JULY, 1967

MANUAL LINE VOLTAGE STARTERS

APPLICATION OF LINE VOLTAGE MANUAL STARTERS

Line voltage manual starters are used where it is convenient for the operator to start and stop small single phase or polyphase motors by pressing push buttons mounted in the cover of the starter enclosure. They are satisfactory when full motor starting torque may be safely applied to the driven machine, and when the current inrush resulting from application of line voltage is not objectionable.

Low voltage protection and low voltage release are **not** obtainable with the manually operated mechanism. If power should fail, the starter contacts will remain closed until the stop button is operated. Therefore, the motor will automatically restart unless the operator has opened the circuit in the meantime.

Compact construction permits mounting on the driven machine, wall, or pedestal convenient to the hand of the operator. Initial cost is low, motor overload protection is included, and operation is both safe and economical.

Classes 2510, 2511 and 2512 manual starters are provided with thermal overload protection including "trip-free" operation. If the overload relays act to open the starter contacts, they cannot again be closed until the relays have been reset by pressing the stop button. This arrangement prevents the operator from holding the motor circuit closed by the start button when the overload relays have operated to protect the motor.

Class 2510
general purpose enclosure
with cover removed.

Class 2510
General Purpose Enclosure.

If the relays are reset by operating the stop button and the starter is again closed while the motor is yet overloaded, the relays will continue to trip until the overload is removed.

Square D manual starters are provided in a **variety of enclosures** designed to shield live parts from accidental contact, to protect the starter mechanism from dirt, oil or excessive moisture or to guard against fire and explosion when starters are used in hazardous locations. There is provision for locking the starter in the "Off" position internally on all enclosures and externally on all enclosures except flush mounting types.

Usual applications are the control of small machine tools, punch presses, fans and blowers, grinders and buffers, and overload protection for pumps, compressors and portable electric tools.

Automatic control devices such as pressure, float, or vacuum switches may be used in conjunction with manual starters, if their contact capacity is sufficient to make and break the motor line current.

RATINGS

• Type B and C manual starters may be used to control single phase motors up to 5 hp, polyphase motors up to 10 hp, and direct current motors up to 2 hp. The maximum ratings are 600 volts ac and 250 volts dc.

•Changed since previous issue.

MANUAL LINE VOLTAGE STARTERS

FEATURES, CONSTRUCTION AND OPERATION

Quick-Make, Quick Break toggle action operating mechanism is used in the manual starter. This toggle operating mechanism is of rugged, long life construction. The contacts cannot be held partially open as there is no dead center position. Vibration or shock will not cause the mechanism to operate or trip from either the "On" or "Off" position.

Double Break Contacts, surfaced with fine silver for the Size M-0 and silver cadmium oxide for Sizes M-1 and M-1P, are used for long life. If contacts need replacement, however, a replacement contact parts kit is available as listed in the Class 9988 section of the catalog.

The Contact Block is of a cold mold inorganic non-tracking material. This material has a high dielectric strength and is moisture resisting.

Melting Alloy Type thermal overload relays are supplied on all manual starters. One-piece construction of the heating element, melting alloy pot, and ratchet wheel maintains a permanently fixed relationship between these important parts. The overload relays trip the starter by releasing a latch which permits the toggle spring to retract the toggle system and yoke bar. The switch is **trip-free** so that it is impossible to hold the contacts closed while an overload condition exists.

A variety of thermal units is available so that selection of the proper units may be made based on the full load motor current. Starters will accommodate the Type B standard trip, Type FB quick trip and Type JB slow trip thermal units. Single phase and direct current starters are each supplied with a single overload relay; the polyphase, three and four pole starters have two overload relays.

Visible Trip Indication is provided by the use of self-centering push buttons. When an overload occurs, both the "Start" and the "Stop" push buttons move to the same level, that is, are self-centering. Normally, when the starter is in the "Off" condition, the "Stop" button is depressed and in the "On" condition, the "Start" button is depressed.

Will not operate without overload relay thermal units — This insures that any motor used with a Type B or C manual starter cannot be started without overload protection.

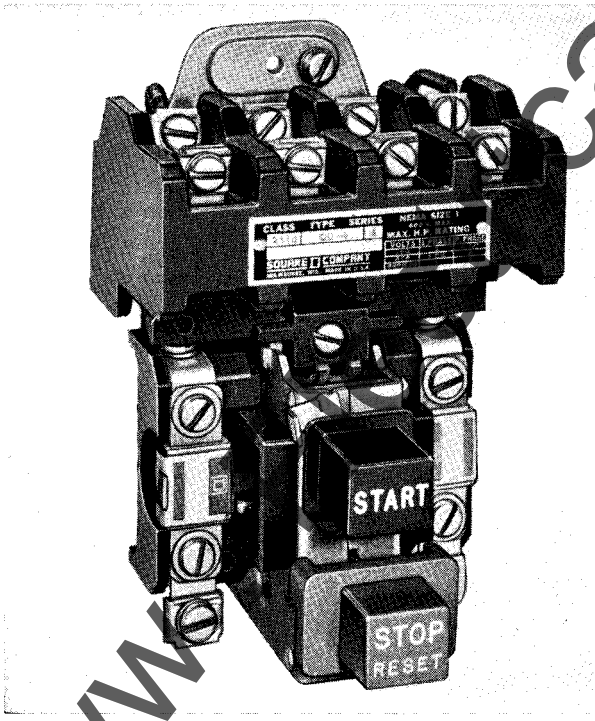
The Safety Latch is a safety feature provided on the operating mechanism which can be used to secure the starter in the "Off" position. This latch is of sturdy construction and easy to operate. It is located directly behind the "Start" button, preventing the closing of the starter contacts unless the latch is disengaged.

Wiring Connections of the user are made to pressure wire connectors or box lugs. These terminals make for easy wiring without removing the starter from the enclosure. Ample wiring space is provided in all enclosures.

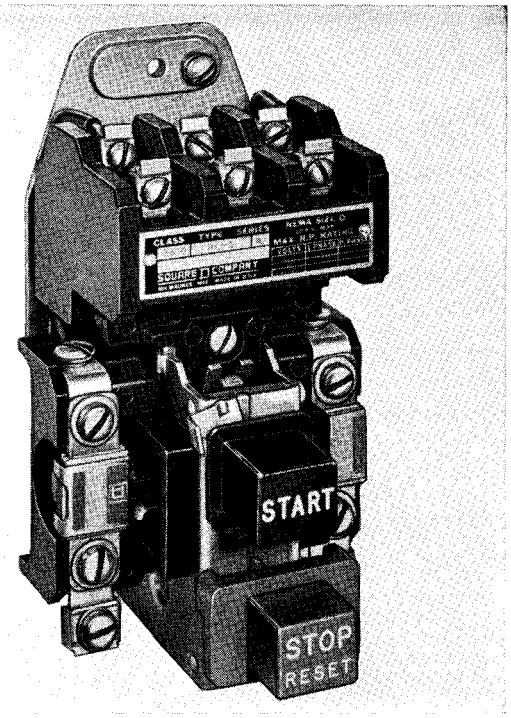
Ease of Installation and Maintenance are features of the Classes 2510, 2511, and 2512 manual starter line. Although the cabinet dimensions are small, the starter is exceptionally easy to wire. The entire switch panel is removable, leaving the cabinet empty for connecting of conduit and wires. Knockouts are conveniently located and line and motor terminals are readily accessible.

GENERAL PURPOSE AND SPECIAL PROTECTIVE ENCLOSURES

NEMA 1 General Purpose Enclosures are of heavy gauge sheet steel finished in baked gray enamel. The cover is formed to provide protection against button damage, and is held in place by a single captive screw accessible from the front.



Class 2510
Size M-1, four pole
open starter



Class 2510
Size M-0, three pole
open starter

General purpose enclosures are intended primarily to prevent accidental contact with live parts and are suitable for indoor use where normal atmospheric conditions prevail.

External Locking Provision permits padlocking the cover of NEMA Type 1 enclosures to prevent unauthorized access. In addition, the "Stop" button on Class 2510, NEMA Type 1 starters may be locked in the depressed position by the same padlock, if desired.

Pilot Light in Cover (Form P11) — A red pilot light can be furnished in the cover of most Class 2510, NEMA 1 enclosed starters. In 2 and 3 pole, Sizes 0 and 1, a knockout in the cover of these starters also permits field installation of a pilot light through the use of a Class 9999 kit.

Flush Mounting, general purpose enclosures are constructed of heavy sheet steel and finished in gray enamel. The starter is mounted in a sheet steel enclosure with a flush plate in place of a standard cover.

Flush mounted starters are used where final appearance is of particular importance. With the starter mounted in a recess, the cover is virtually flush with the surrounding surface. The general purpose flush mounting starter listed in the catalog is a totally enclosed type which offers protection against dirt and metallic particles.

Also available are flush mounted starters without enclosure, but with mounting strap for cavity mounting where the starter will not be subjected to dirt or metallic particles. Another available type is the flush mounted starter with enclosure having plaster adjustment screws. These permit lining up the flush plate with the plaster wall surface when so installed.

NEMA 4 — Water-tight Enclosures are suitable for general outdoor use or where subjected to splashing or dripping water. Enclosures are constructed of heavy gauge stainless steel, AISI No. 304, combining attractive appearance with extra protection against corrosion. They are ideal for installation in meat packing plants, breweries, tanneries, textile finishing plants and food processing concerns.

Neoprene gasketing between cover and box provides a water-tight seal. A cam type latch holds the cover tightly in place, and in addition may be padlocked to prevent unauthorized access.

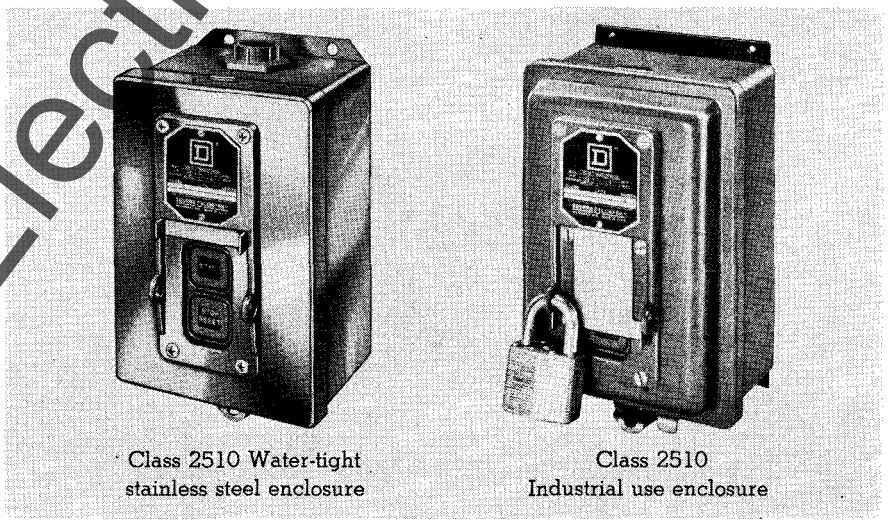
A silicone rubber button cover provides a flexible but water-tight seal over the push buttons and allows direct operation of the buttons. The button cover is recessed in a die cast button guard, affording protection against accidental operation of the push buttons. To prevent unauthorized starting, a sliding stainless steel plate in the guard assembly may be positioned over the "Start" button and locked in place by one or two padlocks.

NEMA 7 and 9 Enclosures for Class I, Group D and Class II, Groups E, F and G hazardous locations are of heavy cast iron construction with a baked gray enamel finish.

The cover and box are machined to provide the metal-to-metal seal required by Underwriters specifications for Class I Group D or Class 2 Groups E, F and G hazardous locations as covered by Article 500 of the National Electrical Code. Large machine screws adequately fasten the cover to the box. Threaded conduit entrances are furnished in top and bottom as standard. Stainless steel push button rods operate through oil impregnated bushings to insure free operation and prevent corrosion of the operating rods. The push buttons are protected from accidental operation by a guard which has provisions for padlocking the "Stop" button in the "Off" position.

Typical applications for starters in these NEMA 7 and 9 enclosures are flour and feed mills, grain elevators, or installations in atmospheres containing vapors of gasoline, naphtha, alcohol, acetone, lacquer, solvents or natural gas. This includes dry cleaning plants, spray painting establishments, etc.

NEMA 12 — Dust-tight — Industrial Use Enclosures are suitable for use in steel mills, coke plants and similar locations



Class 2510 Water-tight stainless steel enclosure

Class 2510 Industrial use enclosure

General revision.

where non-hazardous dusts are present. These enclosures are designed to prevent the entrance of dust, lint, fibers, oil or coolant. The Dust-tight Industrial Use Enclosure is of heavy gauge sheet steel construction, finished in a baked gray enamel.

The cover is held in place with a cam type latch. The cam action of this latch forces the cover against the box, compressing the sponge neoprene gasket to form a secure dust and oil-tight seal. The latch may also be padlocked to prevent unauthorized access to the starter.

To provide a dust and oil-tight seal over the push buttons and to prevent accidental or unauthorized operation, these NEMA Type 12 enclosures include the same button guard assembly, with silicone rubber button cover, sliding plate and padlocking provision, as described above for NEMA Type 4 enclosures.

NEMA Type 12 enclosures meet the requirements for NEMA Type 5 enclosures as specified in NEMA standards.

REVERSING STARTERS

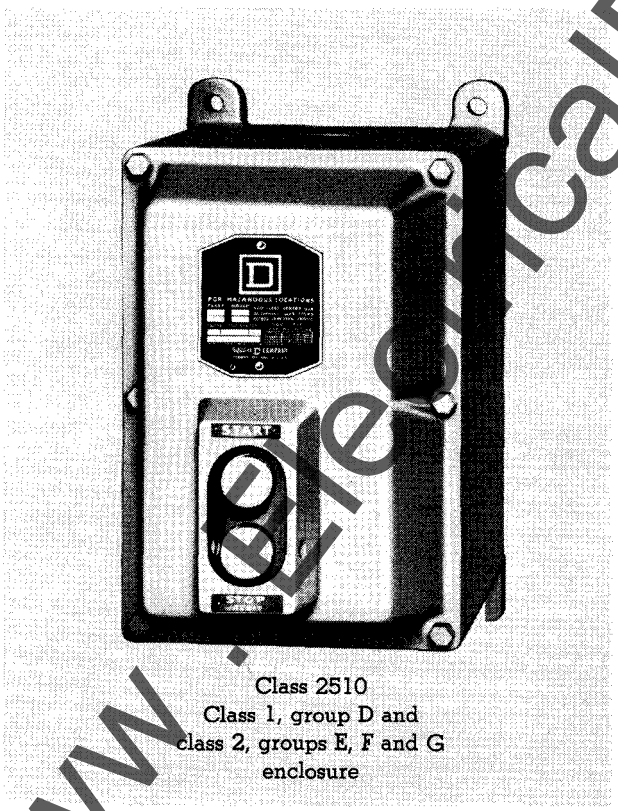
Class 2511 single speed reversing starters are two separate starter mechanisms mechanically interlocked to prevent both switches being closed at the same time. The yoke bars rather than push buttons are interlocked. The "Start" button of the interlocked contactors can be depressed its full stroke without damaging the mechanism or interlock or reducing the closed contact pressure. A set of thermal overload relays on each starter provides overload protection for both directions of rotation. Push button nameplates attached to the cabinet are marked "Forward" and "Reverse" to indicate direction of rotation.

Class 2511 starters are available in open type and in various enclosures, with the exception of flush mounting and NEMA Type 12. Enclosure types, construction and features are described on the preceding pages under General Purpose and Special Protective Enclosures.

MULTI-SPEED STARTERS

Class 2512 starters for two speed motors are constructed similar to the reversing starters. They are designed for control of two speed separate winding motors only. The push button nameplates are marked "Low" and "High". A set of overloads on each starter provides protection for both motor windings.

These starters are available in the same types of enclosures with the same features as indicated above for the Class 2511 reversing starters. The Class 2512 starters use the same enclosures as the Class 2511 starters except for nameplate marking.

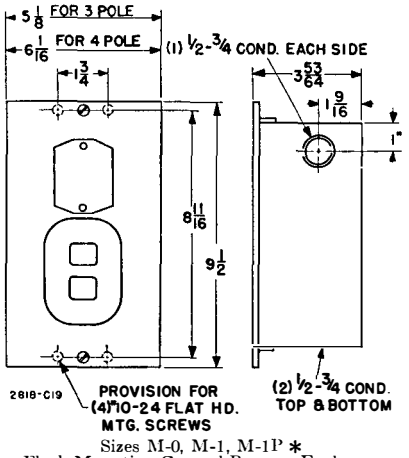


Class 2510
Class 1, group D and
class 2, groups E, F and G
enclosure

Class 2511
reversing starter
in general purpose enclosure.

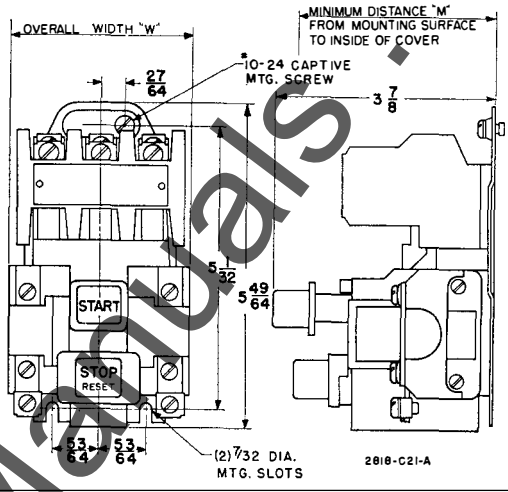
MANUAL STARTERS — LINE VOLTAGE TYPE
CLASS 2510

Approximate Dimensions — Not for Construction



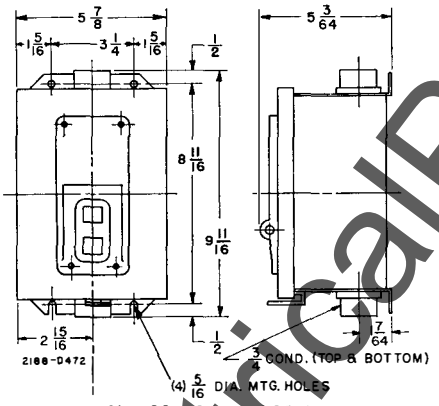
Sizes M-0, M-1, M-1P *
Flush Mounting General Purpose Enclosure
Shipping Weight — 5 Lbs.

Recommended Cutout:
2 or 3 Pole — 8 1/4" x 4 11/16"
4 Pole — 8 1/4" x 5 5/8"

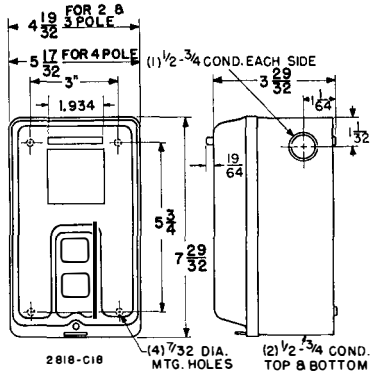


Starter Size	Dimensions "W" 2 Pole	"W" 3 Pole	"W" 4 Pole	Dimensions "M"
M-0	3	3 13/64	3 19/32	3 1/2
M-1	3 1/8	3 13/64	3 15/16	3 23/32
M-1P	3 15/16	.....	.....	3 23/32

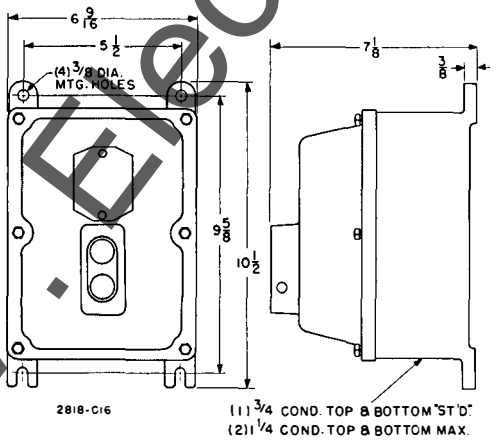
Sizes M-0, M-1, M-1P *
Open Type — Shipping Weight — 3 Lbs.



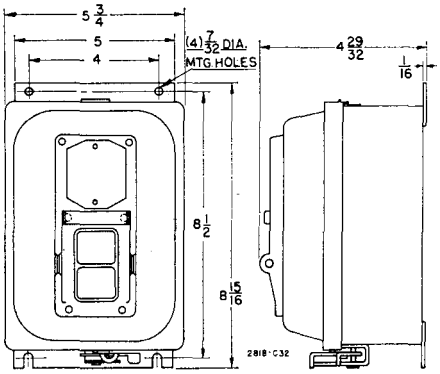
Sizes M-0, M-1 and M-1P
Water-tight, Stainless Steel Enclosure
NEMA Type 4
Shipping Weight — 8 Lbs.



Sizes M-0, M-1, M-1P *
General Purpose Enclosure
NEMA Type 1 — Shipping Weight — 5 Lbs.



Sizes M-0, M-1, M-1P
Hazardous Location Enclosure
NEMA Types 7 and 9 — Shipping Weight — 18 Lbs.



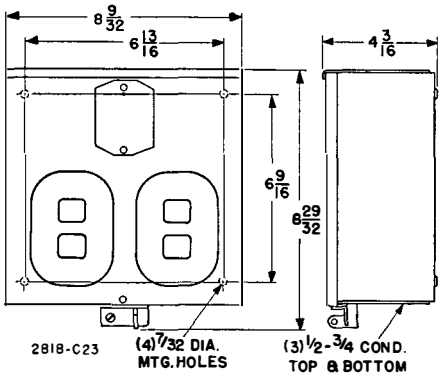
Sizes M-0, M-1, M-1P
Dust-tight Industrial Use Enclosure
NEMA Type 12 — Shipping Weight — 6 Lbs.

*Size M-1P uses 4 pole block

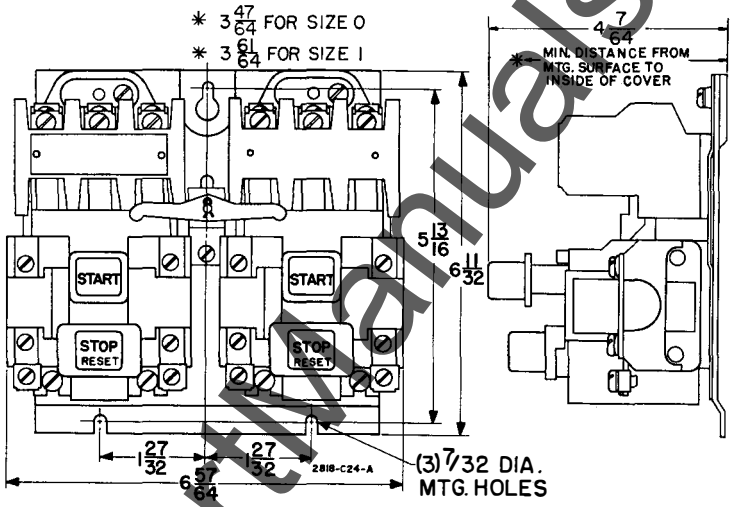
SEPTEMBER, 1967
Supersedes Dimension Sheet 2510, Page 2, dated November, 1963

MANUAL STARTERS — LINE VOLTAGE TYPE
CLASS 2511 AND 2512

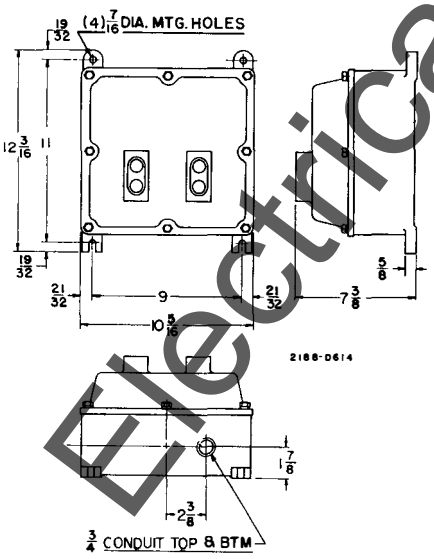
Approximate Dimensions — Not for Construction



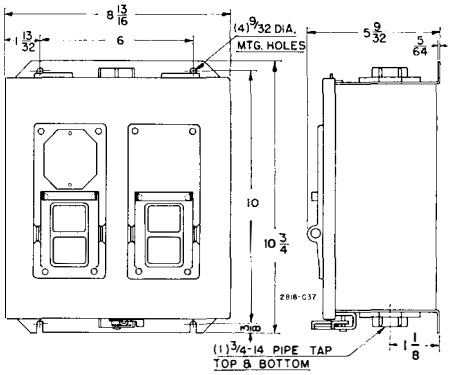
Sizes M-0 and M-1
General Purpose Enclosure
NEMA Type 1
Shipping Weight — 9½ Lbs.



Sizes M-0 and M-1 — Open Type
Shipping Weight — 6 Lbs.



Sizes M-0 and M-1
Hazardous Location Enclosure
NEMA Types 7 and 9
Shipping Weight — 35 Lbs.



Sizes M-0 and M-1
Water-tight Stainless Steel Enclosure
NEMA Type 4
Shipping Weight — 30 Lbs.

AC & DC MANUAL STARTERS — LINE VOLTAGE TYPE

WITH ROUND OPERATING BUTTONS AND OVERLOAD PROTECTION

CLASS 2510 2511 2512

Type M open type manual starters are available with round extended buttons suitable for installations in enclosures of the user's own design.

CLASS 2510 — NON-REVERSING

MAX. VOLTAGE: 600 V. AC — 250 V. DC							
No. of Poles	NEMA Size	Ratings Volts	Max. HP Poly-Phase	Max. HP Single Phase	Open Type With Round Buttons Type	Open Type With Round Buttons Price*	Number of Thermal Units Required
2 Pole▲	M-0	115 230	— —	1 2	MBO-5	$ 66.	1
	M-1	115 230	— —	2 3	MCO-6	86.	1
	M-1P	115 230	— —	3 5	MCO-7	130.	1
3 Pole▲	M-0	115 200-230 380-575	— 7½ 5	2 3 —	MBO-6	80.	3
	M-1	115 200-230 380-575	— 7½ 10	2 3 —	MCO-8	100.	3
DC 2 Pole▲	M-0	115 230	1 HP — DC 1½ HP — DC		MBO-8	66.	1
	M-1	115 230	1½ HP — DC 2 HP — DC		MCO-10	86.	1

***PRICES DO NOT INCLUDE THERMAL UNITS. FOR SELECTION SEE BELOW.**

▲JOG-RUN feature, Form M2 is not available.

CLASS 2511 — REVERSING

MAX. VOLTAGE: 600 V. AC							
No. of Poles	NEMA Size	Ratings Volts	Max. HP Poly-Phase	Max. HP Single Phase	Open Type With Round Buttons Type	Open Type With Round Buttons Price*	Number of Thermal Units Required
3 Pole▲	M-0	200-230 380-575	3 5	— —	MBO-2	$252.	6
	M-1	200-230 380-575	7½ 10	— —	MCO-2	312.	6

***PRICES DO NOT INCLUDE THERMAL UNITS. FOR SELECTION, SEE BELOW.**

▲JOG-RUN feature, Form M2 is not available.

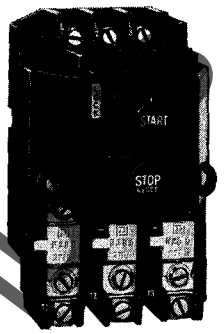
CLASS 2512 — TWO SPEED‡

MAX. VOLTAGE: 600 V. AC							
No. of Poles	NEMA Size	Ratings Volts	Max. HP Poly-Phase	Max. HP Single Phase	Open Type With Round Buttons Type	Open Type With Round Buttons Price*	Number of Thermal Units Required
3 Pole▲	M-0	200-230 380-575	3 5	— —	MBO-2	$252.	6
	M-1	200-230 380-575	7½ 10	— —	MCO-2	312.	6

***PRICES DO NOT INCLUDE THERMAL UNITS. FOR SELECTION, SEE BELOW.**

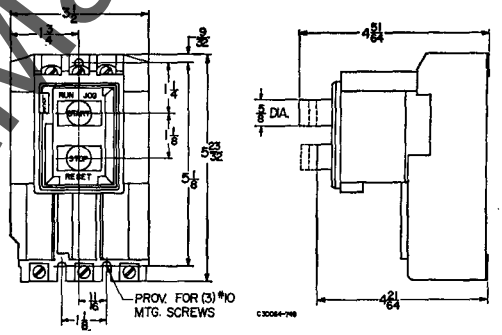
‡For wye-connected separate winding motors only, constant torque or variable torque.

▲JOG-RUN feature, Form M2 is not available.



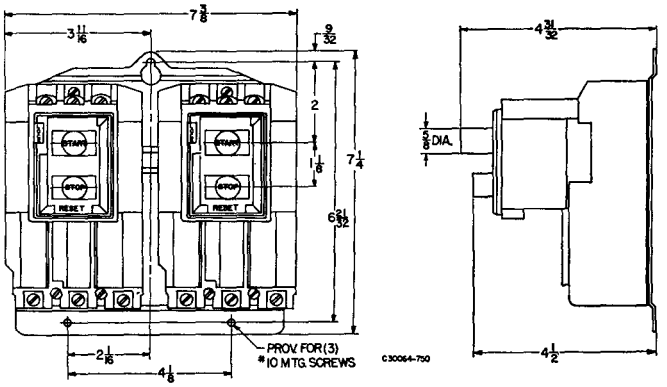
Class 2510
Type MBO-6

APPROXIMATE DIMENSIONS AND SHIPPING WEIGHTS



Class 2510 Types M Sizes M-0, M-1 and M-1P Open Type

Approximate Shipping Weight — 3 Lbs.



Classes 2511, 2512 Type M Sizes M-0 and M-1 Open Type

Approximate Shipping Weight — 6 Lbs.

ORDERING INFORMATION REQUIRED

1. Class and type number.
2. Any special features required. Refer to Standard Class 2510 listing for factory and field modifications.

THERMAL UNITS

Starters will not operate without properly installed thermal units. Thermal unit must be installed so that markings face the front of starter.

Thermal units should be ordered separately. For selection see "Overload and Short Circuit Protection."