

ELECTRICAL INSTALLATION



CHAPTER

2

TABLE OF CONTENTS

Chapter 2: Electrical Installation. . . . . 2-1

    Safety Warning. . . . . 2-2

    Agency Approvals . . . . . 2-2

    Technical Information and Standards . . . . . 2-2

    Electrical Specifications . . . . . 2-3

    Circuit Protection . . . . . 2-4

        Short-Circuit Protection . . . . . 2-4

        Motor overload Protection . . . . . 2-5

    Wire Sizes and Torques . . . . . 2-5

    Electrical Connections. . . . . 2-6

    Electrical Wiring . . . . . 2-7

        Power Circuit Wiring. . . . . 2-7

        Control Circuit Wiring . . . . . 2-8

## SAFETY WARNING



**SR55 SOFT STARTERS CONTAIN DANGEROUS VOLTAGES WHEN CONNECTED TO THE ELECTRICAL POWER SUPPLY. ONLY QUALIFIED PERSONNEL WHO HAVE BEEN COMPLETELY TRAINED AND AUTHORIZED SHOULD CARRY OUT INSTALLATION, OPERATION AND MAINTENANCE OF THIS EQUIPMENT. REFER TO AND CAREFULLY FOLLOW ALL OF THE WARNINGS IN THE "WARNINGS" SECTION AT THE START OF THIS USER MANUAL, AS WELL AS OTHER WARNINGS AND NOTES THROUGHOUT THE MANUAL.**

## AGENCY APPROVALS

All SR55 models are CE, REACH, and RoHS compliant. SR55 models -017 through -361 bear the ETL listing mark and are UL508 and CSA C22.2 No. 14, per ETL, listed to U.S. and Canadian safety standards respectively.

SR55 Soft Starter Agency Approvals	
SR55 Models	Applicable Agency Approvals *
SR55-017 through SR55-361	CE, CSA C22.2 No.14 (ETL tested), ETL 4004274, REACH, RoHS, UL508 (ETL tested)
SR55-414 through SR55-477	CE, REACH, RoHS
* To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.	

## TECHNICAL INFORMATION AND STANDARDS

SR55 Technical Information and Standards			
<b>Rated Operational Voltages</b>	<b><math>U_e</math></b>	200VAC to 480VAC	
<b>Rated Operational Current</b>	<b><math>I_e</math></b>	See Electrical Specifications table	
<b>Rating Index</b>		SR55-017 to -180	$I_e$ : AC-53a: 3.5-17: 90-5
		SR55-242 to -477	$I_e$ : AC-53a: 3.5-17: 90-3
<b>Rated Frequency</b>		50 to 60Hz	
<b>Rated Duty</b>		Uninterrupted	
<b>IEC 60947-4-2 Form Designation</b>		Form 1 internally bypassed	
<b>Rated Insulation Voltage</b>	<b><math>U_i</math></b>	480V	
<b>Rated Impulse Withstand Voltage</b>	<b><math>U_{imp}</math></b>	Main circuit	4kV
		Control supply circuit	2.5 kV
<b>IP Code</b>		Main AC line/load circuit	IP00 (IP20 with optional finger guards SR55-FG-x)
		Supply and control circuit	IP20
<b>Pollution Degree</b>		2	
<b>Rated conditional short-circuit current and type of coordination with associated short-circuit protective device (SCPD).</b>		Type 1 coordination. See short-circuit protection table for rated conditional short-circuit current and required current rating and characteristics of the associated SCPD.	
<b>Rated Control Circuit Voltage (programmable)</b>	<b><math>U_C</math></b>	24VDC, 110VAC or 230VAC	Protect with 4A UL Listed fuse
<b>Rated Control Supply Voltage</b>	<b><math>U_S</math></b>	See Electrical Specifications table	
<b>Relay Specification</b>		AC-15 230VAC, 1A	
		DC-13 30VDC, 0.7A	
<b>EMC Emission Levels</b>	<b>EN 55011</b>	Class A	
<b>EMC Immunity Levels</b>	<b>IEC 61000-4-2</b>	8kV/air discharge or 4kV/contact discharge	
	<b>IEC 61000-4-3</b>	10 V/m	
	<b>IEC 61000-4-4</b>	2kV/5kHz (main power and ports)	
		1kV/5kHz (signal ports)	
	<b>IEC 61000-4-5</b>	2kV line-to-ground	
		1kV line-to-line	
	<b>IEC 61000-4-6</b>	10V	

**ELECTRICAL SPECIFICATIONS**

ELECTRICAL SPECIFICATIONS – SR55 Series Full-Featured Soft Starters									
Model	SR55 -017	SR55 -021	SR55 -027	SR55 -034	SR55 -040	SR55 -052	SR55 -065	SR55 -077	SR55 -096
Frame Size	1								
Rated Current [UL FLC] (A)	17	21	27	34	40	52	65	77	96
Rated Operational Voltage	200VAC to 480VAC								
Motor Rating @ 200V (hp)	3	5	7.5	10	10	15	20	20	30
Motor Rating @ 208V (hp)	5	5	7.5	10	10	15	20	25	30
Motor Rating @ 230V (hp)	5	5	7.5	10	10	15	20	25	30
Motor Rating @ 460V (hp)	10	15	20	25	30	40	50	60	75
Trip Class	programmable 10 to 30								
Index Rating [per IEC 60947-4-2]	I <sub>e</sub> : AC-53a: 3.5–17: 90–5								
Impulse Withstand Voltage	4kV								
Insulation Voltage Rating	480V								
Short-Circuit Current Rating (type 1)	5kA							10kA	
Control Power Consumption	60W inrush to latch internal bypass relays; 4W steady state								
Control Voltage Range	24VDC +10%-15% or 110–230 VAC +10%-15%								
Control Fuse (external)	4A								
Control Inputs	(3) DI @ 24VDC, 110VAC, or 230 VAC; (1) PTC Thermistor; (1) AI @ 0–10VDC 10mA max or 4–20mA								
Control Outputs	(3) N/O relay and (1) N/C relay @ 30VDC 0.5A / 230VAC 1A resistive; (1) AO @ 0–10VDC 10mA max or 4–20mA								
Start Time Setting Range	1 to 300 seconds								
Start Voltage Setting Range	10% to 100%								
Stop Time Setting Range	0 to 300 seconds								
Model	SR55 -124	SR55 -156	SR55 -180	SR55 -242	SR55 -302	SR55 -361	SR55 -414	SR55-477	
Frame Size	2			3					
Rated Current [UL FLC] (A)	124	156	180	242	302	361	414	477	
Rated Operational Voltage	200VAC to 480VAC								
Motor Rating @ 200V (hp)	40	50	60	75	100	125	150	150	
Motor Rating @ 208V (hp)	40	50	60	75	100	125	150	150	
Motor Rating @ 230V (hp)	40	60	60	75	100	150	150	150	
Motor Rating @ 460V (hp)	100	125	150	200	250	300	350	400	
Trip Class	programmable 10 to 30								
Index Rating [per IEC 60947-4-2]	I <sub>e</sub> : AC-53a: 3.5–17: 90–5			I <sub>e</sub> : AC-53a: 3.5–17: 90–3					
Impulse Withstand Voltage	4kV								
Insulation Voltage Rating	480V								
Short-Circuit Current Rating (type 1)	10kA			18kA					
Control Power Consumption	60W inrush to latch internal bypass relays; 4W steady state						120W inrush; 4W steady state		
Control Voltage Range	24VDC +10%-15% or 110–230 VAC +10%-15%						110VAC +10%-15%		
Control Fuse (external)	4A								
Control Inputs	(3) DI @ 24VDC, 110VAC, or 230 VAC; (1) PTC Thermistor; (1) AI @ 0–10VDC 10mA max or 4–20mA								
Control Outputs	(3) N/O relay and (1) N/C relay @ 30VDC 0.5A / 230VAC 1A resistive; (1) AO @ 0–10VDC 10mA max or 4–20mA								
Start Time Setting Range	1 to 300 seconds								
Start Voltage Setting Range	10% to 100%								
Stop Time Setting Range	0 to 300 seconds								

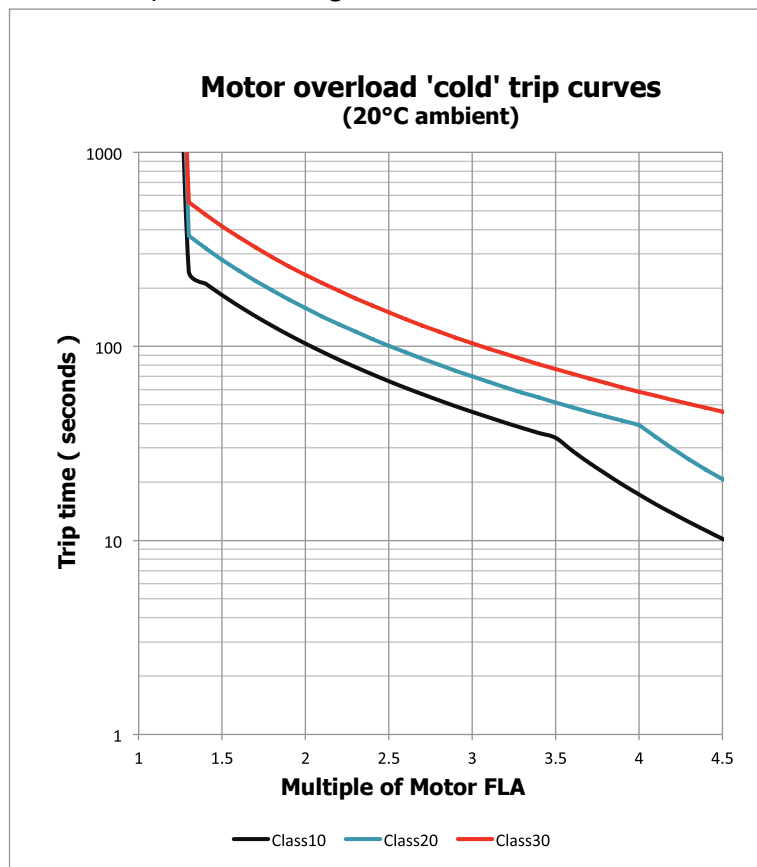
## CIRCUIT PROTECTION

## SHORT-CIRCUIT PROTECTION


External Short-Circuit Protection Required for SR55											
SR55 Model Number			SR55 -017	SR55 -021	SR55 -027	SR55 -034	SR55 -040	SR55 -052	SR55 -065	SR55 -077	SR55 -096
Rated Operational Current	UL FLC	(A)	17	21	27	34	40	52	65	77	96
	IEC I <sub>e</sub>	(A)	17	22	29	35	41	55	66	80	100
Semiconductor Fuse (class aR) #1	Type		Mersen 6,9 URD 30xx Bussmann 170M30xx Bussmann 170M31xx Bussmann 170M32xx SIBA 20 61xx								
	Rating	(A)	100	100	160	160	160	200	200	250	315
Class J High-Speed Current-Limiting Fuse #2	Rating Z <sub>1</sub>	(A)	30	45	60	70	90	110	125	150	175
Class J Time-Delay Fuse #3	Rating Z <sub>2</sub>	(A)	30	40	50	60	70	100	125	150	175
UL Listed Inverse Time- Delay Circuit Breaker #3	Rating Z <sub>3</sub>	(A)	60	60	60	60	60	150	150	250	300
Rated Conditional Short- Circuit Current	I <sub>q</sub>	(kA)	5							10	
SR55 Model Number			SR55 -124	SR55 -156	SR55 -180	SR55 -242	SR55 -302	SR55 -361	SR55 -414	SR55 -477	–
Rated Operational Current	UL FLC	(A)	124	156	180	242	302	361	414	477	–
	IEC I <sub>e</sub>	(A)	132	160	195	242	302	361	430	500	
Semiconductor Fuse (class aR) #1	Type		Mersen 6,9 URD 31xx Bussmann 170M40xx Bussmann 170M41xx Bussmann 170M42xx SIBA 20 61xx			Mersen 6,9 URD 33xx Bussmann 170M60xx Bussmann 170M61xx Bussmann 170M62xx SIBA 20 63xx					
	Rating	(A)	400	550	550	700	800	900	1000	1100	
Class J High-Speed Current-Limiting Fuse #2	Rating Z <sub>1</sub>		250	350	400	500	600	600	n/a		
Class J Time-Delay Fuse #3	Rating Z <sub>2</sub>	(A)	225	300	350	450	500	500	600	600	
UL Listed Inverse Time- Delay Circuit Breaker #3	Rating Z <sub>3</sub>	(A)	350	450	500	700	800	1000	1000	1000	
Rated Conditional Short- Circuit Current	I <sub>q</sub>	(kA)	10			18					
#1 Correctly selected semiconductor fuses can provide additional protection against damage to the SR55 unit (this is sometimes referred to as type 2 coordination). These semiconductor fuses are recommended to provide this increased protection.											
#2 Suitable for use in a circuit capable of delivering not more than I <sub>q</sub> rms Symmetrical Amperes, when protected by Class J high-speed current-limiting 600V rated fuses with a maximum trip rating of Z <sub>1</sub> (IEC Type 1 coordination short-circuit protection).											
#3 Suitable for use in a circuit capable of delivering not more than I <sub>q</sub> rms Symmetrical Amperes, 480 Volts maximum, when protected by Class J time-delay fuses with a maximum rating of Z <sub>2</sub> , or by a circuit breaker with an interrupting rating not less than Z <sub>3</sub> rms Symmetrical Amperes, 480 Volts maximum as in table.											

### MOTOR OVERLOAD PROTECTION

The SR55 soft starter provides full motor overload protection, which can be configured through the touch screen. Overload trip settings are determined by the Motor Current setting and the Trip Class setting. Trip class choices are Class 10, Class 20, and Class 30. The SR55 soft starters are protected using full I<sup>2</sup>T motor overload with memory.





























### WIRE SIZES AND TORQUES

SR55 Wire Sizes and Torques						
Terminal		Models	Wire Size		Torque	
			mm <sup>2</sup>	AWG	N·m	lb·in
Main Terminals Cu STR 75°C Only	Terminal	SR55-017 to SR55-096	2.5–70	12–2/0	9	80
		SR55-124 to SR55-180	4–185	12–350 MCM		
	M10 bolt	SR55-242 to SR55-361	2 x 95	2 x 2/0	14	123
		SR55-414 to SR55-477	2 x 150	2 x 350 MCM		
Control Terminals		all models	0.2–1.5	24–16	0.5	4.5
 Protective Ground * Cu Only	M6 stud	SR55-017	≥ 4	≥ 12	8	70
		SR55-021 to SR55-052	≥ 6	≥ 10		
		SR55-065 to SR55-096	≥ 10	≥ 8		
	M8 stud	SR55-124 to SR55-180	≥ 16	≥ 6	12	105
		SR55-242	≥ 25	≥ 4		
		SR55-302 to SR55-361	≥ 35	≥ 3		
		SR55-414 to SR55-477	≥ 35	≥ 2		

\* Protective Ground wire size based on bonding conductor requirements of UL508 and UL508A

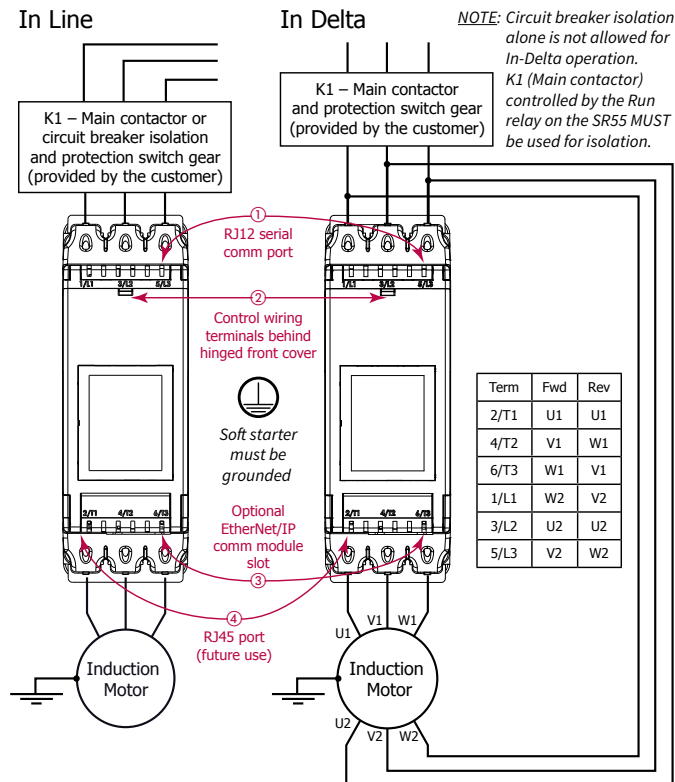
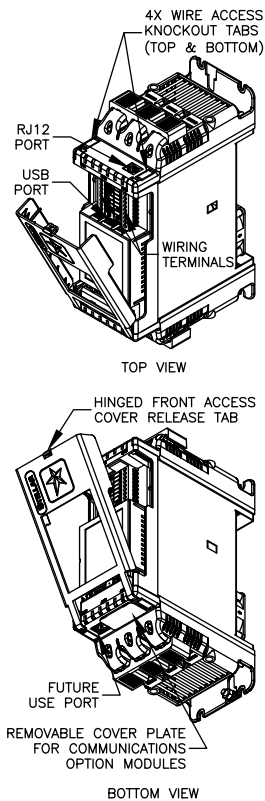
\* Protective Ground wire size based on bonding conductor requirements of UL508 and UL508A

## ELECTRICAL CONNECTIONS

	Required Rating	Pro-gram-mable	Default	Descrip-tion	Control Terminals				Descrip-tion	Default	Pro-gram-mable	Required Rating	
#1	–	–	–	group 1 input common		D1COM	11		group 1 relay common	–	–	–	–
#1	24VDC or 110VAC or 230VAC +10% -15%	yes	start / stop	opto-coupled input		D1-1I	12		relay N/C	fault	yes	230VAC 1A AC15; 30VDC 0.5A Resistive	–
#1	24VDC or 110VAC or 230VAC +10% -15%	yes	none	opto-coupled input		D1-2I	24		relay N/O	fault	yes	230VAC 1A AC15; 30VDC 0.5A Resistive	–
#2	–	–	–	group 2 input common		D2COM	33		group 2 relay common	–	–	–	–
#2	24VDC or 110VAC or 230VAC +10% -15%	yes	reset	opto-coupled input		D2-1I	34		relay N/O	running	yes	230VAC 1A AC15; 30VDC 0.5A Resistive	–
–	–	–	–	not used			44		relay N/O	end of start	yes	230VAC 1A AC15; 30VDC 0.5A Resistive	–
–	3 x PTC in series (130°C)	–	OFF	thermistor		PTC+	AO		analog output	0–10V	yes	0 to 10V 10mA / 4–20mA	–
–	3 x PTC in series (130°C)	–	OFF	thermistor		PTC–	ACOM		analog 0V	–	–	0V	–
–	–	–	–	signal ground			AI		analog input	0–10V	yes	0 to 10V 10mA / 4–20mA	–
#3	110VAC–230VAC +10% -15%	–	–	control supply		N	0VDC		0V input	–	–	0V	#3
#3	110VAC–230VAC +10% -15%	–	–	control supply		L	24VDC		24V input	–	–	24VDC +10% -15%	#3
* 24VDC Specification: 24VDC 60W; Residual ripple 100mV; Spikes/switching Peaks 240mV; Turn On/Off response; No overshoot of V out; Overvoltage voltage protection output voltage must be clamped to <30Vdc													
													
#1	The programmed digital input setting on D1COM, D1-1I, D1-2I <u>must</u> correspond to the voltage applied to these terminals to avoid risk of damage to the equipment.												
#2	The programmed digital input setting on D2COM, D2-1I <u>must</u> correspond to the voltage applied to these terminals to avoid risk of damage to the equipment.												
#3	The control supply can be 110 to 230VAC applied to the N, L terminals or 24VDC applied to the 0VDC, 24V input terminals. The correct voltage as specified must only be applied to one of these supply inputs to avoid risk of damage to the equipment.												

## ELECTRICAL WIRING

### POWER CIRCUIT WIRING



For wire size and torque requirements, refer to the “Wire Sizes and Torques” section of this chapter.



FOR SUITABLE SHORT-CIRCUIT PROTECTION DEVICES (SCPDs), REFER TO THE “CIRCUIT PROTECTION” SECTION OF THIS CHAPTER.



**IN DELTA WIRING:** FOR THIS CONFIGURATION, APPLYING THE FOLLOWING EQUATION ALLOWS THE USE OF A LOWER CURRENT-RATED SR55 THAN THE MOTOR FLC:  $SR55\ I_e = I_e\ (MOTOR) / \sqrt{3}$ .

WHEN IN-DELTA CONFIGURATION IS USED, A LINE CONTACTOR CONTROLLED BY THE SR55 MUST BE USED WITH THE IN-DELTA FIRING MODE SELECTED IN THE ADVANCED MENU.

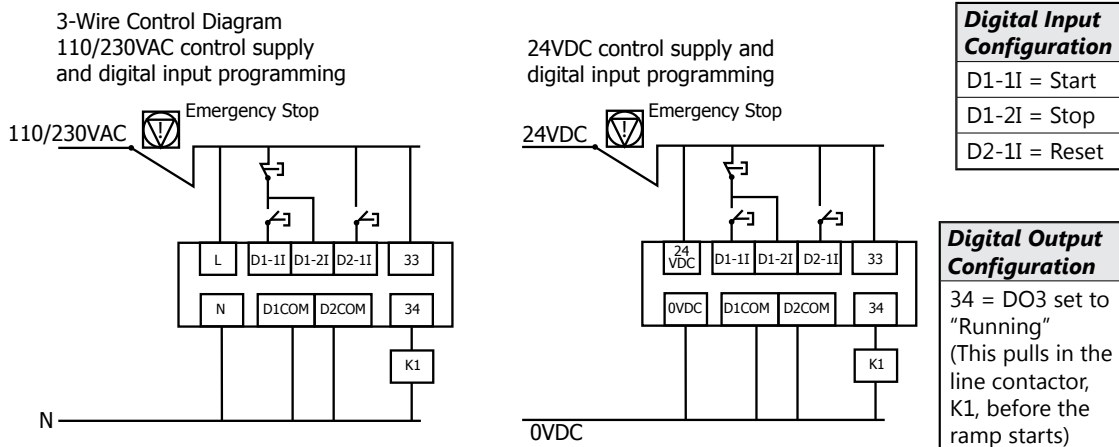
THE SR55 STARTER DOES NOT OFFER IERS OPTIMIZATION WHEN CONNECTED IN-DELTA.



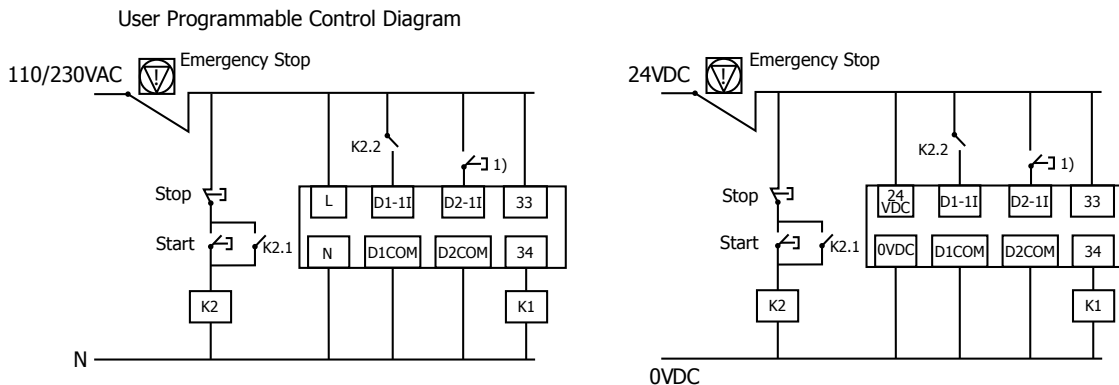
DO NOT PLACE BYPASS CONTACTORS AROUND THE STARTER. THE STARTER HAS BUILT IN BYPASS CONTACTORS. IF AN EXTERNAL BYPASS CONTACTOR IS DESIRED IN ORDER TO ALLOW EMERGENCY ACROSS THE LINE STARTING IN CASE OF AN SR55 FAILURE, THEN THE LOAD SIDE OF THE STARTER WIRING MUST BE DISCONNECTED IN ORDER TO PROTECT THE STARTER.

**CONTROL CIRCUIT WIRING**

- 1) THE PROGRAMMED DIGITAL INPUT SETTINGS FOR D1COM, D1-1I, D1-2I, AND D2COM, D2-1I MUST CORRESPOND TO THE VOLTAGE APPLIED TO THESE TERMINALS TO AVOID RISK OF DAMAGE TO THE EQUIPMENT.
- 2) THE CONTROL SUPPLY CAN BE 110 TO 230VAC APPLIED TO THE N, L TERMINALS OR 24VDC APPLIED TO THE 0VDC, 24V INPUT TERMINALS. THE CORRECT VOLTAGE AS SPECIFIED MUST ONLY BE APPLIED TO ONE OF THESE SUPPLY INPUTS TO AVOID RISK OF DAMAGE TO THE EQUIPMENT.

**THREE-WIRE CONTROL**

**POWER FACTOR CORRECTION CAPACITORS\* MUST NOT BE POSITIONED BETWEEN THE SOFT STARTER AND THE MOTOR, OR THERE IS A RISK OF DAMAGING THE THYRISTORS DUE TO CURRENT PEAKS.**

**USER-PROGRAMMABLE CONTROL**

- 1) Optional high reset. If this reset is required, ensure that "User Programmable" is selected as the control method menu found in the Digital Inputs menu. If you would prefer the reset to work by removing and reapplying the Start Signal on D1-1I then select "Two wire control" in the control method menu.

Digital Input Configuration	
D1-1I = High Start / Low Stop	
D1-2I = None	
D2-1I = High Reset	

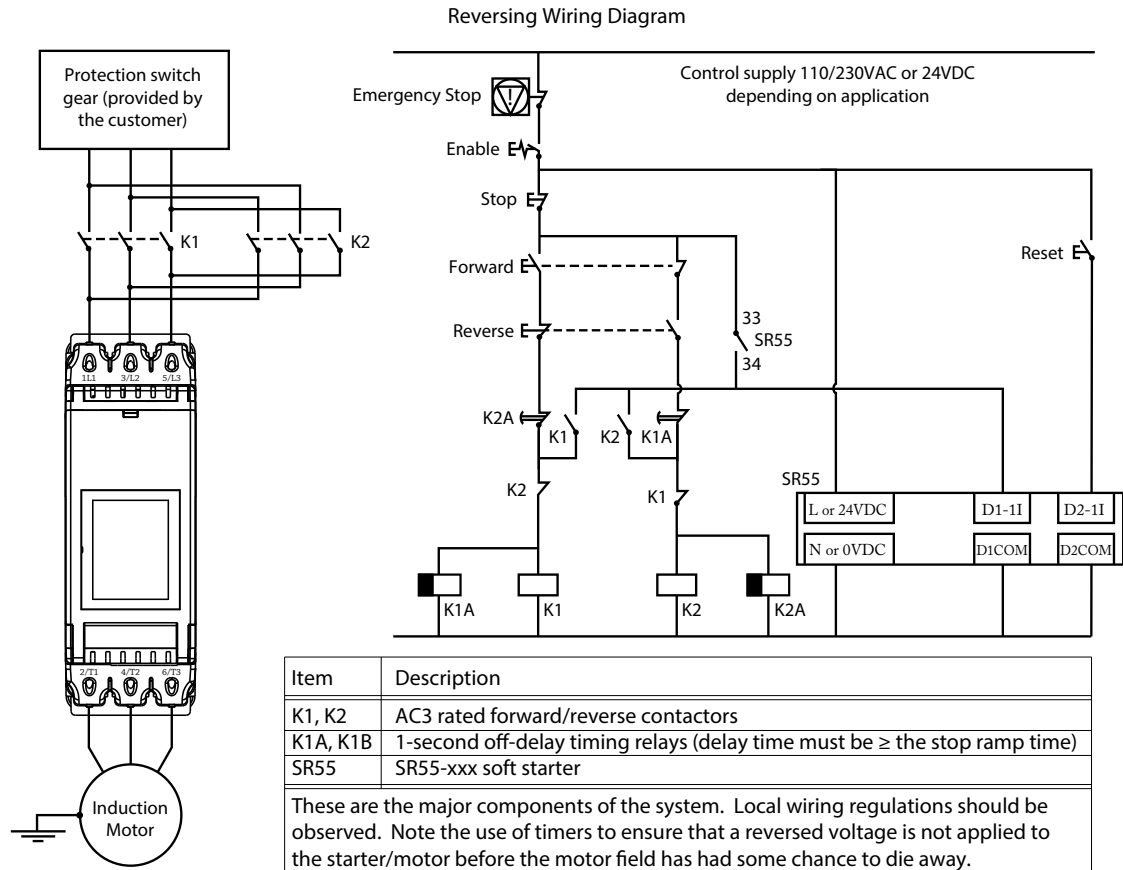
Digital Output Configuration	
34 = DO3 set to "Running"	
(This pulls in the line contactor, K1, before the ramp starts)	



**\*Note:** Power factor correction capacitors (PFCs) can reduce a facility's kVAR charges in some cases. Determining the need for, and location of, PFCs should be performed by a qualified engineer (from your utility company or a power quality engineering firm). PFCs cannot be located between the SR55 and the motor.



## REVERSING WIRING DIAGRAM



*Note: Forward and reverse buttons must remain pressed for longer than timer change over period.*

- "Stop" must be pressed before direction reversal can be initiated.
- Digital Output 3 must be configured to "Running."
- Digital Input 1 must be configured to "High Start / Low Stop."
- Digital Input 2 must be configured to "Reset."

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