SQUARE D

Instruction Bulletin

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May, 1995
Raleigh, NC, U.S.A.

Wye - Delta Reduced Voltage Starter
Open or Closed Transition
Class 8630

Supersedes 50006-026-01D dated 1/94

Reference No. 8630-1

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INTRODUCTION

This instruction bulletin covers the installation, startup, and servicing of wye-delta starters with and without pre-engineered options.

NOTE: Keep this bulletin with the starter.

Class 8630 wye-delta starters are electro-mechanical reduced voltage starters designed to control three-phase squirrel cage wye-delta motors. The class 8630 starter utilizes NEMA rated Type S contactors to provide either open or closed transition starting.

Wye-Delta motors have six leads which allow the motor winding to be connected in either a wye or a delta configuration. To achieve a reduced voltage start, the windings are connected in the wye, reducing the voltage across each winding to 58% of line voltage. This reduces the starting current and torque approximately 1/3 of full voltage starting values. After starting, the motor windings are reconnected in the delta configuration.

Closed transition starters are provided with an additional contactor and resistor bank used to maintain voltage at the motor terminals during the transition from start to run. A wye-delta starter does not truly reduce the voltage applied to the motor terminals but provides the effect of reduced voltage starting and is classified as such.

Precautions

The following list of 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

SERVICE AND HANDLING HAZARD.

- **Read this 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 safety messages.**
- **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 can result in personal injury or equipment damage.

Preliminary Inspection

Inspect for shipping damage upon receiving the wye-delta 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 wye-delta 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 go 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.

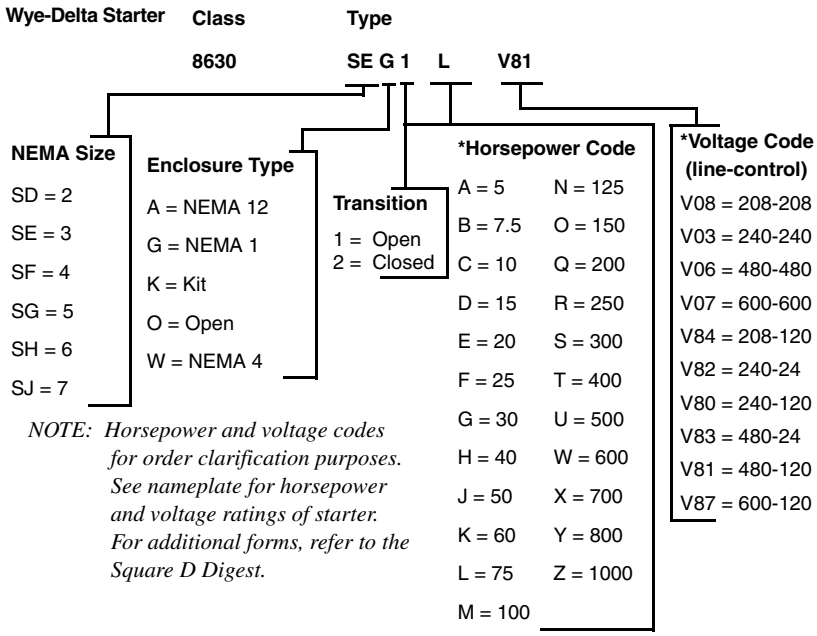
Starter Identification

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 and timer without an enclosure. However, the open version has everything wired and 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 the 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



NOTE: Horsepower and voltage codes for order clarification purposes. See nameplate for horsepower and voltage ratings of starter. For additional forms, refer to the Square D Digest.

Forms (Factory Modification)

Description	Form
A. Control Configuration	
All coils at line voltage (standard)	None required
Fused Control Power Transformer (CPT) for timing relay	*FF4T
Fused CPT for all coils	*FF4T40
Separate control of timing relay	S
Separate control of all coils	Y195
B. Pilot Devices	
Start-Stop push button	A
On-Off push button	A16
Hand-Off-Auto selector switch	C
Red pilot light	P1
Green pilot light	P2
Amber pilot light	P3
D. Disconnecting Means	
Molded case circuit breaker	Y791
Non-fusible disconnect switch	Y792
Fusible disconnect switch	Y793-Y799
C. Meters	
Ammeter with selector switch	G93
Voltmeter with selector switch	G95
Elapsed time meter	G97

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

Wye-Delta Reduced Voltage Starters

The following figures show the typical layout of the Class 8630 wye-delta reduced voltage starter. Enclosure type, branch circuit disconnect, CPT and pilot devices are shown as an example.

Figure 1 **Class 8630 Type SGG2SV81 Forms C FF4 P2 T Y791**

Size 5 Wye-Delta Starter in NEMA 1 enclosure with circuit breaker and 120 VAC CPT for timing relay, H-O-A operator and pilot lights for 300 hp / 460 VAC motor.
(Closed Transition)

Figure 2 **Class 8630 Type SHG1XV81 Form FF4T**

Size 6 Wye-Delta Starter in NEMA 1 enclosure with 120 VAC CPT for 700 hp / 460 VAC motor.
(Open Transition)

APPLICATION DATA

Environmental Conditions

Operating Ambient Air [1]: -20° C to + 50° C (-40° F to +122° F)

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

[1] NOTE: Operating ambient air is the temperature of the air in the immediate vicinity of the device, into which the heat of the device is dissipated.

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) x 0.58
See step C of START-UP PROCEDURE on page 13.

Contact Square D for information on other altitudes.

Operation Rates

Wye-delta type starters are supplied with NEMA rated contactors and starters. Consult your local Square D Sales Office for applications which require frequent starting, jogging or have extremely high inertia. Because of the way the windings are connected in the Δ (RUN) configuration, each contactor carries 58% of motor current. As such, horsepower rating for a wye-delta starter is typically higher than for a full voltage NEMA starter. See Table 2 for continuous current ratings of the NEMA rated wye-delta starters.

Table 2 NEMA Continuous Current Ratings

NEMA Size	Continuous Current Rating: Amperes - 600 Volt Max.
1 YD	47
2 YD	78
3 YD	156
4 YD	233
5 YD	467
6 YD	935
7 YD	1400

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 wye-delta reduced voltage starter. If a disconnect means is included with the device, the source power terminals is 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 [1]			Control Terminals		
		Lug Type (Cu)	Wire Sizes (Min - Max)	Tightening Torque	Lug Type (Cu)	Wire Sizes (Min - Max)	Tightening Torque
2	SD	Box Lug	#14- #4	50 lb-in	Pressure Wire	#16- #12	9-12 lb-in
3	SE	Box Lug	#14- #1/0	100 lb-in	Pressure Wire	#16- #12	9-12 lb-in
4	SF	Box Lug	#8- 250 kcmil	200 lb-in	Pressure Wire	#16- #12	9-12 lb-in
5	SG	Box Lug	#4- 500 kcmil	375 lb-in	Pressure Wire	#16- #12	9-12 lb-in
6	SH	Parallel Groove	One or Two 250-500 kcmil per phase	375 lb-in	Pressure Wire	#16- #12	9-12 lb-in
7	SJ	Parallel Groove	Two to Four 250-500 kcmil per phase	375 lb-in	Pressure Wire	#16- #12	9-12 lb-in

[1] Suitable for use with 75° C rated conductors.

INSTALLATION

Mechanical Installation

DANGER

HAZARDOUS VOLTAGE.

- **Disconnect all power to starter before installation, servicing, inspection or replacement.**
- **Always operate controller with enclosure doors open.**

Electrical shock will cause severe injury or death.

Open-style starters per the dimensions in Table 6 on page 20 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 5. The starter must be mounted with a minimum of 6 inches free space above and below for proper wire bending.

The size 5 and 6 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 wye-delta, 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 A through size 3, 10,000 A for size 4 and 5 and 18,000 A for size 6 and 7.

Wiring

Power conductors feeding the starter should be sized for the maximum input currents and applicable local electrical codes. Connect the power leads to the power terminals provided. Refer to Table 3 on page 6 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 Wiring

Common control wiring is standard for Size 2 through 5 wye-delta reduced voltage 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 3 through 6 show examples of commonly used control circuit wiring options. For details to your specific unit, refer to the wiring diagram shipped with the starter.

Common Control
Open Transition

The starter's 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 3 for details on open transition control circuit wiring options and Figure 4 for closed transition options.

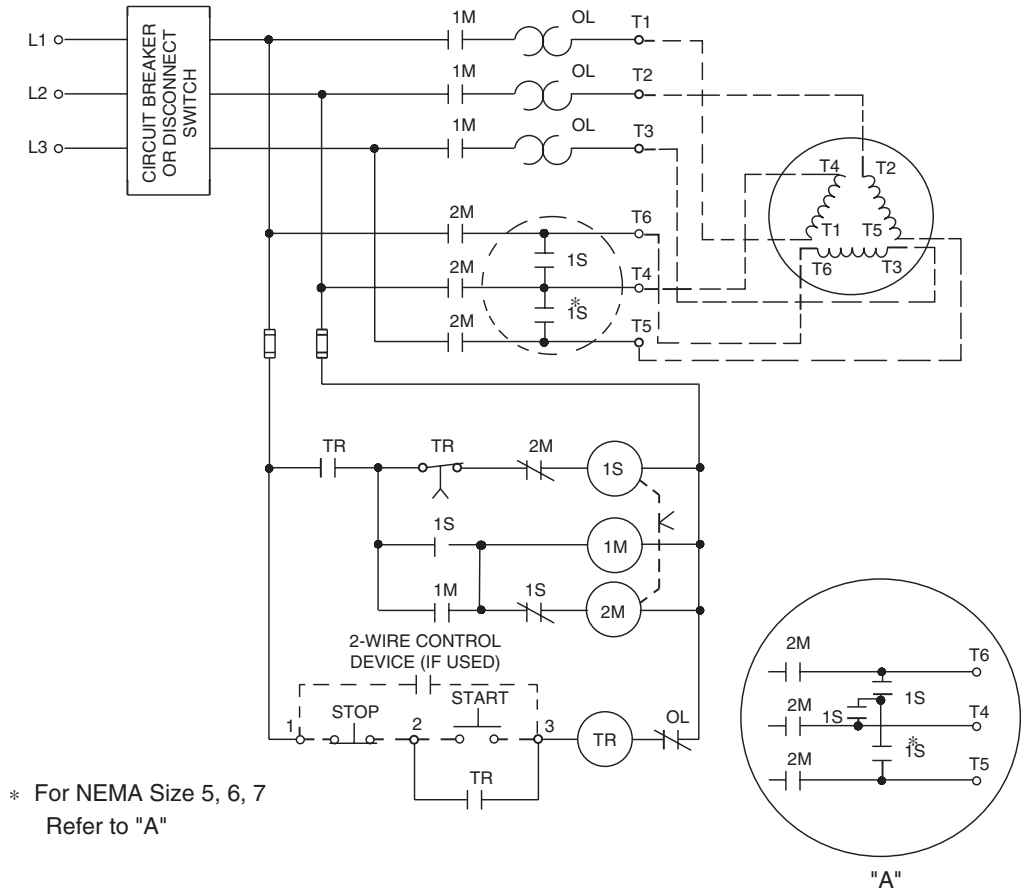


Figure 3 Common Control, Open Transition

Common Control
Closed Transition

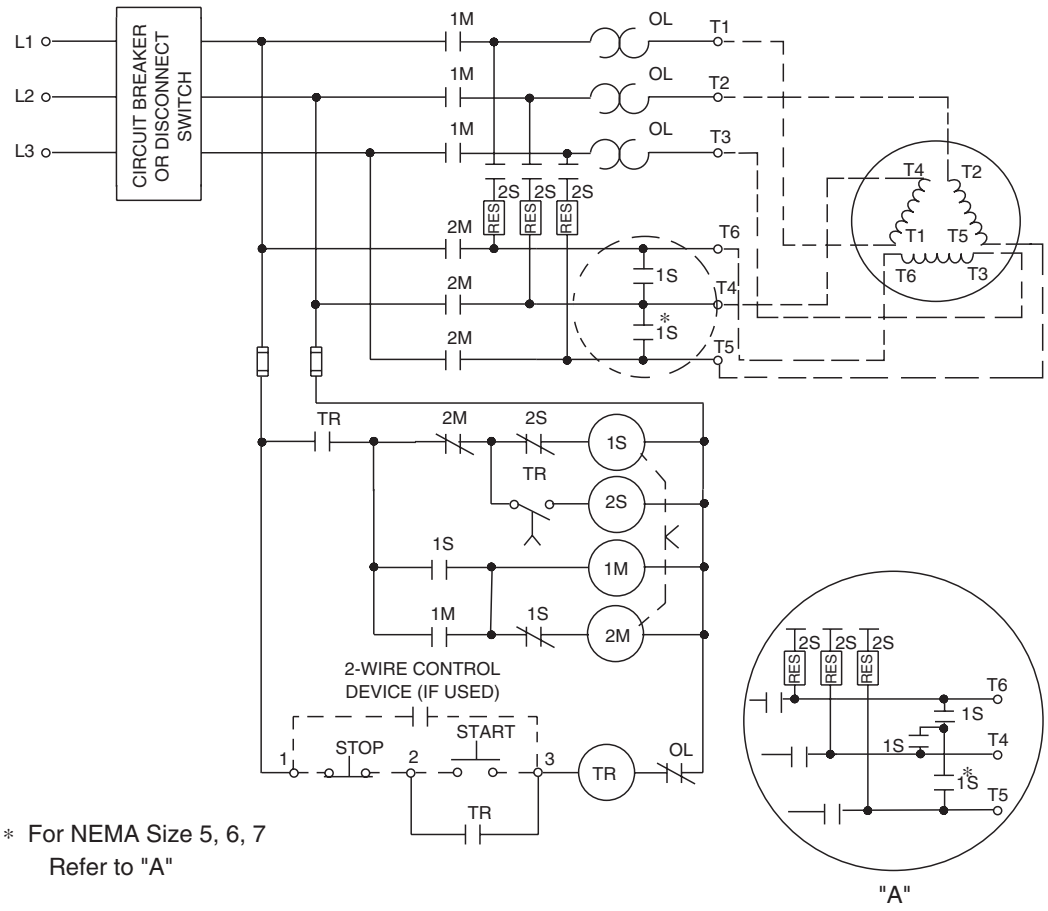


Figure 4 Common Control, Closed Transition

Separate Control
Open Transition

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 an example of separate control wiring on an open transition wye-delta starter.

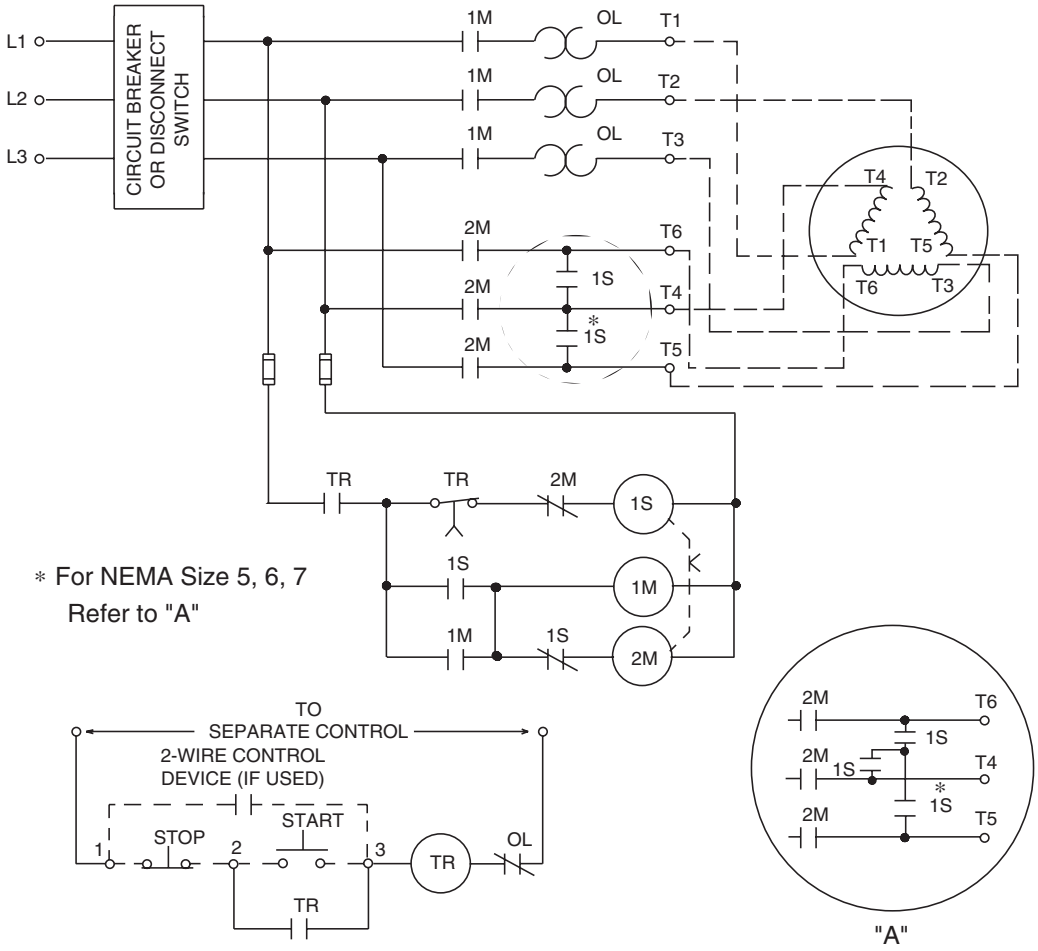


Figure 5 Separate Control, Open Transition (Form S)

Control Power Transformer Closed Transition

A control power transformer (CPT) is supplied from L1 and L2 of the starter's power source. Refer to Figure 6 for an example of a closed transition wye-delta starter with standard capacity control power transformer. The control power transformer as shown feeds the timing relay only.

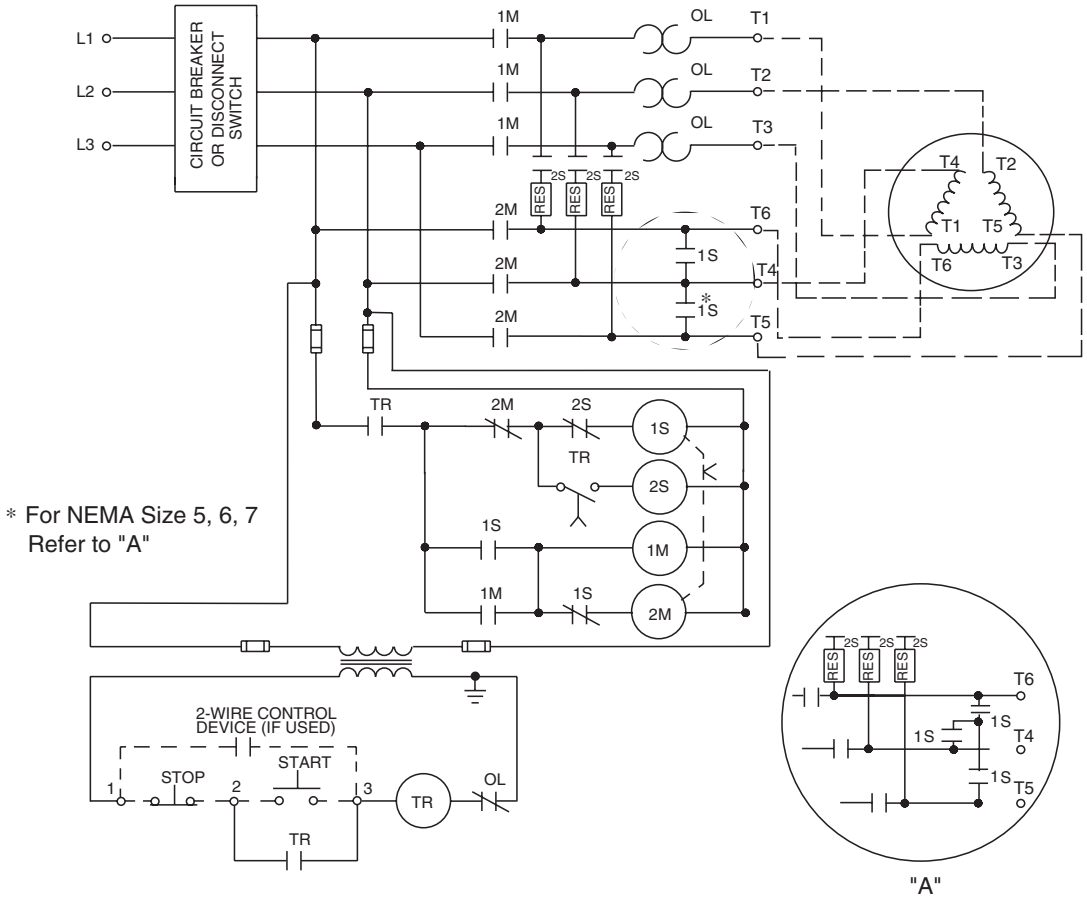


Figure 6 Control Power Transformer, Closed Transition (Form F4T)

Adjustments & Settings

NOTE: The following adjustments and settings must be made prior to applying any power to the wye-delta reduced voltage starter.

Transition Timer Adjustment

The timing relay (TR) is used to initiate the transition from the Y (START) to the Δ (RUN) configuration. This timer (9050AO12E) is factory set at 10 seconds. The length of time the windings can be in the Y connection for starting is limited by the motor characteristics. However, it is recommended that a time delay setting of not more than 15 seconds be used due to coordination of the thermal overload protection.

Starting Characteristics

The Class 8630 wye-delta starter when connected in the Y (START) reduces the voltage across each winding to 58%. This reduces both the starting torque available and current inrush to approximately 1/3 of full voltage values.

Overload Relays

Once the windings are connected in the Δ (RUN), full voltage is applied across each winding. However, because of the way the Δ connection is made, the full load current of the motor is shared between the 1M and 2M contactors. As such, the thermal units used on wye-delta starter must be sized for 58% of the full load amp rating of the motor. Refer to Table 1 on page 5 for thermal overload sizing calculations.

Size 2 through 6 wye-delta reduced voltage starters 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 compensated version. If a bimetallic overload relay is used, a thermal unit must be provided in each available relay pole wired to carry 58% of full load motor current. If contacts need replacement on any bimetallic overload block, a complete overload relay block must be installed.

WARNING

HAZARDOUS VOLTAGE.

If using a bimetallic overload, 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 hazardous voltages if energized without a load on their secondary terminals.

Hazardous voltage on the overload relay terminals can result 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 controller is properly protected in accordance with applicable electrical codes, but in no case exceeding the maximum withstand rating listed in Input Power on page 7 of this bulletin.

B. Verify that line and load terminals are torqued in accordance with Table 3 on page 6, (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 (MFLA), wye-delta correction factor, motor service factor (SF), and altitude using the following formula:

(MFLA) x (.58) X (SF multiplier) x (Altitude Current Derating Factor) x (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 source 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 wye-delta 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 10 seconds. If readjustment is required, a maximum of 15 seconds is recommended.

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 6, 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 is dangerous with the starter energized. 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.**

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

- **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.**

Electrical shock will cause severe injury or death.

Troubleshooting Guide

The following are troubleshooting procedures for the standard Class 8630 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.	Disconnect one of the coil leads and measure resistance between coil terminals. If resistance is less than or more than the given levels, 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.)

Problem	Possible Causes	**Corrective Action
1. Starter will not turn on. (cont'd)	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.
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 above.
	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 above.
	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 contiuity 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.

Problem	Possible Causes	**Corrective Action
	B. Short circuit in wiring between starter and Start switch or pilot switch (thermostat, float switches, etc.)	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.
		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.

**If the starter is still inoperative, consult your local Square D sales office.

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.

Circuit Designation	Device Used	Part Replacement, refer to Instruction Bulletin
Open Transition	**Size 1, Type SCG1, SCA1, SCW1 or SCO1**	
1M	Class 8536SCO3 Form X10	30072-013-10
1S-2M	Class 8702SCO8 Form X0101	30072-013-10
TR	Class 9050AO12E	339AS
SB	Shorting Bar	_ _ _ _ _
Add for Closed Transition	**Size 1, Type SCG2, SCA2, SCW2 or SCO2**	
2S	Class 8502SCO2 Form X01	30072-013-10
RES	Class 6705 N Series	_ _ _ _ _
Open Transition	**Size 2, Type SDG1, SDA1, SDW1, or SEO1**	
1M	Class 8536SDO1 Form X10	30072-013-11
1S-2M	Class 8702SDO4 Form X0101	30072-013-11
TR	Class 9050AO12E	339AS
SB	Shorting Bar	_ _ _ _ _
Add for Closed Transition	**Size 2, Type SDG2, SDA2, SDW2 or SDO2**	
2S	Class 8502SD02 Form X01	30072-013-11
RES	Class 6705 N Series	_ _ _ _ _
Open Transition	**Size 3, Type SEG1, SEA1, SEW1, or SEO1**	
1M	Class 8536SEO1 Form X10	30072-013-01
1S-2M	Class 8702SEO2 Form X0101	30072-013-01
TR	Class 9050AO12E	339AS
SB	30022-281-01 (Shorting Bar)	_ _ _ _ _
Add for Closed Transition	**Size 3, Type SEG2, SEA2, SEW2, or SEO2**	
2S	Class 8502SDO2 Form X01	30072-013-11
RES	Class 6705 N Series	_ _ _ _ _

Circuit Designation	Device Used	Part Replacement, refer to Instruction Bulletin
Open Transition	**Size 4, Type SFG2, SFA2, SFW2, or SFO2**	
1M	Class 8536SFO1 Form X10	30072-013-02
1S-2M	Class 8702SFO3 Form X0101	30072-013-02
TR	Class 9050AO12E	339AS
SB	30022-281-02 (Shorting Bar)	_ _ _ _ _
Add for Closed Transition	**Size 4, Type SFG2, SFA2, SFW2, or SFO2**	
2S	Class 8502SE02 Form X01	30072-013-01
RES	Class 6705 N Series	_ _ _ _ _
Open Transition	**Size 5, Type SGG1, SGA1, SGW1, or SGO1**	
1M	Class 8536SGO1 Form X10	30072-013-16
2M	Class 8502SGO2 Form X01	30072-013-16
1S	Class 8502SFO2 Form X01	30072-013-02
TR	Class 9050 Type AO12E	339AS
MI (1S-2M)	31099-009-50 (1S-2M Mechanical Interlock)	_ _ _ _ _
MI Panel	31096-060-01 (Mounting Panel, OEM kit only)	_ _ _ _ _
SB (1S)	30022-281-02 (Shorting Bar)	_ _ _ _ _
Add for Closed Transition	**Size 5, Type SGG2, SGA2, SGW2, or SGO2**	
2S	Class 8502SFO2 Form X01	30072-013-02
RES	Class 6705 N Series	_ _ _ _ _
Open Transition	**Size 6, Type SHG1, SHA1, SHW1, or SHO1**	
1M	Class 8536SHO2 Form X10	30072-013-12
2M	Class 8502SHO2 Form X01	30072-013-12
1S	Class 8502SGO2 Form X01	30072-013-16
1TR	Class 9050 Type AO12E	339AS
MI (1S-2M)	31099-002-51 (1S-2M Mechanical Interlock)	_ _ _ _ _
MI Panel	31106-010-01 (Mounting Panel, OEM kit only)	_ _ _ _ _
SB (1S)	31099-056-01 (Shorting Bar)	_ _ _ _ _
Add for Closed Transition	**Size 6, Type SHG2, SHA2, SHW2, or SHO2**	
2S	Class 8502SGO2 Form X01	30072-013-16
2TR	Class 9050 Type AO10D	339AS
RES	Class 6705 N Series	_ _ _ _ _
Open Transition	**Size 7, Type SJG1, SJA1, SJW1, or SJO1**	
1M	Class 8536SJO1 Form X10	30072-013-13
1S-2M	Class 8502SJO1 Form X01	30072-013-13
TR	Class 9050 Type AO12E	339AS
MI (1S-2M)	31099-002-52 (1S-2M Mechanical Interlock)	_ _ _ _ _
SB (1S)	30022-281-02 (Shorting Bar)	_ _ _ _ _
Add for Closed Transition	**Size 7, Type SJG2, SJA2, SJW2, or SJO2**	
2S	Class 8502SHO2 Form X01	30072-013-12
RES	Class 6705 N Series	_ _ _ _ _

Note: When starters are provided with a fused 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 ordered with form F4T, the following are used:

* Class 9070,Type K50 control transformer.
* Class 9999, Type SF4 fuse block kit.

Control Power Transformer Selection

A Square D Class 9070 transformer is recommended for use with this device. Select transformer type from Table 4 per controller NEMA size and Form designation. (Example: For a NEMA Size 2 controller with Form T, a Class 9070 K50 transformer is recommended). Primary fusing is given in reference to VA and Voltage per Table 5. (There are two fuses on the primary of the control power transformer).

Table 4 Control Transformer Selection

Form	Timing Relay Coil only on Secondary of Transformer			All Coils on Secondary of Transformer		
NEMA Size	T	T11	T13	T40	T41	T43
	Standard Capacity	100 VA XTRA	300 VA XTRA	Standard Capacity	100 VA XTRA	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 5 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	1 A	1.25	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*
300	1.25 A	1.6 A	1.6 A	2.25 A	2.8 A	3.5 A	4 A	6 A*
350	1.6 A	1.6 A	2.25 A	2.25 A	3.5 A	4 A	5 A	6 A*
500	2.25 A	2.8 A	3.5 A	3.5 A	5 A	5 A*	6 A*	10 A*
750	3.5 A	4 A	5 A	5 A	6 A*	7.5 A*	7.5 A*	10 A*
1000	5 A	5 A*	6 A*	6 A*	7.5 A*	10 A*	10 A*	-------

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

DIMENSIONS

Table 6 Dimensions for Class 8630 Wye-Delta Starters

Type	Width in (mm)	Height in (mm)	Depth in (mm)
SC01, SD01	21 (533)	21 (533)	7 (178)
SCA1, SCG1, SCW11, SDA1, SDG1, SDW11 with or without Form Y791, Y792, Y783, Y794, Y795	23 (584)	25 (635)	8 (203
SE01, SF01 with or without Form Y791	25 (635)	42 (1067)	7 (178)
SEA1, SEG1, SEW11, SFA1, SFG1, SFW11	28 (712)	48 (1219)	8 (203)
SEA1, SEG1, SEW11, SFA1, SFG1, SFW11 with Form Y791, Y792, Y794, Y795, Y796	30 (762)	49 (1245)	11 (279)
SG01, SH01 with or without Form Y791, Y7910	32 (813)	82 (2083)	10 (254)
SCA2, SCG2, SCW12, SDA2, SDG2, SDW12 with or without Form Y791, Y792, Y793, Y794, Y795	23 (584)	25 (635)	16 (406)
SEA2, SEG2, SEW12, SFA2, SFG2, SFW12	28 (712)	48 (1219)	16 (406)
SEA2, SEG2, SEW12, SFA2, SFG2, SFW12with or without Form Y791, Y792, Y794, Y795, Y796	30 (762)	49 (1245)	18 (457)
SGA1, SGA2, SGG1, SGG2, SHA1, SHA2, SHG1, SHG2 with or without Form Y791, Y7910	36 (914)	90 (2286)	16 (406)
SGW1, SGW2, SHW1, SHW2 with Form Y791, Y7910	36 (914)	98 (2489)	16 (406)

Note: Not for construction use.
The above dimensions are subject to change without notice. Contact your local Square D Sales office for verification.