

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 |

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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 . |

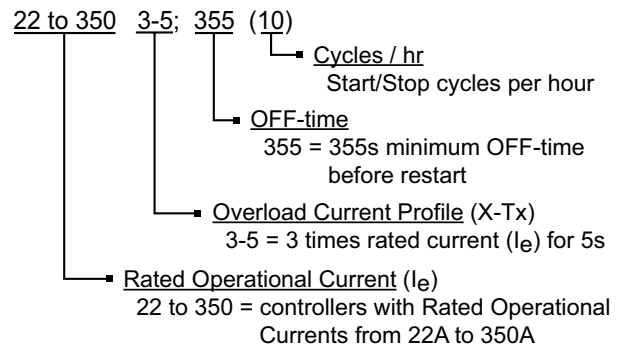
SR33 Soft Starter Index Ratings

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



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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 Agitator Bow Thruster - Zero Pitch Compressor - Rotary Vane Compressor - Scroll Conveyor - Unloaded Fan - Low Inertia < 85A Feeder - screw Lathe machines Mixer - Unloaded | Molding Machine Plastic and textile machines Pump - Submersible Centrifugal Pump - Submersible Rotodynamic Saw - Band Transformers, voltage regulators | Ball mill Bow Thruster - Loaded Compressor - Centrifugal Compressor - Reciprocating Compressor - Rotary Screw Conveyor - Loaded Grinder Hammer mill Mills - Flour, etc. Mixer - Loaded Pelletizers | Pump - Positive displacement Reciprocating Pump - Positive displacement Rotary Pump Jack Rolling mill Roots Blower Saw - Circular Screen - Vibrating Tumblers | Centrifuge* *For centrifuges make selection at I(A) = motor FLA x 2.3 Crusher Fan - High Inertia > 85A Shredder Wood chipper Press, flywheel |
| Step 2: Confirm the rated starting capability of the soft start against the application. | Trip Class | 10 | 20 | 30 | |
| | Rated Starting Capability | 3x Motor Current - 23s | 4x Motor Current - 19s | 4x Motor Current - 29s | |
| | Max Starts per Hour | SR33-55 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 | | | | Trip Class * | | |
| 230VAC | | 460VAC | | 3-23:697 | 4-19:701 | 4-19:691 |
| HP | I _e (A) | HP | I _e (A) | 10 | 20 | 30 |
| - | - | - | - | 5 start/hr | | |
| 5 | 15.5 | 10 | 15.5 | SR33-22 | - | - |
| 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 | - | - |

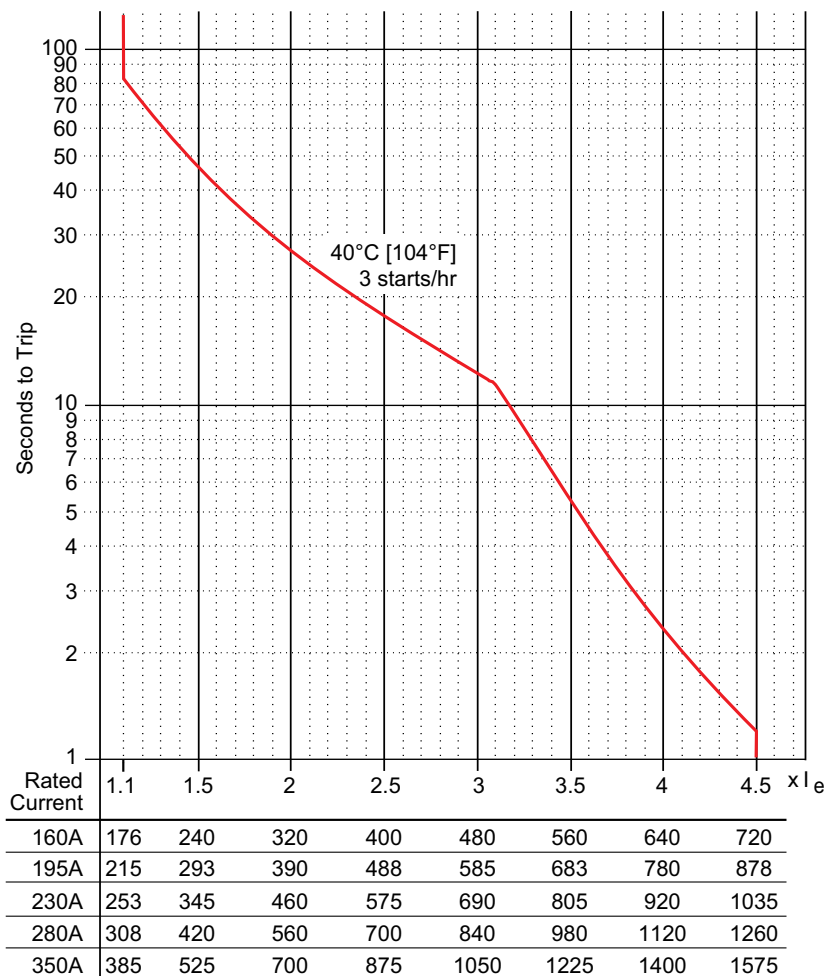
* A separate overload protection device with a rating corresponding to the applicable trip class must be used with the SR33.

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.



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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 | 18kA | 2061032.250A | 250A | JHL250 |
| SR33-280 | | | 450A | JHL450 |
| SR33-350 | | | 2063032.1000 | - |

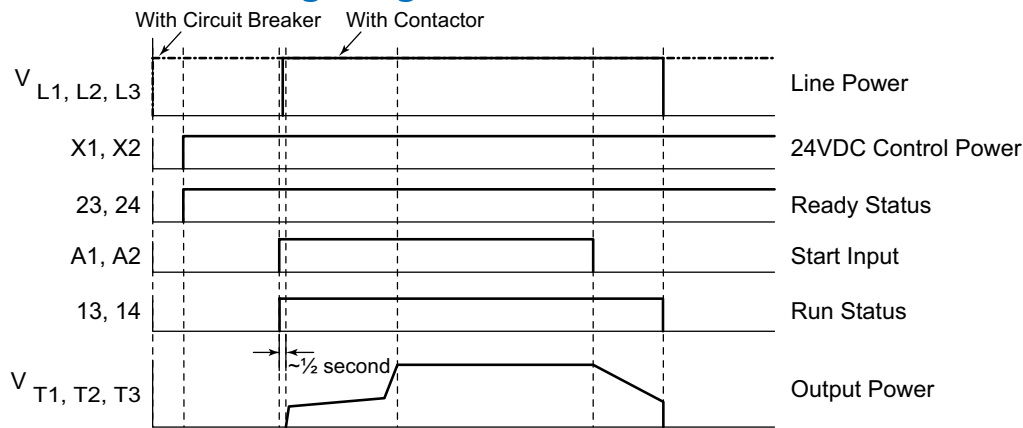
* Fuse comparable to Edison type JHL (class J) or ECSR (class RK5).

Stellar® SR33 Series Basic Soft Starters

| UL Maximum Surrounding Air Temperatures | | | | | | | | | |
|---|----------------------|-----------|----------------------|-----------|-------------------|----------------------|-----------|----------------------|-----------|
| SR33 Model Number* | Maximum 40°C [104°F] | | Maximum 50°C [122°F] | | SR33 Model Number | Maximum 40°C [104°F] | | Maximum 50°C [122°F] | |
| | I (A) | HP @ 480V | I (A) | HP @ 480V | | I (A) | HP @ 480V | I (A) | HP @ 480V |
| SR33-22 | 22 | 15 | 20 | 10 | SR33-97 | 97 | 75 | 78 | 60 |
| SR33-55 | 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 | | | | | |

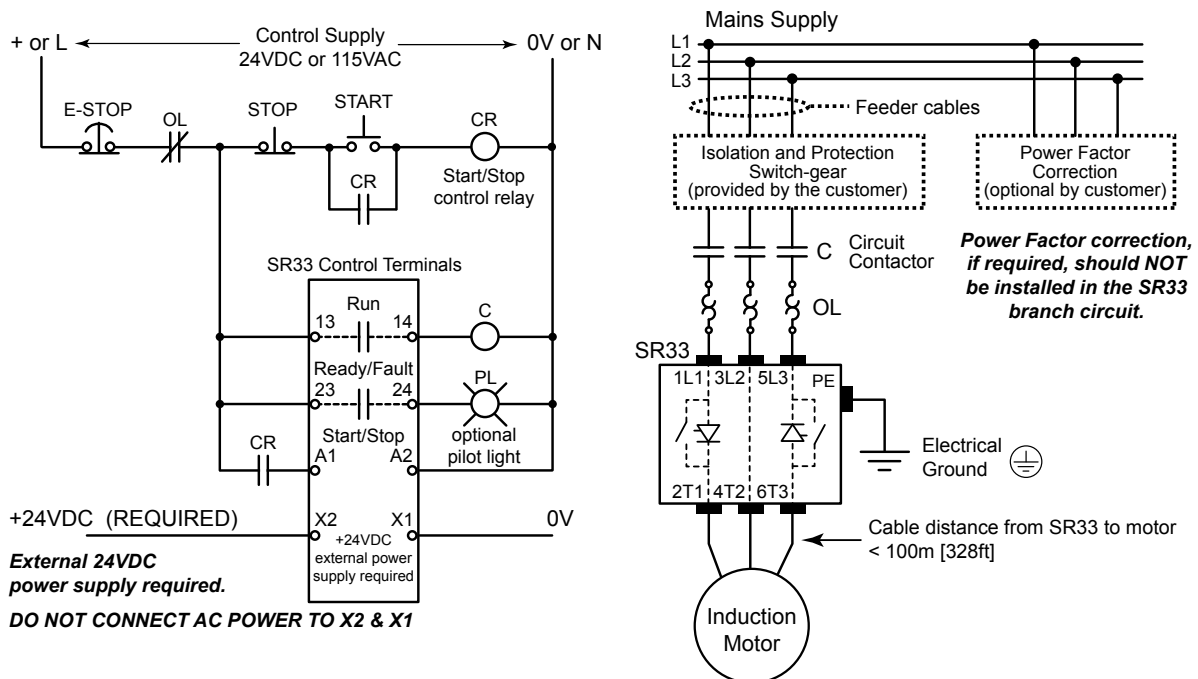
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SR33 Soft Starter Timing Diagram



SR33 Soft Starter Standard Wiring Diagram

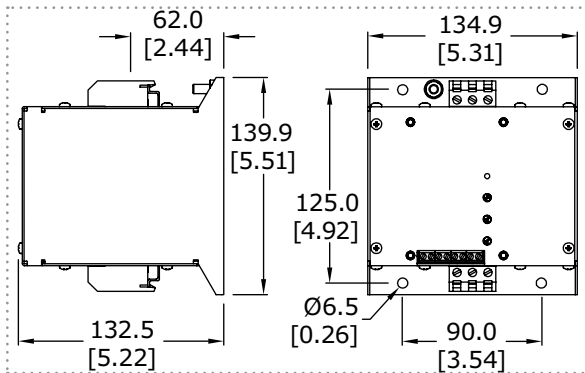
For complete wiring instructions, refer to the "SR33 Digital Soft Starters Quick-start Guide: Installation and Operation" included with the SR33 soft starter and available online at www.AutomationDirect.com.



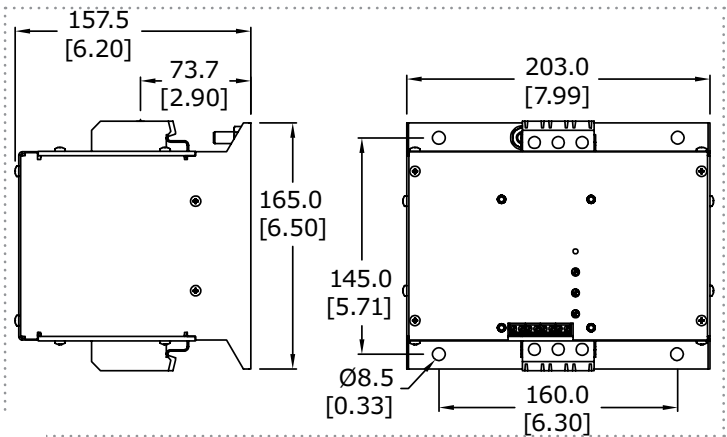
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SR33 Soft Starter Dimensions (mm [in])

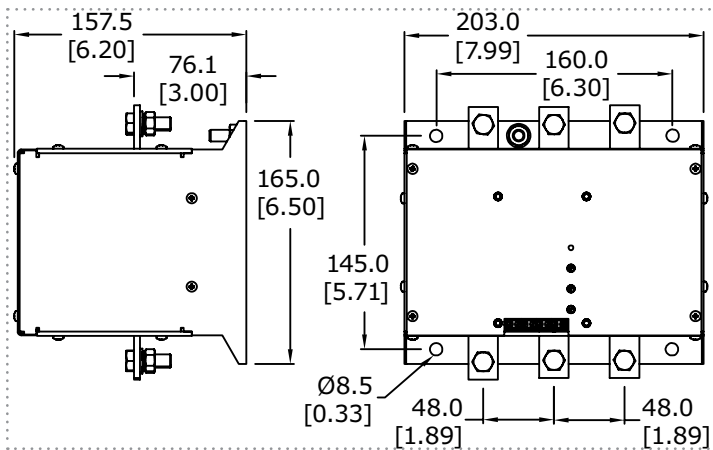
SR33-22 to SR33-55 – 15hp to 40hp @ 460V



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

