Section 17

NEMA Contactors and Starters

Electromechanical Reduced Voltage Starter (p. 17-18)

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SQUARE D
by Schneider Electric

Schneider Electric

The GS1 part numbers can be identified as follows.
See Catalog 9421CT0301 for specific applications.

Table 17.1: Identification System

GS1	D	U	3

Model GS1 Fusible (Class J fuse unless noted), LK3 Nonfusible

Current Range, Operator Type (front operator unless noted), Accessory Type

D	30 A front and side operation	**T**	800 A (Class L if fused)
DD	30 A Class CC front and side operation	**U**	1000 A
E	30 A	**W**	1200 A
EE	30 A Class CC	**AH**	handle
G	60 A	**AHT**	handle with test
J	100 A	**AE**	extension shaft
M	200 A	**AD**	auxiliary contact holder
Q	400 A	**AM**	auxiliary contact
S	600 A		

UL Certification

Poles—Number of Poles, 2 or 3

Note: All fusible switches through 400 A and nonfused switches through 200 A are equipped with a feature to test optional auxiliary contacts without energizing the load when the appropriate GS1AHT•••• handle is used.

200 A Switch
GS1MU3

30 A Side Handle
GS1EERU30

Table 17.2: Fusible Switches

Catalog No.	Description	$ Price
Compact GS1 Fusible IEC Style Disconnect Switches		
GS1DDU3	30 A, 3-pole, Class CC, use 5x5 shaft	**237.00**
GS1DU3	30 A, 3-pole, Class J, use 5x5 shaft	**260.00**
GS1 Fusible IEC Style Disconnect Switches		
GS1EEU3	30 A, 3-pole, Class CC , use 10x10 shaft	**237.00**
GS1EU3	30 A, 3-pole, Class J, use 10x10 shaft	**260.00**
GS1GU3	60 A, 3-pole, Class J, use 10x10 shaft	**336.00**
GS1JU3▲■	100 A, 3-pole, Class J, use 10x10 shaft	**536.00**
GS1MU3▲■	200 A, 3-pole, Class J, use 10x10 shaft	**1181.00**
GS1QU3▲■	400 A, 3-pole, Class J, use 10x10 shaft	**2252.00**
GS1SU3▲■	600 A, 3-pole, Class J, use 15x15 shaft	**3377.00**
GS1TU3▲■	800 A, 3-pole, Class L, use 15x15 shaft	**5061.00**

Table 17.3: Fusible Switches with Direct Mount Side Handle

Catalog No.	Description	$ Price
GS1EERU20	30 A, 2-pole, Class CC	**204.00**
GS1EERU30	30 A, 3-pole, Class CC	**242.00**
GS1AH01	Right side handle for GS1EERU20 & GS1EERU30	**46.40**

▲ Shipped with line side terminal shrouds; for additional shrouds, see page 17-4.
■ Terminal lug must be ordered separately—see page 17-4.

Table 17.4: Nonfusible Switches

Catalog No.	Description	$ Price
Compact LK3 Nonfusible IEC Style Disconnect Switches		
LK3DU3	30 A, 3-pole, 5x5 shaft	**218.00**
LK3 Nonfusible IEC Style Disconnect Switches		
LK3GU3	60 A, 3-pole, use 10x10 shaft	**263.00**
LK3JU3	100 A, 3-pole, use 10x10 shaft	**458.00**
LK3MU3▲■	200 A, 3-pole, use 10x10 shaft	**1010.00**
LK3QU3▲■	400 A, 3-pole, use 15x15 shaft	**1910.00**
LK3SU3▲■	600 A, 3-pole, use 15x15 shaft	**2873.00**
LK3TU3▲■	800 A, 3-pole, use 15x15 shaft	**4301.00**
LK3UU3▲■	1000 A, 3-pole, use 15x15 shaft	**5372.00**
LK3WU3▲■	1200 A, 3-pole, use 15x15 shaft	**6450.00**

Compact 30 A Switch
LK3DU3

Example of the parts to order to build a complete GS or LK switch:

Choose a Switch + **Shaft** + **Handle Assembly** + **Lugs, if needed**

600 A, LK3SU3

Shaft 200 mm, GS1AE6

Black Handle, LK3AH150

Lugs Kit, GS1AW503

For example:

LK3SU3 (600 A nonfusible switch, use 15x15 shaft) + **GS1AE6** (15x15 200 mm Type H shaft) + **LK3AH150** (black/black, lockable)

To add auxiliary contacts:

For front-mounted contacts order **GS1AD30** (front-mounted auxiliary contact holder) + **GS1AM110** (NO contact for GS1AD10, 20, and 30)

Handles

GS1AH101

GS1AH102

Type D—alternate handles for compact switches only

Compact Shaft Kits

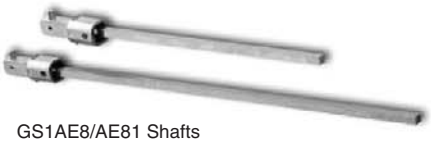
GS1AE7/AE71 Shafts
5 mm x 5 mm

GS1AH110

GS1AH120

Type G—Standard Handle Design

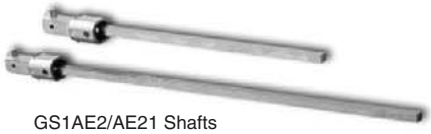
Use these shaft kits when using compact switches:



GS1AE8/AE81 Shafts
5 mm x 5 mm

LK3AH160

GS1AE6



GS1AE2/AE21 Shafts

Table 17.5: Pistol Handles for Compact GS1 and LK3 for Use with Shaft Type D

Type NEMA/UL	Type IEC	Defeatable	Padlockable	Color	Operation	Catalog Number	$ Price
1, 12	IP54	Yes	Yes	Black	Off/On (O/I)	GS1AH101	51.00
				Red/Yellow		GS1AH102	

Table 17.6: Pistol Handles for Compact GS1 and LK3 for Use with Shaft Type G

Type NEMA/UL	Type IEC	Defeatable	Padlockable	Color	Operation	Catalog Number	$ Price
1, 3R, 12	IP54	Yes	Yes	Black	Off/On (O/I)	GS1AH110	62.00
				Red/Yellow	Off/On (O/I)	GS1AH120	62.00
				Black	Test/Off/On (T/O/I)	GS1AHT110	117.00
				Red/Yellow	Test/Off/On (T/O/I)	GS1AHT120	117.00
1, 3R, 4, 4X, 12	IP65	Yes	Yes	Black	Off/On (O/I)	GS1AH410	46.60
				Red/Yellow	Off/On (O/I)	GS1AH420	46.60
				Black	Test/Off/On (T/O/I)	GS1AHT410	78.00
				Red/Yellow	Test/Off/On (T/O/I)	GS1AHT420	78.00

Table 17.7: Pistol Handles for Standard GS1 and LK3

Type NEMA/UL	Type IEC	Defeatable	Padlockable	Color	Operation	Catalog Number	$ Price
GS1 30–100 A and LK3 60–100 A (3 in. handles)							
1, 3R, 12	IP54	Yes	Yes	Black	Off/On (O/I)	GS1AH110	62.00
				Red/Yellow	Off/On (O/I)	GS1AH120	62.00
				Black	Test/Off/On (T/O/I)	GS1AHT110	117.00
				Red/Yellow	Test/Off/On (T/O/I)	GS1AHT120	117.00
1, 3R, 4, 4X, 12	IP65	Yes	Yes	Black	Off/On (O/I)	GS1AH410	70.00
				Red/Yellow	Off/On (O/I)	GS1AH420	70.00
				Black	Test/Off/On (T/O/I)	GS1AHT410	117.00
				Red/Yellow	Test/Off/On (T/O/I)	GS1AHT420	117.00
GS1 200–400 A and LK3 200 A (5 in. handles)							
1, 3R, 12	IP54	Yes	Yes	Black	Off/On (O/I)	GS1AH130	70.00
				Red/Yellow	Off/On (O/I)	GS1AH140	70.00
				Black	Test/Off/On (T/O/I)	GS1AHT130	125.00
				Red/Yellow	Test/Off/On (T/O/I)	GS1AHT140	125.00
1, 3R, 4, 4X, 12	IP65	Yes	Yes	Black	Off/On (O/I)	GS1AH430	78.00
				Red/Yellow	Off/On (O/I)	GS1AH440	78.00
				Black	Test/Off/On (T/O/I)	GS1AHT430	132.00
				Red/Yellow	Test/Off/On (T/O/I)	GS1AHT440	132.00

Table 17.8: Pistol Handles for Use with Shaft Type H

Type NEMA/UL	Type IEC	Defeatable	Padlockable	Color	Operation	Catalog Number	$ Price
For LK3 400–1200 A							
1, 3R, 4, 4X, 12	IP65	No	Yes	Black	Off/On (O/I)	LK3AH150	233.00
		No		Red/Yellow		LK3AH160	233.00
		Yes		Black		LK3AH170	386.00
		Yes		Red/Yellow		LK3AH180	386.00
For GS1 600–800 A							
1, 3R, 4, 4X, 12	IP65	No	Yes	Black	Off/On (O/I)	LK3AH150	233.00
		No		Red/Yellow		LK3AH160	233.00
		Yes		Black		GS1AH170	386.00
		Yes		Red/Yellow		GS1AH180	386.00

Note: Now UL approved for indoor or outdoor applications.

Table 17.9: Shafts

Length in.	Length mm	Catalog No.	$ Price
Shaft 5 mm x 5 mm—For use with Pistol Handles, Type D			
12.6	320	GS1AE7	18.60
15.7	400	GS1AE71	23.30
Shaft 5 mm x 5 mm—For use with Pistol Handles, Type G			
12.6	320	GS1AE8	18.60
15.7	400	GS1AE81	23.30
Shaft 10 mm x 10 mm—For Standard GS1 and LK3			
12.6	320	GS1AE2	20.30
15.7	400	GS1AE21	24.90
Shaft 15 mm x 15 mm—For use with Pistol Handles, Type H			
7.9	200	GS1AE6	32.60
15.7	400	GS1AE61	40.40

GS1AD10 + GS1AM110

GS1AD20 + GS1AM110

GS1AD30 + GS1AM110

Accessories

Table 17.10: Auxiliary Contacts

Type	Description	Catalog No.	$ Price
For Compact LK3 / GS1			
U = Upper or Top mounted	Standard products allow up to 4 auxiliary contacts without any extra contact holders. Contact holder (for 5 to 8 auxiliary contacts)	GS1AD10	**46.70**
10 A	1 N.O. Contact Block	GS1AM110	**14.70**
600 Vac	1 N.C. Contact Block	GS1AM101	**14.70**
For LK3 60–200 A, GS1 30–400 A			
U = Upper or Top mounted	Contact holder required (for 1 to 8 upper auxiliary contacts)	GS1AD20	**46.70**
10 A	1 N.O. Contact Block	GS1AM110	**14.70**
600 Vac	1 N.C. Contact Block	GS1AM101	**14.70**
S = Side mounted ▲	1 N.O. & N.C. Contact Block (max of two blocks—any mix)	GS1AN11	**78.00**
	2 N.O. & N.C. Contact Block (max of two blocks—any mix)	GS1AN22	**140.00**
S = Side mounted ▲	1 N.O. & N.C. Contact Block w/ Test (max of two blocks—any mix)	GS1ANT11	**93.00**
	2 N.O. & N.C. Contact Block w/ Test (max of two blocks—any mix)	GS1ANT22	**156.00**
For LK3 400–1200 A			
U = Upper or Top mounted	Contact holder (for 1 to 4 auxiliary contacts)	LK3AD30	**46.70**
10 A	1 N.O. Contact Block	GS1AM110	**14.70**
600 Vac	1 N.C. Contact Block	GS1AM101	**14.70**
For GS1 600–800 A			
Micro-switch (top mounted)	1 N.O./N.C. Contact	GS1AMU3	**57.00**
	2 N.O./N.C. Contact	GS1AMU4	**83.00**

▲ Cannot be mixed. A single switch must use all GS1AN11/GS1AN22 contact blocks **or** all GS1ANT11/GS1ANT22 contact blocks. A GS1AN•• contact block may not be used on the same switch as a GS1ANT••.

Table 17.11: Terminal Lugs

For Use On	Wire Size	# of Wires per Lug	Wire Type	Lugs per Kit	Catalog No.	$ Price
Compact GS1/LK3	#14–#10	1	Cu	—	Standard	—
GS1 30 A CC	#14–#10	1	Cu	—	Standard	—
GS1 30 A J	#14–#10	1	Cu	—	Standard	—
GS1/LK3 60 A J	#10–#3	1	Cu	—	Standard	—
LK3 100 A	#14–#2/0	1	Cu	—	Standard	—
GS1 100 A	#14–2/0	1	Cu/Al	6	GS1AW303	**59.00**
GS1/LK3 200 A	#6–3/0	1	Cu/Al	6	GS1AW403	**98.00**
GS1/LK3 400–600 A ■	2 x 2–2 x 600	2	Cu/Al	6	GS1AW503	**197.00**
GS1/LK3 800 A / LK3 1000 A ■	3 x 2–3 x 600	3	Cu/Al	6	GS1AW803	**246.00**
LK3 1250 A ■	4 x 2–4 x 600	2	Cu/Al	12	GS1AW903	**395.00**

■ GS1 600–800 A and LK3 800–1250 A can receive 1 lug for 3 cables per terminal or 2 lugs for 2 cables per terminal.

Terminal Lugs

Table 17.12: Terminal Shrouds

For Use On	Catalog No.	$ Price
For Line or Load Side ♦		
Compact GS1/LK3	Standard	—
All GS1/LK3 30 A	Standard	—
All GS1/LK3 60 A	Standard	—
LK3 100 A	Standard	—
GS1 100 A ★	GS1AP33	**101.00**
GS1/LK3 200 A ★	GS1AP43	**132.00**
GS1 400 A	GS1AP63	**213.00**
LK3 400–600 A	LK3AP63	**86.00**
GS1 600–800 A	GS1AP83	**140.00**
LK3 800–1250 A	LK3AP83	**101.00**

♦ All GS1 and LK3 switches supplied with line side shrouding.
★ Three-piece kit for either line or load side.

Terminal Shrouds

Table 17.13: Shorting Links

For Use On	Shorting Links per Kit	Catalog No.	$ Price
GS1 60 A	3	GS1AU203	**29.60**
GS1 100 A		GS1AU303	**41.90**
GS1 200 A		GS1AU403	**62.10**
GS1 400 A		GS1AU503	**93.00**
GS1 600–800 A		GS1AU803	**156.00**

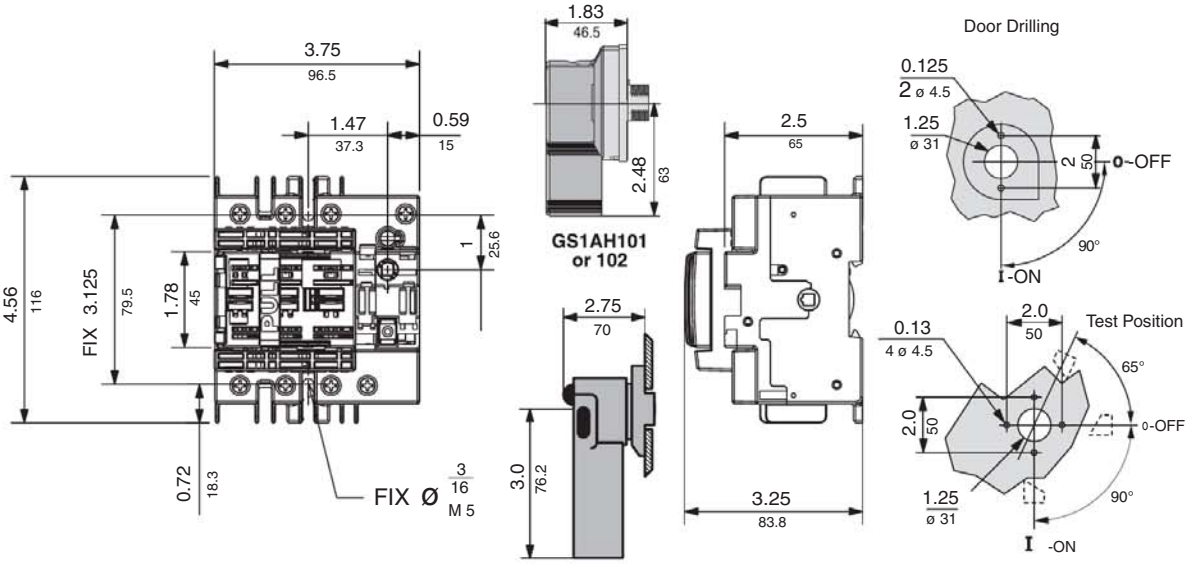
Shorting Links

Table 17.14: Shaft Padlocking Kit

For Use On	Catalog No.	$ Price
Compact GS1/LK3	Standard	—
LK3 60–200 A		
GS1 30–400 A		
LK3 400–1250 A		

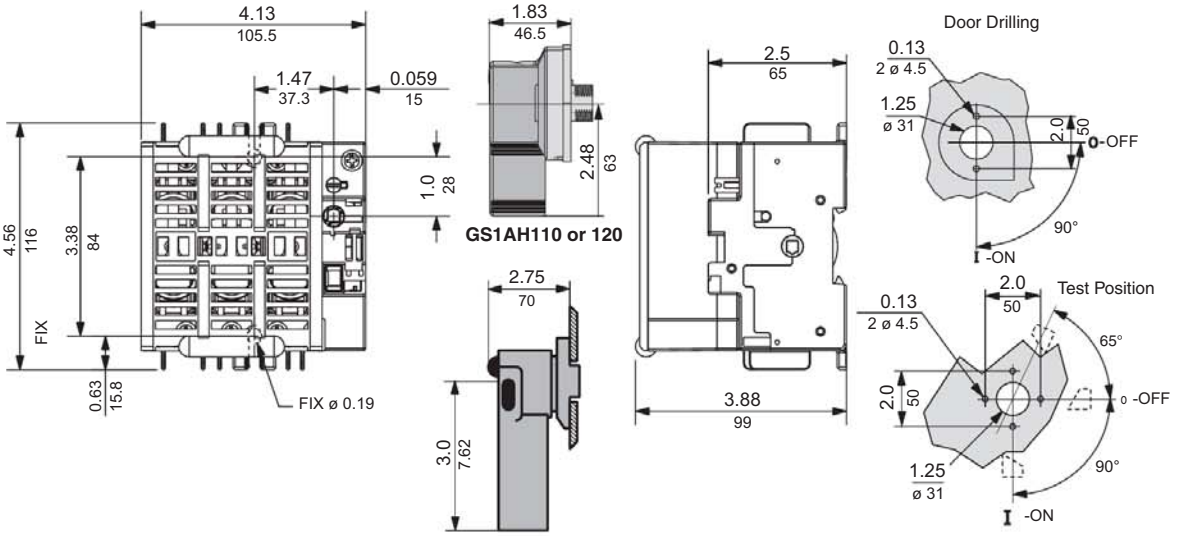
Dimensions

GS1DDU3 Compact CC 30 A



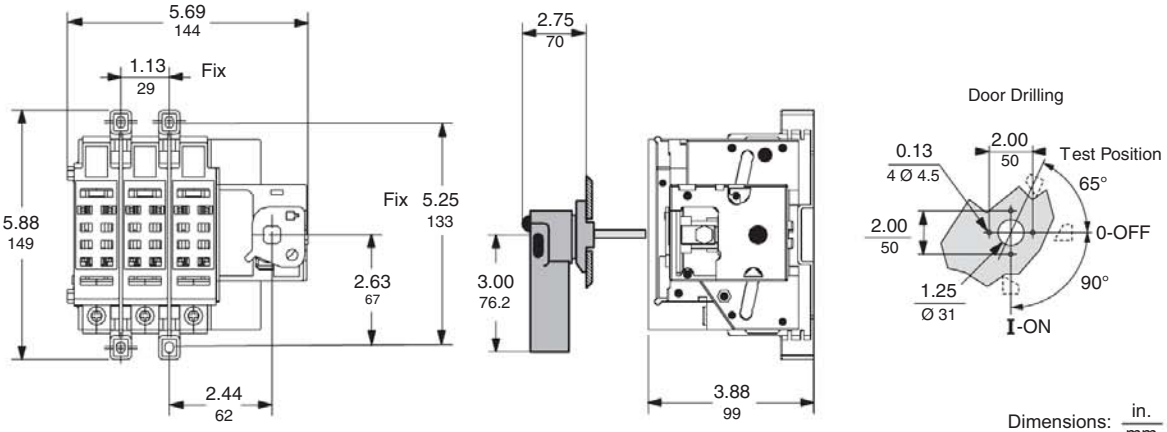
GS1AH/AHT110, 120, 410, or 420

GS1DU3 Compact J 30 A



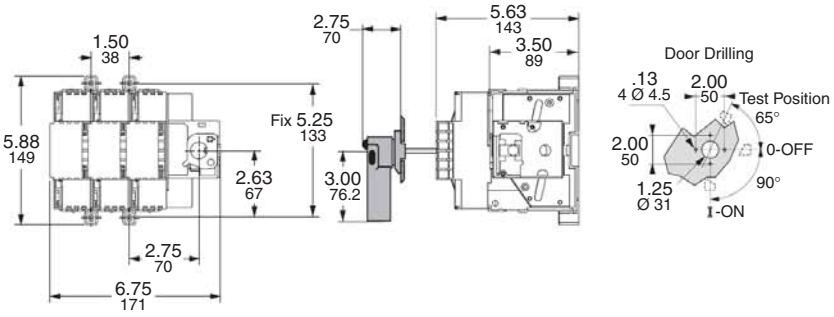
GS1AH/AHT110, 120, 410, or 420

GS1EEU3, GS1 CC 30 A



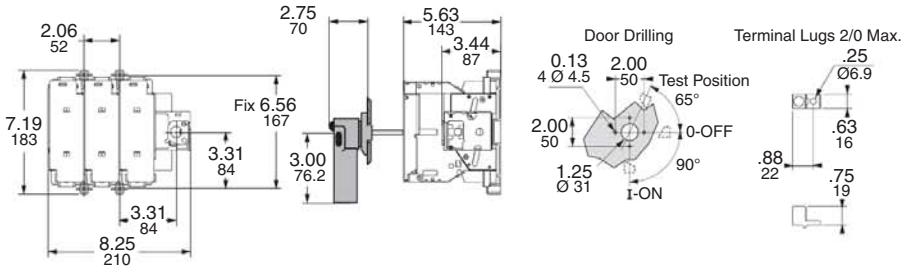
Dimensions: in. / mm

GS1EU3/GS1GU3, GS1 30 A/60 A J



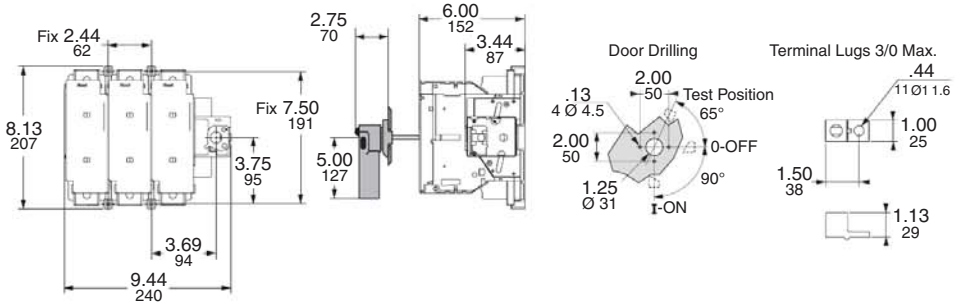
Mounting Hole Dimension: 0.19 in. (4.8 mm)

GS1JU3, GS1 100 A J



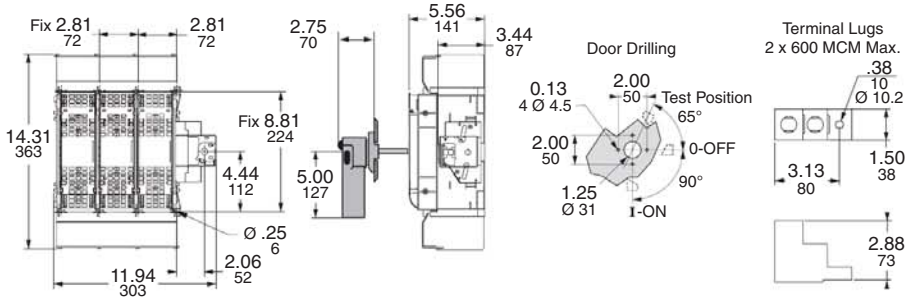
Mounting Hole Dimension: 0.19 in. (4.8 mm)

GS1MU3, GS1 200 A J



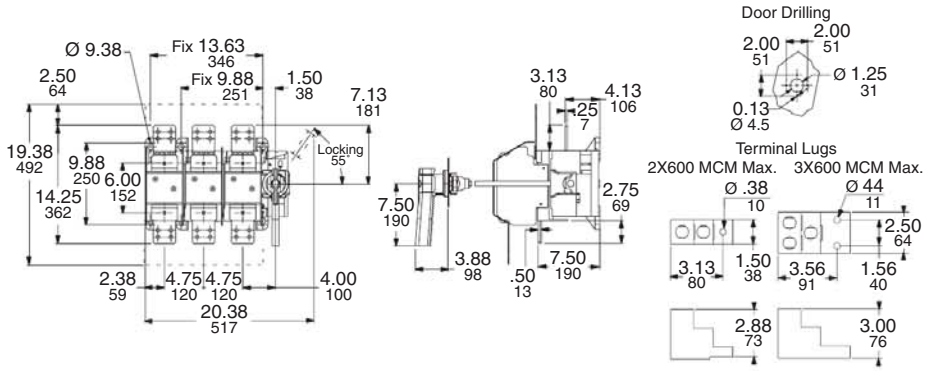
Mounting Hole Dimension: 0.19 in. (4.8 mm)

GS1QU3, GS1 400 A J



Mounting Hole Dimension: 0.25 in. (6.3 mm)

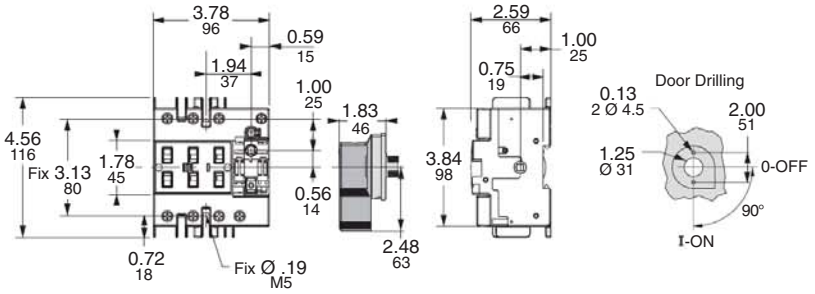
GS1SU3/GS1TU3, GS1 600 A J and 800 A L



Mounting Hole Dimension: 0.38 in. (9.6 mm)

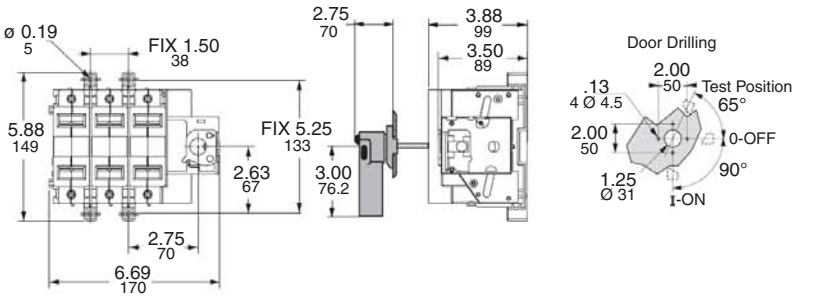
Dimensions: in. / mm

LK3DU3,
Compact LK3
30 A



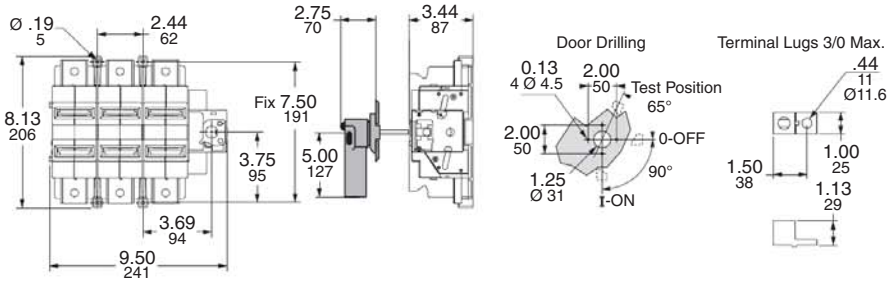
Mounting Hole Dimension: 0.19 in. (4.8 mm)

LK3GU3/LK3JU3,
LK3
60 A/100 A



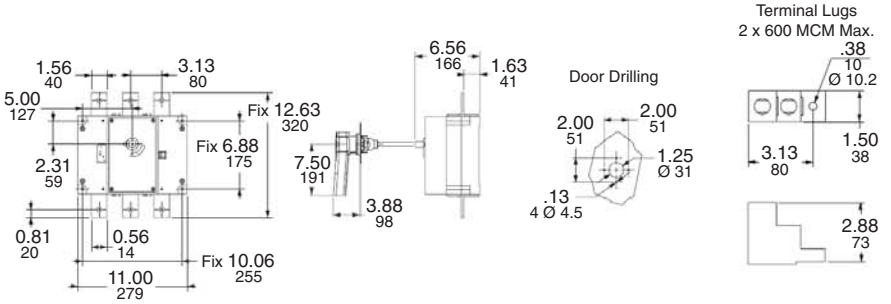
Mounting Hole Dimension: 0.19 in. (4.8 mm)

LK3MU3,
LK3
200 A



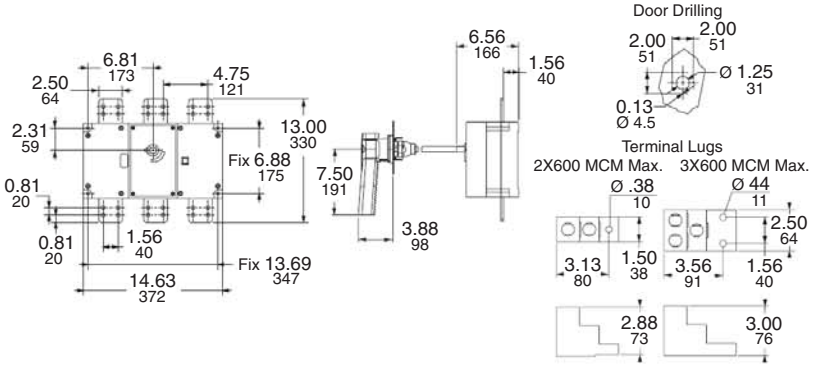
Mounting Hole Dimension: 0.19 in. (4.8 mm)

LK3QU3/LK3SU3,
LK3
400 A/600 A



Mounting Hole Dimension: 0.25 in. (6.3 mm)

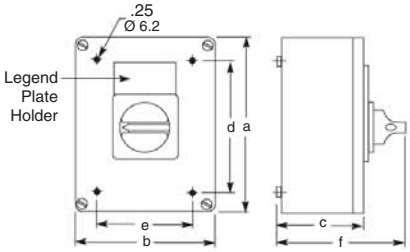
LK3TU3/LK3UU3/
LK3WU3,
LK3
800 A/1000 A/1250 A



Mounting Hole Dimension: 0.38 in. (9.6 mm)

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

Non-Metallic Enclosure



VC1GU–VC6GU

Vario

The Vario Motor Disconnect Switch is also offered as an enclosed switch made of corrosion resistant material. The 3-pole version makes the Vario switch ideal for manual motor control applications. The switches are compact, easy to wire and connect, and come undrilled to allow variable cable entry positions.

NOTE: *VCGUN enclosures are UL approved.*

Table 17.15: Non-Metallic Enclosed Switches ▲

Ampere Size		IP55-PVC 3-Pole, NEMA Type 1 & 12	
UL	IEC	Catalog No.	$ Price
20	32	VC1GUN	**239.00**
25	40	VC2GUN	**287.00**
45	63	VC3GUN	**345.00**
63	80	VC4GUN	**381.00**
100	125	VC5GUN	**548.00**
115	175	VC6GUN	**845.00**

▲ Assembled, includes switches mounted in enclosure with handle.

Table 17.16: Non-Metallic Enclosed Switch Dimensions ▲

Catalog No. ▲	No. of Poles	Dimensions											
		a		b		c		d		e		f	
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
VC1GU–VC2GU	3	6.7	170	4.1	105	3.2	82	4.8	122	2.1	53	5.0	128
VC3GU–VC4GU		6.7	170	5.3	135	3.3	85	5.1	130	3.7	95	5.2	131
VC5GU–VC6GU		11.0	280	8.6	220	5.0	126	7.9	201	7.5	190	8.6	203

▲ UL Rated, NEMA Type 1, 12, IP55.

Table 17.17: Vario Manual Motor Control Switches, IEC

Rating (A) IEC	kW Rating				3-Pole Switch Body	
	230 V	240 V	400 V	415 V	500 V	690 V
20	4	4	5.5	5.5	7.5	11
25	5.5	5.5	7.5	7.5	11	15
32	5.5	5.5	11	11	11	15
40	7.5	7.5	15	15	18.5	15
63	15	15	22	22	30	22
80	18.5	18.5	30	30	37	30
125	22	22	37	37	45	37
175	30	30	45	45	55	45

File D10

The D10 disconnect switch features high I^2T rating, longer contact life, visible contact indication, fuse-mounting flexibility, dead-front construction, and auxiliary interlocks.

A complete installation includes a D10 disconnect switch, D11 handle operator, and D12 fuse clip kit. The D10 accepts Class H, K, J, or R fuses, or can be used for nonfusible applications. The D10 disconnect switch is operated by a cast metal handle operator that is lockable in the "Off" position and defeatable in the "On" position.

Table 17.18: Disconnect Switches (without fuse clips or shorting straps)

600 V—Without Service Entrance Rating							
Starter NEMA Size	Rating (A)	Max. Horsepower Rating▲ 120 V	200–240 V	480 V	600 V	Catalog Number	$ Price
0–1	30	5	10	20	25	D10S1	270.00
2	60	10	20	40	50	D10S2	292.00
3	100	15	30	60	75	D10S3	452.00
4	200	25	50	100	100	D10S4	860.00

600 V—With Service Entrance Rating							
Starter NEMA Size	Rating (A)	Max. Horsepower Rating ▲ 120 V	200–240 V	480 V	600 V	Catalog Number	$ Price
0–1	30	5	10	20	25	D10S1H	320.00
2	60	10	20	40	50	D10S2H	352.00
3	100	15	30	60	75	D10S3H	544.00
4	200	25	50	100	100	D10S4H	1154.00

▲ Nonfused ratings.

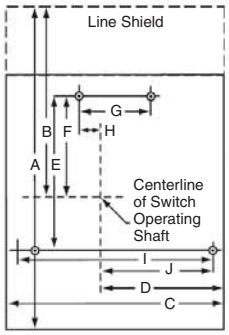


Table 17.19: Rotary Handle Operator Kits and Shafts

Kits include: Handle, Shaft, and Actuator NEMA Type 1, 3, 3R, 4, and 12				
Description	Rating (A)	Enclosure Interior Depth—Inches	Catalog Number	$ Price
Complete Kit with Handle, Shaft, and Actuator	30, 60, 100, 200	5–6	D11SF4	106.00
		6–10	D11SF10	118.00
		10–16	D11SF16	130.00
Shaft only		6	D11SH10	26.20
		12	D11SH16	32.80

Table 17.20: Auxiliary Electrical Interlock

(for mounting on 30–200 A disconnect switch ▲)

Block Description (with switch contacts open)	Catalog Number	$ Price
1 N.O.	D11N0	79.00
1 N.C.	D11NC	79.00
1 N.O. and 1 N.C.	D11N0C	116.00
2 N.O.	D11N00	116.00
2 N.O. and 2 N.C.	D11N0C2	130.00

▲ One block per switch.

Table 17.21: Interrupting and Withstandability Ratings

Rating (A)	Interrupting Rating Amperes Symmetrical 600 Vac, 3Ø	Withstandability I^2T (Amperes^2 seconds)
30	1,200	0.38×10^6
60	1,800	1.28×10^6
100	2.000	2.62×10^6
200	3,600	5.25×10^6

Note: These switches are for motor circuit applications.

Table 17.22: Lug Data

Rating (A)	Number Per Pole	Wire Range ▲	Wire Type
30	1	#14–#8	Cu
60		#14–#4	Cu
100		#14–#1/0	Al–Cu
200		#6–250 kcmil	Al–Cu

▲ One conductor per lug.

Table 17.23: Fuse Clip Kits

D10 Switch Size	Fuse Clip Rating ▲ Amperes	AC Volts	Type	Catalog Number	$ Price
30 A	No Fuse			D12C01	8.30
	0–30	250	H, K	D12C21	16.30
	0–30	250	R	D12CR21	65.00
	0–30	600	H, K	D12C61	24.50
	0–30	600	R	D12CR61	65.00
	0–30	600	J	D12CJ1	49.30
	31–60	250	H, K	D12C22	24.50
	31–60	600	H, K	D12C62	49.30
	31–60	600	R	D12CR62	82.50
	31–60	600	J	D12CJ2	57.50
	61–100	250	H, K	D12C23	65.00
60 A	No Fuse			D12D02	24.50
	0–30	250	R	D12DR21	65.00
	0–30	600	H, K	D12D61	24.50
	0–30	600	R	D12DR61	65.00
	31–60	250	H, K	D12D22	23.80
	31–60	250	R	D12DR22	82.50
	31–60	600	H, K	D12D62	41.00
	31–60	600	R	D12DR62	82.50
	31–60	600	J	D12DJ2	57.50
	61–100	250	H, K	D12D23	65.00
	61–100	600	H, K	D12D63	115.00
	61–100	600	J	D12DJ3	106.30
	61–100	600	R	D12DR63	113.80
100 A	No Fuse			D12E03	49.30
	31–60	250	H, K	D12E22	41.00
	31–60	600	H, K	D12E62	41.00
	61–100	250	H, K	D12E23	32.50
	61–100	250	R	D12ER23	115.00
	61–100	600	H, K	D12F63	90.00
	61–100	600	R	D12FR63	115.00
	61–100	600	J	D12EJ3	115.00
	101–200	250	H, K	D12F24	106.30
	101–200	600	H, K	D12F64	122.50
	101–200	600	J	D12FJ4	140.00
200 A	No Fuse			D12F04	82.50
	61–100	600	H, K	D12F63	90.00
	101–200	250	H, K	D12F24	106.30
	101–200	250	R	D12FR24	140.00
	101–200	600	H, K	D12F64	122.50
	101–200	600	R	D12FR64	135.00
	101–200	600	J	D12FJ4	140.00

▲ Continuous current should not exceed switch rating (size). Fuse clip kits should be sized to accommodate inrush.

Table 17.24: Switch Dimensions (in inches)

Rating (A)	Length A	B	Width C	Mounting Hole Dimensions D	E	F	G	H	I	J	Depth K▲	I■
30	7-5/16	4-15/32	5-7/8	3-15/32	6	3-15/32	1-7/8	13/32	5-7/16	3-1/4	4-3/32	4-11/32
60	7-5/16	4-15/32	5-7/8	3-15/32	6	3-15/32	1-7/8	13/32	5-7/16	3-1/4	4-11/32	4-11/32
100	9-27/32	5-11/32	8-3/16	4-5/8	5-13/16	3-13/16	2-11/16	51/64	7-5/16	4-3/16	5-23/32	4-27/32
200	12-3/16	7-7/32	8-3/16	4-5/8	5-13/16	3-13/16	2-11/16	51/64	7-5/16	4-3/16	5-23/32	4-27/32

▲ Maximum depth with largest fuse.
■ Depth including insulating barrier on service entrance switches.

Operating Mechanism

Type L Circuit Breaker Mechanisms

Type L door-mounted, variable-depth operating mechanisms feature heavy duty, all metal construction with trip indication. All can be padlocked in the "Off" position when the enclosure door is open. Further, the handle assemblies can be locked "Off" with up to three padlocks, which also locks the enclosure when the door is closed. (The 3" handle accepts one padlock.) Complete kits are rated for NEMA Type 1, 3R, and 12 enclosures. They include a handle assembly, operating mechanism, and shaft assembly.

Table 17.25: Complete Kits

Complete Kit Does Not Include Circuit Breaker — Use With			Includes: Operating Mechanism Standard 6 in. Handle Standard Shaft Kit			Includes: Operating Mechanism Standard 6 in. Handle Long Shaft Kit			Includes: Operating Mechanism Short 3 in. Handle Long Shaft Kit		
Circuit Breaker or Interrupter Type	No. of Poles	Frame Size (A)	Type	$ Price	Mounting Depth ▲ Min. – Max.	Type	$ Price	Mounting Depth ▲ Min. – Max.	Type	$ Price	Mounting Depth ▲ Min. – Max.
GJL	3	75, 100	LG1	**140.00**	5-1/2–10-1/4	LG4	**158.00**	5-1/2–20-7/8	LG3	**198.00**	5-1/2–20-7/8
FAL, FCL, FHL	2–3	100	LN1	**140.00**	5-1/2–10-7/16	LN4	**158.00**	5-1/2–21	LN3	**198.00**	5-1/2–21
KAL, KCL, KHL	2–3	250	LP1	**171.00**	6-1/4–11-3/16	LP4	**189.00**	6-1/4–21-3/4	LP3	**230.00**	6-1/4–21-3/4
LAL♦, LHL♦, Q4L	2–3	400	LR1	**242.00**	6-5/16–10-7/8	LR4	**255.00**	6-5/16–21-1/2	LJ3	**230.00**	5-1/2–21-3/8
MEL, MXL	2–3	800	LT1■	**242.00**	7-3/16–11-5/8	LT4■	**255.00**	7-3/16–22-1/4	3 in. handles are not recommended for use with these circuit breakers.		
MAL, MHL	2–3	1200	LT1■	**242.00**	7-3/16–11-5/8	LT4■	**255.00**	7-3/16–22-1/4			
NAL, NCL, NEL, NXL	2–3	1200	LX1■	**242.00**	8-1/4–12-3/4	LX4■	**255.00**	8-1/4–23-3/8			

Table 17.26: Component Parts

Use With			3 in. Handle Assemblies Type 1, 3R, 12		Standard Handle Assemblies Type 1, 3R, 12		Operating Mechanism (Lockout Included)		Standard Shaft (Support Bracket Not Required)			Long Shaft (Support Bracket Included)		
Circuit Breaker or Interrupter Type	No. of Poles	Frame Size (A)	Type	$ Price	Type	$ Price	Type	$ Price	Mounting Depth ▲ Min. – Max.	Type	$ Price	Mounting Depth ▲ Min. – Max.	Type	$ Price
GJL	3	75, 100	LH3	**90.00**	LH6	**50.00**	LG7	**68.00**	5-1/2–10-7/16	LS8	**21.50**	5-1/2–21	LS13	**35.60**
FAL, FCL, FHL	2–3	100	LH3	**90.00**	LH6	**50.00**	LF1	**71.00**	5-1/2–10-7/16	LS8	**21.50**	5-1/2–21	LS12	**35.60**
KAL, KCL, KHL	2–3	250	LH3	**90.00**	LH6	**50.00**	LK1	**105.00**	6-1/4–11-3/16	LS8	**21.50**	6-1/4–21-3/4	LS12	**35.60**
LAL♦, LHL♦, Q4L	2–3	400	3 in. handles are not recommended for use with these circuit breakers.		LH6	**50.00**	LL1	**170.00**	6-5/16–10-7/8	LS8	**21.50**	6-5/16–21-1/2	LS10	**35.60**
MEL, MXL	2–3	800			LH8	**50.00**	LM1	**170.00**	7-3/16–11-5/8	LS8	**21.50**	7-3/16–22-1/4	LS10	**35.60**
MAL, MHL	2–3	1200			LH8	**50.00**	LM1	**170.00**	7-3/16–11-5/8	LS8	**21.50**	7-3/16–22-1/4	LS10	**35.60**
NAL, NCL, NEL, NXL	2–3	1200			LH8	**50.00**	LX7	**170.00**	8-1/4–12-3/4	LS8	**21.50**	8-1/4–23-3/8	LS10	**35.60**

▲ Mounting depth in inches, measured from circuit breaker mounting surface (control panel) to outside of enclosure door.
■ Types LT1, LT4, LX1, and LX4 include an 8 in. handle rather than a 6 in. handle.
♦ These operating mechanisms cannot be used with any LA/LH circuit breaker with an MB or MT suffix.

3 in. Handle Assembly

Table 17.27: NEMA Type 4 and 4X Handle Assemblies ▲

Use With			Standard Handle Assemblies				3 in. Handle Version			
Circuit Breaker or Interrupter Type	No. of Poles	Frame Size (A)	NEMA Type 1, 3R, 4, 12 (Painted)		NEMA Type 1, 3R, 4, 4X, 12 (Chrome Plated)		NEMA Type 1, 3R, 4, 12 (Painted)		NEMA Type 1, 3R, 4, 4X, 12 (Chrome Plated)	
			Type	$ Price	Type	$ Price	Type	$ Price	Type	$ Price
GJL	3	75	LH46	**90.00**	LC46	**149.00**	LH43	**165.00**	LC43	**233.00**
FAL, FCL, FHL	2–3	100	LH46	**90.00**	LC46	**149.00**	LH43	**165.00**	LC43	**233.00**
KAL, KCL, KHL	2–3	250	LH46	**90.00**	LC46	**149.00**	LH43	**165.00**	LC43	**233.00**
LAL, LHL, Q4L	2–3	400	LH46	**90.00**	LC46	**149.00**	3 in. handles are not recommended for use with these circuit breakers.			
MEL, MXL	2–3	800	LH48	**90.00**	LC48	**149.00**				
MAL, MHL	2–3	1000	LH48	**90.00**	LC48	**149.00**				
NAL, NCL, NEL, NXL	2–3	1200	LH48	**90.00**	LC48	**149.00**				

▲ Due to gasketing, NEMA Type 3 and 4 handle assemblies are **not** trip indicating.

Standard Handle Assembly

Table 17.28: IEC Style Operating Mechanisms

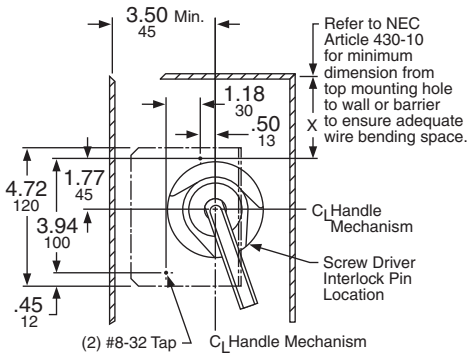
Circuit Breaker or Interrupter Type	Type 1, 4, 4X, 12			Operating Mechanism (Lockout Included)		Extension Shafts			
						Mounting Depth		Type	$ Price
	Color	Type	$ Price	Type	$ Price	Min.	Max.		
GJL	Red/Yellow	NW3	**90.00**	LG8	**71.00**	6-1/8	10-3/4	NS16	**28.70**
	Black	NW3B	**90.00**			6-1/8	17-7/8	NS336▲	**35.60**

▲ Contains support bracket.

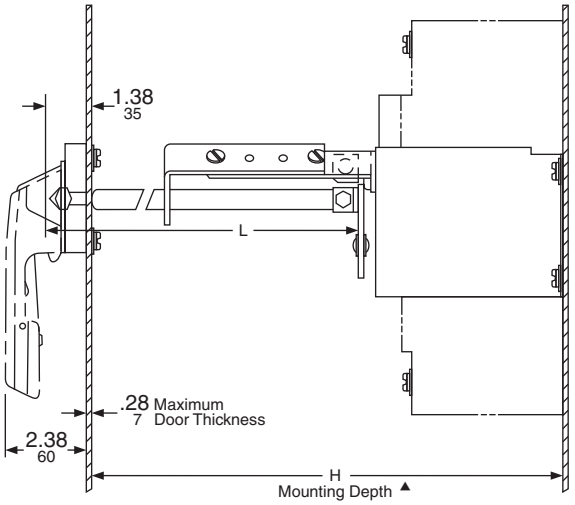
Table 17.29: Electrical Interlock Kits—Class 9999 ▲

Description	Class	Type	$ Price
Single-Pole, Double-Throw	9999	R47	**131.00**
Double-Pole, Double-Throw	9999	R48	**221.00**

▲ Optional accessory for use with 9421L operating mechanisms. Not used with GJL, NAL, NCL, NEL, NXL, NSF, NSJ, PowerPact™ C, D, H, and J circuit breakers; use field-installed circuit breaker interlocks instead.



Panel drilling for GJL circuit breaker and operating mechanism

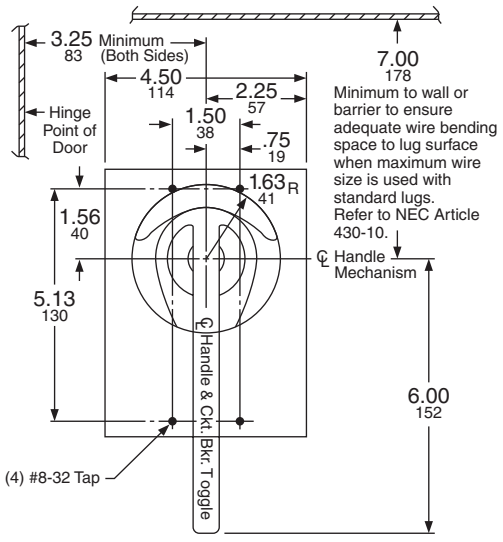


L = Overall shaft length
H = Distance from inside of enclosure door to circuit breaker mounting surface

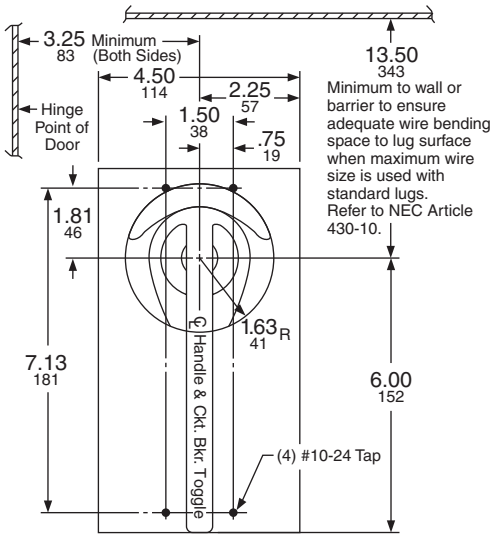
Table 17.30: Shaft Cutting Dimensions

Class	Type	Shaft Length Formula	H = Standard Shaft		H = Long Shaft	
			Min.	Max.	Min.	Max.
9421	LG7, LG1, LG4, LG3	L = H–**2.50**	**5.50**	**10.25**	**5.50**	**20.85**
		64	140	260	140	530
9421	LF1, LN1, LN3, LN4	L = H–**2.88**	**5.50**	**10.44**	**5.50**	**21.00**
		73	140	265	140	533
9421	LK1, LP1, LP3, LP4	L = H–**3.63**	**6.25**	**11.19**	**6.25**	**21.75**
		92	159	284	159	552
9421	LL1, LR1, LR4	L= H–**3.13**	**6.31**	**10.88**	**6.31**	**21.50**
		79	160	276	160	546
9421	LM1, LT1, LT4	L= H–**4.00**	**7.18**	**11.63**	**7.18**	**22.25**
		102	182	295	182	565
9421	LX7, LX1, LX4	L= H–**5.17**	**8.25**	**12.75**	**8.25**	**23.38**
		131	210	324	210	594

▲ Mounting depth measured from circuit breaker mounting surface (control panel) to outside of enclosure door.

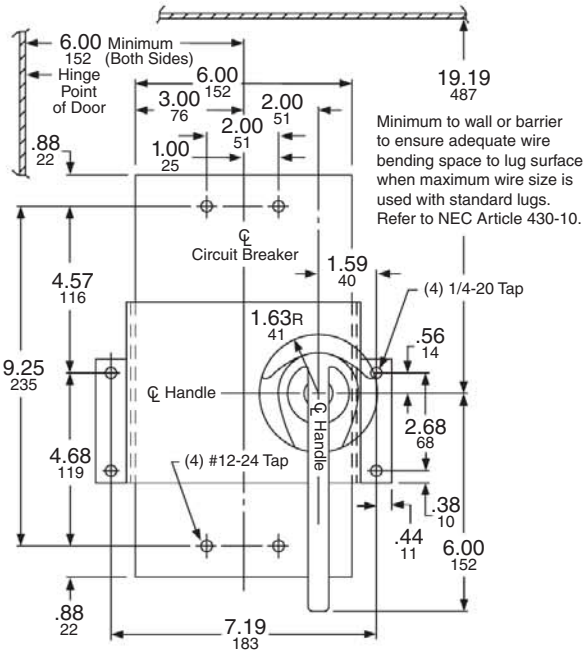


Panel drilling for FAL, FCL, and FHL circuit breakers and operating mechanisms

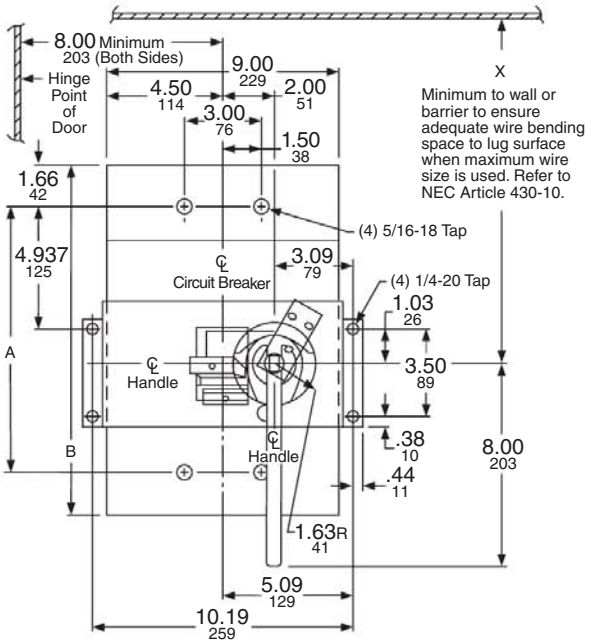


Panel drilling for KAL, KCL, and KHL circuit breakers and operating mechanisms

Dimensions: in. / mm

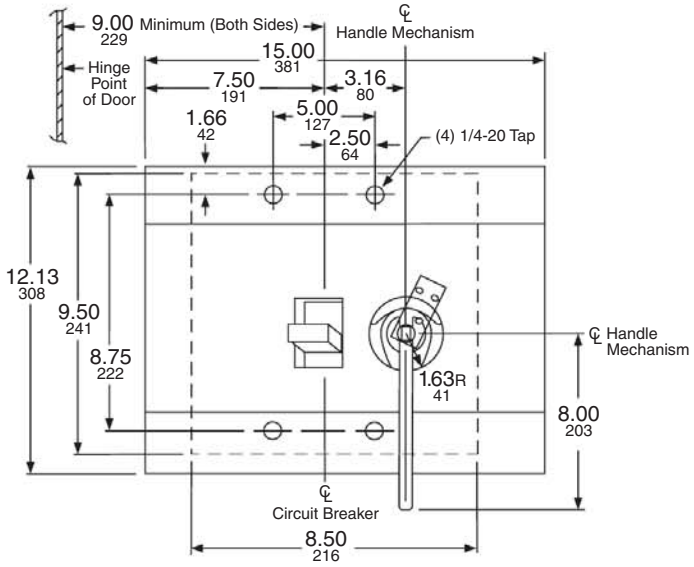


Panel drilling for LAL, LHL, and Q4L circuit breakers and operating mechanisms



Panel drilling for MAL, MEL, MHL, and MXL circuit breakers and operating mechanisms

Circuit Breaker Type	Dimensions = in. (mm)	
	A	B
MAL, MHL	10.69 (272)	14.00 (356)
MEL, MXL	11.47 (291)	14.75 (375)



Panel drilling for NAL, NCL, NEL, and NXL circuit breakers and operating mechanisms

Dimensions: in. / mm

Table 17.31: Bracket-Mounted Operating Mechanisms for Use With Square D™ Circuit Breakers

The circuit breaker operating mechanisms listed below are shipped with the external operating handle assembled to a bracket. Circuit breakers are not included and must be ordered separately. A trim plate is provided with each kit to prevent any mounting screws from being accessible from the front and also to provide an attractive installation.The operating handle is Type A1. These switches can be used with Class 9423 door closing mechanisms.

Use With			Operating Mechanism Right Hand Flange Mounting	
Circuit Breaker or Interrupter Type	No. of Poles	Frame Size (A)	Cat. No.	$ Price
FAL, FHL	2–3	100	BN1	**257.00**
KAL, KHL	2–3	250	BP1	**270.00**
LAL▲, LHL▲, Q4L	2–3	400	BR1	**543.00**

▲ These operating mechanisms cannot be used with any LA/LH circuit breaker with an MB or MT suffix.

Note: Some enclosures may not accept the listed bracket-mounted operating mechanisms; contact the enclosure manufacturer.

Table 17.32: Electrical Interlock Kits—Class 9999

Optional accessory for use with circuit breaker operating mechanisms listed to the left and the flexible cable mechanisms listed below, except GJL.

Description	Class	Type	$ Price
Single Pole, Double Throw	9999	R26	**131.00**
Double Pole, Double Throw	9999	R27	**243.00**

Note: Not used with GJL; use field installed circuit breaker interlocks.

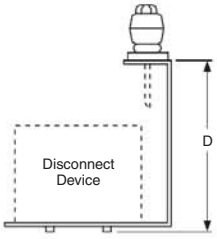
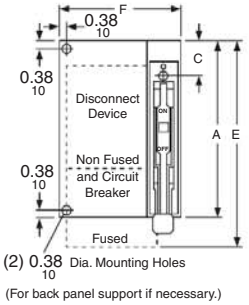


Table 17.33: Dimensions

Type	A in. (mm)	C in. (mm)	D in. (mm)	Min. Enclosure Depth▲ in. (mm)	F in. (mm)
BG1, BN1	8.75 (222)	1.13 (29)	6.50 (165)	8.00 (203)	7.13 (181)
BP1	9.13 (232)				7.38 (187)

▲ The minimum enclosure depth is greater than Dimension D since additional space is needed when mounting the mechanism.

Note: Back panel support is recommended for Types TFB1, 2, and 3. Other devices may also require support if the flange is not sufficiently rigid.



(For back panel support if necessary.)

For use with Square D circuit breakers and Class 9422 A handle operators. Especially designed for tall, deep enclosures where placement flexibility is required. See Digest 176 page 8-24 for dimensions.

Table 17.34: Class 9422—Flexible Cable Mechanisms for Use With Square D Circuit Breakers

Circuit Breaker Type	No. of Poles	Frame Size (A)	Cable Mechanism			Cable Mechanisms with A1 Handle	
			Cable Length	Catalog No.	$ Price	Catalog No.	$ Price
GJL	3	100	36 in.	CGJ30	**273.00**	CGJ31	**417.00**
			48 in.	CGJ40	**291.00**	CGJ41	**432.00**
			60 in.	CGJ50	**291.00**	CGJ51	**432.00**
			120 in.	CGJ10	**333.00**	CGJ11	**476.00**
FAL, FHL	2, 3	100	36 in.	CFA30	**273.00**	CFA31	**417.00**
			60 in.	CFA50	**291.00**	CFA51	**432.00**
			120 in.	CFA10	**333.00**	CFA11	**476.00**
KAL, KHL	2, 3	250	36 in.	CKA30	**288.00**	CKA31	**431.00**
			60 in.	CKA50	**305.00**	CKA51	**446.00**
			120 in.	CKA10	**347.00**	CKA11	**489.00**
LAL▲, LHL▲, Q4L	2, 3	400	36 in.	CLA30	**486.00**	CLA31	**630.00**
			60 in.	CLA50	**504.00**	CLA51	**647.00**
			120 in.	CLA10	**548.00**	CLA11	**689.00**

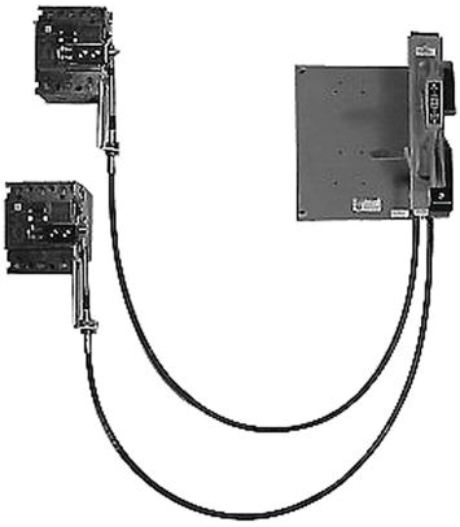
▲ These operating mechanisms cannot be used with any LA/LH circuit breaker with an MB or MT suffix.

Table 17.35: Class 9999 Auxiliary Contact Kits for Disconnect Switches and Circuit Breakers

Class	Type	SPDT		DPDT	
		Type	$ Price	Type	$ Price
Disconnect Switches					
9422	TF	R8	**87.00**	R9	**243.00**
Circuit Breaker Operating Mechanisms					
9421	LF, LK, LL, LM, LN, LP, LR, LT	R47	**131.00**	R48	**221.00**
9422	RM, RN, RP, RR, RT	R26	**131.00**	R27	**243.00**
9422	CFA, CKA, CLA, CSF	R26	**131.00**	R27	**243.00**

Note: No external auxiliary contacts are available for the following circuit breakers:
GJL circuit breakers must use internal auxiliary contacts, catalog number AAC.
PowerPact D circuit breakers must use internal auxiliary contacts, catalog number AAC.

Note: For additional variations, contact the Customer Care Center (CCC) at 1-888-778-2733.



Dual Cable Operating Mechanisms for Square D™ Circuit Breakers

Dual cable operator mechanisms are designed for use with Square D GJL circuit breakers. The cable mechanisms allow for a single handle operator, Class 9422A1, to operate both circuit breakers. The cable mechanism is designed especially for tall, deep enclosures where placement flexibility is required. There are numerous cable arrangements to choose from to accommodate many applications.

Features

- Separate cables for each circuit breaker
- Rugged metal flange handle operator
- Maximized flexibility of circuit breaker placement for existing and new applications
- Control panel can be fed from two separate supply voltages (if required)
- Dual mechanism allows both separate supply voltages to be controlled by a single handle to improve security features

Table 17.36: Dual Cable Operating Mechanisms Selection

Circuit Breaker Type	Cable Length in. / mm (quantity)	Catalog Number	Frame Size (max.)	$ Price
GJL	36 in. / 914 mm (2)	9422CGJD3	100 A	**585.00**
	48 in. / 1219 mm (2)	9422CGJD4		**608.00**
	60 in. / 1524 mm (2)	9422CGJD5		**675.00**
	120 in. / 3048 mm (2)	9422CGJD1		**788.00**
	36 in. / 914 mm (1) 60 in. / 1524 mm (1)	9422CGJD8		**642.00**
	60 in. / 1524 mm (1) 120 in. / 3048 mm (1)	9422CGJD9		**720.00**

Table 17.37: Special Left-hand Mounted Single Cable Operating Mechanisms

Circuit Breaker Type	Cable Length in. / mm (quantity)	Catalog Number	Frame Size (max.)	$ Price
FAL	120 in. / 3048 mm (1)	9422CFAL10	100 A	**350.00**
	36 in. / 914 mm (1)	9422CFAL30		**287.00**
	60 in. / 1524 mm (1)	9422CFAL50		**318.00**

Designed for installation in custom built control enclosures where main or branch circuit protective devices are required. All circuit breaker operating mechanisms are suitable for either right- or left-hand flange mounting, convertible on the job.

Table 17.38: Variable-Depth Mechanisms for Use with Square D™ Circuit Breakers and Schneider Electric™ (formerly Merlin Gerin™) Circuit Breakers

Use With				Operating Mechanism					
				Operating Mechanism Only—Does Not Include Handle Mechanism		Operating Mechanism and Handle Mechanism			
						Includes Type A1 Handle Mechanism		Includes Type A2 Handle Mechanism	
Circuit Breaker Frame Size	No. of Poles	Frame Size A	Variable-Depth Mtg. Range Min.-Max.▲ (Inches)	Type	$ Price	Type	$ Price	Type	$ Price
Square D Circuit Breakers									
GJL	3	100	6.00–17.75	RG1	**116.00**	ARG11	**257.00**	ARG21	**372.00**
FAL, FHL	2–3	100	5.38–17.75	RN1	**116.00**	ARN11	**257.00**	ARN21	**372.00**
KAL, KHL	2–3	250	6.38–17.88	RP1	**129.00**	ARP11	**270.00**	ARP21	**386.00**
LAL♦, LHL♦, Q4L	2–3	400	7.44–18.25	RR1	**329.00**	ARR11	**471.00**	ARR21	**585.00**
MEL, MXL	2–3	800	9.00–18.38	RT1	**449.00**	ART11	**593.00**	ART21	**705.00**
MAL, MHL	2–3	1200	9.00–18.38	RT1	**449.00**	ART11	**593.00**	ART21	**705.00**
NAL, NCL, NEL, NXL	2–3	1200	11.00–18.37	RX1	**513.00**	—	—	—	—

▲ Class 9422 Type R2 will extend mounting depth 7 in.

Table 17.39: Electrical Interlocks—Class 9999

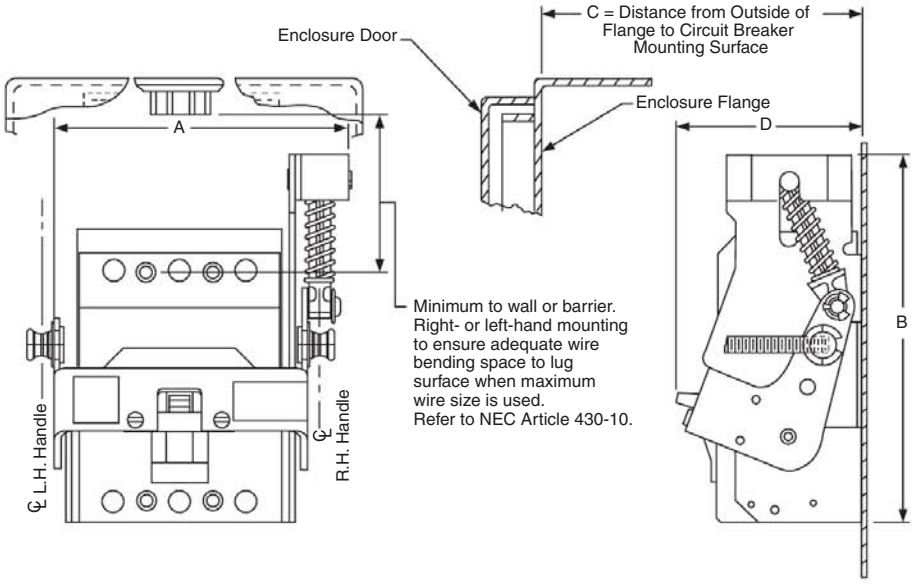
Description	Class	Type	$ Price
Single Pole, Double Throw	9999	R26▲	**131.00**
Double Pole, Double Throw	9999	R27▲	**243.00**

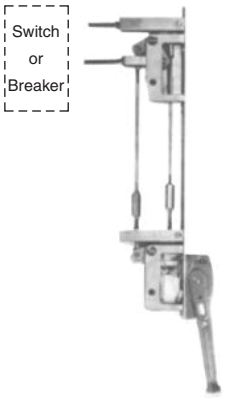
▲ Not for use with the GJL operating mechanism.

Table 17.40: Dimensions

Circuit Breaker Frame Size	Type	Width (A)		Height (B)		Distance to Enclosure Flange▲ (C)				Bracket Depth (D)	
						Minimum		Maximum			
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
GJL	RG1	5.00	127	4.75	121	6.00	152	17.75	451	4.00	102
FAL, FHL	RN1	6.75	171	8.50	216	5.51	140	17.75	451	4.26	108
KAL, KHL	RP1	7.13	181	10.13	257	6.51	165	17.88	454	4.94	125
LAL♦, LHL♦, Q4L	RR1	10.19	259	11.00	279	7.44	189	18.25	464	6.00	152
MEL, MXL	RT1	13.38	340	14.00	356	9.00	229	18.38	467	9.69	246
MAL, MHL■	RT1	13.38	340	14.00	356	9.00	229	18.38	467	9.69	246
NAL, NCL, NEL, NXL	RX1	19.63	499	13.50	343	11.00	279	18.37	467	9.00	229

▲ 9422R2 will extend the dimension by 7 in. Two required.
■ Minimum mounting depth when using MAL or MHL circuit breakers can be decreased to 7.63 inches by using the Class 9422 Type RT1B conversion kit. **$23.00**
♦ **Warning:** These operating mechanisms cannot be used with any LA / LH circuit breaker with an MB or MT suffix.





Remote operation shown (handle mechanism not included in kit)

Remote or Dual Adapter Kit

For the remote or dual operation of GJL, FAL, FHL, KAL, KHL, LAL, LHL, Q4L, MAL, MHL, MEL, and MXL circuit breakers.

Remote Operation—permits mounting the Class 9422 Type A9 or A10 handle mechanism at a lower level than the disconnect device it controls. This arrangement is often required where the disconnect device is mounted too high for personnel to easily reach a conventional operator.

Dual Operation—permits controlling two disconnect devices, one in line with, and one remote from, a single Class 9422 Type A9 or A10 handle mechanism.

NOTE: *A Class 9422 Type A9 or A10 handle (see Digest 176 page 8-15) and the preferred mounting method **must** be used.*

Table 17.41: Disconnect Device

Disconnect Device	Enclosure Mounting Depth		Type	$ Price
	Min.	Max.		
Circuit Breaker				
GJL	10.50	19.50	D2	**251.00**
FAL, FHL	10.66	19.50		
KAL, KHL	11.13	19.50		
LAL, LHL, Q4L	12.13	19.88		
MAL, MHL,MEL, MXL	13.75	20.25		

Air valve interlock mounted on enclosure

Table 17.42: Air Valve Interlock

Note: Air valve interlocks only accept the specific three-way air valves, manufactured by Parker, listed in the table below.

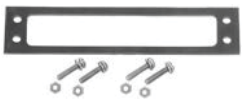
Parker Valve Model Number▲		Class 9422 Air Valve Interlock	
Air Valve Size	Knob Operated	Type	$ Price
0.50 NPT 13	M04841885	G1	**513.00**
	M08541848		
0.75 NPT 19	M04861885	G2	**513.00**
	M08561848		
1.00 NPT 25	M00080004	G1	**513.00**

▲ **Prices do not include air valves or handle mechanism.** For more information on the air valves listed above, contact Parker at c-parker@parker.com, or call 1-800-272-7537.

Channel/Flange Support Kit

Table 17.43: Other Accessories

Accessory	Description	Class	Type	$ Price
Channel/Flange Support Kit	Auxiliary kit recommended for use with 30 A and 60 A disconnect switches and FAL, FCL, FHL, KAL KHL, NSF, and NSJ circuit breaker mechanisms when these devices are to be mounted on the center channel of a multi-door enclosure or when extra rigidity for the flange is required. Supplied as	9422	C1	**42.80**



Alternate Mounting Kit

Auxiliary Lock Plate

NEMA Types 1, 3R, 4, and 13 Without Overload

Class 2601 reversing drum switches may be used for across-the-line starting and reversing of AC polyphase, AC single phase or DC motors, where overload protection is not required or is provided separately. They are compact and inexpensive but ruggedly constructed. Drum switches are field convertible from maintained-only to momentary-only operation. This conversion consists of removing the handle screw and handle, turning the shaft 180 degrees, then replacing the handle and handle screw.

Type AG2

Table 17.44: Reversing Drum Switches

600 Vac Maximum				Class 2601						360 Vdc Maximum			
Ratings				NEMA Type 1 General Purpose Enclosure		NEMA Type 4 Watertight and Dusttight Enclosure		NEMA Type 3R Rainproof Outdoor Enclosure		NEMA Type 1 Maintained & Momentary ▲		NEMA Type 13 Oiltight Flush Mounting	
Voltage	Maximum Horsepower			Type	$ Price	Type	$ Price	Type	$ Price	Type	$ Price	Type	$ Price
	AC Single Phase	AC Poly-Phase	DC										
115- 200/230 230 460/575	1-1/2 — 2 —	— 2 — 2	1/4 — 1/4 —	AG2	**158.00**	AW2	**428.00**	AH2	**207.00**	AG2S2	**158.00**	AF2	**131.00**
115- 200/230 230 460/575	1-1/2 — 3 5	— 5 — 7-1/2	2 — 2 —	BG1	**428.00**	BW1	**590.00**	N/A	—	BG1S4	**428.00**	BF1	**356.00**

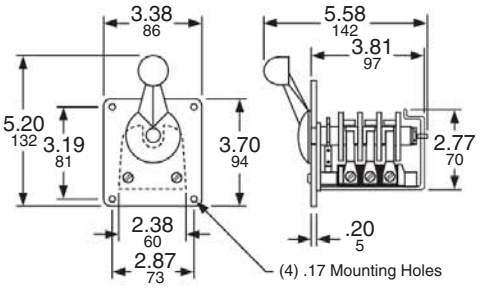
▲ Maintained – "Forward"; Momentary – "Reverse"; (not field convertible)

File CCN E42243 NLRV

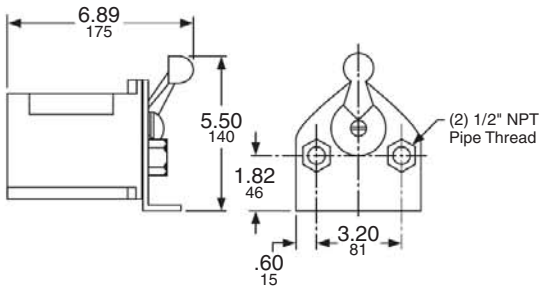
File Class LR25490 3211-05

Approximate Dimensions—Class 2601 Reversing Drum Switches

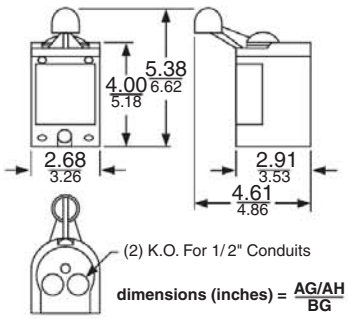
Type AW2



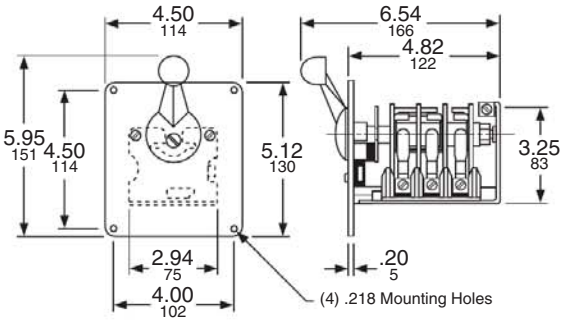
Type AF2



Types AW and BW



Types AG, AH, BG



Type BF1

Dimensions: in. / mm

Table 17.45: How to Order

To Order Specify:	Catalog Number	
• Class Number • Type Number	Class	Type
	2601	AG2

Reduced Voltage Starting of Squirrel Cage Motors

A squirrel cage motor draws high starting current (inrush) and produces high starting torque when started at full voltage. While these values differ for different motor designs, for a typical NEMA design B motor, the inrush will be approximately 600% of the motor full load amperage (FLA) rating, and the starting torque will be approximately 150% of full load torque at full voltage. High current inrush and starting torque can cause problems in the electrical and mechanical systems, or may even damage the materials being processed.

When a motor is started at reduced voltage, the current at the motor terminals is reduced in direct proportion to the voltage reduction, while the torque is reduced by the square of the voltage reduction. If the "typical" NEMA B motor is started at 70% of line voltage, the starting current would be 70% of the full voltage value (that is, 0.70 x 600% = 420% FLA). The torque would then be $(0.70)^2$ or 49% of the normal starting torque (that is, 0.49 x 150% = 74% full load torque). Therefore, reduced voltage starting provides an effective means of reducing both inrush current and starting torque.

If the motor has a high inertia or if the motor rating is marginal for the applied load, reducing the starting torque may prevent the motor from reaching full speed before the thermal overload relays trip. Applications that require high starting torque should be reviewed to determine if reduced voltage starting is suitable.

Square D™ offers several types of electromechanical as well as solid-state reduced voltage starters that provide different starting characteristics. The following describes the 8600 series of reduced voltage starters.

Electromechanical Reduced Voltage Starters

Class 8606—Autotransformer Starter: Autotransformer starters provide reduced voltage to the motor terminals during starting through the use of a tapped, three phase autotransformer. Taps on the autotransformer allow for selection of the motor with 50%, 65%, or 80% of line voltage values supplying 50%, 65%, or 80% of the current inrush seen during a full voltage start. The resulting starting torque will be 25%, 42%, or 64% of full voltage values, as will be the current draw on the line. Thus, the autotransformer provides the maximum torque with minimum line current.

Class 8630—Wye-Delta Starter: Wye-delta starters can only be used on wye-delta motors which have six leads that allow for motor winding to be connected in either a wye or delta configuration. During start up, the windings are connected in the wye, resulting in 58% of line voltage applied across two windings. This reduces both inrush and starting torque to 33% of the delta connected values. After a set time delay, the motor leads are switched to the delta connection. The wye-delta starter is available in both open and closed transition configurations. Closed transition starters are supplied with an additional contactor and resistor bank used to keep the motor windings energized for a few cycles until the transition from wye to delta is complete.

Class 8640—Part Winding Starter: Part winding starters can be used only with part winding motors. During a part winding start, only one winding is energized, reducing the inrush current to 60–70% (depending on the motor design) and starting torque to 50% of normal starting values with both windings energized. Most (but not all) dual voltage 230/460 volt motors are suitable for part winding starts at 230 volts.

Table 17.46: Starter Characteristics

Characteristic	Full Voltage	Autotransformer, Class 8606	Wye-Delta Class, 8630	Part Winding, Class 8640	Solid-State ATS46
Voltage at Motor	100%	50% / 65% / 80% (tap setting)	100%	100%	Ramped Up
Line Current (% Full Load Current)	600%	150% / 250% / 380%	200%	390%	150% to 700% (adjustable)
Starting Torque (% Rated Torque)	150%	40% / 60% / 100%	50%	70%	0% to 100% (adjustable)
Start Time (Factory Setting)	—	6–7 seconds	10 seconds / 15 seconds (open/closed transition)	1–1.5 seconds	10 seconds (adjustable 1–60 seconds)
Advantages	• Simple • Economical • High Starting Torque	• High torque/amperage • High inertial loads • Flexibility	• High inertial loads • Long acceleration loads • Good torque/amperage	• Simple • Small size	• Greatest flexibility • Smooth ramp • Solid-state overload relay • Diagnostics
Disadvantages	• Abrupt starts • Large current inrush	• Large size	• Low torque • No flexibility	Not suitable for: • High inertial loads • Frequent starting	• SCR heat dissipation • Ambient limitations
Motor	Standard	Standard	Special	Special	Standard

How to Order

Note: Tables 17.47 and 17.48 are for 60 Hz; see Table 17.51 for 50 Hz codes.

1. Specify the Class Number and the Type Number.
2. If all coils are at the line voltage, and not Sizes 6 or 7, select the voltage code from Table 17.47 (Sizes 6 and 7 are supplied with a fused transformer with 120 Vac as standard).
3. If the coils are at a different voltage than line supply, or Size 6 or 7, select a voltage code from Table 17.48 and also select a Form code from Table 17.49 (note that a Form code may be used with any voltage code, except as noted).

Table 17.47: Line Voltage Codes

Line	Control	Code
208	208	V08
240	240	V03
380	380	V05
480	480	V06
600	600	V07

Table 17.48: Coil Voltage Codes

Line	Control	Code
208	120	V84
240	24	V82
240	120	V80
480	24	V83
480	120	V81
480	240	V87
600	120	V86
380	110/50	V95
other	specify	V99

Table 17.49: Form Codes

Form Description	Form Code
Fused CPT for timing relay only	F4T
Fused CPT for all coils	F4T40
Separate control of timing relay only	S
Separate control for all coils	Y195

■ See Table 17.50 for sizing of 380 V starters.
♦ 24 V coils are not available on Sizes 4–7.

380 Vac, 50 Hz Starters

Table 17.50: 380 Vac, 50 Hz Starters, Maxiumum Horsepower Rating

Autotransformer, Class 8606		Wye-Delta, Class 8630		Part Winding, Class 8640	
Max. hp	NEMA Size	Max. hp	NEMA Size	Max. hp	NEMA Size
—	—	15	1YD	15	1PW
25	2	40	2YD	40	2PW
50	3	75	3YD	75	3PW
75	4	150	4YD	125	4PW
150	5	250	5YD	250	5PW
300	6	500	6YD	500	6PW

The Class 8600 starters are available for 380 Vac, 50 Hz applications. Table 17.50 provides maximum horsepower ratings. To determine the Type Number, select the second digit based on NEMA size. Select the fifth digit based on the horsepower requirement. Specify V05 voltage code. List prices for the same NEMA size starter apply.

50 Hz Control Voltage

Table 17.51: Coil Voltages

Hz	Voltage	Code	Voltage	Code	Voltage	Code	Voltage	Code
60 50	120 110	V02	240 220	V03	480 440	V06	600 550	V07

The starters in this section can also be operated at 50 Hz at the coil voltages listed in Table 17.51. For additional coil voltage availability, contact the Customer Care Center (CCC) at 1-888-778-2733.

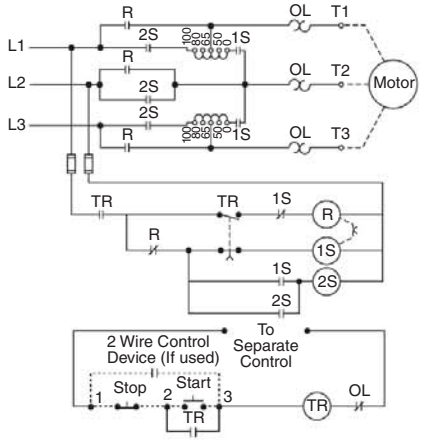
NOTE: *Prices shown do not include thermal units. Devices require 3 thermal units (Sizes 00–6). Standard trip thermal units are **$21.50** each. See Digest 176 page 16-116 for selection information.*

Table 17.52: 3-Pole Polyphase, 600 Vac Maximum, 50–60 Hz

Motor Voltage (Starter Voltage)	Max. HP	NEMA Size	NEMA Type 1 General Purpose Enclosure		NEMA Type 4▲ Watertight and Dusttight Enclosure		NEMA Type 12/3R★ Dusttight & Driptight Industrial Use Enclosure		Open Type		O.E.M. Kit ♦	
			Type■	$ Price	Type■	$ Price	Type■	$ Price	Type■	$ Price	Type■	$ Price
200 (208)	10	2	SDG1C	8076.00	SDW1C	12491.00	SDA1C	10641.00	SDO1C	7734.00	SDK1C	6786.00
	15 20 25	3	SEG1D SEG1E SEG1F	9500.00	SEW1D SEW1E SEW1F	13914.00	SEA1D SEA1E SEA1F	13707.00	SEO1D SEO1E SEO1F	8418.00	SEK1D SEK1E SEK1F	7493.00
	30 40	4	SFG1G SFG1H	18417.00	SFW1G SFW1H	26535.00	SFA1G SFA1H	21834.00	SFO1G SFO1H	16848.00	SFK1G SFK1H	13181.00
	50 75	5	SGG1J SGG1L	30330.00	SGW1J SGW1L	38448.00	SGA1J SGA1L	34176.00	SGO1J SGO1L	27167.00	SGK1J SGK1L	23223.00
	100 125 150	6	SHG1M SHG1N SHG1P	56507.00	SHW1M SHW1N SHW1P	67190.00	SHA1M SHA1N SHA1P	61848.00	SHO1M SHO1N SHO1P	51438.00	SHK1M SHK1N SHK1P	41481.00
230 (240)	10 15	2	SDG1C SDG1D	8076.00	SDW1C SDW1D	12491.00	SDA1C SDA1D	10641.00	SDO1C SDO1D	7734.00	SDK1C SDK1D	6786.00
	20 25 30	3	SEG1E SEG1F SEG1G	9500.00	SEW1E SEW1F SEW1G	13914.00	SEA1E SEA1F SEA1G	12207.00	SEO1E SEO1F SEO1G	8418.00	SEK1E SEK1F SEK1G	7493.00
	40 50	4	SFG1H SFG1J	18417.00	SFW1H SFW1J	26535.00	SFA1H SFA1J	21834.00	SFO1H SFO1J	16848.00	SFK1H SFK1J	13181.00
	75 100	5	SGG1L SGG1M	30330.00	SGW1L SGW1M	38448.00	SGA1L SGA1M	34176.00	SGO1L SGO1M	27167.00	SGK1L SGK1M	23223.00
	125 150 200	6	SHG1N SHG1P SHG1Q	56507.00	SHW1N SHW1P SHW1Q	67190.00	SHA1N SHA1P SHA1Q	61848.00	SHO1N SHO1P SHO1Q	51438.00	SHK1N SHK1P SHK1Q	41481.00
	250 300	7	SJG1R SJG1S	96786.00	SJW1R SJW1S	107468.00	SJA1R SJA1S	102126.00	—	—	—	—
460 (480) / 575 (600)	10 15 20 25	2	SDG1C SDG1D SDG1E SDG1F	8076.00	SDW1C SDW1D SDW1E SDW1F	12491.00	SDA1C SDA1D SDA1E SDA1F	10641.00	SDO1C SDO1D SDO1E SDO1F	7734.00	SDK1C SDK1D SDK1E SDK1F	6786.00
	30 40 50	3	SEG1G SEG1H SEG1J	9500.00	SEW1G SEW1H SEW1J	13914.00	SEA1G SEA1H SEA1J	12207.00	SEO1G SEO1H SEO1J	8418.00	SEK1G SEK1H SEK1J	7493.00
	60 75 100	4	SFG1K SFG1L SFG1M	18417.00	SFW1K SFW1L SFW1M	26535.00	SFA1K SFA1L SFA1M	21834.00	SFO1K SFO1L SFO1M	16848.00	SFK1K SFK1L SFK1M	13181.00
	125 150 200	5	SGG1N SGG1P SGG1Q	30330.00	SGW1N SGW1P SGW1Q	38448.00	SGA1N SGA1P SGA1Q	34176.00	SGO1N SGO1P SGO1Q	27167.00	SGK1N SGK1P SGK1Q	23223.00
	250 300 400	6	SHG1R SHG1S SHG1T	56507.00	SHW1R SHW1S SHW1T	67190.00	SHA1R SHA1S SHA1T	61848.00	SHO1R SHO1S SHO1T	51438.00	SHK1R SHK1S SHK1T	41481.00
	500 600	7	SJG1U SJG1W	96786.00	SJW1U SJW1W	107468.00	SJA1U SJA1W	102126.00	SJO1W	88250.00	—	—

▲ NEMA Type 4 enclosures are painted sheet steel. Where required, stainless steel enclosures are available at extra cost.Specify as **Form G17**. See "Modifications & Forms" for price adder.
■ Both line and control voltage must be specified to order this product. See page 17-18 for the necessary codes and instructions for ordering.
♦ No factory modifications (Forms) are available with O.E.M. Kit.
★ NEMA Type 12 enclosures can be field modified for outdoor non-corrosive and non-service entrance rated applications.

Note: Class 8606 starters are supplied with a NEMA style medium duty autotransformer.
Medium duty service includes applications to motors which drive loads such as fans, pumps, compressors, and line shafts.
NEMA Sizes 2–5: Autotransformer is rated for fifteen 15-second starts per hour.
NEMA Sizes 6–7: Autotransformer is rated for three 30-second starts per hour.
Contact the Customer Care Center (CCC) at 1-888-778-2733 for applications which require frequent starting or jogging, or have extremely high inertia.



Typical Autotransformer Starter
Sizes 2–5
Separate Control (Form S)

Table 17.53: How to Order

To Order Specify:	Catalog Number			
• Class Number • Type Number • Voltage Code • Form(s)▼	Class	Type	Voltage Code	Form(s)
	8606	SFG1M	V81	S

Description: 100 hp, 480 V line, 120 V separate control, 60 Hz

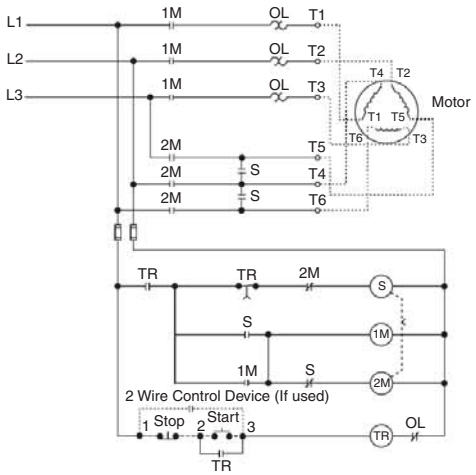
▼ Forms need to be specified only if any of the coils are at a different voltage than line supply (V8•). See page 17-18 for a fuller explanation of how to order; this page also provides the necessary coil voltage and Form codes as well as codes for 380 V starters and 50 Hz applications.

NOTE: *Prices shown do not include thermal units. Devices require 3 thermal units (Sizes 00–6). Standard trip thermal units are **$21.50** each. See Digest 176 page 16-116 for selection information.*

Table 17.54: 3-Pole Polyphase, 600 Vac Maximum, 50–60 Hz

Motor Voltage (Starter Voltage)	Max. HP	NEMA Size	NEMA Type 1 General Purpose Enclosure		NEMA Type 4▲ Watertight and Dusttight Enclosure (Stainless Steel 1YD-4YD)		NEMA Type 12/3R★ Dusttight & Driptight Industrial Use Enclosure		Open Type		O.E.M. Kit ♦	
			Type■	$ Price	Type■	$ Price	Type■	$ Price	Type■	$ Price	Type■	$ Price
200 (208)	10	1YD	SCG1C	4892.00	SCW1C	6602.00	SCA1C	6317.00	SCO1C	4806.00	—	—
	15 20	2YD	SDG1D SDG1E	5790.00	SDW1D SDW1E	7713.00	SDA1D SDA1E	7569.00	SDO1D SDO1E	5562.00	—	—
	25 30 40	3YD	SEG1F SEG1G SEG1H	8424.00	SEW1F SEW1G SEW1H	11204.00	SEA1F SEA1G SEA1H	10562.00	SEO1F SEO1G SEO1H	7542.00	SEK1F SEK1G SEK1H	6596.00
	50 60	4YD	SFG1J SFG1K	17568.00	SFW1J SFW1K	21941.00	SFA1J SFA1K	20417.00	SFO1J SFO1K	15987.00	SFK1J SFK1K	9300.00
	75 100 125 150	5YD	SGG1L SGG1M SGG1N SGG1P	31584.00	SGW1L SGW1M SGW1N SGW1P	39702.00	SGA1L SGA1M SGA1N SGA1P	35429.00	SGO1L SGO1M SGO1N SGO1P	28422.00	SGK1L SGK1M SGK1N SGK1P	18530.00
	200 250 300	6YD	SHG1Q SHG1R SHG1S	67589.00	SHW1Q SHW1R SHW1S	78272.00	SHA1Q SHA1R SHA1S	72930.00	SHO1Q SHO1R SHO1S	62519.00	SHK1Q SHK1R SHK1S	39347.00
230 (240)	10	1YD	SCG1C	4892.00	SCW1C	6602.00	SCA1C	6317.00	SCO1C	4806.00	—	—
	15 20 25	2YD	SDG1D SDG1E SDG1F	5790.00	SDW1D SDW1E SDW1F	7713.00	SDA1D SDA1E SDA1F	7569.00	SDO1D SDO1E SDO1F	5562.00	—	—
	30 40 50	3YD	SEG1G SEG1H SEG1J	8424.00	SEW1G SEW1H SEW1J	11204.00	SEA1G SEA1H SEA1J	10562.00	SEO1G SEO1H SEO1J	7542.00	SEK1G SEK1H SEK1J	6596.00
	60 75	4YD	SFG1K SFG1L	17568.00	SFW1K SFW1L	21941.00	SFA1K SFA1L	20417.00	SFO1K SFO1L	15987.00	SFK1K SFK1L	9300.00
	100 125 150	5YD	SGG1M SGG1N SGG1P	31584.00	SGW1M SGW1N SGW1P	39702.00	SGA1M SGA1N SGA1P	35429.00	SGO1M SGO1N SGO1P	28422.00	SGK1M SGK1N SGK1P	18530.00
	200 250 300	6YD	SHG1Q SHG1R SHG1S	67589.00	SHW1Q SHW1R SHW1S	78272.00	SHA1Q SHA1R SHA1S	72930.00	SHO1Q SHO1R SHO1S	62519.00	SHK1Q SHK1R SHK1S	39347.00
	400 500	7YD	SJG1T SJG1U	91160.00	SJW1T SJW1U	101843.00	SJA1T SJA1U	96501.00	SJO1T SJO1U	86090.00	—	—
460 (480) / 575 (600)	10 15	1YD	SCG1C SCG1D	4892.00	SCW1C SCW1D	6602.00	SCA1C SCA1D	6317.00	SCO1C SCO1D	4806.00	—	—
	20 25 30 40	2YD	SDG1E SDG1F SDG1G SDG1H	5790.00	SDW1E SDW1F SDW1G SDW1H	7713.00	SDA1E SDA1F SDA1G SDA1H	7569.00	SDO1E SDO1F SDO1G SDO1H	5562.00	—	—
	50 60 75	3YD	SEG1J SEG1K SEG1L	8424.00	SEW1J SEW1K SEW1L	11204.00	SEA1J SEA1K SEA1L	10562.00	SEO1J SEO1K SEO1L	7542.00	SEK1J SEK1K SEK1L	6596.00
	100 125 150	4YD	SFG1M SFG1N SFG1P	17568.00	SFW1M SFW1N SFW1P	21941.00	SFA1M SFA1N SFA1P	20417.00	SFO1M SFO1N SFO1P	15987.00	SFK1M SFK1N SFK1P	9300.00
	200 250 300	5YD	SGG1Q SGG1R SGG1S	31584.00	SGW1Q SGW1R SGW1S	39702.00	SGA1Q SGA1R SGA1S	35429.00	SGO1Q SGO1R SGO1S	28422.00	SGK1Q SGK1R SGK1S	18530.00
	400 500 600	6YD	SHG1T SHG1U SHG1W	67589.00	SHW1T SHW1U SHW1W	78272.00	SHA1T SHA1U SHA1W	72930.00	SHO1T SHO1U SHO1W	62519.00	SHK1T SHK1U SHK1W	39347.00
	800 1000	7YD	SJG1Y SJG1Z	91160.00	SJW1Y SJW1Z	101843.00	SJA1Y SJA1Z	96501.00	SJO1Y SJO1Z	86090.00	—	—

▲ NEMA Type 4 enclosures are painted sheet steel. Where required, stainless steel enclosures are available at extra cost. Specify as Form G17. See page 17-32 for price adder.
■ Both line and control voltage must be specified to order this product. See page 17-18 for the necessary codes and instructions for ordering.
♦ No Factory Modifications (Forms) available with O.E.M. Kit.
★ NEMA Type 12 enclosures may be field modified for outdoor non-corrosive and non-service entrance rated applications. See Digest 176 page 16-95 for more information.



Typical Wye-Delta Starter Sizes 1–4 (Open Transition)
Common Control (Standard)

Table 17.55: How to Order

To Order Specify:	Catalog Number			
• Class Number • Type Number • Voltage Code • Form(s)▼	Class	Type	Voltage Code	Form(s)
	8630	SFG1M	V06	

Description: 100 hp, 480 V line, 480 V common control, 60 Hz

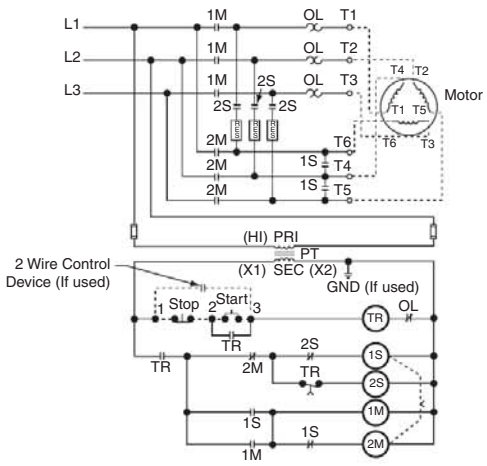
▼ Forms need to be specified only if any of the coils are at a different voltage than line supply (V8•). See page 17-18 for a fuller explanation of how to order; this page also provides the necessary coil voltage and Form codes as well as codes for 380 V starters and 50 Hz applications. Refer to page 17-32 for other factory modifications (Forms).

NOTE: *Prices shown do not include thermal units. Devices require 3 thermal units (Sizes 00–6). Standard trip thermal units are **$21.50** each. See Digest 176 page 16-116 for selection information.*

Table 17.56: 3-Pole Polyphase, 600 Vac Maximum, 50–60 Hz

Motor Voltage (Starter Voltage)	Max. HP	NEMA Size	NEMA Type 1 General Purpose Enclosure		NEMA Type 4★ Watertight and Dusttight Enclosure (Stainless Steel 1YD-4YD)		NEMA Type 12/3R♦ Dusttight & Driptight Industrial Use Enclosure		Open Type		O.E.M. Kit■	
			Type▲	$ Price	Type▲	$ Price	Type▲	$ Price	Type▲	$ Price	Type▲	$ Price
200 (208)	10	1YD	SCG2C	7470.00	SCW2C	9180.00	SCA2C	8895.00	SCO2C	7385.00	—	—
	15 20	2YD	SDG2D SDG2E	8454.00	SDW2D SDW2E	10376.00	SDA2D SDA2E	10233.00	SDO2D SDO2E	8226.00	—	—
	25 30 40	3YD	SEG2F SEG2G SEG2H	11672.00	SEW2F SEW2G SEW2H	14450.00	SEA2F SEA2G SEA2H	13809.00	SEO2F SEO2G SEO2H	10790.00	SEK2F SEK2G SEK2H	10142.00
	50 60	4YD	SFG2J SFG2K	22995.00	SFW2J SFW2K	27368.00	SFA2J SFA2K	25844.00	SFO2J SFO2K	21414.00	SFK2J SFK2K	13931.00
	75 100 125 150	5YD	SGG2L SGG2M SGG2N SGG2P	38363.00	SGW2L SGW2M SGW2N SGW2P	46481.00	SGA2L SGA2M SGA2N SGA2P	42209.00	SGO2L SGO2M SGO2N SGO2P	35202.00	SGK2L SGK2M SGK2N SGK2P	25181.00
	200 250 300	6YD	SHG2Q SHG2R SHG2S	85022.00	SHW2Q SHW2R SHW2S	95702.00	SHA2Q SHA2R SHA2S	90363.00	SHO2Q SHO2R SHO2S	79950.00	SHK2Q SHK2R SHK2S	50319.00
230 (240)	10	1YD	SCG2C	7470.00	SCW2C	9180.00	SCA2C	8895.00	SCO2C	7385.00	—	—
	15 20 25	2YD	SDG2D SDG2E SDG2F	8454.00	SDW2D SDW2E SDW2F	10376.00	SDA2D SDA2E SDA2F	10233.00	SDO2D SDO2E SDO2F	8226.00	— — —	—
	30 40 50	3YD	SEG2G SEG2H SEG2J	11672.00	SEW2G SEW2H SEW2J	14450.00	SEA2G SEA2H SEA2J	13809.00	SEO2G SEO2H SEO2J	10790.00	SEK2G SEK2H SEK2J	10142.00
	60 75	4YD	SFG2K SFG2L	22995.00	SFW2K SFW2L	27368.00	SFA2K SFA2L	25844.00	SFO2K SFO2L	21414.00	SFK2K SFK2L	13931.00
	100 125 150	5YD	SGG2M SGG2N SGG2P	38363.00	SGW2M SGW2N SGW2P	46481.00	SGA2M SGA2N SGA2P	42209.00	SGO2M SGO2N SGO2P	35202.00	SGK2M SGK2N SGK2P	25181.00
	200 250 300	6YD	SHG2Q SHG2R SHG2S	85022.00	SHW2Q SHW2R SHW2S	95702.00	SHA2Q SHA2R SHA2S	90363.00	SHO2Q SHO2R SHO2S	79950.00	SHK2Q SHK2R SHK2S	50319.00
	400 500	7YD	SJG2T SJG2U	118206.00	SJW2T SJW2U	128888.00	SJA2T SJA2U	123548.00	SJO2T SJO2U	113135.00	— —	—
460 (480) / 575 (600)	10 15	1YD	SCG2C SCG2D	7470.00	SCW2C SCW2D	9180.00	SCA2C SCA2D	8895.00	SCO2C SCO2D	7385.00	— —	—
	20 25 30 40	2YD	SDG2E SDG2F SDG2G SDG2H	8454.00	SDW2E SDW2F SDW2G SDW2H	10376.00	SDA2E SDA2F SDA2G SDA2H	10233.00	SDO2E SDO2F SDO2G SDO2H	8226.00	— — — —	—
	50 60 75	3YD	SEG2J SEG2K SEG2L	11672.00	SEW2J SEW2K SEW2L	14450.00	SEA2J SEA2K SEA2L	13809.00	SEO2J SEO2K SEO2L	10790.00	SEK2J SEK2K SEK2L	10142.00
	100 125 150	4YD	SFG2M SFG2N SFG2P	22995.00	SFW2M SFW2N SFW2P	27368.00	SFA2M SFA2N SFA2P	25844.00	SFO2M SFO2N SFO2P	21414.00	SFK2M SFK2N SFK2P	13931.00
	200 250 300	5YD	SGG2Q SGG2R SGG2S	38363.00	SGW2Q SGW2R SGW2S	46481.00	SGA2Q SGA2R SGA2S	42209.00	SGO2Q SGO2R SGO2S	35202.00	SGK2Q SGK2R SGK2S	25181.00
	400 500 700	6YD	SHG2T SHG2U SHG2W	85022.00	SHW2T SHW2U SHW2W	95702.00	SHA2T SHA2U SHA2W	90363.00	SHO2T SHO2U SHO2W	79950.00	SHK2T SHK2U SHK2W	50319.00
	800 1000	7YD	SJG2Y SJG2Z	118206.00	SJW2Y SJW2Z	128888.00	SJA2Y SJA2Z	123548.00	SJO2Y SJO2Z	113135.00	— —	—

▲ Both line and control voltage must be specified to order this product. See page 17-18 for the necessary codes and instructions for ordering.
■ No Factory Modifications (Forms) available with O.E.M. Kit.
♦ NEMA Type 12 enclosures may be field modified for outdoor non-corrosive and non-service entrance rated applications. See Digest 176 page 16-95 for more information.
★ NEMA Type 4 enclosures are painted sheet steel. Where required, stainless steel enclosures are available at extra cost. Specify as Form G17. See page 17-32 for price adder.



Typical Wye-Delta Starter
Sizes 1–4 (Closed Transition)
Fused Control Transformer (Form F4T40)

Table 17.57: How to Order

To Order Specify:	Catalog Number			
	Class	Type	Voltage Code	Form(s)
• Class Number • Type Number • Voltage Code • Form(s)▼	8630	SFG1M	V81	F4T40

Description: 100 hp, 480 V line, 120 V separate control, 60 Hz

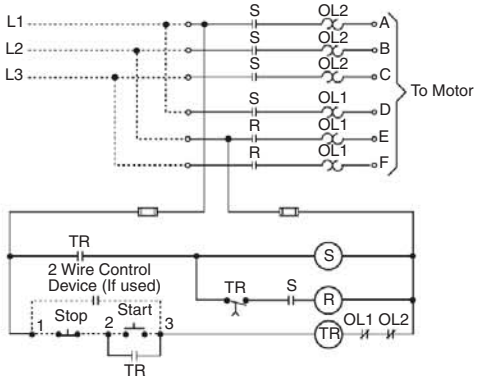
▼ Forms need to be specified only if any of the coils are at a different voltage than line supply (V8 •). See page 17-18 for a fuller explanation of how to order; this page also provides the necessary coil voltage and Form codes as well as codes for 380 V starters and 50 Hz applications. Refer to page 17-32 for other factory modifications (Forms).

NOTE: *Prices shown do not include thermal units. Devices require 6 thermal units (Sizes 00–6). Standard trip thermal units are **$21.50** each. See Digest 176 page 16-116 for selection information.*

Table 17.58: 3-Pole Polyphase—600 Vac Maximum—50–60 Hz

Motor Voltage (Starter Voltage)	Max. HP	NEMA Size	NEMA Type 1 General Purpose Enclosure		NEMA Type 4▲ Watertight and Dusttight Enclosure (Stainless Steel 1PW–4PW)		NEMA Type 12/3R★ Dusttight & Driptight Industrial Use Enclosure		Open Type		O.E.M. Kit ♦	
			Type■	$ Price	Type■	$ Price	Type■	$ Price	Type■	$ Price	Type■	$ Price
200 (208)	10	1PW	SCG1C	3119.00	SCW1C	4829.00	SCA1C	4544.00	SCO1C	3033.00	—	—
	15 20	2PW	SDG1D SDG1E	4445.00	SDW1D SDW1E	6368.00	SDA1D SDA1E	6224.00	SDO1D SDO1E	4217.00	SDK1D SDK1E	2685.00
	25 30 40	3PW	SEG1F SEG1G SEG1H	6267.00	SEW1F SEW1G SEW1H	9045.00	SEA1F SEA1G SEA1H	8405.00	SEO1F SEO1G SEO1H	5868.00	SEK1F SEK1G SEK1H	4359.00
	50 60 75	4PW	SFG1J SFG1K SFG1L	13404.00	SFW1J SFW1K SFW1L	17775.00	SFA1J SFA1K SFA1L	16253.00	SFO1J SFO1K SFO1L	12662.00	SFK1J SFK1K SFK1L	8217.00
	100 125 150	5PW	SGG1M SGG1N SGG1P	28071.00	SGW1M SGW1N SGW1P	36192.00	SGA1M SGA1N SGA1P	31919.00	SGO1M SGO1N SGO1P	26505.00	SGK1M SGK1N SGK1P	18621.00
230 (240)	10	1PW	SCG1C	3119.00	SCW1C	4829.00	SCA1C	4544.00	SCO1C	3033.00	—	—
	15 20 25	2PW	SDG1D SDG1E SDG1F	4445.00	SDW1D SDW1E SDW1F	6368.00	SDA1D SDA1E SDA1F	6224.00	SDO1D SDO1E SDO1F	4217.00	SDK1D SDK1E SDK1F	2685.00
	30 40 50	3PW	SEG1G SEG1H SEG1J	6267.00	SEW1G SEW1H SEW1J	9045.00	SEA1G SEA1H SEA1J	8405.00	SEO1G SEO1H SEO1J	5868.00	SEK1G SEK1H SEK1J	4359.00
	60 75	4PW	SFG1K SFG1L	13404.00	SFW1K SFW1L	17775.00	SFA1K SFA1L	16253.00	SFO1K SFO1L	12662.00	SFK1K SFK1L	8217.00
	100 125 150	5PW	SGG1M SGG1N SGG1P	28071.00	SGW1M SGW1N SGW1P	36192.00	SGA1M SGA1N SGA1P	31919.00	SGO1M SGO1N SGO1P	26505.00	SGK1M SGK1N SGK1P	18621.00
	200 250 300	6PW	SHG1Q SHG1R SHG1S	58694.00	SHW1Q SHW1R SHW1S	67338.00	SHA1Q SHA1R SHA1S	65816.00	SHO1Q SHO1R SHO1S	53622.00	—	—
	400	7PW	SJG1T	89672.00	SJW1T	98865.00	SJA1T	98217.00	SJO1T	80699.00	—	—
460 (480) / 575 (600)	10 15	1PW	SCG1C SCG1D	3119.00	SCW1C SCW1D	4829.00	SCA1C SCA1D	4544.00	SCO1C SCO1D	3033.00	— —	—
	20 25 30 40	2PW	SDG1E SDG1F SDG1G SDG1H	4445.00	SDW1E SDW1F SDW1G SDW1H	6368.00	SDA1E SDA1F SDA1G SDA1H	6224.00	SDO1E SDO1F SDO1G SDO1H	4217.00	SDK1E SDK1F SDK1G SDK1H	2685.00
	50 60 75	3PW	SEG1J SEG1K SEG1L	6267.00	SEW1J SEW1K SEW1L	9045.00	SEA1J SEA1K SEA1L	8405.00	SEO1J SEO1K SEO1L	5868.00	SEK1J SEK1K SEK1L	4359.00
	100 125 150	4PW	SFG1M SFG1N SFG1P	13404.00	SFW1M SFW1N SFW1P	17775.00	SFA1M SFA1N SFA1P	16253.00	SFO1M SFO1N SFO1P	12662.00	SFK1M SFK1N SFK1P	8217.00
	200 250 350	5PW	SGG1Q SGG1R SGG1S	28071.00	SGW1Q SGW1R SGW1S	36192.00	SGA1Q SGA1R SGA1S	31919.00	SGO1Q SGO1R SGO1S	26505.00	SGK1Q SGK1R SGK1S	18621.00
460 (480) / 575 (600)	400 500 600	6PW	SHG1T SHG1U SHG1W	58694.00	SHW1T SHW1U SHW1W	67338.00	SHA1T SHA1U SHA1W	65816.00	SHO1T SHO1U SHO1W	53622.00	—	—
	700 800	7PW	SJG1X SJG1Y	89672.00	SJW1X SJW1Y	98865.00	SJA1X SJA1Y	98217.00	SJO1X SJO1Y	80699.00	— —	—

▲ NEMA Type 4 enclosures are painted sheet steel. Where required, stainless steel enclosures are available at extra cost. Specifiy as **Form G17.** See page 17-32 for price adder.
■ Both line and control voltage must be specified to order this product. See page 17-18 for the necessary codes and instructions for ordering.
♦ No Factory Modifications (Forms) available with O.E.M. Kit.
★ NEMA Type 12 enclosures may be field modified for outdoor non-corrosive and non-service entrance rated applications. See Digest 176 page 16-95 for more information.



Typical Part Winding
Sizes 1–4
Common Control (Standard)

Table 17.59: How to Order

To Order Specify:	Catalog Number			
• Class Number • Type Number • Voltage Code • Form(s)▼	Class	Type	Voltage Code	Form(s)
	8640	SFG1M	V06	C

Description: 100 hp, 480 V line, 480 V common control, 60 Hz

▼ Forms need to be specified only if any of the coils are at a different voltage than line supply (V8•). See page 17-18 for a fuller explanation of how to order; this page also provides the necessary coil voltage and Form codes as well as codes for 380 V starters and 50 Hz applications. Refer to page 17-32 for other factory modifications (Forms).

Approximate Dimensions—Not for Construction

Note: H = Height, W = Width, D = Depth

Class 8606
Autotransformer

Table 17.60: Class 8606—Autotransformer

NEMA Size	Dim.	Open		NEMA Type 1 / 12 Enclosure				NEMA Type 4 Enclosure			
				Non-Combo or Combo with Circuit Breaker		Combo with Disconnect Switch		Non-Combo or Combo with Circuit Breaker		Combo with Disconnect Switch	
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
2	H	43	1092	52	1320	52	1320	52	1320	52	1320
	W	22	559	25	635	25	635	25	635	25	635
	D	8	203	10	254	10	254	10	254	10	254
3 or 4	H	63	1600	70■	1778	70■	1778	75■	1778	75■	1778
	W	28	711	32	813	32	813	32	813	32	813
	D	9	229	16	406	16	406	16	406	16	406
5	H	63	1600	70■	1778	90■	2286	75■	1778	95■	2413
	W	28	711	32	813	36	914	32	813	36	914
	D	9	229	16	406	16	406	16	406	16	406
6	H	56	1422	90■	2286	90■	2286	98■	2489	98■	2489
	W	30	762	34	864	64	1626	34	864	64	1626
	D	14	354	20	508	24	610	20	508	24	610

Class 8630
Wye-Delta

Table 17.61: Class 8630—Wye-Delta, Open Transition

NEMA Size	Dim.	Open		NEMA Type 1 / 12 Enclosure				NEMA Type 4 Enclosure			
				Non-Combo		Combo		Non-Combo		Combo	
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
1YD or 2YD	H	21	553	25	635	25	635	25	635	—	—
	W	21	553	23	584	23	584	23	584	—	—
	D	7	178	8	203	8	203	8	203	—	—
3YD or 4YD	H	42	1067	48	1219	49	1245	48	1219	49	1245
	W	25	635	28	712	30	762	28	712	30	762
	D	7	178	8	203	11	279	8	203	11	279
5YD or 6YD	H	62	1576	90■	2286	90■	2286	98■	2489	98■	2489
	W	29	737	36	914	36	914	36	914	36	914
	D	10	254	16	406	16	406	16	406	16	406

Table 17.62: Class 8630—Wye-Delta, Closed Transition

NEMA Size	Dim.	Open		NEMA Type 1 / 12 Enclosure				NEMA Type 4 Enclosure			
				Non-Combo		Combo		Non-Combo		Combo	
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
1YD or 2YD	H	21	553	25	635	25	635	25	635	—	—
	W	21	553	23	584	23	584	23	584	—	—
	D	14	354	16	406	16	406	16	406	—	—
3YD or 4YD	H	42	1067	48	1219	49	1245	48	1219	49	1245
	W	25	635	28	712	30	762	28	712	30	762
	D	14	354	16	406	18	457	16	406	18	457
5YD or 6YD	H	80	2032	90■	2286	90■	2286	98■	2489	98■	2489
	W	30	762	36	914	36	914	36	914	36	914
	D	12	305	16	406	16	406	16	406	16	406

Class 8640
Part Winding

Table 17.63: Class 8640—Part Winding

NEMA Size	Dim.	Open		Enclosed—NEMA Type 1 / 4 / 12					
				Non-Combo		Combo with Circuit Breaker		Combo with Disconnect Switch	
		in.	mm	in.	mm	in.	mm	in.	mm
1PW or 2PW	H	21	553	25	635	34	853	25	635
	W	21	553	23	584	19	483	23	584
	D	6	152	8	203	11	279	8	203
3PW	H	42	1067	48	1219	44	1118	52	1321
	W	26	660	28	712	30	762	25	635
	D	7	178	8	203	12	305	11	279
4PW	H	42	1067	48	1219	44	1118	78■	1981
	W	26	660	28	712	30	762	32	813
	D	7	178	8	203	12	305	16	406
5PW	H	35	889	44	1118	78■▲	1981	78■▲	1981
	W	22	559	24	610	36	914	36	914
	D	10	254	12	305	16	406	16	406
6PW	H	49	1245	64	1626	—	—	90■	2286
	W	24	610	28	712	—	—	64	1626
	D	11	279	16	406	—	—	24	406

▲ Subtract 8 in. from height for Type 1 or 12 enclosure.
■ Free standing enclosure.

Combination Starter Form Reference

Circuit Breaker: Y791, Y7911
Nonfusible Disconnect Switch: Y792, Y7910
Fusible Disconnect Switch: Y793-Y799

Refer to page 17-32 for a complete listing of Forms for combination devices.

Multispeed motors are available in two basic versions: 1) separate winding, and 2) consequent pole. A separate winding motor has a winding for each speed while a consequent pole motor has a winding for every two speeds (three-speed motors have two windings). The motor connections (and thus the types of controllers) for two speed starters are exemplified by the schematic diagrams shown below. Note that consequent pole two-speed controllers involve a 5-pole and a 3-pole starter, while separate winding controllers have two 3-pole starters.

Verify the type of motor before ordering. Field modification of starters to match the motor **may not be possible.**

Separate winding motors are usually chosen when flexibility is important, since the speeds of a consequent pole motor are usually limited to a 2/1 ratio; a broad range of speeds can be obtained on a separate winding motor.

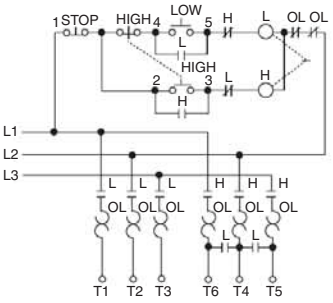
Both separate winding and consequent pole motors are available in three types: 1) constant horsepower, 2) constant torque, and 3) variable torque. Table 17.64 shows typical applications for these different types of motors.

NOTE: *For detailed information involving the technical aspects of flexibility of the starters used in the multispeed controllers, see Classes 8702, 8736, and 8810 application data.*

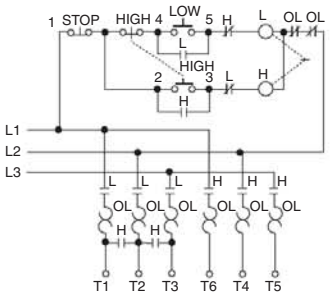
Table 17.64: Typical Applications

Constant HP	Constant Torque	Variable Torque
A. Spindles	A. Conveyors	A. Fans
B. Cutting Tools	B. Mills	B. Centrifugal Pumps
1. Lathes	C. Dough Mixers	
2. Saws	D. Reciprocating Pumps	

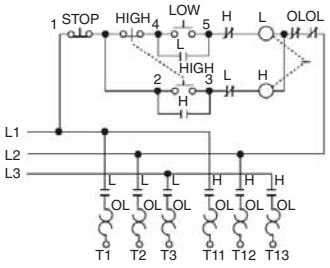
Table 17.65: Typical Schematic Diagrams



2-Speed
Consequent Pole
Constant Horsepower
NEMA Size 0–4
Sizes 5, 6, & 7 Use Special Circuitry



2-Speed
Consequent Pole
Constant or Variable Torque
NEMA Size 0–4
Sizes 5, 6, & 7 Use Special Circuitry



2-Speed
Separate Winding
Constant HP, Constant Torque
and Variable Torque
NEMA Size 0–4
Sizes 5, 6, & 7 Use Special Circuitry

Additional Features—Special Relays for Non-Reversing and Reversing Multispeed Starters

General. Some applications require special relays to control the speed change and/or starting of the motor. The descriptions that follow cover the four common relay schemes for these applications.

Form R1 Compelling Relay. This relay requires the motor to be started at low speed before any higher speed can be selected. This arrangement ensures that the motor will always start the load at low speed. The stop button must be pressed before it is possible to change from a higher to a lower speed. (Not available with **Form R2**.)

Form R2 Accelerating Relay/Timer. With **Form R2** accelerating relays, the ultimate speed is determined by the button which is pressed, but the starter will start the motor at low speed and automatically accelerate it through successive steps until the selected speed is reached. Definite time intervals must elapse between each speed change. Individual adjustable timing relays are provided for each interval.

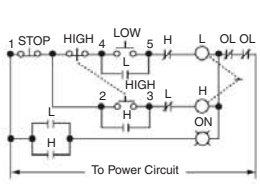
The stop button must be pressed before it is possible to change from a higher to a lower speed. (Not available with **Form R1**.)

Form R3 Decelerating Relay/Timer. This is similar in action to **Form R2** accelerating relays, except that they function to prevent immediate transfer from a higher to a lower speed. A definite time interval, preset on the timer, must elapse between each speed change.

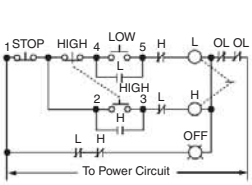
Form R10 Antiplugging Relays/Timers. This Form imposes a time delay when transferring from the forward to the reverse direction or reverse to forward, for **reversing** multispeed starters. This provides up to a 60 second delay in the transfer of the direction of the motor, and can help prevent damage which could result from plugging.

Form Y81 (Low Speed) Overload Relay Modification. For NEMA size 3 and 4, when the low speed full load current does not appear on the appropriate thermal unit selection tables, include **Form Y81** (low speed) (no charge for this Form). This Form modifies the overload relay block to accept Type B thermal units. For assistance on thermal unit selection, contact the Customer Care Center (CCC) at 1-888-778-2733.

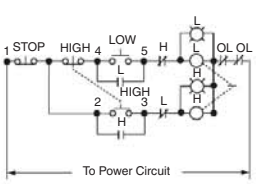
Table 17.66: Special Pilot Lighting



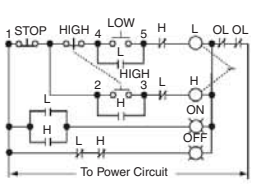
One pilot light "On"



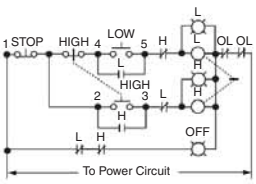
One pilot light "Off"



Two pilot lights
"L" and "H'"



Two pilot lights
"On" and "Off"



Three pilot lights
"L", "H", and "Off"
"L", "H" and "Off"

Multispeed motors are available in two basic versions: 1) consequent pole, and 2) separate winding. A separate winding motor has a winding for each speed while a consequent pole motor has a winding for every two speeds (three-speed motors have two windings).

3-Pole Polyphase, 600 Vac Maximum, 50–60 Hz

Note that the prices shown do not include thermal units. Devices require 6 thermal units (Sizes 0–6). Standard trip thermal units are **$21.50** each. See Digest 176 page 16-116 for selection information.

Table 17.67: Class 8810—Non-Combination Type

Type of Motor	NEMA Size	Maximum Polyphase Horsepower Ratings: Constant Horsepower Motors 200 V	230 V	460–575 V	Constant Torque or Variable Torque Motors 200 V	230 V	460–575 V	NEMA Type 1 General Purpose Enclosure Type	$ Price	NEMA Type 4 & 4X Watertight and Dusttight Enclosure (Stainless Steel) (304) (Sizes 0—5) Sheet Steel (Size 6) Type	$ Price	NEMA Type 4X★ Watertight, Dusttight and Corrosion Resistant Enclosure Type	$ Price	NEMA Type 12/3R△ Dusttight and Driptight Industrial Use Enclosure Type	$ Price	Open Type Type	$ Price
Single Winding (Consequent Pole) 5-Pole–3-Pole																	
Constant HP	0	2	2	3	—	—	—	SBG1♦	2199.	SBW1♦	3567.	SBW51♦	4100.	SBA1♦	2640.	SBO1♦	2142.
	1	5	5	7-1/2	—	—	—	SCG1♦	2370.	SCW1♦	3708.	SCW51♦	4278.	SCA1♦	2811.	SCO1♦	2285.
	2	7-1/2	10	20	—	—	—	SDG1♦	4307.	SDW1♦	5958.	SDW51♦	6557.	SDA1♦	4932.	SDO1♦	4050.
	3	20	25	40	—	—	—	SEG1♦	6501.	SEW1♦	8837.	—	—	SEA1♦	7925.	SEO1♦	6101.
	4	30	40	75	—	—	—	SFG1♦	17352.	SFW1♦	22365.	—	—	SFA1♦	20172.	SFO1♦	15786.
	5	60	75	150	—	—	—	SGG1♦	34286.	SGW1♦	46008.	—	—	SGA1♦	46008.	SGO1♦	31197.
	6	100	150	300	—	—	—	SHG1♦	77286.	SHW1♦	93308.	—	—	SHA1♦	83753.	SHO1♦	70799.
Constant Torque or Variable Torque	0	—	—	—	3	3	5	SBG2♦	2199.	SBW2♦	3567.	SBW52♦	4100.	SBA2♦	2640.	SBO2♦	2142.
	1	—	—	—	7-1/2	7-1/2	10	SCG2♦	2370.	SCW2♦	3708.	SCW52♦	4278.	SCA2♦	2811.	SCO2♦	2285.
	2	—	—	—	10	15	25	SDG2♦	4307.	SDW2♦	5958.	SDW52♦	6557.	SDA2♦	4932.	SDO2♦	4050.
	3	—	—	—	25	30	50	SEG2♦	6501.	SEW2♦	8837.	—	—	SEA2♦	7925.	SEO2♦	6101.
	4	—	—	—	40	50	100	SFG2♦	17352.	SFW2♦	22365.	—	—	SFA2♦	20172.	SFO2♦	15786.
	5	—	—	—	75	100	200	SGG2♦	34286.	SGW2♦	46008.	—	—	SGA2♦	46008.	SGO2♦	31197.
	6	—	—	—	150	200	400	SHG2♦	77286.	SHW2♦	93308.	—	—	SHA2♦	83753.	SHO2♦	70799.
Two Winding (Separate Winding) 3-Pole–3-Pole■																	
Constant HP ■	0	2	2	3	—	—	—	SBG3♦	1571.	SBW3♦	2939.	SBW53♦	3384.	SBA3♦	2015.	SBO3♦	1515.
	1	5	5	7-1/2	—	—	—	SCG3♦	1772.	SCW3♦	3110.	SCW53♦	3567.	SCA3♦	2213.	SCO3♦	1686.
	2	7-1/2	10	20	—	—	—	SDG3♦	3167.	SDW3♦	3231.	SDW53♦	3564.	SDA3♦	2529.	SDO3♦	1956.
	3	20	25	40	—	—	—	SEG3♦	4962.	SEW3♦	7412.	—	—	SEA3♦	6386.	SEO3♦	4590.
	4	30	40	75	—	—	—	SFG3♦	12168.	SFW3♦	17181.	—	—	SFA3♦	14988.	SFO3♦	11429.
	5	60	75	150	—	—	—	SGG3♦	28718.	SGW3♦	40440.	—	—	SGA3♦	40440.	SGO3♦	26994.
	6	100	150	300	—	—	—	SHG3♦	58755.	SHW3♦	66090.	—	—	SHA3♦	65195.	SHO3♦	51848.
	7	—	225	450	—	—	—	SJG3♦	76032.	—	—	—	—	SJA3♦	82826.	SJO3♦	69195.
Constant Torque or Variable Torque ■	0	—	—	—	3	3	5	SBG4♦	1571.	SBW4♦	2939.	SBW54♦	3384.	SBA4♦	2015.	SBO4♦	1515.
	1	—	—	—	7-1/2	7-1/2	10	SCG4♦	1772.	SCW4♦	3110.	SCW54♦	3567.	SCA4♦	2213.	SCO4♦	1686.
	2	—	—	—	10	15	25	SDG4♦	3167.	SDW4♦	3231.	SDW54♦	3564.	SDA4♦	2529.	SDO4♦	1956.
	3	—	—	—	25	30	50	SEG4♦	4962.	SEW4♦	7412.	—	—	SEA4♦	6386.	SEO4♦	4590.
	4	—	—	—	40	50	100	SFG4♦	12168.	SFW4♦	17181.	—	—	SFA4♦	14988.	SFO4♦	11429.
	5	—	—	—	75	100	200	SGG4♦	28718.	SGW4♦	40440.	—	—	SGA4♦	40440.	SGO4♦	26994.
	6	—	—	—	150	200	400	SHG4♦	58755.	SHW4♦	66090.	—	—	SHA4♦	65195.	SHO4♦	51848.
	7	—	—	—	—	300	600	SJG4♦	76032.	—	—	—	—	SJA4♦	82826.	SJO4♦	69195.

Table 17.68: Class 8810—Combination Circuit Breaker Type (Thermal Magnetic Circuit Breakers)▲▼

Single Winding (Consequent Pole) 5-Pole–3-Pole																	
Constant HP	0	2	2	3	—	—	—	CBG1♦	4206.	CBW1♦	6429.	CBW51♦	6962.	CBA1♦	4676.	—	—
	1	5	5	7-1/2	—	—	—	CCG1♦	4377.	CCW1♦	6566.	CCW51♦	7140.	CCA1♦	4867.	—	—
	2	7-1/2	10	20	—	—	—	CDG1♦	6758.	CDW1♦	10089.	CDW51♦	10089.	CDA1♦	7497.	—	—
	3	20	25	40	—	—	—	CEG1♦	9162.	CEW1♦	13836.	—	—	CEA1♦	10787.	—	—
	4	30	40	75	—	—	—	CFG1♦	22224.	CFW1♦	29460.	—	—	CFA1♦	26753.	—	—
	5	60	75	150	—	—	—	CGG1♦	43758.	CGW1♦	57816.	—	—	CGA1♦	56847.	—	—
	6	100	150	300	—	—	—	CHG1♦	91229.	CHW1♦	68843.	—	—	CHA1♦	65841.	—	—
Constant Torque or Variable Torque	0	—	—	—	3	3	5	CBG2♦	4206.	CBW2♦	6429.	CBW52♦	6962.	CBA2♦	4676.	—	—
	1	—	—	—	7-1/2	7-1/2	10	CCG2♦	4377.	CCW2♦	6566.	CCW52♦	7140.	CCA2♦	4867.	—	—
	2	—	—	—	10	15	25	CDG2♦	6758.	CDW2♦	10089.	CDW52♦	10089.	CDA2♦	7497.	—	—
	3	—	—	—	25	30	50	CEG2♦	9162.	CEW2♦	13836.	—	—	CEA2♦	10787.	—	—
	4	—	—	—	40	50	100	CFG2♦	22224.	CFW2♦	29460.	—	—	CFA2♦	26753.	—	—
	5	—	—	—	75	100	200	CGG2♦	43758.	CGW2♦	57816.	—	—	CGA2♦	56847.	—	—
	6	—	—	—	150	200	400	CHG2♦	91229.	CHW2♦	68843.	—	—	CHA2♦	65841.	—	—
Two Winding (Separate Winding) 3-Pole–3-Pole■																	
Constant HP ■	0	2	2	3	—	—	—	CBG3♦	3581.	CBW3♦	5801.	CBW53♦	6251.	CBA3♦	4050.	—	—
	1	5	5	7-1/2	—	—	—	CCG3♦	3780.	CCW3♦	5972.	CCW53♦	6429.	CCA3♦	4248.	—	—
	2	7-1/2	10	20	—	—	—	CDG3♦	5616.	CDW3♦	8379.	CDW53♦	8879.	CDA3♦	6357.	—	—
	3	20	25	40	—	—	—	CEG3♦	7626.	CEW3♦	12297.	—	—	CEA3♦	9248.	—	—
	4	30	40	75	—	—	—	CFG3♦	17040.	CFW3♦	16182.	—	—	CFA3♦	14379.	—	—
	5	60	75	150	—	—	—	CGG3♦	38190.	CGW3♦	52248.	—	—	CGA3♦	51278.	—	—
	6	100	150	300	—	—	—	CHG3♦	72629.	CHW3♦	84306.	—	—	CHA3♦	80199.	—	—
	7	—	225	450	—	—	—	CJG3♦	95358.	—	—	—	—	CJA3♦	103217.	—	—
Constant Torque or Variable Torque ■	0	—	—	—	3	3	5	CBG4♦	3581.	CBW4♦	5801.	CBW54♦	6251.	CBA4♦	4050.	—	—
	1	—	—	—	7-1/2	7-1/2	10	CCG4♦	3780.	CCW4♦	5972.	CCW54♦	6429.	CCA4♦	4248.	—	—
	2	—	—	—	10	15	25	CDG4♦	5616.	CDW4♦	8379.	CDW54♦	8879.	CDA4♦	6357.	—	—
	3	—	—	—	25	30	50	CEG4♦	7626.	CEW4♦	12297.	—	—	CEA4♦	9248.	—	—
	4	—	—	—	40	50	100	CFG4♦	17040.	CFW4♦	16182.	—	—	CFA4♦	14379.	—	—
	5	—	—	—	75	100	200	CGG4♦	38190.	CGW4♦	52248.	—	—	CGA4♦	51278.	—	—
	6	—	—	—	150	200	400	CHG4♦	72629.	CHW4♦	84306.	—	—	CHA4♦	80199.	—	—
	7	—	—	—	—	300	600	CJG4♦	95358.	—	—	—	—	CJA4♦	103217.	—	—

▲ The NEC 1300% maximum setting for instantaneous trip circuit breakers may be inadequate for multispeed motors.
■ Prices and type numbers shown for three phase, separate-winding motor starters apply only when motor windings are wye connected. When motor windings are connected open delta, use the prices shown for three phase consequent pole motor starters.
♦ Voltage code must be specified to order this product. Refer to standard voltage codes shown on page 17-18.
★ NEMA Type 4X hubs are included with each starter at no additional cost.
▼ Not available in Mag-Gard versions.
△ NEMA Type 12 enclosures may be field modified for outdoor non-corrosive and non-service entrance rated applications. See Digest 176 page 16-95 for more information.

3-Pole Polyphase, 600 Vac Max., 50–60 Hz

Note that the prices shown do not include thermal units. Devices require 6 thermal units (Sizes 0–6).

Standard trip thermal units are **$21.50** each.
See Digest 176 page 16-116 for selection information.

Table 17.69: Class 8810—Combination Disconnect Switch Type (Class H Fuse Clips)

Type of Motor	NEMA Size	Maximum Polyphase Horsepower Ratings: Constant Horsepower Motors 200 V	230 V	460–575 V	Constant Torque or Variable Torque Motors 200 V	230 V	460–575 V	Fuse Clip Size A	NEMA Type 1 General Purpose Enclosure: Type	$ Price	NEMA Type 4 & 4X Watertight and Dusttight Enclosure Stainless Steel (304) (Sizes 0–5) Sheet Steel (Size 6 not 4X): Type	$ Price	NEMA Type 12/3R♦ Dusttight and Driptight Industrial Use Enclosure: Type	$ Price
Single Winding (Consequent Pole) 5-Pole–3-Pole														
Constant Horsepower	0	2	2	3	—	—	—	None 30	UBG1■ DBG1■	3537.00 3765.00	UBW1■ DBW1■	5759.00 5988.00	UBA1■ DBA1■	4008.00 4235.00
	1	5	5	7-1/2	—	—	—	None 30	UCG1■ DCG1■	3708.00 3936.00	UCW1■ DCW1■	5903.00 6129.00	UCA1■ DCA1■	4179.00 4406.00
	2	7-1/2	10	20	—	—	—	None 60	UDG1■ DDG1■	6015.00 6129.00	UDW1■ DDW1■	8751.00 8864.00	UDA1■ DDA1■	6758.00 6870.00
	3	20	25	40	—	—	—	None 100	UEG1■ DEG1■	8666.00 8837.00	UEW1■ DEW1■	13337.00 13508.00	UEA1■ DEA1■	10287.00 10458.00
	4	30	40	75	—	—	—	None 200	UFG1■ DFG1■	19517.00 20970.00	UFW1■ DFW1■	27693.00 25964.00	UFA1■ DFA1■	24987.00 22500.00
	5	60	75	150	—	—	—	None 400	UGG1■ DGG1■	39644.00 40154.00	UGW1■ DGW1■	35799.00 54212.00	UGA1■ DGA1■	34622.00 52446.00
	6	100	150	300	—	—	—	None 600	UHG1■ DHG1■	87789.00 91085.00	UHW1■ DHW1■	99824.00 103121.00	UHA1■ DHA1■	95324.00 98621.00
Constant Torque or Variable Torque	0	—	—	—	3	3	5	None 30	UBG2■ DBG2■	3537.00 3765.00	UBW2■ DBW2■	5759.00 5988.00	UBA2■ DBA2■	4008.00 4235.00
	1	—	—	—	7-1/2	7-1/2	10	None 30	UCG2■ DCG2■	3708.00 3936.00	UCW2■ DCW2■	5903.00 6129.00	UCA2■ DCA2■	4179.00 4406.00
	2	—	—	—	10	15	25	None 60	UDG2■ DDG2■	6015.00 6129.00	UDW2■ DDW2■	8751.00 8864.00	UDA2■ DDA2■	6758.00 6870.00
	3	—	—	—	25	30	50	None 100	UEG2■ DEG2■	8666.00 8837.00	UEW2■ DEW2■	13337.00 13508.00	UEA2■ DEA2■	10287.00 10458.00
	4	—	—	—	40	50	100	None 200	UFG2■ DFG2■	19517.00 20970.00	UFW2■ DFW2■	27693.00 25964.00	UFA2■ DFA2■	24987.00 22500.00
	5	—	—	—	75	100	200	None 400	UGG2■ DGG2■	39644.00 40154.00	UGW2■ DGW2■	35799.00 54212.00	UGA2■ DGA2■	34622.00 52446.00
	6	—	—	—	150	200	400	None 600	UHG2■ DHG2■	87789.00 91085.00	UHW2■ DHW2■	99824.00 103121.00	UHA2■ DHA2■	95324.00 98621.00
Two Winding (Separate Winding) 3-Pole–3-Pole														
Constant Horsepower ▲	0	2	2	3	—	—	—	None 30	UBG3■ DBG3■	2910.00 3140.00	UBW3■ DBW3■	5133.00 5360.00	UBA3■ DBA3■	3380.00 3609.00
	1	5	5	7-1/2	—	—	—	None 30	UCG3■ DCG3■	3110.00 3338.00	UCW3■ DCW3■	5304.00 5531.00	UCA3■ DCA3■	3581.00 3807.00
	2	7-1/2	10	20	—	—	—	None 60	UDG3■ DDG3■	4877.00 4991.00	UDW3■ DDW3■	7640.00 7754.00	UDA3■ DDA3■	5616.00 5732.00
	3	20	25	40	—	—	—	None 100	UEG3■ DEG3■	7127.00 7866.00	UEW3■ DEW3■	11798.00 11969.00	UEA3■ DEA3■	8751.00 9491.00
	4	30	40	75	—	—	—	None 200	UFG3■ DFG3■	15159.00 17324.00	UFW3■ DFW3■	22509.00 23021.00	UFA3■ DFA3■	19803.00 21852.00
	5	60	75	150	—	—	—	None 400	UGG3■ DGG3■	34073.00 34586.00	UGW3■ DGW3■	48131.00 48644.00	UGA3■ DGA3■	50439.00 50952.00
	6	100	150	300	—	—	—	None 600	UHG3■ DHG3■	69188.00 72485.00	UHW3■ DHW3■	80868.00 84164.00	UHA3■ DHA3■	76766.00 80063.00
Constant Torque or Variable Torque ▲	0	—	—	—	3	3	5	None 30	UBG4■ DBG4■	2910.00 3140.00	UBW4■ DBW4■	5133.00 5360.00	UBA4■ DBA4■	3380.00 3609.00
	1	—	—	—	7-1/2	7-1/2	10	None 30	UCG4■ DCG4■	3110.00 3338.00	UCW4■ DCW4■	5304.00 5531.00	UCA4■ DCA4■	3581.00 3807.00
	2	—	—	—	10	15	25	None 60	UDG4■ DDG4■	4877.00 4991.00	UDW4■ DDW4■	7640.00 7754.00	UDA4■ DDA4■	5616.00 5732.00
	3	—	—	—	25	30	50	None 100	UEG4■ DEG4■	7127.00 7866.00	UEW4■ DEW4■	11798.00 11969.00	UEA4■ DEA4■	8751.00 9491.00
	4	—	—	—	40	50	100	None 200	UFG4■ DFG4■	15159.00 17324.00	UFW4■ DFW4■	22509.00 23021.00	UFA4■ DFA4■	19803.00 21852.00
	5	—	—	—	75	100	200	None 400	UGG4■ DGG4■	34073.00 34586.00	UGW4■ DGW4■	48131.00 48644.00	UGA4■ DGA4■	50439.00 50952.00
	6	—	—	—	150	200	400	None 600	UHG4■ DHG4■	69188.00 72485.00	UHW4■ DHW4■	80868.00 84164.00	UHA4■ DHA4■	76766.00 80063.00

▲ Prices and type numbers shown for three phase, separate-winding motor starters apply only when motor windings are wye connected. When motor windings are connected open delta, use the prices shown for three phase consequent pole motor starters.

■ Voltage code must be specified to order this product. Refer to standard voltage codes shown below.

♦ NEMA Type 12 enclosures may be field modified for outdoor non-corrosive and non-service entrance rated applications. See Digest 176 page 16-95 for more information.

Dimensions. . . . . page 17-28

Refer to the following Digest 176 pages for:
Factory Modifications (Forms) . . . . . page 16-100
Replacement Parts (Class 9998). . . . . page 16-105
Type S Accessories (Class 9999) . . . . . page 16-109

Table 17.70: Coil Voltage Codes

Voltage 60 Hz	Voltage 50 Hz	Code	$ Price Adder
24▼★	—	V01	No Charge
120▼	110	V02	No Charge
208	—	V08	No Charge
240	220	V03	No Charge
—	380	V05	No Charge
480	440	V06	No Charge
600	550	V07	No Charge
Specify	Specify	V99	**35.60**

★ 24 V coils are not available on Sizes 4–7. On Sizes 00–3, where 24 V coils are available, **Form S** (separate control) must be specified (for example, order as 8810UBG1V01S).

▼ These voltage codes must include **Form S** (supplied at no charge) (for example, order as 8810UCG1V02S).

Note: For voltage codes used with control transformers, see page 17-32. Form S (separate control) is used when a separate source of power is available for the control (coil) voltage. Form S is supplied at no charge.

3-Pole Polyphase, 600 Vac Max., 50–60 Hz

Note that the prices shown do not include thermal units. Devices require 6 thermal units (Sizes 0–6). Standard trip thermal units are **$21.50** each. See Digest 176 page 16-116 for selection information.

Table 17.71: Class 8810—Reversing

Type of Motor	NEMA Size	Maximum Polyphase Ratings						Reversing In One Speed Only (Specify High or Low)■						Reversing In Both Speeds					
		Constant Horsepower Motors			Constant Torque or Variable Torque Motors			NEMA Type 1 General Purpose Enclosure		NEMA Type 12 Dusttight and Driptight Industrial Use Enclosure		Open Type		NEMA Type 1 General Purpose Enclosure		NEMA Type 12/3R△ Dusttight and Driptight Industrial Use Enclosure		Open Type	
		200 V	230 V	460–575 V	200 V	230 V	460–575 V	Type	$ Price	Type	$ Price	Type	$ Price	Type	$ Price	Type	$ Price	Type	$ Price
Single Winding Constant Horsepower	0	2	2	3	—	—	—	SBG21♦	3936.	SBA21♦	5261.	SBO21♦	3851.	SBG31♦	4563.	SBA31♦	6330.	SBO31♦	4449.
	1	5	5	7-1/2	—	—	—	SCG21♦	4248.	SCA21♦	5574.	SCO21♦	4121.	SCG31♦	4926.	SCA31♦	6728.	SCO31♦	4791.
	2	7-1/2	10	20	—	—	—	SDG21♦	6984.	SDA21♦	8522.	SDO21♦	6501.	SDG31♦	8522.	SDA31♦	10517.	SDO31♦	8010.
	3	20	25	40	—	—	—	SEG21♦	10260.	SEA21♦	13892.	SEO21♦	9662.	SEG31♦	13508.	SEA31♦	17139.	SEO31♦	11997.
	4	30	40	75	—	—	—	SFG21♦	20457.	SFA21♦	28290.	SFO21♦	19718.	SFG31♦	26810.	SFA31♦	33390.	SFO31♦	24930.
	5	60	75	150	—	—	—	SGG21♦	46449.	SGA21♦	58172.	SGO21♦	42164.	SGG31♦	56946.	SGA31♦	68679.	SGO31♦	52659.
Single Winding Constant Torque or Variable Torque	0	—	—	—	3	3	5	SBG22♦	3936.	SBA22♦	5261.	SBO22♦	3851.	SBG32♦	4563.	SBA32♦	6330.	SBO32♦	4449.
	1	—	—	—	7-1/2	7-1/2	10	SCG22♦	4248.	SCA22♦	5574.	SCO22♦	4121.	SCG32♦	4926.	SCA32♦	6728.	SCO32♦	4791.
	2	—	—	—	10	15	25	SDG22♦	6984.	SDA22♦	8522.	SDO22♦	6501.	SDG32♦	8522.	SDA32♦	10517.	SDO32♦	8010.
	3	—	—	—	25	30	50	SEG22♦	10260.	SEA22♦	13892.	SEO22♦	9662.	SEG32♦	13508.	SEA32♦	17139.	SEO32♦	11997.
	4	—	—	—	40	50	100	SFG22♦	20457.	SFA22♦	28290.	SFO22♦	19718.	SFG32♦	26810.	SFA32♦	33390.	SFO32♦	24930.
	5	—	—	—	75	100	200	SGG22♦	46449.	SGA22♦	58172.	SGO22♦	42164.	SGG32♦	56946.	SGA32♦	68679.	SGO32♦	52659.
Two Winding Constant▲ Horsepower	0	2	2	3	—	—	—	SBG23♦	3252.	SBA23♦	4577.	SBO23♦	3167.	SBG33♦	4193.	SBA33♦	5958.	SBO33♦	4077.
	1	5	5	7-1/2	—	—	—	SCG23♦	3452.	SCA23♦	4778.	SCO23♦	3324.	SCG33♦	4620.	SCA33♦	6386.	SCO33♦	4449.
	2	7-1/2	10	20	—	—	—	SDG23♦	5817.	SDA23♦	7353.	SDO23♦	5432.	SDG33♦	8067.	SDA33♦	10061.	SDO33♦	7554.
	3	20	25	40	—	—	—	SEG23♦	9005.	SEA23♦	12639.	SEO23♦	8267.	SEG33♦	12027.	SEA33♦	15885.	SEO33♦	11228.
	4	30	40	75	—	—	—	SFG23♦	15929.	SFA23♦	22338.	SFO23♦	15188.	SFG33♦	21284.	SFA33♦	27693.	SFO33♦	20487.
	5	60	75	150	—	—	—	SGG23♦	37335.	SGA23♦	49058.	SGO23♦	33048.	SGG33♦	49455.	SGA33♦	59396.	SGO33♦	43388.
Two Winding Constant▲ Torque or Variable Torque	0	—	—	—	3	3	5	SBG24♦	3252.	SBA24♦	4577.	SBO24♦	3167.	SBG34♦	4193.	SBA34♦	5958.	SBO34♦	4077.
	1	—	—	—	7-1/2	7-1/2	10	SCG24♦	3452.	SCA24♦	4778.	SCO24♦	3324.	SCG34♦	4620.	SCA34♦	6386.	SCO34♦	4449.
	2	—	—	—	10	15	25	SDG24♦	5817.	SDA24♦	7353.	SDO24♦	5432.	SDG34♦	8067.	SDA34♦	10061.	SDO34♦	7554.
	3	—	—	—	25	30	50	SEG24♦	9005.	SEA24♦	12639.	SEO24♦	8267.	SEG34♦	12027.	SEA34♦	15885.	SEO34♦	11228.
	4	—	—	—	40	50	100	SFG24♦	15929.	SFA24♦	22338.	SFO24♦	15188.	SFG34♦	21284.	SFA34♦	27693.	SFO34♦	20487.
	5	—	—	—	75	100	200	SGG24♦	37335.	SGA24♦	49058.	SGO24♦	33048.	SGG34♦	49455.	SGA34♦	59396.	SGO34♦	43388.

3-Pole Polyphase, 600 Vac Max., 50–60 Hz

Note that the prices shown do not include thermal units. Devices require 6 thermal units (Sizes 0–6). Standard trip thermal units are **$21.50** each. See Digest 176 page 16-116 for selection information.

Table 17.72: Class 8810—Non-Reversing, Vertically Arranged, Open Type, Two-Speed Starters

Type of Motor	NEMA Size	Maximum HP Ratings				For Consequent Pole Motors		For Separate Winding Motors	
		200 V	230 V	380 V	460-575 V	Type	$ Price	Type	$ Price
Constant Horsepower	0	2	2	3	3	SBO11♦	2142.00	SBO13♦	1515.00
	1	5	5	7-1/2	7-1/2	SCO11♦	2282.00	SCO13♦	1686.00
	2	7-1/2	10	20	20	SDO11♦	4050.00	SDO13♦	2939.00
	3	20	25	40	40	SEO11♦	6101.00	SEO13♦	4563.00
	4	30	40	60	75	SFO11♦	15786.00	SFO13♦	11429.00
Constant Torque or Variable Torque	0	3	3	5	5	SBO12♦	2142.00	SBO14♦	1515.00
	1	7-1/2	7-1/2	10	10	SCO12♦	2282.00	SCO14♦	1686.00
	2	10	15	25	25	SDO12♦	4050.00	SDO14♦	2939.00
	3	25	30	50	50	SEO12♦	6101.00	SEO14♦	4563.00
	4	40	50	75	100	SFO12♦	15786.00	SFO14♦	11429.00

▲ Prices and type numbers shown for three phase, separate winding motor starters apply only when motor windings are wye connected. When motor windings are connected open delta, use the prices shown for consequent pole motor starters.

■ Specify the speed which requires reversing by adding an L (low) or an H (high) after the type number, e.g., a Class 8810 Type SBG21 with reversing in low only would be ordered as a Class 8810 Type SBG21L.

♦ Voltage codes must be specified to order this product. Refer to standard voltage codes listed below.

Table 17.73: Coil Voltage Codes

Voltage		Code	$ Price Adder
60 Hz	50 Hz		
24▼★	—	V01	No Charge
120▼	110	V02	No Charge
208	—	V08	No Charge
240	220	V03	No Charge
—	380	V05	No Charge
480	440	V06	No Charge
600	550	V07	No Charge
Specify	Specify	V99	**35.60**

★ 24 V coils are not available on Sizes 4–7. On Sizes 00–3, where 24 V coils are available, **Form S** (separate control) must be specified (for example, order as 8810SCG21V01S).

▼ These voltage codes must include **Form S** (supplied at no charge) (for example, order as 8810SDG21V02S).

△ NEMA Type 12 enclosures may be field modified for outdoor non-corrosive and non-service entrance rated applications. See Digest 176 page 16-95 for more information.

Note: For voltage codes used with control transformers, see page 17-18.
Form S (separate control) is used when a separate source of power is available for the control (coil) voltage. Form S is supplied at no charge.

Dimensions . . . . . page 17-28

Refer to the following Digest 176 pages for:
Factory Modifications (Forms) . . . . . page 16-100
Replacement Parts (Class 9998) . . . . . page 16-105
Type S Accessories (Class 9999) . . . . . page 16-109

Table 17.74: NEMA Type 1 Enclosure (see Figure 1)

Type	A	B	C	D	E	F	G	H
SBG and SCG	11-7/8	11-7/8	7-17/32	9-3/4	1-1/16	1-1/16	9-3/4	5/16
SDG	14-7/8	14-1/8	7-21/32	12-3/4	1-1/16	1-1/16	12	5/16
SEG3 & 4 and SFG3 & 4	18-5/32	29-5/32	9-15/64	15-1/2	1-11/32	1-11/32	26-1/2	7/16
SEG1 & 2 and SFG1 & 2	22-5/32	39-5/32	10-15/64	19-1/2	1-11/32	1-11/32	36-1/2	7/16
SGG1, 2, 3, 4	20-7/32	65-3/4	16-29/64	31	2-1/8	2-1/8	42	9/16
SHG1, 2, 3, 4	36-7/32	62-7/32	19-15/32	Floor Mount				
SJG3 & 4	Consult Square D							

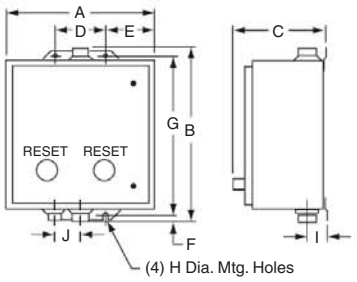


Figure 1:
NEMA Type 1, 4, and 12 Enclosures

Table 17.75: NEMA Type 4 Enclosure (see Figure 1)

Type	A	B	C	D	E	F	G	H	I	J
SBW and SCW	12-5/8	14-11/16	7-13/16	4-1/4	4-3/16	19/32	13-1/2	5/16	1-21/32	2-5/16
SDW	14-7/8	15-3/4	8-1/4	4-1/4	5-5/16	3/8	15	5/16	2-1/32	2-5/8
SEW3 & 4 and SFW3 & 4	18-5/32	32-7/32	8-19/64	12	3-5/64	55/64	30-1/2	7/16	2-37/64	3-3/16
SEW1 & 2 and SFW1 & 2	22-5/32	42-7/32	9-49/64	16	3-5/64	55/64	40-1/2	7/16	2-21/64	2-57/64
SGW1, 2, 3, 4	35-7/32	49-7/32	12-1/8	27	4-3/32	39/64	48	9/16	2-63/64	3-1/2

Table 17.76: NEMA Type 12/3R Enclosure (see Figure 1)

Type	A	B	C	D	E	F	G	H
SBA and SCA	11-7/8	13-1/2	7-3/4	4-1/4	3-13/16	3/8	12-3/4	5/16
SDA	14-7/8	15-3/4	7-7/8	4-1/4	5-5/16	3/8	15	5/16
SEA3 & 4 and SFA3 & 4	18-5/32	31-1/2	9-19/32	16	3-3/32	1/2	30-1/2	7/16
SEA1 & 2 and SFA1 & 2	22-5/3	41-1/2	10-19/32	16	3-3/32	1/2	40-1/2	7/16
SGA1, 2, 3, 4	35-7/32	49	13-7/64	27	4-7/64	1/2	48	9/16
SHA1, 2, 3, 4	36-7/32	62-7/32	19-15/32	Floor Mount				
SJA3 & 4	Consult Square D							

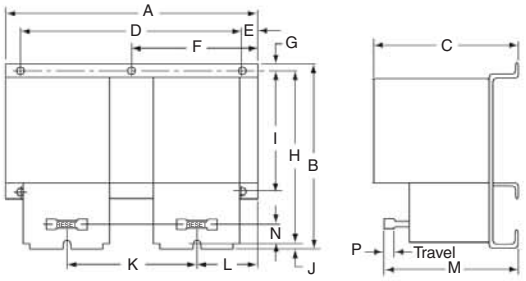


Figure 2:
Class 8810 NEMA Sizes 0, 1, and 2

Table 17.77: Non-Reversing, Open Type

Fig. No.	NEMA Size	Type	Mtg. Holes	A	B	C	D	E	F	G	H	I	J	K	L	M	N
2	0 and 1	SBO1, 2 SCO1, 2	4	9-5/8	7-11/32	5-5/16	8	5/8	—	7/32	6-29/32	—	7/32	4-3/4	2-1/4	5-1/16	19/32
		SBO3, 4 SCO3, 4	3	7-1/8	6-29/32	5-5/16	—	—	3-13/32	15/32	6-7/32	—	7/32	3-9/16	1-5/8	5-1/16	19/32
	2	SDO1, 2	6	12-1/32	8-17/32	6-1/32	10-3/8	1/2	—	1/4	8-1/8	6-1/4	5/32	5-3/4	2-13/16	5-5/32	25/32
		SDO3, 4	3	9	8-1/16	6-1/32	—	—	4-1/2	3/8	7-1/2	—	3/16	4-11/32	2-5/32	5-5/32	25/32
3	3	SEO1, 2	4	18	14-7/16	17	12-1/4	1-1/2	11/16	1/2	6-7/16	7-3/8	1-21/32	2-5/32	—	—	—
		SEO3, 4	4	12-3/4	12-9/32	11-3/4	10-3/4	1-1/32	1/2	1/2	2-1/2	6-3/4	1-5/32	1-5/32	—	—	—
	4	SFO1, 2	4	18-5/8	15-19/32	17	12-1/4	1-27/32	1-1/2	1-1/8	6-7/16	7-21/32	1-21/32	1-21/32	—	—	—
		SFO3, 4	4	14-1/4	14-19/32	13-1/4	12-1/4	1-27/32	1/2	1/2	2-15/16	7-3/8	1-21/32	1-21/32	—	—	—
4	5	SGO1, 2▲	4	29-9/32	20-9/32	9-3/8	5-13/32	1-9/32	28	5/8	12-9/16	19	5/8	22-17/32	1/2	2-13/32	6-5/8
		SGO3, 4	4	19-9/32	20-9/32	9-3/8	5-13/32	1-9/32	18	5/8	2-5/8	19	5/8	12-17/32	1/2	2-13/32	6-5/8
4	6■	SHO1, 2▲	4	29-17/32	22-7/16	9-17/32	6-31/32	3-13/16	28	3/4	11-5/8	21-3/16	5/8	9-7/8	9/16	3-1/32	9-5/16
		SHO3, 4	4	19-17/32	22-7/16	9-17/32	6-31/32	3-13/16	18	3/4	21-3/16	1-11/16	5/8	9-7/8	9/16	3-1/32	9-5/16
—	7♦	SJO3, 4	Consult the Customer Care Center (CCC) at 1-888-778-2733.														

▲ Consequent pole type starters consist of two 3-pole starters as pictured in Figure 4 and an additional 2-pole shorting contactor (not shown), all on a common baseplate, horizontally mounted.
■ Current transformers used with Size 1 overload relay blocks.
♦ Solid-state overload relays and special current transformers.

NOTE: *Illustrations are intended for dimensional information only and may not represent the actual enclosure. Dimensions are shown in inches.*

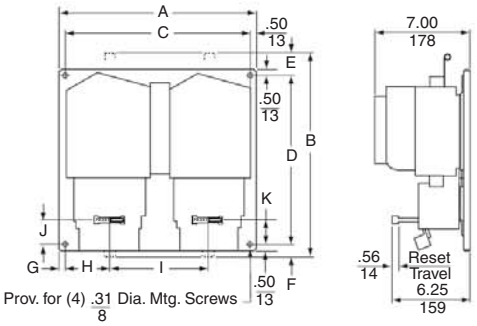


Figure 3: Class 8810 NEMA Sizes 3 and 4

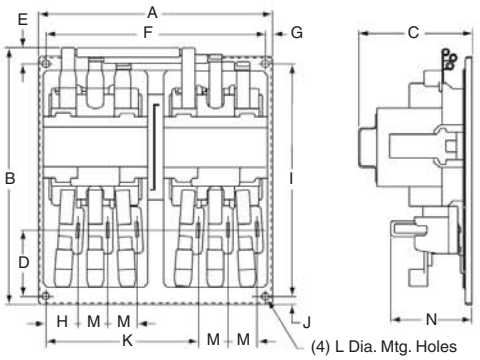


Figure 4: Class 8810 NEMA Size 5 and 6

Disconnect Switch or Circuit Breaker Type

Table 17.78: NEMA Type 1 Enclosure, Figure 1

NEMA Size	Class	Type	Dimensions (in inches)—see Figure 1															Top & Bottom		Sides
			A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	W	X	Y
0–1	8810	CBG UBG DBG CCG UCG DCG	13-7/8	23-1/8	8-1/4	10-5/8	21	19-9/32	1-7/8	1-7/8	3-3/4	2-5/16	1-1/16	3-19/64	2-3/16	1-1/4	7/8	1/2–3/4–1	1/2–3/4–1	1/2
2	8810	CDG UDG DDG	15-5/32	28-29/32	9-9/16	11-5/8	26-1/4	21-13/16	2-3/16	2	4	2-5/8	1-21/64	3-19/64	2-7/32	1-17/64	29/32	1–1-1/4	1/2–3/4	1/2
3▲	8810	CEG UEG DEG	22-1/8	42-5/8	10-1/8	18-5/8	40	29-1/8	2-11/32	2-1/8	4-1/4	2-5/8	1-1/4	3-19/64	2-1/4	7/8	3/4	1–1-1/4–1-1/2	1/2–3/4	1/2
4▲	8810	CFG UFG DFG	22-1/8	50-1/8	10-3/16	18-5/8	47-1/2	29-3/16	2-29/32	2-11/16	5-3/8	2-5/8	1-5/16	3-19/64	2-1/4	7/8	3/4	2-1/2	1/2–3/4	1/2

Table 17.79: NEMA Type 4 Enclosure, Figure 2

NEMA Size	Class	Type	Dimensions (in inches)—see Figure 2											Bottom	Top & Bottom
			A	B	C	D	E	F	G	H	I	J	K	L	W	X
0–1	8810	CBW UBW DBW CCW UCW DCW	13-7/8	8-21/64	25-3/16	3-19/64	2-9/16	8-3/4	24	19/32	3-61/64	1-5/8	2-5/16	18-17/32	3/4 Hub	1 Hub
2	8810	CDW UDW DDW	15-1/8	9-37/64	30-15/16	3-19/64	2-9/16	10	29-3/4	19/32	3-61/64	2	2-5/8	21-11/32	3/4 Hub	1-1/2 Hub
3▲	8810	CEW UEW DEW	22-1/8	10-1/8	46-1/4	3-19/64	3	16	44	5/8	3-15/16	1-3/4	2-5/8	29-1/8	3/4 Hub	2 Hub
4▲	8810	CFW UFW DFW	22-1/8	10-3/16	53-3/4	3-19/64	3	16	51-1/2	5/8	3-15/16	2-9/32	3-3/16	29-3/16	3/4 Hub	2-1/2 Hub

Table 17.80: NEMA Type 12 Enclosure, Figure 3

NEMA Size	Class	Type	Dimensions (in inches)—see Figure 3									
			A	B	C	D	E	F	G	H	I	J
0–1	8810	CBA UBA DBA CCA UCA DCA	13-7/8	10-3/32	24-3/4	3-19/64	2-9/16	8-3/4	24	3/8	3-61/64	20-9/32
2	8810	CDA UDA DDA	15-5/32	10-31/32	31-1/4	3-19/64	3-5/64	9	30-1/4	1/2	4-53/64	23-7/16
3▲	8810	CEA UEA DEA	22-1/8	10-1/8	45	3-19/64	3	16	44	5/8	3-15/16	29-1/8
4▲	8810	CFA UFA DFA	22-1/8	10-3/16	52-1/2	3-19/64	3	16	51-1/2	5/8	3-15/16	29-3/16

▲ Size 3 (5-Pole–3-Pole) with FA, KA circuit breaker or 100 A disconnect switch.
Size 4 (5-Pole–3-Pole) with KA circuit breaker or 200 A disconnect switch. Size 3 & 4 (3-Pole–3-Pole) enclosures may be smaller.
Consult the Customer Care Center (CCC) at 1-888-778-2733 for additional dimensional information.

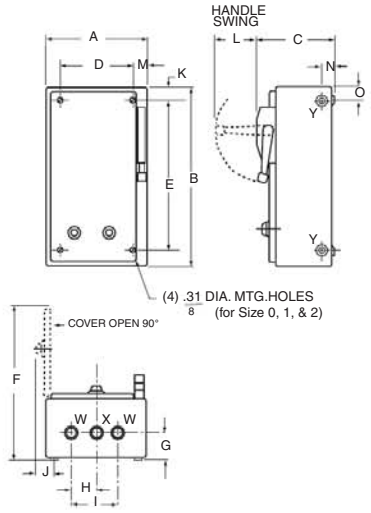


Figure 1:
NEMA Type 1 Enclosure

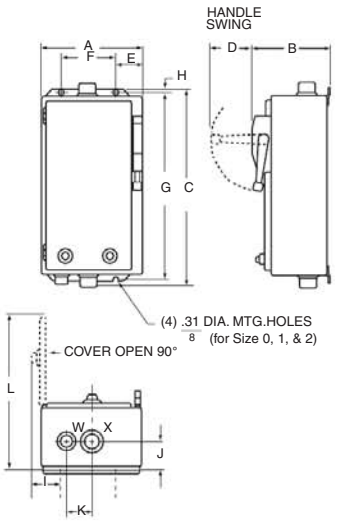


Figure 2:
NEMA Type 4 Enclosure

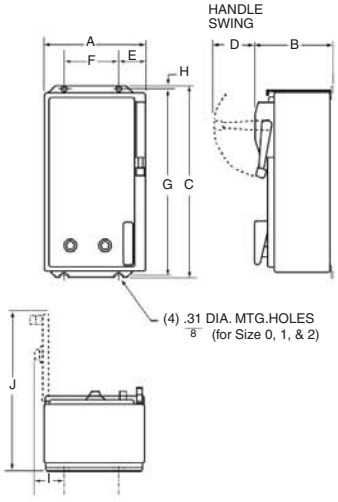


Figure 3:
NEMA Type 12 Enclosure

NOTE: *Illustrations are intended for dimensional information only and may not represent the actual enclosure. Dimensions are shown in inches.*

Panel Mount

File E78427
CCN NRNT

General Information

Panelboard lighting contactors, sometimes called remote control switches, are designed for use with lighting panelboards and motor control centers where either panel or bus mounting is desired. Type PB lighting contactors can be used in a retrofit or new project without increasing the panelboard depth. They can be used to directly replace many inoperative existing switches.

The features include: mechanically held; compatible with Square D panelboards; short-circuit ratings to 100 kA; compact arc suppression; bus or panel mounted; fits in standard-depth lighting panelboards; easy manual operation; standard coil clearing contacts; and operates in any position.

Table 17.81: Class 8903 Type PB Lighting Contactors

Description		Bus Mount		Panel Mount (Includes Lugs)	
Size (A)	Poles	Type	$ Price	Type	$ Price
30	2 3	PBM 10B▲ PBM 11B▲	**2129.00** **2403.00**	PBM 10▲ PBM 11▲	**2640.00** **2973.00**
60	2 3	PBP 10B▲ PBP 11B▲	**2237.00** **2573.00**	PBP 10▲ PBP 11▲	**2762.00** **3185.00**
75	2 3	PBN 10B▲ PBN 11B▲	**2237.00** **2573.00**	PBN 10▲ PBN 11▲	**2762.00** **3185.00**
100	2 3	PBQ 10B▲ PBQ 11B▲	**2541.00** **2978.00**	PBQ 10▲ PBQ 11▲	**3119.00** **3546.00**
150	2 3	PBR 10B▲ PBR 11B▲	**3162.00** **4055.00**	PBR 10▲ PBR 11▲	**3897.00** **4787.00**
200	2 3	PBV 10B▲ PBV 11B▲	**3551.00** **4496.00**	PBV 10▲ PBV 11▲	**4409.00** **5360.00**
225	2 3	PBW 10B▲ PBW 11B▲	**3909.00** **4958.00**	PBW 10▲ PBW 11▲	**4964.00** **5990.00**

▲ Voltage code must be specified to order this product. Refer to standard voltage codes listed below.

Table 17.82: AC Coil Voltage Codes

60 Hz	Voltage Code
120	V02
208	V08
240/277	V39
480	V28

Table 17.83: Class 8903—Auxiliary Contacts

Type	Description	$ Price
PBX1	(1) Auxiliary Contact SPDT	**243.00**
PBX2	(2) Auxiliary Contacts SPDT	**485.00**

Table 17.84: Factory Modifications

Form	Description	$ Price
X11	(1) Auxiliary Contact SPDT	**158.00**
X22	(2) Auxiliary Contacts SPDT	**314.00**

Table 17.85: Dimensions (Panel Mount)

Amperes	Dimensions													
	H		W		D		A		B		C		E	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
30–100	11.75	298	7.50	191	3.88	98	2.25	57	7.38	187	2.25	57	9.25	235
150–225	14.50	368	7.50	191	3.88	98	2.88	73	8.50	216	3.00	76	10.50	267

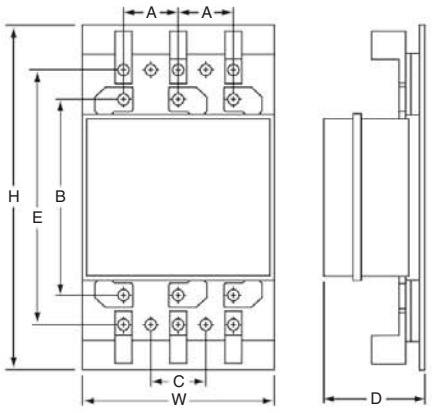


Table 17.86: Control Distance

Wire Gauge AWG	Maximum Distance (feet)				
	120 V	208 V	240 V	277 V	480 V
#14	550	1650	2200	2925	8800
#12	900	2700	3600	4700	14400
#10	1425	4275	5700	7550	22800

Table 17.87: Short-Circuit Ratings

RMS Sym. Current (A)	Max. Volts	Short Circuit Protection Device Recommended
100,000	600	Class J Fuses
22,000	600	Circuit Breaker—Square D—Type LHL
65,000	240	Circuit Breaker—Square D—Type LHL

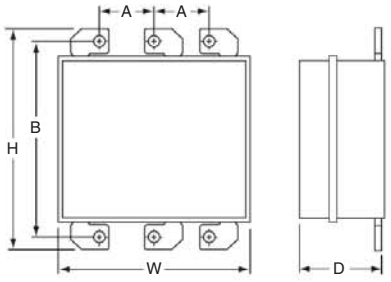
Table 17.88: Maximum Wire Size (AWG)

Current Range	Power Wire (Cu/Al)	Control Wire (Cu Only)
30–100 A	#1/0 Max.	#18–#10
150–225 A	350 MCM Max.	#18–#10

Table 17.89: Dimensions (Bus Mount)

Amperes	Dimensions									
	H		W		D		A		B	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
30–100	8.31	211	7.50	191	3.38	86	2.25	57	7.38	187
150–225	9.50	241	7.50	191	3.38	86	2.88■	73	8.50	216

■ Slotted mounting holes suitable for 2.88–3.19 in. mounting centers.



CP1 Discount Schedule

Type VG4V06K15

Class 8940 reduced voltage panels in NEMA 3R enclosures are specifically designed for pumping applications. Extra space is provided for field installation of auxiliary equipment.

- Type S contactors/starters provided as standard
- All devices are UL Listed, and marked "SUITABLE ONLY FOR USE AS SERVICE EQUIPMENT"
- Price includes Hand-Off-Auto selector switch and Start push button

For How to Order Information, see Digest 176 page 16-12 and Digest 176 page 16-125 for selection information.

Table 17.90: Coil Voltage Codes

Voltage		Code	$ Price Adder
60 Hz	50 Hz		
24♦	—	V01	No Charge
120★	110	V02	No Charge
208	—	V08	No Charge
240	220	V03	No Charge
—	380	V05	No Charge
480	440	V06	No Charge
600	550	V07	No Charge
Specify	Specify	V99	**35.60**

♦ 24 V coils are not available on Sizes 4–7. On Sizes 2–3, where 24 V coils are available, **Form S** (separate control) must be specified.

★ This voltage code must include **Form S** (no charge).

Table 17.91: Closed Transition Autotransformer Type, 3-Pole Polyphase—480 Vac Maximum (50–60 Hz)

Note: The prices shown do not include thermal units. Overload relays are ambient temperature compensated. Devices require 3 thermal units (Sizes 2–6). Standard trip thermal units are **$21.50** each.

Motor (Starter) Volts	Max. HP Polyphase	Coil Voltage	NEMA Size	Fusible Disconnect Type			Circuit Breaker Type		
				Fuse Clip Amperes▲	Type■	$ Price	Circuit Breaker	Type■	$ Price
230 (240)	15	240@ 60 Hz 220@ 50 Hz	2	60	RD4DV03	**11928.00**	FAL36080	VD1DV03	**11928.00**
	25		3	100	RE4FV03	**17055.00**	FAL36100	VE1FV03	**17055.00**
	30			200	RE1GV03	**17342.00**	KAL36100	VE2GV03	**17342.00**
	50		4	200	RF4JV03	**26657.00**	KAL36200	VF1JV03	**28107.00**
	75		5	400	RG1LV03	**43946.00**	LAL36250	VG2LV03	**43946.00**
	100			400	RG1MV03	**46083.00**	LAL36350	VG2MV03	**46083.00**
460 (480)	25	480 @ 60 Hz 440 @ 50 Hz	2	60	RD2FV06	**12555.00**	FAL36070	VD1FV06	**12555.00**
	30		3	100	RE2GV06	**17085.00**	FAL36080	VE1GV06	**17085.00**
	50			100	RE2JV06	**18197.00**	FAL36100	VE1JV06	**18197.00**
	75		4	200	RF2LV06	**26657.00**	KAL36125	VF1LV06	**27872.00**
	100			200	RF2MV06	**28278.00**	KAL36200	VF1MV06	**28278.00**
	150		5	400	RG3PV06	**42735.00**	KAL36250	VG4PV06	**46340.00**
	200			400	RG3QV06	**48860.00**	LAL36350	VG4QV06	**51237.00**
	300		6	—	—	—	MAL36600	VH1SV06	**79338.00**
	400			—	—	—	MAL36900	VH2TV06	**79338.00**
	600		7	—	—	—	MAL361000	VJ1WV06	**123134.00**

▲ Fuse clips are sized for use with dual-element time-delay fuses.

■ Coil voltage code must be specified to order this product. Refer to standard voltage codes shown in Table 17.90.

Table 17.92: Part Winding Type, 3-Pole Polyphase—480 Vac Maximum (50–60 Hz)

Note: The prices shown do not include thermal units. Overload relays are ambient temperature compensated. Devices require 6 thermal units (Sizes 2–6). Standard trip thermal units are **$21.50** each.

Motor (Starter) Voltage	Max. HP Polyphase	Coil Voltage	NEMA Size	Combination Fusible Disconnect Type			Combination Circuit Breaker Type		
				Fuse Clip (2 Sets) (A)♦	Type★	$ Price	Circuit Breaker (2 Bkrs.) Frame Size	Type★	$ Price
230 (240)	25	240 @ 60 Hz 220 @ 50 Hz	2PW	60	MD4FV03	**7536.00**	FAL36070	PD1FV03	**7923.00**
	30		3PW	60	ME5GV03	**11609.00**	FAL36080	PE3GV03	**11322.00**
	50			100	ME6JV03	**11609.00**	FAL36100	PE3JV03	**11322.00**
	75		4PW	200	MF1LV03	**21821.00**	KAL36150	PF3LV03	**23400.00**
	100		5PW	200	MG3MV03	**43326.00**	KAL36175	PG2MV03	**43326.00**
	125			400	MG1NV03	**43326.00**	LAL36250	PG3NV03	**43326.00**
	150			400	MG1PV03	**43326.00**	LAL36250	PG3PV03	**43326.00**
460 (480)	30	480 @ 60 Hz 440 @ 50 Hz	2PW	30	MD5GV06	**7536.00**	FAL36040	PD1GV06	**7293.00**
	40			60	MD2HV06	**7536.00**	FAL36050	PD1HV06	**7293.00**
	60		3PW	60	ME7KV06	**11609.00**	FAL36070	PE3KV06	**12822.00**
	75			100	ME3LV06	**11609.00**	FAL36090	PE3LV06	**11322.00**
	100		4PW	200	MF3MV06	**23400.00**	FAL36100	PF2MV06	**23400.00**
	150			200	MF3PV06	**23400.00**	KAL36125	PF3PV06	**23400.00**
	200		5PW	200	MG4QV06	**43326.00**	KAL36175	PG2QV06	**43326.00**
	250			200	MG4RV06	**43326.00**	KAL36225	PG3RV06	**43326.00**
	350			400	MG2TV06	**43326.00**	LAL36300	PG3TV06	**43326.00**

♦ Fuse clips are sized for use with dual-element time-delay fuses.

★ Coil voltage code must be specified to order this product. Refer to standard voltage codes shown in Table 17.90.

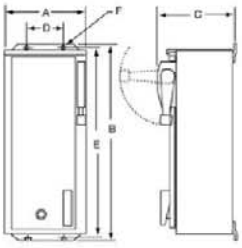


Table 17.93: Part Winding—Reduced Voltage Type

Type	Figure	A		B		C		D		E		F	
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
PD	3	19.00	483	34.50	876	12.25	311	13.00	330	33.50	851	0.44	11
MD	3	23.00	584	25.50	648	10.60	269	17.00	432	24.50	622	0.44	11
PE, PF	3	30.00	762	47.00	1194	13.25	337	22.00	559	46.00	1168	0.56	14
ME	3	25.00	635	52.50	1334	12.13	308	19.00	483	51.50	1308	0.44	11
MF	4	36.00	914	93.00	2362	19.25	489	33.75	857	12.50	318	0.69	18
PG, MG	4	36.00	914	73.00	1854	19.25	489	33.75	857	12.50	318	0.69	18
PH	4	38.00	965	93.00	2362	19.25	489	35.75	908	12.50	318	0.69	18

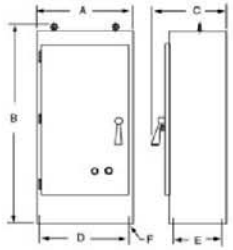


Table 17.94: Autotransformer—Reduced Voltage Type

Type	Figure	A		B		C		D		E		F	
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
RD, VD	3	25.00	635	52.50	1334	11.13	283	19.00	483	51.50	1308	0.44	11
RE, VE, RF, VF	4	32.00	813	72.50	1842	19.25	489	29.75	756	12.50	318	0.68	17
RG	4	36.00	914	93.00	2362	19.25	489	33.75	857	12.50	318	0.69	17
VG	4	32.00	813	72.50	1842	19.25	489	29.75	756	12.50	318	0.68	17
VH	4	34.00	864	93.00	2362	23.25	591	31.75	806	16.50	419	0.69	17
VJ▲	4	64.00	1626	93.00	2362	27.25	692	61.75	1568	17.25	438	0.81	21

▲ Cabinet has double doors.

NOTE: *Illustrations may not represent the actual enclosure; they are intended for dimensional information only.*

Table 17.95: Reduced Voltage Controllers Only

Factory Modifications		Enclosure Type	Form	NEMA Size 1 1PW 1 YD	2 2 PW 2 YD	3 3 PW 3 YD	4 4 PW 4 YD	5 5 PW 5 YD	6 6 PW 6 YD	7 7 PW 7 YD
	Classes 8606, 8630, 8640									
	Push Buttons▲									
	Start-Stop	1, 4, 12	A	336.00	336.00	336.00	33600	336.00	336.00	336.00
	Selector Switches									
	Hand-Off-Auto	1, 4, 12	C	336.00	336.00	336.00	336.00	336.00	336.00	336.00
	On-Off	1, 4, 12	C6	336.00	336.00	336.00	336.00	336.00	336.00	336.00
	Pilot Lights (specify color)■									
	One light On	1, 4, 12	P	336.00	336.00	336.00	336.00	336.00	336.00	336.00
	Separate Control Circuit★▼									
	TR coil only (at control voltage)	1, 4, 12	S	N/C	N/C	N/C	N/C	N/C	N/C	N/C
	All coils (at control voltage)	1, 4, 12	Y195	N/C	N/C	N/C	N/C	N/C	N/C	N/C
	Fused Control Circuit♦★▼△									
Pilot Devices in Cover and Control Circuit	One fuse	1, 4, 12	F	314.00	314.00	314.00	314.00	314.00	N/C◊	N/C◊
	Two fuses	1, 4, 12	F4	314.00	314.00	314.00	314.00	314.00	N/C◊	N/C◊
Reduced Voltage Controllers Only Classes 8606 8630 8640 8647 8650	**Control Circuit Transformer♦★▼ Standard Capacity (50 or 60 Hz)**									
	Fuses									
	Primary / **Secondary**									
	2—	0—	1, 4, 12	F4T	684.00	882.00	1112.00	1254.00	1395.00	N/C◊	N/C◊
	2..	1—	1, 4, 12	FF4T	1026.00	1197.00	1425.00	1566.00	1710.00	314.00	314.00
	2—	0—	1, 4, 12	F4T40	912.00	1182.00	1938.00	2079.00	3803.00	3803.00	3803.00
	2—	1—	1, 4, 12	FF4T40	1224.00	1497.00	2250.00	2393.00	4116.00	4116.00	4116.00
	Additional capacity (50 or 60 Hz)□									
	100 VA additional capacity	1, 4, 12	T11	300.00	300.00	300.00	300.00	300.00	300.00	300.00
	200 VA additional capacity	1, 4, 12	T12	570.00	570.00	570.00	570.00	570.00	570.00	570.00
	300 VA additional capacity	1, 4, 12	T13	1139.00	1139.00	1139.00	1139.00	1139.00	1139.00	1139.00
	400 VA additional capacity	1, 4, 12	T14	2421.00	2421.00	2421.00	2421.00	2421.00	2421.00	2421.00
	500 VA additional capacity	1, 4, 12	T15	2721.00	2721.00	2721.00	2721.00	2721.00	2721.00	2721.00
	Substitute nonstandard single primary and/or single secondary									
	Voltage rating on the control transformer♦	1, 4, 12	T1☆	71.00	71.00	71.00	71.00	71.00	—	—

▲ All push buttons are momentary contact.
■ For pilot light details, refer to the pilot light table in Digest 176 page 16-100.
♦ See Table 17.96 below.
★ As standard, Reduced Voltage Controllers are supplied with common control. If **Form S** or **T** is specified, only the TR coil will be at control voltage. Specify **Form Y195** or **T40** (Ex. **Form F4T40**) if all coils must be at control voltage. Refer to page 17-18 for control circuit arrangements.
▼ Reduced Voltage Controllers are supplied with two control circuit fuses for conductors at line voltage. Additional fusing may be supplied if a fused control circuit transformer or separate control is specified.
△ Must be used with Form specifying separate control (Ex. **Form FS**).
□ Add Form letters and price to that of standard control transformer. (Example: For Size 1, **Form F4T**, plus 100 VA becomes **F4T11, $984.00** **Form F4T40** plus 100 VA becomes **F4T41, $807.00**).
◊ Size 6 and 7 controllers come with **Form F4T** as standard.
☆ Must be used in conjunction with a variation of Form of **F4T.** (Ex. Standard capacity transformer required, 208–24 V. Order as **Form F4TT1**, 208–24 V.)

Table 17.96: Selection of Control Circuit Transformers

Voltage 60 Hz (Primary–Secondary)	Code
120–12	V88
120–24	V89
208–120	V84
240–24	V82
240–120	V80
277–120	V85
480–24	V83
480–120	V81
480–240	V87
600–120	V86
Specify	V99

The standard primary and secondary voltages for control circuit transformers are indicated in Table 17.96. To order, select the desired device with the appropriate transformer Form designation. Then convert the previously selected voltage code (V••) to reflect the desired primary/secondary voltage for the transformer. The secondary voltage should equal the previously selected coil voltage of the device. (24 Vac coils for NEMA Sizes 4–7 are not available).

Example:

You previously selected a Class 8606SDG1V02S. The designation V02S means that you need a coil voltage of 120-60/110-50 wired for separate control. You would like to add **Form FF4T** with the transformer voltages being 480 volt primary, 120 volt secondary. The new, complete Class, Type, Voltage Code, and Form are:

Class	Type	Voltage Code	Form▽
8606	SDG1	V81	FF4T

▽ Form numbers should always be shown in alphabetical order.

Table 17.97: Class 8606 Reduced Voltage Starters Only

	Factory Modifications	Enclosure Type	Form	NEMA Size 1	2	3	4	5	6	7
Circuit Breaker or Disconnect Switch	Molded case thermal magnetic circuit breaker ■	1	Y791	2010.00	2451.00	2664.00	4872.00	9471.00	13944.00	18320.00
		4	Y791	2862.00	3533.00	4886.00	7092.00	11808.00	18216.00	23601.00
		12	Y791	2037.00	2564.00	2862.00	6579.00	10839.00	15012.00	20397.00
	Nonfusible disconnect switch	1	Y792	1340.00	1710.00	2165.00	2991.00	5355.00	—	—
		4	Y792	2195.00	2793.00	4388.00	5327.00	7691.00	—	—
		12	Y792	1368.00	1823.00	2366.00	4815.00	5925.00	—	—
	Atuomatic molded case switch	1	Y7910	—	—	—	—	—	12293.00	13004.00
		4	Y7910	—	—	—	—	—	16565.00	17276.00
		12	Y7910	—	—	—	—	—	13361.00	14072.00
	Fusible Disconnect Switch with Fuse Clips ▲									
	30 A clips	1	Y793	1566.00	1566.00	—	—	—	—	—
		4	Y793	2421.00	2124.00	—	—	—	—	—
		12	Y793	1596.00	1596.00	—	—	—	—	—
	60 A clips	1	Y794	1566.00	1823.00	2066.00	—	—	—	—
		4	Y794	2421.00	2885.00	3609.00	—	—	—	—
		12	Y794	1596.00	1938.00	2280.00	—	—	—	—
	100 A clips	1	Y795	—	—	2336.00	2574.00	—	—	—
		4	Y795	—	—	4559.00	5021.00	—	—	—
		12	Y795	—	—	2537.00	2943.00	—	—	—
	200 A clips	1	Y796	—	—	2885.00	3596.00	—	—	—
		4	Y796	—	—	5129.00	4340.00	—	—	—
		12	Y796	—	—	3105.00	5327.00	—	—	—
	400 A clips	1	Y797	—	—	—	—	5868.00	11039.00	—
		4	Y797	—	—	—	—	8190.00	15354.00	—
		12	Y797	—	—	—	—	6438.00	12861.00	—
	Automatic Molded Case Switch with 600 A fuse clips	1	Y798	—	—	—	—	—	13802.00	—
		4	Y798	—	—	—	—	—	18075.00	—
		12	Y798	—	—	—	—	—	14871.00	—
	Automatic Molded Case Switch with fuse clips 1200 A or less	1	Y799	—	—	—	—	—	—	15425.00
		4	Y799	—	—	—	—	—	—	19697.00
		12	Y799	—	—	—	—	—	—	17562.00

▲ Fuses not included.
■ Mag-Gard™ circuit breakers are not supplied nor recommended.

Table 17.98: Class 8630 Reduced Voltage Controllers Only★

	Factory Modifications	Enclosure Type	Form	NEMA Size 1 YD	2 YD	3 YD	4 YD	5 YD	6 YD	7 YD
Circuit Breaker or Disconnect Switch	Molded case thermal magnetic circuit breaker ▼	1	Y791	2451.00	2664.00	4872.00	9471.00	13944.00	18320.00	32759.00
		4	Y791	3533.00	4886.00	7092.00	11808.00	18216.00	23601.00	37031.00
		12	Y791	2564.00	2856.00	6579.00	10839.00	15012.00	20397.00	33827.00
	Nonfusible disconnect switch	1	Y792	1710.00	2165.00	2991.00	5355.00	—	—	—
		4	Y792	2793.00	4388.00	5327.00	7691.00	—	—	—
		12	Y792	1823.00	2366.00	4815.00	5925.00	—	—	—
	Atuomatic molded case switch	1	Y7910	—	—	—	—	12293.00	13004.00	29483.00
		4	Y7910	—	—	—	—	16565.00	17276.00	33755.00
		12	Y7910	—	—	—	—	13361.00	14072.00	30551.00
	Fusible Disconnect Switch with Fuse Clips♦									
	30 A clips	1	Y793	1823.00	1823.00	—	—	—	—	—
		4	Y793	2421.00	3771.00	—	—	—	—	—
		12	Y793	1938.00	1938.00	—	—	—	—	—
	60 A clips	1	Y794	1823.00	2066.00	—	—	—	—	—
		4	Y794	2421.00	3609.00	—	—	—	—	—
		12	Y794	1938.00	2280.00	—	—	—	—	—
	100 A clips	1	Y795	—	2336.00	2574.00	—	—	—	—
		4	Y795	—	4559.00	5021.00	—	—	—	—
		12	Y795	—	2537.00	2943.00	—	—	—	—
	200 A clips	1	Y796	—	—	2885.00	3596.00	—	—	—
		4	Y796	—	—	5129.00	5840.00	—	—	—
		12	Y796	—	—	3105.00	5327.00	—	—	—
	400 A clips	1	Y797	—	—	—	6510.00	11039.00	—	—
		4	Y797	—	—	—	8204.00	15354.00	—	—
		12	Y797	—	—	—	6438.00	12861.00	—	—
	Automatic Molded Case Switch with 600 A fuse clips	1	Y798	—	—	—	—	13802.00	14513.00	—
		4	Y798	—	—	—	—	18075.00	18786.00	—
		12	Y798	—	—	—	—	14871.00	15227.00	—
	Automatic Molded Case Switch with fuse clips 1200 A or less	1	Y799	—	—	—	—	—	15425.00	30195.00
		4	Y799	—	—	—	—	—	19697.00	34704.00
		12	Y799	—	—	—	—	—	17562.00	31095.00

♦ Fuses not included.
★ Wye-Delta motor starters typically have higher current ratings per NEMA Size than full voltage motor starters. Care must be taken in selecting the appropriate short circuit protection. The table on Digest 176 page 7-33 will assist in selecting proper protection based on motor full-load current.
▼ Mag-Gard™ circuit breakers are not supplied nor recommended.

NOTE: *To comply with Section 430-3 of the National Electrical Code®, combination part-winding starters are provided as follows:*

1. Circuit breaker: two thermal-magnetic, adjustable-trip circuit breakers—one for each motor winding. In the smaller controllers that use the FA and KA frames, a single external operating mechanism operates the two circuit breakers simultaneously. In the larger controllers that use the KA and LA frames, each circuit breaker has its own operating mechanism.
2. Nonfusible disconnect switch: a single 3-pole unfused disconnect switch of the proper rating for both windings. The user must provide proper short-circuit protection external to the starter, using only Class J fuses.
3. Fusible disconnect switch: a single unfused disconnect switch with two sets of fuse clips (each set of the rating indicated) to provide short-circuit protection for each winding.

Table 17.99: Class 8640 Reduced Voltage Starters Only

Factory Modifications		Enclosure Type	Form	NEMA Size 1 PW	2 PW	3 PW	4 PW	5 PW	6 PW
Circuit Breaker or Disconnect Switch	Molded case thermal magnetic circuit breaker ■	1	Y7911	3014.00	3675.00	3996.00	7307.00	14207.00	—
		4	Y7911	4293.00	5300.00	7329.00	10641.00	17711.00	—
		12	Y7911	3056.00	3846.00	4293.00	9872.00	16259.00	—
	Fusible Disconnect Switch with Fuse Clips ▲								
	30 A clips (two sets)	1	Y7931	2006.00	2006.00	—	—	—	—
		4	Y7931	2664.00	2664.00	—	—	—	—
		12	Y7931	2132.00	2132.00	—	—	—	—
	60 A clips (two sets)	1	Y7941	—	2273.00	2570.00	—	—	—
		4	Y7941	—	3969.00	5013.00	—	—	—
		12	Y7941	—	2507.00	2790.00	—	—	—
	100 A clips (two sets)	1	Y7951	—	2570.00	2831.00	3176.00	—	—
		4	Y7951	—	5013.00	5525.00	5642.00	—	—
		12	Y7951	—	2790.00	3239.00	3416.00	—	—
	200 A clips (two sets)	1	Y7961	—	—	3176.00	3959.00	6456.00	—
		4	Y7961	—	—	5642.00	6425.00	9026.00	—
		12	Y7961	—	—	3416.00	5859.00	7082.00	—
	400 A clips (two sets)	1	Y7971	—	—	—	6456.00	15182.00 ♦	15596.00 ♦
		4	Y7971	—	—	—	9026.00	19881.00 ♦	20082.00 ♦
		12	Y7971	—	—	—	7082.00	16356.00 ♦	16592.00 ♦
	Automatic molded case switch with 600 A fuse clips (two sets)	1	Y7920	—	—	—	—	—	15965.00
		4	Y7920	—	—	—	—	—	20664.00
		12	Y7920	—	—	—	—	—	16748.00
	Automatic molded case switch with fuse clips 601–1200 A or less (two sets)	1	Y7921	—	—	—	—	—	16968.00
		4	Y7921	—	—	—	—	—	21668.00
		12	Y7921	—	—	—	—	—	19319.00

▲ Fuses not included.
■ Mag-Gard™ circuit breakers are not supplied nor recommended.
♦ Consists of automatic molded case switch with two sets of 400 A fuse clips.

Table 17.100: Reduced Voltage Controllers Only♦

Classes 8606, 8630, 8640										
Factory Modifications		Enclosure Type	Form	NEMA Size 1 1PW 1 YD	2 2 PW 2 YD	3 3 PW 3 YD	4 4 PW 4 YD	5 5 PW 5 YD	6 6 PW 6 YD	7 7 PW 7 YD
Overload Relays	**Non-Compensated Bimetallic Overload Relays**									
	Three Element									
	Types SC-SD (Sizes 1 & 2)	Any	B2	57.00	57.00	—	—	—	—	—
	Types SE-SG (Sizes 3–5)	Any	B5	—	—	57.00	57.00	57.00	—	—
	Type SH (Size 6)	Any	B2	—	—	—	—	—	57.00	— ■
	Ambient Compensated Bimetallic Overload Relays									
	Three Element									
	Types SC-SD (Sizes 1 & 2)	1, 4, 12	B	86.00	86.00	—	—	—	—	—
	Types SE-SF (Sizes 3 & 4)	Any	Y59	—	—	107.00	107.00	—	—	—
	Types SG-SH (Sizes 5–6)	Any	B	—	—	—	—	86.00	86.00	— ■
	Overload Relays General									
	Substitute 9999SO4 isolated alarm contact on melting alloy overload relay	Any	Y342	179.00	179.00	179.00	179.00	179.00	179.00	— ■
	Substitute 9999SO5 isolated alarm contact on melting alloy overload relay	Any	Y344	179.00	179.00	179.00	179.00	179.00	179.00	— ■
	Motor Logic™ Overload Relays★▼									
		Any	H10	122.00	122.00	122.00	122.00	122.00	57.00	57.00
		Any	H20	122.00	122.00	122.00	122.00	122.00	57.00	57.00
Miscellaneous	Add for thermal protector Class 8606	1, 4, 12	Y116	—	570.00	570.00	570.00	570.00	570.00	—
	Coil transient suppressor per coil	Any	Y145	158.00	158.00	158.00	158.00	158.00	—	—
	Addition of terminal blocks (specify wired or unwired).									
	Wired, per terminal, each	1, 4, 12	G56▲	116.00	116.00	116.00	116.00	116.00	116.00	116.00
	Unwired, per terminal, each	1, 4, 12	G50▲	57.00	57.00	57.00	57.00	57.00	57.00	57.00

▲ Addition of terminal block 9080CA or 9080GR6 only. The number of circuits is the same as the ending of the Form number. (Example: G505 is 5 wire terminal block.) Available in groups of 5 only. Order in increments of 5. The number of circuits is the same as the ending of the Form number. (Example: G505 = 5 unwired terminals, G510 is 10 unwired terminals.)
■ Size 7 uses a solid-state overload relay. See Class 8536 for complete details.
♦ NEMA Type 7 and 9 enclosures not available with Class 8600 devices.
★ Motor Logic overload relays are not available on Class 8640 Size 1PW to 4PW starters.
▼ See Motor Logic overload relays in the Full Voltage section on the bottom of Digest 176 page 16-83 for additional Form options of Motor Logic overload relays.

Type RO10V02

Class 8965 reversing hoist contactors meet the small space requirements found in electrical hoists, light duty cranes, door operators, and related products. They are designed to perform in the short periods of jogging experienced in hoist service. Note that these contactors must be mounted upright on the vertical plane; the contactors will not operate properly when mounted in any other position.

Table 17.101: AC Reversing/Hoist Contactors—600 Vac Maximum

No. of Poles	Horsepower Ratings				Power Terminals	With▲ Jumper Straps	Without▲ Jumper Straps	$ Price
	115 V 1 Ø	230 V 1 Ø	230 V 3 Ø	460/575 V 3 Ø		Open Type	Open Type	
3-Pole Polyphase	1	1-1/2	3	3	Quick Connect ■	RO10♦	RO11♦	998.00
					Pressure Wire ■	RO12♦	RO13♦	

▲ Jumper straps connect the line side power terminals of the same phase between the forward (up) and reverse (down) contactors in common; i.e., L1 to L1, L2 to L2, and L3 to L3.
■ Coils rated 120 Vac or less are supplied with quick connect terminals only.
♦ Voltage code must be specified to order this product. Refer to standard voltage codes shown in Table 17.105.

Table 17.102: Miscellaneous Hoist Contactor Kits For Use With Class 8965

Type	Series	Description	Class	Type	Series	Description	Class	Type	$ Price★
RO10 RO11 RO12 RO13	A & B	Armature Kit	9998	RP1▼	C	Armature Kit	9998	RP2▼	29.40
		Contact Carrier	Order as Part Number 3100206050			Contact Carrier	Order as Part Number 3100208150		39.40

★ CP10 discount schedule.
▼ One armature per kit.

Table 17.103: Class 8965 Replacement Contact Kits

Device Type	Device Series	Class 9998 Kit Type	Device Series	Class 9998 Kit Type	$ Price
RO10	A & B	RA10	C	RA14	202.00
RO11		RA11		RA15	
RO12		RA12		RA16	236.00
RO13		RA13		RA17	

Table 17.104: Auxiliary Contacts Separate Module

Description	Terminals	Class 9999 Type	$ Price
1 N.O. Each Side	Quick Connect	R10	50.00
	Screw	R12	
1 N.C. Each Side	Quick Connect	R11	
	Screw	R13	

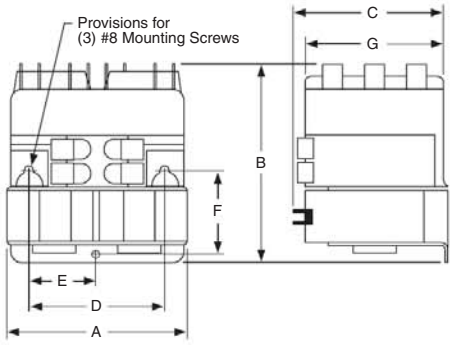


Table 17.105: Coil Table

Voltage 60 Hz	Voltage 50 Hz	Voltage Code	Replacement Part Number	$ Price△
24	—	V01	3100240319□	119.00
120	110	V02	3100240340□	119.00
208/220	—	V21	3100240047◊	114.00
240	220	V03	3100240049◊	114.00
480	440	V06	3100240058◊☆	114.00
600	550	V07	3100240060◊	83.00

△ CP10 Discount Schedule.
□ Tape wound coils, 2 per package.
◊ Molded coil, 1 per package.
☆ Suitable for 440 V 50 Hz applications.

Table 17.106: Approximate Dimensions (3 Poles per Contactor)

Type	A	B	C	D	E	F	G
RO10, 11	3.31 84	3.31 84	3.03 77	2.69 68	1.34 34	1.56 40	2.66 68
RO12, 13	3.31 84	3.69 94	2.69 68	2.69 68	1.34 34	1.56 40	2.66 68

Table 17.107: Cross Reference—Obsolete Devices

Obsolete Device		Replacement Device		Auxiliary Contact Required		Obsolete Device		Replacement Device		Auxiliary Contact Required	
Class	Type	Class	Type	Class	Type	Class	Type	Class	Type	Class	Type
8702 or 8965	HO3	8965	RO12	—	—	8965	RO2	8965	RO10	9999	R10
	HO4		RO12	9999	R12		RO2S1		RO11	9999	R10
	HO5		RO12	9999	R13		RO2S2		RO10	9999	R10
	HO6		RO12	—	—		RO3		RO10	9999	R11
	HO7		RO12	9999	R12		RO3S1		RO11	9999	R11
	HO8		RO12	9999	R13		RO3S2		RO10	9999	R11
8965	RG2S1	8965	RO10	9999	R10		RO3S3		RO10	9999	R11
	RG5S1		RO12	9999	R12		RO4		RO12	—	—
	RG5S2		RO12	9999	R12		RO4S1		RO13	—	—
	RO1		RO10	—	—		RO5		RO12	9999	R12
	RO1S1		RO11	—	—		RO5S1		RO13	9999	R12
	RO1S2		RO10	—	—		RO5S2		RO12	9999	R12
	RO1S3		RO11	—	—		RO6		RO12	9999	R13
	RO1S4		RO10	—	—		RO6S1		RO13	9999	R13
	RO1S5		RO10	—	—		RO6S2		RO12	9999	R13
	RO1S6		RO10	—	—						

Application Data

Coils	Duty: Hoist Duty—H4 Intermittent Voltage Range: AC coils only; +10%, –15% of nominal
Burden	Inrush 76 VA, Sealed 27 VA

Approvals

UL Component Recognized: File E78351, CCN NLDX2

CSA Certified: File LR60905, Class 3211 04

Table 17.108: How to Order

To Order Specify:	Catalog Number		
	Class	Type	Voltage and Frequency
• Class Number • Type Number • Voltage and Frequency	8695	RO10	V02

CP1 | CP10 Discount Schedule

Motor Logic Plus

Motor Logic Plus—Class 9065

The Motor Logic Plus solid-state overload relay is separately powered and fully programmable. It is designed to protect 3-phase AC motor applications, 200–480 Vac or 600 Vac. The SSOLR has one Form C relay output rated for 300 Vac maximum.

Table 17.109: Motor Logic Plus

Class 9065 SP Solid-State Overload Relay			$ Price
200 to 480 V	600 V	Current Range	
SPB4	SPB6	0.5–2.3 A	957.00
SPC4	SPC6	2.0–9.0 A	
SP14	SP16	6.0–27.0 A	
SP24	SP26	10.0–45.0 A	
SP34	SP36	20.0–90.0 A	
SP44▽	SP46▽	60.0–135.0 A	
SP54◒	SP56◒	120.0–270.0 A	
SP64✱	SP66✱	240.0–540.0 A	

▽ Must use 150:5 external current transformer, purchased separately.
◒ Must use 300:5 external current transformer, purchased separately.
✱ Must use 600:5 external current transformer, purchased separately.

Table 17.110: Forms for factory addition to 8536 Open Style only

Alpha Character B	Motor Logic Plus Overload Relay
First Digit	**Current Ranges**
2	0.5–2.3 A
3	2.0–9.0 A
4	6.0–27.0 A
5	10.0–45.0 A
6	20.0–90.0 A
7	60.0–135.0 A
8	120.0–270.0 A
9	240.0–540.0 A
Second Digit	**Modifications**
0	No modification for 200–480 V
2	Add communication module for 200–480 V
4	No modification for 600 V
6	Add communication module for 600 V

Example

Form B 4 2

Motor Logic Plus overload relay with a current range of 6–27 A and modifications to add communication module for an open style starter package.

Lug-Lug Kit

This kit can be field installed on separately mounted Motor Logic Plus overload relays.

Table 17.111: Lug-Lug Kit

For Use With		Parts Kit Description	Class 9999 Type	$ Price
Class & Type	NEMA Size			
8536 SA-SH	1–6	Lug-Lug Kit	MLPL	80.00
9065 SP	1–6			

Software Kit

Solutions software program allows an IBM PC compatible computer (with Windows 95 or greater) to communicate with a Motor Logic Plus overload relay connected to an RS-485 network using Modbus protocol.

Table 17.112: Software Kit

For Use With		Parts Kit Description	Class 9999 Type	$ Price
Class & Type	NEMA Size			
8536 SA–SH	1–6	Software Kit	MLPS	1295.00
9065 SP				

Communication Module

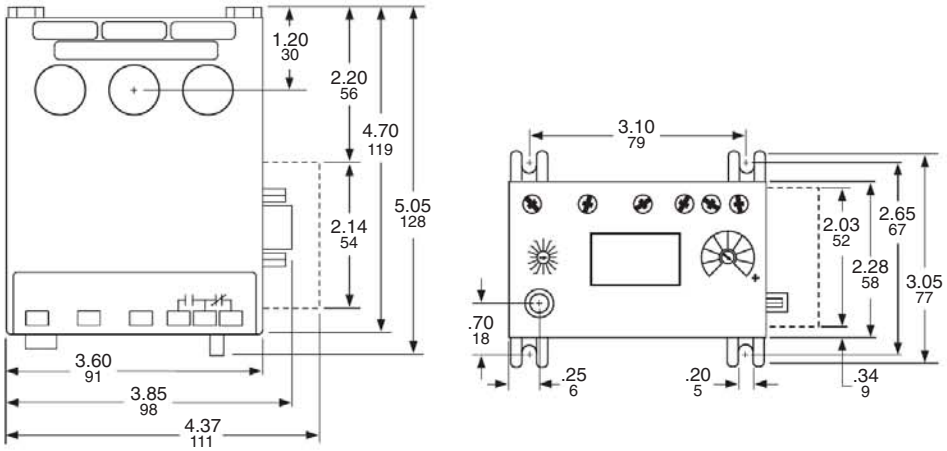
This module allows the Motor Logic Plus overload relay to support RS-485 electrical communications standards. Up to 99 Motor Logic Plus overload relays can be controlled and monitored from one remote personal computer.

Table 17.113: Communication Module

For Use With		Parts Kit Description	Class 9999 Type	$ Price
Class & Type	NEMA Size			
8536 SA-SH	1–6	Modbus Communication Module	MB22	171.00
9065 SP				

Table 17.114: How to Order

To Order Specify:	Catalog Number	
• Class Number • Type Number	Class	Type
	9999	AC04



Motor Logic Plus Solid-State Overload Relay