



## REDUCED VOLTAGE AC MAGNETIC STARTERS AUTOTRANSFORMER TYPE — CLOSED TRANSITION STARTING

With Overload Relay Protection \*

25-60 HERTZ			THREE PHASE*						600 VOLTS MAX.		
Max. HP Ratings ⓪	Volts	Cycles	NEMA Size	General Purpose Enclosure NEMA Type 1		Water-tight Enclosure NEMA Type 4		Industrial Use Dust-tight Enclosure NEMA Type 12		For Hazardous Locations Class II, Group E, F & G NEMA Type 9	
				Type	Price*	Type	Price*	Type	Price*	Type	Price*
15	208-220 440-550	50-60	2	DG-1	\$ 570.	DW-1	\$ 880.	DD-1	\$ 750.	DE-1	\$ 880.
	208-220 440-550	25	2	DG-1	598.	DW-1	908.	DD-1	778.	DE-1	908.
25	208-220 440-550	50-60	3	EG-1	670.	EW-1	980.	ED-1	860.	EE-1	980.
	208-220 440-550	25	2	DG-1	570.	DW-1	880.	DD-1	750.	DE-1	880.
30	208-220 440-550	50-60	3	EG-1	698.	EW-1	1008.	ED-1	888.	EE-1	1008.
	208-220 440-550	25	3	EG-1	956.	EW-1	1266.	ED-1	1146.	EE-1	1266.
50	208-220 440-550	50-60	4	FG-1	1296.	FW-1	1866.	FD-1	1536.	FE-1	1866.
	208-220 440-550	25	3	EG-1	722.	EW-1	1032.	ED-1	912.	EE-1	1032.
75	208-220 440-550	50-60	5	GG-1	2022.	GW-1	2592.	GD-1	2292.	GE-1	2592.
	208-220 440-550	25	4	FG-1	1320.	FW-1	1890.	FD-1	1560.	FE-1	1890.
100	208-220 440-550	50-60	5	GG-1	2076.	GW-1	2646.	GD-1	2346.	GE-1	2646.
	208-220 440-550	25	4	FG-1	1496.	FW-1	2066.	FD-1	1736.	FE-1	2066.
125	208-220 440-550	50-60	5	GG-1	2178.	GW-1	2748.	GD-1	2448.	GE-1	2748.
	208-220 440-550	25	4	FG-1	1320.	FW-1	1890.	FD-1	1560.	FE-1	1890.
150	208-220 440-550	50-60	5	GG-1	2278.	GW-1	2848.	GD-1	2548.	GE-1	2848.
	208-220 440-550	25	4	FG-1	1598.	FW-1	2168.	FD-1	1838.	FE-1	2168.
200	208-220 440-550	50-60	6*	HG-1	3740.	HW-1	4490.	HA-1	4115.	HE-1	4490.
	208-220 440-550	25	5	GG-1	2094.	GW-1	2664.	GD-1	2364.	GE-1	2664.
250	208-220 440-550	50-60	6*	HG-1	4044.	HW-1	4794.	HA-1	4419.	HE-1	4794.
	208-220 440-550	25	5	GG-1	2372.	GW-1	2942.	GD-1	2642.	GE-1	2942.
300	208-220 440-550	50-60	7*	JG-1	6212.	JW-1	6962.	JA-1	6587.	JE-1	6962.
	208-220 440-550	25	6*	HG-1	3934.	HW-1	4684.	HA-1	4309.	HE-1	4684.
400	208-220 440-550	50-60	7*	JG-1	6425.	JW-1	7175.	JA-1	6800.	JE-1	7175.
	208-220 440-550	25	6*	HG-1	4166.	HW-1	4916.	HA-1	4541.	HE-1	4916.
450	208-220 440-550	50-60	8*	KG-1	8521.	KW-1	9271.	KA-1	8521.	KE-1	9271.
	208-220 440-550	25	6*	HG-1	4288.	HW-1	5038.	HA-1	4663.	HE-1	5038.
500	440-550	50-60	7*	JG-1	6730.	JW-1	7480.	JA-1	7105.	JE-1	7480.
600	440-550	50-60	7*	JG-1	6730.	JW-1	7480.	JA-1	7105.	JE-1	7480.
700	440-550	50-60	7*	JG-1	6730.	JW-1	7480.	JA-1	7105.	JE-1	7480.
800	440-550	50-60	8*	KG-1	9357.	KW-1	10107.	KA-1	9732.	KE-1	10107.
900	440-550	50-60	8*	KG-1	9691.	KW-1	10441.	KA-1	10066.	KE-1	10441.

\*Prices of size 2-5 starters include two melting alloy type thermal units. Deduct \$1.50 each if thermal units are omitted. Standard size 6, 7 and 8 starters (manufactured by HI Division) are furnished with two magnetic overload relays.

\*Same prices apply to 2 phase, 3 wire starters, and to 2 phase, 4 wire starters where one line is run direct to motor. Consult factory for 2 phase, 4 wire starters which must break all lines to motor.

⓪NOTE: Not only should the horsepower rating of the motor be within the limits shown for the starter, but the motor full load current should also be less than the values listed on Class 8536, Page 106 for the contactor used in the particular size starters.

**Additions and Special Features — Refer to Tab "Additions and Special Features"**  
**Overload Relay Selection — Refer to Tab "Overload Relays", Table 24**

### ORDERING INFORMATION REQUIRED

- 1—Class and type number.
- 2—Horsepower, voltage, phase, frequency and full load current of motor.
- 3—Control voltage and frequency if different from line voltage or frequency.
- 4—Select thermal units for sizes 2-5, based on motor full load current, from Table 24 behind "Over load Relay Selection" tab.
- 5—Additions or special features.



## REDUCED VOLTAGE AC MAGNETIC STARTERS AUTOTRANSFORMER, STAR-DELTA, and PART WINDING TYPES IN SPIN TOP EXPLOSION-PROOF ENCLOSURES

### FOR HAZARDOUS LOCATIONS

Spin Top explosion-proof enclosures are constructed in accordance with the requirements of Underwriters' Laboratories specifications for Class I, Groups C and D; Class II, Groups E, F, and G; and Class III hazardous locations, as defined in the National Electrical Code. The Spin Top enclosure is designated **NEMA 7**, Class I, Groups C and D; and **NEMA 9**, Class II, Groups E, F and G. Also, the enclosure is **NEMA 3 weather-proof** and **NEMA 4 water-tight**.

### CONSTRUCTION

The Spin Top enclosure is constructed of high density aluminum alloy castings for maximum strength and minimum weight. Light weight facilitates easy handling during installation and maintenance.

The mounting frame containing the starter and breaker is easily installed by means of a Slide and Hook arrangement.

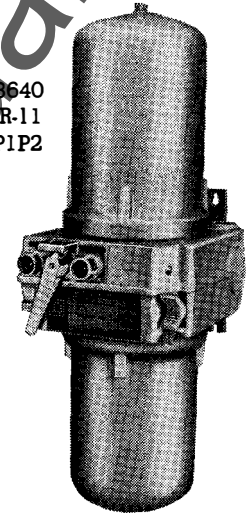
Conduit drillings are provided in both the bottom and in the top of the collar section. A 1/2" tapped opening is furnished in each tank for the installation of a drain and breather, if required.

See Class 9990 Descriptive Sheets for more information on the features of the Spin Top enclosure.

### OPERATION

Refer to Class 8606, 8630 and 8640 Descriptive Sheets for complete information.

Class 8640  
Type ER-11  
Form AP1P2



**Additions and Special Features — Refer to Tab "Additions and Special Features"**  
**Overload Relay Selection — Refer to Tab "Overload Relays", Table 4**

### ORDERING INFORMATION REQUIRED

- |  |  |
|--|--|
| 1—Class and type number.   | 3—Thermal Relay unit number.             |
| 2—Motor hp, voltage, phase, cycles and full load current rating. | 4—Additions or special features desired. |

## CLASS 8606 — AUTOTRANSFORMER TYPE

With Melting Alloy Type Thermal Overload Relays

60 CYCLES		THREE PHASE ★				600 VOLTS MAX.	
Max HP Rating ○	Volts	NEMA Size	WITHOUT CIRCUIT BREAKER		WITH CIRCUIT BREAKER		
			Type	Price	Ckt. Breaker Frame	Type	Price
15	208-220	2	DR-1	\$ 1563.	F	DR-11	\$ 1770.
	440-550						
25	208-220	3	ER-1	1663.	F	ER-11	2119.
	440-550	2					
30	208-220	3	ER-1	1663.	F	ER-11	2119.
	440-550						
50	208-220	4	FR-1	2428.	FJ	FR-11	2926.
	440-550	3					
75	208-220	5	GR-1	3411.	JKL	GR-11	4718.
	440-550	4					
100	208-220	5	GR-1	3567.	JKL	GR-11	4874.
	440-550	4					
125	440-550	5	GR-1	3483.	JKL	GR-11	4790.
	440-550						
150	440-550	5	GR-1	3483.	JKL	GR-11	4790.
	440-550						
200	440-550	5	GR-1	3761.	JKL	GR-11	5068.
	440-550						

Prices include two thermal overload relay units. Deduct \$1.50 each if relay units are omitted.  
★ Same prices apply to 2 phase — 4 wire, where one line is run direct to motor, and 2 phase — 3 wire.  
○ NOTE: Not only should the horsepower rating of the motor be within the limits shown for the starter, but the motor full load current should also be less than the values listed on Class 8502 Price Sheet, page 3, for the contactor used in the starter.



**CLASS 8630 — FOR THREE PHASE STAR-DELTA MOTORS**

**With Three Melting Alloy Type Thermal Overload Relays**

25-60 CYCLES			OPEN TRANSITION STARTING				600 VOLTS MAX.	
Max HP	Volts	NEMA Size	WITHOUT CIRCUIT BREAKER		WITH CIRCUIT BREAKER			
			Type	Price	Ckt. Breaker Frame	Type	Price	
10	208-220 440-550	1YD	CR-5	\$ 813.	F	CR-15	\$ 1045.	
15	208-220 440-550	2YD	DR-5	1011.	F	DR-15	1274.	
		1YD	CR-5	813.	F	CR-15	1045.	
25	208-220 440-550	2YD	DR-5	1011.	F	DR-15	1274.	
30	208-220 440-550	3YD	ER-5	1253.	F	ER-15	1751.	
		2YD	DR-5	1011.	F	DR-15	1274.	
40	208-220 440-550	3YD	ER-5	1253.	FJ	ER-15	1751.	
		2YD	DR-5	1011.	F	DR-15	1274.	
50	208-220 440-550	3YD	ER-5	1253.	FJ	ER-15	1751.	
60	208-220 440-550	4YD	FR-5	1958.	FJ	FR-15	2787.	
		3YD	ER-5	1253.	F	ER-15	1751.	
75	208-220 440-550	4YD	FR-5	1958.	JKL	FR-15	2787.	
		3YD	ER-5	1253.	FJ	ER-15	1751.	
100	440-550	4YD	FR-5	1958.	FJ	FR-15	2787.	
150	440-550	4YD	FR-5	1958.	JKL	FR-15	2787.	

To select thermal relay units: Divide the delta connected full load motor current by 1.73, using this quotient, select ther-

mal overload relay units from Table 4 under "Overload Relays" tab.

**CLASS 8640 — FOR PART WINDING SQUIRREL CAGE MOTORS**

**With Melting Alloy Type Thermal Overload Relays**

25-60 CYCLES			THREE PHASE — TWO STEP PART WINDING STARTERS				600 VOLTS MAX.	
Max HP *	Volts	NEMA Size	WITHOUT CIRCUIT BREAKER		WITH CIRCUIT BREAKER			
			Type	Price	Ckt. Breaker Frame	Type	Price	
15	208-220 440-550	1PW	CR-1	\$ 455.	F	CR-11	\$ 703.	
20	208-220 440-550	2PW	DR-1	660.	F	DR-11	1003.	
		1PW	CR-1	455.	F	CR-11	703.	
30	208-220 440-550	2PW	DR-1	660.	F	DR-11	1003.	
50	208-220 440-550	3PW	ER-1	1008.	FJ	ER-11	1506.	
		2PW	DR-1	660.	F	DR-11	1003.	
60	208-220 440-550	3PW	ER-1	1008.	FJ	ER-11	1506.	
100	208-220 440-550	4PW	FR-1	2130.	JKL	FR-11	3437.	
		3PW	ER-1	1008.	FJ	ER-11	1506.	
200	440-550	4PW	FR-1	2130.	JKL	FR-11	3437.	

Prices include thermal overload relay units. Deduct \$1.50 each if relay units are omitted.

\*These horsepower ratings do not apply when starters are used with Delta wound, dual voltage motors. Refer to factory for further information.



# NOVEMBER, 1963 — REDUCED VOLTAGE STARTERS - AUTO TRANSFORMER TYPE

## APPLICATION

Reduced voltage starters are used with ac squirrel cage motors to limit the inrush starting current, or to lessen the strain on the driven machinery. Class 8606 auto-transformer type starters reduce the voltage across the motor terminals during the accelerating period by means of an auto-transformer.

During the reduced voltage starting period, the motor is connected to taps on the auto-transformer. Due to the lower starting voltage, the motor will draw less current, and will develop less torque than if the motor were connected at line voltage. Because of transformer action in the auto-transformer, the current in the motor windings is actually greater than the line current by a proportion equal to the ratio of transformation. These two factors frequently require the use of auto-transformer starters where current inrush must be greatly limited to avoid line disturbances. Auto-transformer starters provide greater starting torque per ampere of line current than any other form of starter.

## RATINGS

**Size classification** has been made by the National Electrical Manufacturers Association. Starter ratings are expressed in terms of ampere current carrying capacity, and are identified by Size number. Class 8606 auto-transformer type starters are made in seven different sizes: Size 2, 50 amperes; Size 3, 100 amperes; Size 4, 150 amperes; Size 5, 300 amperes; Size 6, 600 amperes; Size 7, 900 amperes; and Size 8, 1350 amperes.

**Volts** — Magnet coils for 220 volts are also suitable for use on 208 volts. 440, 550 and 600 volt starters require different magnet coils and different auto transformers. The magnets for all sizes of starters will operate satisfactorily on line voltages fluctuating as much as 15% below or 10% above normal.

**Frequency** — Standard auto transformers and magnet coils are available for 25, 30, 40, 50 or 60 cycle frequencies. Our Engineering Department should be consulted if transformers or coils for other frequencies, or for use in abnormal ambient temperatures, are required.

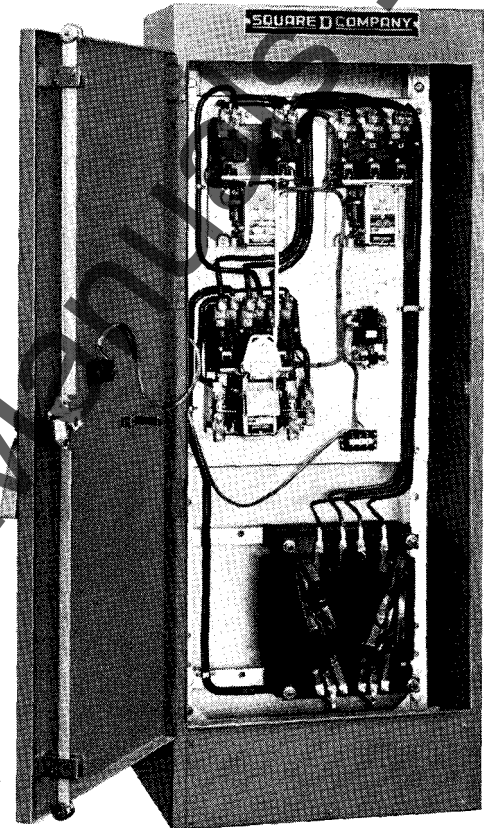
**Poles** — As standard, auto transformer starters are made with three poles for three phase, three wire service. They are also available in three poles for two phase, three wire service, and in Sizes 2-5 in four poles for two phase, four wire service.

## STANDARD FEATURES

**Accessibility** of parts for maintenance or repair is one of the foremost features of Square D equipment. All renewable parts of starters can be inspected or replaced with a minimum of time and labor.

Contacts are mounted independently of line and load connections so that wiring need not be disturbed when servicing or adjusting the tips. No tools other than a screwdriver and pliers are necessary for coil replacement or contact adjustment. Access to all equipment is from the front of all enclosures up to and including Size 7. In floor mounted enclosures this makes possible the installation against a wall, or back-to-back. Size 8 starter enclosures have double doors front and rear.

**Remote Control** — Push buttons or other pilot devices may be mounted within easy reach of the operator while the starter is usually situated closer to the motor. Each control unit may be located for maximum operating efficiency and installation



Class 8606  
Type FG-1, Form A

economy, since only two or three connecting wires are required.

**Holding Circuit Interlocks** — All Class 8606 starters are provided with a normally open electrical holding circuit interlock. Either low voltage protection or low voltage release can be obtained with a standard starter, depending upon the control station and the connection scheme used.

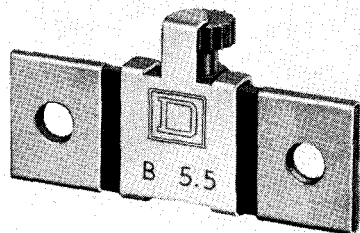
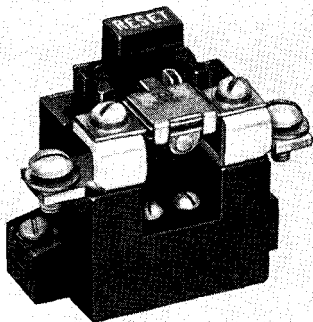
**Low Voltage Protection** prevents motors from starting unexpectedly with resultant damage to machinery or injury to an operator. All Class 8606 starters will provide this protection when momentary contact push buttons or other equivalent pilot devices are connected to the starter by the scheme known as three wire control.

**Low Voltage Release** is obtained with a two wire control scheme and is used when the motor requires automatic starting and stopping without the attention of the operator. The holding interlock is not used since the magnet coil is connected to the power lines through a maintained contact switch. When the motor is stopped by a voltage failure, it restarts automatically upon return of voltage.

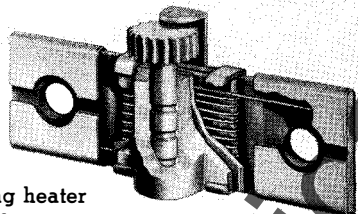


# REDUCED VOLTAGE STARTERS - AUTO TRANSFORMER TYPE—NOVEMBER, 1963

Melting alloy thermal unit in place on overload relay block



Melting alloy type thermal unit



Cutaway showing heater and melting pot

**Closed Transition Starting** — provides smooth acceleration with a minimum of line disturbance. In the starting sequence, the motor is never disconnected from the line, thus avoiding transient currents during switching.

## SPECIAL FEATURES

**Push Button in Cover (Form A)** — Class 8606 starters are available with a "Start-Stop" momentary contact push button mounted in the cover of the starter enclosure for external operation. Where this arrangement is convenient from the operating standpoint, installation economies are obtained with the elimination of a separate push button station in its wiring. Separately mounted push buttons may also be connected in parallel with the one included with the starter.

**Selector Switch in Cover (Form C)** — Where motors are automatically controlled by two wire pilot devices, independent manual means for starting and stopping is frequently required. For such an application, a three position maintained

contactor selector switch may be used. In one position, a circuit is manually completed to the magnet coil of the starter, permitting operation independent of the automatic pilot device. A second position opens the control circuit so that the starter cannot be energized. A third position connects the pilot device in the starter circuit to govern starter operation.

**Low Voltage Control** circuits may be used to provide additional safety for the operator when starters are used in high voltage lines. This feature may be obtained in either of two ways:

1. With starter furnished with the magnet coil wired for control from a power source other than that which feeds the motor. This feature, designated as **Form S** should be used only when the control power source will fail when the main power source fails. Otherwise the motor will automatically restart upon resumption of main power, and at line voltage.
2. Use of a built-in control circuit transformer having a single fuse in the secondary for short circuit protection. This feature, designated as **Form FT** has the transformer primary connected to two incoming power leads, with the 110 volt secondary supplying power for the magnetic starter coil.

**Additional Auxiliary Contacts**, or electrical interlocks, can be supplied in arrangement and number sufficient to satisfy every practical need. These will be installed at the factory, if specified on order, but can be easily installed in the field.

Since auto-transformer type starters have two contactors, one of which closes only during reduced voltage starting of the motor, and the other only while the motor runs at line voltage, an interlock on either contactor will not be closed at all times when the motor is operating. Care must be taken to specify on which contactor the extra electrical interlock is required.

## OVERLOAD PROTECTION

Auto-transformer type starters are equipped with two overload relays, either of which in tripping will allow all of the contactors to open, thus disconnecting all power lines to the motor.

**Sizes 2, 3, 4 and 5** — melting alloy type thermal overload relays are supplied on Square D Class 8606 starters. They offer protection to the motor against continued operation when the line current drawn is dangerously high. Such a condition may be caused by overloading the driven machinery, by excessively low line voltage, or by single phase operation of a poly-phase motor.

Melting alloy thermal units are non-adjustable, thus discouraging unauthorized tampering, and rendering overload protection more reliable. After tripping on overloads, and allowing a few moments for cooling, the relays may be manually reset. No replacement of parts is needed and no deterioration follows repeated tripping.

The patented unit construction of heater and melting pot maintains the permanently fixed relation between these important elements. Possible variations in trip points due to distortion or misalignment are eliminated. Each completed relay is tripped during a factory test before shipment.



NOVEMBER, 1963

# REDUCED VOLTAGE STARTERS - AUTO TRANSFORMER TYPE

**Sizes 6, 7 and 8** — Magnetic overload relays are furnished as standard. These overload relays are of the oil dashpot type with inverse time characteristics. Standard factory setting is 125% of full load current. However, the overload relay can be readjusted in the field if desired.

## AUTO TRANSFORMERS

The auto transformers supplied on these starters are designed to allow one 15 second start each 4 minutes for 1 hour. Should the starting time be longer, or occur at more frequent intervals, refer all details to the factory for consideration.

Auto transformers have taps which are easily adjustable to provide either 50%, 65% or 80% of line voltage during the starting period. Assuming a squirrel cage motor with a line voltage starting torque of 175% of full load torque, the starting torque using an auto transformer start would be approximately 44%, 74% or 112%, according to which transformer taps were used. If this motor had a starting inrush current of 600% of its full load current, the starting inrush to the motor terminals would be 300%, 390% or 480%, while the line current would be only 150%, 255% or 384%.

## TIMING RELAYS

Timing of the starting period is controlled by an adjustable accelerating relay of the pneumatic type. When this relay is once properly set, all starting periods will be identical regardless of variations in the starting load. This automatic timing feature eliminates the danger of improper starting by inexperienced operators.

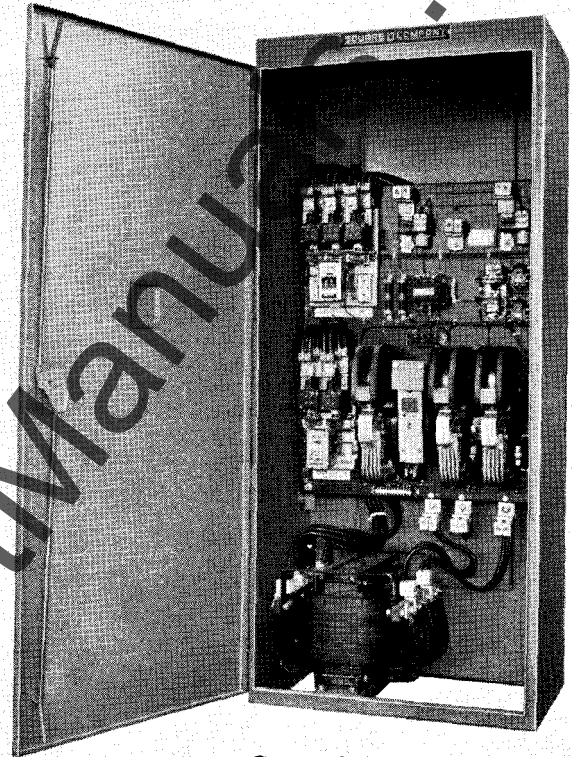
Pneumatic timing units are actuated by their own magnet coil, energized from the pilot device. In the timing relay, passage of air through a restricted orifice governs the timing period. The timing is regulated by the setting of a needle valve which determines the amount of restriction in the orifice. The needle valve is adjusted by turning a knurled wheel on the front of the timer.

## CONSTRUCTION OF CONTACTORS

**Sizes 2, 3, 4 and 5** — Magnetic contactors of these sizes have straight line vertical action from magnet armatures to contacts. Double break, silver contacts increase rupturing capacity and never require cleaning or dressing. Enclosed arc chamber covers confine arcing and protect terminal assemblies while magnetic yokes further increase interrupting ability and reduce contact burning. The E type magnets used on the Sizes 2, 3, 4 and 5 contactors have two shading coils embedded into the ends in order to minimize ac magnetic hum.

**Sizes 6, 7 and 8** — The contactors in these sizes are mill clapper type for the main run contactors. Mill clapper type contactors provide rugged duty; safe, dependable operation; and long life expectancy.

The line-arc principle of circuit interruption is an important feature of the mill clapper type contactor. Magnetic ears directing a magnetic field across the contact tips very quickly force the arc up on the arcing plates during initial interrup-



Class 8606  
Type HG-1

tion. During the elongation of the arc, the arc is held centered in the arc chute by cancelling fields in the arc chute. This distinct line arc principle aids in quickly extinguishing the arc and prolonging arc chute life. The contactors are equipped with a dc operating magnet and a full wave bridge rectifier for the dc source. The rectifier is connected to the 110 volt control voltage supplied by the control transformer. A dc operated contactor has quicker response and quieter operation than an ac operated contactor.

Sizes 6, 7 and 8 start contactors are one NEMA size smaller than the main run contactors because of the intermittent duty requirement and in accordance with NEMA standards. Start contactors NEMA Size 5 are furnished with ac control at system voltage, whereas NEMA Sizes 6 and 7 start contactors are dc operated and equipped with a full wave bridge rectifier.

## GENERAL PURPOSE AND SPECIAL PROTECTIVE ENCLOSURES

**NEMA 1 — General Purpose Enclosures** are constructed of heavy gauge sheet steel finished with a coat of baked aluminum inside and a coat of baked blue-gray enamel outside. Covers are hinged and have latches with provision for padlocking.



## REDUCED VOLTAGE STARTERS-AUTO TRANSFORMER TYPE—NOVEMBER, 1963

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

**NEMA 4 — Water-tight Enclosures** are constructed of heavy gauge sheet steel finished inside and out with a corrosion resistant paint, light gray in color. Covers have reinforcing straps and are clamped to the case by swing bolts. Cover gaskets provide a water-tight seal. Threaded hubs are provided in the top and bottom of the enclosure.

Water-tight enclosures are intended for outdoor use, or for locations where the starter might be subjected to splashing or dripping water. They are not suitable for submersion in water.

**NEMA 5-12 — Dust-tight and Industrial Use Enclosures** are sheet steel with hinged covers and swing bolts. Neoprene cover gaskets are provided to exclude dust. Boxes are finished in blue-gray enamel on the outside and baked aluminum on the inside, while covers are finished in blue-gray enamel inside and out. No conduit entrances are provided, with the user being required to drill the necessary holes for the conduit opening.

Dust-tight enclosures are intended to protect the starter mechanism against injurious accumulation of dust or lint. They are suitable for applications in steel mills, coke plants, or similar locations where dust might interfere with satisfactory starter operation. They are not suitable however, for installation where dust conditions involve fire or explosive hazards.

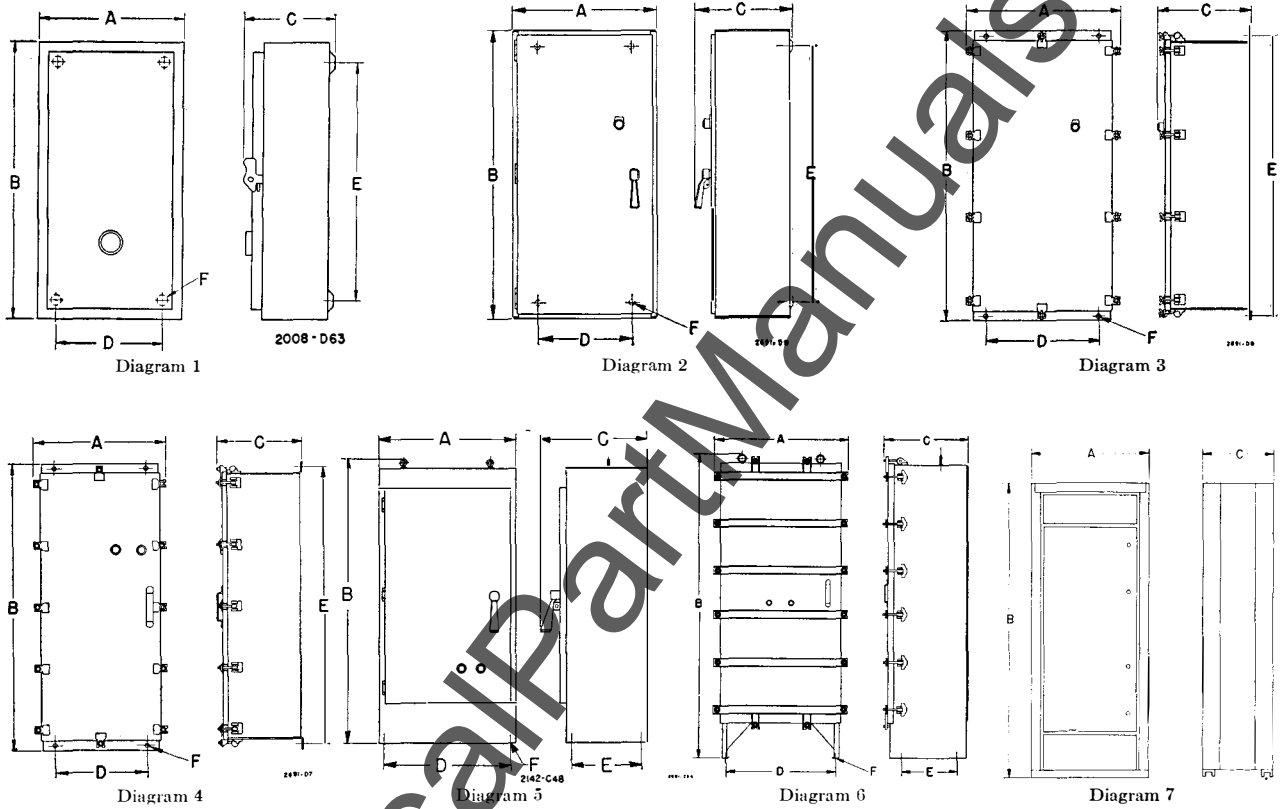
**NEMA 9 — Class 2, Group G Dust-tight Enclosures** are of sheet steel finished inside with baked aluminum and outside in baked blue-gray enamel. Hinged covers are fastened by swing bolts, and wing nuts tighten to allow specially treated felt gaskets to be compressed between the box and cover to exclude combustible dust. Welded conduit hubs are furnished in top and bottom of the box to provide the necessary conduit entrances.

Typical installations of starters with Class II enclosures are found in flour and feed mills, grain elevators, and sugar mills. Such enclosures are not suitable for locations where explosive gases might enter the enclosure, because they are not designed to withstand internal pressure.



## REDUCED VOLTAGE — AUTO TRANSFORMER TYPE — AC MAGNETIC STARTERS

Approximate Dimensions — Not For Construction



**CLASS 8606**

GENERAL PURPOSE ENCLOSURE		NEMA TYPE 1				
Dimension Symbol	Size 2 Type DG-1	Size 3 Type EG-1	Size 4 Type FG-1	Size 5 Type GG-1	Size 6 Type HG-1	Size 9 Type JG-1
	Dia. 1	Dia. 2	Dia. 5	Dia. 5	Dia. 7	Dia. 7
A	18 <sup>3</sup> / <sub>16</sub>	23 <sup>1</sup> / <sub>4</sub>	26 <sup>1</sup> / <sub>4</sub>	28 <sup>1</sup> / <sub>4</sub>	32	56
B	44 <sup>3</sup> / <sub>16</sub>	57 <sup>3</sup> / <sub>16</sub>	70 <sup>3</sup> / <sub>16</sub>	82 <sup>3</sup> / <sub>16</sub>	90	90
C	12 <sup>1</sup> / <sub>2</sub>	17 <sup>3</sup> / <sub>16</sub>	19 <sup>1</sup> / <sub>2</sub>	19 <sup>1</sup> / <sub>2</sub>	20	20
D	15	16	24	26	19	(2 Size 6 Enc. Side by Side)
E	41 <sup>1</sup> / <sub>2</sub>	47 <sup>9</sup> / <sub>16</sub>	52 <sup>1</sup> / <sub>2</sub>	58 <sup>1</sup> / <sub>16</sub>	64	
F	1 <sup>1</sup> / <sub>16</sub>	1 <sup>9</sup> / <sub>16</sub>	1 <sup>9</sup> / <sub>16</sub>	1 <sup>9</sup> / <sub>16</sub>	1 <sup>9</sup> / <sub>16</sub>	

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WATER-TIGHT ENCLOSURES		NEMA TYPE 4		
Dimension Symbol	Size 2 Type DW-1	Size 3 Type EW-1	Size 4 Type FW-1	Size 5 Type GW-1
	Diagram 4	Diagram 4	Diagram 6	Diagram 6
A	20 <sup>3</sup> / <sub>8</sub>	25 <sup>3</sup> / <sub>8</sub>	29 <sup>1</sup> / <sub>16</sub>	31 <sup>1</sup> / <sub>16</sub>
B	47 <sup>1</sup> / <sub>4</sub>	54 <sup>1</sup> / <sub>4</sub>	78 <sup>3</sup> / <sub>16</sub>	90 <sup>3</sup> / <sub>16</sub>
C	13 <sup>19</sup> / <sub>32</sub>	14 <sup>3</sup> / <sub>32</sub>	17 <sup>3</sup> / <sub>8</sub>	17 <sup>3</sup> / <sub>8</sub>
D	14	19	24	26
E	45 <sup>3</sup> / <sub>4</sub>	52 <sup>3</sup> / <sub>4</sub>	13 <sup>1</sup> / <sub>4</sub>	13 <sup>1</sup> / <sub>4</sub>
F	1 <sup>9</sup> / <sub>16</sub>	1 <sup>9</sup> / <sub>16</sub>	1 <sup>11</sup> / <sub>16</sub>	1 <sup>11</sup> / <sub>16</sub>

DUST-TIGHT ENCLOSURES		NEMA TYPE 12		
Dimension Symbol	Size 2 Type DD-1	Size 3 Type ED-1	Size 4 Type FD-1	Size 5 Type GD-1
	Diagram 3	Diagram 3	Diagram 4	Diagram 4
A	18 <sup>3</sup> / <sub>16</sub>	23 <sup>1</sup> / <sub>4</sub>	26 <sup>1</sup> / <sub>4</sub>	28 <sup>1</sup> / <sub>4</sub>
B	46 <sup>1</sup> / <sub>16</sub>	54 <sup>1</sup> / <sub>4</sub>	70 <sup>3</sup> / <sub>8</sub>	82 <sup>3</sup> / <sub>16</sub>
C	12 <sup>1</sup> / <sub>16</sub>	15 <sup>3</sup> / <sub>4</sub>	19 <sup>1</sup> / <sub>2</sub>	19 <sup>1</sup> / <sub>2</sub>
D	15	19	24	26
E	45 <sup>3</sup> / <sub>8</sub>	52 <sup>3</sup> / <sub>4</sub>	12 <sup>1</sup> / <sub>2</sub>	11 <sup>1</sup> / <sub>2</sub>
F	1 <sup>1</sup> / <sub>16</sub>	1 <sup>9</sup> / <sub>16</sub>	1 <sup>9</sup> / <sub>16</sub>	1 <sup>11</sup> / <sub>16</sub>

HAZARDOUS LOCATION ENCLOSURES		NEMA TYPE 9		
Dimension Symbol	Size 2 Type DE-1	Size 3 Type EE-1	Size 4 Type FE-1	Size 5 Type GE-1
	Diagram 4	Diagram 4	Diagram 6	Diagram 6
A	20 <sup>3</sup> / <sub>8</sub>	25 <sup>3</sup> / <sub>8</sub>	29 <sup>1</sup> / <sub>16</sub>	31 <sup>1</sup> / <sub>16</sub>
B	47 <sup>1</sup> / <sub>4</sub>	54 <sup>1</sup> / <sub>4</sub>	78 <sup>3</sup> / <sub>16</sub>	90 <sup>3</sup> / <sub>16</sub>
C	13 <sup>19</sup> / <sub>32</sub>	14 <sup>3</sup> / <sub>32</sub>	17 <sup>3</sup> / <sub>8</sub>	17 <sup>3</sup> / <sub>8</sub>
D	14	19	24	26
E	45 <sup>3</sup> / <sub>4</sub>	52 <sup>3</sup> / <sub>4</sub>	13 <sup>1</sup> / <sub>4</sub>	13 <sup>1</sup> / <sub>4</sub>
F	1 <sup>9</sup> / <sub>16</sub>	1 <sup>9</sup> / <sub>16</sub>	1 <sup>11</sup> / <sub>16</sub>	1 <sup>11</sup> / <sub>16</sub>

Dimensions are in Inches.

Dimensions Subject to Change without Notice.