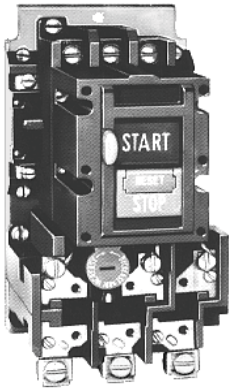
Single-Phase Starters

Single- and Three-Phase Starters



11.1 Single-Phase Starters

MS Series

11.2 Single- and Three-Phase Starters

Type B100

Single-Phase Starters

Contents

MS Series

Product Description

- Eaton's MS motor starter is a compact, versatile unit featuring heavy sliding contacts as well as "quick-make" and "quick-break" mechanism
- 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 0.40A up to 16.0A. 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 Type 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 an G (dust)

Instructional Leaflet

IL12987G

Standards and Certifications

Note: See **Tab 17** for additional information on standards and certifications that apply to all enclosed control products.

- UL File No. E1922, Category NLRV (for motor controller)
- CSA File No. LR39402-6, Class 3211-05
- ABS Type Approved
- OSHPD Certified (OSP-0015-10)

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

MS Series Starters—Open Type

Number of Poles	Horsepower	Voltage	Catalog Number ①
1	1	120/240V, 277 Vac	**MST01**
	1/4	120/240 Vdc	
	1/4	32 Vdc	
2	1	120/240V, 277 Vac	**MST02**
	1	120/240 Vdc	
	1/4	32 Vdc	

Switch and Pilot Light Mounted on Flush Plate

MS Series Starters—Flush Plate Type (No Enclosure Included)

Number of Poles	Flush Plate Type	Description	Catalog Number ①
1	General purpose	Switch only	**MST01FN**
		Switch with pilot light	**MST01FN1P**
2		Switch only	**MST02FN**
		Switch with pilot light	**MST02FN1P**
1	Stainless steel	Switch only	**MST01DN**
		Switch with pilot light	**MST01DN1P**
2		Switch only	**MST02DN**
		Switch with pilot light	**MST02DN1P**

Switch and Pilot Light Mounted in Type 1 Enclosure

Waterproof Type 3, 4 and 5

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

MS Series Starters—Enclosed Type

Number of Poles	Enclosure Type	Description	Catalog Number ①
1	General purpose Type 1	Switch only	**MST01SN**
		Switch with pilot light	**MST01SN1P**
2		Switch only	**MST02SN**
		Switch with pilot light	**MST02SN1P**
1	Waterproof Type 3, 4 and 5	Through hub	**MST01AH**
2		Through hub	**MST02AH**
1	Hazardous location ② Types 7D, 9E, 9F and 9G	Through hub	**MST01EH**
2		Through hub	**MST02EH**

Notes

① Does not include heater. Select heater from table on **Page V10-T11-4**.

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

Typical Heater

Heater Element Installation

Heater Selection for MS Starters

Motor Full Load Current	Catalog Number	Motor Full Load Current	Catalog Number
0.4 –0.43	**MSH-5A**	2.72–2.95	**MSH3-4A**
0.44–0.48	**MSH-55A**	2.96–3.27	**MSH3-7A**
0.49–0.53	**MSH-61A**	3.28–3.59	**MSH4-1A**
0.54–0.58	**MSH-67A**	3.60–3.99	**MSH4-5A**
0.59 –0.64	**MSH-74A**	4.00–4.39	**MSH5-0A**
0.65–0.71	**MSH-81A**	4.40–4.79	**MSH5-5A**
0.72–0.78	**MSH-89A**	4.80–5.26	**MSH6-0A**
0.79–0.87	**MSH-98A**	5.27–5.83	**MSH6-6A**
0.88–0.95	**MSH1-1A**	5.84–6.39	**MSH7-3A**
0.96–1.03	**MSH1-2A**	6.40–7.03	**MSH8-0A**
1.04–1.15	**MSH1-3A**	7.04–7.74	**MSH8-8A**
1.16–1.27	**MSH1-45A**	7.75–8.46	**MSH9-7A**
1.28–1.35	**MSH1-6A**	8.47–9.35	**MSH10-6A**
1.36–1.51	**MSH1-7A**	9.36–10.30	**MSH11-7A**
1.52–1.67	**MSH1-9A**	10.31–11.35	**MSH12-9A**
1.68–1.83	**MSH2-1A**	11.36–12.47	**MSH14-2A**
1.84–1.99	**MSH2-3A**	12.48–13.67	**MSH15-6A**
2.00–2.23	**MSH2-5A**	13.68–15.12	**MSH17-1A**
2.24–2.47	**MSH2-8A**	15.13–16.00	**MSH18-6A**
2.48–2.71	**MSH3-1A**		

Accessories

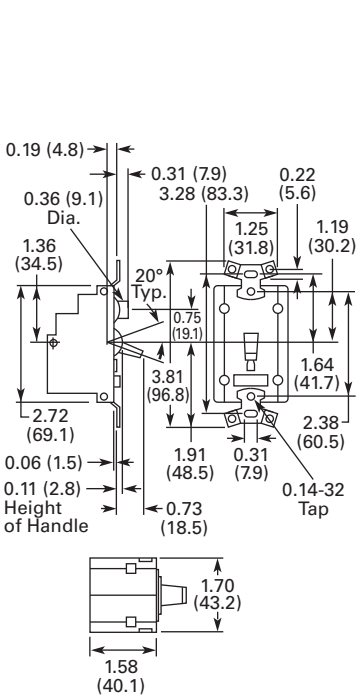
MS Series Accessories

Description	Catalog Number
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**

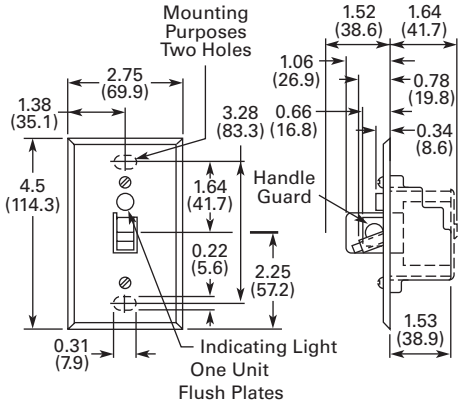
Dimensions

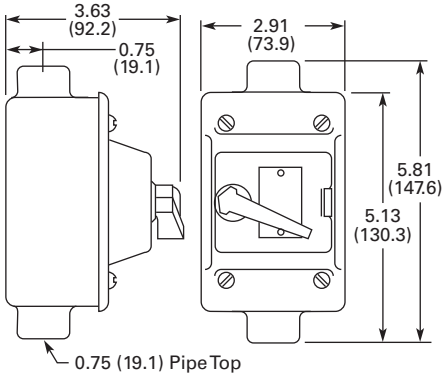
Approximate Dimensions in Inches (mm)

MS Series Single-Phase Starters

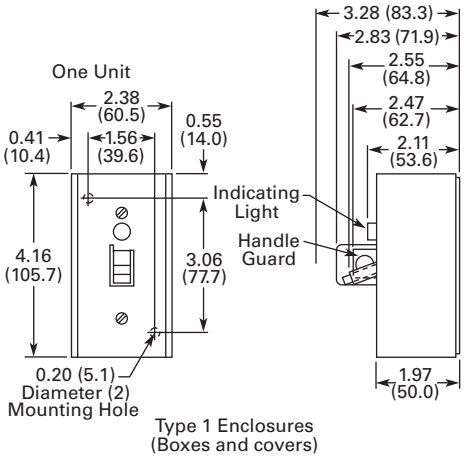


MS Motor Starter
Toggle Operated Open Units

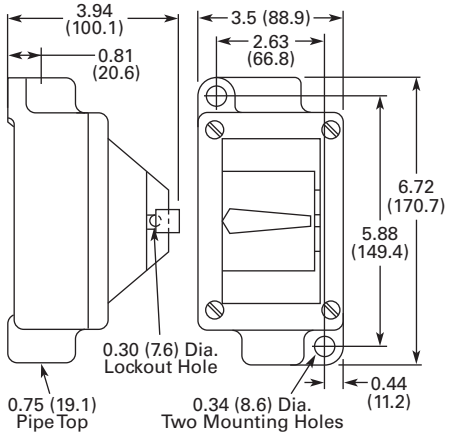




Watertight (Cast aluminum)

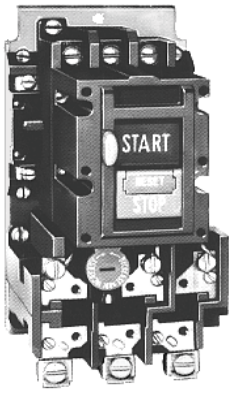


Type 1 Enclosures
(Boxes and covers)



Hazardous Location (Cast aluminum)

Single- and Three-Phase Starters



Contents

Type B100

Product Description

Eaton's B100 manual motor starters can be used in single-phase applications rated 3 hp at 240 Vac or 2 hp at 230 Vdc. The starter can also be rated for three-phase applications up to 10 hp at 600 Vac.

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 38.9A single-phase and 26.8A three-phase with the appropriate heater selection.

Features

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

Instructional Leaflet

IL14890

Standards and Certifications

Note: See **Tab 17** for additional information on standards and certifications that apply to all enclosed control products.

- UL File No. E19222, Category NLRV (for motor controller)
- CSA File No. LR39402-6, Class 3211-05 (open starters)
- CSA File No. LR54517-1, Class 3211-05 (closed starters)
- ABS Type Approved
- OSHPD Certified (OSP-0015-10)

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

Toggle and Pushbutton Operated Starters

NEMA Size	Open Type Toggle Handle	Enclosed			
		Type 1 General Purpose	Type 4 Watertight, Stainless Steel ②	Type 7D, 9E, 9F and 9G for Hazardous Locations ③④	Type 12 Dust-Tight
	Catalog Number ①	Catalog Number ①	Catalog Number ①	Catalog Number ①	Catalog Number ①
Type B100 Non-Reversing Two-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 Three-Pole (For Polyphase Motors) ④					
M-0	**B100M0C**	**B100S0C**	**B100W0C**	**B100U0C**	**B100J0C**
M-1	**B100M1C**	**B100S1C**	**B100W1C**	**B100U1C**	**B100J1C**

Notes

① Does not include heaters. Select catalog numbers of heaters from table on **Page V10-T11-8**.
② One 1-inch chrome hub supplied on each end.
③ Type 7D = Type 7, Class I, Group D. Type 9E, 9F and 9G = Type 9, Class II, Groups E, F and G.
④ Tapped for 1-inch conduit on each end.

Heater Selection

Motor Full Load Current	Maximum Fuse Amps	Catalog Number	Motor Full Load Current	Maximum Fuse Amps	Catalog Number	Motor Full Load Current	Maximum Fuse Amps	Catalog Number
Single-Phase Enclosed Starters ①								
0.28–0.29	1	**FH03**	1.90–2.10	7	**FH22**	9.59–10.40	35	**FH40**
0.30–0.33	1	**FH04**	2.11–2.32	8	**FH23**	10.41–11.30	35	**FH41**
0.34–0.36	1	**FH05**	2.33–2.54	8	**FH24**	11.40–12.20	40	**FH42**
0.37–0.40	1	**FH06**	2.55–2.79	9	**FH25**	12.30–13.50	45	**FH43**
0.41–0.45	1	**FH07**	2.80–3.07	10	**FH26**	13.60–14.90	50	**FH44**
0.46–0.50	1	**FH08**	3.08–3.36	10	**FH27**	15.00–16.00	50	**FH45**
0.51–0.56	1	**FH09**	3.37–3.68	10	**FH28**	16.10–17.10	60	**FH46**
0.57–0.63	2	**FH10**	3.69–4.03	10	**FH29**	17.20–18.30	60	**FH47**
0.64–0.70	2	**FH11**	4.04–4.40	15	**FH30**	18.40–19.70	70	**FH48**
0.71–0.78	2	**FH12**	4.41–4.81	15	**FH31**	19.80–21.20	70	**FH49**
0.79–0.86	2	**FH13**	4.82–5.26	15	**FH32**	21.30–22.80	80	**FH50**
0.87–0.95	3	**FH14**	5.27–5.74	15	**FH33**	22.90–24.50	88	**FH51**
0.96–1.04	3	**FH15**	5.75–6.26	20	**FH34**	24.60–26.40	90	**FH52**
1.05–1.14	3	**FH16**	6.27–6.83	20	**FH35**	26.50–28.50	90	**FH53**
1.15–1.25	4	**FH17**	6.84–7.45	25	**FH36**	28.60–30.80	100	**FH54**
1.26–1.39	4	**FH18**	7.46–8.11	25	**FH37**	30.90–33.30	110	**FH55**
1.40–1.54	5	**FH19**	8.12–8.81	30	**FH38**	33.40–36.00	125	**FH56**
1.55–1.71	5	**FH20**	8.82–9.58	30	**FH39**	36.10–38.90	125	**FH57**
1.72–1.89	6	**FH21**						
Three-Phase Enclosed Starters ②								
0.25–0.26	1	**FH03**	1.51–1.66	5	**FH21**	7.12–7.73	25	**FH38**
0.27–0.29	1	**FH04**	1.67–1.84	5	**FH22**	7.74–8.40	25	**FH39**
0.30–0.32	1	**FH05**	1.85–2.03	7	**FH23**	8.41–9.12	30	**FH40**
0.33–0.35	1	**FH06**	2.04–2.23	7	**FH24**	9.13–9.89	35	**FH41**
0.36–0.39	1	**FH07**	2.24–2.45	8	**FH25**	9.90–10.70	35	**FH42**
0.40–0.44	1	**FH08**	2.46–2.69	9	**FH26**	10.80–11.80	40	**FH43**
0.45–0.49	1	**FH09**	2.70–2.95	10	**FH27**	11.90–13.00	45	**FH44**
0.50–0.55	1	**FH10**	2.96–3.23	10	**FH28**	13.10–14.00	50	**FH45**
0.56–0.61	2	**FH11**	3.24–3.53	10	**FH29**	14.10–15.00	50	**FH46**
0.62–0.68	2	**FH12**	3.54–3.85	10	**FH30**	15.10–16.10	50	**FH47**
0.69–0.75	2	**FH13**	3.86–4.22	10	**FH31**	16.20–17.30	60	**FH48**
0.78–0.83	2	**FH14**	4.23–4.61	15	**FH32**	17.40–18.60	60	**FH49**
0.84–0.91	3	**FH15**	4.62–5.03	15	**FH33**	18.70–20.00	70	**FH50**
0.92–1.00	3	**FH16**	5.04–5.49	15	**FH34**	20.10–21.50	70	**FH51**
1.01–1.10	3	**FH17**	5.50–5.99	20	**FH35**	21.60–23.20	80	**FH52**
1.11–1.22	4	**FH18**	6.00–6.53	20	**FH36**	23.30–25.00	80	**FH53**
1.23–1.35	4	**FH19**	6.54–7.11	25	**FH37**	25.10–26.80	90	**FH54**
1.36–1.50	5	**FH20**						

Notes

① Single-phase starters require two overload heaters.

② Three-phase starters require three overload heaters.

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.

Accessories

Accessories

Description	Catalog Number
Field Mounting Kits	
Auxiliary contact	
1NO	**B1A**
1NC	**B1B**
Red pilot light	
120/60 (Type 1 enclosed only)	**LK-21**
208-240/6 (Type 1 enclosed only)	**LK-22**
480-600/60 (Type 1 enclosed only)	**LK-26**
For Type 4 and 12 Enclosures Only	
Red pilot light	
120V	**LK-41**
240V	**LK-42**

Options

Factory Modifications

Description	Catalog Number ① Suffix
Pushbutton operator (open and Type 1 only)	**A**
Without lockoff (open only)	**X**

Technical Data

Specifications

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

Notes

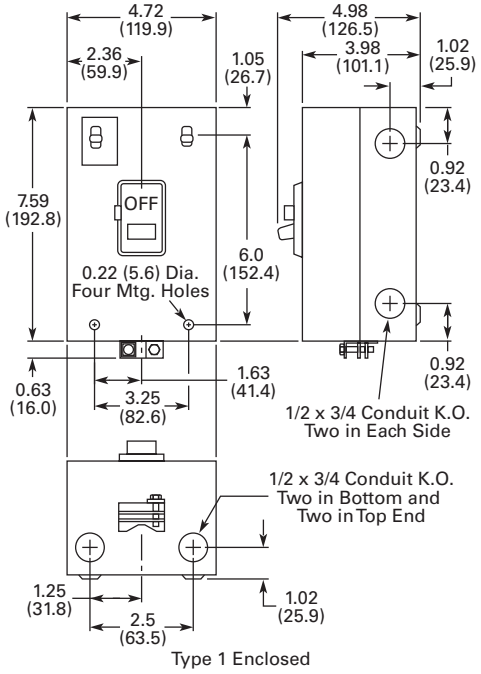
① Add suffix letter to starter catalog number. Example: B100MOC**A.**

② Ratings up to 3 hp, three-phase are suitable for group fusing.

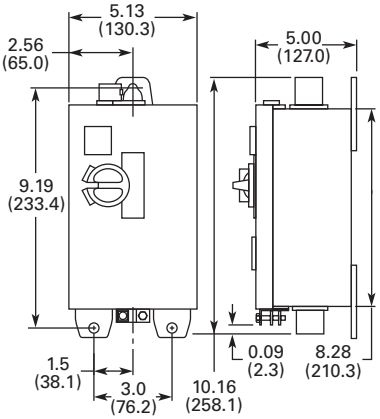
Dimensions

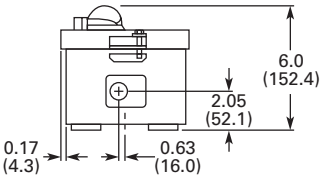
Approximate Dimensions in Inches (mm)

Type B100 Single-and Three-Phase Starters

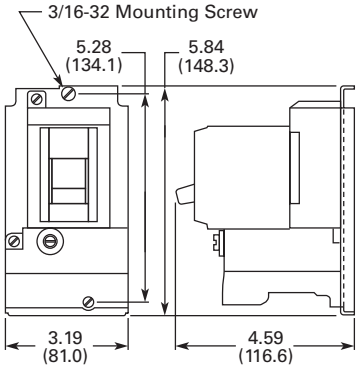


Type 1 Enclosed

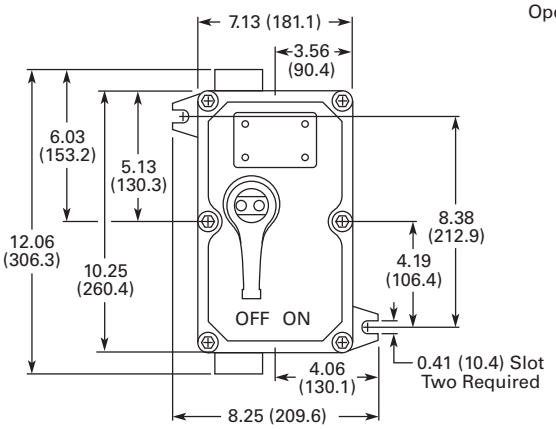


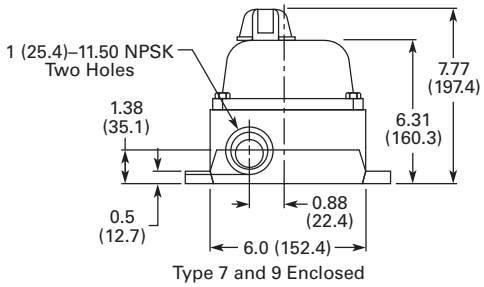


Type 4 Enclosed

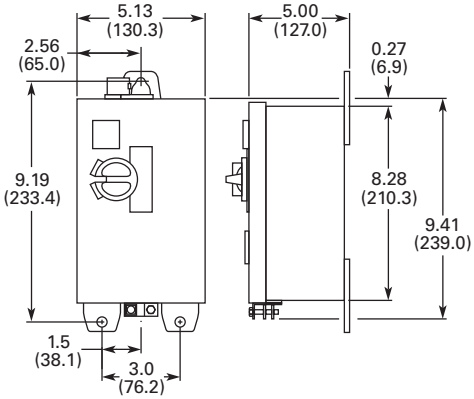


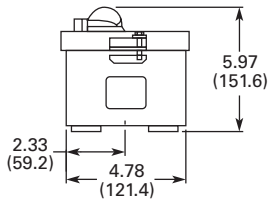
Open, Non-Reversing Starter





Type 7 and 9 Enclosed





Type 12 Enclosed