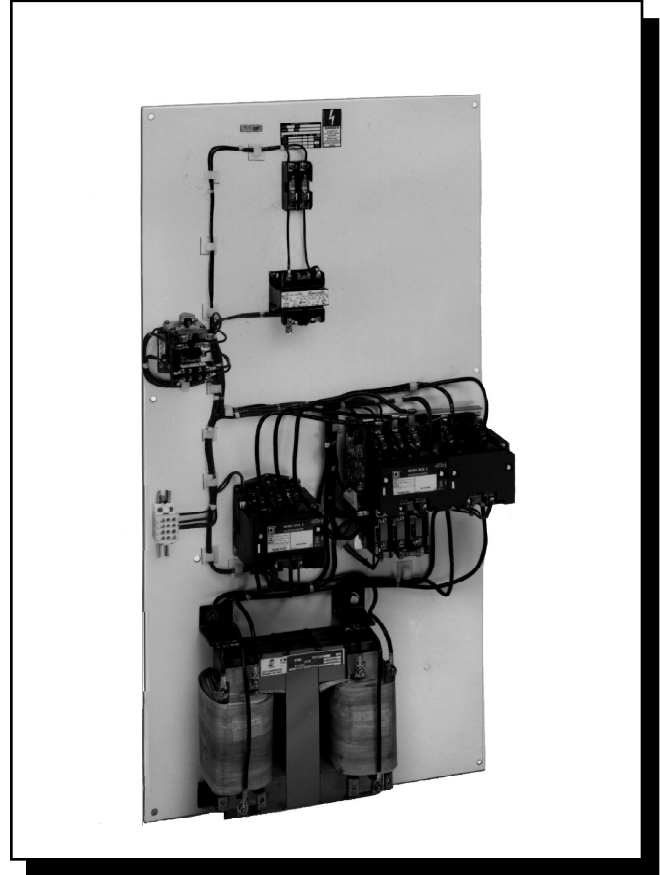


SQUARE D

Instruction Bulletin

Bulletin No. 50006-025-01E
December, 1994
Raleigh, NC, U.S.A.

Reduced Voltage Starters Autotransformer Type Class 8606



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INTRODUCTION

This instruction bulletin covers the installation, startup, and servicing of standard autotransformer reduced voltage starters with and without pre-engineered options.

NOTE: Keep this bulletin with the starter.

Class 8606 Autotransformer Reduced Voltage Starters are electromechanical reduced voltage starters designed to control three phase squirrel cage induction motors. The Class 8606 starter includes a NEMA rated medium duty autotransformer with taps available for starting 50%, 65% or 80% of line voltage and NEMA rated Type S contactors for proven performance. Motor inrush current will then be 50%, 65% or 80% of full voltage values and starting torque will be 25%, 42% or 64% of torque developed during a full voltage start. Because of the transformer action, the line current will be less than motor current at 25%, 42% or 64% of inrush current at full voltage. As such, autotransformer starters provide the maximum torque with minimum line current.

Precautions

The following precautions must be studied and followed during the installation, operation and servicing of the equipment.



DANGER

HAZARDOUS VOLTAGE.

Disconnect all power to starter before installation, servicing, inspection or replacement.

Electrical shock will cause severe injury or death.



CAUTION

EQUIPMENT DAMAGE HAZARD.

- Read this instruction bulletin prior to installing or operating this equipment.
- Only qualified personnel should be permitted to operate or service the starter.
- Service work should be performed only after becoming familiar with all listed danger and caution statements.
- If starters are to be stored prior to installation, they must be protected from the weather and kept free of condensation and dust.
- Use extreme care when moving or positioning starters (even if crated) as they contain devices which may be damaged by rough handling.

Failure to observe this precaution could result in personal injury or equipment damage.

Preliminary Inspection

Inspect for shipping damage upon receiving the autotransformer reduced voltage starter. If any shipping damage is found, immediately notify the freight carrier and your Square D representative. Open the door on the starter and check inside for any visible damage.

NOTE: Do not attempt to operate the starter if any visual damage is noted.

Check all terminations to be sure they are tight and securely in place.

Storage

After the preliminary inspection, package and store the autotransformer reduced voltage starter in a clean, dry location. Do not store this equipment in any area where the ambient temperature will rise above 70° C (158° F) or fall below -30° C (-22° F). Do not store this equipment in high condensation or corrosive atmospheres. Maximum relative humidity: 95% non-condensing. Proper storage is required to prevent equipment damage.

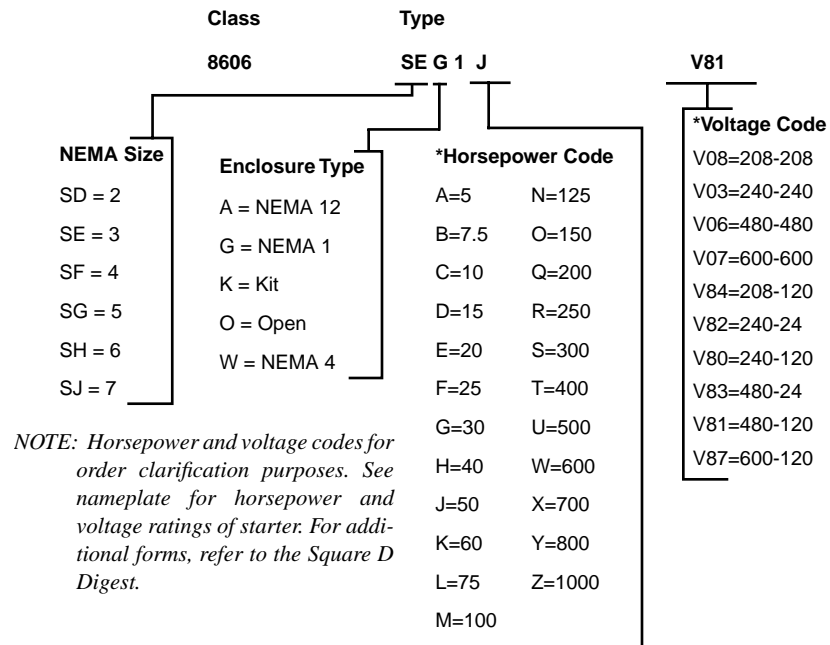
Starter Identification

The starter can be supplied in a kit version, open version, a NEMA Type 1, 4 or 12 enclosure. The kit and open versions have the contactors, autotransformer and associated timers without an enclosure. However, the open version has everything mounted to a metal panel (backpan). The nameplate is located on the bottom left of the backpan. When the starter is factory assembled in an enclosure, an additional nameplate is found on the inside of the door. Device nameplates properly identify the starter options and should be used when corresponding with Square D.

Options

The following chart breaks down the description of the starter into Type and Form numbers. (Voltage and horsepower codes do not appear on nameplate). There are a number of factory and/or field installed options for autotransformer reduced voltage starters. To determine which options (if any) are factory installed, refer to the starter nameplate(s) for the Modification/Form listing. The factory Modifications/Forms are also listed in the Square D Digest.

Class/Type/Form/Identification



Forms (Factory Modification)

Description	Form
A. Control Configuration All coils at line voltage (standard) Fused CPT for timing relay Fused CPT for all coils Separate control of timing relay Separate control of all coils	*FF4T *FF4T40 S Y195
B. Pilot Devices Start-Stop push button On-Off push button Hand-Off-Auto selector switch Red pilot light Green pilot light Amber pilot light	A A16 C P1 P2 P3
D. Disconnecting Means Molded case circuit breaker Non-fusible disconnect switch Fusible disconnect switch	Y791 Y792 Y793-Y799
C. Meters Ammeter with selector switch Voltmeter with selector switch Elapsed time meter	G93 G95 G97

NOTE: * Secondary and primary fusing on CPT.
For additional forms see Square D Digest.

**AUTOTRANSFORMER
STARTERS**

The following Figures show the typical layout of the Class 8606 autotransformer starter. Enclosure type, branch circuit disconnect, CPT and pilot devices are shown as an example.

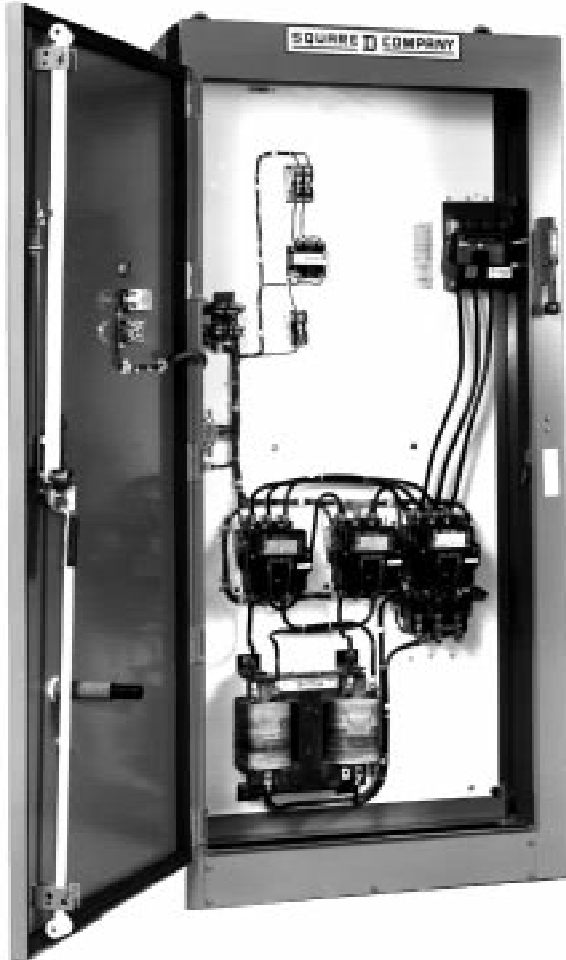


Figure 1 **Class 8606 Type SEA1JV81 Forms C FF4
P1 TY791**

Size 3 Autotransformer Starter in NEMA 12 enclosure with circuit breaker and 120 VAC CPT for timing relay, H-O-A operator and red pilot light for 50 hp / 480 VAC motor.

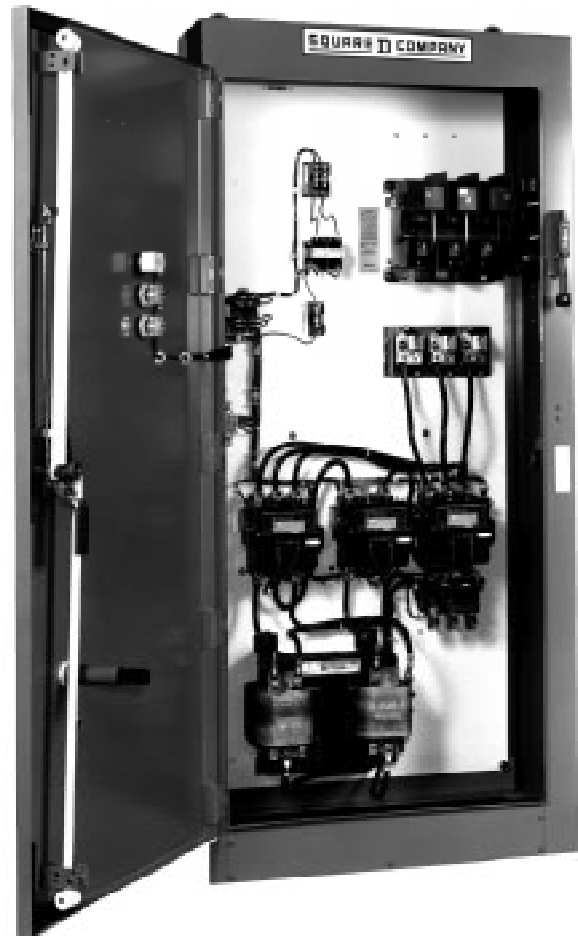


Figure 2 **Class 8606 Type SFG1MV81 Forms C
FF4 P1 P2TY796**

Size 4 Autotransformer Starter in NEMA 1 enclosure with fusible disconnect and 120 VAC CPT for timing relay, H-O-A operator and pilot lights for 100 hp / 480 VAC motor.



Figure 3

Class 8606 Type SJA11UV81 Forms A FF4TY791 Size 7

Size 7 Autotransformer Starter in NEMA 12 enclosure with circuit breaker and 120 VAC CPT for timing relay and START/STOP push buttons for 600 hp / 480 VAC motor.

APPLICATION DATA

Environmental Conditions

Operating ambient air¹: -20° C to + 50° C (- 40° F to +122° F)

Storage temperature: -30° C to + 70° C (- 22° F to +158° F)

A thermal unit correction factor and current derating factor should be used per Table 1 for proper selection of motor thermal protection.

Table 1 Altitude Derating and Corrections

Altitude (Feet)	Current Derating Factor	Thermal Unit Correction Factor
3,000	.9376	1.0327
4,000	.9122	1.0470
5,000	.8872	1.0617
6,000	.8628	1.0766
7,000	.8389	1.0918
8,000	.8155	1.1074
9,000	.7926	1.1232
10,000	.7702	1.1395
11,000	.7483	1.1560
12,000	.7269	1.1729
13,000	.7059	1.1902
14,000	.6854	1.2079
15,000	.6654	1.2259
16,000	.6458	1.2444
17,000	.6267	1.2632
18,000	.6080	1.2825
19,000	.5897	1.3022
20,000	.5718	1.3224

Thermal Unit Selection Formula:

(Motor Full Load Amperes) x (Derating Factor) x
 (Correction Factor) x (Service Factor Multiplier)

See step C of "START-UP PROCEDURE on page 13.

Contact Square D for information on other altitudes.

1. Operating ambient air is the temperature of the medium (air) in the immediate vicinity of the device into which the heat of the device is dissipated.

Operation Rates

Autotransformer type starters are supplied with a NEMA rated medium duty autotransformer. Medium duty service includes applications to motors which drive loads such as fans, pumps, compressors and line shafts. Ratings for medium duty starters are based on the duty cycles shown in Table 2. Consult your local Square D Sales Office for applications that require frequent starting, jogging or have extremely high inertia.

Table 2 Maximum Duty Cycle

Cycle	Up to 200 hp	Above 200 hp
On	15 seconds	30 seconds
Off	3 minutes 45 seconds	30 seconds
Repeat	14 times (total of 15 cycles)	2 times (total of 3 cycles)
Rest	2 hours	1 hour
On	15 seconds	30 seconds
Off	3 minutes 45 seconds	30 seconds
Repeat	14 times (total of 15 cycles)	2 times (total of 3 cycles)
Tap Setting	65%	65%

Terminal Descriptions

All terminals (both power and control) are sized for use with solid or stranded copper wire. Table 3 shows the type of wire lug per NEMA size of the contactors used with the autotransformer reduced voltage starter. If a disconnect device is included, the source power terminals would be determined by the circuit breaker or disconnect used. Contact Square D for more information.

Table 3 Power and Control Terminals

NEMA Size	Type	Power Terminals			Control Terminals		
		Type of Lug (Cu)	Wire Sizes Min. - Max.	Tightening Torque	Type of Lug (Cu)	Wire Sizes Min. - Max.	Tightening Torque
2	SD	Box lug	#14- #4 AWG	20 lb-in	Pressure wire	#16- #12 AWG	9-12 lb-in
3	SE	Box lug	#14- #1/0 AWG	100 lb-in	Pressure wire	#16- #12 AWG	9-12 lb-in
4	SF	Box lug	#8- 250 kcmil	120-130 lb-in	Pressure wire	#16- #12 AWG	9-12 lb-in
5	SG	Box lug	#4- 500 kcmil	100-350 lb-in	Pressure wire	#16- #12 AWG	9-12 lb-in
6	SH	Parallel groove	One or two 250-500 kcmil per phase	250-300 lb-in	Pressure wire	#16- #12 AWG	9-12 lb-in
7	SJ	Parallel groove	One or two 250-500 kcmil per phase	250-350 lb-in	Pressure wire	#16- #12 AWG	9-12 lb-in

INSTALLATION

Mechanical Installation



HAZARDOUS VOLTAGE.

Disconnect all power to starter before installation, servicing, inspection or replacement.

Controller operation should always be performed with enclosure doors closed.

Electrical shock will cause severe injury or death.

Open-style starters per the dimensions in Table 8 on page 19 must be mounted in NEMA rated enclosures. Mount the open-style starter vertically in an enclosure with line terminals (L1, L2, L3) up. Use suitable fastening means and the mounting holes provided. Ensure that the starter is securely attached to the mounting surface and that the mounting surface is capable of supporting the starter weight. Starters must be installed in an area where the environmental conditions are within the ratings detailed in Environmental Conditions on page 6. The starter must be mounted with a minimum of 6 inches free space above and below for proper wire bending.

The OEM kit version is supplied with a panel for mounting the mechanical interlock and the two devices to be interlocked (1S and 2M).

NOTE: Use mounting panel supplied with the Size 5 and 6 OEM kit. Using another panel could cause the mechanical interlock to malfunction resulting in nuisance tripping. The use of this factory supplied panel is critical to the proper operation of the mechanical interlock. Failure to use this panel will void the warranty.

Electrical Installation

Input Power

The starter is designed to operate with an autotransformer, and a three-phase, squirrel-cage motors. Nominal motor voltages are 200 V, 230 V, 460 V, 575 V at 60 Hz and 220 V, 380 V, 415 V, 500 V at 50 Hz (+10% -15%). National and local electrical codes require that a disconnect device (circuit breaker or disconnect switch) be installed on the line side of the starter. If a disconnect/branch circuit protective means is not furnished as part of the starter, it is the responsibility of the user to provide and install a disconnect/ branch circuit protective means in accordance with national and local electrical codes.

The starter is coordinated for fault withstand ratings of 5,000 amperes through size 3, 10,000 amperes size 4 and 5 and 18,000 amperes for size 6 and 7.

Wiring

Power conductors feeding the starter should be sized for the maximum input currents and applicable local electrical codes. Power leads are to be connected to the power terminals provided. Refer to Table 3 on page 7 to determine the range of wire sizes that the terminals will accept. For enclosed starters supplied with a circuit breaker or fusible disconnect switch, terminate input power wiring at lugs provided on line side of circuit breaker or switch.

Control Power

Common control wiring is standard for size 2 through 5 autotransformer starters. All size 6 and 7 contactors are supplied with CPT for 120 VAC control as standard. Separate control and other CPT control configurations are available. Figures 4 through 6 show examples of commonly used control circuit wiring options. For details specific to your unit, refer to the wiring diagram shipped with the starter.

Common Control Wiring

Common control wiring is standard for size 2 through 5 starters. The starter control circuit is at the same voltage as the power circuit. The source of the control circuit is from L1 and L2 of the power source. Refer to Figure 4 for details on control circuit wiring options

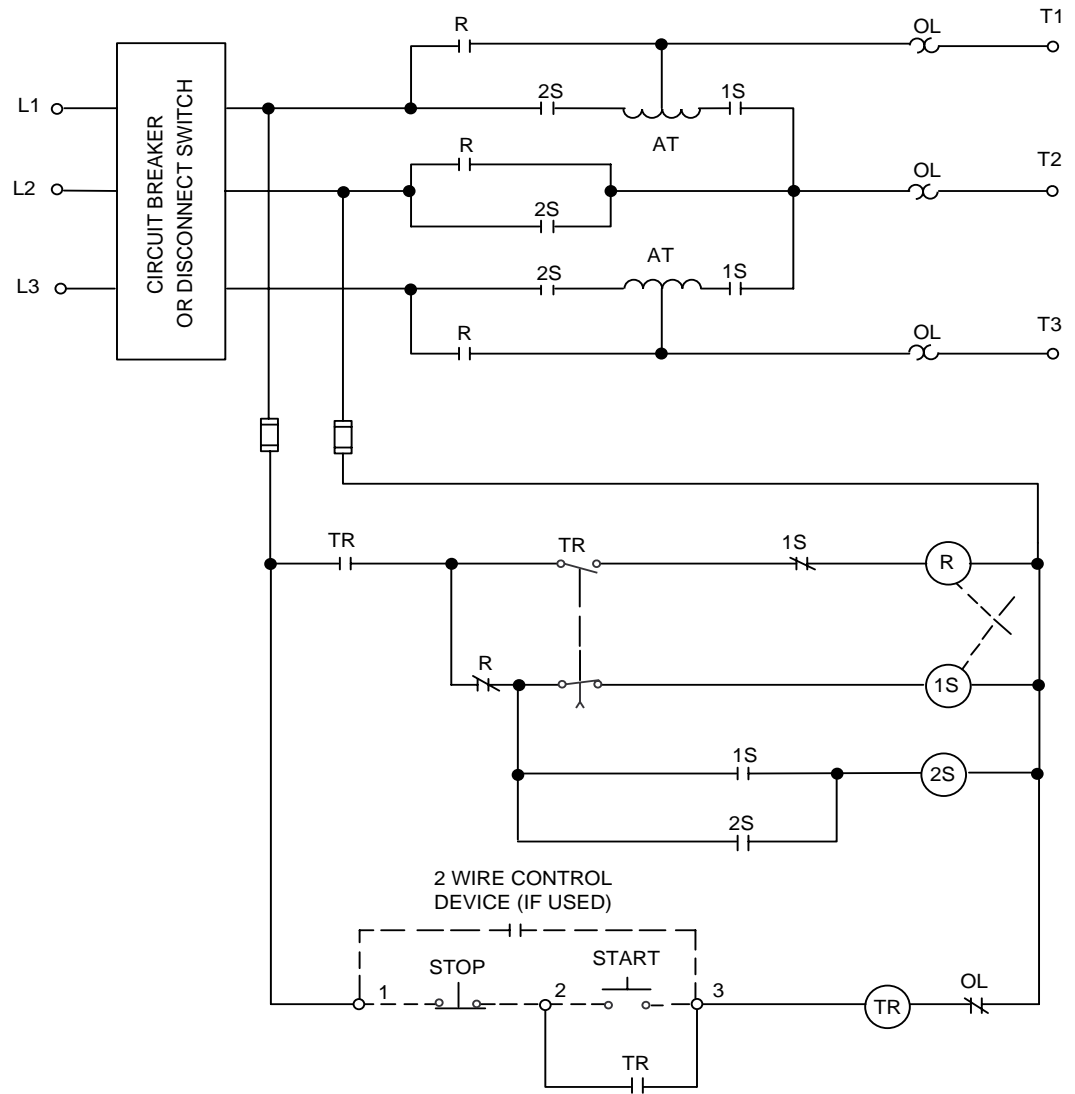


Figure 4 Common Control Closed Transition

Separate Control Wiring

The starter requires a control power source wired to the operating circuit. This power source is supplied separately by the user. The control voltage must be specified with the order so that the proper coils can be supplied on the relays and contactors. Refer to Figure 5 for details on control circuit wiring options.

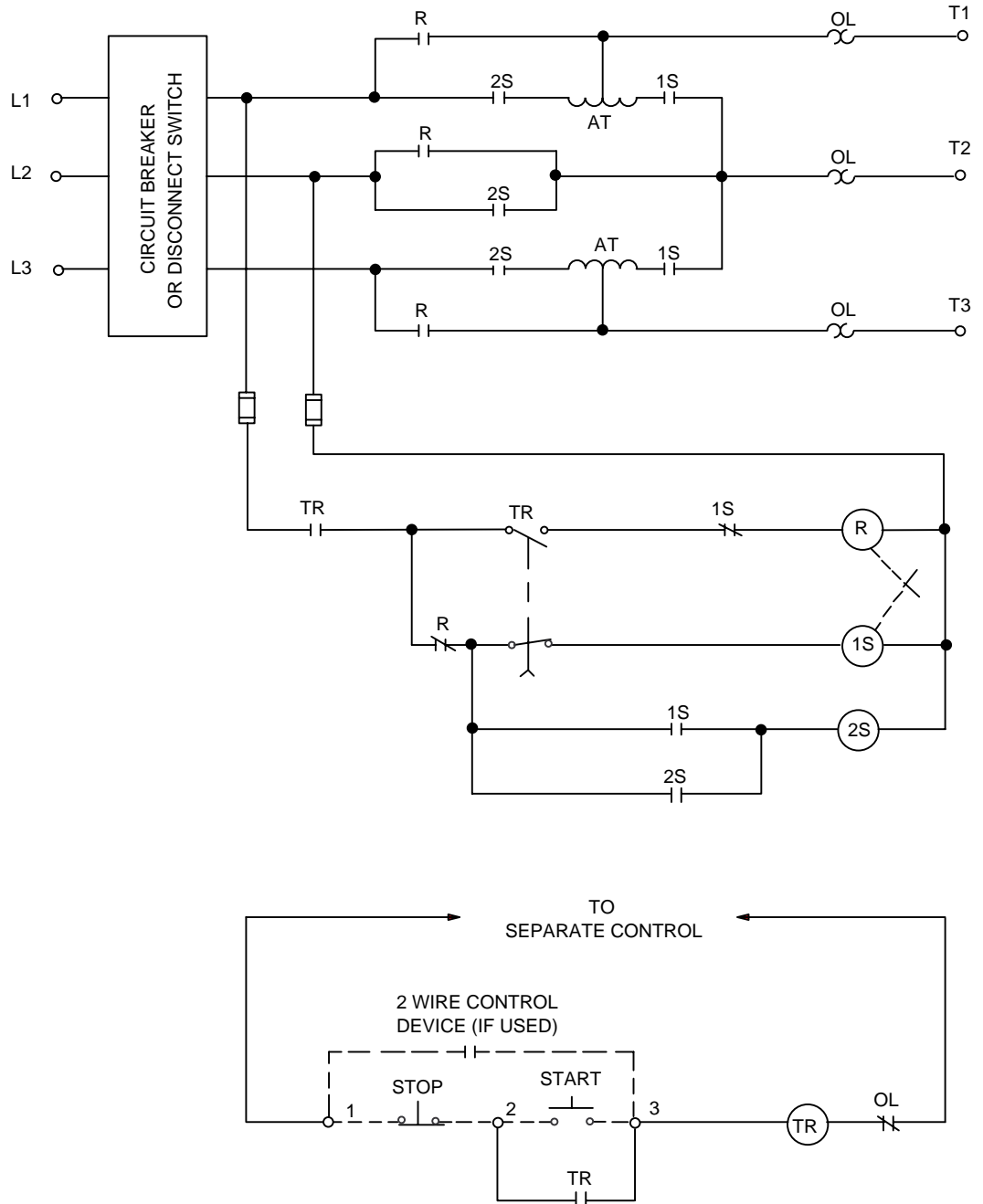


Figure 5 Separate Control (Form S) Closed Transition

Control Power Transformer

A control power transformer (CPT) is supplied from L1 and L2 of the starter's power source. Refer to Figure 6 for details on control circuit wiring options.

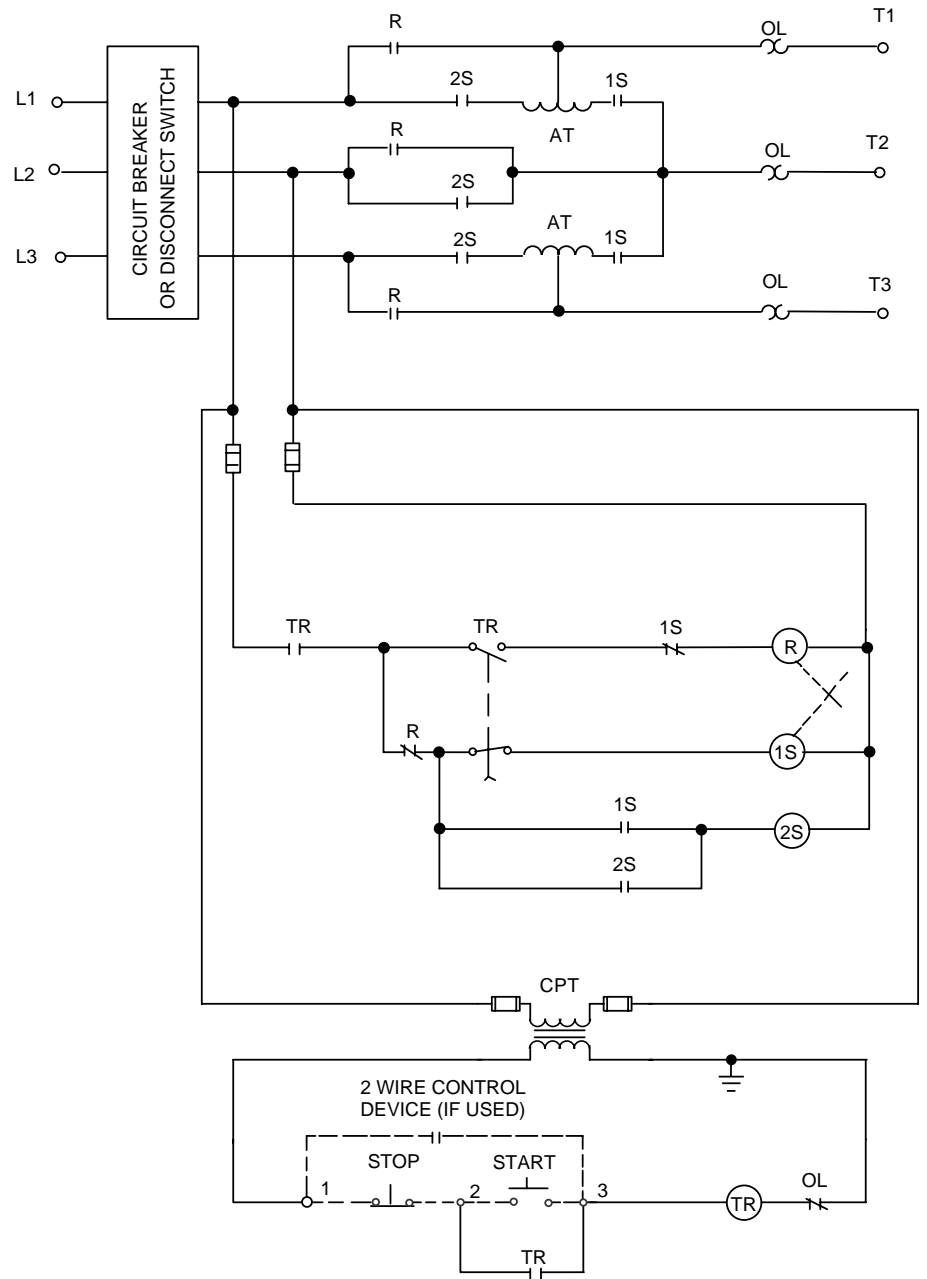



Figure 6 CPT Control (Form FF4T)

Adjustments & Settings


DANGER

HAZARDOUS VOLTAGE.
Equipment must not be energized before all necessary timing adjustments and tap settings are made.
Failure to observe this precaution will cause shock or burn, resulting in severe personal injury or death.

Transition Timer Adjustment

The Timing Relay (TR) controls the duration of time the autotransformer is in the power circuit before transitioning to full voltage. This timer (9050AO12E) is factory set at 6 - 7 seconds. It is recommended that a time delay setting of not more than 15 seconds be used for transition between reduced and full voltage power in order not to damage the autotransformer. Refer to (Table 2 on page 7) for maximum repeat cycles.


Autotransformer Tap Setting

Taps are factory set at the 65% voltage connection. Taps can be adjusted to supply 50%, 65%, or 80% voltage depending on the amount of current and torque required (refer to Table 5). Starting characteristics are listed for each tap setting below.

Starting Characteristics (% of Full Voltage Values)		
Voltage at Motor Taps	Line Current	Starting Torque
80%	64%	64%
65%	42%	42%
50%	25%	25%

Overload Relays

Autotransformer reduced voltage controllers size 2 through 6 use a melting alloy overload relay block as standard with provisions for three thermal units. Optional bimetallic overload relays are available in a non-compensated or an ambient temperature compensated version. Any version of the bimetallic overload relay requires a thermal unit in each available relay pole, wired so that each thermal unit carries full motor current. If contacts need replacement on any bimetallic overload block, a complete overload relay block must be installed.


WARNING

HAZARD VOLTAGE.
Do not energize Size 5 Type SGG1, SGA1, SGW1 or SG01 starter without thermal units installed in the overload relay. Current transformers that power the overload relay can develop dangerous voltages if energized without a load on their secondary terminals.
Failure to observe this precaution can create a hazardous voltage on the overload relay terminals, resulting in severe injury or death.

START-UP PROCEDURE

The controller has been tested at the factory and should require only minor adjustments to complete the field installation.

DANGER

HAZARDOUS VOLTAGE.

Disconnect all power to starter before installation, servicing, inspection or replacement.

Electrical shock will cause severe injury or death.

With the branch circuit and control circuit disconnect means open, make the following equipment settings and adjustments:

- A. Verify that the branch circuit feeding the starter is properly protected in accordance with applicable electrical codes, but in no case exceeding the maximum withstand rating listed in Input Power on page 8 of this bulletin.
- B. Verify that line and load terminals are torqued in accordance with Table 3 on page 7, (and/or to the circuit breaker or disconnect specifications as noted on the device).
- C. Install the proper thermal units in the overload relay per the motor full load current (MFLC), motor service factor (SF), and altitude using the following formula:

$$(MFLA) \times (SF \text{ multiplier}) \times (\text{Altitude Current Derating Factor}) \times (\text{Altitude Thermal Unit Correction Factor})$$

The service factor multiplier is 1.0 if the motor service factor is 1.15 to 1.25.

The service factor multiplier is 0.9 if the motor service factor equals 1.0.

- D. **Close and secure enclosure door**, then close branch circuit and control circuit disconnecting means.
- E. Turn on the starter using hand mode of operation. Check direction of motor rotation. If correct, go to step F. If incorrect, turn starter off, **disconnect three-phase line power and separate control power if supplied**, and correct motor rotation by exchanging any two-phase connections on either the line or load side of the starter.
- F. Motor should start at the reduced voltage setting per the autotransformer connection then transition to full voltage after the preset time delay on the timing relay (TR).
- G. The timing relay (TR) is factory set at 6 to 7 seconds. If readjustment is required, a maximum of 15 seconds is recommended to prevent overheating of the autotransformer. See Table 2 on page 7 for maximum duty cycle ratings.
- H. The startup procedure is now complete.

MAINTENANCE AND TROUBLESHOOTING GUIDE

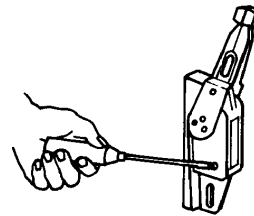
Maintenance

During normal use, the starter will require minimum maintenance; however, good maintenance practice will require periodic inspection of the starter. The maintenance periods should be scheduled based on the particular operating environment of the starter, but should not exceed one year. This maintenance should include keeping the device and enclosure interior clean and dust free. All bolted connections should be checked for the recommended tightening torques. (See Table 3 on page 7, and/or the circuit breaker or disconnect specifications as noted on the device).

! DANGER

HAZARDOUS VOLTAGE.

- Servicing must only be performed by qualified personnel.
- Troubleshooting with the starter energized is dangerous. Remain alert!
- Because of possible shock or burn, always close enclosure door before operating disconnect.
- If energized circuit must be checked, close and latch door, move disconnect handle to ON.
- Gain entry to enclosure by defeating disconnect operating handle door interlock.
- Do not leave starter unattended with enclosure door open and circuit energized.
- Close and latch door when circuit check is completed.
- If power factor correction capacitors are used, before servicing, deenergize power supply to this equipment, wait 5 minutes then measure capacitor voltages to verify voltage has diminished to zero.
- Do not short across capacitors with voltage present.



**To defeat interlock
when handle is On,
insert screwdriver
and turn.**

Failure to observe this precaution will result in will result in severe personal injury or death.

Troubleshooting Guide

The following are troubleshooting procedures for the standard Class 8606 starter. If the starter is still inoperative after following the suggested corrective action or if the problem occurring is not fixed, consult your local Square D Sales office.

Problem	Possible Causes	Corrective Action
1. Starter will not turn on.	A. One or both control circuit fuses are open.	Replace fuse(s). If repeated burnout occurs, see "Open Control-Circuit Fuse" in Problem column.
	B. Overload relay has tripped.	Reset overload relay. Verify thermal unit size with motor full load current and thermal unit selection tables. If repeated tripping occurs, motor is overloaded. Remove cause of overload.
	C. Overload relay switch not making contact.	Disconnect leads to overload relay switch and check continuity between OL and COM terminals while relay is in Reset condition. If no continuity, replace switch.
	D. Start button not making contact.	Remove control circuit fuse from holder. Check continuity between terminals 2 & 3 on terminal block while Start button is depressed. If no continuity, replace Start switch.
	E. Stop button not making contact.	Remove control circuit fuse from holder. Check continuity between terminals 1 & 2 on terminal block with Stop button in released position. If no continuity, replace Stop switch.
	F. Pilot switch (such as thermostat or float switch) not making contact.	Remove control circuit fuse from holder. If control circuit is direct from the power leads L1 and L2, disconnect both control leads. Check continuity between terminals 1 and 3 on terminal block with pilot switch turned on. If no continuity, replace pilot switch.
	G. Coils not operating. (120 VAC) Size 2 = 17.8 ± 0.1 ohms Size 3 = 8.27 ± 0.08 ohms Size 4 = 3.59 ± 0.06 ohms Size 5 = 0.971 ± 0.004 ohms Size 6 & 7 = 3.4 to 4.2 ohms For other voltages, contact your local Square D sales office.	Disconnect one of the contactor coil leads and measure resistance between coil terminals. If resistance is less than or more than the given levels, replace coil.
	H. Timing relay coil is not operating. (120 VAC)	Disconnect one of the coil leads and measure resistance between coil terminals. If resistance is less than 122 ohms, replace coil.
	I. Control transformer (when supplied) connected for wrong voltage or wrong transformer is being used.	Determine voltage rating of control transformer on starter by consulting transformer label. Check connection of transformer primary if it is a dual voltage (4-terminal primary). (See instruction sheet furnished with device.)
	J. System voltage too low or excessive voltage drop in power circuit.	Power circuit: Measure voltage at control transformer primary terminals while Start button is depressed. If it measures less than 85% of the transformer's marked rating, increase motor circuit conductor size, shorten length of conductor run, or increase system voltage. Control circuit: Consult local Square D sales office and ask for Product Data Bulletin M379.
	K. Control voltage and/or current not within ratings or missing.	Measure AC voltage across starter control circuit terminals. If no voltage is present, refer to wiring diagram and check continuity of circuit from these contact points back to control power source. Correct cause of power loss. If voltage is present but measures less than specified control voltage, check control power supply for connections.

Problem	Possible Causes	Corrective Action
2. Open (blown) control circuit fuse(s)	A. Incorrect fuse(s).	Replace fuse(s) with correct size fuse.
	B. Voltage and/or current not within ratings.	See corrective action for problem and possible cause columns, item 1.K on page 15.
	C. Coil for contactors, timing relays, control relays, or auxiliary control circuit device is shorted.	Refer to Instruction Bulletins for these specific devices.
3. Starter starts momentarily then stays off, or starter cycles between on and off.	A. Overload condition.	See corrective action for problem and possible cause columns, item 1.B on page 15
	B. "Telegraphing" pilot device.	If controlled by a two-wire pilot device (pressure switch, thermostat, etc.), observe operation of pilot device to make sure it switches on and off when intended without observable bounce. Replace if necessary.
4. Starter does not remain on when Start button is released.	A. Start/Stop push buttons wired incorrectly.	Check continuity between starter control circuit terminals. An open circuit indicates the Start/Stop pilot device is wired incorrectly. If continuity exists, press Stop push button.
	B. Holding circuit contact not making contact.	Replace holding circuit contact of the timing relay.
5. Starter does not remain off when Stop button is released.	A. Holding circuit contact not opening.	Remove one of the leads connected to the holding circuit contact and check continuity between contact terminals. If continuity exists, replace contact. If it does not, see next step below.
	B. One or more Start switches not opening when button is released.	Remove control circuit fuse from its holder. Check continuity between the two terminals of each Start switch after first removing all leads from one of the terminals of the switch being checked. Replace switches that show continuity when button is not depressed.
	C. Short circuit in control circuit wiring.	If no switches show continuity in check described above, probable cause of problem is short circuit in wiring. Locate short circuit and correct.
6. Starter will not turn off.	A. Stop switch or pilot switch (such as thermostat or float switch) not opening.	Disconnect wires from one terminal of switch. Check continuity between terminals of switch when in Off position. If continuity exists, replace switch.
	B. Short circuit in wiring between starter and Start switch or pilot switch (thermostat, float switches, etc.)	1. If starter is equipped with Start and Stop buttons, either remote or enclosure mounted, remove control circuit fuse from its holder and check for continuity between terminals. If continuity remains when any Stop button is depressed, a short circuit is present in the wiring and must be corrected.
		2. If starter is connected to a remote pilot switch (thermostat, float switch, etc.), remove control circuit fuse from its holder and disconnect wires from one terminal of the pilot switch. Check continuity between terminals. If continuity exists, a short circuit is present in wiring and must be removed.

Component Replacement Guide

The following is a list of standard components used in the standard Class 8606 starter. Prior to ordering replacement parts, verify proper component.

Table 4 Component Replacement Guide

Circuit Designation	Device Used	For Replacing Parts, Refer to Service Bulletin	
Run 1S 2S TR Run-1S Autotransformer	Size 2, Type SDG1, SDA1, SDW1 or SDO1 Class 8536SDO1 Form X01 Class 8502SDO1 Form X11 Class 8502SDO2 Class 9050AO12E Class 9999SM6 mechanical interlock Autotransformer (Table 5 on page 18)	8502/36-279 8502/36-279 8502/36-279 339AS 294AS	30072-013-11 30072-013-11 30072-013-11
Run 1S 2S TR Run-1S Autotransformer	Size 3, Type SEG1, SEA1, SEW1, or SEO1 Class 8536SEO1 Form X01 Class 8502SEO1 Form X11 Class 8502SEO2 Class 9050AO12E Class 9999SM12 mechanical interlock Autotransformer (Table 5 on page 18)	30072-013-01 30072-013-01 30072-013-01 339AS #	
Run 1S 2S TR Run-1S Autotransformer	Size 4, Type SFG1, SFA1, SFW1, OR SFO1 Class 8536SFO1 Form X01 Class 8502SFO1 Form X11 Class 8502SFO2 Class 9050AO12E Class 9999SM12 mechanical interlock Autotransformer (Table 5 on page 18)	30072-013-02 30072-013-02 30072-013-02 339AS #	
Run 1S 2S TR Run-1S MI Panel Autotransformer	Size 5, Type SGG1, SGA1, SGW1, or SGO1 Class 8536SGO1 Form X01 Class 8502SFO1 Form X11 Class 8502SFO2 Class 9050AO12E 31099-009-50 mechanical interlock 31099-012-01 (Mounting panel, OEM kit only) Autotransformer (Table 5 on page 18)	30072-013-16 30072-013-02 30072-013-02 339AS	
Run 1S 2S 1TR 2TR R-1S MI Panel Autotransformer	Size 6, Types SHG1, SHA1, OR SHW1 Class 8536SHO2 Form X01 Class 8502SGO1 Form X11 Class 8502SGO2 Class 9050AO12E Class 9050AO10D 31099-002-51 mechanical interlock 31106-010-01 (Mounting panel, OEM kit only) Autotransformer (Table 5 on page 18)	8502/36-370 8502/36-328 8502/36-328 339AS 339AS	30072-013-12 30072-013-18 30072-013-18
Run 1S 2S 1TR 2TR R-1S Autotransformer	Size 7, Types SJG1, SJA1 or SJW1 Class 8536SJO2 Form X11 Class 8502SHO2 Form X11 Class 8502SHO2 Class 9050AO12E Class 9050AO10D Mechanical Interlock (Not available as a component part) Autotransformer (Table 5 on page 18)	8502/36-397 8502/36-370 8502/36-370 339AS 339AS	30072-013-13 30072-013-12 30072-013-12

Note: When starters are provided with a fuse controlled transformer (Form F4T), only the coil of the timing relay is operated from the secondary of that transformer. Other coils operate at line voltage. For all devices, the following are used:

* Class 9070 Type K50 control transformer.

* Class 9999 Type SF4 fuse block kit.

Table 5 Autotransformer Part Numbers

hp	Part Number				
	208 V	230 V	380 V	460 V	575 V
10	52911-071-50	52911-071-51	52911-071-52	52911-071-52	52911-071-53
15	52911-071-54	52911-071-51	52911-071-52	52911-071-52	52911-071-53
20	52911-071-54	52911-071-59	52911-071-56	52911-071-52	52911-071-53
25	52911-071-54	52911-071-59	52911-071-56	52911-071-56	52911-071-57
30	52911-071-54	52911-071-59	52911-071-68	52911-071-60	52911-071-69
40	52911-071-54	52911-071-59	52911-071-68	52911-071-60	52911-071-69
50	52911-071-62	52911-071-59	52911-071-68	52911-071-60	52911-071-69
60	52911-071-62	52911-071-67	52911-071-68	52911-071-68	52911-071-69
75	52911-071-62	52911-071-67	52911-071-68	52911-071-68	52911-071-69
100	51172-029-52	52911-071-67	52911-071-72	52911-071-68	52911-071-77
125	51172-029-52	51172-029-52	52911-071-72	52911-071-72	52911-071-77
150	51172-029-52	51172-029-52	52911-071-76	52911-071-72	52911-071-77
175		51172-029-52	51172-029-52	52911-071-76	52911-071-77
200		51172-029-52	51172-029-52	52911-071-76	52911-071-77
225		51172-029-54	51172-029-52	51172-029-52	51172-029-52
250		51172-029-54	51172-029-52	51172-029-52	51172-029-52
300		51172-029-54	51172-029-52	51172-029-52	51172-029-52
400				51172-029-52	51172-029-52
450				51172-029-54	51172-029-54
500				51172-029-54	51172-029-54
600				51172-029-54	51172-029-54

Control Power Transformer Selection and Fusing

Square D Class 9070 transformer is recommended for use with this device. Select transformer type from Table 6 per controller NEMA size and Form designation. (Example: For a NEMA size 2 controller with Form T, a Class 9070 K50 transformer is recommended). The required transformer VA capacity is given below in Table 6. Primary fusing is given in reference to VA and Voltage per Table 7 on page 19 (two fuses on the primary of the control power transformer).

Table 6 Control Transformer Selection

Form	Timing Relay Coil only on Secondary of Transformer			All Coils on Secondary of Transformer		
	T Standard Capacity	T11 100 VA XTRA	T13 300 VA XTRA	T40 Standard Capacity	T41 100 VA XTRA	T43 300 VA XTRA
2	K50	K150	K350	K150	K300	K500
3	K50	K150	K350	K300	K500	K750
4	K50	K150	K350	K300	K500	K750
5	K50	K150	K350	K500	K750	K750
6	K50	K150	K350	K750	K1000	K1000

Table 7 Control Transformer Primary Fusing

Control Transformer Rated VA	Primary Voltage Fuse Rating (2 Fuses)							
	600 V	480 V	415 V	380 V	277 V	240 V	208 V	120 V
50	0.25 A	0.25 A	0.3 A	0.3 A	0.5 A	0.5 A	0.5 A	1.25 A
75	0.3 A	0.3 A	0.5 A	0.5 A	0.75 A	0.75 A	1 A	1.6 A
100	0.5 A	0.5 A	0.5 A	0.75 A	1 A	1.25 A	1.25 A	2.25 A
150	0.75 A	0.75 A	1 A	1 A	1.6 A	1.6 A	1.6 A	3.5 A
200	1 A	1.25 A	1.25 A	1.25 A	1.6 A	2.25 A	2.8 A	5 A
250	1.25 A	1.25 A	1.6 A	1.6 A	2.25 A	2.8 A	3.5 A	5 A [1]
300	1.25 A	1.6 A	1.6 A	2.25 A	2.8 A	3.5 A	4 A	6 A [1]
350	1.6 A	1.6 A	2.25 A	2.25 A	3.5 A	4 A	5 A	6 A [1]
500	2.25 A	2.8 A	3.5 A	3.5 A	5 A	5 A [1]	6 A [1]	10 A [1]
750	3.5 A	4 A	5 A	5 A	6 A [1]	7.5 A [1]	7.5 A [1]	10 A [1]
1000	5 A	5 A [1]	6 A [1]	6 A [1]	7.5 A [1]	10 A [1]	10 A [1]	-----

[1] Secondary fuses must also be supplied and rated in accordance with NEC 450-3(b)(2).

APPROXIMATE WEIGHTS
AND DIMENSIONS

Table 8 Dimensions for Class 8606 Autotransformer Reduced Voltage Starters

Type	Width in (mm)	Height in (mm)	Depth in (mm)	Approximate Weight lb (kg) [1]
SDO1	22 (559)	43 (1092)	8 (203)	170 (77)
SDA1,SDG1, SDW1, with or without Form Y791, Y792,Y794 [2]	25 (635)	52 (1312)	10 (254)	210 (95)
SEO1,SFO1,SGO1	28 (711)	63 (1600)	9 (229)	240 (109)
SHO1 (shipped as 2 pieces)	30 (762)	56 (1422)	14 (356)	640 (209)
SEA1,SEG1,SFA1, SFG1, with or without Form Y791,Y792, Y795,Y796 [2]	32 (813)	70 (1778)	16 (406)	430 (195)
SEW1,SFW1, with or without Form Y791,Y792,Y795,Y796 [2]	32 (813)	75 (1905)	16 (406)	450 (204)
SGA1,SGG1 with or without Form Y791[2]	32 (813)	70 (1778)	16 (406)	610 (277)
SGA1,SGG1 with Form Y792,Y797	36 (914)	90 (2286)	16 (406)	740 (336)
SGW1 with or without Form Y791[2]	32 (813)	75 (1905)	16 (406)	580 (263)
SGW1 with Form Y792,Y797	36 (914)	95 (2413)	16 (406)	590 (277)
SHA1,SHG1 with or without Form Y791,Y7910 [2]	34 (864)	90 (2286)	20 (508)	1020 (463)
SHA1,SHG1 with from Y797,Y798,Y799	64 (1626)	90 (2286)	24 (610)	980 (445)
SJA1,SJG1 with or without Form Y791, Y799, Y7910 [2]	64 (1626)	90 (2286)	24 (610)	2000 (900)

[1] For shipping weights, add 40 lbs (18 kg) for each piece. All units shipped as one (1) piece except as noted.

[2] Weights given are approximate and do not include the disconnecting means. When a circuit breaker or disconnect is included, an additional 40 lbs (18 kg) should be added to the above weight total.

NOTE: The dimensions in the table above are approximate – not for construction.

SPECIAL APPLICATIONS

Power Factor Correction Capacitors

When power factor correction capacitors are used in conjunction with autotransformer reduced voltage starters, care should be taken to protect the capacitors from current surges. These current surges can be caused from the device during transition from the "Start" to "Run" mode. To eliminate the possibility of damaging the capacitors during starting, the following recommendations are given:

- A. Connect the capacitors on the "Line" side of the autotransformer reduced voltage starters.
- B. Switch the capacitors on with a properly sized contactor using a time-delay relay to energize the contactor approximately 2 seconds after the transition to "Run" has occurred. The relay can be signaled from an auxiliary contact from the "Run" contactor of the autotransformer reduced voltage starter.

Electronic Motor Brake

An electronic motor brake provides a simple, effective means of braking an AC squirrel cage motor. This device can be used with an autotransformer reduced voltage starter just as it would be used with any standard non-reversing low voltage starter. An auxiliary contact on the "Run" contactor can be supplied to signal the electronic motor brake. Contact your local Square D Sales Office or refer to the Class 8922 "Quick Stop" electronic motor brake information located in the Square D Digest for sizing and connection information.

Electrical equipment should be serviced only by qualified electrical maintenance personnel, and this document should not be viewed as sufficient instruction for those who are not otherwise qualified to operate, service or maintain the equipment discussed. Although reasonable care has been taken to provide accurate and authoritative information in this document, no responsibility is assumed by Square D for any consequences arising out of the use of this material.