

Stellar® SR44 Full-Featured Soft Starters

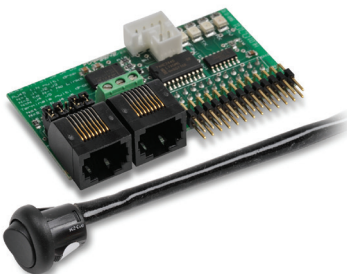
Overview

SR44 full-featured solid-state Soft Starters provide many advantages when used instead of electromechanical contactors to control 3-phase AC induction motors. The SR44 Soft Starters are fully digital, and use thyristors in all three motor phases for controlled reduced voltage motor starting and stopping. SR44s have an Automatic Application Setup that fully configures the starter for a specific application with one entry. SR44s also have a built-in "Optimizing" mode that reduces energy costs when used on lightly loaded and oversized motors, and external bypass capability for efficient running at rated speed.

Features

- 9–370A @ 230–460VAC
- 115 or 230 VAC selectable control voltage
- Full three-phase motor control
- Fully programmable
- Easily and separately adjustable motor start and stop times
- External bypass capability for run
- Advanced energy-saving Optimizing Mode improves motor efficiency and power factor while delivering demanded torque at low rpm (as compared to across-the-line control); and prolongs motor life
- Can be connected 'in-the-delta', allowing use of a smaller Soft Starter
- Can be used for motor reversing (with external contactors)
- Suitable for a wide variety of motor loads
- Keypad: 6 buttons with 2-line, 32-character display
- Can be used with local or remote control
- Optional Modbus or Remote Keypad control
- Programmable I/O for remote control: 1 digital input; 2 relay outputs
- Fault record history of last 5 trips
- IP20, panel mount
- Two-year warranty

SR44-RS485 Communication Card



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

- 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
- Reduced maintenance and replacement of mechanical drive train components
- Reduced starting current lowers demand charges
- Energy Optimizing mode reduces electrical power costs
- Automatic Application setup feature speeds installation by configuring the SR44 for a specific application with one setting.

Standards & Approvals

- CE
- REACH
- RoHS
- UL listed* (E333109)
- * Options SR44-KPD & SR44-RS485 are not UL approved

Optional accessories

- Communication/Modbus card SR44-RS485
- Remote keypad SR44-KPD*
*(requires SR44-RS485)

Applications

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

SR44-KPD Remote Keypad



SR44 Size 1 Soft Starter



SR44 Size 2 Soft Starter



Stellar[®] SR44 Full-Featured Soft Starters

SR44 Soft Starter Technical Specifications

Company Information

Drives

Soft Starters

Motors

Power Transmission

Motion: Servos and Steppers

Motor Controls

Sensors: Proximity

Sensors: Photoelectric

Sensors: Encoders

Sensors: Limit Switches

Sensors: Current

Sensors: Pressure

Sensors: Temperature

Sensors: Level

Sensors: Flow Switches

Pushbuttons and Lights

Stacklights

Signal Devices

Process

Relays and Timers

Pneumatics: Air Prep

Pneumatics: Directional Control Valves

Pneumatics: Cylinders

Pneumatics: Tubing

Pneumatics: Air Fittings

Appendix Book 2

Terms and Conditions

SR44 Series Full-Featured Soft Starters – Size 1 – 9A-146A*										
Model	SR44-9	SR44-16	SR44-23	SR44-30	SR44-44	SR44-59	SR44-72	SR44-85	SR44-105	SR44-146
Price	\$735.00	\$740.00	\$745.00	\$800.00	\$890.00	\$990.00	\$1,050.00	\$1,210.00	\$1,220.00	\$1,240.00
* Rated Current [class 10(B) trip] (A)	9	16	23	30	44	59	72	85	105	146
Rated Operational Voltage	230–460 VAC (-15% +10%) @ 50–60 Hz (±2Hz); 3 phase; (usable on 208V systems down to 196V)									
* Motor Rating	Refer to selection table. Starters must be sized according to HP and starting class .									
Impulse Withstand Voltage	4kV									
Insulation Voltage Rating	690 VAC									
Short Circuit Current Rating (type 1)	5 kA					10 kA				
Control Power Consumption	8VA			10 VA			12 VA			
Control Voltage Range	115 VAC (-15% +10%) or 230 VAC (-15% +10%); 1 phase									
Control Fuse (external)	125 mA @ 115V; 63 mA @ 230V				200 mA @ 115V; 100 mA @ 230V					
Control Input	12/24 VDC or 115/230 VAC									
Control Relay Outputs	(2) SPDT; 3A @ 230 VAC; AC11 (electro-magnet control)									
Start Time Setting Range	1–255 seconds									
Start Voltage Setting Range	10–60% [% of main power voltage]									
Stop Time Setting Range	0–255 seconds									
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]									
Transportation & Storage Temperature	-25–60 °C [-13–140 °F] continuous ; -25–75 °C [-13–167 °F] NOT exceeding 24 hours									
Humidity	max 85% non-condensing; not exceeding 50% @ 40 °C [104 °F]									
Altitude	1000m [3281 ft]; Above 1000m [3281 ft] derate linearly by 1% of unit FLC per 100m to MAX 2000m [6562 ft]									
Environmental Rating	IP20									
Shipping Weight	16 lb [7.3 kg]					18 lb [8.2 kg]				
Dimensions (HxWxD)	415 x 222 x 195 mm [16.3 x 8.74 x 7.68 in]									

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

SR44 Series Full-Featured Soft Starters – Size 2 – 174A-370A*					
Model	SR44-174	SR44-202	SR44-242	SR44-300	SR44-370
Price	\$1,940.00	\$2,025.00	\$2,175.00	\$2,185.00	\$2,695.00
* Rated Current [class 5 starting] (A)	174	202	242	300	370
Rated Operational Voltage	230–460 VAC (-15% +10%) @ 50–60 Hz (±2Hz); 3 phase; (usable on 208V systems down to 196V)				
* Motor Rating	Refer to selection table. Starters must be sized according to HP and starting class .				
Impulse Withstand Voltage	4kV				
Insulation Voltage Rating	690VAC				
Short Circuit Current Rating (type 1)	10 kA			18 kA	
Control Power Consumption	18 VA				
Control Voltage Range	115 VAC (-15% +10%) or 230 VAC (-15% +10%); 1 phase				
Control Fuse (external)	200 mA @ 115V; 100 mA @ 230V				
Control Input	12/24 VDC or 115/230 VAC				
Control Relay Outputs	(2) SPDT; 3A @ 230 VAC; AC11 (electro-magnet control)				
Start Time Setting Range	1–255 seconds				
Start Voltage Setting Range	10–60% [% of main power voltage]				
Stop Time Setting Range	0–255 seconds				
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]				
Transportation & Storage Temperature	-25–60 °C [-13–140 °F] continuous ; -25–75 °C [-13–167 °F] NOT exceeding 24 hours				
Humidity	max 85% non-condensing; not exceeding 50% @ 40 °C [104 °F]				
Altitude	1000m [3281 ft]; Above 1000m [3281 ft] derate linearly by 1% of unit FLC per 100m to MAX 2000m [6562 ft]				
Environmental Rating	IP20				
Shipping Weight	40 lb [18 kg]			50 lb [23 kg]	
Dimensions (HxWxD)	520 x 340 x 265 mm [20.5 x 13.4 x 10.4 in]				

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

Stellar[®] SR44 Full-Featured Soft Starters

SR44 Soft Starter Optional Accessories

SR44 Series Full-Featured Soft Starters – Optional Accessories			
Part Number	Name	Price	Description
SR44-KPD	Remote Keypad	\$215.00	Can be used to remotely monitor and/or program SR44 Soft Starters. Rated NEMA 4/4X. No external power wiring required. Works with all SR44 Soft Starters. Includes: Keypad, Cable (3m). NOTE: Optional SR44-RS485 communication card must be installed to use the SR44-KPD remote keypad. SR44-KPD can control multiple SR44 Soft Starters, but only one at a time.
SR44-RS485*	Communication Card *	\$95.00	Can be used to establish RS-485 communication between an SR44 Soft Starter and most Modbus masters. A PLC or PC is required to demux the data returned from the SR44. (See the User Manual for details and PLC sample ladder programs.) Plugs directly onto the control board of an SR44. No external power needed. Has both RJ45 connections and screw-type terminal strip connections; can be used with CAT5 RJ45-terminated Ethernet cable, or with twisted pair shielded wiring. Max # of networked SR44s: 8. Max network length: 25m [82 ft] for RJ45 connections; 1200m [3937 ft] for RS-485 screw-terminal connections. Can be used with an SR44-KPD to create an internal RS-485 network between SR44 Soft Starters (one remote keypad to control multiple SR44s, one at a time). Works with all SR44 Soft Starters. Includes: Circuit card, Remote/Local selector switch.
Communication cables for use with the SR44-RS485 communication card are available in our ZIPLink Wiring Solutions section: SR44-485HD15-CBL-2 for connection to certain PLCs; SR44-485RJ45-CBL-2 for connection to certain RS485 networks			

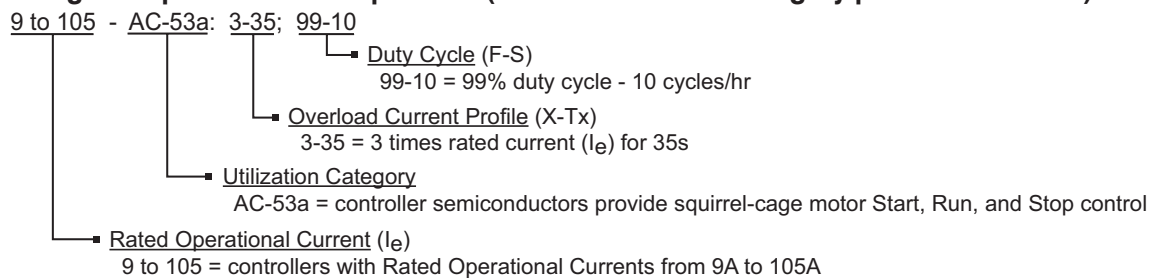
SR44 Index Ratings (per IEC 60947-4-2)

SR44 Index Ratings *			
Model #	I_e (A)	Standard Operation AC-53a; X-Tx; F-S	Bypassed Operation AC-53b; X-Tx; OFF-time
SR44-9 to SR44-105	9 to 105	AC-53a: 5-4; 99-10 AC-53a: 3-35; 99-10	AC-53b: 5-4; 120 AC-53b: 3-35; 120
SR44-146 to SR44-202	146 to 202	AC-53a: 4-6; 99-10 AC-53a: 3-35; 99-10	AC-53b: 4-6; 120 AC-53b: 3-35; 120
SR44-242 to SR44-370	242 to 370	AC-53a: 4-6; 60-3 AC-53a: 3-35; 60-3	AC-53b: 4-6; 420 AC-53b: 3-35; 420
* Index ratings AC-53a and AC-53b are specified by IEC standard # 60947-4-2			

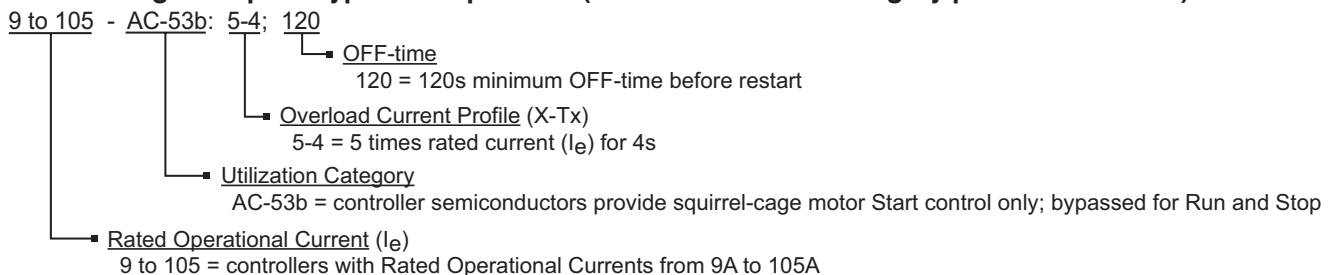
In line with the stated IEC starting duties, starters of 242 Amps and above have an enforced off period of seven minutes set as standard. During this period the display indicates “Stopped. Cooling”, and the starter will not respond to a start signal.

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)



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



Stellar[®] SR44 Full-Featured Soft Starters

SR44 Soft Starter Selection

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Motion: Servos and Steppers

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Sensors: Photoelectric

Sensors: Encoders

Sensors: Limit Switches

Sensors: Current

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Pneumatics: Tubing

Pneumatics: Air Fittings

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Terms and Conditions

SR44 Soft Starters – O/L Trip Classes ①	
Default	10
Heavy	20
Agitator	10
Air Compressor - Equalized	10B
Air Compressor - Loaded	20
Ball Mill	20
Centrifuge - extended start needed for sizing	
Chiller	10B
Conveyor - Unloaded	10B
* Conveyor - Loaded	20
Crusher	30
Escalator	10B
* Fan - Low Inertia < 85A	10
* Fan - High Inertia > 85A	30
Feeder - Screw	10
Grinder	20
Hammer Mill	20
Lathe Machine	10B
Mills - Flour, etc.	20
Mixer - Unloaded	10B
Mixer - Loaded	20
Pelletizer	20
Plastic and Textile Machines	10B
Press - Flywheel	20
* Pump - Centrifugal	10B
* Pump - Positive Displacement - Unloaded	10
Rolling Mill	20
Saw - Band	10
Saw - Circular	20
Screen - Vibrating	20
Transformer, Voltage Regulator	10B
Tumbler	10
Wood Chipper	30
* Commonly required applications	

SR44 Soft Starter Selection Steps

- ① Determine the required trip class based on the motor load and required start time.
- ② Select the applicable SR44 part number based on the required Trip Class, motor HP, and connection type.

SR44 Soft Starters – Selection Table ②											
Motor Size								Soft Starter Size			
In-Line Connection				In-Delta Connection **				Application Trip Class			
I (A)	HP @ 208V*	HP @ 230V	HP @ 460V	I (A)	HP @ 208V*	HP @ 230V	HP @ 460V	Class 10B	Class 10	Class 20	Class 30
9	2	3	5	15	2	3	7.5	SR44-9	SR44-16	SR44-23	
16	3	5	10	27	3	5	15	SR44-16	SR44-23	SR44-30	
23	5	7.5	15	39	5	7.5	25	SR44-23	SR44-30	SR44-44	
30	7.5	10	20	51	7.5	10	30	SR44-30	SR44-44	SR44-59	
44	10	15	30	76	10	15	50	SR44-44	SR44-59	SR44-72	
59	15	20	40	102	15	20	60	SR44-59	SR44-72	SR44-85	
72	20	25	50	124	20	25	75	SR44-72	SR44-85	SR44-105	
85	25	30	60	147	25	30	100	SR44-85	SR44-105	SR44-146	
105	30	40	75	181	30	40	125	SR44-105	SR44-146	SR44-174	
146	50	60	100	252	50	60	150	SR44-146	SR44-174	SR44-202	
174	60	75	150	301	60	75	250	SR44-174	SR44-202	SR44-242	
202	60	75	150	349	60	75	300	SR44-202	SR44-242	SR44-300	
242	75	100	200	419	75	100	300	SR44-242	SR44-300	SR44-370	
300	100	100	250	519	100	100	350	SR44-300	SR44-370	n/a	
370	125	150	300	640	125	150	350	SR44-370	n/a	n/a	

* 208V applications are UL listed only as low as 196V.

** 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 SR44 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.

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SR44 Max Overcurrent Protection

UL requires Recognized special purpose fuses (JFHR2) for the protection of semi-conductor devices (rated 700 VAC, as indicated in the Semiconductor Fuse Table) be used to obtain the short circuit ratings required by UL.

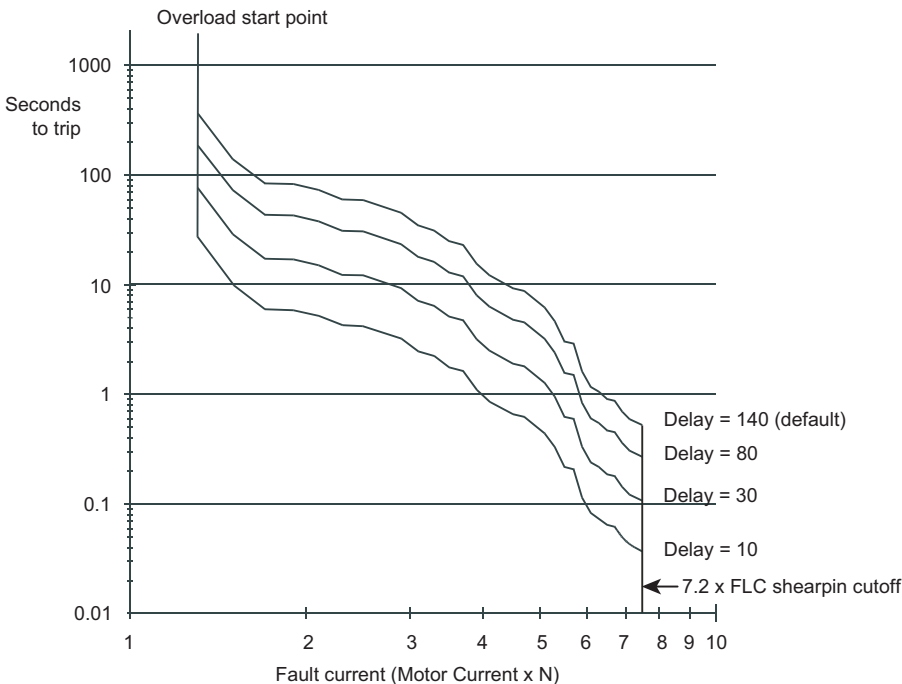
Suitable for use on a circuit capable of delivering not more than the indicated RMS Symmetrical Amperes at maximum rated operational voltage, when protected by Semiconductor Fuse type manufactured by Company and Model Number indicated in the table.

These fuses are for short circuit protection of the semiconductors and must be mounted externally by the user between the unit and the incoming main power source; not between the unit and the motor.

Semiconductor Fuse Types for SR44 Soft Starters								
Model Name	I _e (A)	S.C. With-stand	UL JFHR2 Fuses for UL Applications *			Non-UL **		
			Bussman Model # *	Mersen (formerly Ferraz) Model # *	Amps	Bussmann Model # **	Edison Model # **	Amps
SR44-9	9	5kA	170M3110	6.9 URD 30 D08A 0063	63	FWP-50B	E70S50	50
SR44-16	16							
SR44-23	23							
SR44-30	30							
SR44-44	44							
SR44-59	59	10 kA	170M3112	6.9 URD 30 D08A 0100	100	FWP-80B	E70S80	80
SR44-72	72							
SR44-85	85							
SR44-105	105							
SR44-146	146							
SR44-174	174	18 kA	170M3114	6.9 URD 30 D08A 0160	160	FWP-125A	E70S125	125
SR44-202	202							
SR44-242	242							
SR44-300	300							
SR44-370	370							
			170M3115	6.9 URD 30 D08A 0200	200			
			170M3116	6.9 URD 30 D08A 0250	250			
			170M3119	6.9 URD 30 D08A 0400	400			
			170M3121	6.9 URD 30 D08A 0500	500			
			170M4114	6.9 URD 31 D08A 0500	500			
			170M4116	6.9 URD 31 D08A 0630	630			

* Use these fuses with SR44 soft starters in UL applications.
 ** Use these fuses with SR44 soft starters only in NON-UL applications.

SR44 Internal Overload Trip



'Current limit', 'Overload level' and 'Overload delay' settings may be adjusted to limit overload currents in accordance with the trip curves shown here.

(See Menu Structure in User Manual or Quick-start Guide for default settings.)

» For motors with FLCs lower than the rated current of the SR44, the 'Overload level' may be adjusted using the following formula:

$$\text{Overload Level} = \text{Motor FLC} \times 1.1(\text{A})$$

Note:
 The overload monitors only one of the phases, and the 'Current Limit' level is active only during motor starting.

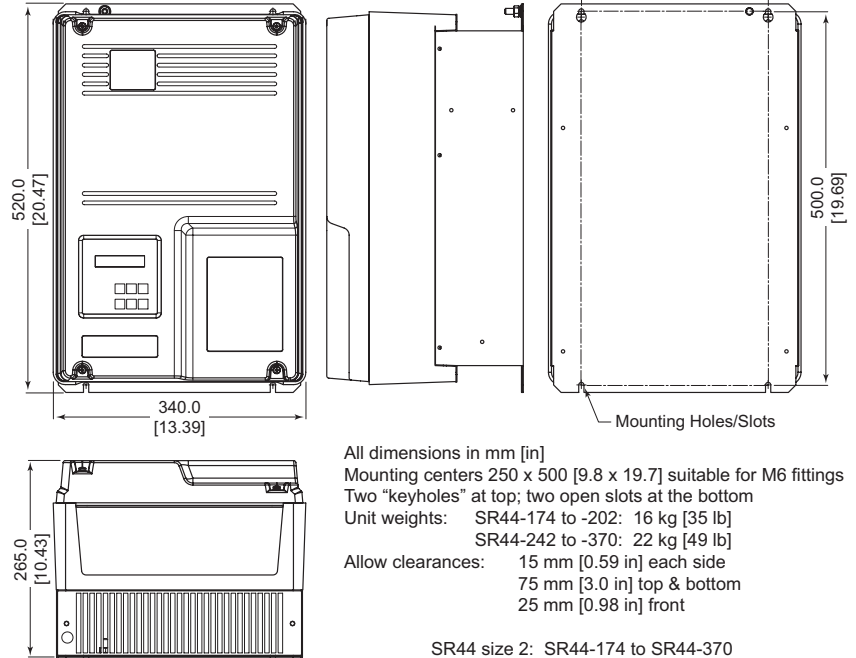
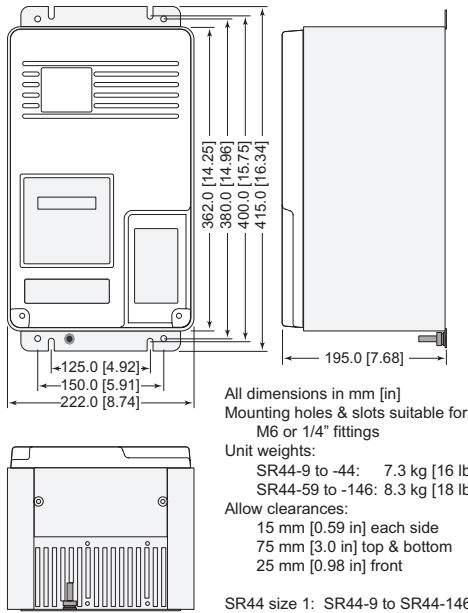
IMPORTANT:
 We recommend that the control supply is maintained between starts to ensure the integrity of the overload, which will reset on control power removal.

Stellar[®] SR44 Full-Featured Soft Starters

SR44 Dimensions

Size 2: SR44-174 to SR44-370

Size 1: SR44-9 to SR44-146



Ventilation for Enclosures

When fitting an SR44 into an electrical enclosure, ventilation must be provided if the heat output of the unit is greater than the enclosure will dissipate.

If the enclosure cannot dissipate enough heat, use the following formula to determine the fan requirement. An allowance has been incorporated into the formula so that the figure for "Q" is the air delivery quoted in the fan supplier's data.

$$Q = (4 \times W_t) / (t_{max} - t_{amb})$$

- Q = required volume of air (cubic meters per hour; m³/h)
- W_t = total heat produced by the unit and all other heat sources within the enclosure (Watts)
- t_{max} = maximum permissible temperature within the enclosure (40 °C for a fully rated SR44)
- t_{amb} = temperature of the air entering the enclosure (°C)
(If you prefer to work in CFM, substitute °F for °C. Q will then be in CFM, instead of m³/h.)

An approximation of the heat produced by the SR44 (in Watts) can be made by multiplying the Full Load Line Current by three. Exact figures for unit Full Load Current are available in the SR44 user manual.

SR44-KPD Mounting Dimensions

