

Stellar[®] SR22 Compact Soft Starters

Overview

SR22 semi-conductor soft starters provide many advantages when used instead of electro-mechanical contactors to control 1-phase (split phase, cap run, or cap start / cap run motor) and 3-phase AC induction motors. The SR22 soft starters use thyristors for controlled reduced voltage motor starting and stopping, then switch to internal contacts for efficient running at rated speed.

Features

- 3–22A @ 110-240V 1Ph or 208–460V 3Ph Class 10 starting
- 5–40A @ 110-240V 1Ph or 208–460V 3Ph (lightly loaded)
- 24 VDC control voltage
- Easily and separately adjustable motor start and stop times
- Two-phase control
- Internal bypass contacts for run
- 35mm DIN rail mounting
- Two standard-size widths: 45 & 55 mm
- Six error/trip indications: AC Supply, Control Supply, Overheated, Bypass Failure, Shear Pin, Overcurrent

Standards & Approvals

- CE
- RoHS
- UL listed* (E333109) *(optional fans are UL recognized: E132139, E77551, E89936)

Optional Accessories

Cooling fan (increases # of starts/hour)

Applications

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

Advantages

Mechanical Advantages

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

Electrical Advantages

- Reduced starting current
- 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



WARNING: NOT FOR USE WITH SINGLE PHASE, SHADED POLE MOTOR



SR22 Series Compact Soft Starters *											
Model		SR22-05	SR22-07	SR22-09	SR22-12	SR22-16	SR22-22	SR22-30	SR22-36	SR22-40	
Price		\$188.00	\$208.00	\$218.00	\$247.00	\$264.00	\$312.00	\$419.00	\$521.00	\$628.00	
*Rated Motor Current	std Class 10 starting	3A	4A	5A	6.5 A	9A	12A	16A	19A	22A	
	lightly loaded Class 2 starting	5A	7A	9A	12A	16A	22A	30A	36A	40A	
Rated Operational Voltage		110-240 VAC 1Ph or 208–460 VAC 3Ph (-15% +10%) @ 50–60 Hz (±2Hz); 3 phase (2 phases controlled)									
*Motor Rating		Starters must be sized according to HP AND starting class. Refer to selection tables or to online selection tool (https://www.automationdirect.com/selectors/softstarters).									
Impulse Withstand Voltage		2.5 kV									
Insulation Voltage Rating		500V									
Short Circuit Current Rating		5kA Type 1 when protected by recommended semiconductor fuses									
Control Power		approx 4VA @ 24 VDC (external power supply required) (UL applications require max 4A UL listed fuse)									
Control Inputs		galvanically isolated opto-coupled inputs; require sourcing +24 VDC (control)									
Auxiliary Relay Output		250 VAC: 2.5A resistive, 0.2A inductive / 30 VDC: 3.0A resistive, 0.7A inductive									
Start Time Setting Range		1–30 seconds									
Start Voltage Setting Range		30–100%									
Stop Time Setting Range		0–30 seconds									
Start Duty		3 x full load current for 10 seconds @ Trip Class 10									
Starts / Hour (standard)		5 starts / hr									
Starts / Hour (with optional fan)		[(30 starts / hr) + (30 soft stops / hr)] internally bypassed									
Ambient Operating Temperature		0–40 °C [32–104 °F] – Above 40 °C [104 °F] derate linearly by 2% of unit FLC per °C to a max derate of 40% @ 60 °C [140 °F] *** NOT UL TESTED ABOVE 40 °C ***									
Transportation & Storage Temperature		-25–60 °C [-13–140 °F]									
Humidity		max 85% non-condensing; not exceeding 50% @ 40 °C [104 °F]									
Altitude		1000m [3281 ft]; 1000–2000m [3281–6562 ft] derate 1% of unit FLC per 100–2000m [328–6562 ft]									
Environmental Rating		IP20									
Shipping Weight		400g [14 oz]			680g [24 oz]			725g [26 oz]			
Dimensions [HxWxD]		143 x 45 x 117.8 mm [5.63 x 1.77 x 4.64 in]					167.5 x 55 x 117.8 mm [6.59 x 2.17 x 4.64 in]				
Accessories											
Cooling Fan (temperature controlled)**		SR22-FAN-45					SR22-FAN-55				
Price		\$61.00					\$64.00				
Dimensions		does not add to soft starter overall dimensions					adds 10 mm [0.39 in] to soft starter H dimension				

* Important: Care must be taken to select the correct SR22 for the application to ensure that the SR22 is not undersized. Refer to Selection Tables or to online selection tool for deratings by application and overload trip class (<https://www.automationdirect.com/selectors/softstarters>).

** Cooling fans do not run continuously.

Stellar® SR22 Compact Soft Starters

SR22 Soft Starters – Selection									
Step 1: Select the application from the list and follow that column down.									
Typical applications	Standard Duty			Medium Duty			Heavy Duty	Light Duty	
	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	Unloaded / Lightly loaded motor			
Step 2: Confirm the rated starting capability of the soft start against the application.									
Trip Class	10			20			30	2	
Rated Starting Capability	3x Motor Current - 23s 3.5x Motor Current - 17s			4x Motor Current - 19s			4x Motor Current - 29s	3x Motor Current - 5s	
Max Starts per Hour	5 starts/hr (or 30 starts/hr with fan) 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 30 start/hr will cause the starter to overheat and fail.								
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://www.automationdirect.com/selectors/softstarters								
Step 4: Select SR22 model based on your motor Voltage and Horsepower (3Ph only; 1Ph on next page)									
Motor HP						Trip Class			
208VAC		230VAC		460VAC		3-23:697	4-19:701	4-19:691	3-5:355
HP	I_e (A)	HP	I_e (A)	HP	I_e (A)	10	20	30**	2***
0.5	2.4	0.5	2.2	1.5	3	SR22-05	SR22-07	SR22-09	SR22-05
0.75	3.5	0.75	3.2	2	3.4	SR22-07	SR22-09	SR22-12	SR22-05
1	4.6	1	4.2	3	4.8	SR22-09	SR22-12	SR22-16	SR22-05
1.5	6.6	2	6.8	3	4.8	SR22-12	SR22-16	SR22-22	SR22-07
2	7.5	3	9.6	5	7.6	SR22-16	SR22-22	SR22-30	SR22-12
3	10.6	3	9.6	7.5	11	SR22-22	SR22-36	SR22-40	SR22-12
3	10.6	5	15.2	10	14	SR22-30	SR22-40	SR22-40 w/fan	SR22-16
5	16.7	5	15.2	10	14	SR22-36	SR22-40	SR22-40 w/fan	SR22-22
5	16.7	7.5	22	15	21	SR22-40	SR22-40 w/fan	–	SR22-22
7.5	24.2	10	28	20	27	SR22-40 w/fan	–	–	SR22-30

* A separate overload protection device with a rating corresponding to the applicable trip class must be used with the SR22.

** The SR22 is not suitable for very high inertia loads such as centrifuges or loaded crushers with start times > 30s.

*** Do NOT use the Class 2 rating when there is a possibility of the motor starting under a heavy load.

Online Product Selection Tool:

<https://www.automationdirect.com/selectors/softstarters>

Stellar[®] SR22 Compact Soft Starters

SR22 Soft Starters – Selection (Cont'd)

Step 4: Select SR22 model based on your motor Voltage and Horsepower (1Ph only)

Motor HP				Trip Class			
110-120V		220-240V		3-23:697*	4-19:701*	4-29:691*	3-5:355**
HP	I _e (A)	HP	I _e (A)	10	20	30	2
-	-	-	1.2	SR22-05	SR22-05	SR22-05	SR22-05
-	-	0.1	1.6	SR22-05	SR22-05	SR22-07	SR22-05
-	-	0.12	1.9	SR22-05	SR22-05	SR22-07	SR22-05
-	2.4	0.16	2.3	SR22-05	SR22-07	SR22-09	SR22-05
0.1	3.3	0.25	2.9	SR22-07	SR22-09	SR22-12	SR22-05
0.12	3.8	0.33	3.9	SR22-09	SR22-12	SR22-16	SR22-05
0.16	4.5	0.5	-	SR22-09	SR22-12	SR22-16	SR22-05
0.25	5.8	-	5.5	SR22-12	SR22-16	SR22-22	SR22-07
-	-	0.75	-	SR22-12	SR22-16	SR22-22	SR22-07
0.33	7.9	1	7.3	SR22-16	SR22-22	SR22-30	SR22-09
0.5	11	1.5	10	SR22-22	SR22-36	SR22-40	SR22-12
0.75	-	2	13	SR22-30	SR22-40	SR22-40 w/fan	SR22-16
1	15	3	-	SR22-40	SR22-40 w/fan		SR22-22
1.5	21	-	19	SR22-40	SR22-40 w/fan		SR22-22
2	26	-	24	SR22-40 w/fan			SR22-30
-	-	5	27	SR22-40 w/fan			SR22-30
-	-	-	30	SR22-40 w/fan			SR22-30
3	37	-	-				SR22-40
-	-	7.5	41				SR22-40

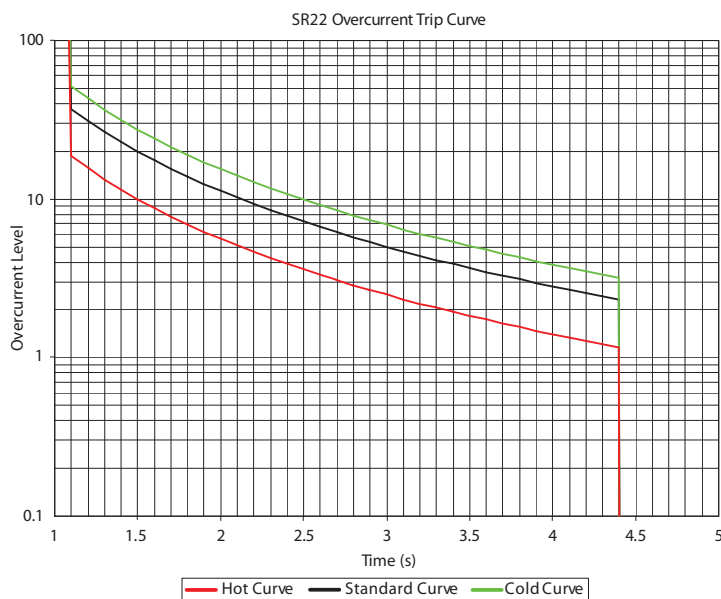
*5 starts/hour without fan; 30 starts/hour with fan
 **10 starts/hour without fan; 60 starts/hour with fan

Online Product Selection Tool:
<https://www.automationdirect.com/selectors/softstarters>

SR22 Max UL Overcurrent Protection

SR22 Internal Overcurrent Trip Curve

The internal overcurrent trip of the soft starter does not replace the required external overcurrent device.



Soft Starter Model Number	Maximum Non-Time-Delay Trip Rating *	
	Fuse * – Class J or T (600V rated)	Circuit Breaker * (600V rated)
SR22-05	15A	N/A
SR22-07	15A	
SR22-09	30A	
SR22-12	40A	
SR22-16	50A	80A
SR22-22	80A	
SR22-30	100A	100A
SR22-36	125A	125A
SR22-40	150A	150A

* Maximum trip ratings are for non-time-delay overcurrent protection devices.

* Motor branch circuit protection must be based on MOTOR Full Load Current, and must comply with applicable local electrical codes. The 2008 NEC section 430.52 recommends a maximum of 175% (up to 225% absolute maximum) of motor FLC for time-delay fuses. (Class CC time-delay fuses are permitted up to the non-time-delay fuse maximum rating.)

Stellar[®] SR22 Compact Soft Starters



45mm Stellar Compact Soft Starter

55mm Stellar Compact Soft Starter

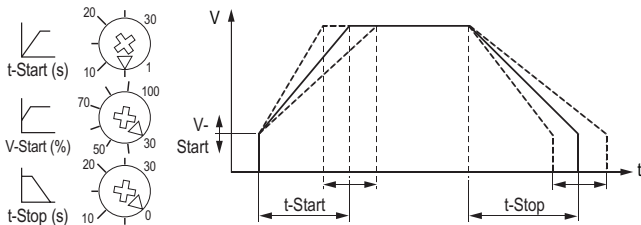


Cooling Fan for 45mm Soft Starters

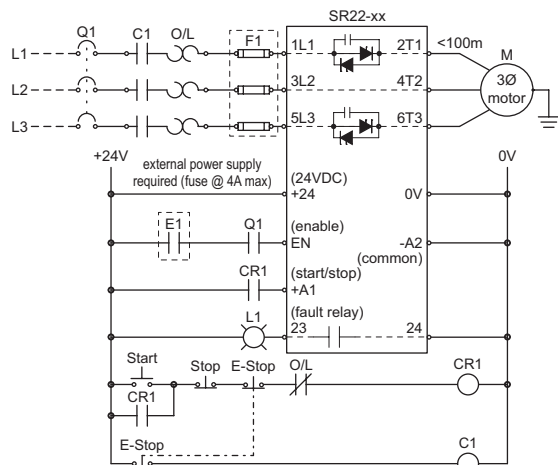


Cooling Fan for 55mm Soft Starters

SR22 Start/Stop Timing Diagram



SR22 Wiring Diagram

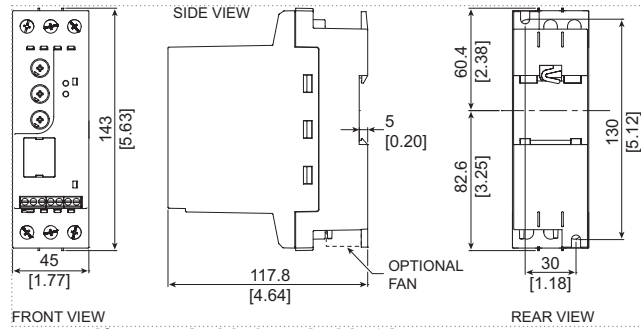


External Control Elements:

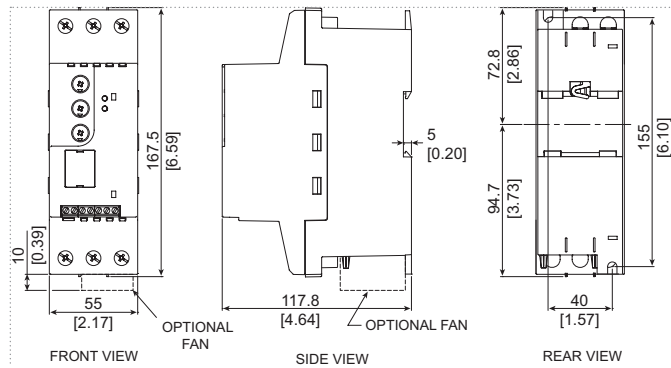
- C1 = E-Stop contactor
- CR1 = Start contactor
- E1 = Optional switch to allow trip reset without opening main breaker Q1
- F1 = Optional semiconductor fuse for Type 1 Coordination (in addition to Q1)
- O/L = Overload relay
- Q1 = Cable protection circuit breaker
- L1 = Indicator lamp: ON = Ready; OFF = Fault
- E-Stop/Start/Stop = E-Stop/Start/Stop pushbuttons

SR22 Dimensions

Dimensions = mm [in]



Frame Size 45 (SR22-05 - SR22-16)



Frame Size 55 (SR22-22 - SR22-40)

SR22 - PLC I/O Compatibility

SR22 - PLC & I/O Compatibility		
Product Line	Module Type	Module Numbers
CLICK	PLC	C0-00AR-D , C0-00DD2-D , C0-00DR-D , C0-02DD2-D , C0-02DR-D
	DC Output	C0-08TD2 , C0-16TD2
	Relay Output	C0-04TRS , C0-08TR
Productivity3000	DC Output	P3-08ND3S , P3-16ND3 , P3-32ND3 , P3-64ND3
	Relay Output	P3-08TAS , P3-16TA , P3-08TRS , P3-16TR , P3-08TRS-1
DL05	PLC	D0-05AR , D0-05DR , D0-05DR-D
DL06	PLC	D0-06AR , D0-06DD2 , D0-06DD2-D , D0-06DR , D0-06DR-D
DL05/DL06	DC I/O	D0-07CDR
	DC Output	D0-10TD2 , D0-16TD2 , D0-08TR , F0-04TRS
DL105	PLC	F1-130-DR , F1-130-DR-D
DL205	DC I/O	D2-08CDR
	DC Output	D2-08TD2 , D2-16TD2-2 , D2-32TD2 , F2-16TD2P
DL305	Relay Output	D2-04TRS , D2-08TR , D2-12TR , F2-08TR , F2-08TRS
	DC Output	D3-08TD2 , D3-16TD2
DL405	Relay Output	D3-08TR , D3-16TR
	DC Output	D4-16TD2 , D4-32TD2
Terminator I/O	Relay Output	D4-08TR , D4-16TR , F4-08TRS-1 , F4-08TRS-2
	DC Output	T1K-08TD2-1 , T1K-16TD2-1
	Relay Output	T1K-08TR , T1K-08TRS , T1K-16TR

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 SR33-350) 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 starter [SR33-350](#) is 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.



[SR33-22 to SR33-55](#)



[SR33-66 to SR33-97](#)



[SR33-132](#)



[SR33-280 to SR33-350](#)

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	SR33-55	SR33-66	SR33-80	SR33-97	SR33-132	SR33-280	SR33-350
Price	Retired	Retired	Retired	Retired	Retired	Retired	Retired	Retired
* Rated Current [class 10 starting] (A)	15.5	41	55	66	72	97	195	230
* 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 SR33-280 to SR33-482							
Steady State Power Loss (W)	6	15	17	20	24	35	69	83
Control Power Supply Required Output Capacity	approx 4VA					approx 12VA, capable of 4A for 250ms		
Overload Trip	n/a					n/a	Single-phase sensing; Non-adjustable; (refer to O/L trip curve)	
Terminals: Power / Ground	wire clamp terminals / M6		wire clamp terminals / M8			external busbars / M8	external busbars / M10	
Design Standards	UL508 Industrial Control Equipment; EN/IEC 60947-4-2 "AC Semiconductor Motor Controllers and Starters"						EN/IEC 60947-4-2 "AC Semiconductor Motor Controllers and Starters"	
Environmental Rating	IP20					IP00		
Product Weight (kg [lb])	2.3 [5.1]		3.5 [7.75]			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://www.automationdirect.com/selectors/softstarters>).

** When protected by recommended semiconductor fuse.

SR33 Series Basic Soft Starters – General Specifications and Features	
Models	All Models
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 SR33-132: 5 starts per hour; SR33-280 to SR33-350: 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	\$9.25	Heat-shrink insulation required for soft starters SR33-132 to SR33-280 used in UL applications. Can also be used with SR33-350 .

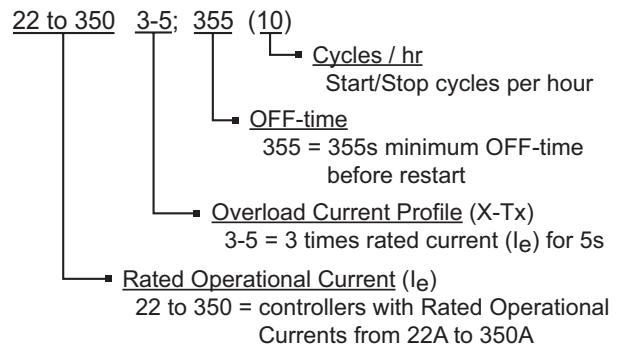
SR33 Soft Starter Index Ratings

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.

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	SR33-55 to SR33-280
	3-23; 1177 (3)	350 to 482	SR33-350
20	4-19; 701 (5)	29 to 350	SR33-55 to SR33-350
30	4-29; 691 (5)	41 to 430	SR33-55 to SR33-350

* Index rating AC-53b is specified by IEC standard # 60947-4-2



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)						
Step 1: Select the application from the list and follow that column down.		Typical Applications				
		Standard Duty		Medium Duty		Heavy Duty
		Default	Molding Machine	Ball mill	Pump - Positive displacement	Centrifuge*
Agitator	Plastic and textile machines	Bow Thruster - Loaded	Reciprocating	*For centrifuges make selection at I(A) = motor FLA x 2.3		
Bow Thruster - Zero Pitch	Pump - Submersible	Compressor - Centrifugal	Pump - Positive displacement	Crusher		
Compressor - Rotary Vane	Centrifugal	Compressor - Reciprocating	Rotary	Fan - High Inertia > 85A		
Compressor - Scroll	Pump - Submersible	Compressor - Rotary Screw	Pump Jack	Shredder		
Conveyor - Unloaded	Rotodynamic	Conveyor - Loaded	Rolling mill	Wood chipper		
Fan - Low Inertia < 85A	Saw - Band	Grinder	Roots Blower	Press, flywheel		
Feeder - screw	Transformers, voltage regulators	Hammer mill	Saw - Circular			
Lathe machines		Mills - Flour, etc.	Screen - Vibrating			
Mixer - Unloaded		Mixer - Loaded	Tumblers			
		Pelletizers				
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	SR33-55 to -SR33-280: 5 starts/hr SR33-350: 3 starts/hr		SR33-55 to -SR33-350: 5 starts/hr		SR33-55 to -SR33-350: 5 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://www.automationdirect.com/selectors/softstarters

SR33 Soft Starters – Selection – Step 4 (of 4)						
Step 4: Select SR33 model based on your motor Voltage and Horsepower				Trip Class *		
Motor HP		230VAC		460VAC		
HP	I _e (A)	HP	I _e (A)	3-23:697	4-19:701	4-19:691
				10	20	30
				5 start/hr		
5	15.5	10	15.5	SR33-22	-	-
10	29	20	29	-	-	SR33-55
10	34	25	34	-	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	-
30	97	75	97	SR33-132	-	-
50	132	100	132	-	SR33-280	SR33-280
60	160	125	160	SR33-280	SR33-350	SR33-350
				3 start/hr		
75	241	200	241	SR33-350	-	-

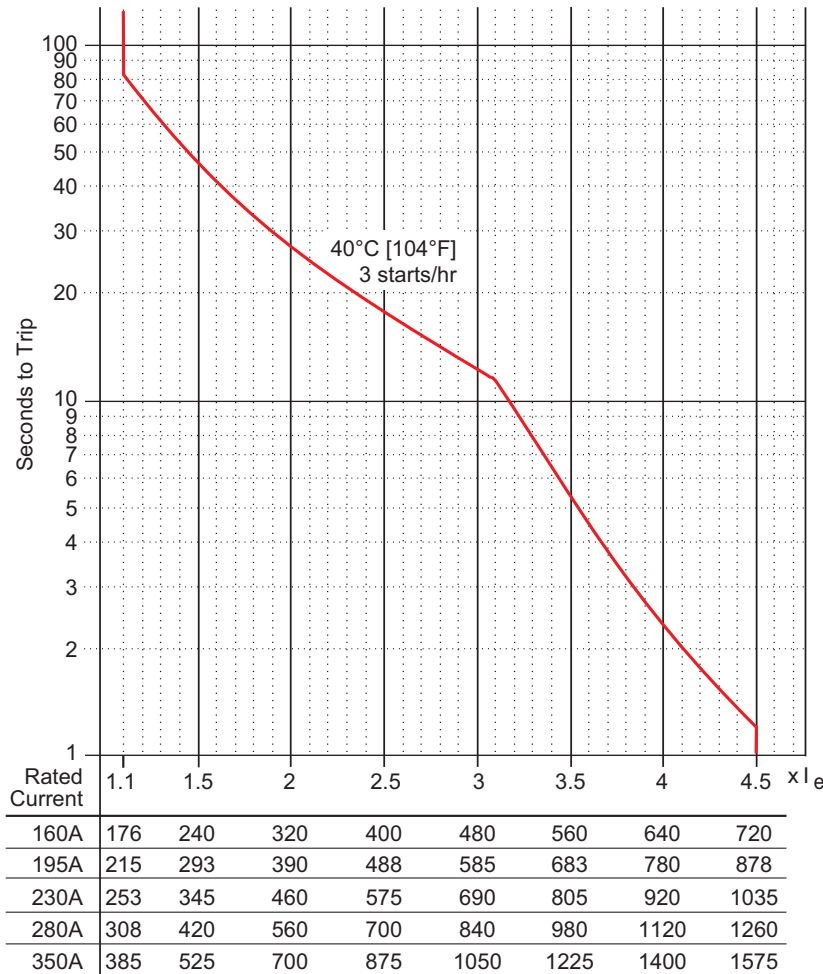
* A separate overload protection device with a rating corresponding to the applicable trip class must be used with the SR33.



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.

Stellar® SR33 Series Basic Soft Starters

SR33 Soft Starter Circuit Protection



Trip Level Current (Amps)

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 SR33-280 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.



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	-
SR33-55	5kA	80A	-
SR33-66	10kA	125A	-
SR33-80	10kA	175A	-
SR33-97	10kA	200A	-
SR33-132	10kA	250A	350A
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).

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
SR33-55			80A	JHL80
SR33-66	10kA	2018920.125A	125A	JHL125
SR33-80			175A	JHL175
SR33-97			200A	JHL200
SR33-132			250A	JHL250
SR33-280	18kA	2062032.630	450A	JHL450
SR33-350			-	-

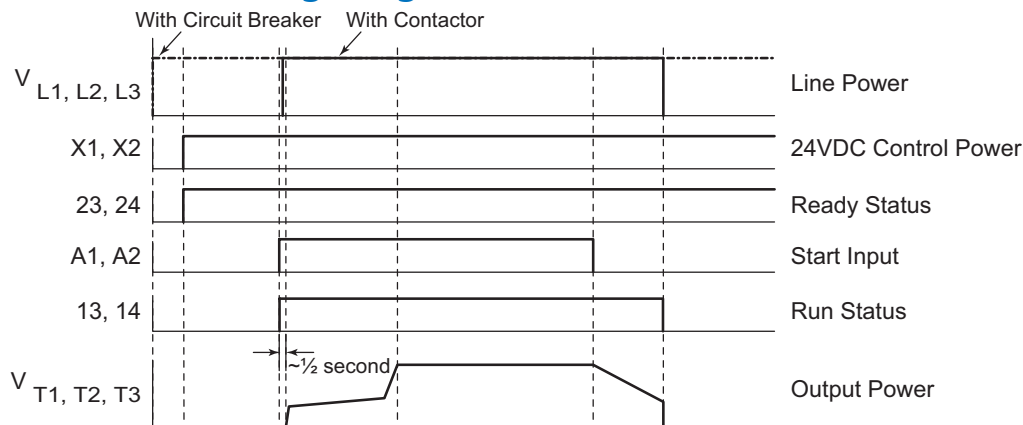
* Fuse comparable to Edison type JHL (class J) or ECSR (class RK5).

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
SR33-55	55	40	45	30	SR33-132	132	100	119	75
SR33-66	66	50	60	40	SR33-280	280	200	224	150
SR33-80	80	60	72	50					

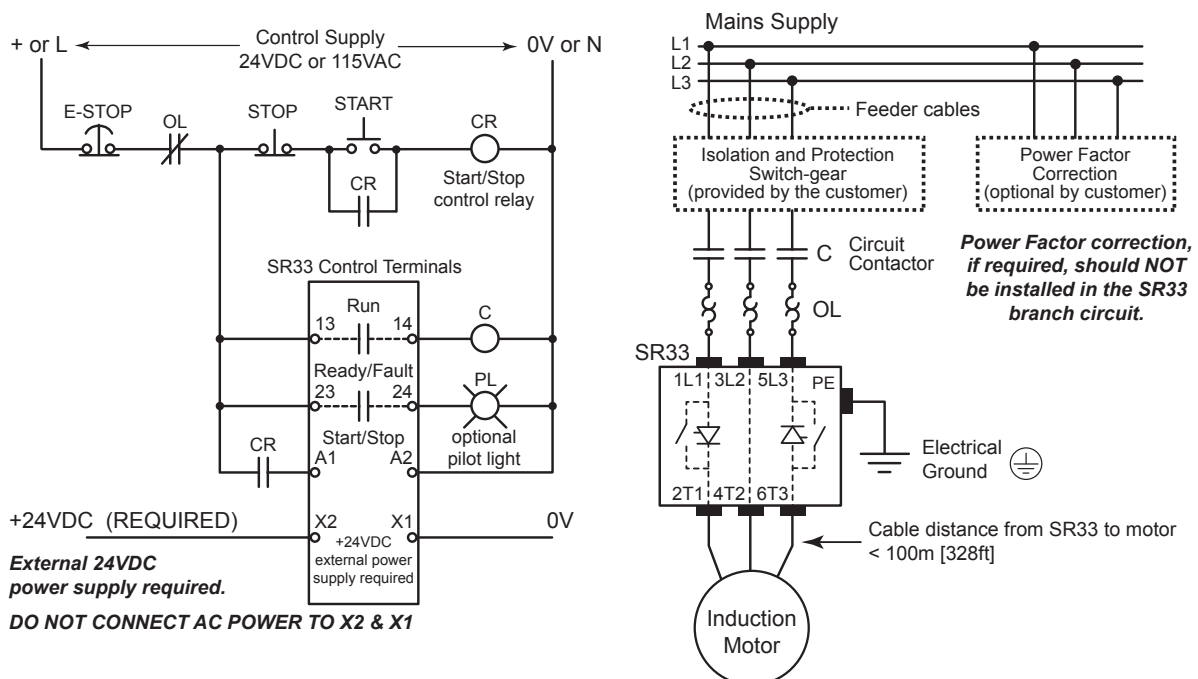
* Soft starters SR33-350 to SR33-482 are NOT UL listed or recognized.

SR33 Soft Starter Timing Diagram



SR33 Soft Starter Standard Wiring Diagram

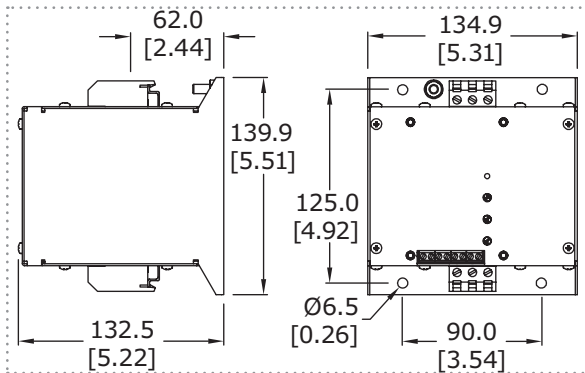
For complete wiring instructions, refer to the "SR33 Digital Soft Starters Quick-start Guide: Installation and Operation" included with the SR33 soft starter and available online at www.AutomationDirect.com.



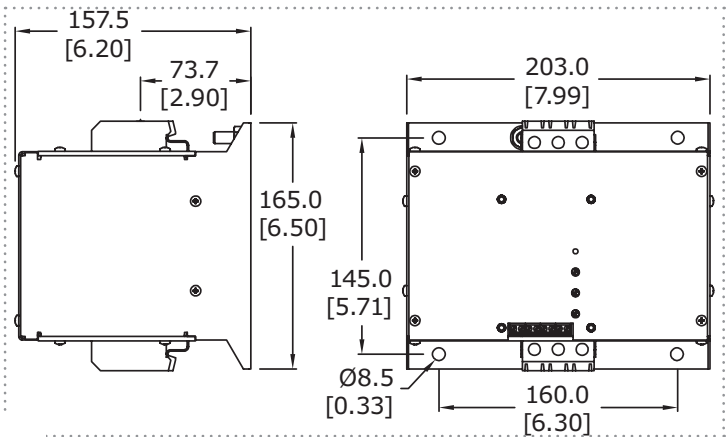
Stellar® SR33 Series Basic Soft Starters

SR33 Soft Starter Dimensions (mm [in])

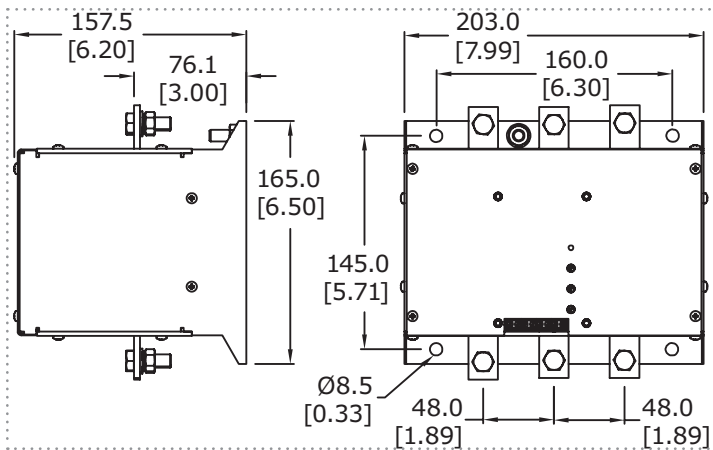
SR33-22 to SR33-55 – 15hp to 40hp @ 460V



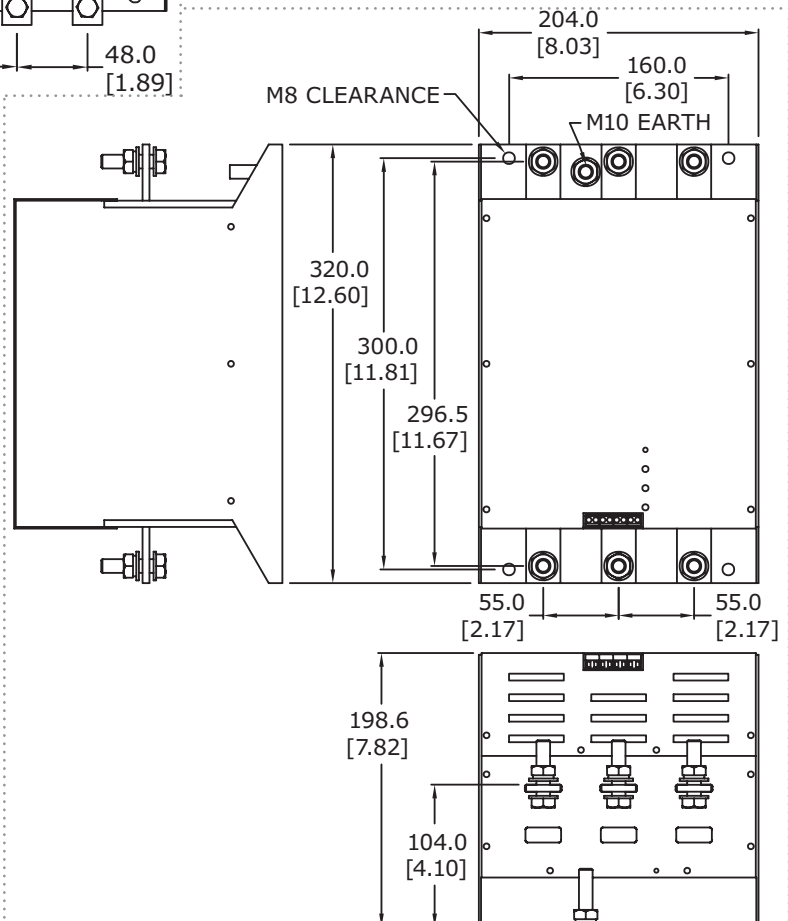
SR33-66 to SR33-97 – 50hp to 75hp @ 460V



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



SR33-280 to SR33-482 – 200hp to 400hp @ 460V



Stellar® SR35 Basic Soft Starters

Overview

SR35 full-featured solid-state Soft Starters provide many advantages when used instead of electromechanical contactors to control both 1-phase and 3-phase AC induction motors. The SR35 Soft Starters are fully digital, and use thyristors on the A and C phases for controlled reduced voltage motor starting and stopping. SR35s have an Automatic Application Setup that fully configures the starter for a specific application with one entry.

Features

- 17–361 A @ 110–240 VAC, 1PH or 200–600 VAC, 3PH
- 24VDC control voltage, 110–230 VAC with optional power supply, [SR35-PSU](#)
- Internally bypassed during run
- Two-phase motor control
- Built-in SCR failure protection
- Full motor overload protection
- Full data logging (fault records, motor current, operational status, etc.)
- Fully programmable
- Easily and separately adjustable motor start and stop times
- Can be used for motor reversing (with external contactors)
- Suitable for a wide variety of motor loads
- Easy-to-navigate menu structure and quick automatic application set up
- Can be used with local or remote control
- Integrated Modbus RTU communication
- Optional remote keypad available
- Programmable digital inputs, and relay outputs for remote control
- Fault record history of last 9 trips (using the download fault log will give faults and running data for the life of the SR35)
- IP20, panel mount with optional finger guards for frame sizes 1 and 2 soft starters
- Two-year warranty
- CE, cULus, REACH, RoHS
- Suitable for soft starting, split phase, cap run or cap start / cap run motors



WARNING: NOT FOR USE WITH SINGLE PHASE, SHADED POLE MOTOR



Advantages

Mechanical Advantages

- Smaller physical size than equivalent SR55 models (even with the built-in bypass contactors)
- 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

- Reduced starting currents and spikes
- More motors or larger motors can be started from lower-capacity power sources
- Allows motors to be started more frequently

Economic Advantages

- Lower overall costs for new installations
- Bypass relays built in
- Reduced maintenance and replacement of mechanical drive-train components
- Reduced starting current lowers demand charges
- Automatic Application setup feature speeds installation by configuring the SR35 for a specific application with one setting

Optional Accessories

- Power terminal IP20 finger guards
- Power terminal covers (Size 3)
- Remote keypad
- 110–230 VAC Power supply
- I/O Expansion module
- Cooling fans increase starts per hour

Applications

- General purpose applications where traditional across-the-line starting or wye-delta starting would typically be appropriate
- Applications with oversized or lightly loaded motors.
- Applications requiring lower inrush currents



STELLAR®
soft starters



Stellar® SR35 Basic Soft Starters

SR35 Soft Starter General Specifications				
Product standard		En 60947-4-2: 2012		
Rated operational voltages U_e		110 – 240 VAC 1Ph; 200 – 600 VAC 3Ph		
Rated operational current I_e		See Rating Table on page tSST-18		
Rating index		See Rating Table on page tSST-18		
Rated frequencies		50 – 60 Hz \pm 5hz		
Rated duty		Uninterrupted		
Form designation		Form 1, internally bypassed		
Method of operation		Symmetrically controlled starter		
Method of control		Semi-automatic		
Method of connecting		Thyristors connected between motor windings and supply		
Number of poles		3 Main poles (2 main poles controlled by semiconductor switching element)		
Rated insulation voltage	U_i	Main circuit	See key to part numbers	
		Control supply circuit	230VAC r.m.s ¹	
Rated impulse withstand voltage	U_{imp}	Main circuit	6 kV	
		Control supply circuit	4 kV ¹	
Ip code		Main circuit	IP00 (IP20 with finger guards ⁵)	
		Supply and control circuit	IP20	
Overvoltage category / pollution degree		III/3		
Rated conditional short-circuit current and type of coordination with associated short circuit protective device (SCPD)		Type 1 coordination (See Short Circuit Protection tables on page tSST-15 for rated conditional short-circuit current and required current rating and characteristics of the associated SCPD)		
Protect with 4a UL listed fuse	As standard	Control supply ²	Supply input	0, 24V
			Kind of current, rated frequency	DC
			Rated voltage U_s	24VDC
		Control circuit ²	Maximum power consumption	12Va (SR35-017 – SR35-065) 48va (SR35-077 – SR35-361)
			Programmable opto-isolated inputs	D1, D2
			Common input, marking	COM
	With SR35-PSU module	Control supply	Kind of current, rated frequency	DC
			Rated voltage U_c	24VDC
			Rated input current	1A
		Control circuit	Programmable opto-isolated inputs	D1, D2
			Common input	COM
			Kind of current, rated frequency	AC, 50 - 60 Hz \pm 5hz
	Auxiliary Circuit ³	Rated voltage U_c	110V – 230 VAC	
		Form a – single gap make -contact (normally open)	L, n	
		Form b – single gap break-contact (normally closed)	AC, 50 – 60 Hz \pm 5hz	
	Utilization category, voltage rating, current rating		Resistive load, 250VAC, 2A. Cos ϕ = 0.5, 250VAC, 2A ⁴	
	Electronic overload relay with manual reset and thermal memory		Trip class	10 (Factory default), 20 or 30 (selectable)
			Current setting	See electronic overload relay current settings
Rated frequency			50 – 60 Hz \pm 5hz	
Time-current characteristics			See Motor Overload Protection on page tSST-15 For trip curves (trip time $T_p \pm 20\%$)	

With optional SR35-PSU power supply module.

Must be supplied by class 2, limited voltage current or protected by a 4A UL 248 listed fuse.

Compliant with Annex S of IEC 60947-1:2007 at 24VDC

Not applicable for UL

For models SR35-017 – SR35-192 the main circuit IP20 rating only applies when the finger guards as supplied are fitted

The safety functions were not evaluated by UL. Listing is accomplished according to requirements of Standard UL 508 and CSA14-13, general use applications

Stellar® SR35 Basic Soft Starters

SR35 Soft Starter Technical Specifications

Technical Specifications										
Model (SR35-)	Price	Frame Size	Heat Output (W)	Weight kg [lb]	Ambient Operating Temperature	Transportation and Storage Temperature	Humidity	Maximum Altitude	Environmental Rating	Drawing Links
017	\$497.00	1	9	1.97 [4.2]	-20°C [-4°F] to 40°C [104°F]; above 40°C derate linearly by 2% of SR35 Ie per °C to a maximum of 60°C (140°F)	-20°C to 70°C [-4°F to 158°F] continuous	Max 85% non-condensing, not exceeding 50% @ 40°C [104°F]	1,000m [3281ft]; above 1000m derate by 1% of SR35 Ie per 100m (328ft) to a maximum altitude of 2,000m (6562ft)	Main circuit: IP00 (Ip20 with optional finger guards); Control circuit: Ip20; no corrosive gases permitted	PDF
022	\$529.00		12							PDF
027	\$576.00		14							PDF
034	\$602.00		16							PDF
041	\$672.00		20							PDF
052	\$763.00		25							PDF
065	\$810.00	30	2	6.0 [13.23]					PDF	
077	\$1,021.00	37							PDF	
100	\$1,149.00	49							PDF	
125	\$1,525.00	61							PDF	
156	\$2,386.00	74							PDF	
192	\$2,511.00	90							PDF	
242	\$2,825.00	3	111	15 [33.1]				Main circuit: IP00; Control circuit: IP20; no corrosive gases permitted	PDF	
302	\$3,268.00		139						PDF	
361	\$3,491.00		166						PDF	



Ventilation for Enclosures

SR35 Minimum Clearance Distances * (in [mm])					
SR35 Soft Starter Model	Top	Bottom	Left	Right	Front
Size 1: SR35-017 to SR35-065	3 [75]			1 [25]	
Size 2: SR35-077 to SR35-192	3.9 [100]			1.6 [40]	1 [25]
Size 3: SR35-242 to SR35-361	4.9 [125]			2.4 [60]	1 [25]

* For heat dissipation, the SR35 must not be mounted any closer to another object than these distances.



The addition of optional finger guards to size 1 and size 2 SR35 soft starters adds approximately 14mm [0.5in] to the soft starter vertical dimension, but does NOT change the clearance distance.



When installing the SR35 starter in an enclosure, ventilation must be provided if the heat output of the unit is greater than what the enclosure will dissipate. Use the formula at right to determine the fan requirement. An allowance has been incorporated into the formula so that the figure for Q is the air delivery in the fan suppliers data.

$$Q = (4xWt) / (T_{max} - T_{amb})$$

Q = Volume of air (cubic meters per hour - m³/h)

Wt = Heat produced by the unit and all other heat sources within the enclosure (Watts)

T_{max} = Maximum permissible temperature within the enclosure (50°C for a fully rated SR35)

T_{amb} = Temperature of the air entering the enclosure (°C) (If you prefer to work in CFM, substitute °F for °C. Q is now in CFM)

Stellar® SR35 Basic Soft Starters

SR35 Soft Starter Overcurrent Protection



Customer-supplied external power-circuit isolation devices (contactors, disconnect switches, fusible disconnects, shunt-trip circuit breakers, etc.) and short-circuit protection devices (circuit breakers, fuses, etc.) are required for use with SR35 soft starters.

Short Circuit Protection – SR35 Frame Size 1										
Type designation (SR35-)			017	022	027	034	041	052	065	
Rated operational current	I_e	A	17	22	29	35	41	55	66	
Rated conditional short circuit current	I_q	kA	5	5	5	5	5	5	5	
Class J time-delay fuse #1	Maximum rating Z1	A	30	40	50	60	70	100	125	
UL Listed inverse-time delay circuit breaker #1	Maximum rating Z2	A	60	60	60	60	60	150	150	
Semiconductor fuse (class aR) #2	Type		Mersen 6,9 URD 30 _				Mersen 6,9 URD 31 _			
			Bussmann 170M30_				Bussmann 170M40_			
			Bussmann 170M31_				Bussmann 170M41_			
			Bussmann 170M32_				Bussmann 170M42_			
			SIBA 20 61_				SIBA 20 61_			
	Fuse rating	A	160A	160A	200A	200A	250A	250A	250A	

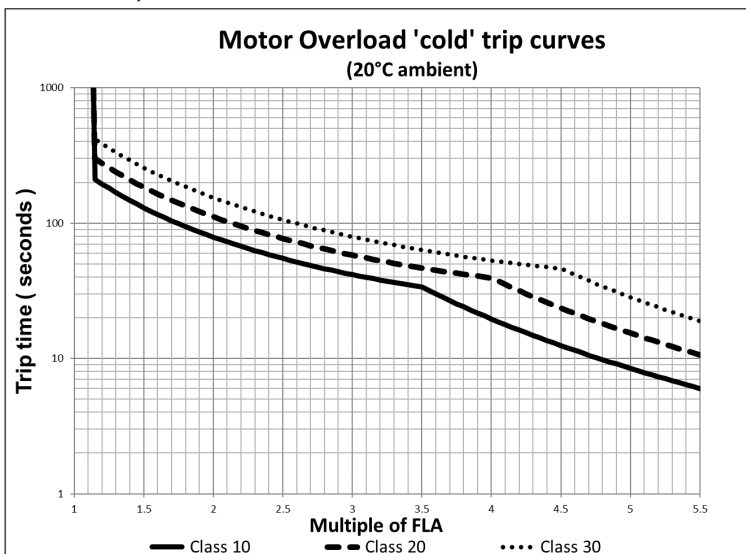
Suitable For Use On A Circuit Capable Of Delivering Not More Than I_q r.m.s. Symmetrical Amperes, 600V Maximum, When Protected by Class J Time Delay Fuses with a Maximum Rating of Z1 or by a Circuit Breaker with a Maximum Rating of Z2. Correctly selected semiconductor fuses can provide additional protection against damage to the SR35 unit (this is sometimes referred to as type 2 coordination). These semiconductor fuses are recommended to provide this increased protection.

Short Circuit Protection – SR35 Frame Size 2 & 3										
Type designation (SR35-)			077	100	125	156	192	242	302	361
Rated operational current	I_e	A	80	106	132	160	195	242	302	361
Rated conditional short circuit current	I_q	kA	10	10	10	10	10	18	18	18
Class J time-delay fuse #1	Maximum rating Z1	A	150	200	250	300	400	450	600	600
UL Listed inverse-time delay circuit breaker #1	Maximum rating Z2	A	250	300	350	450	500	700	800	800
Semiconductor fuse (class aR) #2	Type		Mersen 6,9 URD 31_				Mersen 6,9 URD 33_			
			Bussmann 170M40_				Bussmann 170M60_			
			Bussmann 170M41_				Bussmann 170M61_			
			Bussmann 170M42_				Bussmann 170M62_			
			SIBA 20 61_				SIBA 20 63_			
	Fuse rating	A	400A	400A	550A	550A	550A	800A	900A	1000 A

Suitable For Use On A Circuit Capable Of Delivering Not More Than I_q r.m.s. Symmetrical Amperes, 600Volts Maximum, When Protected by Class J Time Delay Fuses with a Maximum Rating of Z1 or by a Circuit Breaker with a Maximum Rating of Z2. Correctly selected semiconductor fuses can provide additional protection against damage to the SR35 Soft Starter (this is sometimes referred to as type 2 coordination). These semiconductor fuses are recommended to provide this increased protection.

SR35 Soft Starter Overload Trip

The SR35 soft starter provides motor overload protection, which can be configured through the keypad. 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 SR35 soft starters are protected using full I2T motor overload with memory.



Stellar® SR35 Basic Soft Starters

An Online Product Selection Tool is available on our website: <https://www.automationdirect.com/selectors/softstarters>

SR35 Soft Starter Selection												
Step 1 - Select the application from the list and follow that column down												
Typical Applications	Standard Duty			Medium Duty			Heavy Duty					
	Agitator	Compressor - Centrifugal			Crusher							
	Compressor - Rotary Vane	Compressor - Reciprocating			Shredder							
	Compressor - Unloaded	Compressor - Rotary Screw			Wood Chipper							
	Bow Thruster - Zero Pitch	Ball Mill			Fan - High Inertia or >85A							
	Fan - Low Inertia or <85A	Bow Thruster - Loaded			-							
	Feeder - Screw	Conveyor - Loaded			-							
	Lathe Machines	Grinder			-							
	Mixer - Unloaded	Hammer Mill			-							
	Molding Machine	Mills - Flour etc.			-							
	Plastic and Textile Machines	Mixer - Loaded			-							
	Pump - Submersible; Centrifugal	Pelletizers			-							
	Pump - Submersible; Rotodynamic	Press, Flywheel			-							
	Saw - Band	Positive Displacement Pump; (Reciprocating or Rotary)			-							
	Transformers	Pump Jack			-							
	Voltage Regulators	Rolling Mill			-							
-	Roots Blower			-								
-	Saw - Circular			-								
-	Screen - Vibrating			-								
-	Tumblers			-								
Step 2 - Confirm the rated starting capability of the soft starter against the application												
Trip Class	Trip Class 10			Trip Class 20			Trip Class 30					
Rated Starting Capability	3x Motor Current - 23s 3.5x Motor Current - 17s			4x Motor Current - 19s			4x Motor Current - 29s					
Max Starts per Hour	5 starts/hour			5 starts/hour			5 starts/hour					
Max Starts per Hour w/Optional Cooling Fan	40 starts/hour			40 starts/hour			40 starts/hour					
Step 3 - Consider the operating environment and make the model selection on a higher amp rating												
Height Above Sea Level	Standard operating height is 1000m, for every 100m increase motor Amps/kW by 1% up to 2000m. Example: For a 20A motor at 1500m, make model selection based on 21A (5% higher).											
Operating Temperatures	Standard operating temperature is 40degC, for every 1°C above, increase motor Amps/kW by 2%, up to 60°C. Example: For a 20A motor at 50°C make model selection based on 24A (20% higher).											
Increased Starts per Hour	Fit optional fan to increase maximum up to 40 starts per hour.											
Step 4 (Three Phase) - Select your motor Voltage and Horsepower/kW and select model												
I _e A	kW			FLA A	Hp (3Ph)					Select Model 5 starts/hour @ 40°C	Select Model 5 starts/hour @ 40°C	Select Model 5 starts/hour @ 40°C
	230V	400V	500V		200V	208V	220-240V	440-480V	550-600V			
17	4	7.5	7.5	17	3	5	5	10	15	SR35-017	SR35-022	SR35-027
22	5.5	11	11	22	5	5	7.5	15	20	SR35-022	SR35-027	SR35-034
29	7.5	15	15	27	7.5	7.5	7.5	20	25	SR35-027	SR35-034	SR35-041
35	7.5	18.5	22	34	10	10	10	25	30	SR35-034	SR35-041	SR35-052
41	11	22	22	41	10	10	10	30	40	SR35-041	SR35-052	SR35-065
55	15	30	37	52	15	15	15	40	50	SR35-052	SR35-065	SR35-077
66	18.5	37	45	65	20	20	20	50	60	SR35-065	SR35-077	SR35-100
80	22	45	55	77	20	25	25	60	75	SR35-077	SR35-100	SR35-125
106	30	55	75	100	30	30	30	75	100	SR35-100	SR35-125	SR35-156
132	37	75	90	125	40	40	40	100	125	SR35-125	SR35-156	SR35-192
160	45	90	110	156	50	50	60	125	150	SR35-156	SR35-192	SR35-242*
195	55	110	132	192	60	60	60	150	200	SR35-192	SR35-242*	SR35-302*
242	75	132	160	242	75	75	75	200	250	SR35-242*	SR35-302*	SR35-361*
302	90	160	200	302	100	100	100	250	300	SR35-302*	SR35-361*	-
361	110	200	250	361	125	125	150	300	350	SR35-361*	-	-

*SR35-242, SR35-302, and SR35-361, 3 starts/hour @ 40°C

Stellar® SR35 Basic Soft Starters

SR35 Soft Starter Selection (1Ph)										
Step 4 (Single Phase) - Select your motor Voltage and Horsepower/kW and select model										
Motor Rating								Select Model 5 starts/hour @ 40°C	Select Model 5 starts/hour @ 40°C	Select Model 5 starts/hour @ 40°C
110 – 120 V (1Ph)				220 – 240 V (1Ph)						
HP	FLA	kW	I _e (A)	HP	FLA	kW	I _e (A)			
-	-	-	-	-	-	0.07	1.2	SR35-017	SR35-017	SR35-017
-	-	-	-	0.1	1.5	0.1	1.6	SR35-017	SR35-017	SR35-017
-	-	-	-	0.12	1.9	0.12	1.9	SR35-017	SR35-017	SR35-017
-	-	0.07	2.4	0.16	2.2	0.18	2.3	SR35-017	SR35-017	SR35-017
0.1	3	0.1	3.3	0.25	2.9	0.25	2.9	SR35-017	SR35-017	SR35-017
0.12	3.8	0.12	3.8	0.33	3.6	0.37	3.9	SR35-017	SR35-017	SR35-017
0.16	4.4	0.18	4.5	0.5	4.9	-	-	SR35-017	SR35-017	SR35-017
0.25	5.8	0.25	5.8	-	-	0.56	5.5	SR35-017	SR35-017	SR35-017
-	-	-	-	0.75	6.9	-	-	SR35-017	SR35-017	SR35-017
0.33	7.2	0.37	7.9	1	8	0.75	7.3	SR35-017	SR35-017	SR35-017
0.5	9.8	0.56	11	1.5	10	1.1	10	SR35-017	SR35-017	SR35-017
0.75	13.8	-	-	2	12	1.5	13	SR35-017	SR35-017	SR35-022
1	16	0.75	15	3	17	-	-	SR35-017	SR35-022	SR35-027
1.5	20	1.1	21	-	-	2.2	19	SR35-022	SR35-027	SR35-034
2	24	1.5	26	-	-	3	24	SR35-027	SR35-034	SR35-041
-	-	-	-	5	28	3.7	27	SR35-027	SR35-034	SR35-041
-	-	-	-	-	-	4	30	SR35-034	SR35-041	SR35-052
3	34	2.2	37	-	-	-	-	SR35-041	SR35-052	SR35-065
-	-	-	-	7.5	40	5.5	41	SR35-041	SR35-052	SR35-065
-	-	3	49	10	50	-	-	SR35-052	SR35-065	SR35-077
5	56	3.7	54	-	-	7.5	55	SR35-065	SR35-077	SR35-100
-	-	4	60	-	-	-	-	SR35-065	SR35-077	SR35-100
-	-	-	-	15	68	9.2	67	SR35-077	SR35-100	SR35-125
7.5	80	5.5	85	20	88	11	80	SR35-100	SR35-125	SR35-156
-	106	-	106	-	106	-	106	SR35-100	SR35-125	SR35-156
10	100	7.5	110	25	110	-	132	SR35-125	SR35-156	SR35-192
15	135	-	160	30	136	-	160	SR35-156	SR35-192	SR35-242*
-	195	-	195	40	176	-	195	SR35-192	SR35-242*	SR35-302*
-	242	-	242	50	216	-	242	SR35-242*	SR35-302*	SR35-361*
-	302	-	302	-	302	-	302	SR35-302*	SR35-361*	-
-	361	-	361	-	361	-	361	SR35-361*	-	-

*SR35-242, SR35-302, and SR35-361, 3 starts/hour @ 40°C

Stellar® SR35 Basic Soft Starters

SR35 Index Ratings (per IEC 60947-4-2)

Rating Table – Vertically Mounted (3Ph)												
I_e	kW ¹			FLA	Hp ²					Trip Class 10	Trip Class 20	Trip Class 30
	A ³	230V	400V	500V ⁴	A ³	200V	208V	220-240V	440-480V	550-600V ⁴	I_e : AC-53a: 3.5-17: F-S ⁵	I_e : AC-53a: 4-19: F-S ⁵
17	4	7.5	7.5	17	3	5	5	10	15	SR35-017	SR35-022	SR35-027
22	5.5	11	11	22	5	5	7.5	15	20	SR35-022	SR35-027	SR35-034
29	7.5	15	15	27	7.5	7.5	7.5	20	25	SR35-027	SR35-034	SR35-041
35	7.5	18.5	22	34	10	10	10	25	30	SR35-034	SR35-041	SR35-052
41	11	22	22	41	10	10	10	30	40	SR35-041	SR35-052	SR35-065
55	15	30	37	52	15	15	15	40	50	SR35-052	SR35-065	SR35-077
66	18.5	37	45	65	20	20	20	50	60	SR35-065	SR35-077	SR35-100
80	22	45	55	77	20	25	25	60	75	SR35-077	SR35-100	SR35-125
106	30	55	75	100	30	30	30	75	100	SR35-100	SR35-125	SR35-156
132	37	75	90	125	40	40	40	100	125	SR35-125	SR35-156	SR35-192
160	45	90	110	156	50	50	60	125	150	SR35-156	SR35-192	SR35-242
195	55	110	132	192	60	60	60	150	200	SR35-192	SR35-242	SR35-302
242	75	132	160	242	75	75	75	200	250	SR35-242	SR35-302	SR35-361
302	90	160	200	302	100	100	100	250	300	SR35-302	SR35-361	-
361	110	200	250	361	125	125	150	300	350	SR35-361	-	-

Rating Table – Horizontally Mounted (3Ph)												
I_e	kW ¹			FLA	Hp ²					Trip Class 10	Trip Class 20	Trip Class 30
	A ³	230V	400V	500V ⁴	A ³	200V	208V	220-240V	440-480V	550-600V ⁴	I_e : AC-53a: 3.5-17: F-S ⁵	I_e : AC-53a: 4-19: F-S ⁵
17	4	7.5	7.5	17	3	5	5	10	15	SR35-022	SR35-027	SR35-034
22	5.5	11	11	22	5	5	7.5	15	20	SR35-027	SR35-034	SR35-041
29	7.5	15	15	27	7.5	7.5	7.5	20	25	SR35-034	SR35-041	SR35-052
35	7.5	18.5	22	34	10	10	10	25	30	SR35-041	SR35-052	SR35-065
41	11	22	22	41	10	10	10	30	40	SR35-052	SR35-065	SR35-077
55	15	30	37	52	15	15	15	40	50	SR35-065	SR35-077	SR35-100
66	18.5	37	45	65	20	20	20	50	60	SR35-077	SR35-100	SR35-125
80	22	45	55	77	20	25	25	60	75	SR35-100	SR35-125	SR35-156
106	30	55	75	100	30	30	30	75	100	SR35-125	SR35-156	SR35-192
132	37	75	90	125	40	40	40	100	125	SR35-156	SR35-192	SR35-242
160	45	90	110	156	50	50	60	125	150	SR35-192	SR35-242	SR35-302
195	55	110	132	192	60	60	60	150	200	SR35-242	SR35-302	SR35-361
242	75	132	160	242	75	75	75	200	250	SR35-302	SR35-361	-
302	90	160	200	302	100	100	100	250	300	SR35-361	-	-

Rated operational powers in kW as per IEC 60072-1 (primary series) corresponding to IEC current rating.

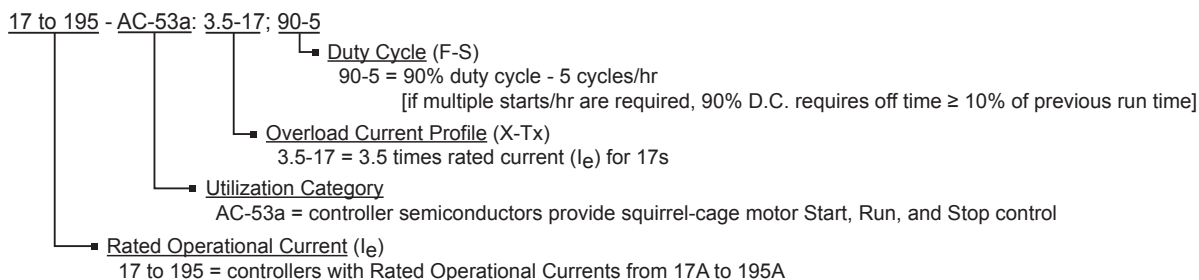
Rated operational powers in hp as per UL508 corresponding to FLA current rating.

The I_e and FLA rating applies for a maximum surrounding air temperature of 40°C. Above 40°C de-rate linearly by 2% of I_e or FLA per °C to a maximum of 60°C.

kW and Hp ratings applicable for SR35-017 – SR35-361 models only.

For SR35-017 – SR35-192 models, a higher duty cycle F-S is possible with optional fan fitted as indicated in Fan option table. For SR35-242 – SR35-361 models, fans fitted as standard. Reference page tSST-19 for duty cycle.

Index Rating Example – Standard Operation (AC-53a Utilization Category per IEC 60947-4-2)



Stellar® SR35 Basic Soft Starters

Standard Overload Current Profile and Duty Cycle




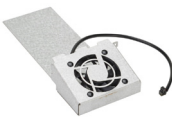



The SR35 has been designed for a specific Overload Current Profile and Duty Cycle as shown above in the SR35 Index Ratings. The Overload Current Profile is expressed by two symbols, X and Tx. X denotes the overload current as a multiple of I_e and represents the maximum value of operating current due to starting, operating, or maneuvering under overload conditions. For example, X = 3.5 means that the maximum overload start current allowed is 3.5 times FLC. Tx denotes the duration of the controlled overload currents during starting, stopping, operating, or maneuvering. For example, Tx = 17 means that the maximum allowed overload current is permitted for up to 17 seconds only.

The Duty Cycle is expressed by two symbols, F and S which describe the duty and also set the time that must be allowed for cooling. F is the ratio of the on-load period to the total period expressed as a percentage. For example, F= 90 means that the soft starter is ON for 90% of the time and then OFF for 10% of the time between each start. If there are not multiple starts per hour, then the Duty Cycle is continuous. S is the number of starts or operating cycles per hour. For example, S = 5 means that the soft starter is capable of 5 equally spaced starts per hour. These characteristics are summarized in the table below:

Model	Rated Current (A)"	Class 10 O/L Multiple (X)"	Class 10 O/L Time (Tx)"	Starts/Hour (S)	Duty (F)
<u>SR35-017</u>	17	3.5	17	5	90%
<u>SR35-022</u>	22				
<u>SR35-027</u>	27				
<u>SR35-034</u>	34				
<u>SR35-041</u>	41				
<u>SR35-052</u>	52				
<u>SR35-065</u>	65				
<u>SR35-077</u>	77				
<u>SR35-100</u>	100				
<u>SR35-125</u>	125				
<u>SR35-156</u>	156				
<u>SR35-192</u>	192				
<u>SR35-242</u>	242			3	
<u>SR35-302</u>	302				
<u>SR35-361</u>	361				


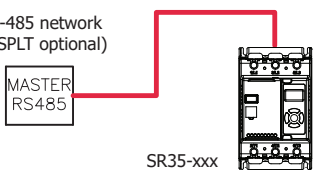
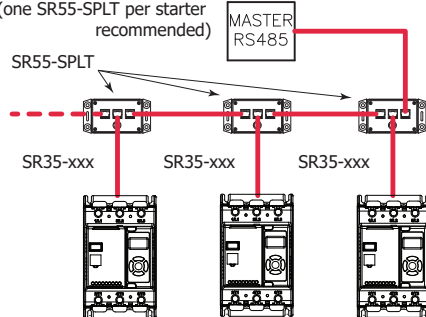


Stellar® SR35 Basic Soft Starters

SR35 Accessories

SR35 Optional Accessories					
Part Number	Price	Description	Image	For SR35 Models	Drawing Link
<u>SR35-FG-1</u>	\$31.00	Stellar SR35 series finger guards, replacement. Package of 2. For use with size 1 Stellar SR35 series soft starters. Provides IP20 protection rating.		-017 thru -065	<u>PDF</u>
<u>SR35-FG-2</u>	\$31.00	Stellar SR35 series finger guards, replacement. Package of 2. For use with size 2 Stellar SR35 series soft starters. Provides IP20 protection rating.		-077 thru -192	<u>PDF</u>
<u>SR35-TC-3</u>	\$258.00	Stellar SR35 series finger guards, package of 6. For use with size 3 Stellar SR35 series soft starters.		-242 thru -361	N/A
<u>SR35-FAN-1</u>	\$69.00	Stellar SR35 series main cooling fan, 36 x 222 x 90mm, 24 VDC. For use with size 1 Stellar SR35 series soft starters. Electrical connector included.		-017 thru -065	<u>PDF</u>
<u>SR35-FAN-2</u>	\$73.00	Stellar SR35 series main cooling fan, 68 x 297 x 102mm, 12 VDC. For use with size 2 Stellar SR35 series soft starters. Electrical connector included.		-077 thru -192	<u>PDF</u>
<u>SR35-KPD-REM</u>	\$272.00	Stellar SR35 series remote keypad, for use with Stellar SR35 series soft starters.		All	<u>PDF</u>
<u>SR35-AUX-IO</u>	\$151.00	Stellar SR35 series temperature combo module, thermistor, 1-channel input, 2-point input, 110-230 VAC/24 VDC, 2-point output, 250 VAC, (2) Form A (SPST) relays. For use with Stellar SR35 series soft starters. (1) 500mm ribbon cable included.		All	<u>PDF</u>

Stellar® SR35 Basic Soft Starters

SR35 Accessories

SR35 Optional Accessories					
Part Number	Price	Description	Image	For SR35 Models	Drawing Link
<u>SR35-PSU</u>	\$215.00	Stellar SR35 series switching power supply, 24 VDC @ 1A/120W (adjustable), 120/240 VAC nominal input, 1-phase, enclosed, plastic housing, direct mount.		All	<u>PDF</u>
<u>SR55-SPLT</u>	\$166.00	<p>Stellar SR55 series communication splitter, 3 ports, (3) RS-485 (RJ45) female port(s). For use with Stellar SR55 series soft starters. (1) <u>SR55-RJ45-RJ12</u> adapter and (1) 9.8ft/3m Cat5e cable included.</p> <p>Single SR35 RS-485 network (SR55-SPLT optional)</p>  <p>Multiple SR35 RS-485 network (one SR55-SPLT per starter recommended)</p>  <p>RS-485 Network Examples</p>		All	<u>PDF</u>
<u>USB-FLASH</u>	\$25.50	SanDisk USB Flash drive, 32GB.		All	<u>N/A</u>

Stellar® SR55 Full-Featured Soft Starters

Overview

SR55 full-featured solid-state Soft Starters provide many advantages when used instead of electromechanical contactors to control 3-phase AC induction motors. The SR55 Soft Starters are fully digital, and use thyristors in all three motor phases for controlled reduced voltage motor starting and stopping. SR55's have an Automatic Application Setup that fully configures the starter for a specific application with one entry. SR55's also have a built-in internal bypass and patented iERS (intelligent Energy Recovery System) that reduces energy costs when used on lightly loaded and oversized motors.

Features

- 17-477A @ 200-480VAC
- 24VDC, 110VAC, or 230VAC selectable control voltage
- Internally bypassed during run
- Full three-phase motor control
- Built-in SCR failure protection
- Full motor overload protection
- Full data logging (fault records, motor current, operational status, etc.)
- Fully programmable
- Easily and separately adjustable motor start and stop times
- iERS (intelligent Energy Recovery System) saves energy on lightly-loaded motors
- Can be connected 'in-the-delta', allowing use of a smaller Soft Starter (no iERS optimizing with in-delta connections)
- Can be used for motor reversing (with external contactors)
- Suitable for a wide variety of motor loads
- Touchscreen with easy-to-navigate menu structure and quick automatic application set up
- Can be used with local or remote control
- Integrated Modbus RTU, or optional Modbus TCP or EtherNet/IP communication
- Optional remote touchscreen available
- Programmable analog I/O, digital inputs, and relay outputs for remote control
- Fault record history of last 10 trips (using the download fault log will give faults and running data for the life of the SR55)
- IP20, panel mount with optional finger guards for frame sizes 1 and 2 soft starters
- Two-year warranty
- CE, ETL (CSA C22.2 No.14 and UL 508), REACH, RoHS
- Auto Reset Feature available

Advantages

Mechanical Advantages

- Smaller physical size than equivalent SR44 models (even with the built-in bypass contactors)
- 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

- Reduced starting currents and spikes
- More motors or larger motors can be started from lower-capacity power sources
- Allows motors to be started more frequently

Economic Advantages

- Lower overall costs for new installations
- Bypass relays built in
- Reduced maintenance and replacement of mechanical drive-train components
- Reduced starting current lowers demand charges
- iERS (intelligent Energy Recovery System) reduces electrical power costs
- Automatic Application setup feature speeds installation by configuring the SR55 for a specific application with one setting

Optional Accessories

- EtherNet/IP communication module
- Modbus TCP communication module
- Modbus serial communication splitter
- RJ12 to RJ45 adapter
- Power terminal IP20 finger guards
- Remote touchscreen
- Replacement touchscreen
- Replacement cooling fans

Applications

- General purpose applications where traditional cross-the-line starting or wye-delta starting would typically be appropriate
- Applications with oversized or lightly loaded motors (iERS reduces energy usage)
- Applications requiring lower inrush currents



Stellar® SR55 Full-Featured Soft Starters

SR55 Soft Starter Technical Specifications

SR55 Series Full-Featured Soft Starters – 17A–96A *									
Model	SR55-017	SR55-021	SR55-027	SR55-034	SR55-040	SR55-052	SR55-065	SR55-077	SR55-096
Frame Size	1								
Price	\$1,167.00	\$1,199.00	\$1,213.00	\$1,255.00	\$1,351.00	\$1,463.00	\$1,559.00	\$1,742.00	\$1,785.00
* Rated Current I _e (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]	Ie: AC-53a: 3.5–17: 90–5								
Impulse Withstand Voltage	4kV								
Insulation Voltage Rating	480V								
Short Circuit Current Rating (type 1) (kA)	5							10	
Control Power Consumption	60W inrush to latch internal bypass relays; 4W steady state								
Control Voltage Range	24VDC +10%-15% or 110–230VAC +10%-15%								
Control Fuse (external)	4A								
Control Inputs	(3) DI @ 24VDC, 110VAC, or 230VAC; (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 (s)	1 to 300								
Start Voltage Setting Range (%)	10 to 100								
** Stop Time Setting Range (s)	0 to 300								
Ambient Operating Temperature	-20°C [-4°F] to 50°C [122°F]; above 50°C derate linearly by 4% of SR55 I _e per °C to a maximum of 60°C (140°F)								
Transportation & Storage Temperature	-20°C to 60°C [-4°F to 140°F] continuous								
Humidity	max 85% non-condensing, not exceeding 50% @ 40°C [104°F]								
Maximum Altitude	1,000m [3,281ft]; above 1000m derate by 1% of SR55 I _e per 100m (328ft) to a maximum altitude of 2000m (6562ft)								
Environmental Rating	Main Circuit: IP00 (IP20 with optional finger guards for sizes 1&2 only); Control Circuit: IP20 No corrosive gases permitted								
Weight (lb [kg])	6.6 [3.0]				7.7 [3.5]				
*** Agency Approvals	CE, CSA C22.2 No.14 (ETL tested), ETL 4004274, REACH, RoHS, UL508 (ETL tested)								

* Refer to Selection Table for deratings by application and overload trip class.

Important: Care must be taken to select the correct SR55 for the application to ensure that the SR55 is not undersized. Refer to Selection Tables or to online selection tool for deratings by application and overload trip class (<https://www.automationdirect.com/selectors/softstarters>).

** Start Time and Stop Time define the length of time the soft starter varies the voltage to the motor. While a Variable Frequency Drive (AC Drive) can define motor speed throughout the acceleration and deceleration ramps by varying its output frequency, a soft starter only controls average voltage to the motor and cannot accurately control motor speed. Therefore, motor speed during acceleration and deceleration can vary with load. Example: a conveyor soft starter could have a Start Time of 10s. If the conveyor is empty, the motor may actually reach top speed in 8s. If the conveyor is heavily loaded, the motor may not reach full speed until 10s. For more information, please see the [SR55 User Manual - "Appendix B: Soft Starter Application Considerations."](#)

*** To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

Stellar® SR55 Full-Featured Soft Starters

SR55 Soft Starter Technical Specifications

SR55 Series Full-Featured Soft Starters – 124A–477A *								
Model	SR55-124	SR55-156	SR55-180	SR55-242	SR55-302	SR55-361	SR55-414	SR55-477
Frame Size	2			3				
Price	\$1,955.00	\$2,762.00	\$3,018.00	\$3,068.00	\$3,289.00	\$3,860.00	\$4,840.00	\$5,533.00
* Rated Current I _e (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]	Ie: AC-53a: 3.5–17: 90–5			Ie: AC-53a: 3.5–17: 90–3				
Impulse Withstand Voltage	4kV							
Insulation Voltage Rating	480V							
Short Circuit Current Rating (type 1)(kA)	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 110–230VAC +10%-15%						110VAC +10%-15%	
Control Fuse (external)	4A							
Control Inputs	(3) DI @ 24VDC, 110VAC, or 230VAC; (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 (s)	1 to 300							
Start Voltage Setting Range (%)	10 to 100							
** Stop Time Setting Range (s)	0 to 300							
Ambient Operating Temperature	-20°C [-4°F] to 50°C [122°F]; above 50°C derate linearly by 4% of SR55 I _e per °C to a maximum of 60°C (140°F)							
Transportation & Storage Temperature	-20°C to 60°C [-4°F to 140°F] continuous							
Humidity	max 85% non-condensing, not exceeding 50% @ 40°C [104°F]							
Maximum Altitude	1,000m [3,281ft]; above 1000m derate by 1% of SR55 I _e per 100m (328ft) to a maximum altitude of 2000m (6562ft)							
Environmental Rating	Main Circuit: IP00 (IP20 with optional finger guards for sizes 1&2 only); Control Circuit: IP20							
Weight (lb [kg])	12.1 [5.5]	14.3 [6.5]	35.3 [16.0]			46.7 [21.2]		
*** Agency Approvals	CE, CSA C22.2 No.14 (ETL tested), ETL 4004274, REACH, RoHS, UL508 (ETL tested)						CE, REACH, RoHS	

* Refer to Selection Table for deratings by application and overload trip class.

Important: Care must be taken to select the correct SR55 for the application to ensure that the SR55 is not undersized. Refer to Selection Tables or to online selection tool for deratings by application and overload trip class (<https://www.automationdirect.com/selectors/softstarters>).

** Start Time and Stop Time define the length of time the soft starter varies the voltage to the motor. While a Variable Frequency Drive (AC Drive) can define motor speed throughout the acceleration and deceleration ramps by varying its output frequency, a soft starter only controls average voltage to the motor and cannot accurately control motor speed. Therefore, motor speed during acceleration and deceleration can vary with load. Example: a conveyor soft starter could have a Start Time of 10s. If the conveyor is empty, the motor may actually reach top speed in 8s. If the conveyor is heavily loaded, the motor may not reach full speed until 10s. For more information, please see the SR55 User Manual - "Appendix B: Soft Starter Application Considerations."

*** To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

Stellar® SR55 Full-Featured Soft Starters

SR55 Energy-Saving iERS Feature

Intelligent Energy Recovery System

iERS is an advanced SR55 feature that can reduce the energy consumed by lightly-loaded (or oversized) motors. iERS matches the power consumption to the load by monitoring and regulating voltage, current, and power factor during the motor starting and running stages. iERS automatically bypasses itself when it is not needed (as the motor approaches full load torque/current), and continues monitoring to re-engage itself as needed (as the required motor torque/current decreases).

In its most basic function, iERS reduces the voltage being fed to the motor when the motor does not need it. While the torque (and therefore current) required by the load stays the same, reducing the voltage to the motor reduces excess magnetizing current inside the motor. For a more detailed explanation of how iERS reduces magnetizing current and saves energy, please see "Chapter 4: Principles of IERS" in the SR55 User Manual.

Many, if not most, AC motor applications are oversized when the motor FLA is compared to actual running current. Oversizing can be due to non-optimal design, but can also occur intentionally: many applications need a larger motor for starting reasons, for available headroom, for future expansion, etc. Other applications may have different motor demands based on loading; think of an "up" escalator. A fully-loaded escalator requires a lot of torque (current), while an empty escalator requires significantly less torque (current) to maintain speed. When the escalator is empty, the motor will not draw as much current as its FLA. When the SR55 senses this reduced torque load, the starter will reduce the voltage to the motor. This reduced voltage results in reduced magnetizing current in the motor (and thereby saves energy). Note that the current required by the load stays the same; only magnetizing current is reduced.



How Much Will iERS Save?

The savings realized by using iERS will vary by application, how heavily the motor is loaded, and the losses internal to the motor. While these factors can be difficult to quantify, the following estimating tools and examples may help predict your potential savings:

Estimating Energy Savings

Basis for estimations:

- 3-phase squirrel cage induction motor, standard type.
- Supply: 380 to 440V, 50Hz.
- Supply voltage > minimum working voltage on motor rating plate.
- Operation 30% rated nameplate full load.

Energy Savings Estimations – Table 1

4-Pole Motor Size	kW	HP	Estimated Savings (% rated kW)
Less than	5	7.5	10
	22.5	30	6.5
	55	75	3.5
	110	150	2.5
More than	110	150	1.5

Energy Savings Modifying Factors – Table 2

Motor Poles		Motor Slip	
Number of Poles	Add (% kW)	% Slip	Add (% kW)
2	-0.5	0.5	-0.5
4	0	2	0
6	0.5	3.3	0.5
8	1	5	1

Examples of estimated savings:

1) 37.5 kW 4-pole motor

From Table 1, use the estimated savings figure for the next higher rating, i.e. 55 kW = 3.5% of full rated kW.

The savings would be approximately 3.5% x 37.5 kW = 1.3125 kW.
Savings % = kW saved / (30% loaded motor kW)
= 1.3125 kW / (30% x 37.5 kW) = 12%.

2) 37.5 kW 2-pole motor

From Table 1, use the estimated savings figure for the next higher rating, i.e. 55 kW = 3.5% of full rated kW.

From Table 2, apply the pole-number factor of -0.5 %.

The savings would be approximately (3.5 % - 0.5 %) x 37.5 kW = 1.125 kW.

Savings % = kW saved / (30% loaded motor kW)
= 1.125 kW / (30% x 37.5 kW) = 10%.

Real-world applications:

iERS has been installed in many pump-jack applications (for oil drilling, etc.). The cycle of a pump jack is extreme; for part of the cycle the pump requires near-full torque. In the other part of the cycle, the pump jack is very lightly loaded. In this extreme application, iERS reduced average power consumed by the pump jack (over 30-minute intervals) from 23.99kW down to 19.85kW. This is a 17% reduction in consumed power. Again, this is an extreme example and is not indicative of what a typical application may save.

iERS has been installed on metal grinding equipment. A machine that was retrofitted with an iERS starter had a 75hp motor on a spindle that typically ran at about 20–30% of full load. iERS was able to reduce the energy consumed by this motor by 13–15%.

Stellar® SR55 Full-Featured Soft Starters

SR55 Soft Starter Overcurrent Protection



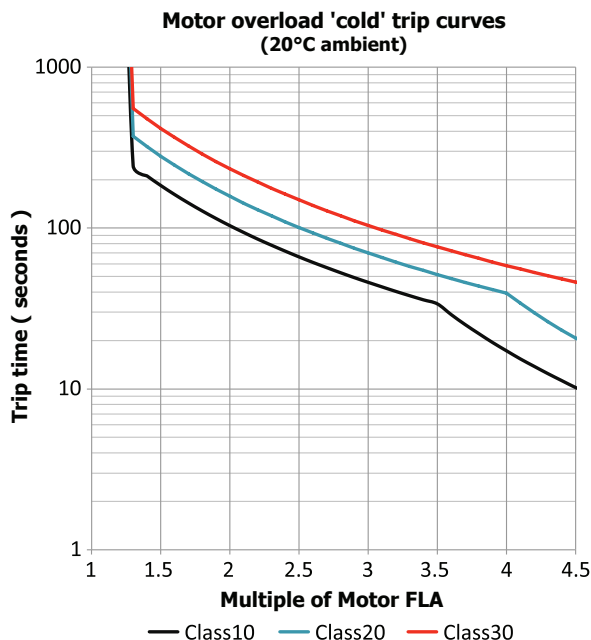
Customer-supplied external power-circuit isolation devices (contactors, disconnect switches, fusible disconnects, shunt-trip circuit breakers, etc.) and short-circuit protection devices (circuit breakers, fuses, etc.) are required for use with SR55 soft starters.

External Short-Circuit Protection Required for SR55												
SR55 Model Number (SR55-XXX)			017	021	027	034	040	052	065	077	096	
Rated Operational Current	<i>I_e</i>	(A)	17	21	27	34	40	52	65	77	96	
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 Z1	(A)	30	45	60	70	90	110	125	150	175	
Class J Time-Delay Fuse #3	Rating Z2	(A)	30	40	50	60	70	100	125	150	175	
UL Listed Inverse Time-Delay Circuit Breaker #3	Rating Z3	(A)	60	60	60	60	60	150	150	250	300	
Rated Conditional Short-Circuit Current	<i>I_q</i>	(kA)	5								10	
SR55 Model Number (SR55-XXX)			124	156	180	242	302	361	414	477	-	
Rated Operational Current	<i>I_e</i>	(A)	124	156	180	242	302	361	414	477	-	
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 Z1		250	350	400	500	600	600	n/a			
Class J Time-Delay Fuse #3	Rating Z2	(A)	225	300	350	450	500	500	600	600	-	
UL Listed Inverse Time-Delay Circuit Breaker #3	Rating Z3	(A)	350	450	500	700	800	1000	1000	1000	-	
Rated Conditional Short-Circuit Current	<i>I_q</i>	(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_q* rms Symmetrical Amperes, when protected by Class J high-speed current-limiting 600V-rated fuses with a maximum trip rating of Z1 (IEC Type 1 coordination short-circuit protection).
- #3 Suitable for use in a circuit capable of delivering not more than *I_q* rms Symmetrical Amperes, 480 Volts maximum, when protected by Class J time delay fuses with a maximum rating of Z2, or by a circuit breaker with an interrupting rating not less than Z3 rms Symmetrical Amperes, 480 Volts maximum as in table.

SR55 Soft Starter Overload Trip

The SR55 soft starter provides motor overload protection, which can be configured through the touchscreen. 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 I2T motor overload with memory.



Stellar[®] SR55 Full-Featured Soft Starters

SR55 Soft Starter Selection

An Online Product Selection Tool is available on our website:
<https://www.automationdirect.com/selectors/softstarters>

SR55 Soft Starters – O/L Trip Classes 1	
Default	10
Heavy	20
Agitator	10
Compressor - Centrifugal	20
Compressor - Reciprocating	20
Compressor - Rotary Screw	20
Compressor - Rotary Vane	10
Compressor - Scroll	10
Ball mill	20
Centrifuge*	30
Bow Thruster - Zero Pitch	10
Bow Thruster - Loaded	20
Conveyor - Unloaded	10
Conveyor - Loaded	20
Crusher	30
Fan - Low Inertia < 85A	10
Fan - High Inertia > 85A	30
Feeder - screw	10
Grinder	20
Hammer mill	20
Lathe machines	10
Mills - Flour, etc.	20
Mixer - Unloaded	10
Mixer - Loaded	20
Molding Machine	10
Pelletizers	20
Plastic and textile machines	10
Press, flywheel	20
Pump - Submersible Centrifugal	10
Pump - Submersible Rotodynamic	10
Pump - Positive displacement Reciprocating	20
Pump - Positive displacement Rotary	20
Pump Jack	20
Rolling mill	20
Roots Blower	20
Saw - Band	10
Saw - Circular	20
Screen - Vibrating	20
Shredder	30
Transformers, voltage regulators	10
Tumblers	20
Wood chipper	30

SR55 Soft Starter Selection Steps

- Determine the required trip class based on the motor load and required start time. See examples to the left (refer to the definitions of Class 10, 20, and 30 Trip Curves on [page tSST-26](#)).
- Below, select the row with the correct motor full load amps. Then select the correct SR55 soft starter to the right based on Trip Class (longer start times require a larger starter). Notice that there are different Motor Amps columns for starters wired In-Line (most common) and In-Delta. Select the applicable SR55 part number based on the required Trip Class, motor HP, and connection type.



Derating is necessary if your application requires multiple starts per hour. Refer to [page tSST-29](#), “SR55 Increased Starts per Hour – Derating.”

SR55 Soft Starters – Selection Table 2 (per IEC 60947-4-1:2009 Table G.1)												
Motor Size										Soft Starter Size		
In-Line Connection					In-Delta Connection *					Application Trip Class		
I (A)	HP @				I (A)	HP @				Class 10	Class 20	Class 30
	200V	208V	230V	460V		200V	208V	230V	460V			
17	3	5	5	10	29	7.5	7.5	10	20	SR55-017	SR55-021	SR55-027
21	5	5	5	15	36	10	10	10	25	SR55-021	SR55-027	SR55-034
27	7.5	7.5	7.5	20	47	10	15	15	30	SR55-027	SR55-034	SR55-040
34	10	10	10	25	59	15	15	20	40	SR55-034	SR55-040	SR55-052
40	10	10	10	30	69	20	20	25	50	SR55-040	SR55-052	SR55-065
52	15	15	15	40	90	25	30	30	60	SR55-052	SR55-065	SR55-077
65	20	20	20	50	113	30	30	40	75	SR55-065	SR55-077	SR55-096
77	20	25	25	60	133	40	40	50	100	SR55-077	SR55-096	SR55-124
96	30	30	30	75	166	50	50	60	125	SR55-096	SR55-124	SR55-156
124	40	40	40	100	215	60	75	75	150	SR55-124	SR55-156	SR55-180
156	50	50	60	125	270	75	75	100	200	SR55-156	SR55-180	SR55-242
180	60	60	60	150	312	100	100	125	250	SR55-180	SR55-242	SR55-302
242	75	75	75	200	419	150	150	150	300	SR55-242	SR55-302	SR55-361
302	100	100	100	250	523	150	150	200	450	SR55-302	SR55-361	SR55-414
361	125	125	150	300	625	200	200	250	500	SR55-361	SR55-414	SR55-477
414	150	150	150	350	717	250	250	250	500	SR55-414	SR55-477	n/a
477	150	150	150	400	826	250	300	300	600	SR55-477	n/a	n/a

* For In-Delta connections, all six motor wires must be available for connection, and it is critical to exactly follow the In-Delta wiring diagram in the SR55 User Manual or Quick-start Guide. Nine-lead motors CANNOT be connected in the delta. The Soft Starter will only sense the Phase Current, which is about 58% of the Line Current.

* For In-Delta connections, a main contactor that is controlled by the Run relay of the SR55 must be used in the incoming power circuit for isolation. Circuit breaker isolation alone is not sufficient.

* iERS energy optimizing feature is not available for In-Delta connections.

* Size centrifuge starter at I(A)
 = (motor FLA x 2.3). Trip Class 30.

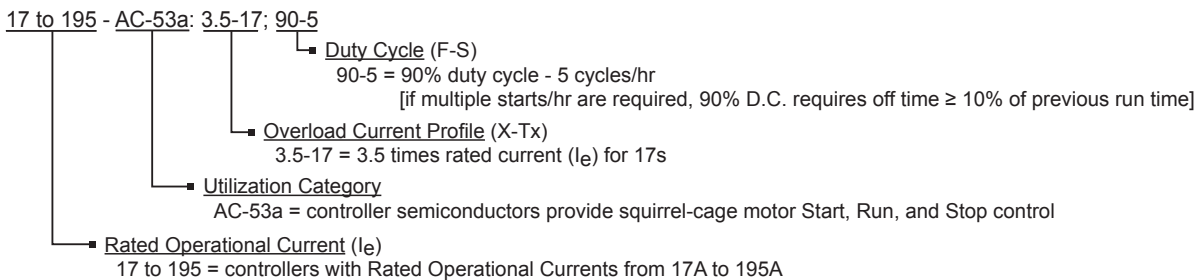
Stellar® SR55 Full-Featured Soft Starters

SR55 Index Ratings (per IEC 60947-4-2)

SR55 Index Ratings *		
Model Number	I _e (A)	Standard Operation AC-53a; X-Tx; F-S
SR55-017 to SR55-180	17 to 195	AC-53a: 3.5-17; 90-5
SR55-242 to SR55-477	242 to 500	AC-53a: 3.5-17; 90-3

* Index ratings AC-53a and AC-53b are specified by IEC standard # 60947-4-2. IEC Index Ratings are comprised of Rated Operational Current (I_e), Utilization Category, Overload Current Profile (X-Tx), and Duty Cycle (F-S) or OFF-time.

Index Rating Example – Standard Operation (AC-53a Utilization Category per IEC 60947-4-2)



Standard Overload Current Profile and Duty Cycle

The SR55 has been designed for a specific Overload Current Profile and Duty Cycle as shown above in the SR55 Index Ratings.

The Overload Current Profile is expressed by two symbols, X and Tx.

X denotes the overload current as a multiple of I_e and represents the maximum value of operating current due to starting, operating, or maneuvering under overload conditions.

For example, X = 3.5 means that the maximum overload start current allowed is 3.5 times FLC.

Tx denotes the duration of the controlled overload currents during starting, stopping, operating, or maneuvering.

For example, Tx = 17 means that the maximum allowed overload current is permitted for up to 17 seconds only.

The Duty Cycle is expressed by two symbols, F and S which describe the duty and also set the time that must be allowed for cooling.

F is the ratio of the on-load period to the total period expressed as a percentage.

For example, F = 90 means that the soft starter is ON for 90% of the time and then OFF for 10% of the time between each start.

If there are not multiple starts per hour, then the Duty Cycle is continuous.

S is the number of starts or operating cycles per hour.

For example, S = 5 means that the soft starter is capable of 5 equally spaced starts per hour.

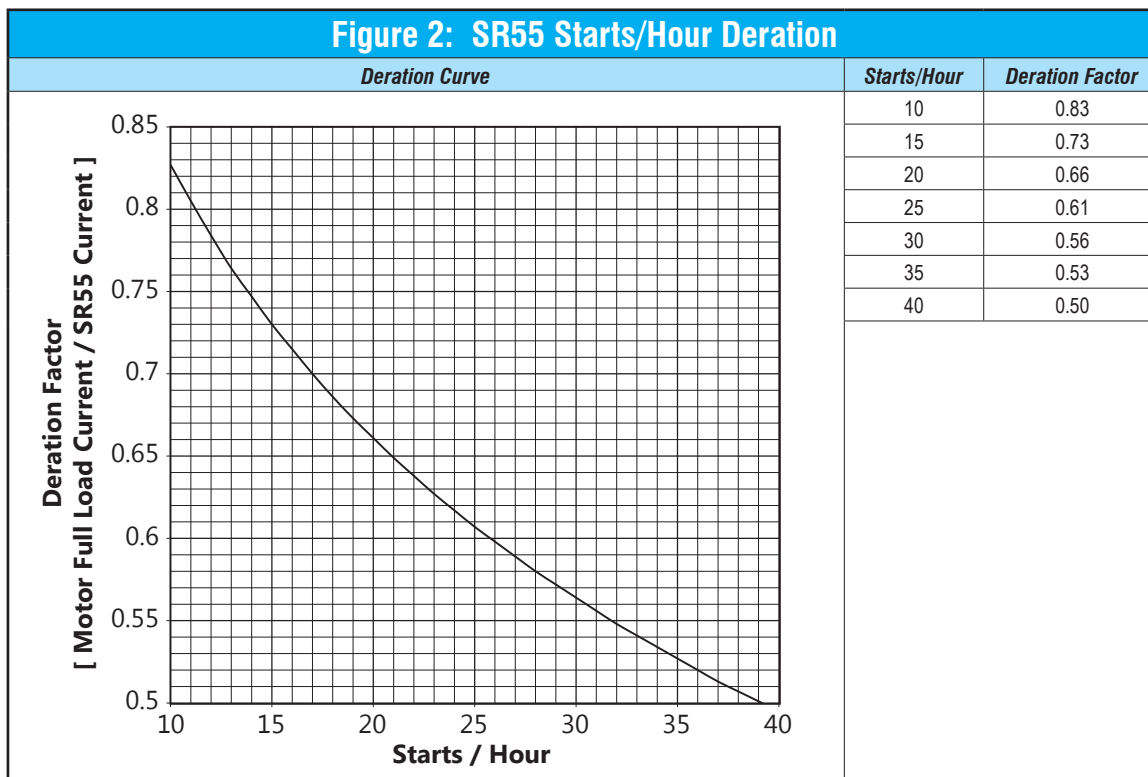
These characteristics are summarized in Figure 1.

Figure 1: Standard Overload Current Profiles and Duty Cycles					
Model	Rated Current (A)	Class 10 O/L Multiple (X)	Class 10 O/L Time (Tx)	Starts / Hour (S)	Duty (F)
SR55-017	017	3.5	17	5	90%
SR55-021	021				
SR55-027	027				
SR55-034	034				
SR55-040	040				
SR55-052	052				
SR55-065	065				
SR55-077	077				
SR55-096	096				
SR55-124	124				
SR55-156	156				
SR55-180	180				
SR55-242	242			3	
SR55-302	302				
SR55-361	361				
SR55-414	414				
SR55-477	477				

Stellar® SR55 Full-Featured Soft Starters

SR55 Increased Starts per Hour – Derating

If more than the standard number of starts/hour is required, the SR55 must be derated. To derate for more starts/hour, the motor full load current must be less than the SR55 current. The relationship between the SR55 deration and the starts/hour is given below in Figure 2 and the two examples that follow. This assumes that the SR55 is still operating at the same duty (F) as given in Figure 1.



Deration Factor = $(138 - (24 \cdot \ln(\text{starts/hr}))) / 100$
 [where $\ln(\text{starts/hr})$ is the natural log of the # of starts/hour]
 Example: Deration Factor for 10 starts/hr = $(138 - (24 \cdot \ln(10))) / 100 = 0.83$

Example 1: SR55 Selection and Configuration		
Step	SR55 Selection	
1	Application	Loaded Conveyor
2	Trip Class	20
3	Duty	90%
4	In-Line or In-Delta	In-Line
5	Ambient Temperature	40°C
6	Altitude	1000m
7	Full Motor Load Current	80A
8	Current Limit	4 x 80A = 320A
9	Number of Starts/Hour	10
10	Deration Factor (from Fig.2)	0.83
11	SR55 (A) = Motor FLC / Deration Factor	96A
12	Determine SR55 from Sizing Guide	SR55-096
Step	SR55 Configuration	
1	Select Application	(Auto Setup)
2	Leave Motor Current 100A (maximum)	(Auto Setup)
3	Set Start Current Limit to 320A (400% of motor FLC)	(Start Current Limit)
4	Set Overload Level to 88A (110% of motor FLC)	(Overload Settings)
Step	SR55 Alternative Configuration	
1	Set Application	(Auto Setup)
2	Set Motor Current to 80A	(Auto Setup)
3	Warm Trip Time will be reduced to Trip Class 10 value	(320A for 13s)

Example 2: SR55 Selection and Configuration		
Step	SR55 Selection	
1	Application	Agitator
2	Trip Class	10
3	Duty	90%
4	In-Line or In-Delta	In-Line
5	Ambient Temperature	40°C
6	Altitude	1000m
7	Full Motor Load Current	66A
8	Current Limit	3.5 x 66A = 231A
9	Number of Starts/Hour	20
10	Deration Factor (from Fig.2)	0.66
11	SR55 (A) = Motor FLC / Deration Factor	100A
12	Determine SR55 from Sizing Guide	SR55-124
Step	SR55 Configuration	
1	Select Application	(Auto Setup)
2	Leave Motor Current 100A (maximum)	(Auto Setup)
3	Set Start Current Limit to 231A (350% of motor FLC)	(Start Current Limit)
4	Set Overload Level to 72A (110% of motor FLC)	(Overload Settings)
Step	SR55 Alternative Configuration	
1	Set Application	(Auto Setup)
2	Set Motor Current to 66A	(Auto Setup)
3	Set Trip Class to 30	(Overload Settings)
4	Warm Trip Time will be reduced to Trip Class 10 value	(231A for 17s)

Stellar[®] SR55 Full-Featured Soft Starters

SR55 Soft Starter Dimensions

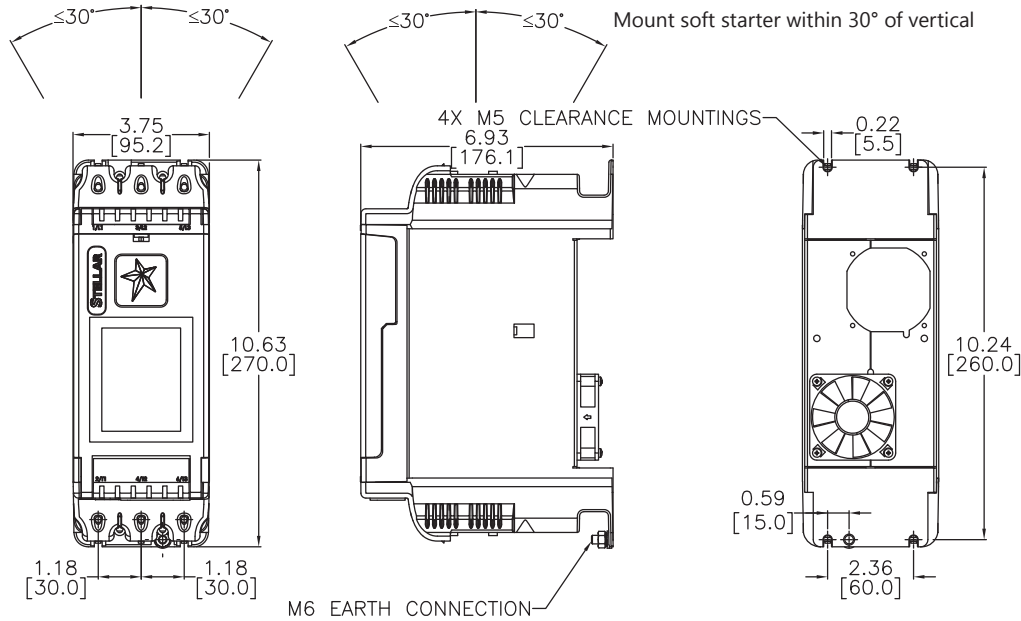
Dimensions = in [mm]

See our website: www.AutomationDirect.com for complete engineering drawings.

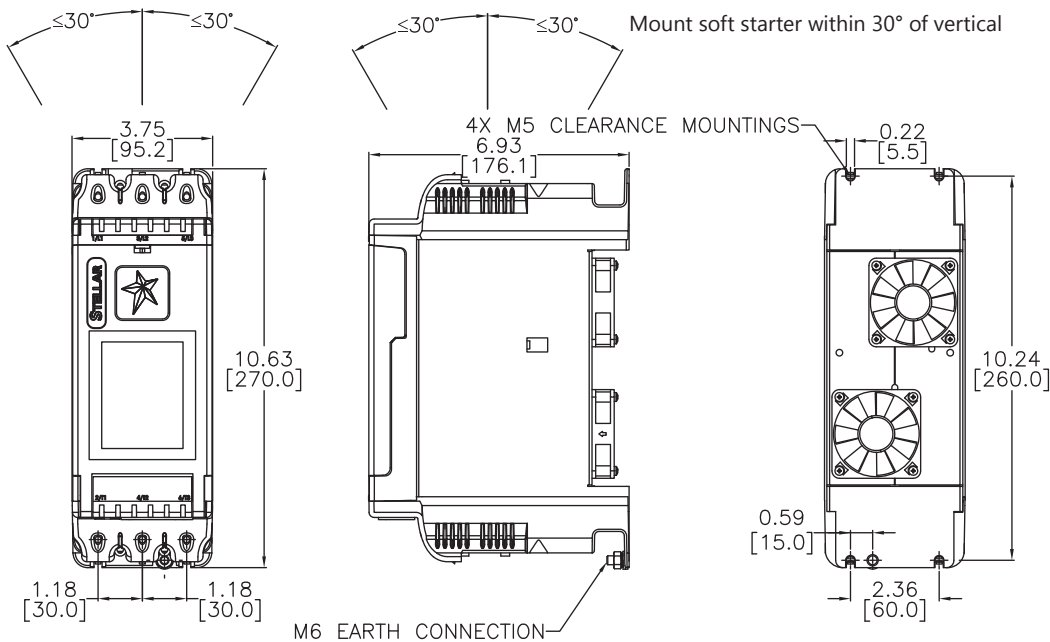


The addition of optional finger guards to size 1 and size 2 SR55 soft starters adds approximately 14mm [0.5in] to the soft starter vertical dimension, but does NOT change the clearance distance.

Frame Size 1: SR55-017 to SR55-027



Frame Size 1: SR55-034 to SR55-096



Stellar[®] SR55 Full-Featured Soft Starters

SR55 Soft Starter Dimensions

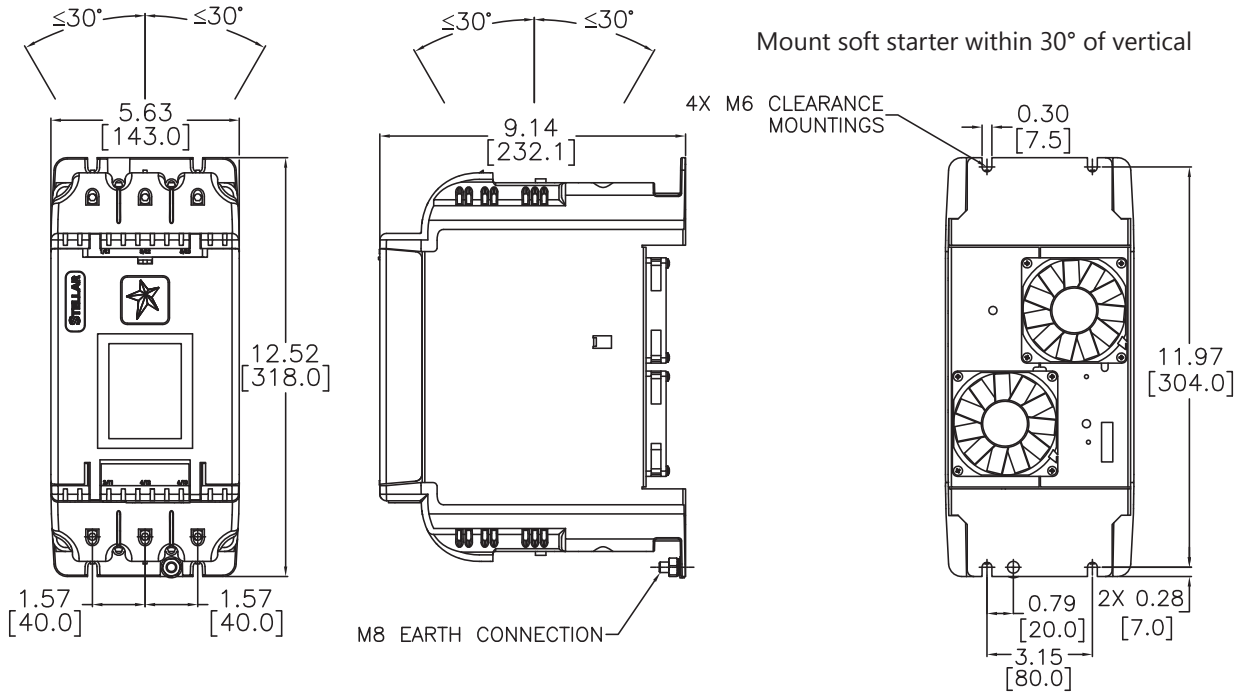
Dimensions = in [mm]

See our website: www.AutomationDirect.com for complete engineering drawings.

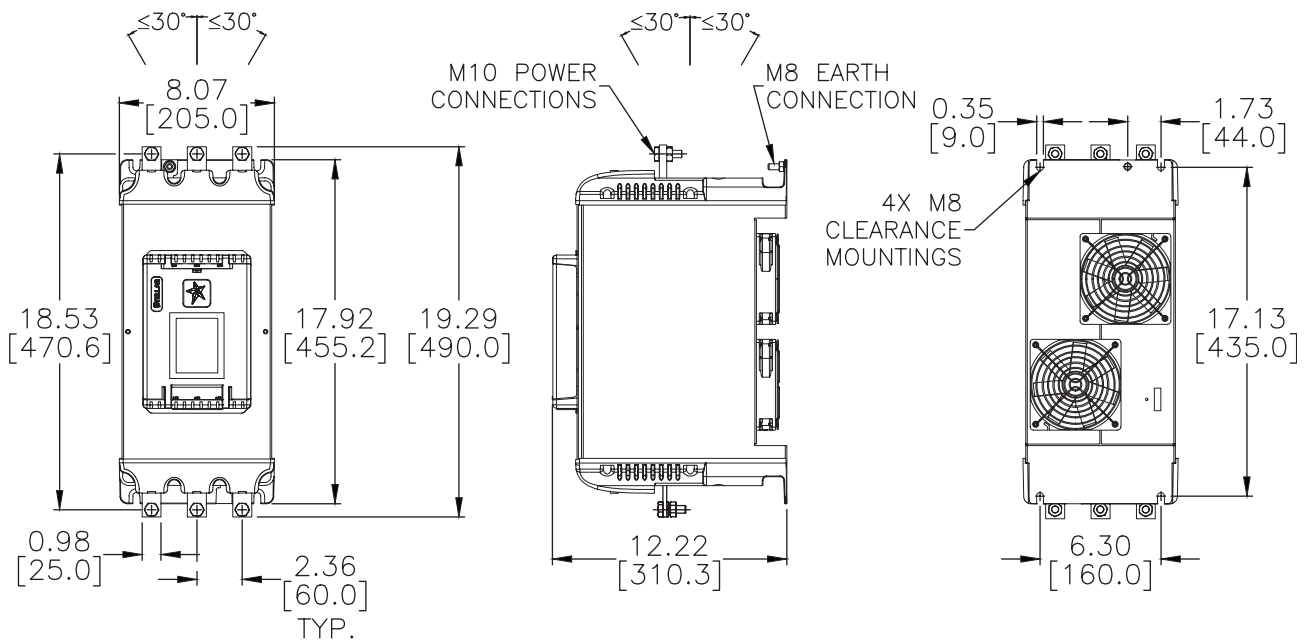


The addition of optional finger guards to size 1 and size 2 SR55 soft starters adds approximately 14mm [0.5in] to the soft starter vertical dimension, but does NOT change the clearance distance.

Frame Size 2: SR55-124 to SR55-180



Frame Size 3: SR55-242 to SR55-361



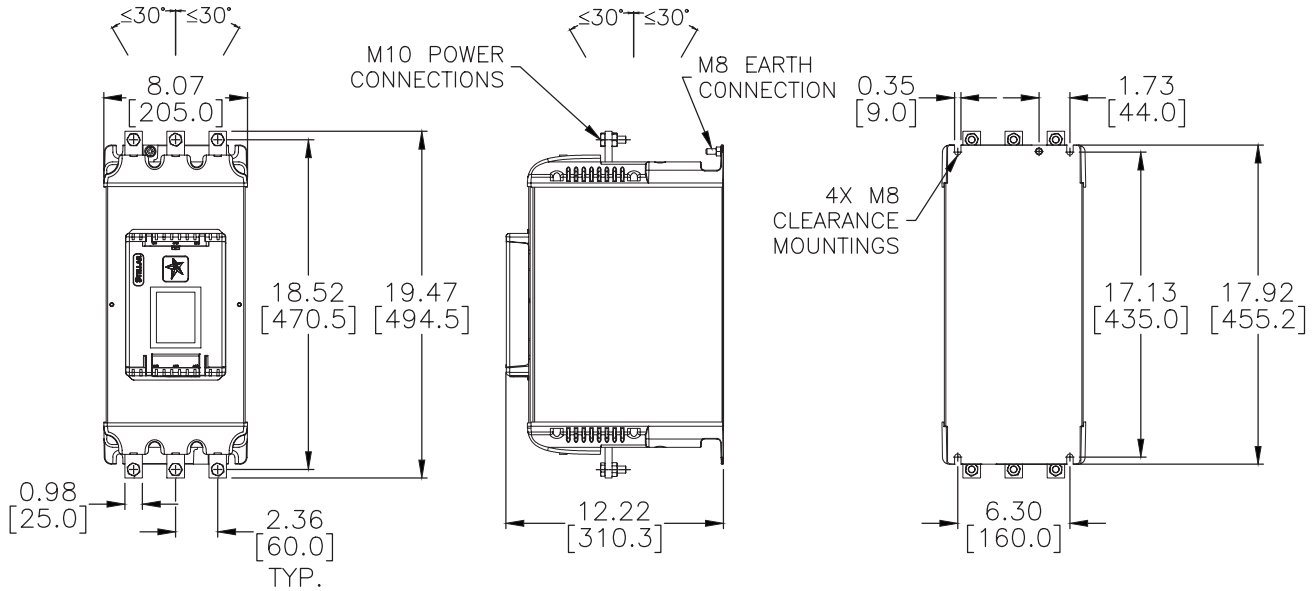
Stellar® SR55 Full-Featured Soft Starters

SR55 Soft Starter Dimensions

Dimensions = in [mm]

See our website: www.AutomationDirect.com for complete engineering drawings.

Frame Size 3: SR55-414 to SR55-477



Ventilation for Enclosures

SR55 Minimum Clearance Distances * (in [mm])					
SR55 Soft Starter Model	Top	Bottom	Left	Right	Front
Size 1: SR55-017 to SR55-096	3 [75]			1 [25]	
Size 2: SR55-124 to SR55-180	3.9 [100]		1.6 [40]		1 [25]
Size 3: SR55-242 to SR55-477	4.9 [125]		2.4 [60]		1 [25]

* For heat dissipation, the SR55 must not be mounted any closer to another object than these distances.



The addition of optional finger guards to size 1 and size 2 SR55 soft starters adds approximately 14mm [0.5in] to the soft starter vertical dimension, but does NOT change the clearance distance.



When fitting SR55 into an enclosure, ventilation must be provided if the heat output of the unit is greater than the enclosure will dissipate. Use the formula at right to determine the fan requirement. An allowance has been incorporated into the formula so that the figure for Q is the air delivery in the fan suppliers data.

The power dissipation of the thyristors are at their peak when the SR55 is in energy saving mode (iERS), therefore causing the most heat generated from the starter. Heat dissipated can be approximated with the formula:
 Watts (SR55) = 1/2 x (SR55 current rating) x 3

$$Q = (4xWt) / (T_{max} - T_{amb})$$

Q = Volume of air (cubic meters per hour - m³/h)

Wt = Heat produced by the unit and all other heat sources within the enclosure (Watts)

T_{max} = Maximum permissible temperature within the enclosure (50°C for a fully rated SR55)

T_{amb} = Temperature of the air entering the enclosure (°C)
 (If you prefer to work in CFM, substitute °F for °C. Q is now in CFM)

Stellar® SR55 Full-Featured Soft Starters

SR55 Soft Starter Optional Accessories

EtherNet/IP Module

The EtherNet/IP communication module is intended to be installed in the SR55 option slot, and allows the SR55 to be connected to an EtherNet/IP network. The interface offers the following functionality:

- CIP Parameter Object Support
- Supports Explicit and Implicit Messaging

SR55-CM-ENETIP2

- 7 Input Words from the network master to SR55
- 5 Output Words from SR55 to the network master

SR55-CM-ENETIP

- 2 Input Words from the network master to SR55
- 2 Output Words from SR55 to the network master

Modbus TCP Module

Allows an SR55 soft starter to be connected to a Modbus TCP network using TCP/IP protocol.

The communication module supports 4 simultaneous (master) connections and allows access to all user parameters.



EtherNet/IP Module: [SR55-CM-ENETIP\(2\)](#)



Modbus TCP Module: [SR55-CM-MODTCP](#)

Finger Guards

For SR55 soft starter power-circuit line and load side terminals; provides IP20 protection for soft starter sizes [SR55-180](#) and below (frame sizes 1 and 2).

Remote Touchscreen

Allows remote monitoring, configuration, and control of SR55 soft starters. Since the touchscreen is a master RS-485 device, it can control multiple SR55 soft starters. Includes a 3m Ethernet cable and an [SR55-RJ45-RJ12](#) adapter.



Remote Touchscreen: [SR55-KPD-REM](#)



Modbus Serial Splitter: [SR55-SPLT](#)



Finger Guards: [SR55-FG-1](#) & [SR55-FG-2](#)



RJ45 to RJ12 Adapter: [SR55-RJ45-RJ12](#)



USB Flash Drive: [USB-FLASH](#)

Modbus Serial Splitter

Includes an [SR55-RJ45-RJ12](#) adapter cable. Allows a Modbus network over RS-485 to be constructed as plug-and-play with standard Ethernet cables. Customer must provide cable between RS-485 master and the first splitter. Can only be used with one master at a time on the network, e.g. Remote Touchscreen, PLC, or HMI. Splitter includes (3) female RJ45 ports.

RJ45 to RJ12 Adapter

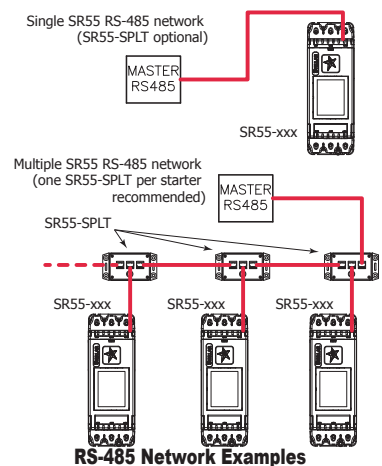
Allows connection of the Remote Touchscreen, Modbus Splitter, or other Modbus master to the RJ12 port on top of the SR55 soft starter.

Adapter has a male RJ12 connector and a female RJ45 connector (allows use of standard Ethernet cables).

USB Flash Drive

4GB USB Flash drive. Recommended for SR55 firmware updates and data logging.

NOTE: Other flash drives may not work with SR55. [USB-FLASH](#) has been successfully tested with SR55.



RS-485 Network Examples

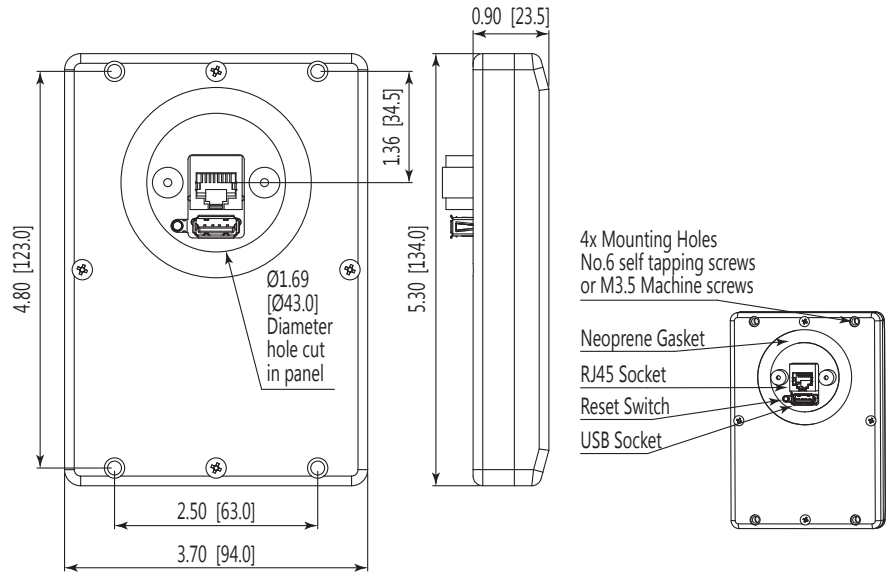
SR55 Optional Accessories			
Part Number	Price	Description	For SR55 Models
SR55-CM-ENETIP2	\$689.00	EtherNet/IP communication module, optional, for Stellar SR55 series soft starters, dual RJ45 communication ports, complete EtherNet/IP adapter, TCP/IP socket interface, CIP parameter object support, implicit and explicit messaging, transformer isolated Ethernet interface, 10/100 Mbps full duplex.	all
SR55-CM-ENETIP	\$425.00	EtherNet/IP communication module, optional, for Stellar SR55 series soft starters, dual RJ45 communication ports, complete EtherNet/IP adapter, TCP/IP socket interface, CIP parameter object support, implicit and explicit messaging, transformer isolated Ethernet interface, 10/100 Mbps full duplex.	all
SR55-CM-MODTCP	\$491.00	Modbus TCP communication module, optional, for Stellar SR55 series soft starters, dual RJ45 communication ports, complete Modbus TCP server, up to 256 bytes of I/O data in each direction, transformer isolated interface, 100 Mbps full duplex, TCP/IP socket interface, supports 4 simultaneous (master) connections.	all
SR55-FG-1	\$33.00	Finger guards, replacement, for size 1 Stellar SR55 series soft starter power terminals. Provides IP20 protection rating. Package of 2.	017 thru 096
SR55-FG-2	\$33.00	Finger guards, replacement, for size 2 Stellar SR55 series soft starter power terminals, Provides IP20 protection rating. Package of 2.	124 thru 180
SR55-KPD-REM	\$417.00	Touchscreen, optional remote, for Stellar SR55 series soft starters. Used to remotely monitor, configure, and control SR55 series units without opening enclosures. Rated for NEMA 4/4X enclosures, no external power wiring required. Includes 3m RJ45 cable and SR55-RJ45-RJ12 adapter.	all
SR55-SPLT	\$166.00	Serial Modbus communication splitter, optional, for Stellar SR55 series soft starters. Used for creating a Modbus network with multiple SR55 series soft starters. Uses 3 serial RJ45 connectors for upstream/downstream connectivity and connection to the starter.	all
SR55-RJ45-RJ12	\$7.00	RJ45 female to RJ12 male adapter, optional, for Stellar SR55 series soft starters.	all
USB-FLASH	\$25.50	USB Flash drive, SanDisk, 4GB (SanDisk P/N SDCZ50-004G-A46).	all

Stellar® SR55 Full-Featured Soft Starters

SR55 Soft Starter Accessory Dimensions

Dimensions = in [mm]

SR55-KPD-REM Remote Touchscreen Dimensions & Panel Mounting Cut-Out Dimensions



SR55 Soft Starter Replacement Parts



Replacement Fan: **SR55-FAN-2**



Replacement Fan: **SR55-FAN-3**



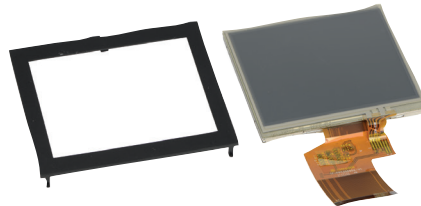
Replacement Fan: **SR55-FAN-6**



Replacement Fan: **SR55-FAN-7**

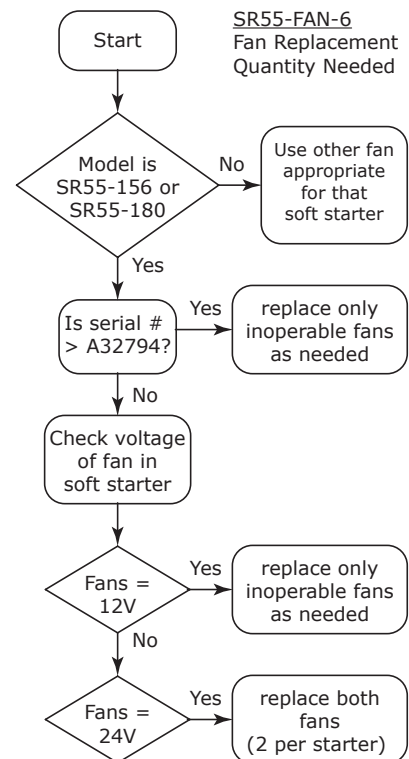


Replacement Fan: **SR55-FAN-8**



Replacement Touchscreen: **SR55-KPD**

SR55-FAN-6 Fan Replacement Quantity Flowchart



SR55 Spare/Replacement Parts *

Part Number	Price	Description	For SR55 Models
SR55-FAN-2 **	\$19.00	Cooling fan, replacement, for size 1 Stellar SR55 series soft starters, 60 x 60 x 15 mm	017 thru 096
SR55-FAN-3 **	\$22.00	Cooling fan, replacement, for size 2 Stellar SR55 series soft starters, 80 x 80 x 15 mm	124
SR55-FAN-6 ***	\$24.00	Cooling fan, replacement, for size 2 Stellar SR55 series soft starters, 80 x 80 x 20 mm	156 thru 180
SR55-FAN-7 **	\$49.00	Cooling fan, replacement, for size 3 Stellar SR55 series soft starters, 120 x 120 x 25 mm	242 thru 361
SR55-FAN-8 **	\$129.00	Cooling fan, replacement, for size 3 Stellar SR55 series soft starters, 171 x 151 x 151 mm	414 thru 477
SR55-KPD	\$117.00	Touchscreen, replacement, for Stellar SR55 series soft starters	all

* These items are exact replacements for the comparable part that is originally installed on the applicable SR55.

** These fans include wiring connectors.

*** SR55-FAN-6 12VDC fan kits fit SR55-156 and SR55-180 soft starters. Some early models of these starters were equipped with 24VDC fans, and two SR55-FAN-6 kits are required for those particular models since both 24VDC fans require replacement. The 12VDC fan kits include wiring connectors and a resistor, which is for use only with the 24VDC soft starters. Refer to the Fan Replacement Quantity flowchart above to determine how many fan kits you need.