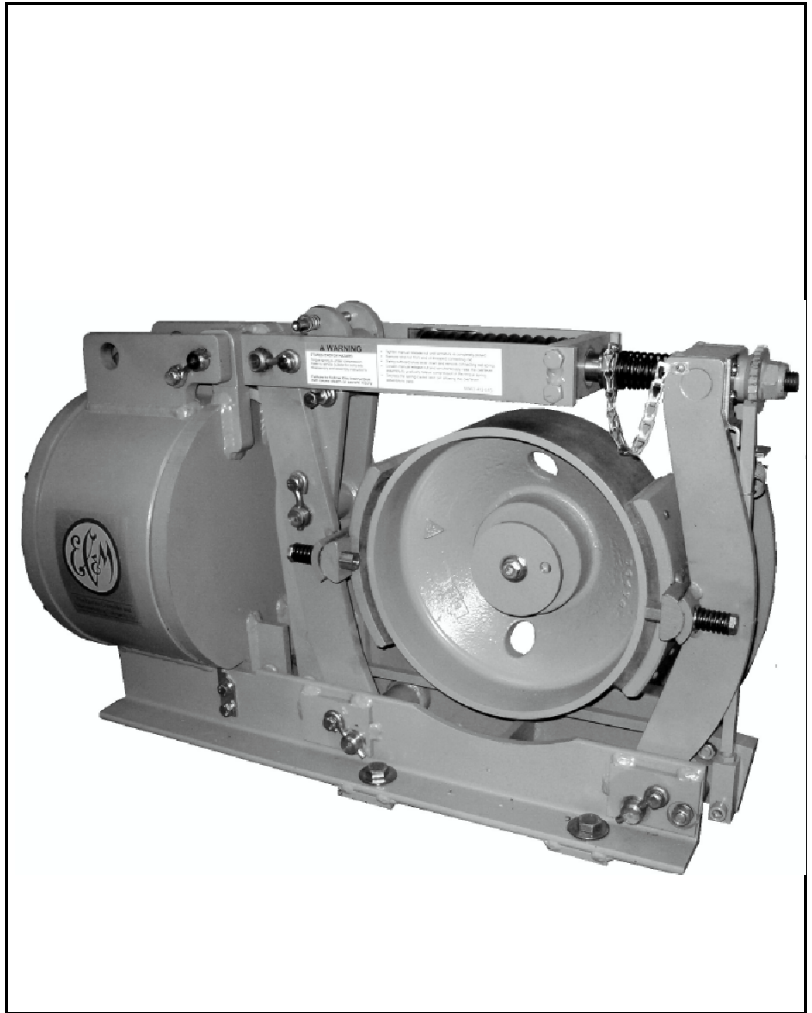


Crane Control Class 5010 WB Type F Brakes and Brake Rectifiers

Catalog

13



CRANE CONTROL
CLASS 5010

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The Electric Controller and
Manufacturing Company, LLC

Crane Control Class 5010

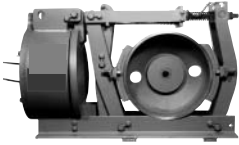
DC Magnetic Drum Brakes

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.

- 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



Class 5010
Type F1325
13" 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



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

ORDERING INFORMATION

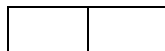
Series Brakes

Brake Size	Maximum Torque (ft-lb)		Maximum HP Rating at 230 VDC ■		Type		
	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		
10	200	130	7+ 11 14 23 30	5+ 8 11 18 23	F1028 F1027 F1026 F1025 F1024		
13	550	365	19+ 30 39 49 63	15+ 24 31 40 50	F1326 F1325 F1324 F1323 F1329		
16	1000	650	47+ 60 77 96 122	36+ 46 59 76 95	F1624 F1625 F1623 F1622 F1621		
19	2000	1300	78+ 97 120 155 178	59+ 76 90 116 134	F1908 F1907 F1906 F1905 F1904		
23	4000	2600	160+ 180 206 235 320 365	127+ 142 162 185 252 290	F2324 F2336 F2323 F2335 F2322 F2321		
30	9000	6000	300+ 380 410 505 580	230+ 290 315 390 445	F3005 F3004 F3003 F3002 F3001		

■ 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.

**CRANE CONTROL
CLASS 5010**



Crane Control Class 5010

DC Magnetic Drum Brakes

ORDERING INFORMATION

Shunt Brakes †

Brake Size	Maximum Torque (ft-lb)		Type		
	1 Hour	8 Hour			
8	100	75	F0857		
10	200	150	F1077		
13	550	400	F1375		
16	1000	750	F1674		
19	2000	1500	F1959		
23	4000	3000	F2374		
30	9000	6750	F3051		

† 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			Type
230	8	RO125		RO126	
	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	
230	16	RO126	
	19	RO148	
	23	RO116	
	30	RO57	

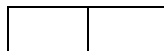
◆ For resistors for smaller brake sizes, consult factory.

Relays for High-Speed Shunt Brakes

VDC	Brake Size ◆	Class 7001 Type KFO01	
		Form	
230	16	F16	
	19	F19	
	23	F23	
	30	F30◆◆	

◆ For relays for smaller brake sizes, consult factory.

◆◆ F30 includes one Class 7004 Type MXDO1 contactor and one Class 9001 Type KIO11 relay.

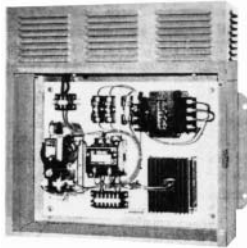


ORDERING INFORMATION

Brake Rectifier Controllers

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:

- 1 460/230Vac 60Hz, or 380Vac 50Hz, to 120V fused Transformer
- 1 Class 8502 Type S 3-pole contactor
- 1 Full wave rectifier
- 1 Dropping resistor
- 1 Class 7001 Type K DC relay



Class 5010
Type QW110
Brake Rectifier Controller

Brake Rectifier Controllers ●■

VAC 60 Hz	Brake Size (Wheel dia. in inches)	Outdoor Enclosure NEMA Type 3R			
		For Single Brake		For Two Brakes in Series	
		Type		Type	
230 – 460	8	QKW108		QKW208	
	10	QW110		QW210	
	13	QW113		QW213	
	16	QW116		QW216	
	19	QW119		QW219	
	23	QW123		...	

- For 30" applications, consult factory.
- Add voltage code to the end of the Type No.: V80 for 230 Vac input, V81 for 460 Vac input, V95 for 380Vac / 50Hz input.

Rectifier Operated Brakes ▲●

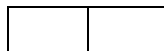
Brake Size	Maximum Torque (ft-lb) (Any Duty)	Single Brake	Two Brakes in Series		
		Type	Type		
8	100	F0853	F0851		
10	200	F1072	F1070		
13	550	F1370	F1385		
16	1000	F1670	F1686		
19	2000	F1954	F1951		
23	4000	F2383	F2384		

- ▲ Must be used with rectifier controller.
- For 30" applications, consult factory.

Brake Modifications ▼

Form	● = Form Available for Brake	8	10	13	16	19	23	30
B – Conduit Connection Box		●	●	●	●	●	●	●
H – Half Torque Spring		●	●	●	●	●	●	N/A
R1 – Manual Release Lever On Right Side ★		●	●	●	●	●	●	N/A
R2 – Manual Release Lever On Left Side ★		●	●	●	●	●	●	N/A
S – Self Adjuster		●	●	●	●	●	●	N/A
M – Grease Fittings φ		●	●	●	●	STD	STD	STD
E1 - NEMA 3R Enclosure With Right Hand Slot ■		●	●	●	●	●	●	N/A
E2 - NEMA 3R Enclosure With Left Hand Slot ■		●	●	●	●	●	●	N/A
E3 - NEMA 3R Enclosure With Double Slots ■		●	●	●	●	●	●	N/A
W - Vertical (Wall) Mounting		●	●	●	●	●	●	N/A
K1 - Limit Switches Right Side		●	●	●	●	●	●	●
K2 - Limit Switches Left Side		●	●	●	●	●	●	●

- 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.
- ▼ Additional modifications are available. Consult factory.
- Form M is recommended for use with Forms E1, E2, and E3.



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:

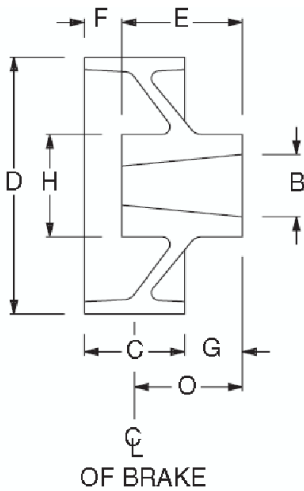
Supply the dimensions required for ordering wheels.
6. For brake wheels only:

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

**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:

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

**Replacement Ductile Iron Brake Wheels
AISE Standard**

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

**CRANE CONTROL
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



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.	

CRANE CONTROL 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)

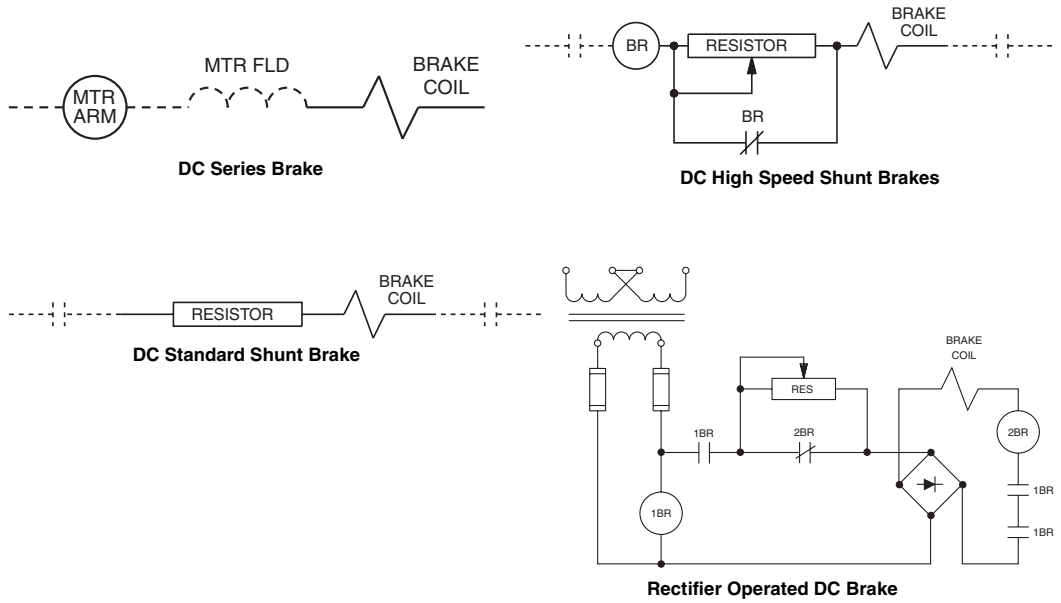
A stop can be made from full speed this often without overheating the brake wheel. Four times as many stops can be made from half speed in this time interval. For unloaded crane conditions (CWL) and (SL) are replaced by (CWU) and (SU).

Brake Size (Wheel dia. in inches)	(kl)
8	26.50 x 10 ⁻⁶
10	15.90 x 10 ⁻⁶
13	9.34 x 10 ⁻⁶
16	6.10 x 10 ⁻⁶
19	4.30 x 10 ⁻⁶
23	3.00 x 10 ⁻⁶
30	1.76 x 10 ⁻⁶

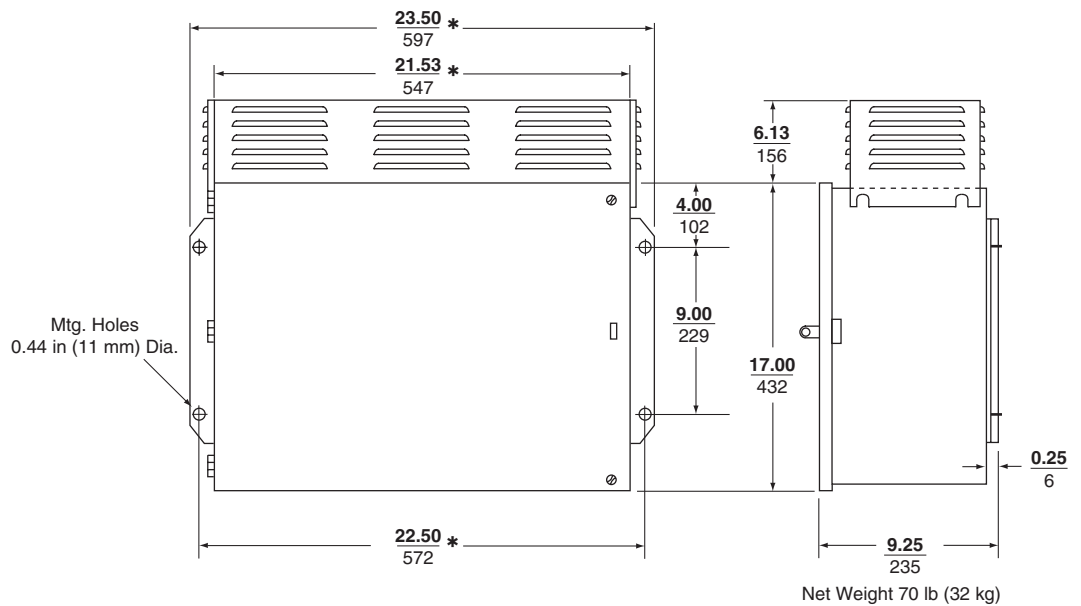


Crane Control Class 5010 Approximate Dimensions and Weights

Elementary Wiring Diagrams for Standard Brake Circuits



BRAKE RECTIFIER CONTROLLER (For Types QW108 through QW223)



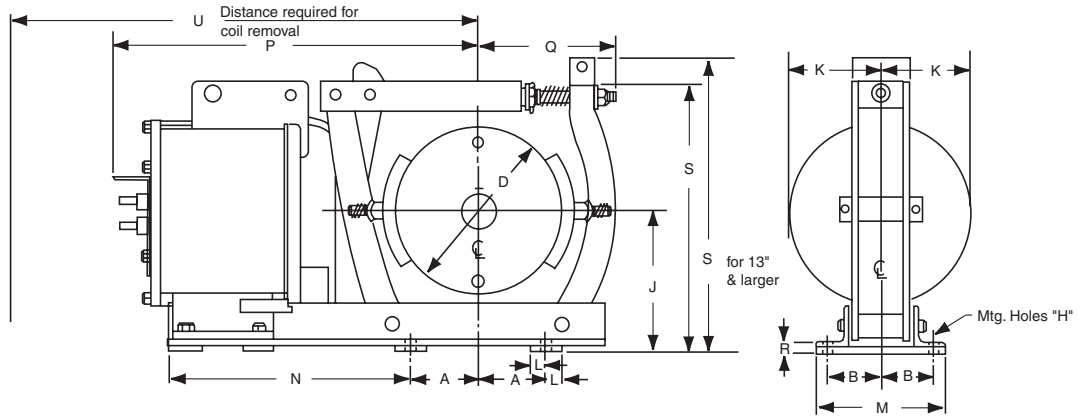
Dual Dimensions **inches**
mm

CRANE CONTROL
CLASS 5010

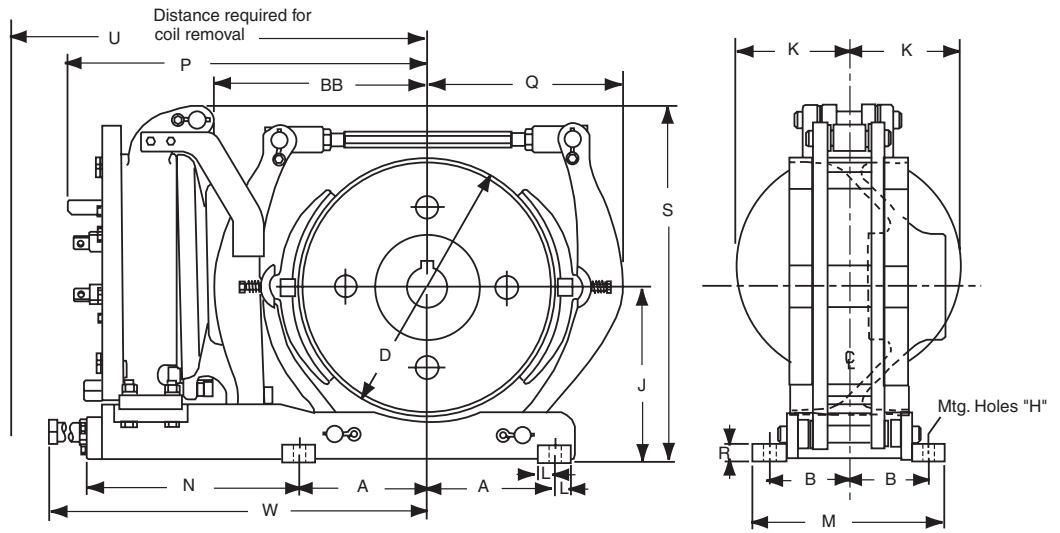
Crane Control Class 5010

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

