Stellar® SR33 Series Basic Soft Starters

Overview

SR33 semi-conductor soft starters provide many advantages when used instead of electro-mechanical contactors to control 3-phase AC induction motors. The SR33 soft starters use thyristors for controlled reduced voltage motor starting and stopping, then switch to internal contacts for efficient running at rated speed.

Designed to fit in place of existing wye-delta starters.

Features

- • 15.5–350A @ 208-230/460 VAC
- • 24 VDC or 115 VAC I/O
- • 24 VDC control power required
- • Two-phase control
- • Internal bypass contacts for Run
- • Easily and separately adjustable motor start voltage and start and stop times
- • Suitable for a wide variety of motor loads
- • Can replace wye/delta starters
- • Fault indication of 4 or 7 fault types, depending upon model: SCR or Power Supply, Overheat, Control Power Supply, Bypass Relay Failure, Shearpin, Overload, Overcurrent
- • IP20 (SR33-22 to SR33-97) IP00 (SR33-132 to SR33-482) panel mount
- • Two-year warranty

Advantages

Mechanical Advantages
- • Smooth acceleration; reduced mechanical shock and starting stress
- • Extend lifespan of mechanical drive train components
- • Fluid couplings and some clutches can be eliminated

Electrical Advantages
- • Reduces starting currents and spikes
- • Reduces high transient currents
- • More motors or larger motors can be started from lower-capacity power sources
- • Allows motors to be started more frequently
- • Internal mechanical contacts open and close under reduced current, increasing lifespan and reliability

Economic Advantages
- • Lower overall costs for new installations
- • Reduced maintenance and replacement of mechanical drive train components
- • Reduced starting current reduces electrical power costs

Standards & Approvals

- • • CE
- • • REACH
- • • RoHS
- • • UL listed* (E333109) * (soft starters SR33-350 to SR33-482 are not UL listed or recognized)

Accessories

- • Heat-shrink insulation kit SR33-HS1 (required for soft starters SR33-132 to SR33-280 used in UL applications)

Applications

- • General purpose applications where traditional across-the-line starting or wye-delta starting would typically be appropriate.

SR33-66 to SR33-97

SR33-22 to SR33-55

SR33-132 to SR33-195

SR33-241 to SR33-482

Stellar® SR33 Series Basic Soft Starters

SR33 Soft Starter Technical Specifications

SR33 Series Basic Soft Starters – 22A-482A * – Model-Specific Specifications and Features							
Model	**SR33-22**	**SR33-29**	**SR33-41**	**SR33-55**	**SR33-66**	**SR33-80**	**SR33-97**
Price							
* Rated Current [class 10 starting] (A)	15.5	22	29	41	55	66	72
* Motor Rating	Refer to selection table. Starters must be sized according to HP and **starting class**.						
** Short Circuit Current Rating (Type 1)	5kA for SR33-22 to SR33-55; 10kA for SR33-66 to SR33-195; 18kA for SR33-241 to SR33-482						
Steady State Power Loss (W)	6	10	12	15	17	20	24
Control Power Supply Required Output Capacity	approx 4VA						
Overload Trip	n/a						
Terminals: Power / Ground	wire clamp terminals / M6				wire clamp terminals / M8		
Design Standards	UL508 Industrial Control Equipment; EN/IEC 60947-4-2 "AC Semiconductor Motor Controllers and Starters"						
Environmental Rating	IP20						
Product Weight (kg [lb])	2.3 [5.1]				3.5 [7.75]		

Model	**SR33-132**	**SR33-160**	**SR33-195**	**SR33-241**	**SR33-280**	**SR33-350**	**SR33-430**	**SR33-482**
Price		5.00	8.00	1.00	3.00	3.00	4.00	0.00
* Rated Current [class 10 starting] (A)	97	116	132	160	195	230	280	350
* Motor Rating	Refer to selection table. Starters must be sized according to HP and **starting class**.							
** Short Circuit Current Rating (type 1)	5kA for SR33-22 to SR33-55; 10kA for SR33-66 to SR33-195; 18kA for SR33-241 to SR33-482							
Steady State Power Loss (W)	35	42	52	60	69	83	104	121
Control Power Supply Required Output Capacity	approx 12VA, capable of 4A for 250ms							
Overload Trip	n/a			Single-phase sensing; Non-adjustable; (refer to O/L trip curve)				
Terminals: Power / Ground	external busbars / M8			external busbars / M10				
Design Standards	UL508 Industrial Control Equipment					n/a		
	EN/IEC 60947-4-2 "AC Semiconductor Motor Controllers and Starters"							
Environmental Rating	IP00							
Product Weight (kg [lb])	4.3 [9.5]			9.7 [21.4]			13.5 [29.8]	

* Important: Care must be taken to select the correct SR33 for the application to ensure that the SR33 is not undersized. Refer to Selection Tables or to online selection tool for deratings by application and overload trip class (https://_____/selectors/softstarters).

** When protected by recommended semiconductor fuse.

SR33 Series Basic Soft Starters – General Specifications and Features	
Models	**All Models** **(SR33 -22, -29, -41, -55, -66, -80, -97, -132, -160, -195, -241, -280, -350, -430, -482)**
Rated Operational Voltage / Frequency	230–460VAC rms 3-phase (-15% +10%) / 50–60Hz +/- 2Hz; Form Designation = Form 1
Impulse Withstand Voltage	4kV
Insulation Voltage Rating	500V (IEC standard insulation rating. Actual testing proves insulation withstand capacity beyond 460V+10%)
Control Power Supply General Requirements	24VDC supplied externally to terminals X1-X2; Residual Ripple: 100mV; Spikes/Switching Peaks: 240mV; Turn On/Off Response: No overshoot of V_{out}; Output voltage must be clamped to < 30V
Control Input (Start/Stop)	24V DC/110V AC galvanically isolated terminals A1-A2 (1mA @ 24V DC; 3mA @ 110V AC; not suitable for use with PLC triac output)
Control Relay Outputs	230VAC, 3A, resistive; 230VAC, 1A, AC15; Run – 13/14; Ready – 23/24
Start Time Setting Range	0 to 30 seconds
Start Voltage Setting Range	30 to 100 percent
Stop Time Setting Range	0 to 30 seconds
Start Duty	S1 per IEC 34-1 & VDE0530 Part 1. 3 x FLC for 10 seconds @ standard rating (Class 10, 40°C [104°F]).
Starts / Hour	SR33-22 to SR33-195L: 5 starts per hour; SR33-241 to SR33-482: 3starts per hour
Indication	Multi function LED on front panel
Ambient Operating Temperature	0 to 40 °C [32 to 104 °F] − Above 40°C [104 °F] derate linearly by 2% of unit FLC per °C to a max derate of 40% at 60°C [140 °F] (Derating not UL. Refer to separate UL Ratings and Protection Requirements)
Transportation & Storage Temperature	-25 to 60 °C [-13 to 140 °F]
Humidity	max 85% non-condensing, not exceeding 50% at 40°C [104°F]
Altitude	1000m [3281 ft]. Above 1000m de-rate linearly by 1% of unit FLC per 100m to a max altitude of 2000m [6562 ft].
Pollution Degree	For use in a Pollution Degree 2 environment; No corrosive gases

Stellar® SR33 Series Basic Soft Starters

SR33 Soft Starter Accessory

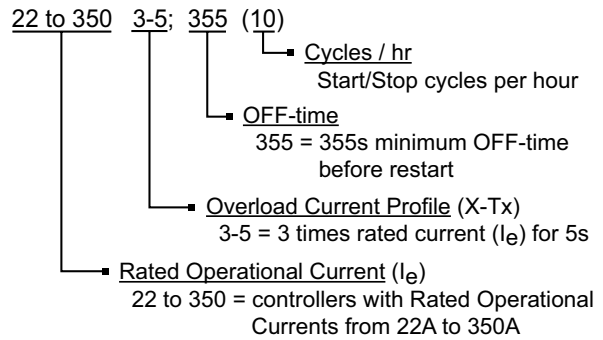| SR33 Series Basic Soft Starters – Accessory			
Part Number	**Name**	**Price**	**Description**
SR33-HS1	Insulation Kit		Heat-shrink insulation required for soft starters SR33-132 to SR33-280 used in UL applications. Can also be used with SR33-350 to SR33-482.

SR33 Soft Starter Index Ratings

SR33 Index Ratings – AC-53b (Bypassed Operation) *			
Trip Class	**X-Tx; OFF-time**	**I_e (A)**	**Model #**
10	3-23; 697 (5)	29 to 280	**SR33-29 to SR33-280**
	3-23; 1177 (3)	350 to 482	**SR33-350 to SR33-482**
20	4-19; 701 (5)	29 to 350	**SR33-29 to SR33-350**
	4-19; 1181 (3)	430 to 482	**SR33-430 to SR33-482**
30	4-29; 691 (5)	41 to 430	**SR33-41 to SR33-430**
	4-29; 1171 (3)	482	**SR33-482**
Index rating AC-53b is specified by IEC standard # 60947-4-2			

Index Rating Example - Bypassed Operation (AC-53b Utilization Category per IEC 60947-4-2)

- AC-53b = controller semiconductors provide squirrel-cage motor Start control only; bypassed for Run and Stop.
- IEC Index Ratings are comprised of Rated Operational Current (I_e), Utilization Category, Overload Current Profile (X-Tx), OFF-time.

22 to 350   3-5; 355 (10)

- **Cycles / hr**
  Start/Stop cycles per hour
- **OFF-time**
  355 = 355s minimum OFF-time before restart
- **Overload Current Profile (X-Tx)**
  3-5 = 3 times rated current (I_e) for 5s
- **Rated Operational Current (I_e)**
  22 to 350 = controllers with Rated Operational Currents from 22A to 350A

Stellar® SR33 Series Basic Soft Starters

SR33 Soft Starter Selection

SR33 Sizing Guide

The SR33 is designed for general purpose applications and where a traditional Wye/Delta is currently used (or considered appropriate). Generally the motor will start off-load, and the time to accelerate to full speed will be in the range of a few seconds.

The standard SR33 range is suitable for the majority of applications, and conforms to Trip Class 10, which means it is capable of withstanding three times Full Load Current for ≈10-second starts. However, there are instances where a different start profile is required. To satisfy these applications, the SR33 has two other ratings; Class 20 and Class 30.

These ratings correspond to IEC thermal/electronic overload trip classes, and the SR33 must be used with an overload protection device that has a rating corresponding to the Trip Class selected.

When using the selection tables to select the most appropriate SR33 model, please note the following:

• • The SR33 is not suitable for very high inertia loads, such as centrifuges or loaded crushers, with starts > 30 seconds.

• • 2-pole motors may take longer to start.

SR33 Soft Starters – Selection – Steps 1 & 2 (of 4)

	Typical Applications		
	Standard Duty	**Medium Duty**	**Heavy Duty**
Step 1: Select the application from the list and follow that column down.	Default Agitator Bow Thruster - Zero Pitch Compressor - Rotary Vane Compressor - Scroll Conveyor - Unloaded Fan - Low Inertia < 85A Feeder - screw Lathe machines Mixer - Unloaded Molding Machine Plastic and textile machines Pump - Submersible Centrifugal Pump - Submersible Rotodynamic Saw - Band Transformers, voltage regulators	Ball mill Bow Thruster - Loaded Compressor - Centrifugal Compressor - Reciprocating Compressor - Rotary Screw Conveyor - Loaded Grinder Hammer mill Mills - Flour, etc. Mixer - Loaded Pelletizers Pump - Positive displacement Reciprocating Pump - Positive displacement Rotary Pump Jack Rolling mill Roots Blower Saw - Circular Screen - Vibrating Tumblers	Centrifuge* *For centrifuges make selection at I(A) = motor FLA x 2.3 Crusher Fan - High Inertia > 85A Shredder Wood chipper Press, flywheel

Step 2: Confirm the rated starting capability of the soft start against the application.	Trip Class	10	20	30
	Rated Starting Capability	3x Motor Current - 23s	4x Motor Current - 19s	4x Motor Current - 29s
	Max Starts per Hour	SR33-29 to -280: 5 starts/hr SR33-350 to -482: 3 starts/hr	SR33-29 to -350: 5 starts/hr SR33-430 to -482: 3 starts/hr	SR33-41 to -430: 5 starts/hr SR33-482: 3 starts/hr
		Index Rating Standard (Class5) AC53b: 3-5: 355; Overcurrent = 3 x I_rated for 5 seconds		
		Warning: Applying more starts per hour than the specified 5 or 3 starts/hr will cause the starter to overheat and fail.		

SR33 Soft Starters – Selection – Step 3 (of 4)

Step 3: Consider the operating environment and make the model selection on a higher horsepower rating.

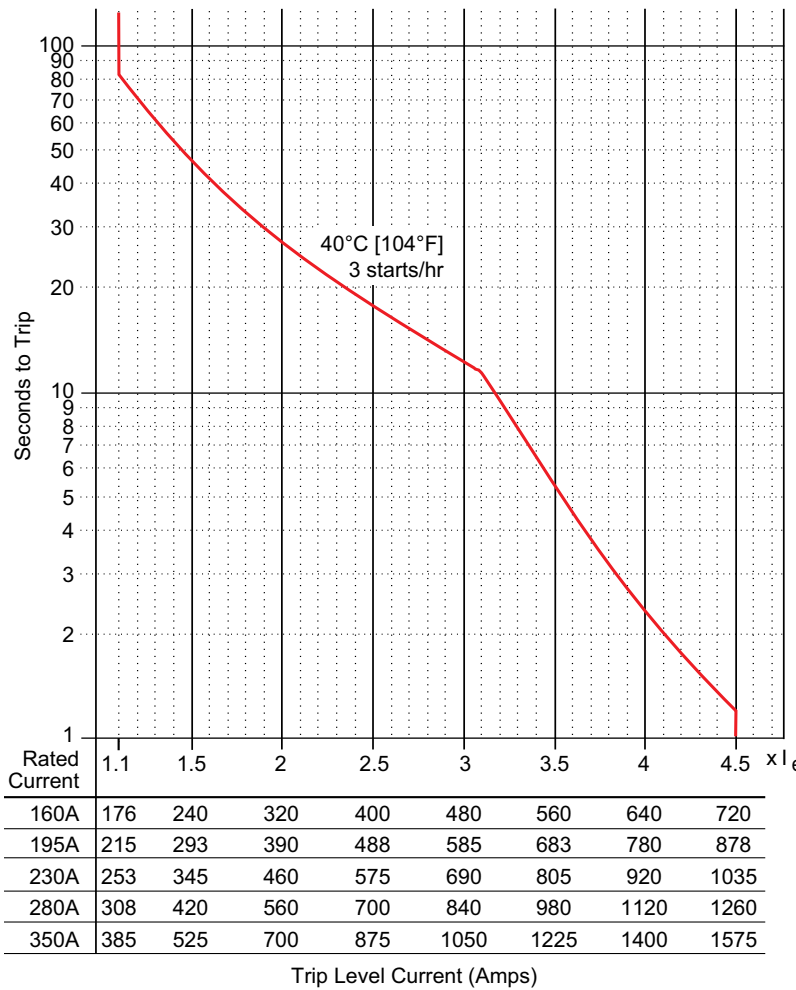| Height Above Sea Level	Standard operating height is 3280ft. For every 328ft, increase motor HP by 1%, up to 6600ft. Example: For a 100HP motor at 4900ft, make model selection based on 105HP (5% higher).
Operating Temperature	Standard operating temperature is 122°F. For every 1°F above, increase motor HP by 2.2%, up to 140°F. Example: For a 100HP motor at 132°F, make model selection based on 122HP (22% higher).
Increased Starts per Hour	Use our online tool to select the model: https:// /selectors/softstarters

SR33 Soft Starters – Selection – Step 4 (of 4)

Step 4: Select SR33 model based on your motor Voltage and Horsepower

Motor HP				Trip Class *		
230VAC		**460VAC**		**3-23:697**	**4-19:701**	**4-19:691**
HP	I_e (A)	HP	I_e (A)	**10**	**20**	**30**
–	–	–	–	5 start/hr		
5	15.5	10	15.5	SR33-22	SR33-29	SR33-29
7.5	22	15	22	SR33-29	SR33-29	SR33-41
10	29	20	29	SR33-41	SR33-41	SR33-55
10	34	25	34	SR33-41	SR33-55	SR33-66
15	41	30	41	SR33-55	SR33-66	SR33-97
20	55	40	55	SR33-66	SR33-97	SR33-132
20	66	50	66	SR33-80	SR33-132	SR33-132
30	80	60	80	SR33-132	SR33-132	SR33-160
30	97	75	97	SR33-132	SR33-160	SR33-195
50	132	100	132	SR33-195	SR33-241	SR33-280
60	160	125	160	SR33-241	SR33-280	SR33-350
75	195	150	195	SR33-280	SR33-350	SR33-430
–	–	–	–	3 start/hr		
75	241	200	241	SR33-350	SR33-430	SR33-482
100	280	200	280	SR33-430	SR33-482	–
125	350	250	350	SR33-482	–	–
250	361	300	361	SR33-482	–	–

* A separate overload protection device with a rating corresponding to the applicable trip class must be used with the SR33.

FOR MOTOR OVERLOAD PROTECTION, the SR33 MUST BE USED WITH A SEPARATE CUSTOMER-SUPPLIED OVERLOAD PROTECTION DEVICE THAT HAS A RATING CORRESPONDING TO THE APPLICABLE TRIP CLASS.

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SR33 Soft Starter Circuit Protection

40°C [104°F]
3 starts/hr

Seconds to Trip (y-axis): 100, 90, 80, 70, 60, 50, 40, 30, 20, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1

Rated Current	1.1	1.5	2	2.5	3	3.5	4	4.5	× I e
160A	176	240	320	400	480	560	640	720	
195A	215	293	390	488	585	683	780	878	
230A	253	345	460	575	690	805	920	1035	
280A	308	420	560	700	840	980	1120	1260	
350A	385	525	700	875	1050	1225	1400	1575	

Trip Level Current (Amps)

UL Short Circuit Protection **

SR33 Model Number *	Short Circuit Rating	Class J High-Speed or RK5 Time-Delay Current-Limiting Fuse *** Rated 600VAC	Circuit Breaker Rated 600VAC
SR33-22	5kA	35A	–
SR33-29	5kA	45A	–
SR33-41	5kA	60A	–
SR33-55	5kA	80A	–
SR33-66	10kA	125A	–
SR33-80	10kA	175A	–
SR33-97	10kA	200A	–
SR33-132	10kA	250A	350A
SR33-160	10kA	350A	450A
SR33-195	10kA	400A	500A
SR33-241	18kA	450A	–
SR33-280	18kA	450A	–

* Soft starters SR33-350 to SR33-482 are NOT UL listed or recognized.

** Suitable for use on a circuit capable of delivering not more than the RMS symmetrical Amperes as indicated at 480VAC maximum, when protected by fuses or inverse-time circuit breakers with rated maximum Amperes as indicated.

*** Fuse comparable to Edison type JHL (class J) or ECSR (class RK5).

The SR33 can be used at ratings other than those stated. Use the above trip curves to determine the required unit for the duty.

As an example, the SR33-280 will run a 150hp motor (195 Amp) at the maximum continuous running current and will allow an overload of 3 x 150 Amp (450A) for 12 seconds, 3 times per hour. The unit would also allow a 3.5 x overload (525A) for approximately 5½ seconds, 3 times per hour.

Following an overload trip, subsequent restarts need to be restricted due to a cooling time. The severity of overload determines the cooling time, which has a maximum value of 10 minutes.

THE SOFT STARTER OVERLOAD TRIP curve shown on this page applies only to model numbers SR33-241 through SR33-482, and it provides protection only for the SOFT STARTER. FOR MOTOR OVERLOAD PROTECTION, a separate customer-supplied OVERLOAD PROTECTION DEVICE must be provided.

RECOMMENDED FUSING
for IEC Type 1 Coordination Short Circuit Protection

| SR33 Model Number	Rated Short Circuit Current	SIBA Semiconductor Fuse	Class J High-Speed or RK5 Time-Delay Current-Limiting Fuse* Rated 600VAC	
			Amp	Edison JHL Part #
SR33-22	5kA	2018920.50A	35A	JHL35
SR33-29	5kA	2018920.100A	45A	JHL45
SR33-41	5kA	2018920.100A	60A	JHL60
SR33-55	5kA	2018920.125A	80A	JHL80
SR33-66	10kA	2018920.125A	125A	JHL125
SR33-80	10kA	2061032.200A	175A	JHL175
SR33-97	10kA	2061032.200A	200A	JHL200
SR33-132	10kA	2061032.250A	250A	JHL250
SR33-160	10kA	2061032.400A	350A	JHL350
SR33-195	10kA	2061032.400A	400A	JHL400
SR33-241	18kA	2062032.630	450A	JHL450
SR33-280	18kA	2062032.630	450A	JHL450
SR33-350	18kA	2063032.1000	–	
SR33-430	18kA	2063032.1000	–	
SR33-482	18kA	2063032.1000	–	

* Fuse comparable to Edison type JHL (class J) or ECSR (class RK5).

Stellar® SR33 Series Basic Soft Starters

| UL Maximum Surrounding Air Temperatures									
SR33 Model Number *	Maximum 40°C [104°F]		Maximum 50°C [122°F]		SR33 Model Number *	Maximum 40°C [104°F]		Maximum 50°C [122°F]	
	I (A)	HP @ 480V	I (A)	HP @ 480V		I (A)	HP @ 480V	I (A)	HP @ 480V
SR33-22	22	15	20	10	SR33-97	97	75	78	60
SR33-29	29	20	27	20	SR33-132	132	100	119	75
SR33-41	41	30	37	25	SR33-160	160	125	144	100
SR33-55	55	40	45	30	SR33-195	195	150	176	125
SR33-66	66	50	60	40	SR33-241	241	200	193	150
SR33-80	80	60	72	50	SR33-280	280	200	224	150

* Soft starters SR33-350 to SR33-482 are NOT UL listed or recognized.

SR33 Soft Starter Timing Diagram
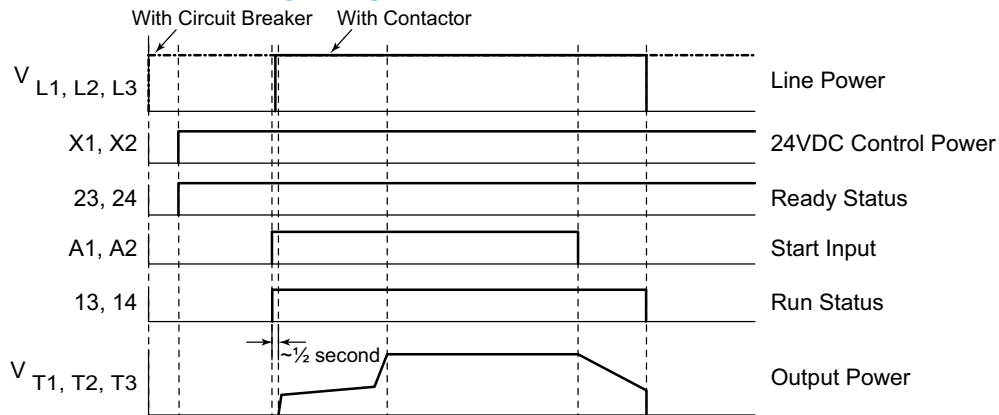
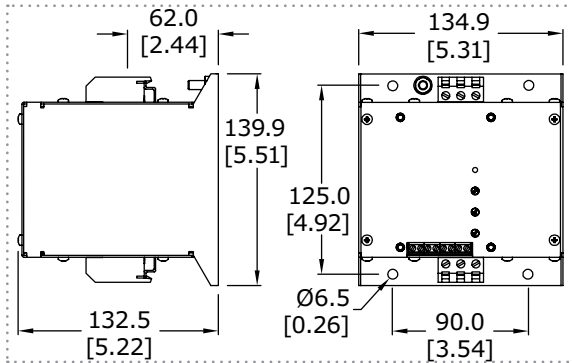## SR33 Soft Starter Standard Wiring Diagram

For complete wiring instructions, refer to the "SR33 Digital Soft Starters Quick-start Guide: Installation and Operation" included with the SR33 soft starter and available online at .
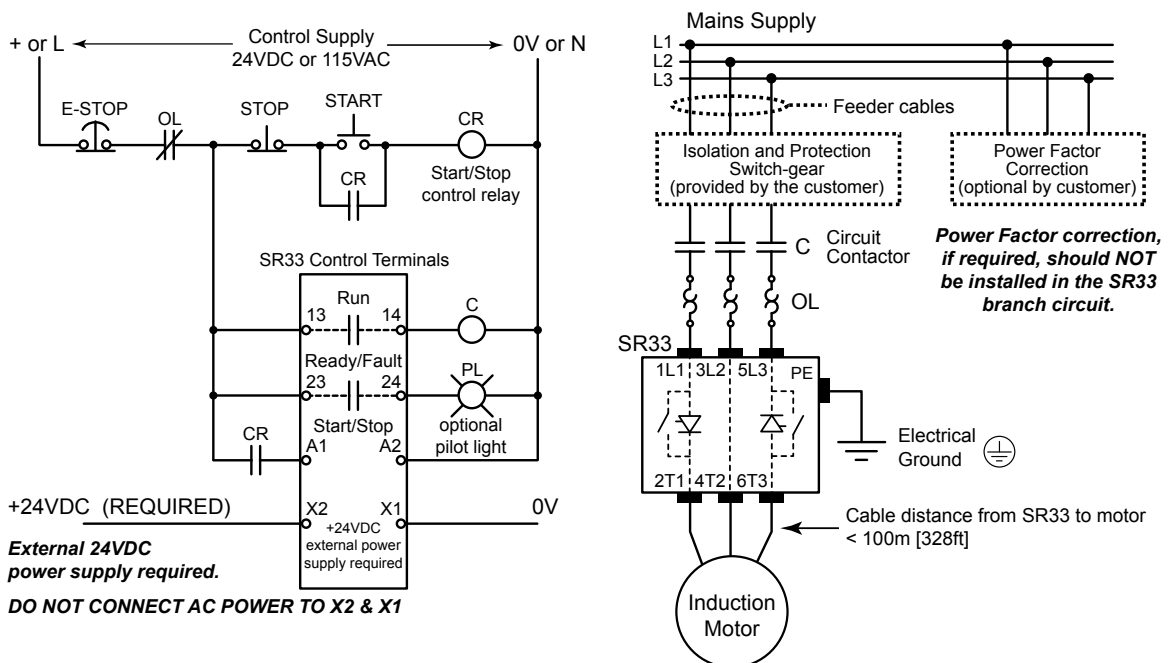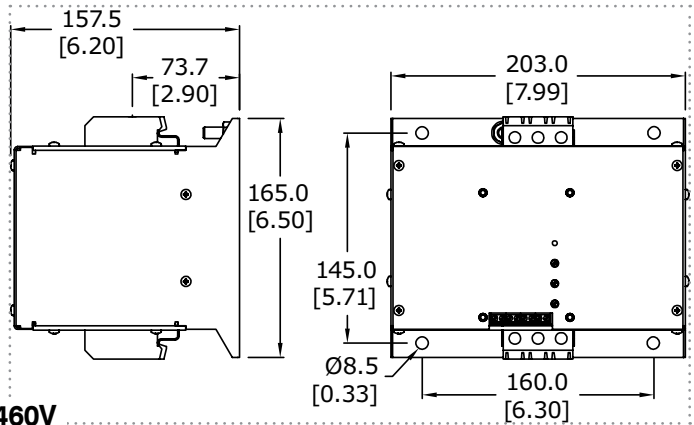
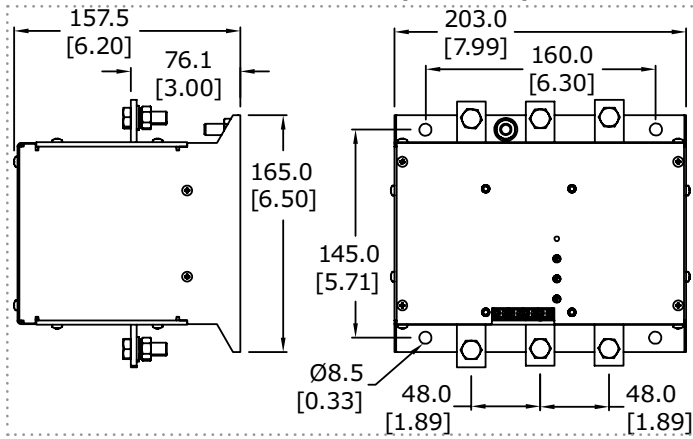# Stellar® SR33 Series Basic Soft Starters

SR33 Soft Starter Dimensions (mm [in])

SR33-22 to SR33-55 – 15hp to 40hp @ 460V

62.0 [2.44]
139.9 [5.51]
132.5 [5.22]
134.9 [5.31]
125.0 [4.92]
90.0 [3.54]
Ø6.5 [0.26]

SR33-66 to SR33-97 – 50hp to 75hp @ 460V

157.5 [6.20]
73.7 [2.90]
165.0 [6.50]
203.0 [7.99]
145.0 [5.71]
160.0 [6.30]
Ø8.5 [0.33]

SR33-132 to SR33-195 – 100hp to 150hp @ 460V

157.5 [6.20]
76.1 [3.00]
165.0 [6.50]
203.0 [7.99]
160.0 [6.30]
145.0 [5.71]
48.0 [1.89]
48.0 [1.89]
Ø8.5 [0.33]

SR33-241 to SR33-482 – 200hp to 400hp @ 460V

M8 CLEARANCE
M10 EARTH
204.0 [8.03]
160.0 [6.30]
320.0 [12.60]
300.0 [11.81]
296.5 [11.67]
55.0 [2.17]
55.0 [2.17]
198.6 [7.82]
104.0 [4.10]