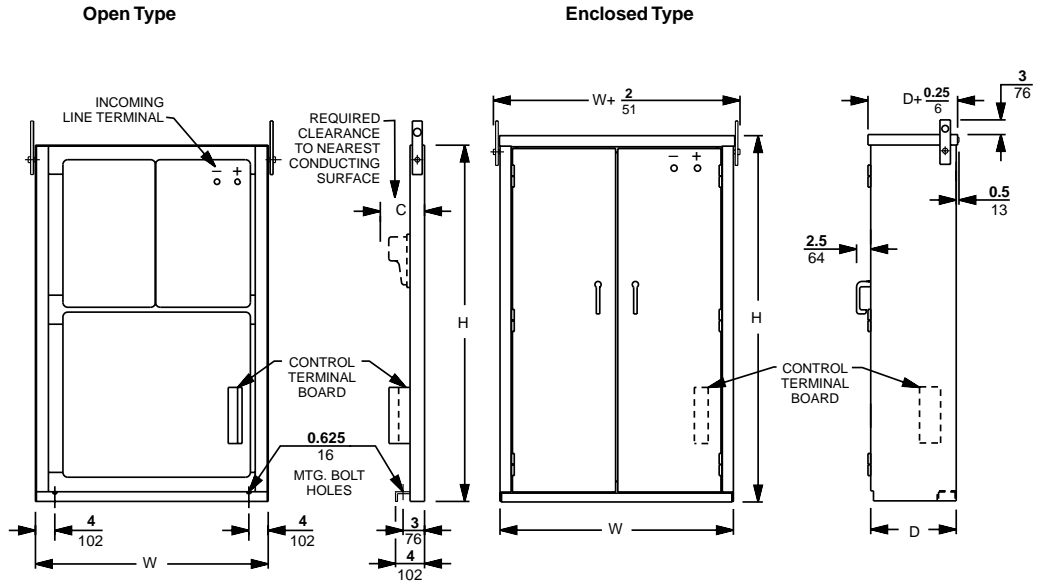


Crane Control Class 6121

Approximate Dimensions and Weights

SINGLE MOTOR CONTROL STANDARD FLOOR MOUNTED CONTROLLERS

CLASS 6121



Dual Dimensions $\frac{\text{inches}}{\text{mm}}$

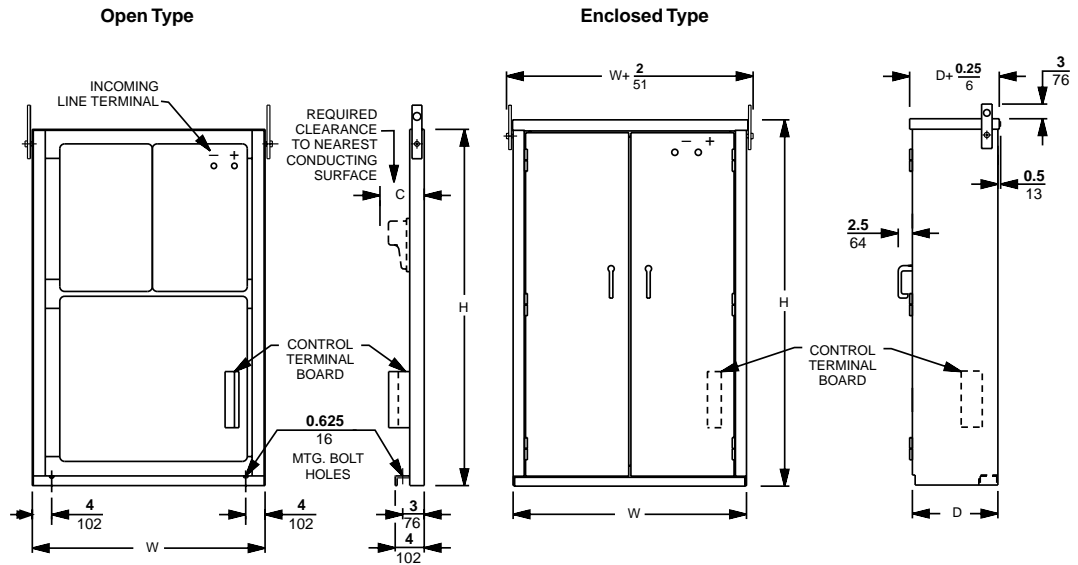
Drive	Maximum HP (230V)	Open Type				Enclosed Type			
		H	W	C	Net Weight lbs (kg)	H	W	D	Net Weight lbs (kg)
Hoist	35	<u>68</u> 1727	<u>33</u> 838	<u>12</u> 305	500 (227.3)	<u>68</u> 1727	<u>33</u> 838	<u>15</u> 381	700 (318.2)
	55	<u>68</u> 1727	<u>33</u> 838	<u>12</u> 305	500 (227.3)	<u>68</u> 1727	<u>33</u> 838	<u>15</u> 381	700 (318.2)
	150 ▲	<u>78</u> 1981	<u>38</u> 965	<u>15</u> 381	700 (318.2)	<u>78</u> 1981	<u>38</u> 965	<u>17</u> 432	900 (409.1)
	275	<u>72</u> 1829	<u>72</u> 1829	<u>21</u> 533	1300 (590.9)	<u>72</u> 1829	<u>72</u> 1829	<u>23</u> 584	1800 (818.2)
	500	<u>90</u> 2286	<u>99</u> 2515	<u>25</u> 635	2600 (1181.8)	<u>90</u> 2286	<u>99</u> 2515	<u>27</u> 686	3700 (1681.8)
Bridge or Trolley	35	<u>68</u> 1727	<u>33</u> 838	<u>12</u> 305	500 (227.3)	<u>68</u> 1727	<u>33</u> 838	<u>15</u> 381	700 (318.2)
	55	<u>68</u> 1727	<u>33</u> 838	<u>12</u> 305	500 (227.3)	<u>68</u> 1727	<u>33</u> 838	<u>15</u> 381	700 (318.2)
	150 ▲	<u>78</u> 1981	<u>38</u> 965	<u>15</u> 381	700 (318.2)	<u>78</u> 1981	<u>38</u> 965	<u>17</u> 432	900 (409.1)
	225	<u>72</u> 1829	<u>72</u> 1829	<u>21</u> 533	1200 (545.5)	<u>72</u> 1829	<u>72</u> 1829	<u>23</u> 584	1500 (681.8)

▲ Dimensions are for a 5 speed point controller. NEMA standards require 6 speeds above 110HP. Refer to Form M3 for increase in panel width.

Crane Control Class 6121

Approximate Dimensions and Weights

DUPLEX MOTOR CONTROL STANDARD FLOOR MOUNTED CONTROLLERS



Dual Dimensions inches
mm

CLASS 6121

Drive	Maximum HP (230V)	Open Type				Enclosed Type			
		H	W	C	Net Weight lbs (kg)	H	W	D	Net Weight lbs (kg)
Hoist	70 (2-35)	68 1727	66 1676	12 305	1000 (453.6)	68 1727	66 1676	15 381	1000 (453.6)
	110 (2-55)	68 1727	66 1676	12 305	1000 (453.6)	68 1727	66 1676	15 381	1000 (453.6)
	220 (2-110)	78 1981	77 1956	15 381	1400 (635.0)	78 1981	77 1956	17 432	1800 (818.2)
	300 (2-150) ♦	78 1981	56/45 1422/1143	15 381	1100 (500.0)	78 1981	56/45 1422/1143	17 432	1420 (645.5)
	450 (2-225) ♦	72 1829	72/78 1829/1981	21 533	1300 (590.9)	72 1829	72/78 1829/1981	23 584	1800 (818.2)
	550 (2-275) ♦	72 1829	72/78 1829/1981	21 533	1300 (590.9)	72 1829	72/78 1829/1981	23 584	1800 (818.2)
	1000 (2-500) ♦	90 2286	99 2515	25 635	2600 (1181.8)	90 2286	99 2515	27 686	3700 (1681.8)
Bridge or Trolley	70 (2-35)	68 1727	66 1676	12 305	1000 (453.6)	68 1727	66 1676	15 381	1400 (635.0)
	110 (2-55)	68 1727	66 1676	12 305	1000 (453.6)	68 1727	66 1676	15 381	1400 (635.0)
	300 (2-150)	78 1981	77 1956	15 381	1400 (635.0)	78 1981	77 1956	17 432	1800 (818.2)
	450 (2-225) ♦	72 1829	72 1829	21 533	1200 (545.5)	72 1829	72 1829	23 584	1800 (818.2)

- ♦ Two control panels are required. Dimensions are given for each except:
 The Size 5A hoist, which has one panel 56" (1422 mm) wide and the second at 45" (1143 mm) wide.
 The Size 6 and 6A hoists, which have one panel 72" (1829 mm) wide, and one at 78" (1981 mm) wide.



Crane Control Class 6121

Rectified DC Constant Potential HWR Hoist Control

CLASS 6121

GENERAL INFORMATION AND PRICING

HWR hoist control is recommended for use with DC series motors on AC powered cranes requiring the speed range, accuracy and dependability of a DC powered crane hoist controller. Typically, 230 VDC rated motors are applied at either 230 VDC, 300 VDC, or 360 VDC.

The complete HWR Hoist Control system consists of:

- 1 Class 6121 DC reversing dynamic lowering controller
- 1 Set of Class 6715 TAB-WELD® resistors
- 1 Class 9004 Master switch
- 1 Rectifier power supply

Consult factory for price and delivery.

TAB-WELD® Resistor Selection Table ▲

Maximum HP Crane Rating @230 VDC	NEMA Class ●	
	162-DL ★	172-DL ★
5	\$ 3786.	\$ 5304.
7-1/2	3186.	4464.
10	3186.	4464.
15	3048.	4266.
20	3606.	5052.
25	4158.	5820.
30	4768.	6618.
35	5334.	7464.
40	5886.	8244.
45	6876.	9624.
50	7464.	10452.
60	8574.	12006.
65	9192.	12762.
70	9960.	13944.
75	10554.	14778.
90	12252.	17154.
100	13428.	18798.
135	18240.	25536.
150	19950.	27930.
200	26244.	36744.
250	33702.	47184.
275	37044.	51864.
300	39900.	55860.
325	43248.	60546.
375	49014.	68622.

- ▲ For resistors mounted in racks - refer to Class 6715.
- Class 162 is recommended for standard crane duty. Class 172 is recommended for severe crane duty. For explanation of NEMA Resistor Classifications- refer to Class 6715 Application Data.
- ★ Resistor pricing based on 300 VDC rectifier output. For 360 VDC applications, consult factory.

CP9A Discount Schedule

Crane Control Class 6121 Rectified DC Constant Potential HWR Hoist Control

CLASS 6121

APPLICATION DATA

Comparison Of Basic Characteristics Of DC Series Motors And AC Wound Rotor Motors

DC Series Motor	AC Wound Rotor Motor
<ul style="list-style-type: none"> - No Load speed is approximately two or three times full load speed. - When used with a dynamic lowering controller the motor can lower rated load at a speed much greater than the rated load hoisting speed. 	<ul style="list-style-type: none"> - Maximum motor speed limited to near synchronous speed for no load and full load.
<ul style="list-style-type: none"> - Maximum motor speed increases in proportion to increase in line voltage. - Increased speeds result in increased horsepower without change in motor size. 	<ul style="list-style-type: none"> - Maximum motor speed not affected by increase in line voltage.

HWR hoist control features a rectifier supplying 300 VDC power to a Class 6121 DC dynamic lowering hoist controller and a standard 230 VDC series wound crane hoist motor and series brake.

The 300 VDC output from the rectifier increases the developed horsepower of a 230 VDC series wound motor by 30%. Inherently, a DC series wound motor increases its hoisting speed as the load is decreased; and with a dynamic lowering controller, has the ability to safely lower loads at greater than full load speed. As a result of the increase in developed horsepower and these inherent performance characteristics, a given hoisting cycle can be completed in the same average time by using a 230 VDC series wound motor having a horsepower rating between 50% to 65% of its AC counterpart.

Even greater performance can be obtained by increasing the voltage to the motor to 360 VDC.

Performance Comparison ▲

Control Type	Standard AC	Standard 230 VDC	Standard HWR 300 VDC	Optional HWR 360VDC
Hoist Full Load	96%	100%	125%	155%
Lower Full Load	102%	230%	235%	240%
Hoist Empty Hook	99%	180%	250%	280%
Lower Empty Hook	100%	140%	175%	215%
Average	99%	148%	182%	212%

▲ 100% speed = AC motor synchronous speed or DC rated speed at 230 VDC. A 90% efficiency is assumed.

Number Of Separately Mounted Standard Class 6715 TAB-WELD® Resistor Sections 26.5" (673 mm) Long ▲

Horsepower @ 230 VDC	10	13-1/2	19	26	33	45	65	100	135	200	265	360
NEMA Class 162-DL	5	5	6	8	10	12	17	21	30	43	53	68
NEMA Class 172-DL	7	7	9	11	14	17	24	30	42	60	74	96

▲ Includes teaser field resistors to limit no load hoisting speed.



Crane Control Class 6121

DC Mill Auxiliary Control

GENERAL INFORMATION

DC mill auxiliary controllers are recommended for use with DC series, shunt, or compound wound motors. They are frequently used on steel mill auxiliary drives such as screwdowns, tables, sideguards, shears, and similar applications. Mill auxiliary controllers can have continuous ratings as well as intermittent and they typically include one less acceleration point than crane drives.

- Mill Duty Class 7004 Type M LINE-ARC® contactors & Class 7001 Type K relays
- Class 7001 Type ST-1 static acceleration timers

Five basic control types are available. The equipment supplied as standard on each of these controllers is listed below:

Reversing Plugging (RP) Control

- 1 Two pole fused control circuit knife switch (CSW)
- 1 Two pole unfused main line knife switch with padlock clip (LSW)
- 1 Surge suppressor for motor shunt field protection (included on panels used with shunt or compound wound motors only)
- 4 Type M single pole directional contactors with mechanical interlocks (1F, 2F, 1R, 2R)
- 3 or 4 Type M single pole acceleration contactors (including one for plugging) (1A, 2A, 3A, P)
- 2 or 3 Type ST-1 static acceleration timers (1AR, 2AR, 3AR)
- 1 Type M single pole negative line contactor (M)
- 1 Type KP rectifier-plugging relay (PR)
- 1 Undervoltage relay (UV)
- 2 Magnetic overload relays (one instantaneous and one inverse time) (1OL, 2OL)

Reversing Plugging Dynamic Braking (RPD) Control

Includes the same equipment as the reversing plugging (RP) controller, but with the addition of:

- 1 Type M single pole spring-closed dynamic braking contactor (DB)

Non-Reversing (NR) Control

- 1 Two pole fused control circuit knife switch (CSW)
- 1 Two pole unfused main line knife switch with padlock clip (LSW)
- 1 Surge suppressor for motor shunt field protection (included on panels used with shunt or compound wound motors only)
- 1 Type M single pole positive line contactor (1M)
- 1 Type M single pole negative line contactor (2M)
- 2 or 3 Type M single pole acceleration contactors (1A, 2A, 3A)
- 2 or 3 Type ST-1 static acceleration timers (1AR, 2AR, 3AR)
- 1 Undervoltage relay (UV)
- 2 Magnetic overload relays (one instantaneous and one inverse time) (1OL, 2OL)

Non-Reversing Dynamic Braking (NRD) Control

Includes the same equipment as the non-reversing (NR) controller, but with the addition of:

- 1 Type M single pole spring-closed dynamic braking contactor (DB)

Consult factory for price and delivery.



GENERAL INFORMATION

Reversing Non-Plugging Dynamic Braking (RNPB) Control

- 1 Two-pole fused control circuit knife (CSW)
- 1 Two-pole unfused main line knife switch with padlock clip (LSW)
- 1 Surge suppressor for motor shunt field protection (included on panels used with shunt or compound wound motors only)
- 4 Type M single-pole directional contactors with mechanical interlocks (1F, 2F, 1R, 2R)
- 2 or 3 Type M single-pole acceleration contactors (including one for plugging) (1A, 2A, 3A)
- 2 or 3 Type ST-1 static acceleration timers (1AR, 2AR, 3AR)
- 1 Type M single-pole negative line contactor (M)
- 1 Type M single-pole spring-closed dynamic braking contactor (DB)
- 1 Type KE non-plugging relay (NP)
- 1 Undervoltage relay (UV)
- 2 Magnetic overload relays (one instantaneous and one inverse time) (1OL, 2OL)

Duplex Motor Control – 2 Motors Connected In Parallel

The duplex controller consists of the equipment for a single motor controller with the exception that all contactors are double pole devices and one additional main line knife switch and two overload relays are added to the controller.



Crane Control Class 6131



CLASS 6131

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SQUARE D
GROUPE SCHNEIDER

Crane Control Class 6131

Frontline® DC Crane Control



Class 6131
Type ESH8
Hoist Controller



Class 6131
Type ESR8
Bridge or Trolley Controller

GENERAL INFORMATION AND PRICING

Class 6131 controllers are recommended for use with DC series motors on hoist, bridge and trolley drives of general purpose overhead cranes. The hoist controllers are of the reversing dynamic lowering type and are designed for use on cranes without mechanical load brakes. The bridge and trolley controllers are of the reversing-plugging type and can also be used to control hoists with mechanical load brakes. Both the hoist and the bridge and trolley controllers are designed for use with series wound magnetic brakes. The bridge and trolley controllers can also be used with shunt wound brakes when an optional shunt brake relay is supplied.

- Standard controllers meet the requirements of NEMA Service Classification II (CMAA Service Classification B).
- To meet the requirements of NEMA Service Classification I (CMAA Service Classifications A,C, D, E and F), the controller must be priced from the Class 6121 catalog.
- Mill Duty Class 7004 Type M LINE-ARC® contactors & Class 7001 Type K relays
- Class 7001 Type ST-1 static acceleration timers

Hoist Service

The standard single motor reversing dynamic lowering controller consists of:

- 1 Two pole fused control circuit knife switch with padlock clip (CSW)
- 1 Two pole unfused main line knife switch with padlock clip (LSW)
- 4 Type M single pole contactors with mechanical interlocks for hoisting and lowering circuits (H, 1L, 2L, 3L)
- 3 Type M single pole acceleration contactors (1A, 2A, 3A)
- 2 Type ST-1 static acceleration timers (1AR, 2AR)
- 1 Type KE voltage relay for acceleration lowering (VR)
- 1 Type KE limit switch relay (LSR)
- 1 Type M single pole spring-closed dynamic lowering contactor (DB)
- 1 Undervoltage relay (UV)
- 2 Magnetic overload relays (one instantaneous and one inverse time) (1OL, 2OL)

Bridge or Trolley Service

The standard single motor reversing plugging controller consists of:

- 1 Two pole fused control circuit knife switch with padlock clip (CSW)
- 1 Two pole unfused main line knife switch with padlock clip (LSW)
- 4 Type M single pole directional contactors with mechanical interlocks (1F, 2F, 1R, 2R)
- 3 Type M single pole acceleration contactors (including one for plugging) (1A, 2A, P)
- 2 Type ST-1 static acceleration timers (1AR, 2AR)
- 1 Type KP rectifier-plugging relay (PR)
- 1 Undervoltage relay (UV)
- 2 Magnetic overload relays (one instantaneous and one inverse time) (1OL, 2OL)

VDC	Max. HP Crane Rating	Contactors NEMA Size	No. of Speed Points	General Purpose Enclosure NEMA Type 1 Gasketed		Outdoor Enclosure NEMA Type 3R	
				Controller Type	Price	Controller Type	Price
Single Motor Reversing Dynamic Lowering Hoist Control							
230	7-1/2	1	4	CSH8	\$ 7008.	CWH8	\$ 7284.
	15	2	4	DSH8	8598.	DWH8	9072.
	35	3	4	ESH8	9354.	EWH8	9828
	55	4	4	FSH8	10674.	FWH8	11148.
Single Motor Reversing-Plugging Bridge Or Trolley Control							
230	7-1/2	1	4	CSR8	6204.	CWR8	\$ 6438.
	15	2	4	DSR8	6924.	DWR8	7398.
	35	3	4	ESR8	7674.	EWR8	8148.
	55	4	4	FSR8	8874.	FWR8	9348.

Ordering Information Required:

1. Class
2. Type
3. Motor Horsepower at 230 VDC
4. Motor Duty Rating
5. Controller Modifications:
Specify Form Numbers
6. Resistor Service Classification
7. Master Switch Class, Type and Form

CP9A	
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Discount
Schedule



PRICING INFORMATION AND APPLICATION DATA

A complete set of motor control equipment consists of a controller, separately mounted TAB-WELD® resistors, and a master switch. The following tables are for selecting the resistors and master switches used with Class 6131 controllers.



**Class 6715
TAB-WELD® Resistor**

TAB-WELD® Resistor Selection Table * †

Maximum HP Rating Single Motor	Hoist	Bridge or Trolley		Price Addition Continuous Duty Slowdown Resistors ◆
	NEMA Class ●	NEMA Class ●		
	162-DL	Without Armature Shunt 162-P	With Intermittent Duty Armature Shunt ▲ 162-PAS	
5	\$ 1398.	\$ 810.	\$ 1272.	\$ 870.
7-1/2	2010.	954.	1416.	990.
10	2082.	954.	1416.	1110.
15	2220.	1068.	1518.	1350.
20	2370.	1068.	1518.	1920.
25	2520.	1128.	1584.	2250.
30	2928.	1308.	1776.	2463.
35	3060.	1482.	1932.	2670.
40	3756.	1650.	2124.	2970.
45	4182.	1842.	2430.	3270.
50	4602.	1980.	2646.	3600.
55	5394.	2394.	2964.	3930.



**Class 9004
Type CG8
Master Switch**

- * It is recommended that hoist resistors be selected based on the 1/2 hour motor horsepower rating unless specified otherwise. It is also recommended that bridge or trolley resistors be selected based on the 1 hour motor horsepower rating unless specified otherwise.
- † For resistors mounted in racks, refer to Class 6715.
- Class 162 is recommended for standard crane duty. For explanation of NEMA Resistor Classifications – refer to Class 6715 Application Data.
- ▲ Armature shunt resistors are intermittent rated for use with an armature shunt contactor, (controller Form M51).
- ◆ Slowdown resistors are designed to limit Bridge drives to approximately 50% of their present free running speed. Complete motor nameplate data plus the free running current drawn by the motor must be provided to design the slowdown resistors.

Master Switch Selection Table

Class 9004 NEMA 1 Enclosed ■						
Drive	Speed Points	Control Type Δ	VM		CM	
			Type	Price	Type	Price
Hoist	4	Y	VG9	\$ 1586.	CG8	\$ 1820.
Bridge or Trolley	4	Z	VG9	1586.	CG8	1820.

- For pendant type push button stations, see Class 9004.
- Δ Substitute W for Y and U for Z if negative line contactor used.

Modifications

Description	Optional Feature Form Letter	Price Addition	
		VM	CM
Spring Return to Off Point	S	\$ 296.	\$ 296.

Accessories

Brakes see Class 5010 or 5015
 Adjustable Torque Brakes see Class 5060
 Manual-Magnetic Disconnect Switch see Class 6140
 YOUNGSTOWN® Power Limit Switch see Class 6170



**Class 9004
Type VG9
Master Switch**

CLASS 6131



CP9A

Discount
Schedule

Crane Control Class 6131

Frontline® DC Crane Control

PRICING INFORMATION AND APPLICATION DATA

Controller Modifications ★

Form	Description	Max. HP Rating — Single Motor			
		7-1/2	15	35	55
B2 ▲	Shunt Brake Relay	\$ 1104.	\$ 1104.	\$ 1104.	\$ 1104.
B3 ▲	Shunt Brake Relay	1104.	1104.	1104.	1104.
B4 ▲	Shunt Brake Relay	1104.	1104.	1104.	1104.
M2 †	Negative Line Contactor	...	...	702.	906.
M3 †	Additional Acceleration Point	...	...	1164.	1368.
M52 ▲	Armature Shunt Contactor	552.	606.	702.	906.
Y17	Arc Suppressors (Required on Pendant and Radio Operated Controllers)	660.	660.	660.	660.

▲ For bridge and trolley controllers only. See Application Data for explanation of form number.

† Additional contacts are required in the master switch for these modifications. Select master switch from Class 6121 master switch selection tables.

★ For additional controller modifications, consult factory.

Application Data

Special features to be added to standard controllers are identified by Form number.

Forms B2, B3, and B4 cover various shunt brake relay applications. These modifications are for Bridge and Trolley controllers only and in each case a double-pole, 25-ampere brake relay is supplied. The three modifications differ from each other in the way the relay is wired and controlled. Each is as follows:

B2: Relay interlocked with reversing contactors through N.O. electrical interlocks. With this arrangement, the shunt brake will set whenever the master switch is moved to the off point.

B3: Relay controlled from external push button, foot switch, etc. This arrangement allows the shunt brake to be manually applied by the crane operator whenever necessary.

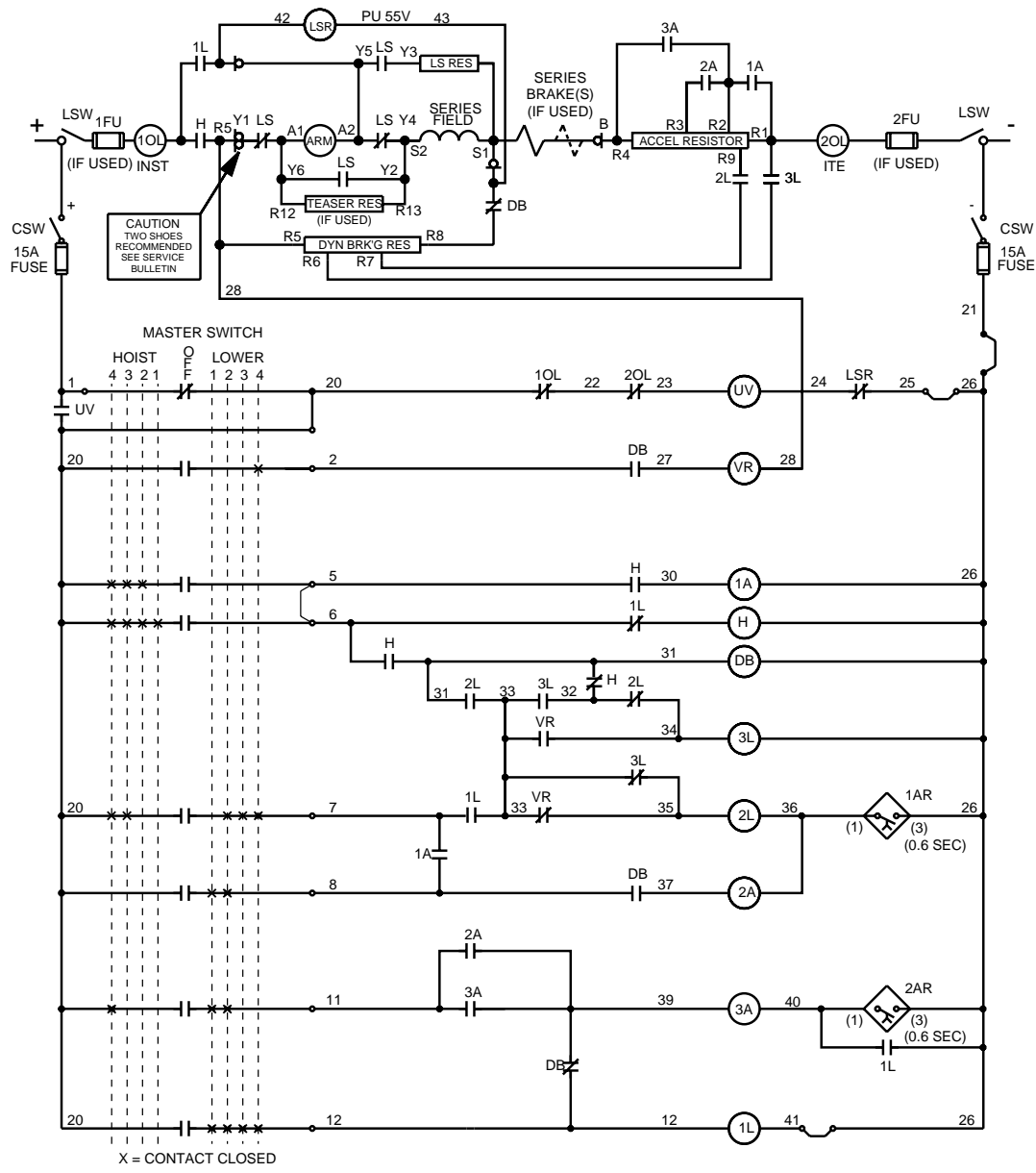
B4: Relay connected in parallel with undervoltage relay. The arrangement allows the shunt brake to set only when the main disconnect for the crane is opened or upon power failure.

Form M52 is an armature shunt contactor for use on bridge and trolley controllers only. This modification consists of a single-pole, normally-open contactor of equal NEMA size to the contactors in the basic controller. The operation is as follows:

The contactor is arranged to provide slowdown of bridge drives during floor operation of cab/floor operated cranes. A customer supplied contact, maintained closed during floor operation, initiates the slowdown. This modification is to be used with NEMA Class 162P accelerating resistors plus a continuous duty bridge slowdown resistor.



DYNAMIC LOWERING
Elementary Wiring Diagram For Hoist Control



X = CONTACT CLOSED

CONTACTOR SEQUENCE
X=POWER TIPS CLOSED

DEVICE	HOIST			LOWER				
	4	3	2	1	1	2	3	4
H	X	X	X	X				
DB					X	X	X	X
1L					X	X	X	X
2L					X	X	X	X
3L					X	X	X	X
1A	X	X	X	X				
2A					X	X	X	X
3A	X	X	X	X				

CONTACTORS 1A & 1L, 3L & H, H & 2L,
ARE MECHANICALLY INTERLOCKED.

CLASS 6131

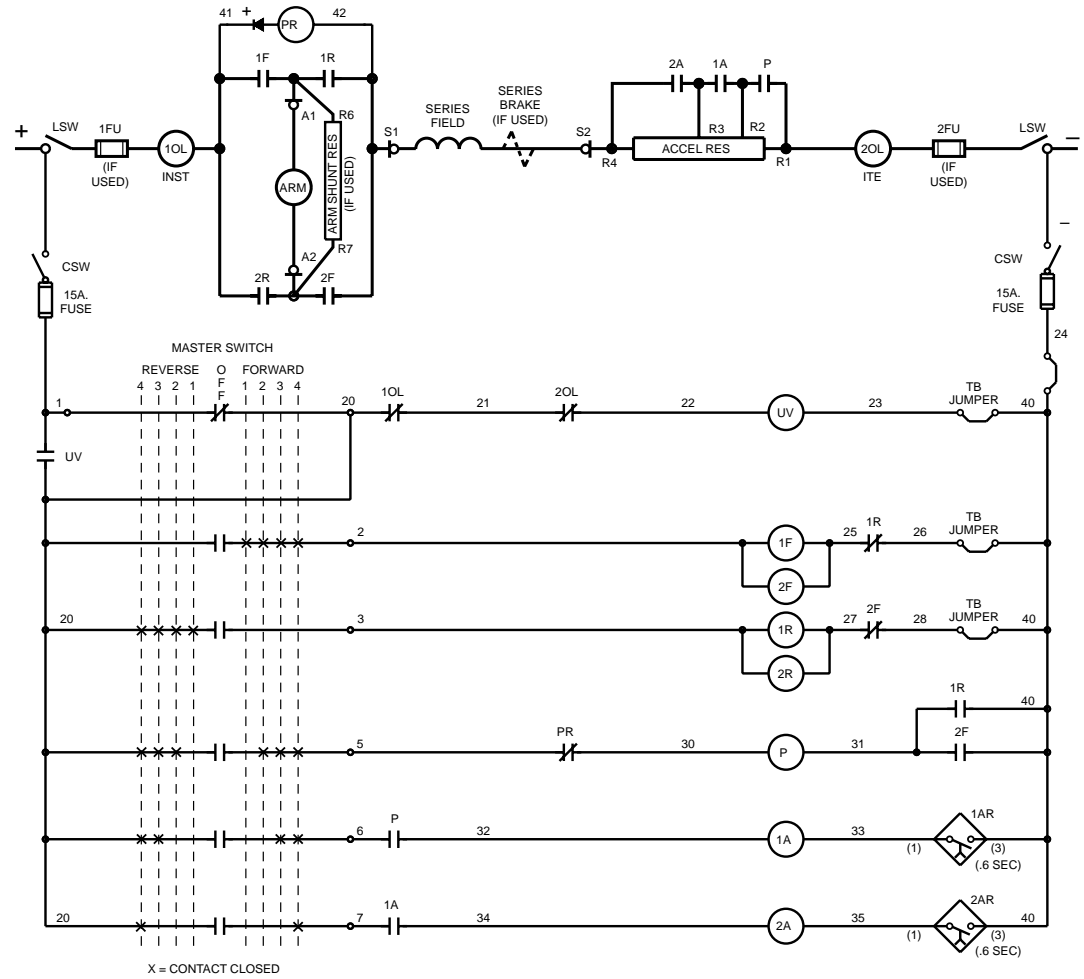


Crane Control Class 6131

Frontline® DC Crane Control

REVERSING PLUGGING

Elementary Wiring Diagram for Bridge or Trolley Control



CONTACTOR SEQUENCE
X=POWER TIPS CLOSED

DEVICE	REVERSE				FORWARD			
	4	3	2	1	1	2	3	4
1F					X	X	X	X
2F	X	X	X	X				
1R	X	X	X	X				
2R	X	X	X	X				
P	X	X	X	X				
1A	X	X	X	X				
2A	X	X	X	X				

CONTACTORS 1F & 1R, 2F & 2R ARE MECHANICALLY INTERLOCKED.

CLASS 6131

APPLICATION DATA

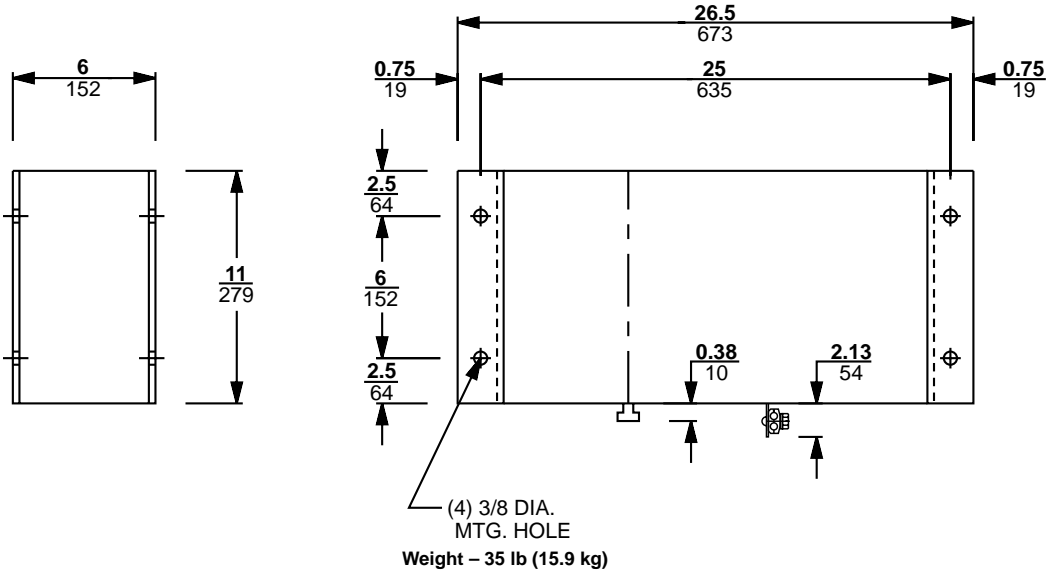
Approximate Number Of Separately Mounted Standard Class 6715 TAB-WELD® Resistor Sections Furnished With Class 6131 Controllers

This tabulation is based on Square D resistor designs for use with Class 6131 controllers only. This tabulation is for typical drive loading and may vary for a specific application.

Maximum HP Rating Single Motor (230V)	Hoist	Bridge or Trolley		
	162-DL	Without Armature Shunt	With Armature Shunt	Continuous Duty Slowdown Resistors
		162-P	162-PAS	
5	5	1	2	1
7-1/2	2	1	2	1
10	2	1	2	1
15	3	2	3	2
20	3	2	3	3
25	4	2	3	4
30	4	2	3	4
35	5	2	3	5
40	6	3	4	5
45	6	3	4	6
50	8	3	4	6
55	9	4	5	7

CLASS 6131

Standard Class 6715 TAB-WELD® Resistor Section



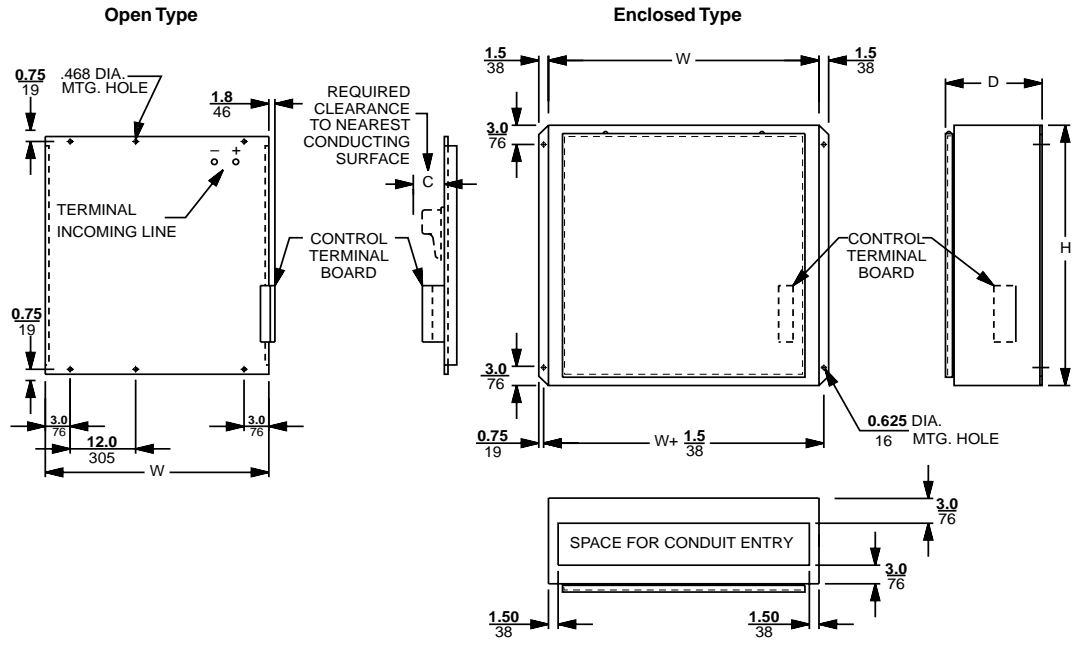
Dual Dimensions **inches**
mm



Crane Control Class 6131
Frontline® DC Crane Control

STANDARD WALL MOUNTED CONTROLLERS

Approximate Dimensions and Weights



Dual Dimensions $\frac{\text{inches}}{\text{mm}}$

Drive	Maximum HP (230V)	Open Type				Enclosed Type			
		H	W	C	Net Weight lbs (kg)	H	W	D	Net Weight lbs (kg)
Hoist Bridge or Trolley	7-1/2	40.0 1016	24.0 610 ▲	8.5 216	150 (68.0)	42 1067	30.0 762 ▲	15.0 381	300 (136.1)
	15	40.0 1016	24.0 610 ▲	8.5 216	150 (68.0)	42 1067	30.0 762 ▲	15.0 381	300 (136.1)
	35	40.0 1016	30.0 762 ●	10.0 254	200 (90.7)	42 1067	36.0 914 ●	15.0 381	385 (174.6)
	55	40.0 1016	30.0 762 ●	10.0 254	200 (90.7)	42 1067	36.0 914 ●	15.0 381	385 (174.6)

- ▲ Add 6" (152 mm) for controllers with Forms B2, B3, or B4.
- Add 6" (152 mm) for controllers with Form M3 – Additional Acceleration Point and/or Form M2 – Negative Line Contactor.

CLASS 6131

Crane Control Class 6140



CLASS 6140

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SQUARE D
GROUPE SCHNEIDER

Crane Control Class 6140

Frontline® Manual-Magnetic Disconnect Switches for DC Cranes



**Class 6140 Type MHS11
Manual and Magnetic
Disconnect Switch**

PRICING AND ORDERING INFORMATION

The manual-magnetic disconnect switch is used for protecting electrical crane circuits except lifting magnet circuits. It meets OSHA requirements for a crane disconnect switch.

- Contactors operated remotely or by handle on the enclosure
- Flange mounted operator permits operation only with door closed

The standard disconnect switch consists of:

- 2 Class 7004 Type M, Form Y781 (with silver-faced power contact tips), SPNO contactors. The contactors are mechanically tied. One normally open and one normally closed electrical interlocks are included for indicating lights.
- 1 Two pole, fused, control circuit knife switch.
- 1 Class 9999 Type AI-1 arc suppressor.
- 1 Set of incoming and outgoing power lugs.
- 1 Class 7001 relay only on NEMA Sizes 6, 8, and on 1600 and 2700 A devices.

VDC	Contactors NEMA Size	Continuous Ampere Rating	General Purpose Enclosure NEMA Type 1 Gasketed		Industrial Enclosure NEMA Type 12 Outdoor Enclosure NEMA Type 3R	
			Type	Price	Type	Price
230	4	150	MFS11	\$ 4173.	MFA11	\$ 4656.
	5	300	MG511	5168.	MGA11	5649.
	5A★	400	MGAS11	5943.	MGAA11	6496.
	6	600	MHS11	7155.	MHA11	7643.
	8	1350	MKS11	14304.	MKA11	15281.
	...	1600	▲	▲	▲	▲
	...	2700	▲	▲	▲	▲

- ▲ Consult factory for price and delivery.
- ★ Not a NEMA size/rating.

Controller Modifications

Form	Description	Price				
		Continuous Ampere Rating				
		150	300	400	600	1350
F30 ■	2 Main-line, DC-rated power fuses	\$ 1950.	\$ 2610.	\$ 2715.	\$ 4160.	\$ 4625.
A3	"On-Off" pushbutton	204.	204.	204.	204.	204.
P1	Red "On" pilot light	204.	204.	204.	204.	204.
P2	Green "Off" pilot light	204.	204.	204.	204.	204.

- Customer must specify fuse rating in amperes. If not specified, fuse will be sized for maximum current rating of switch.

Pilot Devices

For separately mounted pilot devices refer to Class 9001.

Ordering Information Required:

1. Class
2. Type
3. Controller Modifications: Specify Form Numbers

**Class 6440 Manual-Magnetic Disconnect Switches for AC cranes are also available.
Consult factory.**

CP9A Discount
Schedule

Crane Control Class 6140

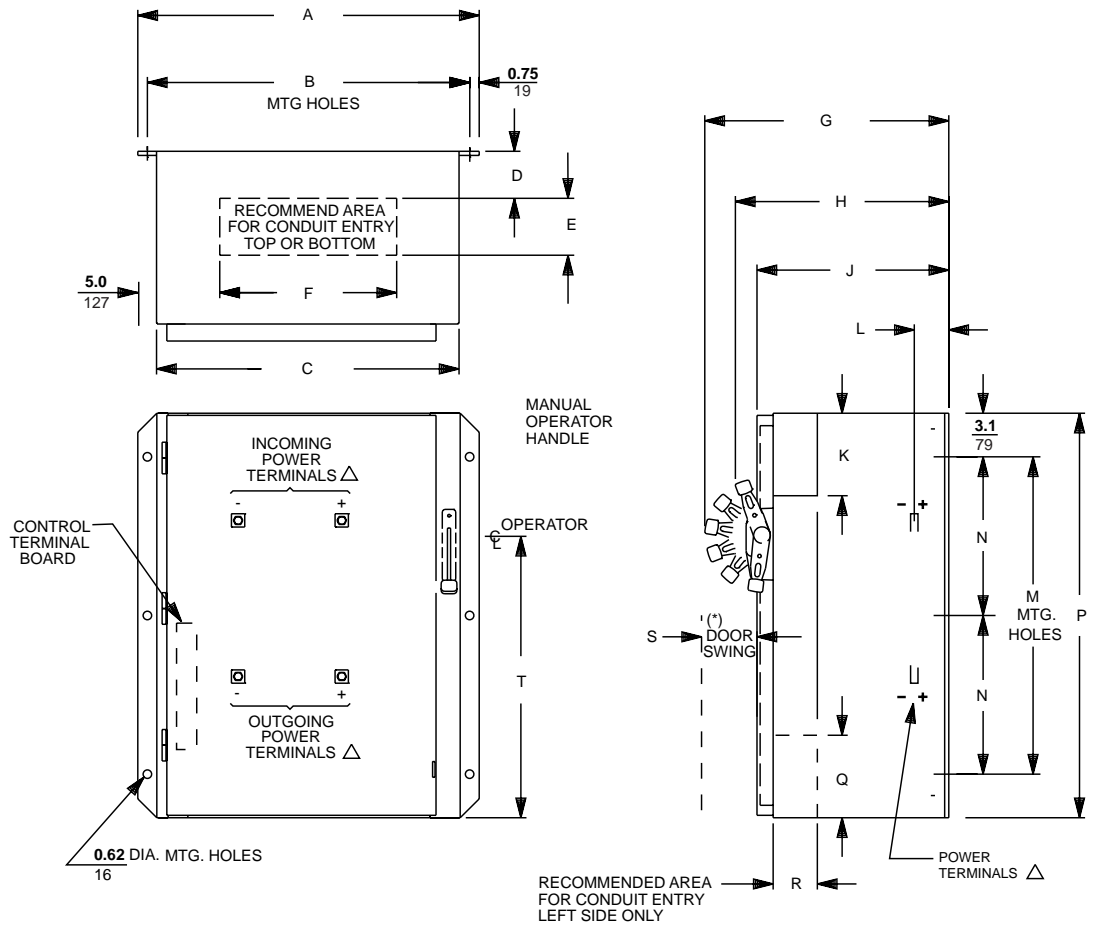
Frontline® Manual-Magnetic Disconnect Switches for DC Cranes

APPLICATION DATA

Disconnect Switch Selection

When applied to cranes, the continuous ampere rating of the disconnect switch shall not be less than 50% of the combined short time ampere rating of all motors on the crane, nor less than 75% of the short time ampere rating of the motors applied for any single crane motion.

Approximate Dimension and Weights



(*) Door supplied with "lift off" type hinges for door removal in limited space if necessary.
 ▲ Solderless connectors for #8 to #1/0 cable.

Dual Dimensions $\frac{\text{inches}}{\text{mm}}$

NEMA SIZE	CONTINUOUS AMPERE RATING	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	Weight lbs (kg)
4	150	27 686	25.5 648	24 610	3.5 89	4.5 114	10 254	20.8 528	17 432	15 381	3 76	4.5 114	26 660	▲ 32.2 818	3 76	3.5 89	19 483	20.5 521	165 (75)	
5	300	30 762	28.5 724	27 686	3.5 89	4.5 114	14 356	20.8 528	17 432	15 381	3 76	5.5 140	36 914	▲ 42.2 1072	3 76	3.5 89	22 559	26.7 678	235 (106.8)	
6	600	33 838	31.5 800	30 762	5 127	8 203	18 457	25.8 655	22 559	20 508	14 356	7.2 183	42 1067	▲ 48.2 1224	14 356	7 178	25 635	24.5 622	405 (184.9)	
8	1350	39 991	37.5 953	36 914	5 127	9 229	19 483	29.8 757	26 660	24 610	16 406	7.8 198	54 1372	27 686	60.2 1529	16 406	10 254	20 508	31 787	740 (336.4)

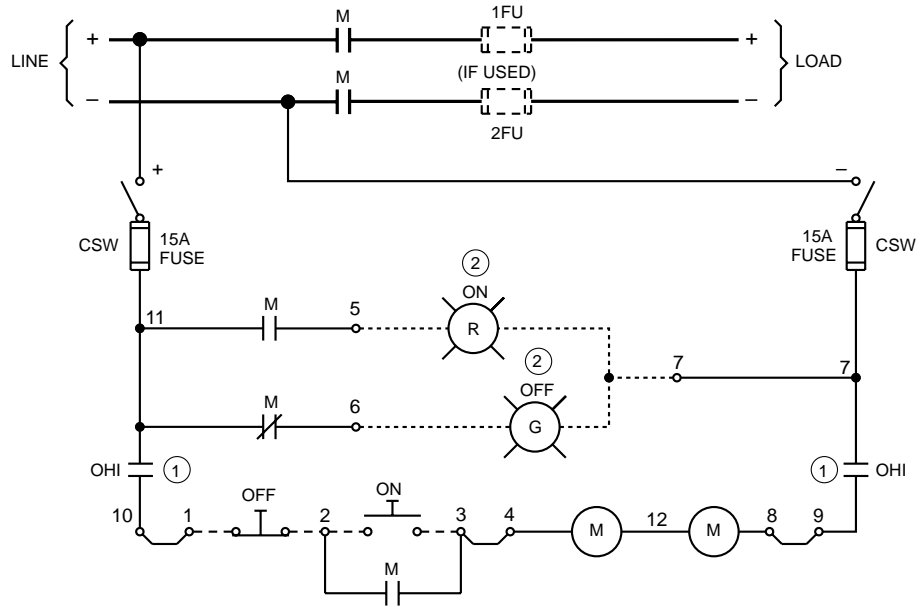
▲ Center mounting holes not supplied.

For dimensions of 1600 and 2700 A disconnect switches, consult factory.



Crane Control Class 6140
Frontline® Manual-Magnetic Disconnect Switches for DC Cranes

ELEMENTARY WIRING DIAGRAM



- ① CONTACTS CONTROLLED BY OPERATING HANDLE.
- ② INDICATING LAMPS (IF USED).

Pilot Device Selection

The pilot device should be selected so the current rating is adequate for controlling the disconnect switch. For coil operating currents refer to Class 9998 Coil Data catalog sheet.

Contactors coils for NEMA Sizes 4 and 5 disconnect switches are controlled directly by the pilot device. An arc suppressor is supplied as standard.

An interposing relay is standard on NEMA Sizes 6, 7 and 8 disconnect switches. An arc suppressor may be required depending upon the rating of the pilot device.

Contactors coils on the 1600 and 2700 A disconnect switches are controlled by interposing relays. An arc suppressor may be required depending upon the rating of the pilot device.



Crane Control Class 6170



CLASS 6170

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SQUARE D
GROUPE SCHNEIDER

Crane Control Class 6170

YOUNGSTOWN® Power Limit Switches for AC and DC Cranes

GENERAL INFORMATION AND PRICING

YOUNGSTOWN® Power Limit Switches are used on crane hoist drives to limit over travel in the hoisting direction.

- Operated by crane hoist hook block
- Interrupts hoist motor current directly

The standard limit switch is supplied for right hand operation and consists of:

- 2—Normally open and 2 – normally closed mechanically interlocked power contacts for simplex switches and 4 – normally open and 4 – normally closed contacts for duplex switches
- 1—General purpose NEMA Type 1 enclosure
- 1—Standard straight operating arm



Class 6170 Type DG1
Limit Switch

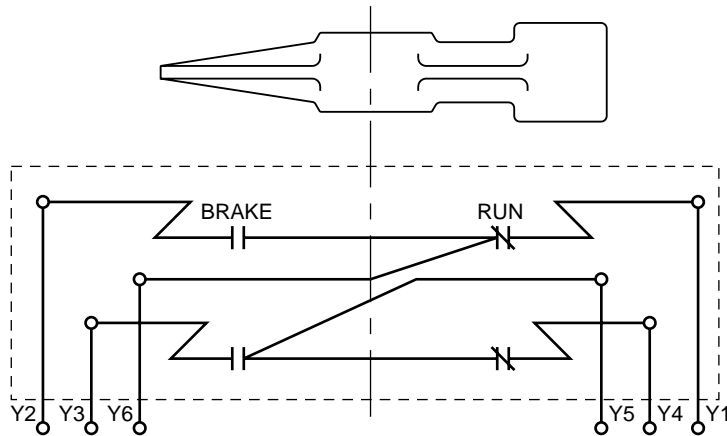


Class 6170 Type CW8

Maximum HP – Crane Rating				Size Number	Limit Switch Without Weight & Cable ★ (Standard Arm ●)		Weight & Cable Kit	
DC		AC			Type	Price	Type	Price
230 V	550 V	230 V	440 V					
Simplex Youngstowns								
26	25	25	50	5	AG1	\$ 2207.	AW8	\$ 147.
50	50	50	100	10	BG1	4043.	BW8	484.
100	100	100	200	20	CG1	6800.	CW8	637.
200	200	200	400	30	DG1	9146.	DW8	814.
500	660	...	...	50	FG1	24837.	FW8	1697.
Duplex Youngstowns								
2-100	2-100	2-100	2-200	20D	CCG1	\$ 12098.	CCW8	\$ 1815.
2-200	2-200	2-200	2-400	30D	DDG1	17834.	DDW8	2587.
2-500	2-600	...	...	50D	FFG1	40137.	FFW8	3039.

- ★ Limit switch resistor required. See page 80 for selection.
- Consult factory if 90° arm is required.

Elementary Wiring Diagram



CP9A Discount Schedule

Crane Control Class 6170

YOUNGSTOWN® Power Limit Switches for AC and DC Cranes

PRICING INFORMATION AND APPLICATION DATA

Right Hand Operation

The limit switch is arranged for right hand operation when the reset weight and cable are on the right side (when facing the operating arm).

Standard Operating Arm

The standard operating arm is used when the weight and cable can be suspended beneath the limit switch.

Control Circuit Interlocks

Control circuit interlocks are provided on the power limit switch by an externally mounted control circuit limit switch which is operated by the power limit switch operating arm.

For a Type AG limit switch, a Class 9007 Type B limit switch is used.

For Types BG through FFG limit switches, a Class 9007 Type FT limit switch is used.

Modifications ★

Form	Description	Price
L	Operating arm arranged for left hand operation	No Charge
X110	Control Circuit Interlock: 1 N.O. and 1 N.C. Contact	\$ 302.
X111 ▲	Control Circuit Interlock: 1 N.O. and 1 N.C. Contact set to operate prior to main power contacts (required for drive applications)	500.

▲ Only available on Size 5, 10, and 20 Power Limit Switches.

★ Consult factory for additional modifications.

Ordering Information Required:

1. Class and Type of limit switch.
2. Modifications of limit switch: specify form number.
3. Class and type of weight and cable kit, if required.
4. Class and type of resistor (see next page).



Crane Control Class 6170
YOUNGSTOWN® Power Limit Switches for AC and DC Cranes

RESISTORS FOR LIMIT SWITCH APPLICATIONS ON DC DYNAMIC LOWERING HOISTS

Class 6715 TAB-WELD® Resistors



**Class 6715
 Type TW120D
 Resistor**

230 VDC				
HP	Open Type	Price	Enclosed Type	Price
5-10	TW16F	\$ 360.	TW16FG	\$ 600.
11-13-1/2	TW21F	360.	TW21FG	600.
14-26	TW27F	360.	TW27FG	600.
27-33	TW32F	330.	TW32FG	570.
34-45	TW37F	360.	TW37FG	600.
46-65	TW42F	330.	TW42FG	570.
66-100	TW62E	420.	TW62EG	750.
101-135	TW85E	420.	TW85EG	750.
136-200	TW120D	690.	TW120DG	1230.
201-265	TW150D	690.	TW150DG	1230.
266-360	2-TW120D	1380.	2-TW120DG	2190.
361-550	2-TW150D	1380.	2-TW150DG	2190.

Ordering Information Required:

1. Class
2. Type

Application Data

Class 6715 TAB-WELD® Resistor

Recommended for applications where environmental conditions of vibration and dirt are severe.
 Suitable for outdoor use with general purpose enclosure.

Resistors for Duplex Limit Switches

One resistor required for each motor, double the prices shown.

CLASS 6170

CP9A Discount Schedule



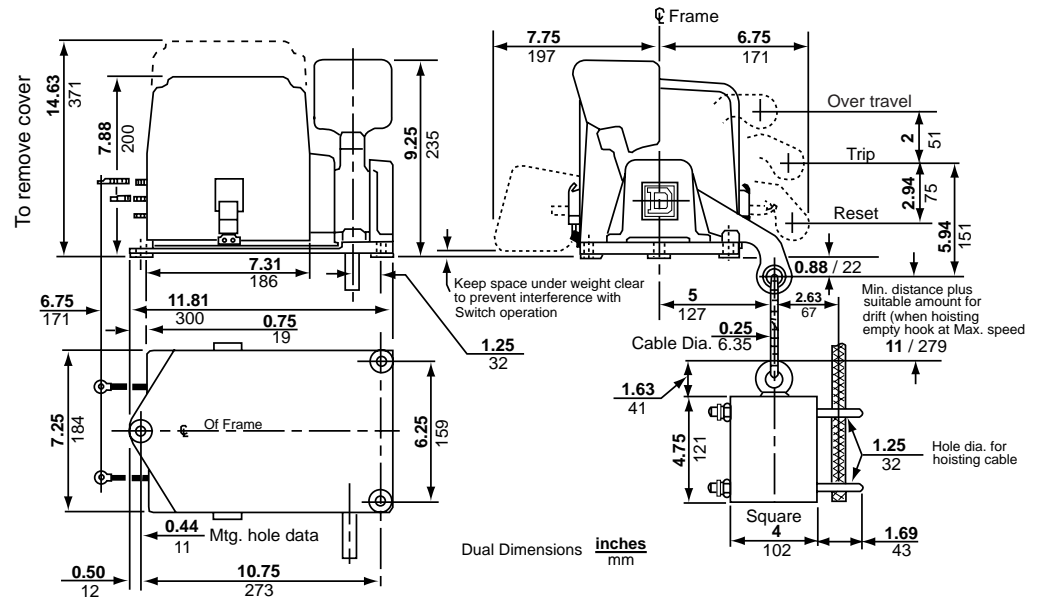
Crane Control Class 6170

YOUNGSTOWN® Power Limit Switches for AC and DC Cranes

APPROXIMATE DIMENSIONS AND WEIGHTS

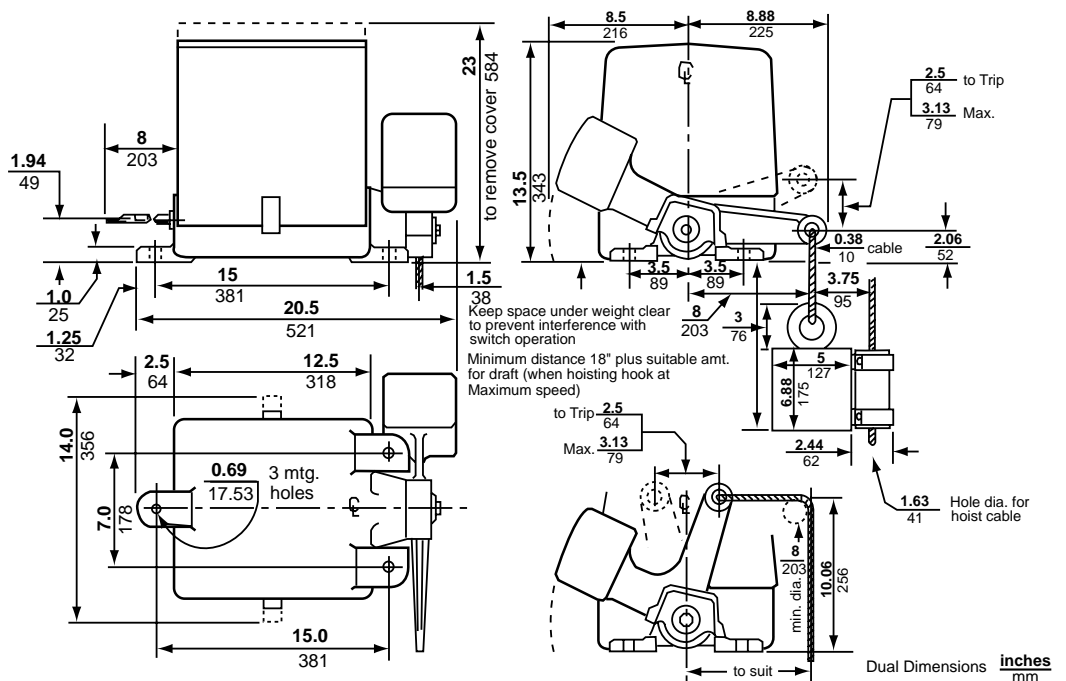
Type AG

Type	Size Number	Net Weight, lbs (kg)	
		Limit Switch Only	Operating Weight Only
AG	5	50 (22.7)	22.5 (10.2)



Type BG

Type	Size Number	Net Weight, lbs (kg)	
		Limit Switch Only	Operating Weight Only
BG	10	170 (77.3)	54 (24.5)



CLASS 6170



Crane Control Class 6170
YOUNGSTOWN® Power Limit Switches for AC and DC Cranes

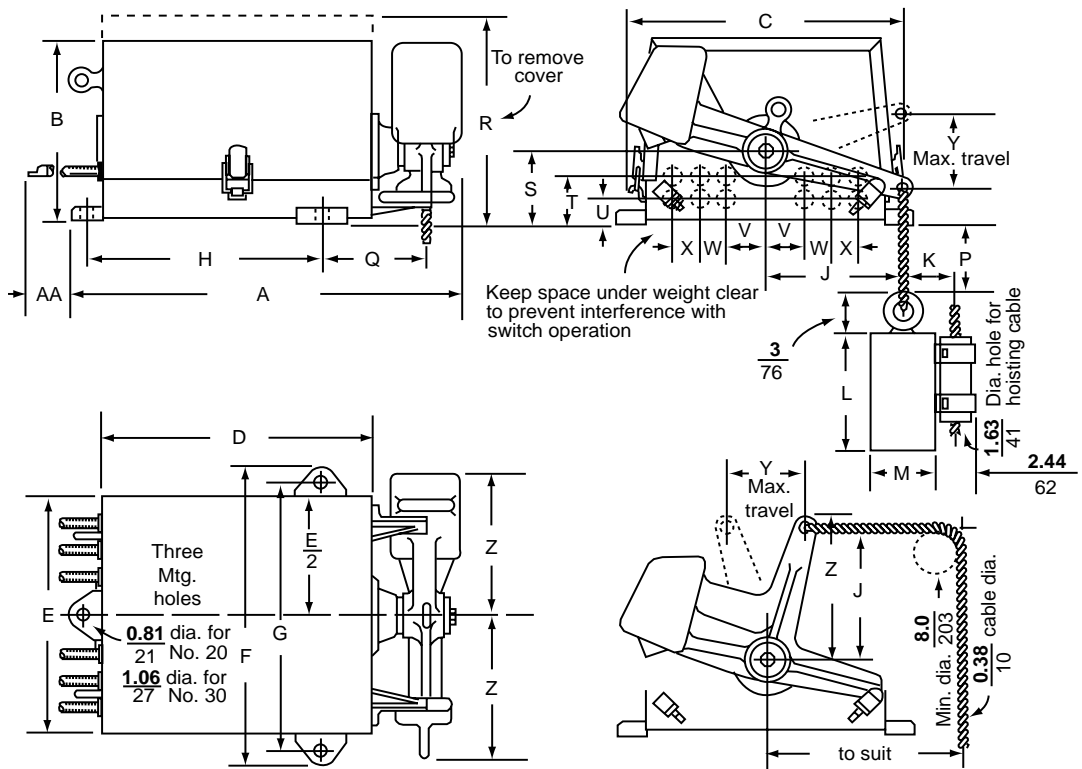
APPROXIMATE DIMENSIONS AND WEIGHTS

Types CG and DG

Type	Size No.	A	B	C	D	E	F	G	H	J	K	L	Net Weight, lbs (kg)	
													Limit Switch Only	Operating Weight Only
CG	20	22.5 572	12.2 310	16.3 414	15.4 391	15 381	18.4 467	16.9 429	13.2 335	8.4 213	3.8 97	9.5 241	320 (145.5)	67 (30.5)
DG	30	25.6 650	16.4 417	19.5 495	18 457	18.1 460	22.4 569	20.4 518	15.9 404	10.3 262	3.8 97	12 305	460 (209.1)	90 (40.9)
CCG	20D	34.3 871	12.2 310	16.3 414	25.5 648	15.1 384	18.5 470	16.9 429	23.3 592	8.4 213	4.3 109	11 279	540 (245.5)	111 (50.5)
DDG	30D	41.6 1057	16.4 417	19.5 495	30.3 770	18.3 465	22.5 572	20.4 518	28.1 714	10.3 262	4.8 122	14.5 368	750 (340.9)	218 (99.1)

Type	Size No.	M	P	Q	R	S	T	U	V	W	X	Y	Z	AA
CG	20	5 127	9 229	6.8 173	21 533	4.4 112	2.9 74	-	2.8 71	1.4 36	1.6 41	4.4 112	9.3 236	10.4 264
DG	30	5 127	10 254	6.8 173	27.4 696	5.4 137	3.6 91	-	3.1 79	1.9 48	2 51	5.4 137	11.3 287	13.4 340
CCG	20D	6 152	9 229	7.3 185	21 533	4.4 112	2.9 74	1.6 41	2.8 71	1.4 36	1.6 41	4.4 112	9.3 236	10.4 264
DDG	30D	7 178	10 254	8.5 216	27.4 696	5.4 137	3.6 91	1.7 43	3.1 79	1.9 48	2 51	5.4 137	11.3 287	13.4 340

Dual Dimensions $\frac{\text{inches}}{\text{mm}}$



CLASS 6170

Crane Control Class 6170

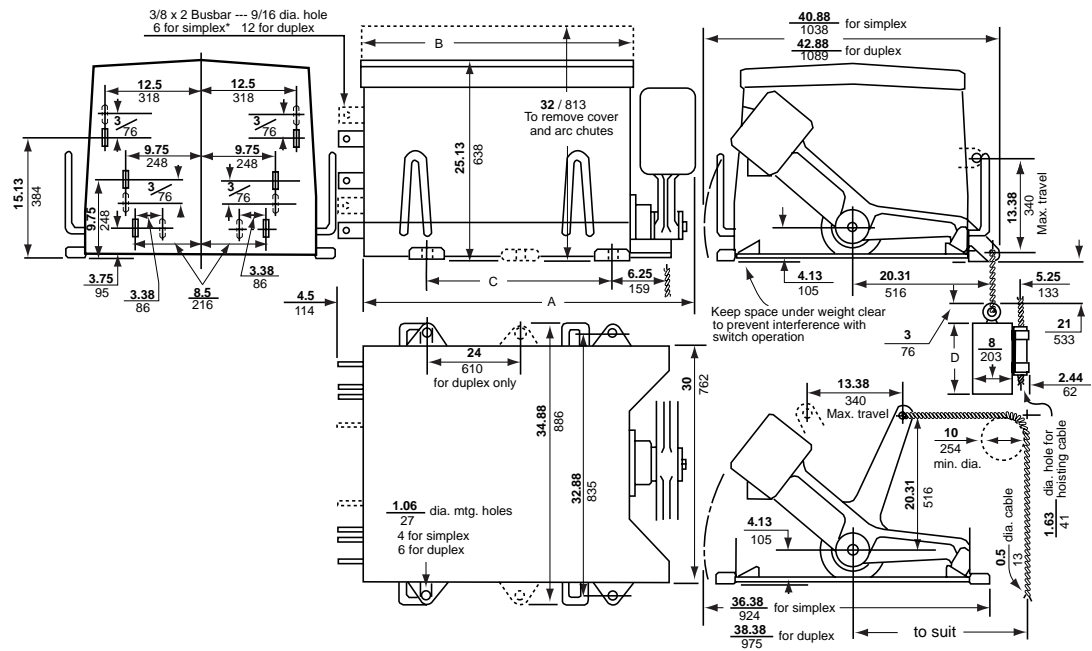
YOUNGSTOWN® Power Limit Switches for AC and DC Cranes

APPROXIMATE DIMENSIONS AND WEIGHTS

Type FG

Type	Size No.	A	B	C	D	Net Weight, lbs (kg)	
						Limit Switch Only	Operating Weight Only
FG	50	42.4 1077	36 914	24 610	14.8 376	1550 (704.5)	265 (120.5)
FFG	50D	66.4 1687	60 1524	48 1219	29.5 749	2350 (1068.2)	530 (240.9)

Dual Dimensions **inches**
mm



CLASS 6170



Crane Control Class 6170
YOUNGSTOWN® Power Limit Switches for AC and DC Cranes

APPROXIMATE DIMENSIONS AND WEIGHTS

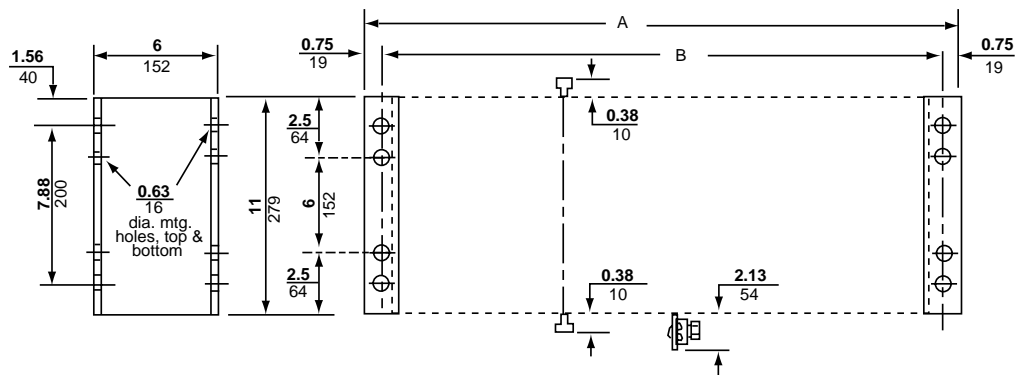
Class 6715 TAB-WELD® Resistors

Type Section		A	B	C	Net Weight, lbs (kg)
Open	Enclosed				
	TW_DG	27 686	29 737	30.3 770	40 (18.0)
	TW_EG	18.5 470	20.5 521	21.8 554	25 (11.3)
TW_D		26.5 673	25 635	...	35 (15.8)
TW_E		18 457	16.5 419	...	22 (9.9)

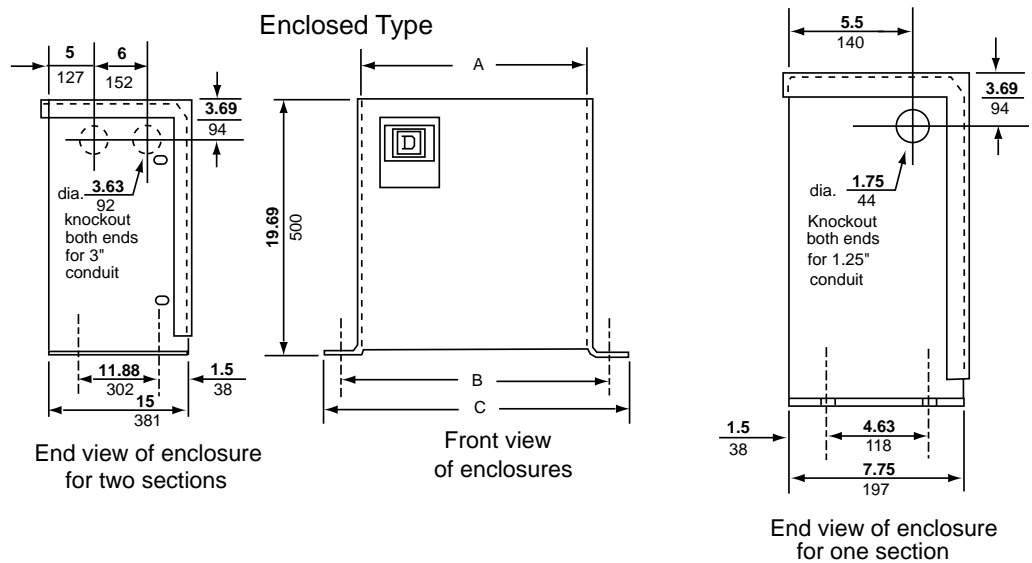
Dual Dimensions $\frac{\text{inches}}{\text{mm}}$

Class 6715 TAB-WELD® Resistors

Open Type



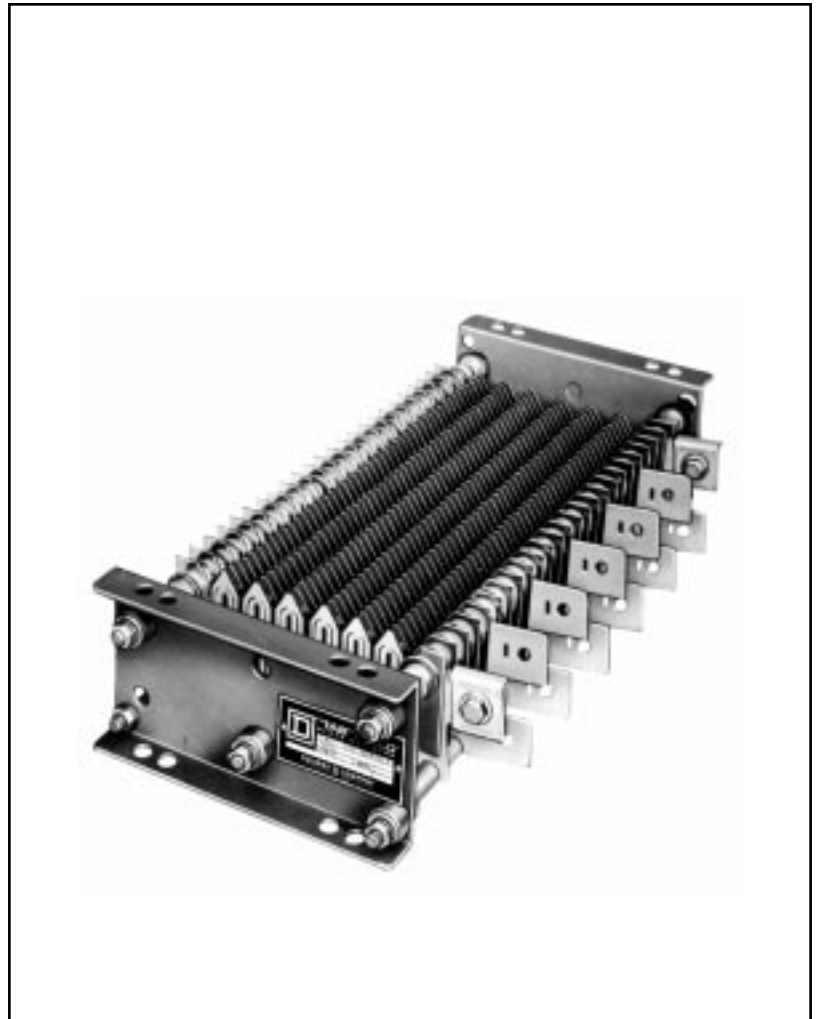
Enclosed Type



CLASS 6170



Crane Control Class 6715



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SQUARE D
GROUPE SCHNEIDER

Crane Control Class 6715 TAB-WELD® Resistors

PRICING AND ORDERING INFORMATION

- Stainless steel alloy grids
- Applicable where environmental conditions of vibration and dirt are severe
- The standard resistor section is supplied with 2 terminals



**Class 6715
Type TW100D
Resistor**

Volts	Continuous Ampere Capacity (375 °C Rise)	Resistance Between Taps †	26-1/2" Section ▲			18" Section ▲			Extra Unmounted Terminals	
			Total Resistance†	Type	Price	Total Resistance†	Type	Price	Type	Price
600 VAC or VDC max.	500	0.0039	0.0214	TW500D	\$ 750.	T1	\$ 24.
	430	0.0051	0.0306	TW430D			
	360	0.0072	0.0432	TW360D			
	280	0.0088	0.0748	TW280D		T2	12.
	220	0.014	0.126	TW220D			
	180	0.022	0.198	TW180D			
	150	0.021	0.231	TW150D	690.	0.126	TW150E	\$ 420.	T3	9.
	120	0.031	0.341	TW120D		0.186	TW120E			
	100	0.042	0.504	TW100D		0.252	TW100E			
	85	0.057	0.741	TW85D	690.	0.399	TW85E			
	72	0.073	1.022	TW72D		0.511	TW72E	420.		
	62	0.17	1.445	TW62D		0.680	TW62E			
	50	0.30	2.55	TW50D	690.	1.20	TW50E	420.		
	42	0.36	4.14	TW42D		2.16	TW42E			
	32	0.58	6.96	TW32D		3.77	TW32E			
	37	0.118	5.20	TW37D	840.	2.83	TW37E	540.	T4	6.
	27	0.217	9.55	TW27D		5.20	TW27E			
	21	0.350	15.75	TW21D		8.75	TW21E			
16	0.560	25.20	TW16D	14.00		TW16E				
13	0.850	40.00	TW13D	22.10		TW13E				

† Ohms at 25 °C.

▲ Consult factory for 12" resistor sections.

CP9B Discount Schedule



PRICING AND ORDERING INFORMATION

Resistors with Isolated Sections

Resistors with either 2 or 3 isolated sections can be provided for use as the accelerating resistor in the secondary of an AC wound rotor motor, where isolated sections are needed for each rotor phase. The D3 resistor is divided into 3 isolated sections of equal resistance. The D2 resistor is divided into 2 isolated sections. The resistance of one portion is twice the resistance of the other portion.

The price includes:

- 1 D2 or D3 resistor sections
- 4 Terminals (D2 sections only)
- 6 Terminals (D3 sections only)



**TW27D2 Resistor
with 2 isolated sections**

Volts	Continuous Ampere Capacity (375 °C Rise)	Resistance Between Taps †	26-1/2" D2 Section				26-1/2" D3 Section			Extra Unmounted Terminals	
			Resistance †		Type	Price	Resistance †	Type	Price	Type	Price
			Total in Section 1	Total in Section 2								Total in each Section
600 VAC or VDC max.	50	0.300	1.65	0.75	TW50D2		0.75 ▲	TW50D3			
	42	0.362	2.52	1.26	TW42D2	\$ 690.	1.08	TW42D3	\$ 690.	T3	\$ 9.
	32	0.584	4.35	2.03	TW32D2		1.74	TW32D3			
	37	0.118	3.30	1.66	TW37D2		1.42	TW37D3			
	27	0.217	6.08	3.04	TW27D2		2.60	TW27D3			
	21	0.350	9.80	4.90	TW21D2	840.	4.20	TW21D3	840.	T4	6.
	16	0.560	15.66	7.83	TW16D2		6.71	TW16D3			
	13	0.850	...	...	...		11.90	TW13D3			

† Ohms at 25 °C.

▲ Resistance in middle section is 0.60 Ohm.

Ordering Information Required:

1. For Resistor:
 - a. Class
 - b. Type
 - c. Class and Type of extra unmounted terminals
2. For Rack:
 - a. Class
 - b. Type
 - c. Form

CP9B Discount
Schedule



Crane Control Class 6715 TAB-WELD® Resistors

PRICING AND ORDERING INFORMATION

Resistor Racks

Maximum Number of Resistor Sections	Open Type		General Purpose Enclosure NEMA Type 1 ▲		Outdoor Enclosure NEMA Type 3R ▲	
	Type	Price	Type	Price	Type	Price
4	BRO4	\$ 536.	BRG4	\$ 768.	BRW4	\$ 878.
6	BRO6	606.	BRG6	938.	BRW6	1032.
8	BRO8	782.	BRG8	1163.	BRW8	1218.

▲ Consult factory for continuous resistor applications (such as load banks) in enclosed resistor banks.

Modifications

Expanded Metal Enclosure: Form C – add \$500.00 to BRG list price.

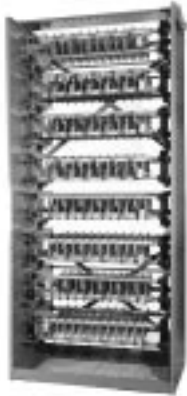
Resistors Mounted in Racks and Wired: Form R – add 15% of total resistor and rack price.

APPLICATION DATA

Ratings

Ampere ratings shown in the first column of the table below are for continuous duty. Intermittent ratings are also shown for the various duty cycles.

NEMA Class No.	9_	11_	13_	14_	15_	16_	17_
Type	Continuous Capacity	5 sec on out of 80 sec	10 sec on out of 80 sec	15 sec on out of 90 sec	15 sec on out of 60 sec	15 sec on out of 45 sec	15 sec on out of 30 sec
TW500_	500	1750	1350	1200	1000	850	700
TW430_	430	1450	1160	1000	850	725	600
TW360_	360	1200	960	850	700	600	500
TW280_	280	900	760	650	530	470	390
TW220_	220	700	600	500	410	375	310
TW180_	180	560	480	400	330	300	250
TW150_	150	485	375	325	275	245	210
TW120_	120	375	300	260	222	197	170
TW100_	100	300	245	217	185	166	140
TW85_	85	265	203	180	153	137	117
TW72_	72	218	175	150	130	116	100
TW62_	62	190	150	132	113	103	90
TW50_	50	143	113	100	86	78	69
TW42_	42	115	95	85	75	68	59
TW32_	32	85	70	65	58	53	45
TW37_	37	100	87	78	68	61	50
TW27_	27	76	63	58	50	45	38
TW21_	21	58	48	44	39	35	30
TW16_	16	44	37	33	29	26	22
TW13_	13	33	27	25	22	20	17



Type BRO8 Open Rack



Type BRG4 General Purpose Enclosure NEMA Type 1



Type BRW6 Outdoor Enclosure NEMA Type 3R

APPLICATION DATA

Resistor Terminals

Type	Resistor Capacity Range	Minimum Wire Size	Maximum Wire Size
T1	500 Amperes	250 MCM	500 MCM
T2	180-430 Amperes	# 1/0	300 MCM
T3	32-150 Amperes	# 2	# 4/0
T4	13-37 Amperes	# 8	# 2

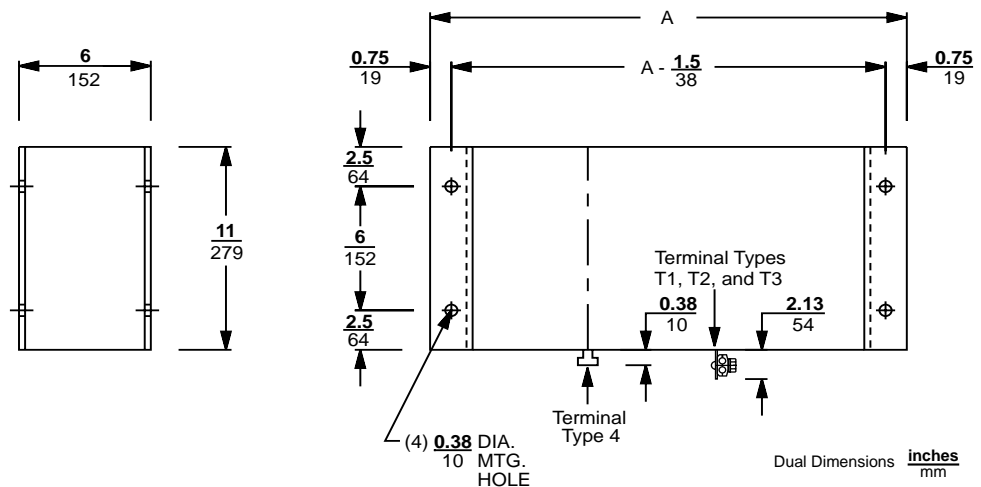
NEMA Service Classifications of Resistors

The numerical portion of the class number refers to the starting current and duty cycle requirements. The letter suffix refers to the special requirements of that resistor based on its application. The letter P denotes reversing plugging service. The letters DL denote dynamic lowering hoist service. When an armature shunt resistor is added to any of the classes, the class number will include the suffix AS. When a dynamic braking resistor is added to any of the classes, the number will include the suffix DB. A class 153P-AS is a reversing plugging resistor which includes an armature shunt and which will allow an initial inrush of 70 percent on a duty cycle of 15 seconds out of 60 seconds with the armature shunt open.

Approximate percent of full load current on first starting point	Class Numbers Applying to Duty Cycles						
	5 sec on out of each 80 sec	10 sec on out of each 80 sec	15 sec on out of each 90 sec	15 sec on out of each 60 sec	15 sec on out of each 45 sec	15 sec on out of each 30 sec	Continuous Duty
25	111	131	141	151	161	171	91
50	112	132	142	152	162	172	92
70	113	133	143	153	163	173	93
100	114	134	144	154	164	174	94
150	115	135	145	155	165	175	95
200 or Over	116	136	146	156	166	176	96

APPROXIMATE DIMENSIONS AND WEIGHTS

Resistor Open Type



Type Section	A	Net Weight, lbs (kg)
TW_D	$\frac{26.5}{673}$	35 (15.8)
TW_E	$\frac{18}{457}$	22 (9.9)

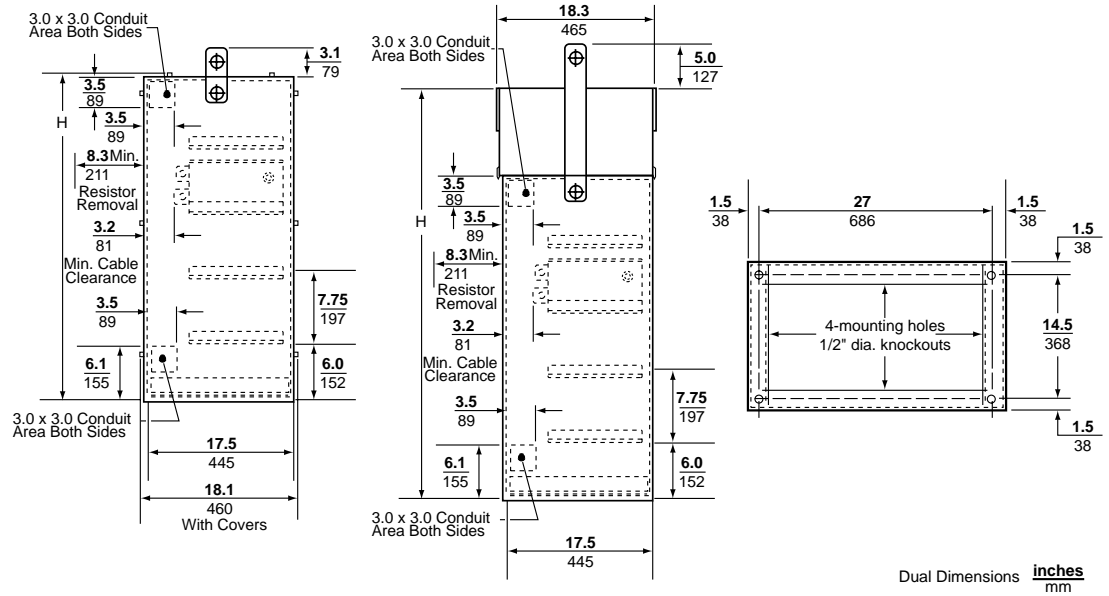
CLASS 6715



**Crane Control Class 6715
TAB-WELD® Resistors**

APPROXIMATE DIMENSIONS AND WEIGHTS

Resistor Racks



Height H

Max. Number of Resistor Sections	Open Type	General Purpose Enclosure NEMA Type 1	Outdoor Enclosure NEMA Type 3R	Weight Open Style lbs (kg)
4	37.4 950	37.4 950	47.0 1194	50 (22.5)
6	52.9 1344	52.9 1344	62.5 1588	75 (33.8)
8	68.4 1737	68.4 1737	78.0 1981	100 (45.0)



Crane Control Class 6815



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Crane Control Class 6815

Type A Lifting Magnet Controllers

CLASS 6815



Class 6815 Type A130 Controller

TYPE A LIFTING MAGNET CONTROLLERS FOR 31 TO 130 AMPERE GENERATOR POWERED MAGNETS

Pricing and Ordering Information

Typical applications include crawler cranes, mobile cranes, locomotive cranes, and DC-powered overhead travelling cranes.

For rectifier-powered magnets, such as on AC cranes, select a Type M controller

- LINE-ARC® Type M mill-type contactors
- Reliable, simple circuitry, easy to maintain
- Adjustable reverse current by rheostat inside the enclosure

Controller for Use With DC Generator Supply Only

VDC	Cold Magnet Current (A)	Indoor/Outdoor Type 3R Enclosure	
		Type	Price
230	31-80	AW80	\$ 4020.
	81-130 ▲	AW130	4481.

▲ 50-130 A range if generator is 20 kW or larger.

Modifications

Form No.	One modification from each group is available in the same controller.	Price
X11	Electrical interlocks on lift contactor, single-pole double throw, with 1.1 A break rating on 230 VDC, wired to terminal block for customer's use.	\$ 227.
R30 †	Booster (over-excitation) relay provides a limited-time contact closure at the start of each lift, for connection to a customer's generator shunt field circuit equipped for 275 V "pickup" and 190 V "carry," in order to increase all-day lifting efficiency. A Class 6815 Lift-Drop master switch or pushbutton station (or equivalent 230 VDC-rated pilot device) is required.	425.
R33 †	Booster with 12 VDC pilot relays. Provides a contact closure same as R30 above, but includes Lift-Drop pilot relays designed for use with low-voltage 1-N.O. momentary-contact Lift-Drop pushbuttons and a separate control source from customer's 12 V battery.	918.
R34 †	Booster with 24 VDC pilot relays. Same circuit as R33, but designed for a 24 V battery.	918.

† All booster (over-excitation) relay modifications require additional generator field circuitry and resistors properly matched to the generator. Square D is not in a position to specify or furnish this equipment. Therefore, controllers with booster relay modifications are recommended only to qualified crane manufacturers, or for replacement of existing booster-equipped controllers.

Pilot devices

Use Lift-Drop pushbutton station or master switch.

Ordering Information Required:

1. Class
2. Type
3. Form number

CP9B

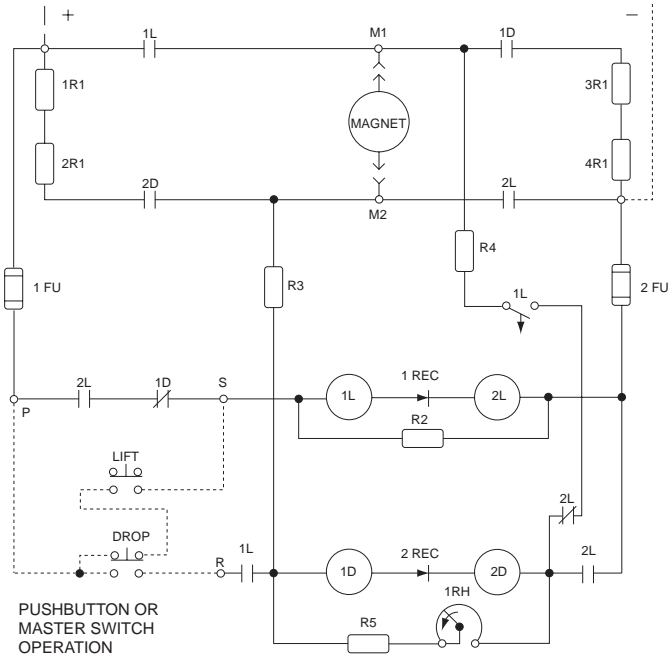
Discount Schedule



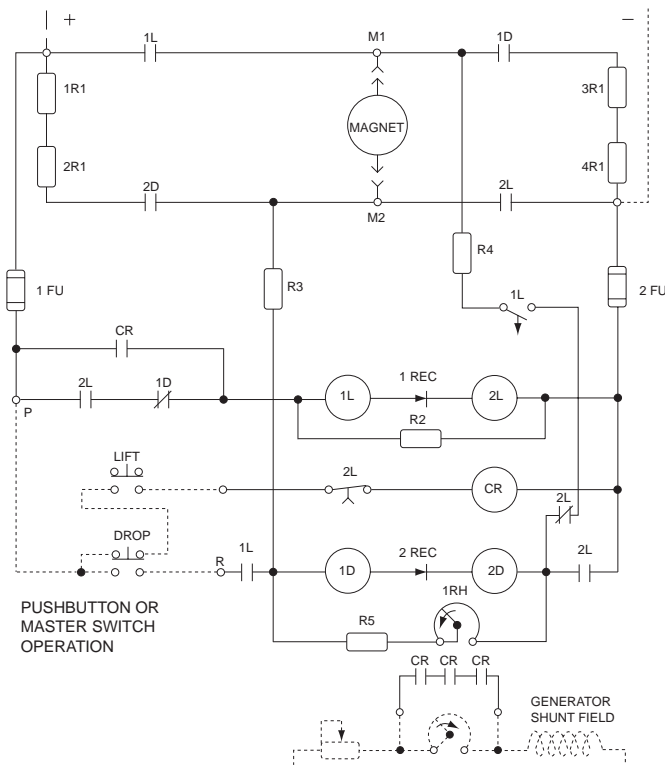
**TYPE A LIFTING MAGNET CONTROLLERS
FOR 31 TO 130 AMPERE GENERATOR POWERED MAGNETS**

Elementary Wiring Diagrams

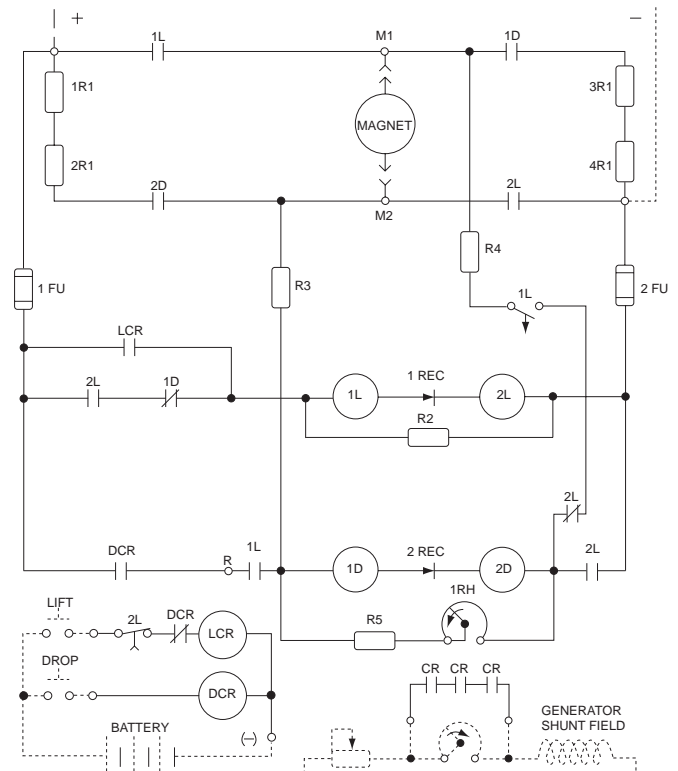
Standard Type A Controller



Type A Form R30 Controller



Type A Form R33 & R34 Controllers

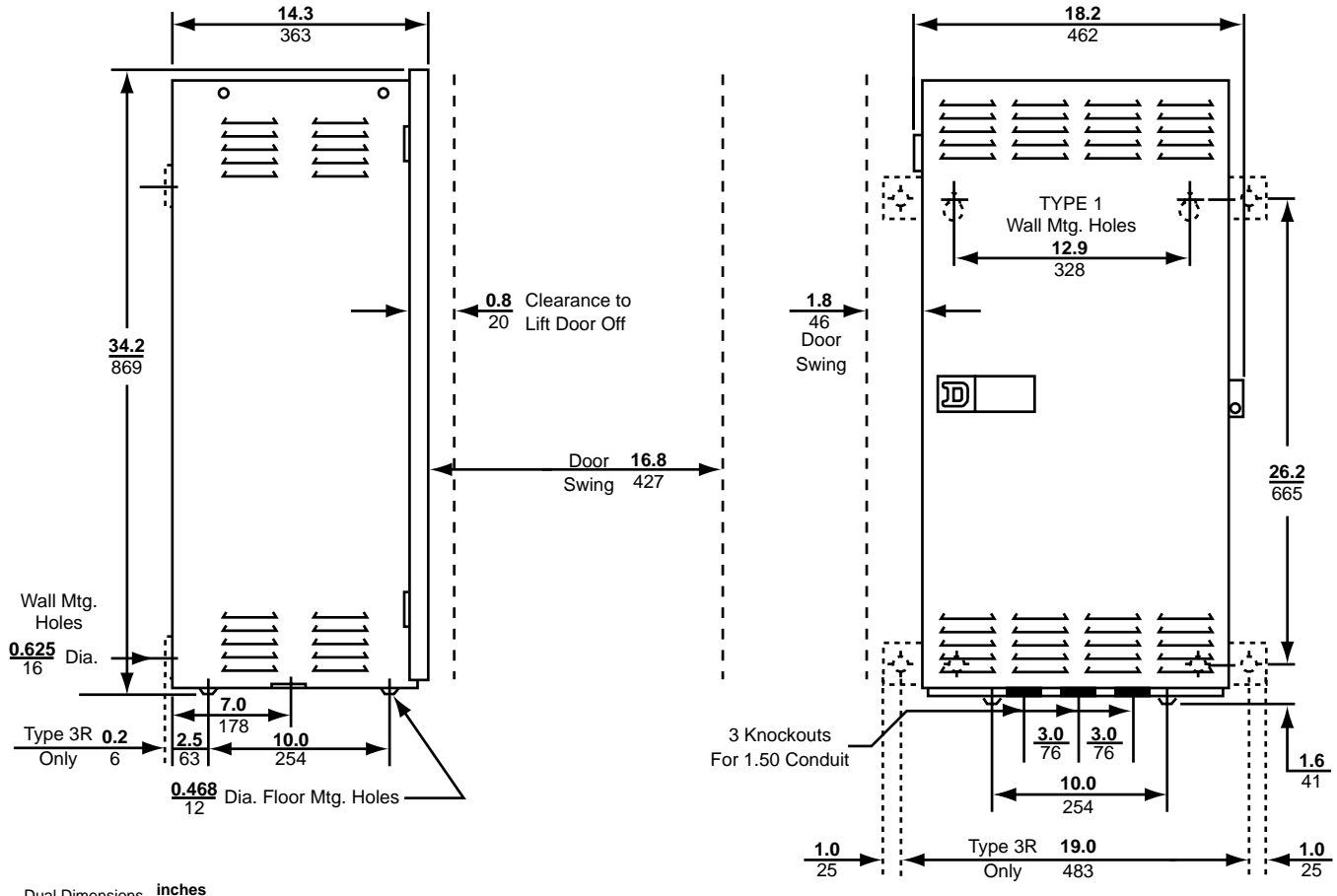


CLASS 6815

Crane Control Class 6815 Type A Lifting Magnet Controllers

TYPE A LIFTING MAGNET CONTROLLERS FOR 31 TO 130 AMPERE GENERATOR POWERED MAGNETS

Approximate Dimensions and Weights



Dual Dimensions $\frac{\text{inches}}{\text{mm}}$

Approximate Net Weight – 150 lbs (67.5 kg)

Crane Control Class 6815

Type M Lifting Magnet Controllers

CLASS 6815



Class 6815 Type M135 Controller

TYPE M LIFTING MAGNET CONTROLLERS FOR 15 TO 175 AMPERE MAGNETS

Pricing and Ordering Information

For use with rectifier or generator power source on AC or DC cranes.

- LINE-ARC® Type M mill-type contactors
- TAB-WELD® mill-type discharge resistor
- Reverse-current adjustable within enclosure
- Reverse-current monitor light for optimum clean-drop adjustment
- Rectifier or generator power source is completely isolated from magnet discharge

For Use with 3-Phase Rectifier or Generator DC Supply ▲

VDC	Cold Magnet Current (A) ■		Indoor/Outdoor Type 3R Enclosure	
	Min.	Max.	Type	Price
230	15	35	M35	\$ 4122.
	25	60	M60	4122.
	40	85	M85	5070.
	60	135	M135	5730.
	85	175	M175	6027.

▲ Consult factory for fanning applications.

■ For magnets with less than 15 A or greater than 175 A cold magnet current, consult factory.

Pilot Devices

Use Lift-Drop push button station or master switch.

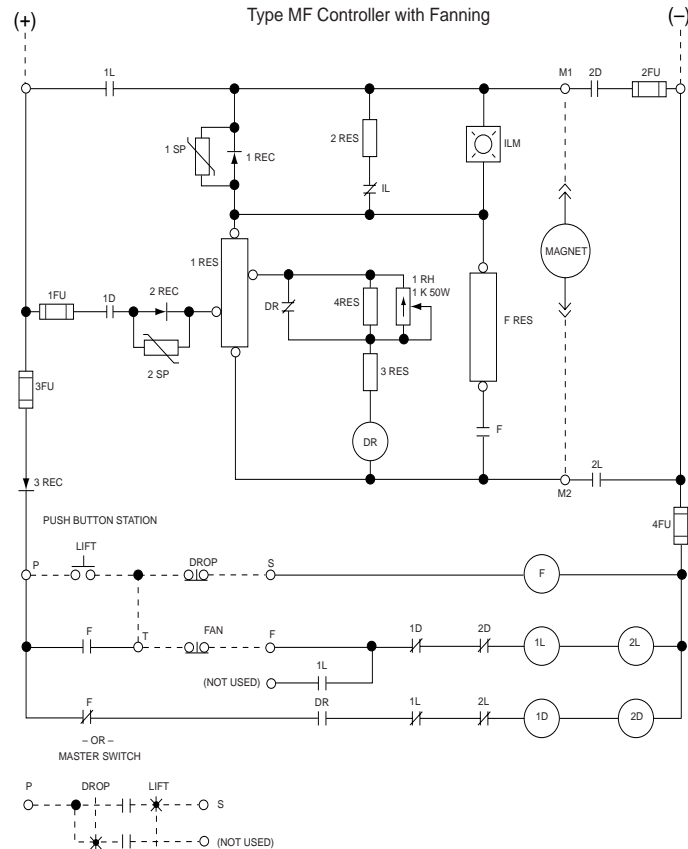
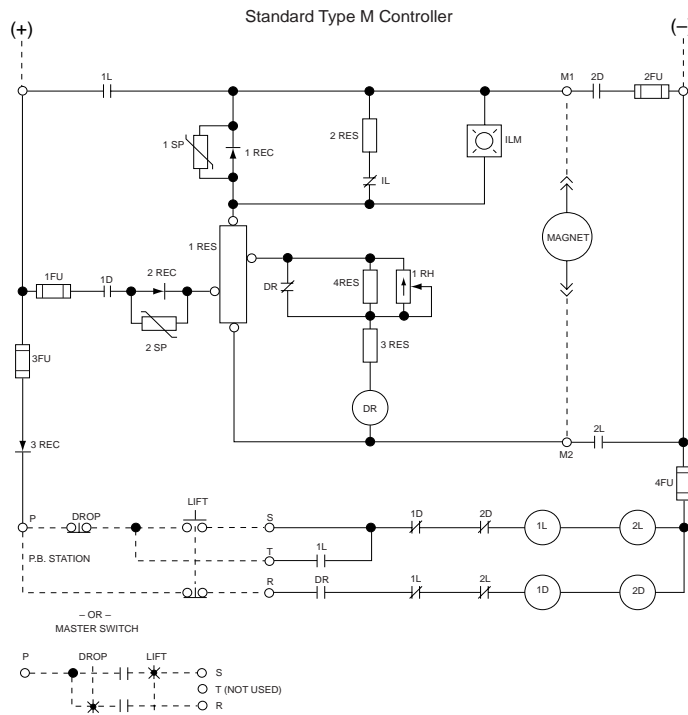
Ordering Information Required:

1. Class
2. Type

CP9B Discount Schedule

TYPE M LIFTING MAGNET CONTROLLERS FOR 15 TO 175 AMPERE MAGNETS

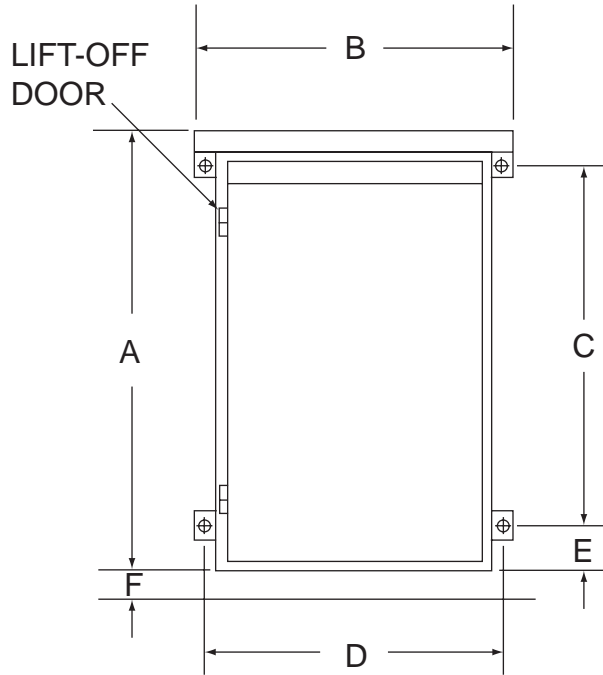
Elementary Wiring Diagram



Crane Control Class 6815
Type M Lifting Magnet Controllers

TYPE M LIFTING MAGNET CONTROLLERS
FOR 15 TO 175 AMPERE MAGNETS

Approximate Dimensions and Weights



Magnet Controller Class 6815 Type	Approx. Weight lbs (kg)	Overall			Door Swing	Wall Mounting Holes				Minimum Clearance Required for Ventilation
		Height	Width	Depth		Diameter	C	D	E	
		A	B							F
M35, M60	101 (45.5)	<u>29.00</u>	<u>20.38</u>	<u>11.73</u>	<u>18.00</u>	<u>.44</u>	<u>24.00</u>	<u>19.38</u>	<u>3.21</u>	<u>1.50</u>
MF35, MF60	104 (46.8)	737	518	298	457	11	610	492	82	38
M85	158 (71.1)									
M135	175 (78.8)	<u>37.30</u>	<u>24.20</u>	<u>13.90</u>	<u>20.70</u>	<u>.44</u>	<u>29.50</u>	<u>23.00</u>	<u>3.20</u>	None
M175	175 (78.8)	947	615	352	526	11	749	584	81	
MF85	208 (93.6)									
MF135	225 (101.3)	<u>43.30</u>	<u>24.20</u>	<u>13.90</u>	<u>20.70</u>	<u>.44</u>	<u>35.50</u>	<u>23.00</u>	<u>3.20</u>	None
MF175	225 (101.3)	1100	615	352	526	11	902	584	81	

Dual Dimensions: inches
mm



Crane Control Class 6815

Magnet Controller Pilot Devices

CLASS 6815



Type MG1

PRICING AND ORDERING INFORMATION

Class 6815 master switches and push button stations are designed for use with Square D magnet controllers on 230 VDC. They should not be used with other controllers or on other applications.

Lever Type Lift-Drop Master Switch – Type MG1

- NEMA 1 enclosure
- Double-pole overlapping contacts
- Horizontal or vertical mounting

Lift-Drop Master Switch		
Type	Price	Discount Schedule
MG1	\$ 297.	CP9B

Push Button Station – Type KYK312

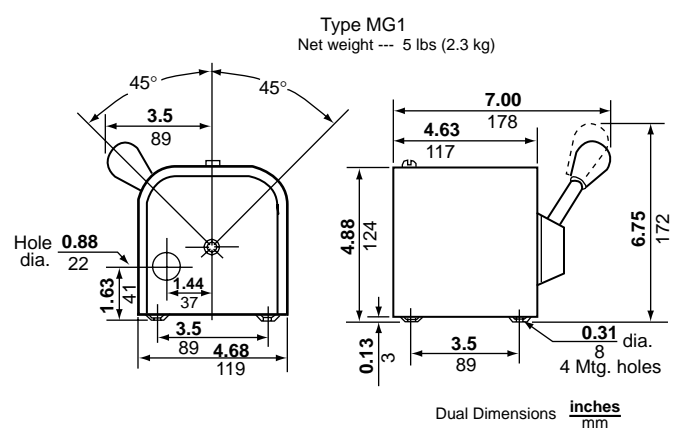
- NEMA 12 enclosure
- Mushroom Head operators
- Horizontal or vertical mounting



Type KYK312 Lift-Drop

Push Button Station			
Class	Type	Price	Discount Schedule
9001	KYK312	\$ 162.	CP1

Approximate Dimensions and Weights



Ordering Information Required:

1. Class
2. Type

These products for lifting magnet service are also available. Consult factory for price and delivery:

- Class 6820 Manual-Magnetic Disconnect Switches
- Class 6823 Fusible Manual Disconnect Switches
- Class 6825 Power Conversion Units

CP1	CP9B	Discount Schedule
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Crane Control Class 7001

CLASS 7001



CONTENTS

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Type K DC Relays	100
Type ST DC Static Timer	106
Type SSI DC Acceleration Module	107



SQUARE D
GROUPE SCHNEIDER

Crane Control Class 7001

Type K DC Relays



Class 7001
Type K
DC Relays

SELECTION GUIDE

- Mill duty construction
- Designed for steel base mounting
- 10 A continuous rating
- 600V DC maximum

Type KG General Purpose Relay	<ul style="list-style-type: none"> • Used for general purpose relaying applications • Available with up to 4 double pole single throw contact blocks • Uses shunt operating coils
Type KP Plugging Relay	<ul style="list-style-type: none"> • Used on DC reversing plugging control panels to detect motor plugging operations • Available with one normally closed contact • Rectifier in series with operating coil
Type KE Voltage Sensitive Relay	<ul style="list-style-type: none"> • Recommended for applications requiring voltage sensitive adjustable relays • Frequently used for sensing DC motor armature voltage • Available with up to 2 double pole single throw contact blocks
Type KF Field Relay	<ul style="list-style-type: none"> • Recommended for controlling DC motor shunt fields and other inductive loads such as groups of relay or contactor coils • Used as UV relay on control panels • 25 ampere continuous rating • Single-pole, normally-open or normally-closed contact with permanent magnet blowout
Type KI Current Sensitive Relay	<ul style="list-style-type: none"> • Recommended for applications requiring current sensitive adjustable relays • Frequently used for sensing DC motor current • Available with up to 2 double-pole, single-throw contact blocks

For dimensional information, see page 105.

Application Data for All Type K Relays

Wiring

All wires can be terminated directly at the relay. Each contact block has self-aligning, captive screw type wire clamps. Similar wire clamps are used on the coil terminals. Since these relays are completely front mounted and connected, all wires are accessible from the front.

Mounting

The Type K relays make use of a steel mounting plate and can therefore be mounted directly onto a steel pan or a steel framework structure of suitable dimensions.

Contacts

All Type K relays with the exception of the Type KF field relay use the same basic contact block. Each control circuit block contains one normally open and one normally closed contact. The contact block on the Type KG, KE, and KI Relays is rated in accordance with NEMA Standard ICS2-125-2 for a heavy duty rating. The Type KF relay uses heavy duty contacts equipped with a permanent magnet blowout.

See Class 9999 catalog section for replacement contact block kits.

Contact Ratings

Relay Type	Continuous Current	System Voltage	Interrupting Rating (Inductive)
KG KE KI	10 A	115-125 230-250 550-600	2.2 A 1.1 A 0.4 A
KF	25 A	115-600	25.0 A ① 15.0 A ②

① The Type KF relay can interrupt 25 A when used to switch resistance in a motor shunt field circuit. Examples are relays designated as FA, FFA, FK, and FD.

② The Type KF relay interrupting rating is limited to 15 A when the relay is used to switch highly inductive circuits consisting of contactor and relay combinations. A typical example would be a low voltage protective relay, designated UV.

Coil Data

For complete coil data refer to the Class 9998 Coil Data Catalog Sheets beginning on page 152.



PRICING INFORMATION AND APPLICATION DATA

Type KG General Purpose Relay

Type KG relays are recommended for general purpose relaying applications. The shunt operating coils are designed in accordance with NEMA standards to withstand 110% of rated voltage continuously and to operate successfully at 80% rated voltage.

Total Number of Control Circuit Contacts		Open Type	
N.O.	N.C.	Type	Price
1	1	KGO11	\$ 312.
2	2	KGO22	384.
3	3	KGO33	456.
4	4	KGO44	528.

Ordering Information Required:

1. Class
2. Type
3. Coil Voltage

Type KP Plugging Relay

To insure proper operation, the Type KP relay is furnished with a coil rated for one half the system voltage. See Class 6121 or Class 6131 catalog sheets for typical plugging relay connection on reversing plugging bridge and trolley drives.

The relay is furnished with one normally closed contact. Relay KPO2 operates when the motor approaches standstill and is thus suitable for use on a single-step plugging scheme or as the final step in a two-step plugging scheme. Relay KPO5 operates at about motor full load speed and is therefore used in the first plugging step of a two step scheme. To achieve the correct pick-up and drop-out characteristics, relay KPO5 includes a resistor and capacitor mounted to the relay base.

Relay Function	System Voltage ^a	Contacts	Open Type	
			Type	Price
Single-step plugging system or second step for two point plugging system	240	1 N.C.	KPO2	\$ 354.
First step for two-point plugging system	240	1 N.C.	KPO5	444.

a For other voltages, consult factory.

Ordering Information Required:

1. Class
2. Type



Crane Control Class 7001

Type K DC Relays

PRICING INFORMATION AND APPLICATION DATA

Type KE Voltage-Sensitive Relay

Application Data – Adjustment Range

Relay pick-up is adjustable between .20 and 1.34 of rated coil voltage. Relay drop-out is adjustable between .04 and .98 of rated coil voltage. The total adjustment range is obtainable by the use of various springs and core caps. Pick-up and drop-out adjustments are not independent. No single relay is available with the entire adjustment range.



**Class 7001
Type KEO11
Relay**

Applications

Relay Designation	Relay Function	Type	Coil VDC	Relay Setting
LSR	Limit Switch Relay used on Class 6121 FRONTLINE® hoist control panels with Type H and M contactors.	KEO11	120	55V P.U.
LSR	Limit Switch Relay used on Class 6110 or Class 6121 hoist control panels with Type L LINE-ARC® contactors.	KEO22	120	55V P.U.
NP	Non-Plug relay for compound and shunt motors.	KEO22	240	Min. D.O.
VR	Voltage relay initiates high speed lowering on hoist controllers.	KEO11	240	105V P.U.
VR	Voltage relay used on reversing-plugging controllers with Emergency or Service Dynamic Braking.	KEO11	240	Min. D.O.
1VR 2VR	Voltage relays used on hoist controllers. 1VR initiates high speed lowering. 2VR functions as an overspeed relay.	KEO11 KEO11	120 120	105V P.U. 250V P.U.
VR	Voltage relay used to control application of armature shunt contactors on multi-step slowdown circuits.	KEO11	as required	as required
VR	Voltage relay used for over voltage protection on adjustable voltage controllers.	KEO11	as required	as required
VR	Voltage relay used for clamping circuit to provide fast start in slow speed operating range of controller.	KEO11	as required	as required

Total Number of Control Circuit Contacts		Open Type	
N.O.	N.C.	Type	Price
1	1	KEO11	\$372.
2	2	KEO22	444.

Ordering Information Required:

1. Class
2. Type
3. System Voltage
4. Pick-up and/or drop-out setting. If both pick-up and drop-out settings are required, also specify which is most important.

CP9B Discount Schedule



CLASS 7001

Crane Control Class 7001 Type K DC Relays

Type KF Field Relay

Applications

Relay Designation	Relay Function	Type
FA	Acceleration of adjustable speed motors on weakened field. (Requires provision on the control with which it is used, for short-circuiting the relay contacts in order to provide full field during acceleration to base speed.)	KFO10 through KFO18
FFA	Acceleration of adjustable speed motors on weakened field and provides full field during acceleration to base speed.	Consult Factory.
FK	Acceleration and deceleration of adjustable speed motors. Provides full field during acceleration to base speed and during dynamic braking for stopping; also provides for acceleration on weakened field.	KFO50 through KFO58
FD	Deceleration of adjustable speed motors by alternately strengthening and weakening the shunt field during dynamic braking.	KFO50 through KFO58 Form NC
UV	Low voltage protective relay used on DC crane and mill controllers with protection.	KFO70 through KFO73

Coils		Contacts ■	Open Type	
Type	Max. Continuous Amperes ▲ (Series Coil)		Type	Price
1 Series	7.4 11.7 18.8	1 N.O.	KFO10 KFO11 KFO12	\$ 513.
	29.5 46.9 73.6	1 N.O.	KFO13 KFO14 KFO15	513.
	114 172 258	1 N.O.	KFO16 KFO17 KFO18	513.
1 Series and 1 Shunt	7.4 11.7 18.8	1 N.O.	KFO50 KFO51 KFO52	513.
	29.5 46.9 73.6	1 N.O.	KFO53 KFO54 KFO55	513.
	114 172 258	1 N.O.	KFO56 KFO57 KFO58	513.
1 Shunt	240 V 120 440 550	1 N.O.	KFO70 KFO71 KFO72 KFO73	513.

■ For 1 N.C. contact in place of N.O. contact, specify Form NC

▲ Pick-up and/or drop-out adjustment range is obtainable by use of various springs and core caps.

Ordering Information Required:

1. Class
2. Type
3. Form (Normally open or normally closed)
4. System voltage (for shunt applications only) or Continuous current (for series applications only)
5. Pick-up and/or drop-out settings. If both pick-up and drop-out settings are required, also specify which is most important.

CP9B		Discount Schedule
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Crane Control Class 7001

Type K DC Relays

Type KI Current Sensitive Relay

Application Data

For low currents, the terminals are on the operating coil. For higher current applications a wire wound or strap wound coil is used. Coil leads are brought to a power termination block at the top of the relay.

Adjustment Range

Relay pick-up is adjustable between .24 and 1.34 of rated coil current. Relay drop-out is adjustable between .20 and .98 of rated coil voltage. The total adjustment range is obtainable by the use of various springs and core caps. Pick-up and drop-out adjustments are not independent. The ratio of drop-out setting to pick-up setting of the relay must be between .13 and .85

Applications

Relay Designation	Relay Function	Type
FL	Field Failure Relay for compound and shunt motors.	KIO11
JR	Jam Relay limits stall torque on series motors.	KIO11
LR	Load Relay operates at a preset current (load).	KIO11
SR	Series Relay used as shunt brake interlock relay.	KIO11

Total Number of Control Circuit Contacts		Open Type	
N.O.	N.C.	Type	Price
1	1	KIO11	\$ 402.
2	2	KIO22	474.

Note: Maximum coil rating 258 A continuous. For higher current coils consult factory.

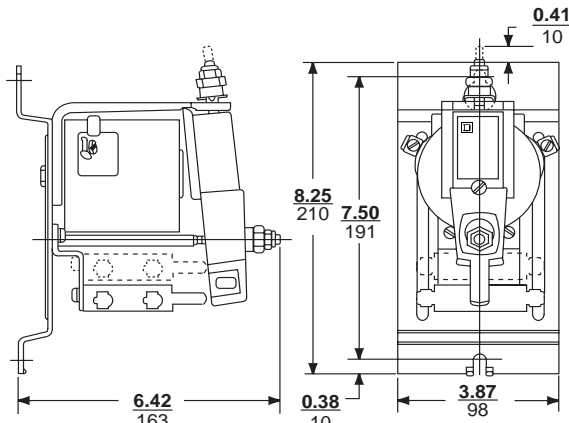
Ordering Information Required:

1. Class
2. Type
3. Continuous current
4. System voltage
5. Pick-up and drop-out settings

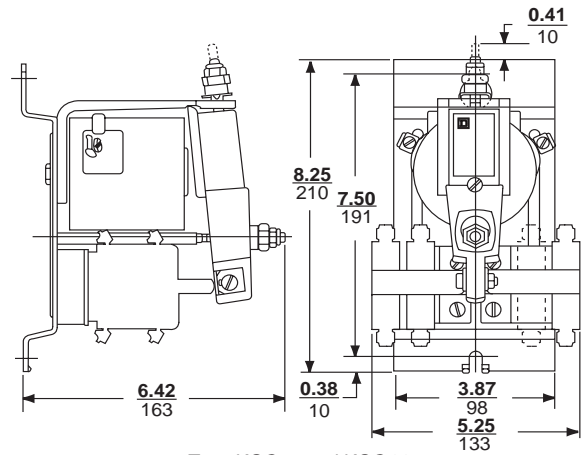
CP9B Discount Schedule

Crane Control Class 7001 Type K DC Relays

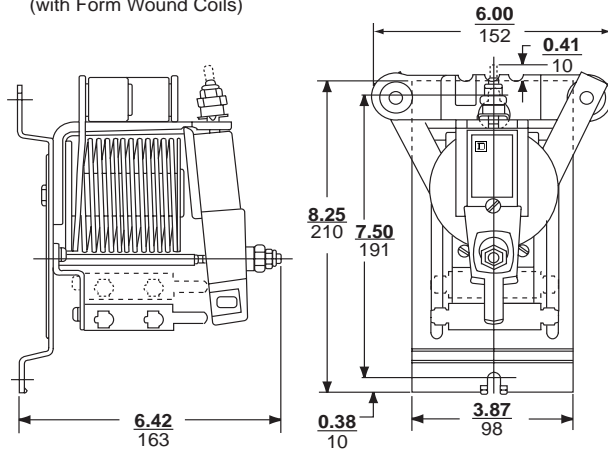
APPROXIMATE DIMENSIONS AND WEIGHTS



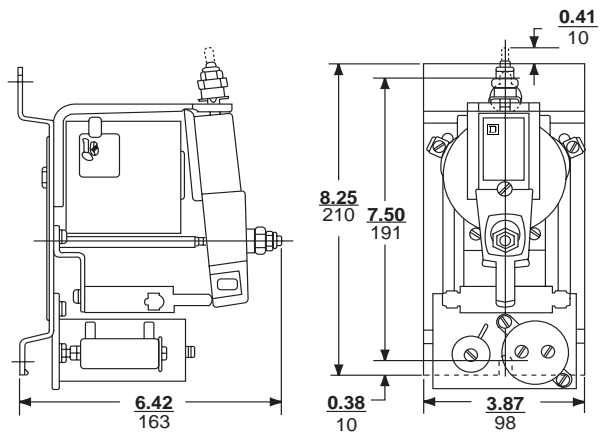
Type KGO11 and KGO22, Type KEO11 and KEO22,
Type KPO11, Type KIO11 and KIO22
(with Form Wound Coils)



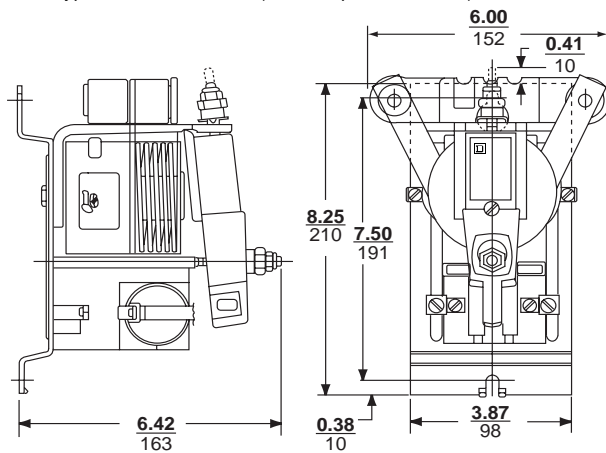
Type KGO33 and KGO44



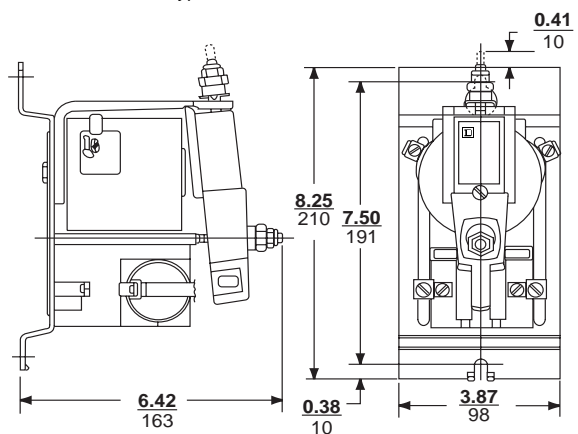
Type KIO11 and KIO22 (with Strap Wound Coils)



Type KPO5



Type KFO10 thru KFO69



Type KFO70 thru KFO73

All relays have two mounting holes for 1/4" screws.

Weight - 7 lbs (3.2 kg)

Enclosed Type

Minimum recommended dimensions for enclosure for all Type K relays –
Height: 16", Width: 12", Depth: 8".

Dual Dimensions $\frac{\text{inches}}{\text{mm}}$



CLASS 7001

Crane Control Class 7001

Type ST DC Static Timer



Class 7001
Type ST1
Static Timer

PRICING INFORMATION AND APPLICATION DATA

Class 7001 Type ST Static Timers are used to control closure of accelerating contactors on DC panels.

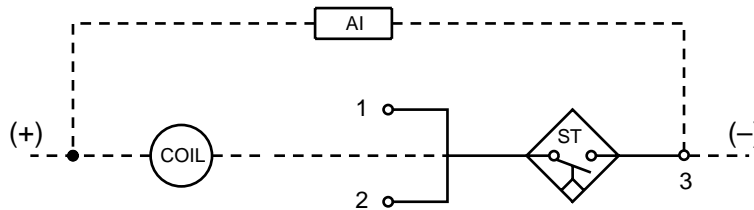
- Three time delay settings
- Encapsulated DC timing relay consisting of solid state circuit components

Class	Type	Voltage Rating	Current Capacity	Price
7001	ST1	200/300 VDC	1 A @ 55 °C	\$ 144.
	ST2	300/500 VDC	0.65 A @ 55 °C	144.
	ST3	500/600 VDC	0.65 A @ 55 °C	144.

Application Data

The static timer is wired in series with the acceleration contactor coil and appears as a normally open timed closed contact. Voltage applied across terminals 1-3 initiates a 0.6 second time delay, whereas voltage applied across terminals 2-3 initiates a 1.2 second time delay (for time delay of 3 seconds, clip jumper wire on top). (Terminal 3 is always connected to the power supply negative.) Upon completion of the timing cycle the static timer appears as a contact closure and allows energization of the contactor coil.

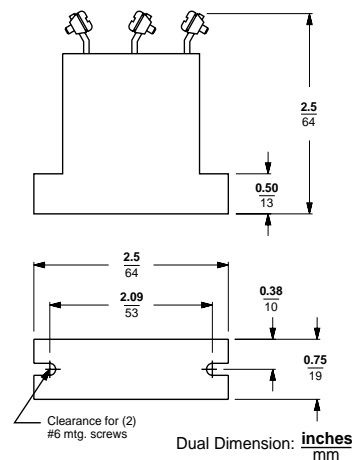
Arc suppressors installed in the control circuit must be connected in parallel with the series combination of static timer and contactor coil as shown below.



NOTE: Erratic operation of the static timer may result if an arc suppressor is located directly across the contactor coil.

Time Delay	Seconds	Terminals
	0.6	1(+)-3(-)
1.2	2(+)-3(-)	
Operating Temperature	-20 to +85 °C	
Load Impedance (Maximum)	3K ohms	

Approximate Dimensions



Ordering Information Required:

1. Class 7001
2. Type

CP9B Discount Schedule

Crane Control Class 7001 Type SSI DC Acceleration Module

PRICING INFORMATION AND APPLICATION DATA



**Class 7001
Type SSI
Acceleration Module**

Class 7001 Type SSI accelerating modules are recommended for use in DC motor circuits and are used to control the closure of the accelerating contactors on DC control panels.

- Time delay depends on motor current
- Single module provides up to 4 steps of acceleration control using 4 replaceable output power thyristor units
- No power connections required—motor current signal obtained from voltage drop across last acceleration resistor step
- Indicating light monitors module operation

Type	Acceleration Steps	Price
SSI03	3	\$ 900.
SSI04	4	1050.

Application Data

The Type SSI module is used to control closure of the acceleration contactors on DC crane and mill panels. Proper DC motor acceleration is achieved by the module monitoring motor current and automatically adjusting the timing period between acceleration contactor closure.

A sixteen position switch is used to adjust a current set point to equal 100% of motor full load current for hoist drives and 50% of motor full load current for travel drives. When the acceleration current falls below the set point, or the maximum time has elapsed, the next acceleration circuit is energized.

A 15 ampere (maximum) fuse should be installed in the control circuit for proper protection of printed circuit board foil runs.

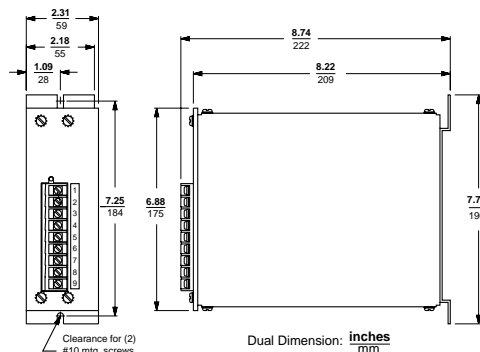
If arc suppressors are installed on the contactor coils, it is necessary that they be connected from the positive side of the contactor coil to the power supply negative.

NOTE: Erratic operation may result if the arc suppressors are located directly across the contactor coils.

Voltage Range	200-300 VDC
Current Capacity	0.36 A at 85 °C
	1.00 A at 55 °C
Time Delay ▲	0.1 to 1.0 seconds
Operating Temperature	-20 to +85 °C
Load Impedance (Maximum)	3K ohms

- ▲ On hoist controllers the time delay is increased from 0.5 to 1.0 seconds on the first point of acceleration in the lowering direction to ensure brake release.

Approximate Dimensions



Ordering Information Required:

1. Class
2. Type

CP9B Discount Schedule





Crane Control Class 7004



CLASS 7004

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SQUARE D
GROUPE SCHNEIDER

Crane Control Class 7004

Type M LINE-ARC® DC Contactors



Class 7004
Type MXDO1 Contactor



Class 7004
Type MGO1 Contactor

PRICING INFORMATION

Type M DC magnetic, mill type, clapper contactors are designed for the control of DC motors.

- Front connected
- High strength glass polyester insulating base for steel base mounting
- LINE-ARC® method of arc extinction for longer tip life

Basic Contactor

The basic contactor is furnished without power lugs, electrical or mechanical interlocks.

Maximum VDC	Number of Poles ▲	NEMA Size	Open 8 Hr Ampere Rating	Open Type ●	
				Type	Price ★
600	Single Pole Normally Open	1	25	MXCO1	\$ 270.
		2	50	MXDO1	371.
		3	100	MEO1	564.
		4	150	MFO1	684.
		5	300	MGO1	1016.
		5A †	400	MGAO1	1320.
		6	600	MHO1	1908.
		6A †	810	MHAO1	2303.
		8	1350	MKO1	3828.
	Single Pole Normally Closed	1	25	MXCO3	540.
		2	50	MXDO3	621.
		3	100	MEO3	768.
		4	150	MFO3	936.
		5	300	MGO3	1545.
		5A †	400	MGAO3	2010.
		6 ■	600	MHO3	2829.
		8 ■	1350	MKO3	5286.

- ▲ See contactor Application Data for double pole contactors.
- † Not a NEMA size/rating.
- See Class 9998 for coil data.
- Operating coil forcing circuit may be required; consult factory.

Factory Installed Modifications

Form	Description	NEMA Size	Price ★
Y781	Silver Faced Power Contact Tips	1	\$ 179.
		2	179.
		3	282.
		4	289.
		5 & 5A †	439.
		6 & 6A †	598.
		8	1121.

† 5A/6A is not a NEMA size/rating.

Ordering Information Required:

1. Class
2. Type
3. Form
4. Coil Voltage

Accessory Kits For User Installation

Class 9999 user modification kits include all necessary mounting hardware and installation instructions. Mechanical interlocks, pneumatic timers, and tie bars can be mounted on normally open devices only.

NEMA Size	Mechanical Interlock ●		Tie Bar ●		Power Lug ▲	
	Type	Price ★	Type	Price ★	Type	Price ★
1 & 2	MM1	\$ 102.	MT1	\$ 36.	...	
3 & 4	MM2	102.	MT2	36.	ML1	\$ 36.
5 & 5A †	MM3	144.	MT3	36.	ML2	60.
6 & 6A †	MM4	180.	MT4	60.	ML3	138.
8	MM5	212.	MT5	61.	ML3	138.

- ▲ Contains four clam shell type lugs. For copper conductors only.
- † 5A/6A is not a NEMA size/rating.
- For use with normally open contactors only.

NEMA Size	Electrical Interlock (one N.O. and one N.C. contact)	
	Type	Price ◇
1 to 8	MX11	\$93.

- ★ CP9B
- ◇ CP9C

Ordering Information Required:

1. Class
2. Type

CP9B CP9C Discount Schedule



APPLICATION DATA

Mounting

The Type M contactor with its insulated base can be mounted directly on uninsulated steel panels, angle iron frames, etc. The contactors are completely front-connected.

Wiring

Size 1 through 5A Type M contactors have a wire accessway in the base for convenient out-of-the-way routing of cables and control wires. Size 6 through 8 contactors have a flat mounting base. Power connections to the NEMA Sizes 3 through 8 contactors can be made from either side.

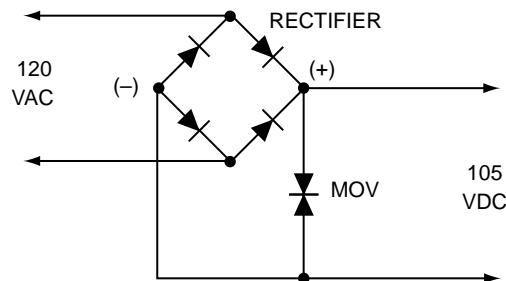
Coil Data

DC operating coils are designed in accordance with NEMA standards to withstand 110% of rated voltage continuously and to operate the contactor successfully at 80% of rated voltage. Standard coil voltages are 120 VDC and 240 VDC. For other available coil voltages, refer to the Class 9998 Coil Data Catalog Sheet.

AC to DC Control Voltage Conversion

To control the DC contactor coil from a 120 VAC supply, order each single pole contactor with 120 VDC coil or for double pole contactors, order each contactor with a 60 VDC coil.

Connect the rectifier and suppressor (MOV) as shown.



Rectifier part no. is 27907-34220 (800 PIV, 30 A)

MOV part no. is 52906-028-59

Double Pole Contactors

Double-pole, normally-open contactors can be built by ordering two single-pole, normally-open contactors with half-voltage operating coils and one tie bar kit. The two coils must be connected in series.

User Modification Kits

A number of Class 9999 user modification kits are available for use with Type M contactors. Power contact tip parts kits are listed under Class 9998.

Maximum Number of Accessories and Accessory Combinations

For single-pole, normally-open contactors, two electrical interlock kits and any one of the following:

- Two mechanical interlock kits
- One tie bar kit and one mechanical interlock kit

For single-pole, normally-closed contactors, two electrical interlock kits



Crane Control Class 7004

Type M LINE-ARC® DC Contactors

APPLICATION DATA

Electrical Interlocks

Control circuit interlocks are available in units of one normally open and one normally closed contacts. On each single pole normally open and normally closed contactor a maximum of two interlock kits can be mounted. Interlock kits include the movable and stationary contacts plus all necessary hardware for mounting.

Electrical interlocks are rated in accordance with NEMA Standard ICS- 2-125 (A600 and N600 Table Ratings).



Class 9999 Type MX11
Electrical Interlock Kit

A600	Maximum Continuous Amperes	Maximum Make and Break Current Amperes ▲							
		120V		240V		480V		600V	
		Make	Break	Make	Break	Make	Break	Make	Break
AC	10	60	6	30	3	15	1.5	12	1.2

N600	Maximum Continuous Amperes	Maximum Make and Break Current Amperes ▲					
		125V		250V		600V	
		Make	Break	Make	Break	Make	Break
DC	10	2.2	2.2	1.1	1.1	0.4	0.4

▲ Make and break ratings apply for double-throw contacts only when both the normally open and normally closed contacts are connected to the same polarity.

Mechanical Interlock

A horizontal mechanical interlock is mounted between two single pole normally open or double pole tied normally open contactors mounted side by side. This interlock prevents the two contactors from operating simultaneously.



Class 9999
Type MM2
Mechanical
Interlock Kit

Lugs

Type M contactors are furnished without power lugs. A kit is available consisting of lugs and hardware for mounting on Size 3 and larger contactors. No power lug kits are available for the NEMA Size 1 and 2 contactors. These contactors are designed to use lugs supplied by the user.

Lug Wire Capacity

Lug Type ▲	Minimum Wire Size	Maximum Wire Size
ML1	Number 8	Number 00
ML2	Number 0	300 MCM
ML3	250 MCM	500 MCM

▲ Contains four clam shell type lugs. For copper conductors only.

Power Contact Tips

A Class 9998 power contact tips part kit consists of movable and stationary contact tips with necessary mounting hardware for two single pole contactors. Consult Catalog Section 9998 for additional information.

Copper contact tips are standard. Silver-faced contact tips are available and are recommended for applications where the contactors remain closed for long periods of time. Silver-faced contact tips are standard on crane manual-magnetic disconnect switches.

Tie Bar

Applications requiring double pole Type M contactors can be met by supplying single pole normally open only contactors with tie bars. The tie bar is made from an insulating material and connects the armatures of the contactors together. For double pole contactors, it is recommended that the operating coils be connected in series. Each coil should be rated for one half of system voltage. See Catalog Section 9999, page 160, for additional information.



Crane Control Class 7004 Type M LINE-ARC® DC Contactors

APPLICATION DATA

Class 9999 AI1 Arc Suppressor

The Class 9999 AI1 arc suppressor is designed to reduce arcing of pilot devices in DC inductive control circuits of 250 VDC or less.

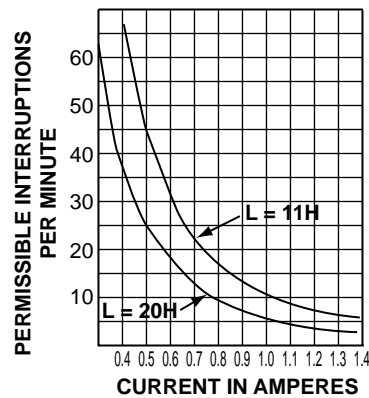


Class 9999
Type AI1
Arc Suppressor

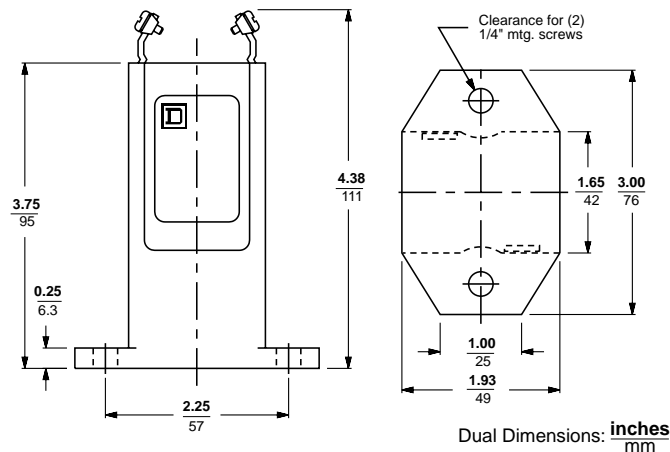
Type	Price
AI1	\$111.

The AI1 arc suppressor will limit the inductive voltage surge to a maximum of 600 VDC when applied in accordance with the application chart. When applying the arc suppressor to a circuit, two factors must be considered, the current drawn by the inductive load and the number of times per minute that the load will be interrupted. Once these two factors are determined, the application is checked against the application chart. The chart shows the maximum interruptions per minute that the arc suppressor can handle at a given current. As long as an application falls below the curve, the arc suppressor will handle the load. The arc suppressor is connected in parallel with the inductive load and is in the circuit at all times.

Application Chart For AI1 Arc Suppressor



Approximate Dimensions And Weights



Net Weight – 1 lb (0.45 kg)

Ordering Information Required:

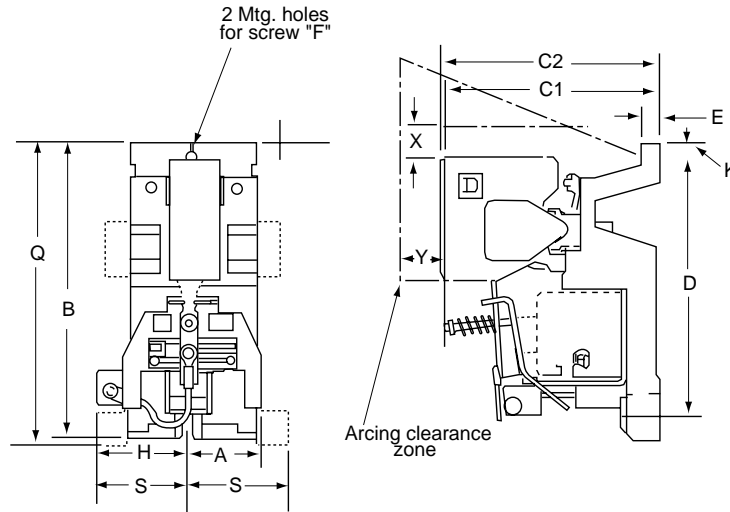
1. Class 9999
2. Type AI1

CP9B

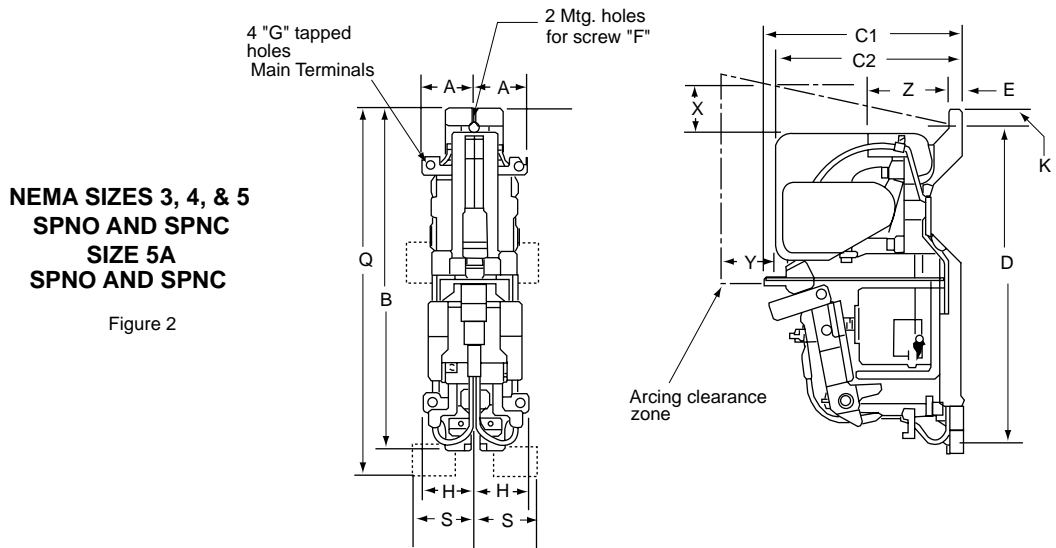
Discount
Schedule


Crane Control Class 7004
Type M LINE-ARC® DC Contactors

APPROXIMATE DIMENSIONS

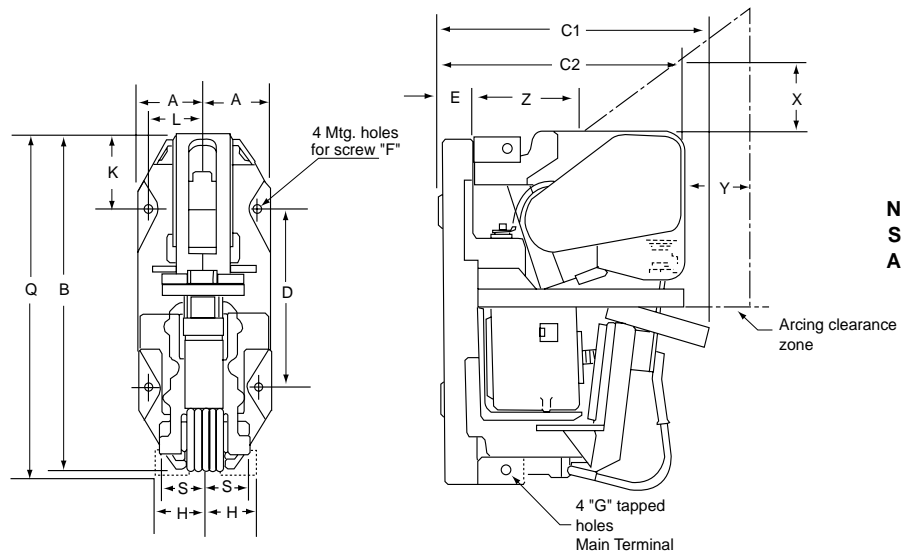


**NEMA SIZES 1, 2
 SPNO AND SPNC**
 Figure 1



**NEMA SIZES 3, 4, & 5
 SPNO AND SPNC**
**SIZE 5A
 SPNO AND SPNC**

Figure 2



**NEMA SIZES 6, 8
 SPNO AND SPNC**
AND SIZE 6A SPNO
 Figure 3

CLASS 7004

Crane Control Class 7004 Type M LINE-ARC® DC Contactors

APPROXIMATE DIMENSIONS AND WEIGHTS

NEMA Size	Type	Fig. No.	Contactor Dimensions ▲											Weight	Center to Center Spacing of S.P. Tied or Mechanically Interlocked Contactors
			A	B	C1	C2	D	E	F	G	H	K	L		
1	MXCO1	1	1.79	8.65	6.00	6.38	7.56	0.52	0.25	...	2.29	0.44	...	7	5.63
2	MXDO1		46	220	153	162	192	13	6	...	58	11	...	3	143
1	MXCO3	1	1.79	8.65	6.00	6.38	7.56	0.52	0.25	...	2.29	0.44	...	7	5.63
2	MXDO3		46	220	153	162	192	13	6	...	58	11	...	3	143
3	MEO1	2	2.12	13.10	7.83	7.40	11.50	0.56	0.375	5/16-18	2.13	0.80	...	15	6.00
4	MFO1		54	333	199	188	292	14	10	...	55	20	...	7	153
3	MEO3	2	2.12	13.10	7.83	7.40	11.50	0.56	0.375	5/16-18	2.13	0.80	...	15	6.00
4	MFO3		54	333	199	188	292	14	10	...	55	20	...	7	153
5	MGO1	2	2.75	16.54	9.50	9.68	14.50	0.96	0.375	3/8-16	2.78	1.02	...	30	7.00
5A†	MGAO1		70	420	242	246	368	25	10	...	71	26	...	14	178
5	MGO3	2	2.75	16.54	9.50	9.68	14.50	0.96	0.375	3/8-16	2.78	1.02	...	30	7.00
5A†	MGAO3		70	420	242	246	368	25	10	...	71	26	...	14	178
6	MHO1	3	3.50	19.15	...	13.64	6.00	...	0.375	1/2-13	2.85	8.30	2.94	70	9.00
6A†	MHAO1		89	487	...	346	153	...	10	...	73	211	75	32	229
6	MHO3	3	3.50	19.15	...	13.64	6.00	...	0.375	1/2-13	2.85	8.30	2.94	70	9.00
			89	487	...	346	153	...	10	...	73	211	75	32	229
8	MKO1	3	4.50	22.90	17.40	15.80	12.00	2.30	0.50	1/2-13	6.90	5.38	3.69	160	11.30
			114	582	442	402	305	59	13	...	176	137	94	73	287
8	MKO3	3	4.50	22.90	17.40	15.80	12.00	2.30	0.50	1/2-13	6.90	5.38	3.69	160	11.30
			114	582	442	402	305	59	13	...	176	137	94	73	287

NEMA Size	Type	Fig. No.	Accessory Dimensions▲				Arcing Clearances					
			Electrical Interlock		240 VDC			600 VDC				
			Q	S	X	Y	Z	X	Y	Z		
1	MXCO1	1	9.98	2.34	1.70	1.70	...	3.00	3.00	...		
2	MXDO1		253	60	43	43	...	76	76	...		
1	MXCO3	1	9.98	2.34	1.70	1.70	...	3.00	3.00	...		
2	MXDO3		253	60	43	43	...	76	76	...		
3	MEO1	2	13.74	2.43	2.00	2.00	4.00	2.00	6.00	4.00		
4	MFO1		349	62	51	51	102	51	153	102		
3	MEO3	2	13.74	2.43	2.00	2.00	4.00	2.00	6.00	4.00		
4	MFO3		349	62	51	51	102	51	153	102		
5	MGO1	2	16.72	2.60	2.04	2.80	...	2.04	6.00	...		
5	MGO3		424	66	52	71	...	52	153	...		
5A†	MGAO1	2	16.72	2.60	2.50	3.2	...	2.50	6.00	...		
5A†	MGAO3		424	66	64	82	...	64	153	...		
6	MHO1	3	18.54	2.43	2.0	2.60	3.50	4.00	11.00	3.50		
			471	62	51	66	89	102	280	89		
6A†	MHAO1	3	18.54	2.43	4.0	6.0	3.50	7.00	12.00	3.50		
			471	62	102	153	89	178	305	89		
6	MHO3	3	18.54	2.43	2.0	2.60	...	4.00	11.00	...		
			471	62	51	66	...	102	280	...		
8	MKO1	3	23.5	3.45	4.5	4.5	4.00	9.00	12.00	4.00		
8	MKO3		597	88	115	115	102	229	305	102		

The table lists recommended minimum enclosure sizes for single pole-240 VDC contactors with contactor mounted accessories. For double pole contactors, increase width by 50%.

NEMA Size	Height	Width	Depth
1	12.00	12.00	9.00
2	305	305	229
3	18.00	12.00	12.00
4	457	305	305
5	22.00	15.00	15.00
	559	381	381
5A†	28.00	17.00	18.00
	714	434	457
6	32.00	18.00	20.00
	813	457	508
6A†	40.00	22.00	24.00
	1020	561	610
8	48.00	24.00	24.00
	1219	610	610

▲ Electrical interlocks and all live electrical parts must have a $\frac{.50}{13}$ clearance to ground and other live electrical parts.

† Not a NEMA size/rating.

Dual Dimensions: $\frac{\text{in}}{\text{mm}}$

Dual Weights: $\frac{\text{lb}}{\text{kg}}$

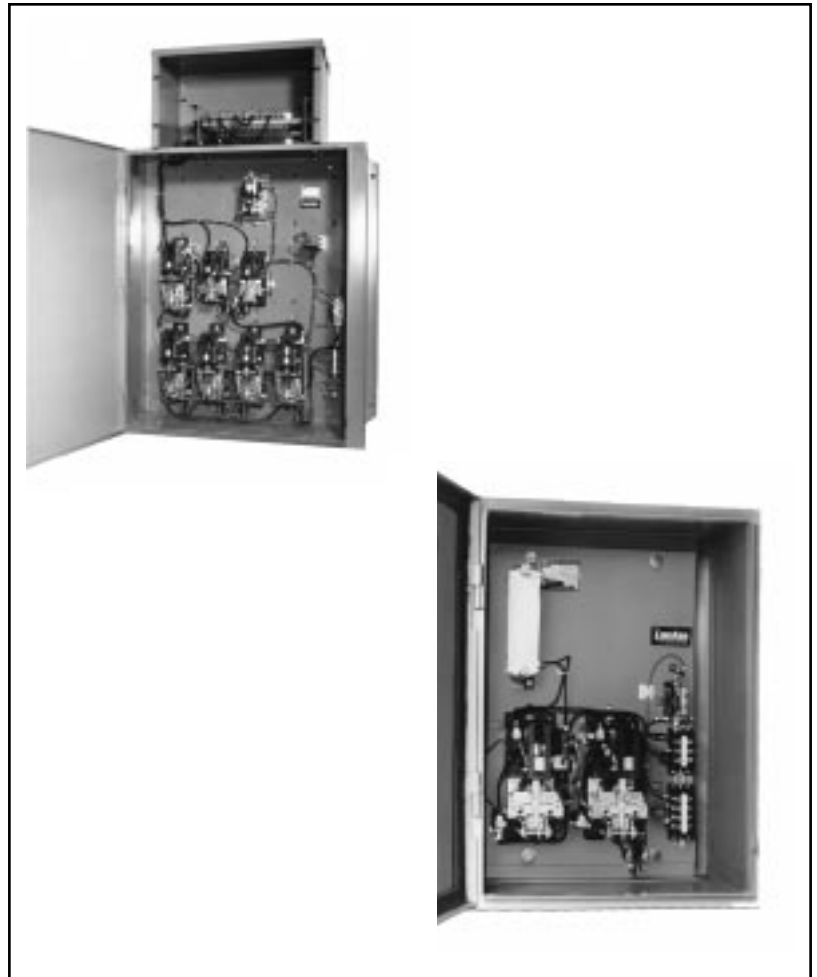
CLASS 7004



CLASS 7004



Crane Control Class 7135, 7136, 7145, 7146



CLASS 7135, 7136,
7145, 7146

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SQUARE D
GROUPE SCHNEIDER

Crane Control Class 7135, 7136 DC Reduced-Voltage Motor Starters



Class 7135 Type MCA1

GENERAL INFORMATION AND PRICING

Class 7135, Constant Speed and Class 7136, Adjustable Speed starters are reduced voltage non-reversing type for use with shunt or compound wound DC motors.

These starters provide a time limit acceleration method to accelerate DC motors, which brings the motor up to speed in a definite time, independent of load.

Typical applications include: machine tools, conveyors, pumps, blowers and emergency lube pumps.

- Designed to meet NEMA standards
- Rugged mill duty components
- Time limit acceleration

Class 7135 starter price includes:

- 1 Main contactor (M)
- 1 Set Acceleration contactors (1A, 2A . . .), each with static timer
- 1 Set Acceleration resistors (starting duty, NEMA-rated Class 135)
- 1 Thermal overload relay including heater unit

Class 7136 starter price includes:

- 1 Class 7135 starter as described above; plus
- 1 Field acceleration relay (FA) with series and shunt coils

Class 7135 Non-Reversing Constant Speed

115 VDC Max. HP ▲	230 VDC Max. HP ▲	NEMA Size	Number of Acceleration Points	General Purpose Enclosure NEMA Type 1 Gasketed		Dust Tight Industrial Use Enclosure NEMA Type 12		Open Type	
				Type	Price	Type	Price	Type	Price
3	5	1	2	MCS1	\$ 3512.	MCA1	\$ 3551.	MCO1	\$ 2321.
5	10	2	3	MDS1	3956.	MDA1	3984.	MDO1	2939.
10	25	3	3	MES1	5640.	MEA1	6161.	MEO1	4307.
20	40	4	3	MFS1	6543.	MFA1	7146.	MFO1	4995.

Class 7136 Non-Reversing Adjustable Speed ■

115 VDC Max. HP ▲	230 VDC Max. HP ▲	NEMA Size	Number of Acceleration Points	General Purpose Enclosure NEMA Type 1 Gasketed		Dust Tight Industrial Use Enclosure NEMA Type 12		Open Type	
				Type	Price	Type	Price	Type	Price
3	5	1	2	MCS1	\$ 4439.	MCA1	\$ 4472.	MCO1	\$ 3380.
5	10	2	3	MDS1	5088.	MDA1	5126.	MDO1	4560.
10	25	3	3	MES1	6735.	MEA1	6789.	MEO1	5670.
20	40	4	3	MFS1	7812.	MFA1	7830.	MFO1	6578.

▲ For higher rated horsepower starters, consult factory.

■ Does not include field rheostat.

Ordering Information Required:

1. Class and Type number.
2. Horsepower, voltage, full load current.
3. Specify additions and special features by form number.
4. Class 7135 Starters requiring field relays, specify: shunt field resistance and shunt field current.
5. Class 7136 Starters, specify: speed range (or ratio) of rheostat, shunt field current at normal and maximum speeds, shunt field resistance.

CP9B Discount
Schedule

Crane Control Class 7145, 7146 DC Reduced-Voltage Motor Starters

GENERAL INFORMATION AND PRICING



Class 7145 Type MES1

Class 7145, Constant Speed and Class 7146, Adjustable Speed starters are reduced voltage reversing type for use with shunt or compound wound DC motors.

These starters provide a time limit acceleration method to accelerate DC motors, which brings the motor up to speed in a definite time, independent of load.

To minimize the motor stopping time, dynamic braking is supplied on all reversing starters.

Typical applications include: machine tools and conveyors.

- Designed To Meet NEMA Standards
- Rugged Mill Duty Components
- Time Limit Acceleration
- Dynamic Braking

Class 7145 starter price includes:

- 2 Two pole directional contactors (F,R) with mechanical interlocks
- 1 Dynamic braking contactor (DB), normally closed
- 1 Set Acceleration contactors (1A, 2A . . .), each with static timer
- 1 Set Acceleration resistors (starting duty, NEMA-rated class 135)
- 1 Non-plug relay (NP), normally closed, single pole
- 1 Surge suppressor
- 1 Thermal overload relay including heater unit

Class 7146 starter price includes:

- 1 Class 7145 starter as described above; plus
- 1 Field acceleration relay (FA) with series and shunt coils

Class 7145 Reversing Constant Speed

115 VDC Max. HP ▲	230 VDC Max. HP ▲	NEMA Size	Number of Acceleration Points	General Purpose Enclosure NEMA Type 1 Gasketed		Dust Tight Industrial Use Enclosure NEMA Type 12		Open Type	
				Type	Price	Type	Price	Type	Price
3	5	1	2	MCS1	\$ 6975.	MCA1	\$ 7008.	MCO1	\$ 6030.
5	10	2	3	MDS1	8085.	MDA1	8115.	MDO1	6948.
10	25	3	3	MES1	11819.	MEA1	11879.	MEO1	9140.
20	40	4	3	MFS1	13709.	MFA1	13779.	MFO1	10752.

Class 7146 Reversing Adjustable Speed ■

115 VDC Max. HP ▲	230 VDC Max. HP ▲	NEMA Size	Number of Acceleration Points	General Purpose Enclosure NEMA Type 1 Gasketed		Dust Tight Industrial Use Enclosure NEMA Type 12		Open Type	
				Type	Price	Type	Price	Type	Price
3	5	1	2	MCS1	\$ 7806.	MCA1	\$ 7835.	MCO1	\$ 6765.
5	10	2	3	MDS1	8826.	MDA1	8853.	MDO1	7815.
10	25	3	3	MES1	12420.	MEA1	12518.	MEO1	9749.
20	40	4	3	MFS1	14408.	MFA1	14520.	MFO1	11309.

- ▲ For higher rated horsepower starters, consult factory.
- Does not include field rheostat.

Ordering Information Required:

1. Class and Type number.
2. Horsepower, voltage, full load current.
3. Specify additions and special features by form number.
4. Class 7145 Starters requiring field relays, specify: shunt field resistance and shunt field current.
5. Class 7146 Starters requiring field relays, specify: speed range (or ratio) of rheostat, shunt field current at normal and maximum speeds, shunt field resistance.

CP9B Discount
Schedule



CLASS 7135, 7136,
7145, 7146

Crane Control Class 7135, 7136, 7145, 7146

DC Reduced-Voltage Motor Starters

MODIFICATIONS, PRICING AND APPLICATION DATA

Additions and Special Features	Form Number	Panel Space	Price NEMA Size Starter			
			1	2	3	4
Power Knife Switch						
With DC rated fuses, operable from inside enclosure	D1	2	\$ 1035.	\$ 1165.	\$ 2570.	\$ 4065.
Non-fused, operable from inside enclosure	D9	1	690.	690.	785.	1052.
Molded Case Switch						
With DC rated fuses, operable from outside enclosure	D4	2	\$ 930.	\$ 1050.	\$ 2315.	\$ 3660.
Non-fused, operable from outside enclosure	D5	1	620.	620.	710.	950.

Additions and Special Features	Form Number	Panel Space	Price
Pilot Devices (Flange mounted)			
"Start-Stop" push button	A	–	\$ 204.
"Forward-Reverse-Stop" push button	A1	–	345.
"On-Off" push button	A3	–	204.
"Hand-Off-Auto" selector switch	C	–	204.
Pilot light (specify color) (P1 = red, P2 = green, P37 = white)	P_	–	204.
Control Circuit Modifications			
Control Circuit knife switch (fusible)	D19	1	264.
Terminal board space for remote pilot devices, per terminal point	G50	–	63.
Extra electrical interlocks (1 N.O. and 1 N.C.)	X11	–	158.
Auxiliary and Protective Relays			
Undervoltage relay	R1	1	660.
Field decelerating relay (limits motor armature current while motor is decelerating to base speed)	R3	1	759.
Field Loss relay (disconnects motor from line in event of loss of field)	R4 ★	1	609.
Field economizing relay (relay inserts resistance in shunt field to prevent overheating of field winding when motor is at rest)	R5 ★	1	759.
Jog control relay: Non-Reversing (Class 7135, 7136) – 1 relay Reversing (Class 7145, 7146) – 2 relays	R16 R27	1 1	609. 917.
Control relay	R17 ▲	1	609.

- ▲ Specify contact arrangement.
- ★ Specify shunt field data.

CLASS 7135, 7136, 7145, 7146

CP9B Discount Schedule

Crane Control Class 7135, 7136, 7145, 7146 DC Reduced-Voltage Motor Starters

COMPONENT EQUIPMENT

CONTACTORS

Main (M), Reversing (F&R), Acceleration (1A, 2A, 3A), Dynamic Braking (DB).

Construction – Clapper type, Square D Class 7004, Type MX on Sizes 1 and 2; Type M on Sizes 3 and 4.

Volts – 600 VDC Maximum.

CURRENT RATING

NEMA Size	1	2	3	4
Open	25 A	50 A	100 A	150 A
Enclosed	22 A	45 A	90 A	135 A

Contact Tips – Copper

Coil – 120 or 240 VDC, operating range, 110 to 80% of rated voltage.

Auxiliary Contacts – Maximum 2 N.O. + 2 N.C. 10 ADC, double break. Interrupting rating (inductive) is 2.2 A, 1.1 A and 0.4 A at 125V , 250 V and 600 V, respectively.

Lugs – NEMA Size 1 and 2, box lug type; NEMA Size 3 and higher, clam-shell type.

CONTROL CIRCUIT

Wiring – Stranded, 600 V, 90 °C rating.

Overloads – Class 9065, single pole, hand reset melting alloy.

Push buttons – Class 9001, Type K, 10 A continuous rating.

Fuses – 15 A, 250 VDC

Pilot Lights – Class 9001, Type K.

Terminal Blocks – Class 9080, Type GR, 600 V rating, maximum wire 2- #12.

Acceleration Timers – Class 7001, Type ST1, non-adjustable static timer(s), provide 1.2 seconds accelerating time for each acceleration contactor. The static timer is wired in series with the acceleration contactor coil and appears as a normally open timed closed contact.

NEMA Size	Number Acceleration Contactors
1	1
2	2
3	2
4	2

Accelerating Resistors – These starting duty resistors will provide starting torques of at least 150% of motor full load torque. The resistor designs permit 10 seconds on out of each 80 seconds.

CLASS 7135, 7136,
7145, 7146



Crane Control Class 7135, 7136, 7145, 7146

DC Reduced-Voltage Motor Starters

APPLICATION DATA AND WIRING DIAGRAMS

Enclosures

Construction – Sheet steel, welded construction.

#14 gauge: NEMA Size 1 through 4.

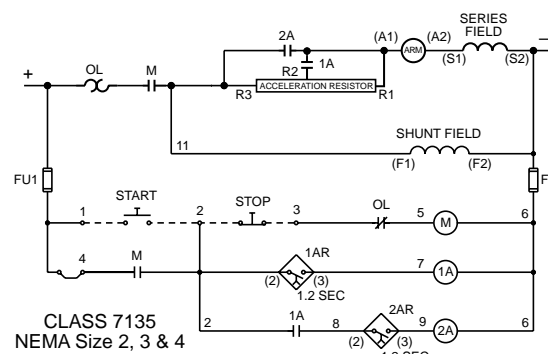
Types–NEMA 1 Gasketed, NEMA 12, and Open.

Protective and Auxiliary Devices

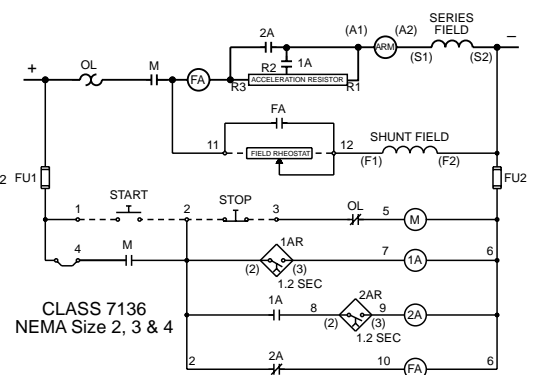
Description	Class & Type	Function
Field Acceleration Relay (FA)	7001, KFO N.O.	Provides full field during acceleration to base speed, and provides current limit control to final operating speed.
Field Deceleration Relay (FD)	7001, KFO N.C.	Avoids the effects of too rapid deceleration and limits the armature current and voltage during deceleration.
Field Loss Relay (FL)	7001, KIO	Prevents motor from "running away" in case the motor field is accidentally opened.
Field Economizing Relay (FE)	7001, KFO N.O. (25 A continuous)	Protects motor shunt field against overheating (by inserting series resistance) when shunt field is energized and motor is at rest.
Non-Plugging Relay (NP)	7001, KGO	Prevents closing of directional contactor until motor has come to rest after running in forward or reverse direction.
Undervoltage Relay (UV)	7001, KFO70	Recommended with master switch operation.
Jog (Inch) Relay	CA3DN	Allows small movements of driven machine.
Control Relay	CA3DN	Used for auxiliary controls.
Overload Relay (OL)	9065 Melting Alloy or Bimetallic or 9055 Magnetic	Current sensing devices which detects overload condition and removes motor from source of power. Relays are hand reset type.
Short Circuit Protection	Per Horsepower Rating	Fused knife switch.
Surge Suppressor	MOV Type	Connected across motor shunt field to provide voltage discharge path when field is opened.
Dynamic Braking Contactor (DB)	7004, Type M	Inserts a resistor in motor armature circuit when armature is disconnected from power source. With shunt field energized this causes motor to run as a loaded generator which makes it to come to a quick stop.

Elementary Wiring Diagrams

Constant Speed, DC Starter



Adjustable Speed, DC Starter



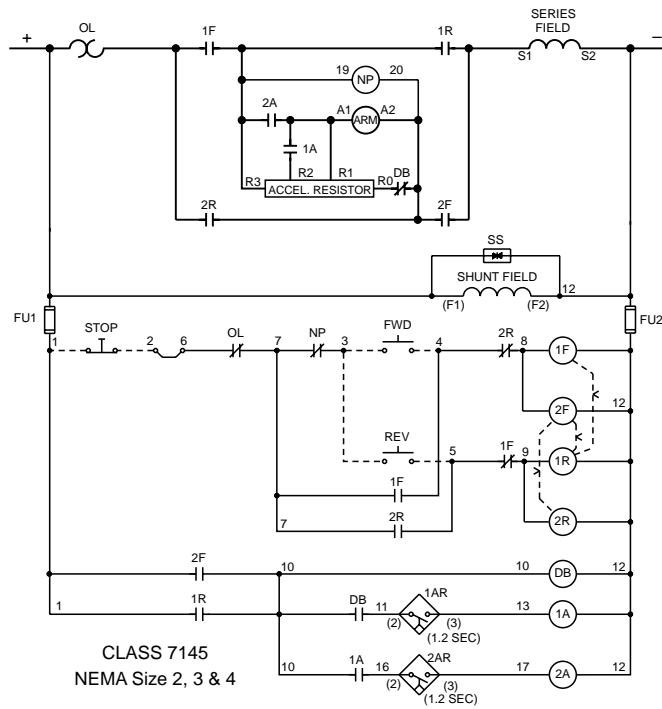
CLASS 7135, 7136,
7145, 7146



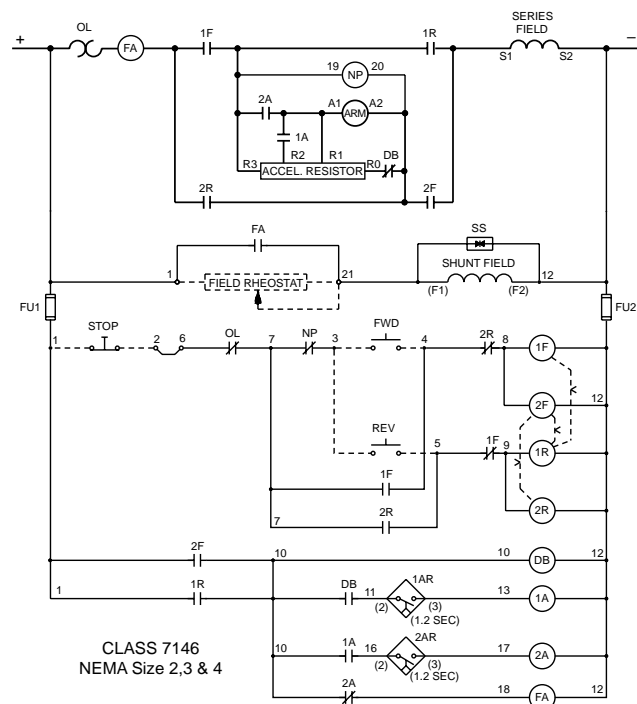
Crane Control Class 7135, 7136, 7145, 7146 DC Reduced-Voltage Motor Starters

ELEMENTARY WIRING DIAGRAMS

Reversing, Constant Speed, DC Starter



Reversing, Adjustable Speed, DC Starter



CLASS 7135, 7136,
7145, 7146



Crane Control Class 7135, 7136, 7145, 7146
 DC Reduced-Voltage Motor Starters

APPROXIMATE DIMENSIONS

Figure 1

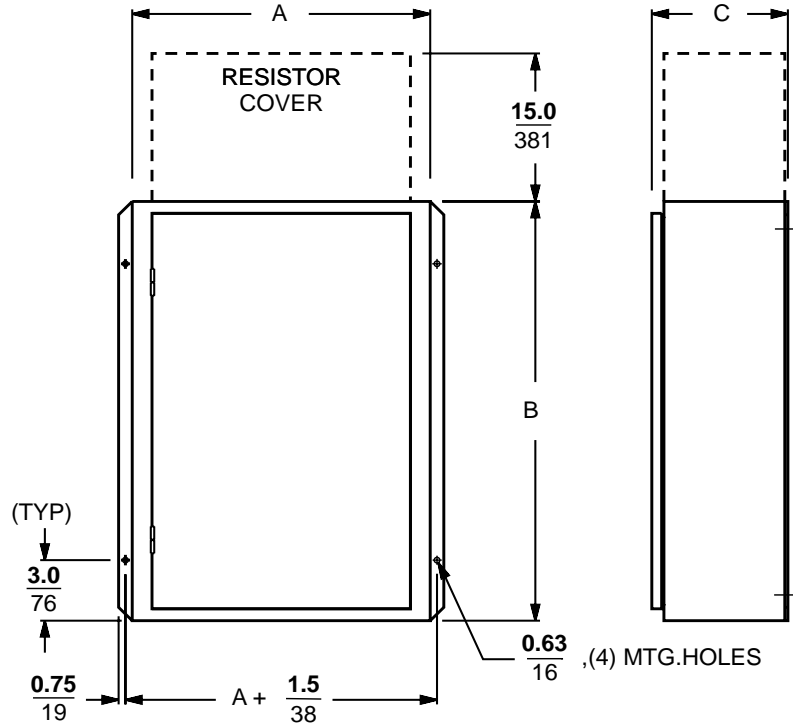
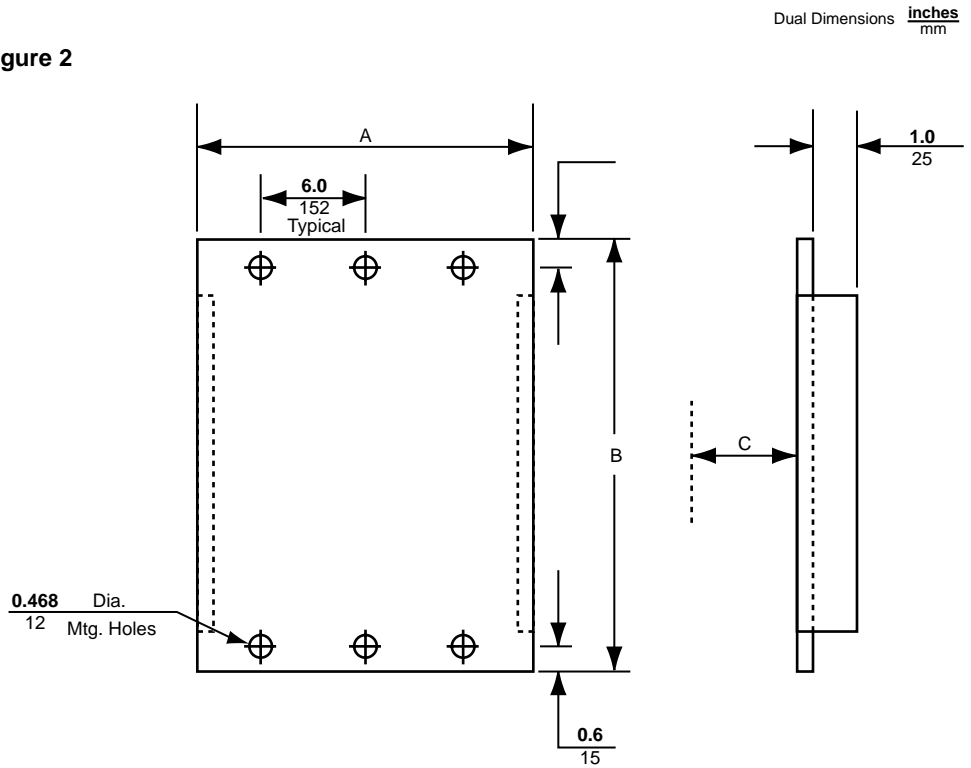


Figure 2



CLASS 7135, 7136,
 7145, 7146



Crane Control Class 7135, 7136, 7145, 7146 DC Reduced-Voltage Motor Starters

APPROXIMATE DIMENSIONS AND WEIGHTS

The panel space shown in table below is the number of optional devices (listed in modification price table) that can be added to a standard starter. If more optional devices are required, consult factory.

The resistor cover shown in the outline drawing is for NEMA Size 3 and larger starters. NEMA Size 1 and 2 starters do not require a resistor cover since resistors are mounted on starter panel.

Class 7135, 7136, 7145, 7146 NEMA Type 1G, 12, & Open

Class	Description		Figure 1				Figure 2				
			MCA1 MCS1	MDA1 MDS1	MEA1 MES1	MFA1 MFS1	MCO1	MDO1	MEO1	MFO1	
7135	Dimensions	A	inch	24	24	26	26	20.4	20.4	22.2	22.2
			mm	610	610	660	660	518	518	564	564
		B	inch	32	32	42	42	30	30	40	40
			mm	813	813	1067	1067	762	762	1016	1016
		C	inch	13.6	13.6	13.6	13.6	9.4	9.4	10.5	10.5
			mm	345	345	345	345	239	239	267	267
	Panel Space			4	3	3	3	4	3	3	3
	Weight	Pounds		73	97	134	134	31	43	47	47
		Kilograms		33	43	60	60	14	19	21	21
	7136	Dimensions	A	inch	24	24	26	26	20.4	20.4	22.2	22.2
mm				610	610	660	660	518	518	564	564
B			inch	32	32	42	42	30	30	40	40
			mm	813	813	1067	1067	762	762	1016	1016
C			inch	13.6	13.6	13.6	13.6	9.4	9.4	10.5	10.5
			mm	345	345	345	345	239	239	267	267
Panel Space			3	2	2	2	3	2	2	2	
Weight		Pounds		73	97	134	134	31	43	47	47
		Kilograms		33	43	60	60	14	19	21	21
7145		Dimensions	A	inch	26	26	32	32	22.2	22.2	29.3	29.3
	mm			660	660	813	813	564	564	744	744
	B		inch	42	42	52	52	40	40	50	50
			mm	1067	1067	1320	1320	1016	1016	1270	1270
	C		inch	13.6	13.6	13.6	13.6	9.4	9.4	10.5	10.5
			mm	345	345	345	345	239	239	267	267
	Panel Space			4	3	3	3	4	3	3	3
	Weight	Pounds		73	97	134	134	31	43	47	47
		Kilograms		33	43	60	60	14	19	21	21
	7146	Dimensions	A	inch	26	26	32	32	22.2	22.2	29.3	29.3
mm				660	660	813	813	564	564	744	744
B			inch	42	42	52	52	40	40	50	50
			mm	1067	1067	1320	1320	1016	1016	1270	1270
C			inch	13.6	13.6	15	15	9.4	9.4	10.5	10.5
			mm	345	345	381	381	239	239	267	267
Panel Space			3	2	2	2	3	2	2	2	
Weight		Pounds		73	97	134	134	31	43	47	47
		Kilograms		33	43	60	60	14	19	21	21

CLASS 7135, 7136,
7145, 7146



Crane Control Class 7135, 7136, 7145, 7146

CLASS 7135, 7136,
7145, 7146



Crane Control Class 8501



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SQUARE D
GROUPE SCHNEIDER

Crane Control Class 8501

Type SZF Frequency Relay



Class 8501 Type SZF1
Frequency Relay

PRICING INFORMATION AND APPLICATION DATA

Class 8501 Type SZF Static Frequency Sensitive Relays are recommended for use in AC wound rotor motor circuits to monitor motor rotor frequency and operate an output relay at a specific programmed frequency.

- User programmable
- Frequency set points for relay pick-up and drop-out
- Output relay contact is user programmable as normally open or normally closed (as supplied from factory)
- Indicating light monitors output contact status

Application Data

The Class 8501 Type SZF1 Frequency Relay is a solid state, frequency sensitive device. The relay is capable of detecting and annunciating (through an output contact operation) that the input frequency is above, below, or within selected bounds. An indicating light is used to denote the state of the output contact. A removable cover allows access to the programmable, 12 position, DIP switch to set the frequency set points and mode of operation.

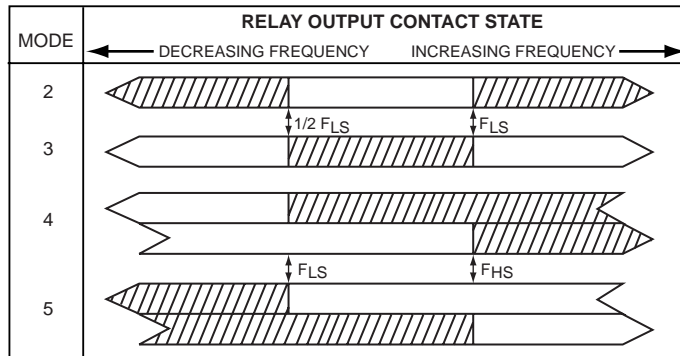
The relay is a general purpose control device. However, it is specifically intended to be used as an acceleration, plugging, overspeed, or non-hoist relay on AC crane controllers where the relay detects the frequency of the rotor voltage of a wound rotor motor.

The programmable frequency set points F_{LS} (low set frequency) and F_{HS} (high set frequency) are defined by the following equations:

$$F_{LS} = 6 \text{ Hz} + A \text{ Hz} \quad (A = 1 \text{ thru } 127 \text{ in increments of } 1)$$

$$F_{HS} = F_{LS} + B \text{ Hz} \quad (B = 2, 5, 20, 22, 23, 25, 40, \& 43)$$

NOTE: F_{HS} only applies to modes 4 and 5.



□ denotes contacts (terminals 11-12) open
 ▨ denotes contacts (terminals 11-12) closed

Type	Price
SZF1	\$ 693.
Input voltage range	0 - 1250 VAC
Input frequency range	0 - 200 Hz
Relay output range	1.5 A @ 120 VAC or 230 VDC
Operating temperature	- 20° C to + 70° C
Power supply	30 VAC @ 50 - 60 Hz, 5 VA

NOTE: Maximum continuous voltage input is 600 VAC

Factory Installed Modifications

Form	Description	Price
B	Relay mounted on replacement ZF relay base.	\$ 72.
BP ▲	Relay mounted on replacement ZF relay base with power supply and fuse. Power supply can be used to power 4 additional SZF relays.	297.

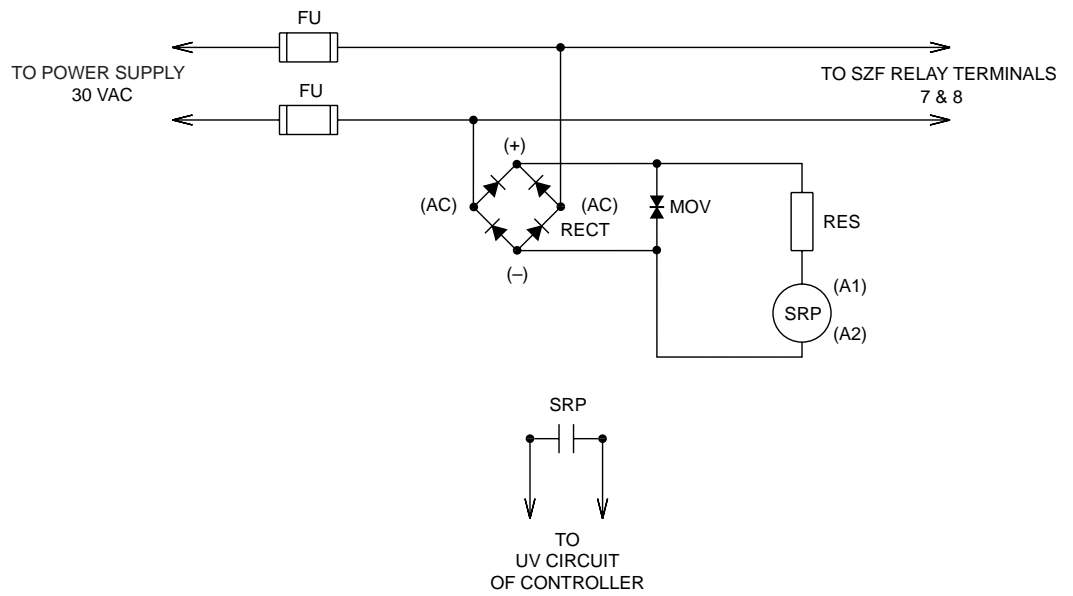
▲ Power supply is 230/460 VAC @ 50 - 60 Hz 30 VA

CP9B Discount Schedule

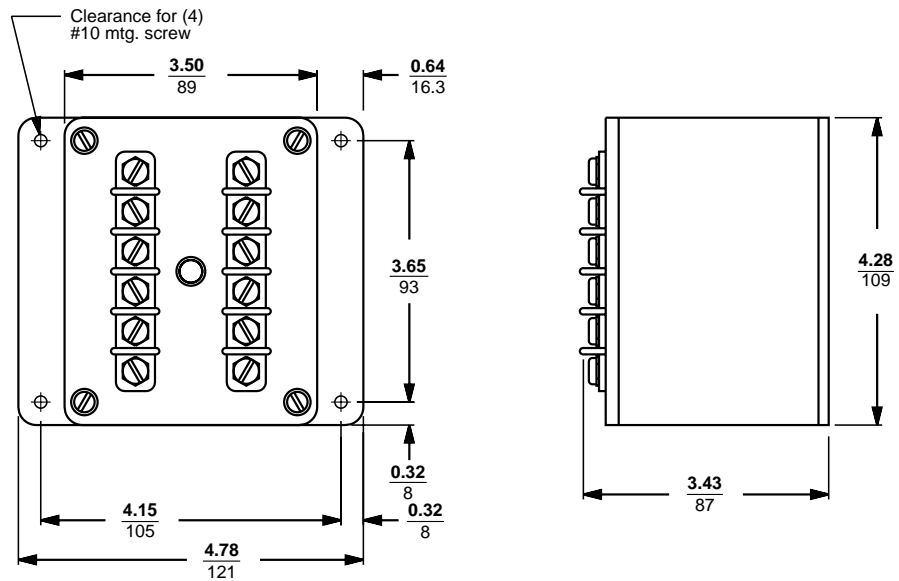
Crane Control Class 8501 Type SZF Frequency Relay

APPLICATION DATA

Suggested Circuit



APPROXIMATE DIMENSIONS



Dual Dimensions $\frac{\text{inches}}{\text{mm}}$

Ordering Information Required:

1. Class
2. Type
3. Form





Crane Control Class 8503



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SQUARE D
GROUPE SCHNEIDER

Crane Control Class 8503

Type M LINE-ARC® AC Contactors

CLASS 8503



Class 8503
Type MXDO1 Contactor



Class 8503
Type MGO1 Contactor

GENERAL INFORMATION AND PRICING

Type M AC magnetic, mill type, clapper contactors are especially designed for heavy industry AC drives such as cranes and mill auxiliaries. These contactors are ideally suited for the control of AC motors. The basic contactor is furnished with a DC operating coil.

- Front connected
- High strength glass polyester insulating base for steel base mounting
- LINE-ARC® method of arc extinction for longer tip life
- DC operating coil

Basic Contactor

The basic contactor is furnished without power lugs, electrical or mechanical interlocks.

Maximum VAC	Number of Poles ▲	NEMA Size	Open 8 Hr Ampere Rating	Open Type ●	
				Type	Price ★
600	Single Pole Normally Open	2	50	MXDO1	\$ 371.
		3	100	MEO1	621.
		4	150	MFO1	753.
		5	300	MGO1	1017.
		6	600	MHO1	1908.

- ▲ See contactor Application Data for double pole contactors.
- See Class 9998 for coil data.

Factory Installed Modifications

Form	Description	NEMA Size	Price ★
Y781	Silver Faced Power Contact Tips	2	\$ 179.
		3	282.
		4	289.
		5	439.
		6	598.

Ordering Information Required:

1. Class
2. Type
3. Form
4. Coil Voltage

Accessory Kits For User Installation

Class 9999 user modification kits include all necessary mounting hardware and installation instructions.

NEMA Size	Mechanical Interlock ●		Tie Bar ●		Power Lug ▲	
	Type	Price ★	Type	Price ★	Type	Price ★
2	MM1	\$ 102.	MT1	\$ 36.	...	
3 & 4	MM2	102.	MT2	36.	ML1	\$ 36.
5	MM3	144.	MT3	36.	ML2	60.
6	MM4	180.	MT4	60.	ML3	138.

- ▲ Contains four clam shell type lugs. For copper conductors only.
- Two tie bar kits are required for each triple pole contactor.
- For use with normally-open contactors only.

NEMA Size	Electrical Interlock (one N.O. and one N.C. contact)	
	Type	Price ◇
2 to 6	MX11	\$93.

- ★ CP9B
- ◇ CP9C

Ordering Information Required:

1. Class
2. Type

CP9B CP9C

 Discount Schedule

APPLICATION DATA

Mounting

The Type M contactor with its insulated base can be mounted directly on uninsulated steel panels, angle iron frames, etc. The contactors are completely front-connected.

Wiring

The NEMA Sizes 2 through 5 Type M contactors have a wire accessway in the base for convenient out-of-the-way routing of cables and control wires. Power connections to the NEMA Sizes 3 through 6 contactors can be made from either side.

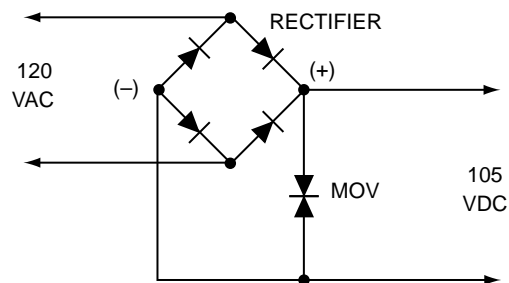
Coil Data

Operating coils are designed in accordance with NEMA standards to withstand 110% of rated voltage continuously and to operate the contactor successfully at 80% of rated voltage. Standard coil voltages are 120 VDC and 240 VDC. For other available coil voltages, refer to the Class 9998 Coil Data Catalog Sheet.

AC to DC Control Voltage Conversion

To control the DC contactor coil from a 120 VAC supply, order each double pole contactor, with 60 VDC coil or for triple pole contactors, order each contactor with a 36 VDC coil.

Connect the rectifier and suppressor (MOV) as shown.



Rectifier part no. is 27907-34220 (800 PIV, 30 A)

MOV part no. is 52906-028-59

Double Pole and Triple Pole Contactors

Double pole, normally open contactors can be built by ordering two single pole, normally open contactors with half voltage coils and one tie bar kit. The two coils must be wired in series.

Triple pole, normally open contactors can be built by ordering three single pole, normally open contactors with one third voltage coils and two tie bar kits. The three coils must be wired in series.

User Modification Kits

A number of Class 9999 user modification kits are available for use with Type M Contactors. Power contact tip parts kits are listed under Class 9998.

Maximum Number of Accessories and Accessory Combinations for Single Pole, Normally Open Contactors

Two electrical interlock kits and any one of the following:

- Two mechanical interlock kits
- One tie bar kit and one mechanical interlock kit



Crane Control Class 8503

Type M LINE-ARC® AC Contactors

CLASS 8503

APPLICATION DATA

Electrical Interlocks

Control circuit interlocks are available in units of one normally open and one normally closed contacts. On each single pole normally open and normally closed contactor a maximum of two interlock kits can be mounted. Interlock kits include the movable and stationary contacts plus all necessary hardware for mounting.

Electrical interlocks are rated in accordance with NEMA Standard ICS- 2-125 (A600 and N600 Table Ratings).



Class 9999 Type MX11
Electrical Interlock Kit

A600	Maximum Continuous Amperes	Maximum Make and Break Current A ▲							
		120V		240V		480V		600V	
		Make	Break	Make	Break	Make	Break	Make	Break
AC	10	60	6	30	3	15	1.5	12	1.2

N600	Maximum Continuous Amperes	Maximum Make and Break Current A ▲					
		125V		250V		600V	
		Make	Break	Make	Break	Make	Break
DC	10	2.2	2.2	1.1	1.1	0.4	0.4

▲ Make and break ratings apply for double-throw contacts only when both the normally open and normally closed contacts are connected to the same polarity.

Mechanical Interlock

A horizontal mechanical interlock is available for mounting between two double or triple pole tied normally open contactors mounted side by side. This interlock prevents the two contactors from operating simultaneously.



Class 9999
Type MM2
Mechanical
Interlock Kit

Lugs

Type M contactors are furnished without power lugs. A kit is available consisting of lugs and hardware for mounting on Size 3 and larger contactors. No power lug kits are available for the NEMA Size 2 contactors. This contactor is designed to use lugs supplied by the user.

Lug Wire Capacity

Lug Type ▲	Minimum Wire Size	Maximum Wire Size
ML1	Number 8	Number 00
ML2	Number 0	300 MCM
ML3	250 MCM	500 MCM

▲ Contains four clam shell type lugs. For copper conductors only.

Power Contact Tips

A Class 9998 power contact tips part kit consists of movable and stationary contact tips with necessary mounting hardware for two single pole contactors. Consult Catalog Section 9998 for additional information.

Copper contact tips are standard. Silver-faced contact tips are available and are recommended for applications where the contactors remain closed for long periods of time. Silver-faced contact tips are standard on crane manual-magnetic disconnect switches.

Tie Bar

Applications requiring double and triple pole Type M contactors can be met by supplying single pole (normally open only) contactors with tie bars. The tie bar is made from an insulating material and connects the armatures of the contactors together. For double and triple pole contactors, it is recommended that the operating coils be connected in series. Each coil should be rated for one half of system voltage for double pole contactors and one third of system voltage for triple pole contactors.



APPLICATION DATA

Class 9999 AI1 Arc Suppressor

The Class 9999 AI1 arc suppressor is designed to reduce arcing of pilot devices in DC inductive control circuits of 250 VDC or less.

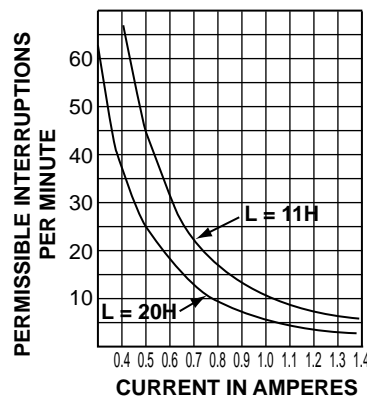


**Class 9999
Type AI1
Arc Suppressor**

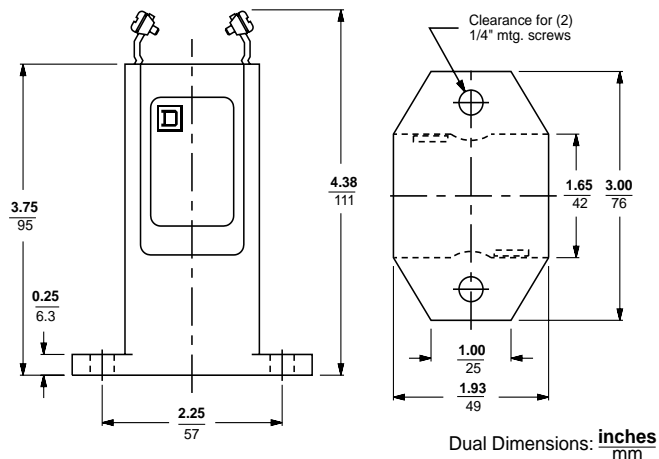
Type	Price
AI1	\$111.

The AI1 arc suppressor will limit the inductive voltage surge to a maximum of 600 VDC when applied in accordance with the application chart. When applying the arc suppressor to a circuit, two factors must be considered, the current drawn by the inductive load and the number of times per minute that the load will be interrupted. Once these two factors are determined, the application is checked against the application chart. The chart shows the maximum interruptions per minute that the arc suppressor can handle at a given current. As long as an application falls below the curve, the arc suppressor will handle the load. The arc suppressor is connected in parallel with the inductive load and is in the circuit at all times.

Application Chart For AI1 Arc Suppressor



Approximate Dimensions and Weights



Net Weight – 1 lb (0.45 kg)

Ordering Information Required:

1. Class 9999
2. Type AI1

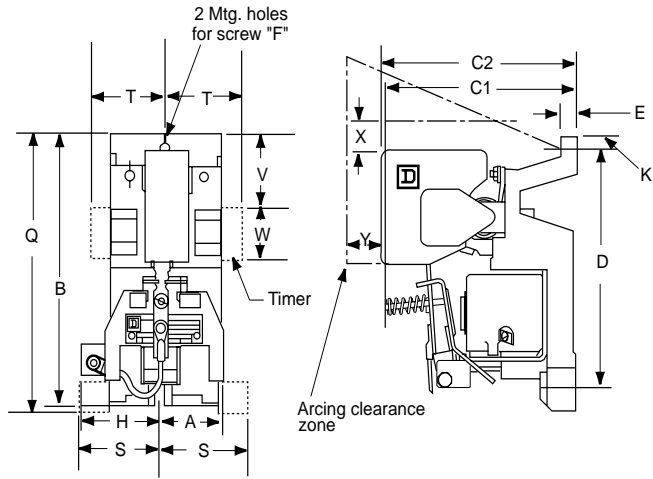
CP9B Discount Schedule



Crane Control Class 8503
Type M LINE-ARC® AC Contactors

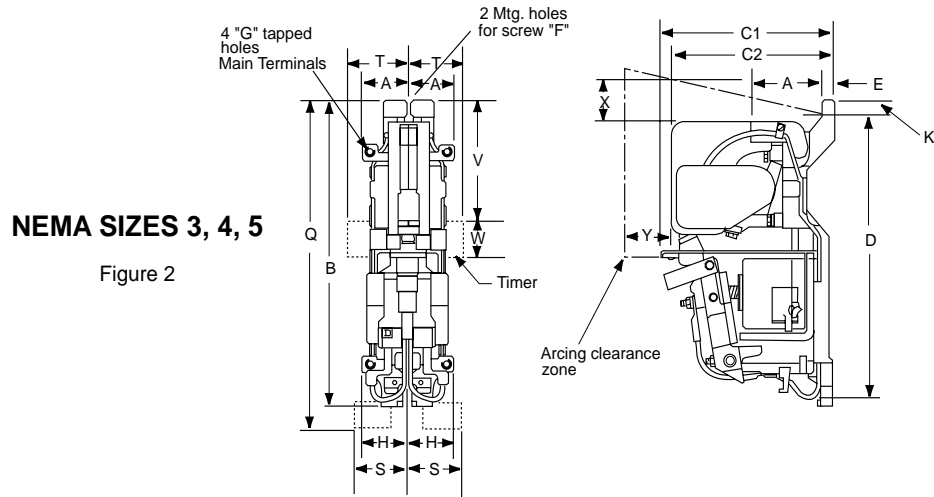
CLASS 8503

APPROXIMATE DIMENSIONS



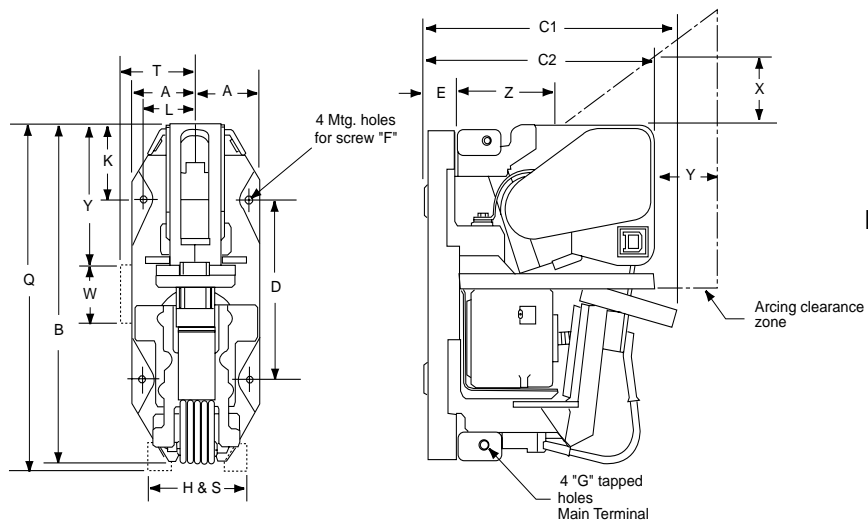
NEMA SIZE 2

Figure 1



NEMA SIZES 3, 4, 5

Figure 2



NEMA SIZE 6

Figure 3

Crane Control Class 8503 Type M LINE-ARC® AC Contactors

APPROXIMATE DIMENSIONS AND WEIGHTS

NEMA Size	Type	Fig. No.	Contactor Dimensions ▲											Weight	Center to Center Spacing of S.P. Tied or Mechanically Interlocked Contactors
			A	B	C1	C2	D	E	F	G	H	K	L		
2	MXDO1	1	<u>1.79</u> 46	<u>8.65</u> 220	<u>6.00</u> 153	<u>6.38</u> 162	<u>7.56</u> 192	<u>0.52</u> 13	<u>0.25</u> 6	...	<u>2.29</u> 58	<u>0.44</u> 11	...	<u>7</u> 3	<u>5.63</u> 143
3	MEO1	2	<u>2.12</u> 54	<u>13.10</u> 333	<u>7.83</u> 199	<u>7.40</u> 188	<u>11.50</u> 292	<u>0.56</u> 14	<u>0.375</u> 10	5/16-18	<u>2.13</u> 55	<u>0.80</u> 20	...	<u>15</u> 7	<u>6.00</u> 153
4	MFO1		5	<u>2.75</u> 70	<u>16.54</u> 420	<u>9.50</u> 242	<u>9.68</u> 246	<u>14.50</u> 368	<u>0.96</u> 25	<u>0.375</u> 10	3/8-16	<u>2.78</u> 71	<u>1.02</u> 26	...	<u>30</u> 14	7.00 178
6	MHO1	3	<u>3.50</u> 89	<u>19.15</u> 487	...	<u>13.64</u> 346	<u>6.00</u> 153	...	<u>0.375</u> 10	1/2-13	<u>2.85</u> 73	<u>8.30</u> 211	<u>2.94</u> 75	<u>70</u> 32	<u>9.00</u> 229

NEMA Size	Type	Fig. No.	Accessory Dimensions ▲		Arcing Clearance								
			Electrical Interlock		240 VAC			460 VAC			600 VAC		
			Q	S	X	Y	Z	X	Y	Z	X	Y	Z
2	MXDO1	1	<u>9.98</u> 253	<u>2.34</u> 60	<u>1.70</u> 43	<u>1.70</u> 43	...	<u>2.30</u> 59	<u>2.30</u> 59	...	<u>3.00</u> 76	<u>3.00</u> 76	...
3	MEO1	2	<u>13.74</u> 349	<u>2.43</u> 62	<u>2.00</u> 51	<u>2.00</u> 51	<u>4.00</u> 102	<u>2.00</u> 51	<u>3.00</u> 76	<u>4.00</u> 102	<u>2.00</u> 51	<u>6.00</u> 153	<u>4.00</u> 102
4	MFO1		5	<u>16.72</u> 424	<u>2.60</u> 66	<u>2.00</u> 51	<u>2.00</u> 51	...	<u>2.00</u> 51	<u>3.00</u> 76	...	<u>2.00</u> 51	<u>6.00</u> 153
6	MHO1	3	<u>18.54</u> 471	<u>2.43</u> 62	<u>2.00</u> 51	<u>2.60</u> 66	<u>3.50</u> 89	<u>3.00</u> 76	<u>7.00</u> 178	<u>3.50</u> 89	<u>4.00</u> 102	<u>11.00</u> 280	...

The table below lists recommended minimum enclosure sizes for single pole – 460 VAC contactors with contactor mounted accessories. For triple pole contactors, increase width by 75%.

NEMA Size	Height	Width	Depth
2	<u>12.00</u> 305	<u>18.00</u> 457	<u>12.00</u> 305
3 4	<u>18.00</u> 457	<u>18.00</u> 457	<u>12.00</u> 305
5	<u>22.00</u> 559	<u>22.00</u> 559	<u>15.00</u> 381
6	<u>32.00</u> 813	<u>27.00</u> 686	<u>22.00</u> 559

▲ Electrical interlocks and all live electrical parts must have a $\frac{0.50}{13}$ clearance to ground and other live electrical parts.

Dual Dimensions: in
mm

Dual Weights: lb
kg

CLASS 8503





Crane Control Class 9004



CLASS 9004

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SQUARE D
GROUPE SCHNEIDER

Crane Control Class 9004 Master Switches

PRICING AND ORDERING INFORMATION

The standard master switch is supplied with a standard operating handle arranged for right hand operation.

VM Master Switch

Maximum Number of Circuits Including Off-Position Reset	Number of Speed Points Each Direction	Open type		General Purpose Enclosure NEMA Type 1	
		Type	Price	Type	Price
9	1-6	VO9	\$ 1374.	VG9	\$ 1586.
12		VO12	1586.	VG12	1850.
16		VO16	2471.	VG16	2879.

CM Master Switch

Maximum Number of Circuits Including Off-Position Reset	Number of Speed Points Each Direction	General Purpose Enclosure NEMA Type 1	
		Type	Price
8	2-6	CG8	\$ 1820.
12		CG12	2142.
16		CG16	3110.

Control Type Identification

Control Class	Controller		Control Type ▲
	Description	Class and Type of Contactor Used	
6121	Hoist	7004 M	W
6121	Travel		U
6131	Hoist	7004 M	Y or W
6131	Travel		Z or U

▲ For standard control scheme.

Modifications

Description	Optional Feature Form Letter	Price addition	
		VM	CM
Left hand operation	L	N.C.	N.C.
Spring return to off point	S	\$ 296.	\$ 296.
Push button in handle-N.O. contact (reduce the number of circuits available by one)	B	552.	552.
Off point mechanical latch	O	482.	...
Short 24 in high enclosure	E	N.C.	...

Application Data

Contact Ratings

VDC	DC Amperes		VAC	AC Amperes		
	Continuous	Interrupting		Inrush	Continuous	Interrupting
115	15	1.5	120	30	15	10
230	15	0.9				

How to Order: Example

To Order Specify:	Catalog Number Example		
● Class Number	Class	Type	Form(s)
● Type Number ▲			
● Form(s)	9004	VG12W5	S

▲ Consists of master switch type, control type identification and the number of speed points.

Ordering Information Required:

1. Class
2. Type
3. Form
4. If for use with controller other than Square D, specify number of speed points and contact arrangement in addition to Class and Type numbers.

CP9A Discount Schedule

CLASS 9004



Class 9004 Type VG12 Master Switch



Class 9004 Type CG12 Master Switch

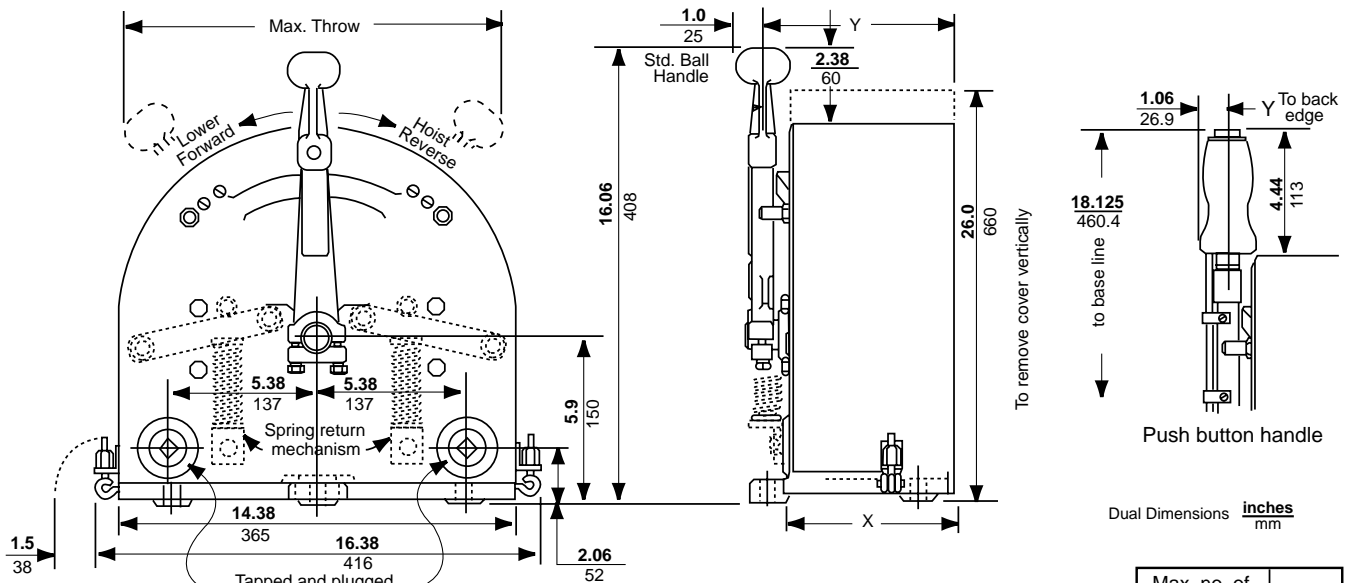


ORDERING INFORMATION

(CIRCLE ONE)							(CIRCLE ONE)						
REVERSE OR HOIST							FORWARD OR LOWER						
6	5	4	3	2	1	OFF	1	2	3	4	5	6	

APPROXIMATE DIMENSIONS AND WEIGHTS

CM Master Switch



Type	X	Y ▲	Net weight lbs (kg)
CG8	$\frac{6.187}{157}$	$\frac{7.0}{178}$	58 (26.1)
CG12	$\frac{7.31}{186}$	$\frac{8.125}{206}$	63 (28.4)
CG16	$\frac{8.44}{214}$	$\frac{9.25}{235}$	70 (31.5)

▲ Add 1.37" (35) to "Y" dimension for Master Switch with Off-point latch handle.

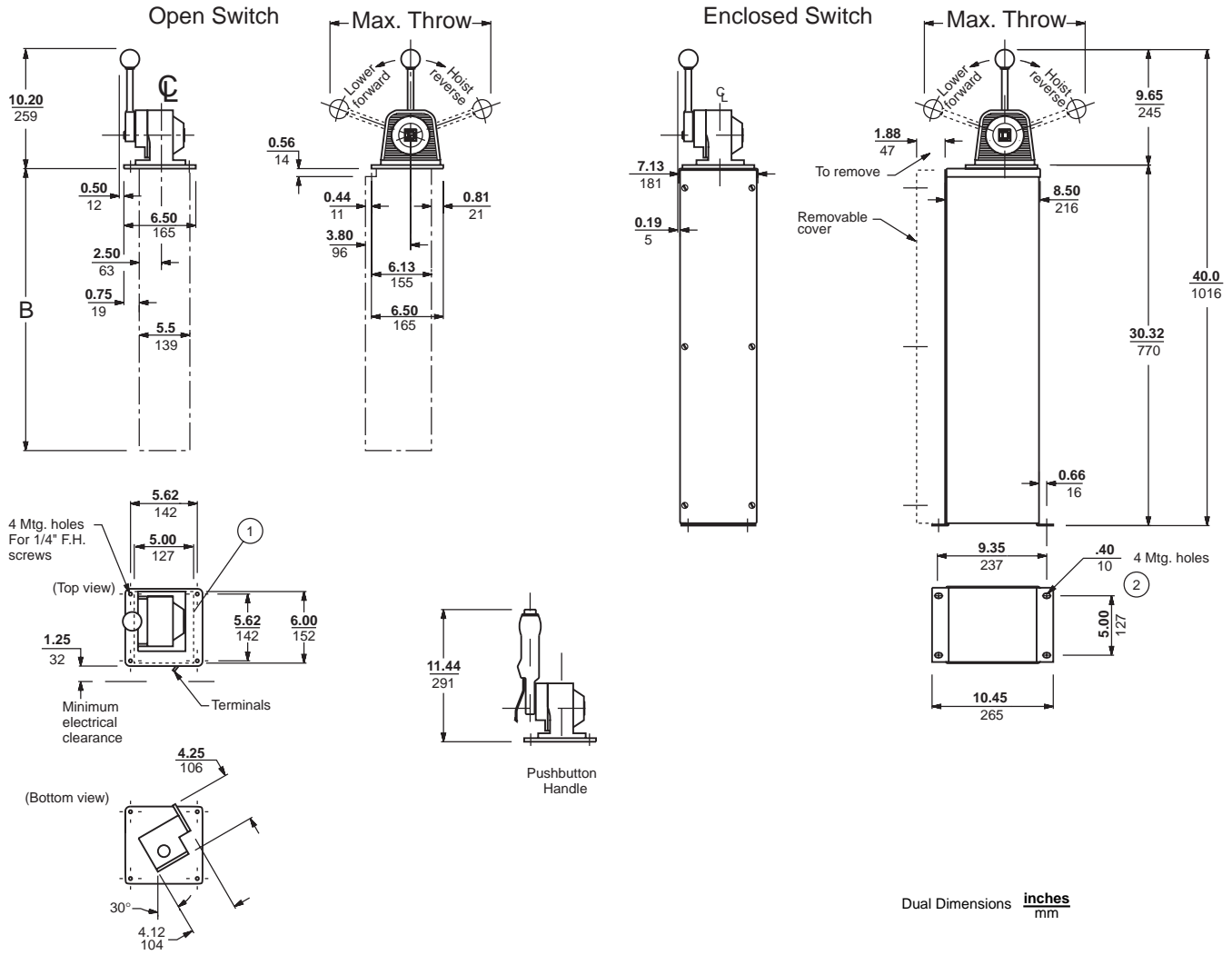
Max. no. of Speed points in each direction	Max. throw
1-2	$\frac{6.5}{165}$
3	$\frac{8.44}{214}$
4	$\frac{10.38}{264}$
5	$\frac{12.19}{310}$
6	$\frac{13.5}{343}$



Crane Control Class 9004 Master Switches

APPROXIMATE DIMENSIONS AND WEIGHTS

VM Master Switch



Dual Dimensions $\frac{\text{inches}}{\text{mm}}$

Dashed line represents 5" x 6" cutout in bench board up to .25" thick. The switch must be turned approximately 30° during withdrawal through cutout for clearance of lower part.

Mounting straps may be turned at right angle to position shown.

Master switches are shown for right hand operation. For left hand operation, the orientation of handle and gear box is reversed.

Open Master Switch			Enclosed Master Switch	
Type	B+ (in/mm)	Net Weight, lbs (kg)	Type	Net Weight, lbs (kg)
VO9	15.25 (387)	19 (8.6)	VG9	53 (24.1)
VO12	18.63 (473)	22 (10)	VG12	56 (25.5)
VO16	23.13(587)	25 (11.4)	VG16	59 (26.8)

+ Add 1.38 in (35 mm) to "B" dimension for master switch with spring return.

Maximum Number of Speed Points In Each Direction	Maximum Throw (in/mm)
1	3.5 (89)
2	7.88 (200)
3	10.00 (254)
4	11.75 (298)
5	13.25 (337)
6	14.25 (362)

CLASS 9004

Crane Control Class 9004 Pendant Push Button

PRICING AND APPLICATION DATA

Each station consists of:

- 1 Pilot light
- 1 Momentary contact start/reset button
- 1 Momentary contact stop button
- 2 Mechanically interlocked speed control push buttons for each crane motion (Standard position of push buttons for each crane motion from top to bottom is as follows: Bridge – Forward, Reverse; Trolley – Forward, Reverse; Hoist – Up, Down)



Class 9004 Type PBC3
Pendant
Push Button Station

Number of Stepped Crane Motions	General Purpose Enclosure NEMA Type 1 ▲		Outdoor Enclosure NEMA Type 3R ▲	
	Type	Price	Type	Price
3	PBC3	\$ 3454.	WPBC3	\$ 3590.
4	PBC4	3860.	WPBC4	4025.
5	PBC5	4353.	WPBC5	4607.

▲ Consult factory for delivery.

Application Data

Controller Modifications

Class 9999 Type AI arc suppressors may be required. The contactor coil current ratings should be checked against the contact ratings shown in the table below.

Contact Ratings ▲

VAC	AC Amperes	VDC	DC Amperes
	Interrupting		Interrupting
120	3.0	125	1.1
		250	0.55

▲ 5 amperes continuous

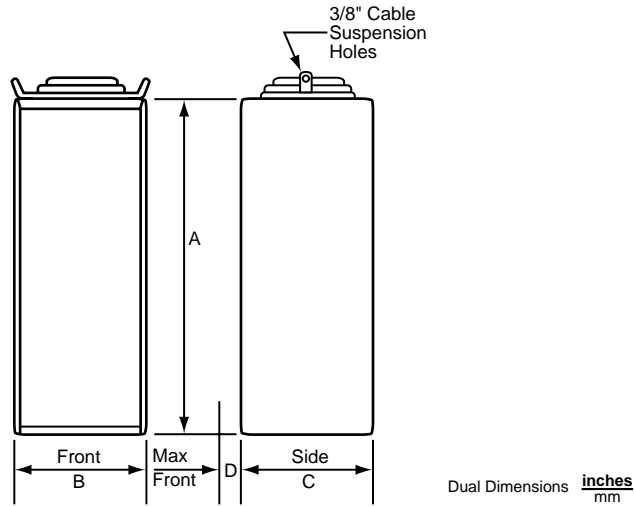
Push Button Selection Data

Each set of speed control push buttons for each crane motion will control up to 5 speed points and 7 circuits in each direction.



Crane Control Class 9004 Pendant Push Button

APPROXIMATE DIMENSIONS AND WEIGHTS



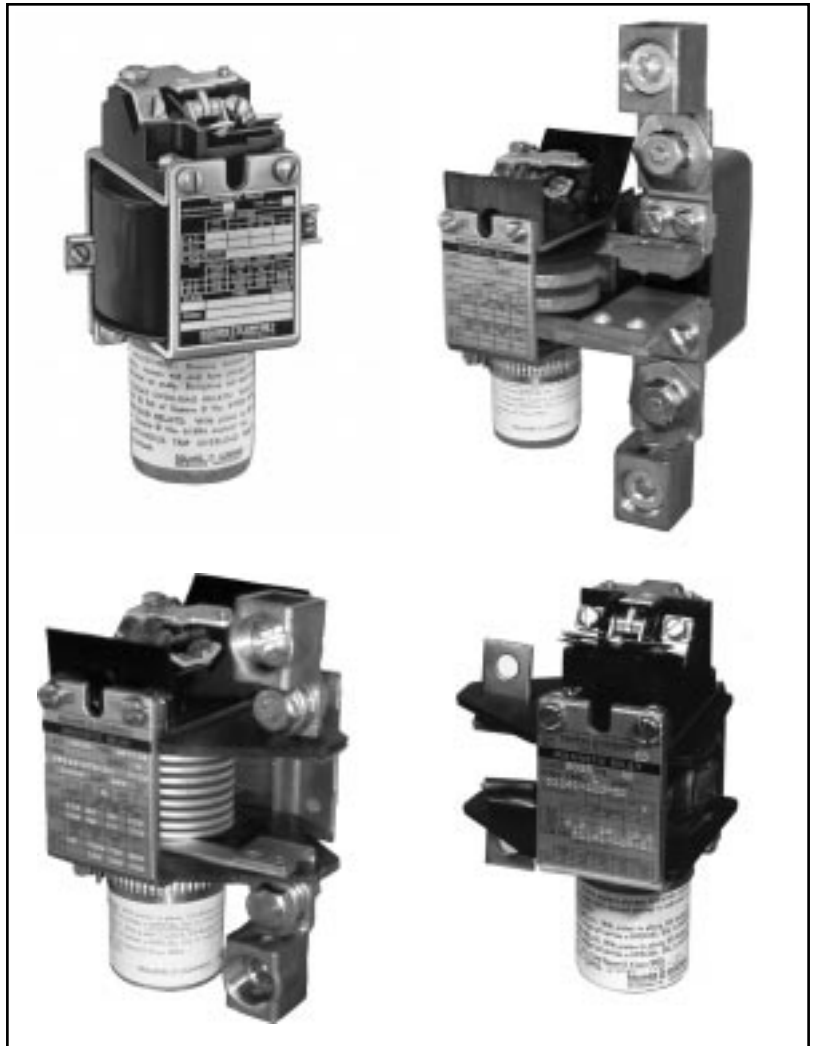
Type	A	B	C	D	Net Weight lbs (kg)
PBC3	25.6 650	3.1 79	3.4 86	0.5 13	12 (5.4)
PBC4	30.1 765	3.1 79	3.4 86	0.5 13	15 (6.8)
PBC5	34.8 884	3.1 79	3.4 86	0.5 13	17 (7.7)
WPBC3	22.3 566	4.0 102	4.0 102	0.75 19	19 (8.6)
WPBC4	26.3 668	4.0 102	4.0 102	0.75 19	24 (10.8)
WPBC5	32.0 813	4.0 102	4.0 102	0.75 19	29 (13.1)

Ordering Information Required:

1. Class
2. Type
3. Indicate the number of speed points for each crane motion.
4. If push button station is for use with existing or new Square D panels give wiring diagram number and/or Class and Type number of controller. If push button station is for use with other than Square D controller, supply elementary wiring diagram for each function it controls.
5. Specify position of speed control push buttons for each motion if order required is different than standard.



Crane Control Class 9055



CLASS 9055

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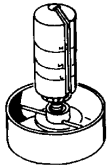
SQUARE D
GROUPE SCHNEIDER

Crane Control Class 9055

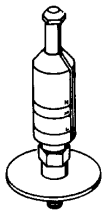
Magnetic Current Overload Relays



Type AO101-AO116



Type A



Type N



Type AO117-AO121



Type AO122-AO126



Type AO167-AO176

APPLICATION DATA

General

All Class 9055 magnetic current relays use the same basic frame. This frame supports a contact mechanism on the top and a dashpot on the bottom. When the relay picks up, a plunger is drawn upward into the coil until it stops against an insulated trip pin which operates a set of contacts.

The distance the plunger travels is adjustable by means of threading the plunger up or down on a threaded stud. Changing the distance between the pole piece and the plunger affects the current at which the relay will pick up. Relays are designed to be adjustable over a 2 to 1 range.

Coils range from tapewound versions with many turns of insulated wire to one with a single turn of bare copper busbar. In the lower current ranges, up to a continuous current of 20 amperes AC, coils are all tapewound with self-supporting terminals one on each side of coil (See AO101-AO116).

In higher current ranges, coils are designed either to have their terminals supported by insulating washers standing free of the mounting panel (See AO117-AO121 and AO122-AO126), or to have their terminals flush with the mounting surface of the relay so that they can be bolted onto an insulating panel and wired from the back of the panel (See AO167-AO176).

Inverse Time Delay Type A

A time delay which decreases in proportion to the amount of overcurrent is provided by means of a piston attached to the plunger which is submerged in oil in the dashpot. When the current through the coil becomes sufficient to pick up the plunger, the motion of the plunger is retarded while the oil flows around the piston as it moves towards the top of the dashpot. This time delay can be adjusted by changing the rate of flow of the oil through and around the piston. This is done by rotating a disk in the bottom of the piston so that one or more holes of various diameters are uncovered. The piston is equipped with a 1-way ball valve which opens when the piston drops through the oil so that drop out is almost instantaneous.

Several types of dashpot oil are available for these relays with different viscosities to produce different tripping times.

Type A relays are used to provide motor running overcurrent protection in applications where exceptionally long time delays are required or exceptionally high currents are encountered. Once the Type A relay has tripped, current must be reduced to a very low value before reset occurs.

Standard devices are supplied with a single normally closed contact which opens on increasing current and closes automatically when the current goes to zero.

Instantaneous Trip Type N

Type N relays do not have a piston on the end of the plunger and do not use dashpot oil. The bottom of the piston is equipped with a disc which guides the piston within the dashpot to maintain its vertical position.

Standard devices are equipped with a single normally closed contact which opens upon increasing current. Contacts reset automatically at approximately 80% of the trip current setting on AC, and approximately 67% on DC.

Instantaneous trip relays are normally used in applications where mechanical overloads are expected to occur with relative frequency or where motor circuits need to be protected from brief overload currents in excess of those detected by motor running overcurrent protection.

Application Data

Magnetic Current Relays, particularly in the lower current ranges, have a relatively high impedance. Because of this, a minimum horsepower rating of 1 1/2 HP is recommended for 3-phase motors and 1/2 HP for 1-phase motors. This recommendation is made to avoid the possibility of excessive voltage drop across the magnetic current relay which could interfere with the operation of the motor.

For Crane Control Applications:

Inverse time delay Type A relays are typically set @ 125% of motor full load current.

Instantaneous trip Type N relays are typically set @ 200% of motor full load current.



Crane Control Class 9055 Magnetic Current Overload Relays

GENERAL INFORMATION AND PRICING

Maximum Continuous Current		Trip Current Adjustment Range Auto or Hand Reset		Type A ◆		
				Open Type ●		Price
AC	DC	AC	DC	Steel Panel Mounting Type	Insulating Panel Mounting Type	
0.38 0.48 0.54 0.70	0.47 0.60 0.67 0.87	0.19-0.38 0.24-0.48 0.27-0.54 0.35-0.70	0.18-0.35 0.23-0.45 0.25-0.50 0.32-0.64	AO101 AO102 AO103 AO104		\$ 272.
0.74 1.04 1.4 2.0	0.92 1.30 1.75 2.5	0.37-0.74 0.52-1.04 0.7-1.4 1.0-2.0	0.34-0.68 0.48-0.96 0.65-1.3 0.93-1.8	AO105 AO106 AO107 AO108		272.
3.2 4.0 4.8 7.0	4.0 5.0 6.0 8.7	1.6-3.2 2.0-4.0 2.4-4.8 3.5-7.0	1.5-3.0 1.8-3.7 2.2-4.5 3.3-6.5	AO109 AO110 AO111 AO112		272.
8.0 10 12 20	10.0 12.5 15 25	4.0-8.0 5.0-10.0 6.0-12.0 10.0-20.0	3.7-7.5 4.7-9.3 5.6-11.1 9.3-18.6	AO113 AO114 AO115 AO116		272.
32 48 60	40 60 75	16.0-32.0 24.0-48.0 30.0-60.0	15.0-30.0 22.0-45.0 28.0-56.0	AO117R AO118R AO119R	AO167R AO168R AO169R	272.
80 120 160	100 150 200	40.0-80.0 60.0-120.0 80.0-160.0	37.0-75.0 56.0-110.0 75.0-150.0	AO120R AO121R AO122R	AO170R AO171R AO172R	293. 293. 396.
210 320	260 400	107.0-210.0 160.0-320.0	100.0-195.0 150.0-300.0	AO123R AO124R	AO173R AO174R	840. 840.
420 640	525 800	210.0-420.0 320.0-640.0	200.0-400.0 300.0-600.0	AO125R AO126R	AO175R ▲ AO176R ▲	840. 840.

Maximum Continuous Current ■		Trip Current Adjustment Range Auto Reset ■		Trip Current Adjustment Range Hand Reset ■		Type N		
						Open Type ●		Price
AC	DC	AC	DC	AC	DC	Steel Panel Mounting Type	Insulating Panel Mounting Type	
0.38 0.48 0.54 0.70	0.47 0.60 0.67 0.87	0.26-0.54 0.33-0.69 0.36-0.76 0.47-0.98	0.27-0.60 0.35-0.76 0.38-0.84 0.5-1.1	0.17-0.34 0.22-0.44 0.24-0.48 0.31-0.62	0.21-0.41 0.26-0.53 0.29-0.58 0.38-0.75	NO101 NO102 NO103 NO104		\$ 269.
0.74 1.04 1.4 2.0	0.92 1.30 1.75 2.5	0.5-1.1 0.7-1.5 0.9-2.0 1.4-2.9	0.53-1.2 0.75-1.6 1.0-2.2 1.5-3.1	0.33-0.65 0.46-0.92 0.62-1.24 0.9-1.8	0.4-0.8 0.56-1.12 0.75-1.5 1.1-2.2	NO105 NO106 NO107 NO108		269.
3.2 4.0 4.8 7.0	4.0 5.0 6.0 8.7	2.2-4.6 2.8-5.8 3.3-7.0 4.8-10.0	2.3-5.0 2.9-6.2 3.5-7.5 5.0-11.0	1.45-2.9 1.8-3.6 2.1-4.3 3.1-6.2	1.75-3.5 2.2-4.4 2.6-5.2 3.8-7.6	NO109 NO110 NO111 NO112		269.
8.0 10 12 20	10.0 12.5 15 25	5.6-11.6 7.0-14.5 8.4-17.5 14.0-29.0	5.8-12.4 7.3-15.5 8.8-18.7 15.0-32.0	3.6-7.2 4.5-9.0 5.4-10.8 9.0-18.0	4.4-8.8 5.4-10.8 6.5-13.0 11.0-22.0	NO113 NO114 NO115 NO116		269.
32 48 60	40 60 75	23.0-47.0 34.0-69.0 40.0-83.0	24.0-50.0 35.0-74.0 42.0-92.0	14.0-29.0 21.0-43.0 26.0-52.0	18.0-35.0 26.0-52.0 32.0-64.0	NO117R NO118R NO119R	NO167R NO168R NO169R	269.
80 120 160	100 150 200	56.0-117.0 82.0-170.0 110.0-220.0	59.0-125.0 85.0-182.0 115.0-230.0	36.0-72.0 52.0-104.0 72.0-144.0	44.0-88.0 64.0-128.0 88.0-176.0	NO120R NO121R NO122R	NO170R NO171R NO172R	293. 293. 416.
210 320	260 400	147.0-286.0 230.0-470.0	152.0-292.0 230.0-540.0	96.0-192.0 144.0-287.0	117.0-234.0 175.0-350.0	NO123R NO124R	NO173R NO174R	840. 840.
420 640	525 800	290.0-610.0 435.0-915.0	308.0-674.0 480.0-950.0	191.0-383.0 287.0-575.0	233.0-466.0 350.0-700.0	NO125R NO126R	NO175R ▲ NO176R ▲	840. 840.

- Relays rated 32 A and above (A, or NO 117R and higher) have both coil terminals on the right hand side as standard. Relays with right hand coil terminals can be field converted to the left hand side. Relays with left hand coil terminals can be ordered from the factory by changing the "R" in the type number to "L". Example: Class 9055 Type NO 117L.
- ▲ DC continuous ratings shown for these relays apply when coil terminals are front connected with suitable lugs. When back connected, DC ratings of Types 175 and 176 are 420 and 640 A, respectively.
- These relays should normally be adjusted to trip at a current value less than the listed maximum continuous current. In special applications requiring the use of a higher trip setting, care should be taken that the coil is not subjected to current in excess of its maximum continuous rating for any prolonged period.
- ◆ For crane applications use Type C2U dashpot oil and dashpot locking strap 750D107G1.

Ordering Information Required:

1. Class 2. Type 3. Form 4. Current setting (AC or DC)

CP9B		Discount Schedule
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



CLASS 9055

Crane Control Class 9055 Magnetic Current Overload Relays

PRICING INFORMATION AND APPLICATION DATA

Maximum Current Ratings for Control Circuit Contacts

Relay Type	Contact Arrangement	AC							DC			
		Volts	Inductive 35% Power Factor				Cont. A	Resistive 75% P.F. Make, Break and Cont. A	Volts	Inductive and Resistive		
			Make		Break					Make and Break		Cont. A
			A	VA	A	VA				A	VA	
A, N	 or  (Standard) (Form Y44)	120	60	7200	6	720	10	10	125	0.8	100	10
		240	30	7200	3	720	10	10	250	0.4	100	10
		480	15	7200	1.5	720	10	10	...	...	...	...
		600	12	7200	1.2	720	10	10	...	...	...	...

Maximum coil voltage all types 600 VAC 60Hz or 600 VDC.

Additional Dashpot Oil (Order by Class 9055 and Type Number)

1 oz Bottle (Sufficient for one relay)		1 Pint Container	
Type	Price	Type	Price ★
C2U ●	\$ 11.	C2P ●	\$ 44.
R2U ▲	9.	R2P ▲	36.
R10U	16.	R10P	96.
R11U	16.	R11P	108.

- ▲ Supplied as standard with type A relays.
- Recommended for crane applications.

Recommended Minimum Horsepower Ratings

To avoid excessive voltage drop, which may be encountered when using these magnetic relays with small motors, the following minimum horsepowers are recommended.

Motor Type	Minimum HP
3-Phase	1-1/2
1-Phase	1/2

Factory Modifications and Forms

Class 9055 Magnetic Current Relays

Description of Special Features	Form Letters	Price Addition (Per Relay) ★		
		Type A	Type B	Type N
		List Price	List Price	List Price
Hand Reset: On open type relay	H3	\$ 18.	...	\$ 18.
Substitute normally-open contact for normally-closed	Y44	12.	...	18.

Accessories

Description	Part Number	Price ◇
Dashpot locking strap. (Recommended on all crane applications or when subject to vibration.)	750D107G1	\$ 2.50
Mounting Bracket (Allows Types 101 thru 121 to be mounted from the front of panel)	750X103	7.00

CP9B CP9C Discount Schedule

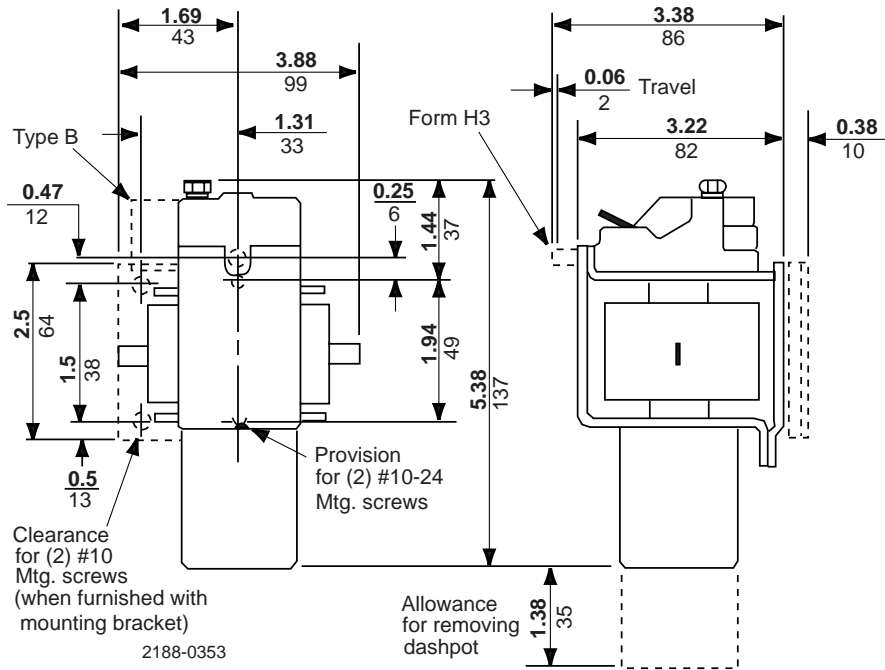
★ = CP9B
◇ = CP9C



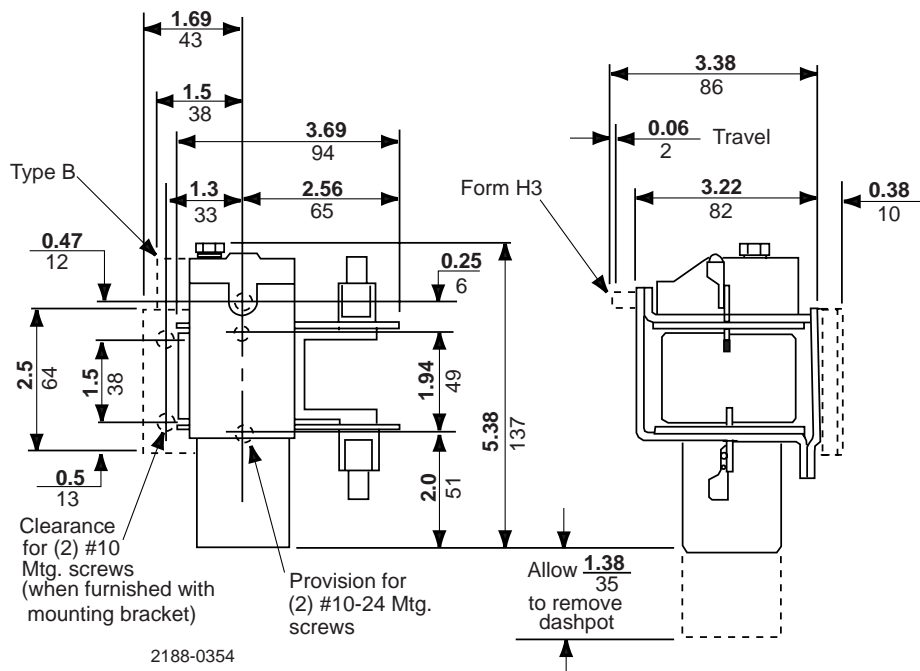
CLASS 9055

Crane Control Class 9055 Magnetic Current Overload Relays

APPROXIMATE DIMENSIONS AND WEIGHTS



Types AO101 thru 116, 191 thru 116
Weight – 4 lb (1.8 kg)



Types AO117R thru 121R, 117R thru 121R
Weight – 4 lbs (1.8 kg)

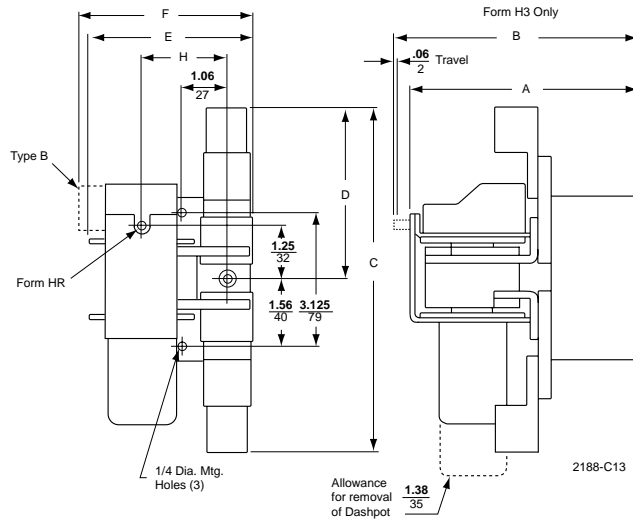
NOTE: Only right hand versions are shown. Dimensions also apply to left hand versions, except that all parts are assembled opposite to position shown. Dimensions to left and right of vertical centerline, therefore would be reversed.

CLASS 9055

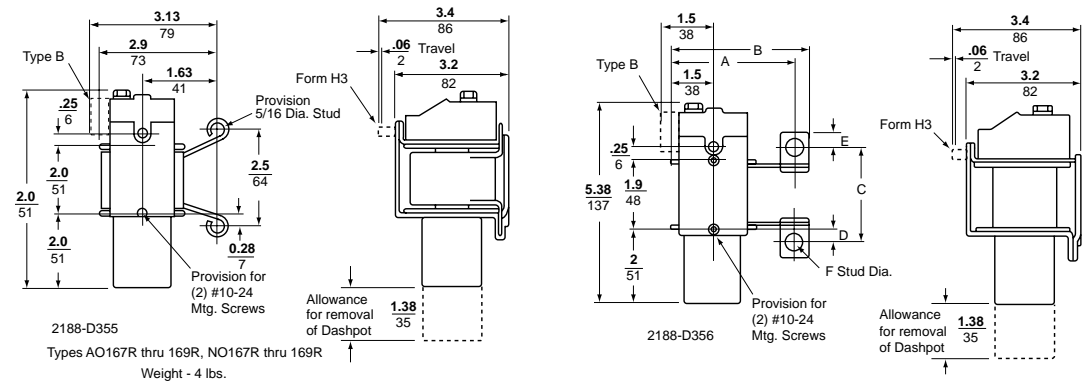


Crane Control Class 9055 Magnetic Current Overload Relays

APPROXIMATE DIMENSIONS AND WEIGHTS



Type ▲	Dimension								Shipping Weight lbs (kg)
	A	B	C	D	E	F	G	H	
AO122R	5.41 137	5.59 142	8.38 213	4.19 106	3.81 97	...	0.56 14	2.0 51	5 (2.3)
NO122R	5.41 137	5.59 142	8.38 213	4.19 106	3.81 97	...	0.56 14	2.0 51	5 (2.3)
AO123R	5.41 137	5.59 142	8.38 213	4.19 106	3.81 97	...	0.56 14	2.0 51	5 (2.3)
NO123R	5.41 137	5.59 142	8.38 213	4.19 106	3.81 97	...	0.56 14	2.0 51	5 (2.3)
AO124R	5.38 137	5.59 142	9.5 241	4.75 121	4.19 106	...	0.94 24	2.0 51	6 (2.7)
NO124R	5.38 137	5.59 142	9.5 241	4.75 121	4.19 106	...	0.94 24	2.0 51	6 (2.7)
AO125R	5.63 143	5.84 148	9.5 241	4.75 121	4.19 106	...	0.94 24	2.0 51	6 (2.7)
NO125R	5.63 143	5.84 148	9.5 241	4.75 121	4.19 106	...	0.94 24	2.0 51	6 (2.7)
AO126R	5.88 149	6.06 154	13.69 348	6.84 174	4.94 125	...	1.19 30	2.5 54	8 (3.6)
NO126R	5.88 149	6.06 154	13.69 348	6.84 174	4.94 125	...	1.19 30	2.5 54	8 (3.6)



Type ▲	Dimension						Shipping Weight lb (kg)
	A	B	C	D	E	F	
AO170R THRU 173R	2.88 73	3.25 83	2.5 64	0.28 7	0.38 10	0.38 10	4 (1.8)
NO170R THRU 173R	2.88 73	3.25 83	2.5 64	0.28 7	0.38 10	0.38 10	4 (1.8)
AO174R, NO174R	3.25 83	3.88 98	3.0 76	0.53 13	0.56 14	0.5 13	5 (2.3)
AO175R, NO175R	3.25 83	3.88 98	5.0 127	0.53 13	0.56 14	0.5 13	5 (2.3)
AO176R, NO176R	3.75 95	4.5 114	5.0 127	1.53 39	1.25 32	0.75 19	5 (2.3)

▲ Only right hand versions are shown. Dimensions also apply to left hand versions, except that all parts are assembled opposite to position shown. Dimensions to left and right of vertical centerline, therefore, would be reversed.

CLASS 9055

Crane Control Class 9998



CLASS 9998

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SQUARE D
GROUPE SCHNEIDER

**Crane Control Class 9998
DC Coil Data**

DC COIL DATA FOR CLASS 7001 TYPE K RELAYS

DC operating coils are designed in accordance with NEMA Standards to withstand 110% of rated voltage continuously and to operate the contactor successfully at 80% of rated voltage.

Standard DC Operating Coils for Class 7001 Type K Relays

Full Shunt Coils

Class 7001 Device Type	Coil Number	VDC	Coil Resistance Ohms @ 20 °C †	Coil Amperes @ 20 °C †
KG, KE, KF	5101706750	300	2050	0.146
	5101705650	230-240	1619	0.148
	5101706752	190	863	0.222
	5101706753	150	547	0.274
	5101705651	115-120	407	0.294
	5101706755	100	226	0.442
	5101706756	75	140	0.536
	5101706757	60	87	0.690
	5101706758	45	57	0.789
	5101706759	36	36	1.000
	5101706760	24	12.8	1.880
	5101706761	12	3.5	3.43

Half Shunt Coils

Devices Using Coil Type	Coil Number	VDC	Coil Resistance Ohms @ 20 °C †	Coil Amperes @ 20 °C †
KF	5115204450	230-240	1828	0.131
	5115204451	115-120	477	0.252

† At normal operating temperature the coil resistance will increase by approximately 20%

Price Information – Consult your Local Square D Field Office.

DC COIL DATA FOR CLASS 7001 TYPE K RELAYS

Full Series Coils

Class 7001 Device Type	Coil Number	Coil Resistance Ohms @ 20 °C †	Coil Amperes @ 20 °C †
KI, KF	5115207750	177	0.39
	5115207751	110	0.49
	5115207752	71.2	0.62
	5115207753	45.6	0.77
	5115207754	28.6	0.97
	5115207755	16.6	1.2
	5115207756	10.4	1.6
	5115207757	6.67	2.0
	5115207758	4.46	2.4
	5115207759	2.76	3.1
	5115207760	1.78	3.8
	5115207761	1.08	4.9
	5115207762	0.69	6.1
	5115207763	0.43	7.3
	5115207764	0.27	9.9
	5115207850	–	12.5
	5115207851	–	16.0
	5115207852	–	20.8
	5115207853	–	26.6
	5115207854	–	35.2
	5115207855	–	45.3
	5115207856	–	58.0
	5115207857	–	75.6
	5115207858	–	114.5
5115207902	–	171.5	
5115207903	–	257.5	
5115207904	–	200.0	

Half Series Coils

Devices Using Coil Type	Coil Number	Coil Resistance Ohms @ 20 °C †	Coil Amperes @ 20 °C †
KI, KF	5115203650	–	7.36
	5115203651	–	11.71
	5115203652	–	18.75
	5115203653	–	29.45
	5115203654	–	46.90
	5115203655	–	73.60
	5115203301	–	114.5
	5115203302	–	171.5
	5115203303	–	257.5

Coils with External Diode

Devices Using Coil Type	Coil Number ▲	System Volts	Coil Volts	Coil Ohms @ 20 °C †	Coil Amps @ 20 °C †	Reverse Ohms ● @ 20 °C †
KP	5101705651	240	120	407	0.294	1MEG
	5101705659	120	60	107	0.561	1MEG

- ▲ Does not include external diode. Diode P/N is 5122902950.
- Reverse ohms can only be measured when externally mounted diode is in series with coil.
- † At normal operating temperature the coil resistance will increase by approximately 20%.

Price Information – Consult your Local Square D Field Office.



Crane Control Class 9998
DC Coil Data

DC COIL DATA FOR CLASS 7004 TYPE M CONTACTORS

DC operating coils are designed in accordance with NEMA Standards to withstand 110% of rated voltage continuously and to operate the contactor successfully at 80% of rated voltage.

Standard DC Operating Coils for Class 7004 Type M Contactors

Class 7004 Device			VDC	Coil Part Number	Coil Resistance Ohms @ 20 °C †	Coil Amperes @ 20 °C †
Size	Type	Poles				
1 & 2	MXCO1, MXDO1 MXCO3, MXDO3	SPNO SPNC	300	5101505654	3910	0.077
			230-240	5101505650	2133	0.113
			190	5101505655	1515	0.125
			150	5101505656	940	0.160
			115-120	5101505651	613	0.196
			100	5101505657	397	0.252
			75	5101505658	257	0.292
			60	5101505659	166	0.361
			45	5101505660	103	0.437
			36	5101505661	65	0.554
			24	5101505662	27.5	0.873
			12	5101505663	7.35	1.63
			3 & 4	MEO1, MFO1 MEO3, MFO3	SPNO SPNC	300	5101705654	2734	0.110
230-240	5101705650	1712				0.140
190	5101705655	1135				0.167
150	5101705656	706				0.212
115-120	5101705651	415				0.289
100	5101705657	312				0.321
75	5101705658	181				0.414
60	5101705659	122				0.492
45	5101705660	65				0.692
36	5101705661	45				0.800
24	5101705662	19.7				1.22
12	5101705663	5.20				2.31
5 & 5A	MGAO1, MGO1 MGAO3, MGO3	SPNO SPNC				300	5101924352	1960	0.153
			230-240	5101924353	1240	0.194
			190	5101924354	801	0.237
			150	5101924355	520	0.288
			115-120	5101924356	315	0.381
			100	5101924357	242	0.413
			75	5101924358	137	0.547
			60	5101924359	89	0.674
			45	5101924360	45	1.00
			36	5101924361	31	1.16
			24	5101924362	14.5	1.66
			12	5101924363	3.9	3.08
			6 & 6A	MHAO1, MHO1 MHO3	SPNO SPNC	300	5102024352	1097	0.273
230-240	5102024353	720				0.333
190	5102024354	439				0.433
150	5102024355	284				0.528
115-120	5102024356	177				0.678
100	5102024357	114				0.877
75	5102024358	74				1.01
60	5102024359	42.3				1.42
45	5102024360	27.5				1.64
36	5102024361	17.8				2.02
24	5102024362	6.78				3.54
12	5102024363	1.81				6.63
7 & 8	MJO1, MKO1 MJO3, MKO3	SPNO SPNC				300	5102205670	639	0.469
			230-240	5102205671	401	0.599
			190	5102205672	259	0.734
			150	5102205673	159	0.943
			115-120	5102205674	94	1.28
			100	5102205675	61	1.64
			75	5102205676	37.9	1.98
			60	5102205677	24.0	2.50
			45	5102205678	15.2	2.96
			36	5102205679	9.9	3.64
			24	5102205680	6.0	4.00
			12	5102205681	1.4	8.57

† At normal operating temperature the coil resistance will increase by approximately 20%

Price Information – Refer to "Repair Parts Price List," or consult your Local Square D Field Office.

Crane Control Class 9998 Replacement Parts Kits

FOR MAGNET CONTROLLERS AND AC AND DC TYPE M AND MX CONTACTORS

Copper contact tips are standard. Silver-faced contact tips are available and are recommended for applications where the contactors remain closed for long periods of time. Silver-faced contact tips are standard on crane manual-magnetic disconnect switches and are optional on DC starters. Each kit contains movable and stationary contacts, necessary hardware and servicing instructions.

Copper Contact Tips

Equipment to be Maintained			Number of Poles in Kit	Parts Kit Type	Price
Class	Type	Contactor Size			
6815 Magnet Controllers	AD-01 through AD-04 (2-19 A)	...	▲	MA1	\$ 171.
	AD-13 through AD-16 (19-130 A)	...	▲	MA2	165.
	SD-20 through SD-29 (2-30 A)	...	▲	MA3	81.
	SD-30 through SD-39 (31-80 A)	...	▲	MA4	81.
	SD-40 through SD-49 (81-130 A)	...	▲	MA5	122.
7004 DC Contactors and 8503 AC Contactors	MX	1 & 2	2	MX1	86.
	MX	3	2	MX3	182.
	M	3	2	ME1	70.
	M	4	2	MF1	78.
	M	5 & 5A	2	MG1	102.
	M	6 & 6A	2	MH1	206.
	M	7 & 8	2	MJK1	356.

▲ Each kit contains complete set of parts to change contacts on both "Lift" and "Drop" contactors.

Silver Contact Tips

Equipment to be Maintained			Number of Poles in Kit	Parts Kit Type	Price
Class	Type	Contactor Size			
7004 DC Contactors and 8503 AC Contactors	MX	1 & 2	2	MX2	\$ 476.
	M	3	2	ME2	766.
	M	4	2	MF2	792.
	M	5 & 5A	2	MG2	1108.
	M	6 & 6A	2	MH2	1330.
	M	7 & 8	2	MJK2	2216.

Ordering Information Required:

1. Class
2. Type





Crane Control Class 9999



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SQUARE D
GROUPE SCHNEIDER

Crane Control Class 9999

User Modification Kits

FOR CLASSES 7004 AND 8503 TYPE M CONTACTORS

Electrical Interlocks, Mechanical Interlocks, Arc Suppressors

Class 9999 user modification kits can be added to the Class 7004 and Class 8503 Type M contactors used in DC starters and AC and DC crane and mill control panels. The kits include all necessary mounting hardware and illustrated installation instructions.

Electrical Interlocks

Control circuit interlocks are available as units of one normally open and one normally closed contact. On each single pole normally open or normally closed contactor a maximum of two interlock kits can be used. For maximum number of accessories or accessory combinations, refer to Class 7004 catalog sheets. Interlock kits include the movable and stationary contacts plus all necessary hardware for mounting.



**Class 9999 Type MX11
Electrical Interlock Kit**

Kit Description	Contactors Size	Type	Price ◇
1 Normally Open & 1 Normally Closed	1 to 8	MX11	\$ 93.

Mechanical Interlocks

A horizontal mechanical interlock is available for use between two single pole, normally open or two double pole, normally open tied contactors mounted side by side. This interlock prevents the two contactors from opening simultaneously.



**Class 9999
Type MM2
Mechanical
Interlock Kit**

Kit Description	Contactors Size	Type	Price ★
Mechanical Interlock	1 & 2	MM1	\$ 102.
Mechanical Interlock	3 & 4	MM2	102.
Mechanical Interlock	5 & 5A	MM3	144.
Mechanical Interlock	6 & 6A	MM4	180.
Mechanical Interlock	8	MM5	212.

Arc Suppressor

The Class 9999 AI1 arc suppressor is designed to reduce arcing of pilot devices in DC inductive control circuits of 250 VDC or less.

Class 9999 Type AI1 Arc Suppressor

Type	Price ★
AI1	\$111.

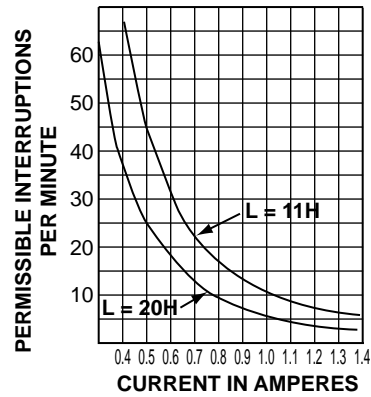


**Class 9999 AI1
Arc Suppressor**

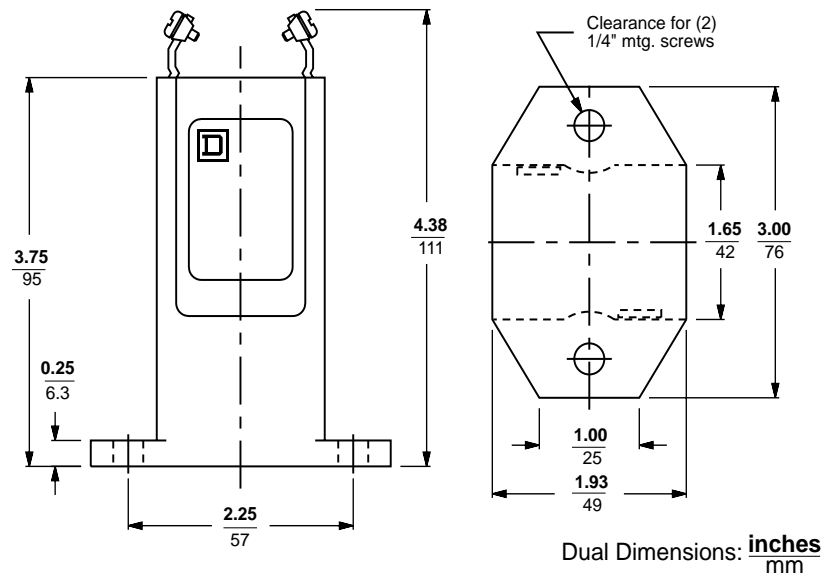
The AI1 arc suppressor will limit the inductive voltage surge to a maximum of 600 VDC when applied in accordance with the application chart. When applying the arc suppressor to a circuit, two factors must be considered – the current drawn by the inductive load and the number of times per minute that the load will be interrupted. Once these two factors are determined, the application is checked against the application chart. The chart shows the maximum interruptions per minute that the arc suppressor can handle at a given current. As long as an application falls below the curve, the arc suppressor will handle the load. The arc suppressor is connected in parallel with the inductive load and is in the circuit at all times.



Application Chart for AI1 Arc Suppressor



APPROXIMATE DIMENSIONS AND WEIGHTS



Net Weight – 1 lb (0.45 kg)

Ordering Information Required:

1. Class
2. Type



Crane Control Class 9999 User Modification Kits

FOR CLASS 7001 TYPE K RELAYS AND CLASSES 7004 AND 8503 TYPE M CONTACTORS



Class 9999 Type MT2
Tie Bar Kit

Tie Bar - Power Lugs - Control Circuit Contacts

Tie Bar

Applications requiring double pole normally open Type M contactors can be met by supplying single pole normally open contactors with tie bars. The tie bar is made from an insulating material and connects the armatures of the contactors together. For double pole contactors, it is recommended that the operating coils be connected in series. Each coil should be rated for one half of line voltage.

For Use With Class 7004 DC & 8503 AC Contactors

Kit Description	Contactors Size	Type	Price
Tie Bar Kit	1 & 2	MT1	\$ 36.
Tie Bar Kit	3 & 4	MT2	36.
Tie Bar Kit	5 & 5A	MT3	36.
Tie Bar Kit	6 & 6A	MT4	60.
Tie Bar Kit	7 & 8	MT5	60.



Class 9999 Type ML1
Lug Kit

Power Lugs for Type M Contactors

Type M contactors are furnished without power lugs. A kit is available consisting of lugs and hardware for mounting on Size 3 and larger contactors. No power lug kits are available for the NEMA Size 1 and 2 contactors. These contactors are designed to use lugs supplied by the user.

Kit Description		Contactors Size	Type ▲	Price
Min. Wire Size	Max. Wire Size			
#8	#00	4	ML1	\$ 36.
#0	300 MCM	5 & 5A	ML2	60.
250 MCM	500 MCM	6, 6A, 7 & 8	ML3	138.

▲ Contains four clam shell type lugs. For copper conductors only.



Class 9999
Type KX3 Contact Kit

Control Circuit Contacts for Class 7001 Type K Relays

Description	For Use on Relay Type	Type	Price
1 N.O. and 1 N.C. Contact	KG, KE, KI, KP	KX3	\$ 77.
1 N.O. Contact	KF	KX4	201.
1 N.C. Contact	KF	KX5	201.

Ordering Information Required:

1. Class
2. Type



Class 9999
Type KX5 Contact Kit

CP9B Discount
Schedule










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