

NEMA Manual Starters

Contents

<i>Description</i>	<i>Page</i>
Starters and Switches	
Types B230, B330, Switches	38-2
MS Series, Single-Phase Starters	38-4
Type B100, Single- and Three-Phase Starters	38-6
Type 9441, Reversing Drum Switches	38-10

Contents

<i>Description</i>	<i>Page</i>
Manual Motor Switches	
Product Description	38-2
Application Description	38-2
Features	38-2
Instructional Leaflet	38-2
Standards and Certifications	38-2
Wiring Diagrams	38-2
Dimensions	38-2
Product Selection	38-3



2-Pole B230BN
3-Pole B330AN

Product Description

Manual Motor Switches are available in two- or three-pole configurations rated at 30A.

Optional NEMA 1 aluminum enclosure is supplied with a padlock guard for locking in the OFF or STOP position.

Application Description

Manual Motor Switches provide manual control of single- and three-phase motors where overload protection is not required or provided separately. Applications include:

- Fans
- Blowers
- Pumps
- Wood Working Equipment
- Machine Tools

Features

- Compact size
- Easy installation
- Simple operation
- Padlockable NEMA 1 enclosure available

Instructional Leaflet

Pub25371

Standards and Certifications

- UL File No. E146654, Category NLRV
- CSA File No. LR710828, Class 3211-05



Wiring Diagrams

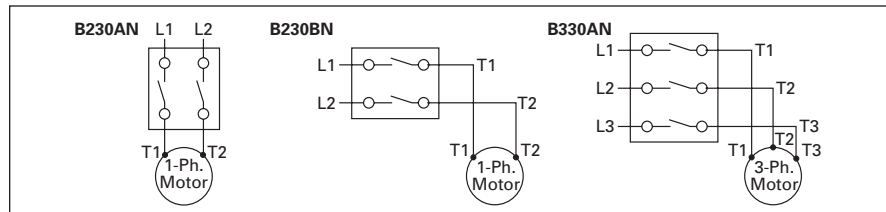


Figure 38-1. Wiring Diagrams

Dimensions

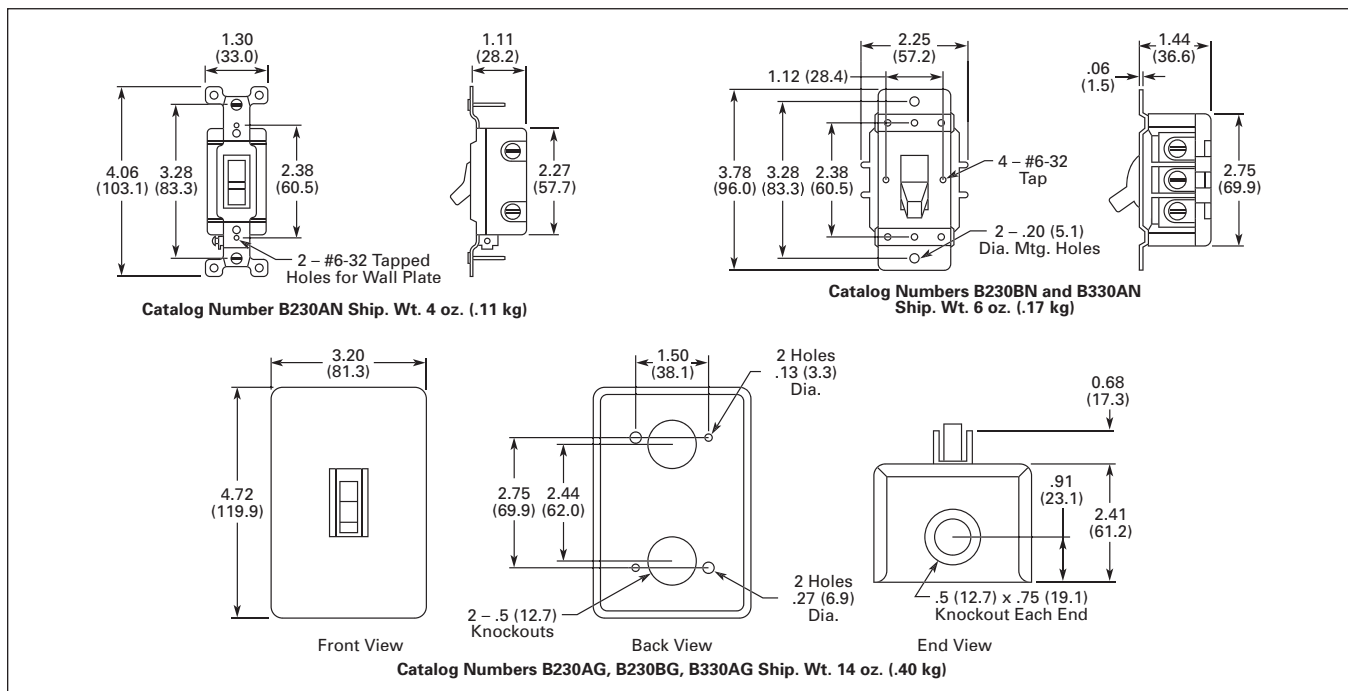


Figure 38-2. Approximate Dimensions in Inches (mm) and Shipping Weights

Product Selection

When Ordering Specify

- Catalog Number of Manual Motor Switch



2-Pole B230AN



3-Pole B330AN



2-Pole
NEMA 1 Enclosure
B230BG

Table 38-1. Manual Motor Switches without Overload

Maximum Horsepower Ratings				Open	Price U.S. \$	NEMA 1 Enclosed	Price U.S. \$
120V	240V	480V	600V				
2-Pole — Manual Motor Switches							
2	5	—	—	B230AN B230BND		B230AG B230BGD	
2	5	10	15				
3-Pole — Manual Motor Switches							
3	7-1/2	15	20	B330AND		B330AGD	

Contents

Description	Page
Manual Motor Starters	
Product Description	38-4
Application Description	38-4
Features	38-4
Instructional Leaflet	38-4
Standards and Certifications	38-4
Accessories	38-4
Dimensions	38-4
Product Selection	38-5



Modular Toggle Operated Starter

Product Description

- The MS Motor Starter is a compact, versatile unit featuring heavy sliding contacts as well as “quick-make” and “quick-break” mechanism

Dimensions

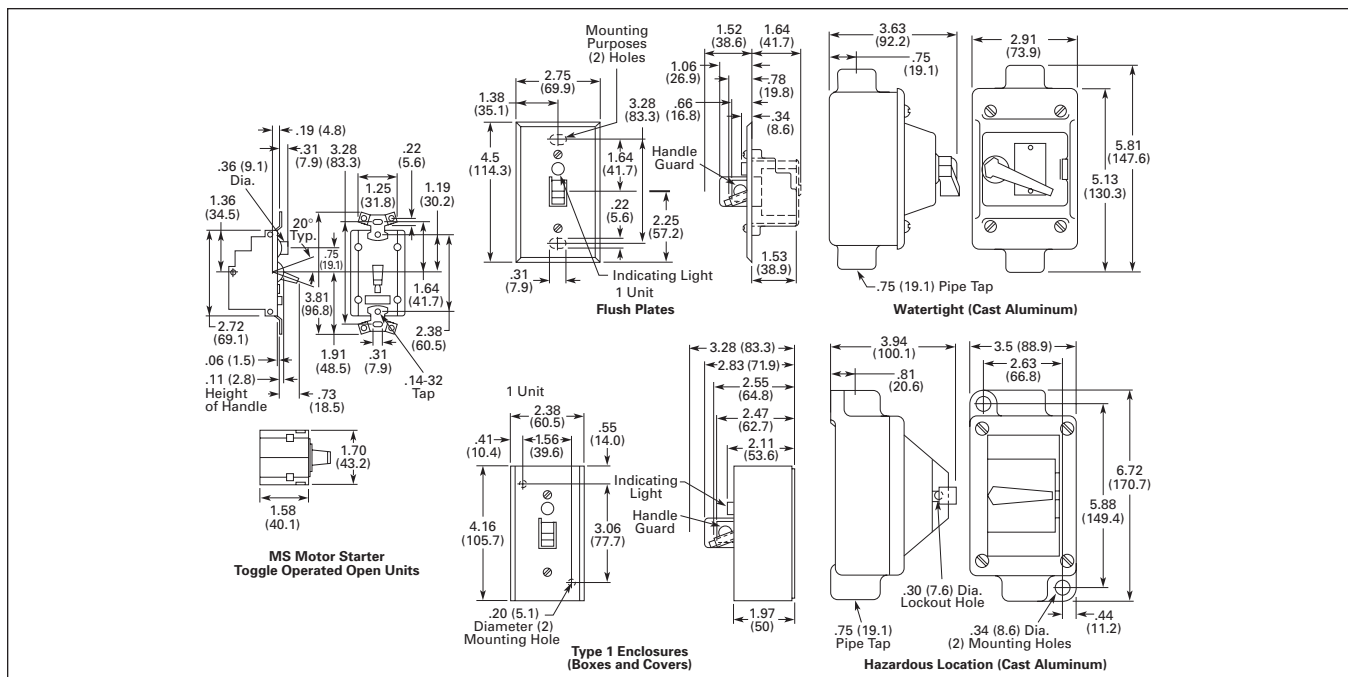


Figure 38-3. Approximate Dimensions in Inches (mm)

- Standard with large pressure type terminals, straight-through wiring and a trip-free handle mechanism
- The “plug-in” heater element is keyed to ensure proper positioning and an adjustable knob allows a setting of plus or minus ten percent of the nominal heater rating

Application Description

The MS Manual Motor Starter provides manual control and overload protection to single-phase motors. By utilizing the interchangeable heater elements, the starter can protect motors ranging from .40 amps up to 16.0 amps. Ideal for HVAC applications.

Features

- Compact size
- Trip-free handle mechanism
- Keyed heater elements to ensure proper installation
- Starters available with red pilot light
- The operating handle of the enclosed units can be locked in the OFF position
- Enclosures are offered in NEMA 1, 3, 4 and 5
- Hazardous locations cast aluminum enclosures are available rated for Type 7, Class I, Group D (vapors) and Type 9, Class II, Groups E, F and G (dust).

Instructional Leaflet

IL12987G

Standards and Certifications

- UL File No. E19222, Category NLRV
- CSA File No. LR39402-6, Class 3211-05



Accessories

Table 38-2. MS Accessories

Description	Catalog Number	Price U.S. \$
Pilot Light Kit (NEMA 1 Enclosure and Flush Plates)	MSPT	
Box, 1 Unit (NEMA 1 Enclosure)	MS1BN	
Cover, 1 Unit (NEMA 1 Enclosure)	MS1CN	
Flush Plate, 1 Unit (Steel)	MS1FN	
Flush Plate, 1 Unit (Stainless Steel)	MS1DN	
Handle Guard (Padlockable for NEMA 1 Enclosure and Flush Plates)	MSLG	

Discount Symbol 1CD-1C

Product Selection

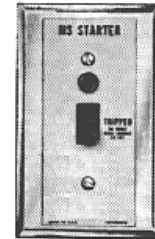
When Ordering Specify

- Catalog Number of Manual Motor Starter
- Heater Pack selection
- Any required Accessories
- Heater Coil selection according to the motor full load current requirements

Table 38-3. Product Selection — MS Series Starters

Number of Poles	Horsepower	Voltage	Catalog Number ①	Price U.S. \$
Open Type				
1	1 1/4 1/4	120/240V, 277V AC 120/240V DC 32V DC	MST01	
2	1 1 1/4	120/240V, 277V AC 120/240V DC 32V DC	MST02	
Flush Plate (No Enclosure Included)				
1	Flush Plate Type	Switch Only Switch with Pilot Light	MST01FN MST01FN1P	
2	General Purpose	Switch Only Switch with Pilot Light	MST02FN MST02FN1P	
1	Stainless Steel	Switch Only Switch with Pilot Light	MST01DN MST01DN1P	
2		Switch Only Switch with Pilot Light	MST02DN MST02DN1P	
Enclosed Types				
1	Enclosure Type	Switch Only Switch with Pilot Light	MST01SN MST01SN1P	
2	General Purpose Type 1	Switch Only Switch with Pilot Light	MST02SN MST02SN1P	
1	Waterproof Type 3, 4 & 5	Through Hub	MST01AH	
2		Through Hub	MST02AH	
1	Hazardous Location ②	Through Hub	MST01EH	
2	Types 7D, 9E, 9F & 9G	Through Hub	MST02EH	

① Does not include heater. Select heater from **Table 38-4**.
 ② Type 7D = Type 7, Class I, Group D; Type 9E, 9F and 9G = Type 9, Class II, Groups E, F and G.



Switch and Pilot Light Mounted on Flush Plate



Switch and Pilot Light Mounted in Type 1 Enclosure



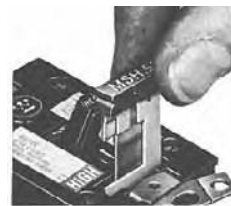
Waterproof Type 3, 4 & 5



Hazardous Location Type 7D, 9E, 9F & 9G



Typical Heater



Heater Element Installation

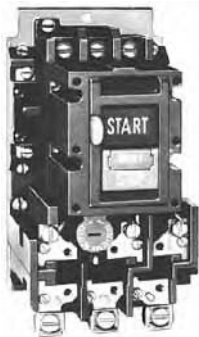
Table 38-4. Heater Selection for MS Starters

Motor Full Load Current	Catalog Number	Price U.S. \$	Motor Full Load Current	Catalog Number	Price U.S. \$	Motor Full Load Current	Catalog Number	Price U.S. \$	Motor Full Load Current	Catalog Number	Price U.S. \$
.4 – .43	MSH-5A		1.04 – 1.15	MSH1-3A		2.72 – 2.95	MSH3-4A		7.04 – 7.74	MSH8-8A	
.44 – .48	MSH-55A		1.16 – 1.27	MSH1-45A		2.96 – 3.27	MSH3-7A		7.75 – 8.46	MSH9-7A	
.49 – .53	MSH-61A		1.28 – 1.35	MSH1-6A		3.28 – 3.59	MSH4-1A		8.47 – 9.35	MSH10-6A	
.54 – .58	MSH-67A		1.36 – 1.51	MSH1-7A		3.60 – 3.99	MSH4-5A		9.36 – 10.30	MSH11-7A	
.59 – .64	MSH-74A		1.52 – 1.67	MSH1-9A		4.00 – 4.39	MSH5-0A		10.31 – 11.35	MSH12-9A	
.65 – .71	MSH-81A		1.68 – 1.83	MSH2-1A		4.40 – 4.79	MSH5-5A		11.36 – 12.47	MSH14-2A	
.72 – .78	MSH-89A		1.84 – 1.99	MSH2-3A		4.80 – 5.26	MSH6-0A		12.48 – 13.67	MSH15-6A	
.79 – .87	MSH-98A		2.00 – 2.23	MSH2-5A		5.27 – 5.83	MSH6-6A		13.68 – 15.12	MSH17-1A	
.88 – .95	MSH1-1A		2.24 – 2.47	MSH2-8A		5.84 – 6.39	MSH7-3A		15.13 – 16.00	MSH18-6A	
.96 – 1.03	MSH1-2A		2.48 – 2.71	MSH3-1A		6.40 – 7.03	MSH8-0A				

Discount Symbol 1CD-1C

Contents

<i>Description</i>	<i>Page</i>
Manual Motor Starters	
Product Description	38-6
Application Description	38-6
Features	38-6
Instructional Leaflet	38-6
Standards and Certifications	38-6
Technical Data	38-6
Options	38-6
Accessories	38-6
Dimensions	38-7
Product Selection	38-8



Pushbutton Operated

Product Description

The B100 Manual Motor Starters can be used in single-phase applications rated 3 hp at 240V AC or 2 hp at 230V DC. The starter can also be rated for three-phase applications up to 10 hp at 600V AC.

There are two methods of operation for the B100 Manual Starter. It can be ordered with a toggle switch operator or a START/STOP pushbutton operator.

Application Description

The B100 family of Manual Motor Starters provides manual control, as well as overload protection, to both single-phase and three-phase motors. The starter protects motors up to 38.9 amp single-phase and 26.8 amp three-phase with the appropriate heater selection.

Features

- Includes three-pole bimetallic overload relay
- Straight-through wiring
- Field mounted auxiliary contacts
- Available in NEMA 1, 4, 7, 9 and 12 enclosures with toggle operation (NEMA 1 enclosure for pushbutton operator)
- Standard with a lockout device to lock motor in the OFF position

Instructional Leaflet

IL14890

Standards and Certifications

- UL File No. E19222, Category NLRV
- CSA File No. LR39402-6, Class 3211-05 (Open Starters)
- CSA File No. LR54517-1, Class 3211-05 (Closed Starters)



Technical Data

Table 38-5. Specifications

NEMA Size	Maximum hp for AC Ratings ①			Maximum hp for DC Ratings	
	120V AC	208 – 240V AC	480 – 600V AC	115V DC	230V DC
2-Pole, Single-Phase					
M-0	1	2	—	1	1-1/2
M-1	2	3	—	1-1/2	2
3-Pole, Three-Phase					
M-0	2	3	5	—	—
M-1	3	7-1/2	10	—	—

① Ratings up to 3 hp, 3-phase are suitable for group fusing.

Options

Table 38-6. Factory Modifications

Description	Catalog Number ② Suffix	Adder U.S. \$
Pushbutton operator (open and NEMA 1 only)	A	
Without lockoff (open only)	X	

② Add Suffix letter to starter Catalog Number
Ex: B100MOCA.

Accessories

Table 38-7. Accessories

Description	Catalog Number	Price U.S. \$
Field Mounting Kits		
1NO elect. auxiliary	B1A	
1NC elect. auxiliary	B1B	
Red pilot light 120/60 (NEMA 1 Enc. Only)	LK-21	
Red pilot light 208-240/6 (NEMA 1 Enc. Only)	LK-22	
Red pilot light 480-600/60 (NEMA 1 Enc. Only)	LK-26	
For Type 4 and 12 Enclosures Only		
Red pilot light 120V	LK-41	
Red pilot light 240V	LK-42	

Discount Symbol **1CD-1C**

Dimensions

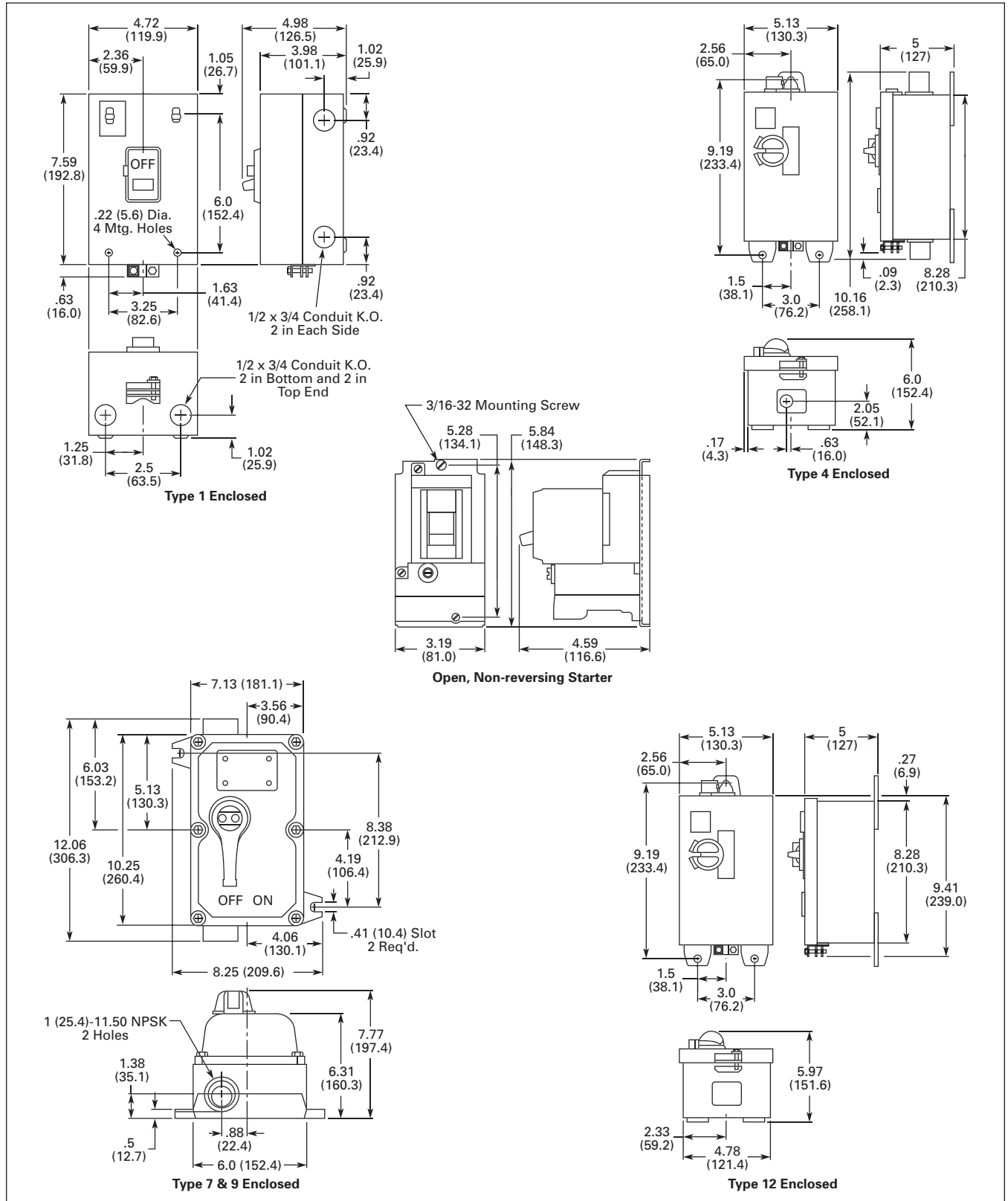


Figure 38-4. Approximate Dimensions in Inches (mm)

Type B100, Single- and Three-Phase Starters

Product Selection

When Ordering Specify

- Catalog Number of Starter with application modifications
- Heater Pack selection — A three-phase starter requires three heaters, and a single-phase starter requires two heaters
- Any required Accessories



Toggle Operated



Type 1 Enclosure

Table 38-8. Product Selection — Toggle and Pushbutton Operated Starters

NEMA Size	Open Type Toggle Handle		Enclosed							
	Catalog Number ③	Price U.S. \$	NEMA 1 General Purpose		NEMA 4 Watertight, Stainless Steel ①		NEMA 7D, 9E, 9F & 9G for Hazardous Locations ②④		NEMA 12 Dust-Tight	
			Catalog Number ③	Price U.S. \$	Catalog Number ③	Price U.S. \$	Catalog Number ③	Price U.S. \$	Catalog Number ③	Price U.S. \$
Type B100 Non-reversing 2-Pole (For Single-Phase Motors and DC)										
M-0	B100M0B		B100S0B		B100W0B		B100U0B		B100J0B	
M-1	B100M1B		B100S1B		B100W1B		B100U1B		B100J1B	
Type B100 Non-reversing 3-Pole (For Polyphase Motors) ④										
M-0	B100M0C		B100S0C		B100W0C		B100U0C		B100J0C	
M-1	B100M1C		B100S1C		B100W1C		B100U1C		B100J1C	

① One 1-inch chrome hub supplied on each end.

② NEMA 7D = NEMA 7, Class I, Group D. NEMA 9E, 9F and 9G = NEMA 9, Class II, Groups E, F and G.

③ Starter does not include heaters. Select Catalog Numbers of heaters from **Table 38-9**.

④ Tapped for 1-inch conduit on each end.

Type B100, Single- and Three-Phase Starters

Table 38-9. Heater Selection

Motor Full Load Current	Max. Fuse Amps	Catalog Number	Price U.S. \$	Motor Full Load Current	Max. Fuse Amps	Catalog Number	Price U.S. \$
Single-Phase Enclosed Starters ①				Three-Phase Enclosed Starters ②			
.28 – .29	1	FH03		.25 – .26	1	FH03	
.30 – .33	1	FH04		.27 – .29	1	FH04	
.34 – .36	1	FH05		.30 – .32	1	FH05	
.37 – .40	1	FH06		.33 – .35	1	FH06	
.41 – .45	1	FH07		.36 – .39	1	FH07	
.46 – .50	1	FH08		.40 – .44	1	FH08	
.51 – .56	1	FH09		.45 – .49	1	FH09	
.57 – .63	2	FH10		.50 – .55	1	FH10	
.64 – .70	2	FH11		.56 – .61	2	FH11	
.71 – .78	2	FH12		.62 – .68	2	FH12	
.79 – .86	2	FH13		.69 – .75	2	FH13	
.87 – .95	3	FH14		.78 – .83	2	FH14	
.96 – 1.04	3	FH15		.84 – .91	3	FH15	
1.05 – 1.14	3	FH16		.92 – 1.00	3	FH16	
1.15 – 1.25	4	FH17		1.01 – 1.10	3	FH17	
1.26 – 1.39	4	FH18		1.11 – 1.22	4	FH18	
1.40 – 1.54	5	FH19		1.23 – 1.35	4	FH19	
1.55 – 1.71	5	FH20		1.36 – 1.50	5	FH20	
1.72 – 1.89	6	FH21		1.51 – 1.66	5	FH21	
1.90 – 2.10	7	FH22		1.67 – 1.84	6	FH22	
2.11 – 2.32	8	FH23		1.85 – 2.03	7	FH23	
2.33 – 2.54	8	FH24		2.04 – 2.23	7	FH24	
2.55 – 2.79	9	FH25		2.24 – 2.45	8	FH25	
2.80 – 3.07	10	FH26		2.46 – 2.69	9	FH26	
3.08 – 3.36	10	FH27		2.70 – 2.95	10	FH27	
3.37 – 3.68	10	FH28		2.96 – 3.23	10	FH28	
3.69 – 4.03	10	FH29		3.24 – 3.53	10	FH29	
4.04 – 4.40	15	FH30		3.54 – 3.85	10	FH30	
4.41 – 4.81	15	FH31		3.86 – 4.22	10	FH31	
4.82 – 5.26	15	FH32		4.23 – 4.61	15	FH32	
5.27 – 5.74	15	FH33		4.62 – 5.03	15	FH33	
5.75 – 6.26	20	FH34		5.04 – 5.49	15	FH34	
6.27 – 6.83	20	FH35		5.50 – 5.99	20	FH35	
6.84 – 7.45	25	FH36		6.00 – 6.53	20	FH36	
7.46 – 8.11	25	FH37		6.54 – 7.11	25	FH37	
8.12 – 8.81	30	FH38		7.12 – 7.73	25	FH38	
8.82 – 9.58	30	FH39		7.74 – 8.40	25	FH39	
9.59 – 10.40	35	FH40		8.41 – 9.12	30	FH40	
10.41 – 11.30	35	FH41		9.13 – 9.89	35	FH41	
11.40 – 12.20	40	FH42		9.90 – 10.70	35	FH42	
12.30 – 13.50	45	FH43		10.80 – 11.80	40	FH43	
13.60 – 14.90	50	FH44		11.90 – 13.00	45	FH44	
15.00 – 16.00	50	FH45		13.10 – 14.00	50	FH45	
16.10 – 17.10	60	FH46		14.10 – 15.00	50	FH46	
17.20 – 18.30	60	FH47		15.10 – 16.10	50	FH47	
18.40 – 19.70	70	FH48		16.20 – 17.30	60	FH48	
19.80 – 21.20	70	FH49		17.40 – 18.60	60	FH49	
21.30 – 22.80	80	FH50		18.70 – 20.00	70	FH50	
22.90 – 24.50	88	FH51		20.10 – 21.50	70	FH51	
24.60 – 26.40	90	FH52		21.60 – 23.20	80	FH52	
26.50 – 28.50	90	FH53		23.30 – 25.00	80	FH53	
28.60 – 30.80	100	FH54		25.10 – 26.80	90	FH54	
30.90 – 33.30	110	FH55					
33.40 – 36.00	125	FH56					
36.10 – 38.90	125	FH57					

① Single-Phase Starters require two overload heaters.
 ② Three-Phase Starters require three overload heaters.

Note: FH Series heaters are for Type B100 manual motor starters. Heater element selection is based on motor nameplate's listed full load amperes. Trip rating of this series of elements is 125% of minimum motor full load amperes listed for the element.

When motor and overload relay are in the same ambient and the service factor of the motor is 1.15 to 1.25, select heaters from the heater selection table. If the service factor is 1.0 or less (including zero), or a maximum of 115% protection is desired, select a heater one size smaller than indicated for the amperage range required.

Contents

<i>Description</i>	<i>Page</i>
Reversing Drum Switches	
Application Description . . .	38-10
Features	38-10
Operation	38-10
Standards and Certifications	38-10
Wiring Diagrams	38-10
Dimensions	38-11
Product Selection	38-11

Application Description

These drum switches are designed primarily for use with single-phase and squirrel cage, single-speed reversible motors which may be connected directly across-the-line. Typical applications would be hoists and machine tools.

Features

- Compact size
- Front mounting — easily installed
- Terminals front accessible — slanted 45° for extra convenience
- Captive pressure clamps on terminal screws back off with screw — no prying with screwdriver necessary
- Choice of operators
 - Large
 - Lever
 - Knob
- Orientation of operator independent of legend — 360° positioning in 22-1/2° increments — pointer remains oriented to legend
- Field convertible from maintained to momentary operation
- Replaceable, large volume, silver plated contacts
- Oiltight machine cavity or surface mounting types
- Modern attractive appearance

Operation

All of the operators may be rotated 360° in 22-1/2° increments without losing the indication of the drum position. A red-lined pointer is permanently orientated to the legend markings and clearly indicates the selected drum function regardless of the selected setting for the operator. This enables the user to “offset” the operator to afford the most comfortable operating position. This is accomplished simply by loosening and retightening one screw.

Standards and Certifications

- UL File No. E37316, Category NLRV
- CSA Guide No. 184-N-13.13A, Class 3211



Type DB and DD

Wiring Diagrams

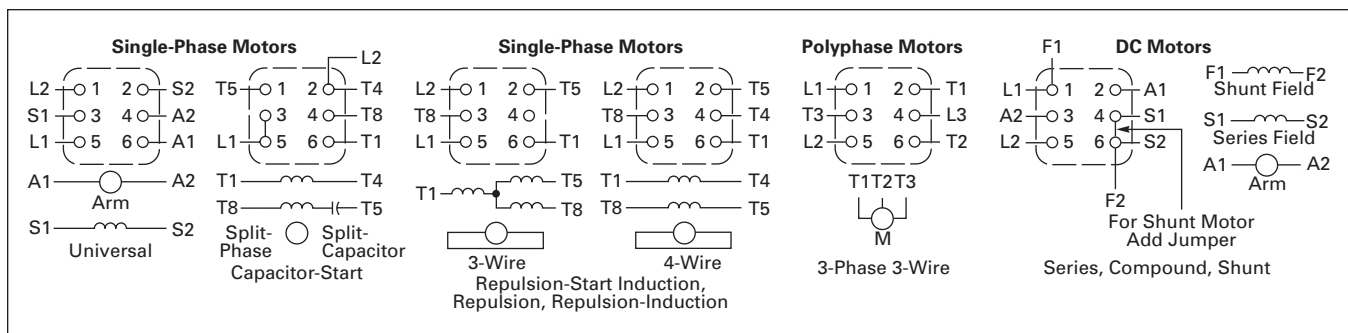


Figure 38-5. Wiring Diagrams

Dimensions

Table 38-10. Approximate Dimensions and Shipping Weights

Size	Type of Operator	Dimensions in Inches (mm)					Shipping Weights		
		Wide A	High B	Deep C	Mounting		Lever F	Lbs. (kg)	
						D	E		
Surface Mounting									
DB1 & DB2	Lever	2.50 (63.5)	5.88 (149.4)	4.38 (111.3)	2.00 (50.8)	2.25 (57.2)	1.88 (47.8)	3.0 (1.4)	
	Knob	2.50 (63.5)	5.38 (136.7)	3.00 (76.2)	2.00 (50.8)	2.25 (57.2)	1.38 (35.1)	3.0 (1.4)	
DD1 & DD2	Lever	3.38 (85.9)	6.88 (174.8)	4.75 (120.7)	2.63 (66.8)	2.75 (69.9)	2.00 (50.8)	4.0 (1.8)	
	Knob	3.38 (85.9)	6.25 (158.8)	3.63 (92.2)	2.63 (66.8)	2.75 (69.9)	1.38 (35.1)	4.0 (1.8)	
Cavity Mounting									
DB1 & DB2	Lever	4.00 (101.6)	4.75 (120.7)	5.00 (127.0)	3.50 (88.9)	4.00 (101.6)	1.88 (47.8)	3.0 (1.4)	
	Knob	4.00 (101.6)	4.50 (114.3)	4.50 (114.3)	3.50 (88.9)	4.00 (101.6)	1.38 (35.1)	3.0 (1.4)	
DD1 & DD2	Lever	4.50 (114.3)	5.75 (146.1)	5.25 (133.4)	4.00 (101.6)	4.50 (114.3)	2.00 (50.8)	4.0 (1.8)	
	Knob	4.50 (114.3)	5.13 (130.3)	4.63 (117.6)	4.00 (101.6)	4.50 (114.3)	1.38 (35.1)	4.0 (1.8)	

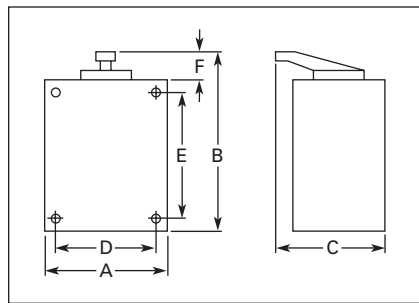


Figure 38-6. Approximate Dimensions Surface Mounting

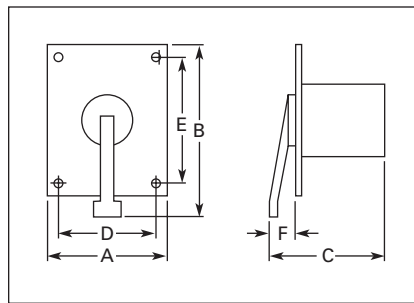


Figure 38-7. Approximate Dimensions Cavity Mounting

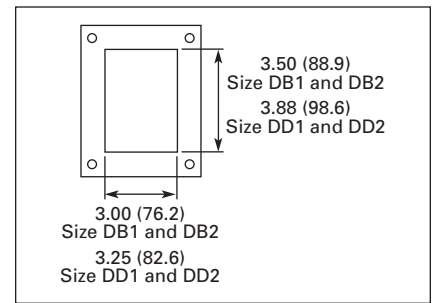


Figure 38-8. Approximate Dimensions Panel Cutout Cavity Mount

Product Selection

When Ordering Supply

- Catalog Number



Table 38-11. Reversing Drum Type without Overload Relay

Maximum Horsepower						Size	Type of Operation	Surface Mounting General Purpose — NEMA 1			Flush or Cavity Mounting (Oiltight Mounting on Sizes DB and DD)		
3-Phase		Single-Phase		DC				Lever Operator	Knob	Price U.S. \$	Lever Operator	Knob	Price U.S. \$
200 – 230V	380 – 575V	115V	230V	115V	230V	Catalog Number			Catalog Number				
3-Pole													
2	2	1-1/2	2	1	1	DB 1	Maintained ①	9441H268	9441H269		9441H274	9441H275	
							Maintained and Momentary ②	9441H271	9441H272		9441H276	9441H277	
3	5	1-1/2	2	1	1	DB 2	Maintained ①	9441H353	9441H354		9441H347	9441H348	
							Maintained and Momentary ②	9441H356	9441H357		9441H349	9441H350	
5	7-1/2	1-1/2	3	2	3	DD 1	Maintained ①	9441H284	9441H285		9441H388	9441H287	
7-1/2	10	2	5	2	3	DD 2	Maintained ①	9441H361	9441H363		9441H362	9441H364	

① These devices are field convertible from maintained both positions to momentary both positions.
 ② These devices are field convertible from maintained FORWARD and momentary REVERSE to momentary FORWARD and maintained REVERSE.

