

## SR33 DIGITAL SOFT STARTERS

### QUICK-START GUIDE: INSTALLATION AND OPERATION



**WARNING: ELECTRIC SHOCK RISK. DANGER. ONLY QUALIFIED INDUSTRIAL ELECTRICAL TECHNICIANS SHOULD PERFORM THE OPERATIONS DESCRIBED IN THIS DOCUMENT.**

SR33 soft starters are semi-conductor devices designed for reduced-voltage start/stop control of 3-phase AC induction motors; typically in applications that would otherwise require an electromechanical wye-delta starter.

SR33 soft starters are suitable for use in industrial environments.  
EN 55011/22 Class A.

**SR33-22 through SR33-55**



**SR33-66 through SR33-97**



**SR33-132 through SR33-195**



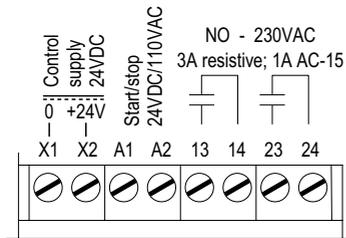
**SR33-241 through SR33-482**



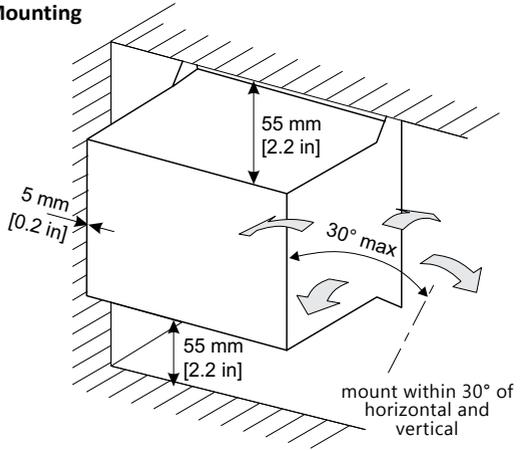
## CONTROL CABLES & MOUNTING POSITION

ALL SR33 MODELS

### Control Terminals



### Mounting

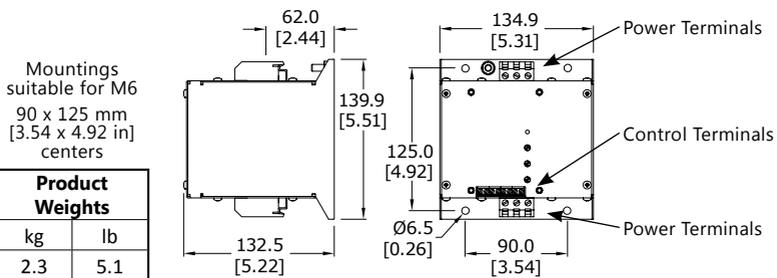


Control Cables	X2, X2 A1, A2 13, 14 23, 24				
	mm <sup>2</sup>	AWG	mm [in]	N·m [lb·in]	mm
	1 x 0.75–2.5	1 x 18–12	6 [0.24]	0.8 [7.1]	0.5 x 3.5
	2 x 0.75–1	2 x 18–16	11 [0.43]		

## POWER CABLES & DIMENSIONS

Dimensions = mm [in]

### SR33-22 to SR33-55 – 10hp to 30hp @ 460V



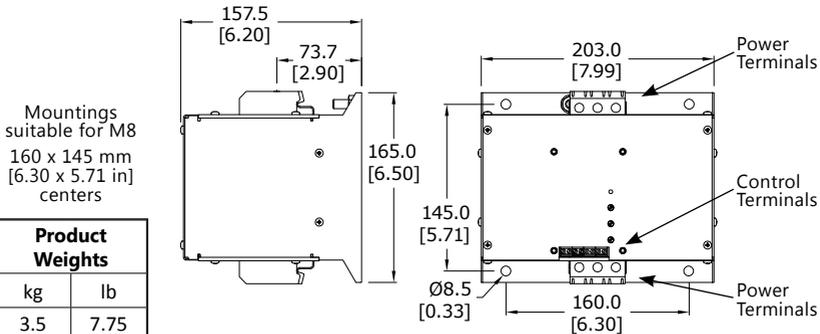
Product Weights	
kg	lb
2.3	5.1

Power Cables	1L1, 3L2, 5L3 2T1, 4T2, 6T3					
	mm <sup>2</sup>	AWG	mm [in]	N·m [lb·in]	mm	M6
CU stranded 75°C [167°F]	6–16	8–4	13 [0.51]	2 [18]	0.8 x 4	8 N·m [70 lb·in]

**POWER CABLES & DIMENSIONS (CONTINUED)**

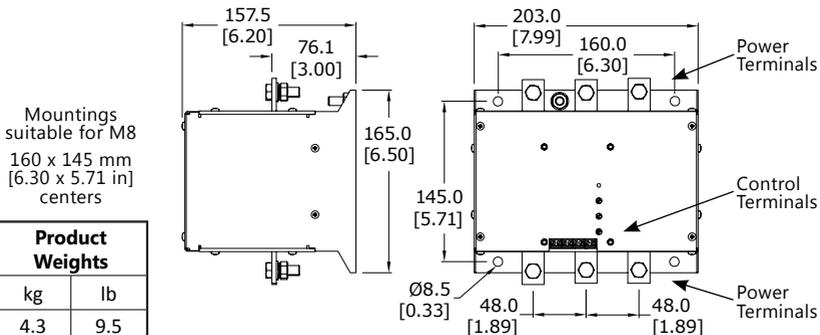
Dimensions = mm [in]

**SR33-66 to SR33-97 – 25hp to 40hp @ 460V**



Power Cables	1L1, 3L2, 5L3 2T1, 4T2, 6T3					
	CU stranded 75°C [167°F]	mm <sup>2</sup> 16–35	AWG 6–1	mm [in] 17 [0.67]	N·m [lb·in] 2.5 [27]	mm 1.2 x 6.5

**SR33-132 to SR33-195 – 40hp to 100hp @ 460V**



Power Cables				
	1L1, 3L2, 5L3 2T1, 4T2, 6T3 PE			
CU stranded 75°C [167°F]	mm <sup>2</sup> 50 – 95	AWG 1/0 – 250 kcmil	mm 20 x 5	M8 x 1.00 x 25mm 12 N·m [106 lb·in]



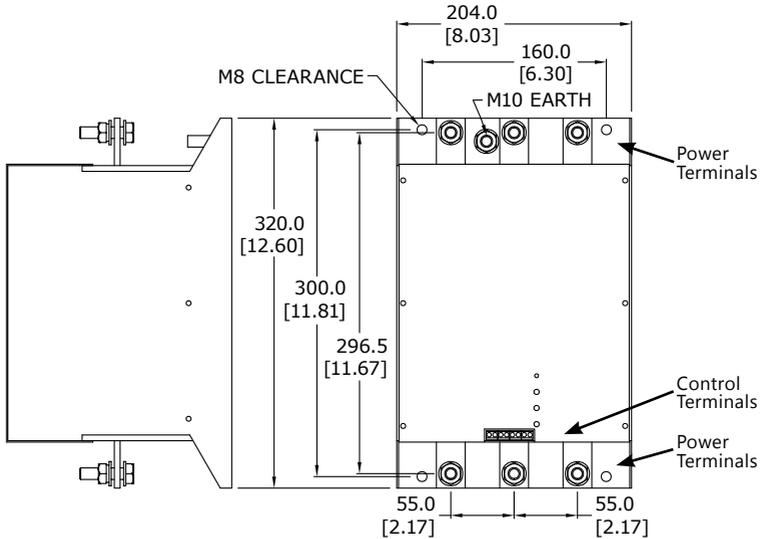
**NOTE:** FOR UL APPLICATIONS, HEAT-SHRINK INSULATION KIT # SR33-HS1 IS REQUIRED FOR SOFT STARTERS SR33-132 TO SR33-280. (SR33-350 TO SR33-482 ARE NOT UL CERTIFIED.)

# Stellar SR33 Soft Starter Basic Quick-Start Guide

## POWER CABLES & DIMENSIONS – (CONTINUED)

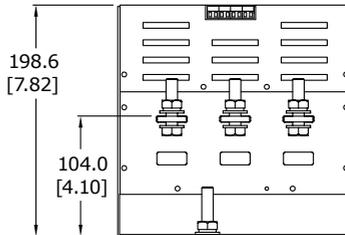
Dimensions = mm [in]

### SR33-241 to SR33-482 – 100hp to 300hp @ 460V



Mountings suitable for M8  
160 x 300 mm [6.3 x 11.8 in] centers

Product Weights			
Soft Starter	kg	lb	
SR33-241 & SR33-280	9.7	21.4	
SR33-350 to SR33-482	13.5	29.8	

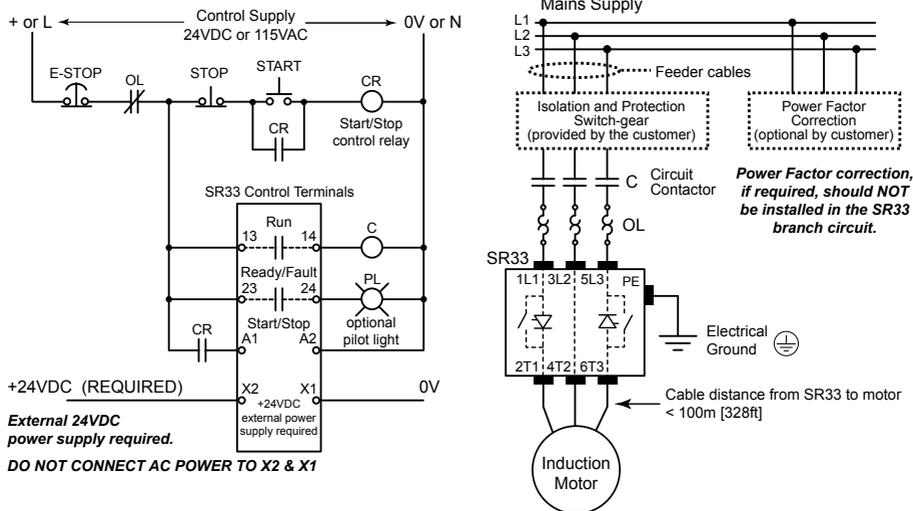


Power Cables				
	mm <sup>2</sup>	AWG	mm	M10 x 1.25 x 30mm
CU stranded 75°C [167°F]	1L1, 3L2, 5L3 2T1, 4T2, 6T3 (PE)			
Soft Starter	2 x 95	2 x 2/0	25 x 5	14 N·m [123.9 lb·in]
SR33-241 & SR33-280	2 x 150	2 x 350 kcmil	25 x 10	
SR33-350 to SR33-482	<b>All electrical connections are M10.</b>			



**NOTE:** FOR UL APPLICATIONS, HEAT-SHRINK INSULATION KIT # SR33-HS1 IS REQUIRED FOR SOFT STARTERS SR33-132 TO SR33-280. (SR33-350 TO SR33-482 ARE NOT UL CERTIFIED.)

**STANDARD CONNECTION – SOFT STARTER WITH MAIN CONTACTOR**



**NOTE:** WHERE SEVERAL CONDUCTORS ARE TO BE CONNECTED, THE DIFFERENCE BETWEEN THE WIRES/CABLES USED MUST NOT EXCEED ONE STANDARD AWG SIZE LEVEL.



**NOTE:** THE SOFT STARTER MUST BE CONNECTED TO A 3-PHASE POWER SUPPLY AND A 3-PHASE LOAD FOR PROPER OPERATION. ATTEMPTED STARTS WILL RESULT IN A STARTER FAULT IF EITHER THE 3-PHASE POWER OR THE 3-PHASE LOAD IS NOT CONNECTED.



**WARNING:** NEVER CARRY OUT ANY WORK ON ELECTRICAL OR MECHANICAL EQUIPMENT BEFORE ISOLATING ALL POWER SUPPLIES. THE SR33 DOES NOT PROVIDE ISOLATION. LIVE OUTPUTS MAY BE PRESENT WITHOUT MOTOR ROTATION.

**SETTINGS**

<p>Uni </p> <p>30% 100%</p>	<p>Pedestal Voltage: 30% for standard rating 100% for high-breakaway loads</p>
<p>Stop </p> <p>0 30</p>	<p>Soft Stop Time: Default = 0 Range = 0s to 30s</p>
<p>Start </p> <p>0 30</p>	<p>Soft Start Time: Default = approx 5s (SR33-22 to SR33-195) approx 12s (SR33-241 to SR33-482) Range = 0s to 30s</p>

**SR33-22 TO SR33-195 – 15HP TO 150HP @ 460V**

**Green**  
On = Ready  
Off = Fault

**Flash Red (fault)**  
1 = SCR / supply  
2 = Thermal  
3 =  $V_c < 24V$   
4 = Bypass relay failure



**LED Green**  
On – Ready for operation  
Off – Fault

**Fault LED Red**  
(reset by cycling power at Start/Stop input A1 & A2)

Flashes  
1 SCR or supply  
2 Too hot  
3 Control supply low volts  
4 Bypass relay failure

Green/Orange Flash – Tripped & reset; ready

**SR33-241 TO SR33-482 – 200HP TO 400HP @ 460V**

**Green**  
On = Ready  
Off = Fault

**Flash Red (fault)**  
1 = SCR / supply  
2 = Thermal  
3 =  $V_c < 24V$   
4 = Bypass relay failure  
5 = Shearpin  
6 = Overload

**Rapid = Overcurrent**



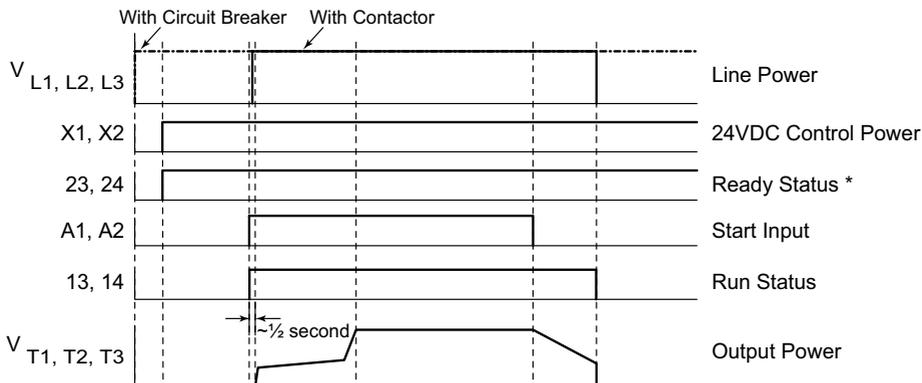
**LED Green**  
On – Ready for operation  
Off – Fault

**Fault LED Red**  
(reset by cycling power at Start/Stop input A1 & A2)

Flashes  
1 SCR or supply  
2 Too hot  
3 Control supply low volts  
4 Bypass relay failure  
5 Shearpin ( $I > 4.5 \times I_e$ )  
6 Overload – see separate O/L trip chart

Green/Orange Flashes – Tripped & reset; ready  
Green/Orange Rapid Flashes – Overcurrent  
>300% starting; >110% running  
(very brief flashing is normal during start)

**SR33 TIMING DIAGRAM**



\* The “Ready/Fault” contact (terminals 23 and 24) is energized and closed when control power is applied and the SR33 soft starter is ready. This same contact will be de-energized and open if the control power is off or the SR33 soft starter is faulted. The contact as designed provides a failsafe means of determining the “Ready” status of the starter. The presence of an input from the contact indicates that the starter has control power, is without fault, and is ready to start.



**WARNING: ATTENTION! WITHIN THE SCOPE OF THE EU DIRECTIVES, THE SR33 SOFT STARTERS AND THEIR ACCESSORIES MAY BE COMMISSIONED ONLY PROVIDED IT IS ESTABLISHED THAT THE MACHINE FULFILLS THE PROTECTIVE REQUIREMENTS OF MACHINE DIRECTIVE 89/392/EWG.**

**SIZING GUIDE**



**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 OUR ONLINE SELECTION TOOL FOR DERATINGS BY APPLICATION AND OVERLOAD TRIP CLASS: ([HTTPS://WWW.AUTOMATIONDIRECT.COM/SELECTORS/SOFTSTARTERS](https://www.automationdirect.com/selectors/softstarters)).**

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 with crushers, with starts > 30 seconds.
- 2-pole motors may take longer to start.

**SR33 SELECTION**

SR33 Soft Starters – Selection – Steps 1 & 2 (of 4)					
<b>Step 1: Select the application from the list and follow that column down.</b>	<b>Typical Applications</b>				
		<b>Standard Duty</b>	<b>Medium Duty</b>	<b>Heavy Duty</b>	
		<u>Default</u>	Ball mill		
		Agitator	Bow Thruster - Loaded		
		Bow Thruster - Zero Pitch	Compressor - Centrifugal		
		Compressor - Rotary Vane	Compressor - Reciprocating		
		Compressor - Scroll	Compressor - Rotary Screw		
		Conveyor - Loaded	Conveyor - Unloaded		
		Fan - Low Inertia < 85A	Grinder		Centrifuge*
		Feeder - screw	Hammer mill		*For centrifuges make selection at I(A) = motor FLA x 2.3
	Lathe machines	Mills - Flour, etc.			
	Mixer - Unloaded	Mixer - Loaded		Crusher	
	Molding Machine	Pelletizers		Fan - High Inertia > 85A	
	Plastic and textile machines	Pump - Positive displacement reciprocating		Shredder	
	Pump - Submersible Centrifugal	Pump - Positive displacement rotary		Wood chipper	
	Pump - Submersible Rotodynamic	Pump Jack		Press, flywheel	
	Saw - Band	Rolling mill			
	Transformers	Roots Blower			
	Voltage regulators	Saw - Circular			
		Screen - Vibrating			
		Tumblers			
<b>Step 2: Confirm the rated starting capability of the soft start against the application.</b>	<b>Trip Class</b>	10	20	30	
	<b>Rated Starting Capability</b>	3x Motor Current - 23s	4x Motor Current - 19s	4x Motor Current - 29s	
	<b>Max Starts per Hour</b>	SR33-29 to -280: 5 starts/hr	SR33-29 to -350: 5 starts/hr	SR33-41 to -430: 5 starts/hr	
		SR33-350 to -482: 3 starts/hr	SR33-430 to -482: 3 starts/hr	SR33-482: 3 starts/hr	
Index Rating Standard (Class5) AC53b: 3-5: 355; Overcurrent = 3 x I <sub>rated</sub> 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.**

<b>SR33 Soft Starters – Selection – Step 3 (of 4)</b>	
<b>Step 3: Consider the operating environment and make the model selection on a higher horsepower rating.</b>	
<b>Height Above Sea Level</b>	Standard operating height is 3280ft. For every 328ft, increase motor HP by 1%, up to 6600ft. <b>Example:</b> For a 100HP motor at 4900ft, make model selection based on 105HP (5% higher).
<b>Operating Temp-erature</b>	Standard operating temperature is 122°F. For every 1°F above, increase motor HP by 2.2%, up to 140°F. <b>Example:</b> For a 100HP motor at 132°F, make model selection based on 122HP (22% higher).
<b>Increased Starts per Hour</b>	Use our online tool to select the model: <a href="https://www.automationdirect.com/selectors/softstarters">https://www.automationdirect.com/selectors/softstarters</a>

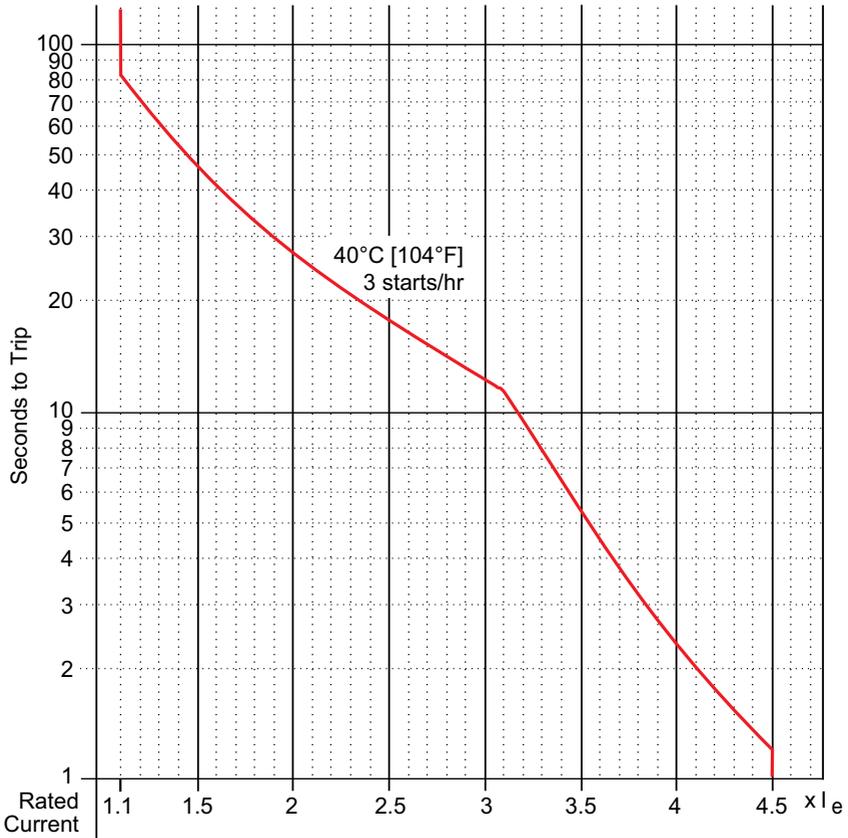
<b>SR33 Soft Starters – Selection – Step 4 (of 4)</b>						
<b>Step 4: Select SR33 model based on your motor Voltage and Horsepower</b>						
<b>Motor HP</b>				<b>Trip Class *</b>		
<b>230VAC</b>		<b>460VAC</b>		<b>3-23:697</b>	<b>4-19:701</b>	<b>4-19:691</b>
<b>HP</b>	<b>I<sub>e</sub> (A)</b>	<b>HP</b>	<b>I<sub>e</sub> (A)</b>	<b>10</b>	<b>20</b>	<b>30</b>
-	-	-	-	<b>5 start/hr</b>		
5	15.5	10	15.5	SR33-22	SR33-29	SR33-29
7.5	22	15	22	SR33-29	SR33-29	SR33-41
10	29	20	29	SR33-41	SR33-41	SR33-55
10	34	25	34	SR33-41	SR33-55	SR33-66
15	41	30	41	SR33-55	SR33-66	SR33-97
20	55	40	55	SR33-66	SR33-97	SR33-132
20	66	50	66	SR33-80	SR33-132	SR33-132
30	80	60	80	SR33-132	SR33-132	SR33-160
30	97	75	97	SR33-132	SR33-160	SR33-195
50	132	100	132	SR33-195	SR33-241	SR33-280
60	160	125	160	SR33-241	SR33-280	SR33-350
75	195	150	195	SR33-280	SR33-350	SR33-430
-	-	-	-	<b>3 start/hr</b>		
75	241	200	241	SR33-350	SR33-430	SR33-482
100	280	200	280	SR33-430	SR33-482	-
125	350	250	350	SR33-482	-	-
250	361	300	361	SR33-482	-	-

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



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

**OVERLOAD TRIP CURVE FOR SR33-160 TO SR33-350**



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

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

As an example, the SR33-280 will run a 150hp motor (180A @ 460V) at the maximum continuous running current and will allow an overload of 3 x 280 Amp (840A) for 12 seconds, 3 times per hour. The unit would also allow a 3.5 x overload (980A) 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.

**SPECIFICATIONS**

SPECIFICATIONS	
<b>Rated Impulse Withstand Voltage</b>	4kV
<b>Rated Insulation Voltage</b>	500V (IEC standard insulation rating. Actual testing proves insulation withstand capacity beyond 460V+10%)
<b>Pollution Degree</b>	For use in a Pollution Degree 2 environment
<b>Short Circuit Current (Type 1) *</b>	5kA for SR33-22 to SR33-55 10kA for SR33-66 to SR33-195 18kA for SR33-241 to SR33-482
<b>Short Circuit Coordination</b>	Type 1 *
<b>Surrounding Air Temperature</b>	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, <a href="#">page QS-13.</a> )
<b>Transport and Storage</b>	-25 to 60 °C [-13 to 140 °F]
<b>Altitude</b>	1000m [3281 ft]. Above 1000m de-rate linearly by 1% of unit FLC per 100m to a max altitude of 2000m [6562 ft].
<b>Humidity</b>	max 85% non-condensing, not exceeding 50% at 40°C [104°F]
<b>Environmental Rating</b>	SR33-22 to SR33-97 = IP20; SR33-132 to SR33-482 = IP00
<b>Design Standards</b>	EN/IEC 60947-4-2 “AC Semiconductor Motor Controllers and Starters” UL508 Industrial Control Equipment (except SR33-350, -430, -482)
<b>Operational Voltage</b>	230–460VAC rms 3-phase (-15% +10%)
<b>Rated Frequency</b>	50–60Hz +/- 2Hz; Form Designation = Form 1
<b>Index Rating</b>	Class 5; AC53b: 3-5: 355; internally bypassed (10 starts/hr)
<b>Control Power Supply Requirements</b>	24VDC supplied externally to terminals X1-X2 Residual Ripple: 100mV; Spikes/Switching Peaks: 240mV Turn On/Off Response: No overshoot of V <sub>out</sub> Over Voltage Protection: Output voltage must be clamped to < 30V Output Capacity SR33-22 to SR33-97: approx 4VA SR33-132 to SR33-482: approx 12VA, capable of 4A for 250ms
* When protected by recommended semiconductor fuse.	

**FEATURES**

<b>SR33 Overload Trip *</b> (not available on all models)	Single-phase sensing; Non-adjustable; (refer to O/L trip curve)
<b>Start/Soft Stop Control</b>	24V DC/110V AC galvanically isolated terminals A1-A2 (1mA @ 24VDC; 3mA @ 110VAC; not suitable for use with PLC triac output)
<b>Auxiliary Circuits (relays)</b>	230VAC: 3A (resistive); 1A (AC-15); Run – 13/14; Ready – 23/24
<b>Indication</b>	Multi function LED on front panel
<b>Start Time Range</b>	0 to 30 seconds
<b>Stop Time Range</b>	0 to 30 seconds
<b>Start Duty</b>	S1 per IEC 34-1 & VDE0530 Part 1. 3 x FLC for 5 seconds @ standard rating (Class5, 40°C [104°F]).
<b>Starts / Hour</b>	10 evenly spaced starts per hour, or 5 starts + 5 soft stops per hour
<b>Power Terminals</b> <b>SR33-22 to SR33-97</b> <b>SR33-132 to SR33-482</b>	Inputs: 1/L1, 3/L2, 5/L3; Outputs: 2/T1, 4/T2, 6/T3 up to 97A: Wire clamp terminals (unit is IP20) 132A to 482A: External busbars (unit is IP00)
<b>Ground Terminals</b> <b>SR33-22 to SR33-55</b> <b>SR33-66 to SR33-195</b> <b>SR33-241 to SR33-482</b>	External stud up to 55A: M6 66A to 195A: M8 241A to 482A: M10
* Overload trip applies ONLY to models SR33-241, SR33-280, SR33-350, SR33-430, & SR33-482.	

<b>EMC EMISSION AND IMMUNITY LEVELS</b>		
<b>ESD Immunity</b>	IEC 61000-4-2	4kV contact; 8kV air discharge
<b>RF Immunity</b>	IEC 61000-4-6	140dBuV over 0.15–80MHz
	EC 61000-4-3	10V/m over 80–1000MHz
<b>Fast Transient Immunity</b>	IEC 61000-4-4	2kV/5kHz
<b>Surge Immunity</b>	IEC 61000-4-5	2kV line to ground; 1kV line to line
<b>Conducted RF Emissions</b>	EN 55011	Class A
<b>Radiated RF Emissions</b>		

<b>RECOMMENDED FUSING – for IEC Type 1 Coordination Short Circuit Protection</b>			
<b>SR33 Model Number</b>	<b>Rated Short Circuit Current</b>	<b>Siba Semiconductor Fuse</b>	<b>Class J High-Speed or RK5 Time-Delay Current-Limiting Fuse* Rated 600VAC</b>
<b>SR33-22</b>	5kA	2018920.50A	35A
<b>SR33-29</b>		2018920.100A	45A
<b>SR33-41</b>			60A
<b>SR33-55</b>			80A
<b>SR33-66</b>	10kA	2018920.125A	125A
<b>SR33-80</b>		2061032.200A	175A
<b>SR33-97</b>			200A
<b>SR33-132</b>		2061032.250A	250A
<b>SR33-160</b>			350A
<b>SR33-195</b>		2061032.400A	400A
<b>SR33-241</b>	18kA	2062032.630	450A
<b>SR33-280</b>			
<b>SR33-350</b>		2063032.1000	-
<b>SR33-430</b>			
<b>SR33-482</b>			

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

**UL RATINGS AND PROTECTION REQUIREMENTS**

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

\* Soft starters SR33-350 to SR33-482 are NOT UL certified.

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

\* Soft starters SR33-350 to SR33-482 are NOT UL certified.  
 \*\* 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).