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.

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</tr>
</thead>
<tbody>
<tr>
<td>Rated Operational Current</td>
<td>$I_e$ (A)</td>
<td>17</td>
<td>21</td>
<td>27</td>
<td>34</td>
<td>40</td>
<td>52</td>
<td>65</td>
<td>77</td>
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<tr>
<td>Semiconductor Fuse (class aR)</td>
<td>Type</td>
<td>Mersen 6.9 URD 30xx</td>
<td>Bussmann 170M30xx</td>
<td>Bussmann 170M31xx</td>
<td>Bussmann 170M32xx</td>
<td>SIBA 20 61xx</td>
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<tr>
<td>Rating</td>
<td>(A)</td>
<td>100</td>
<td>100</td>
<td>160</td>
<td>160</td>
<td>160</td>
<td>200</td>
<td>200</td>
<td>250</td>
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<tr>
<td>Class J High-Speed Current-Limiting Fuse</td>
<td>Rating $Z_1$ (A)</td>
<td>30</td>
<td>45</td>
<td>60</td>
<td>70</td>
<td>90</td>
<td>110</td>
<td>125</td>
<td>150</td>
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<tr>
<td>Class J Time-Delay Fuse</td>
<td>Rating $Z_2$ (A)</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>100</td>
<td>125</td>
<td>150</td>
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<tr>
<td>UL Listed Inverse Time-Delay Circuit Breaker</td>
<td>Rating $Z_3$ (A)</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>150</td>
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<td>250</td>
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<tr>
<td>Rated Conditional Short-Circuit Current</td>
<td>$I_q$ (A)</td>
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<td>10</td>
<td></td>
<td></td>
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SR55 Model Number

<table>
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<tr>
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<tbody>
<tr>
<td>Rated Operational Current</td>
<td>$I_e$ (A)</td>
<td>124</td>
<td>156</td>
<td>180</td>
<td>242</td>
<td>302</td>
<td>361</td>
<td>414</td>
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<tr>
<td>Semiconductor Fuse (class aR)</td>
<td>Type</td>
<td>Mersen 6.9 URD 31xx</td>
<td>Bussmann 170M40xx</td>
<td>Bussmann 170M41xx</td>
<td>Bussmann 170M42xx</td>
<td>SIBA 20 61xx</td>
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<tr>
<td>Rating</td>
<td>(A)</td>
<td>400</td>
<td>550</td>
<td>550</td>
<td>700</td>
<td>800</td>
<td>900</td>
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<tr>
<td>Class J High-Speed Current-Limiting Fuse</td>
<td>Rating $Z_1$</td>
<td>250</td>
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<td>400</td>
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<tr>
<td>Class J Time-Delay Fuse</td>
<td>Rating $Z_2$ (A)</td>
<td>225</td>
<td>300</td>
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<td>450</td>
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<tr>
<td>UL Listed Inverse Time-Delay Circuit Breaker</td>
<td>Rating $Z_3$ (A)</td>
<td>350</td>
<td>450</td>
<td>500</td>
<td>700</td>
<td>800</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>Rated Conditional Short-Circuit Current</td>
<td>$I_q$ (KA)</td>
<td>10</td>
<td>18</td>
<td></td>
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</tbody>
</table>

#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 $I_e$ rms Symmetrical Amperes, when protected by Class J high-speed current-limiting 600V-rated fuses with a maximum trip rating of $Z_1$ (IEC Type 1 coordination short-circuit protection).

#3 Suitable for use in a circuit capable of delivering not more than $I_e$ rms Symmetrical Amperes, 480 Volts maximum, when protected by Class J time delay fuses with a maximum rating of $Z_2$, or by a circuit breaker with an interrupting rating not less than $Z_3$ 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.

Motor overload ‘cold’ trip curves (20°C ambient)
SR55 Soft Starter Selection Steps

1. 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-15).

2. 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.

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

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Stellar® SR55 Full-Featured Soft Starters

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

<table>
<thead>
<tr>
<th>Model Number</th>
<th>I_e (A)</th>
<th>Standard Operation AC-53a; X-Tx; F-S</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR55-017 to SR55-180</td>
<td>17 to 195</td>
<td>AC-53a: 3.5-17; 90-5</td>
</tr>
<tr>
<td>SR55-242 to SR55-477</td>
<td>242 to 500</td>
<td>AC-53a: 3.5-17; 90-3</td>
</tr>
</tbody>
</table>

* 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)

17 to 195 - AC-53a: 3.5-17; 90-5

Duty Cycle (F-S)
90-5 = 90% duty cycle - 5 cycles/hr
[If multiple starts/hr are required, 90% D.C. requires off time ≥ 10% of previous run time]

Overload Current Profile (X-Tx)
3.5-17 = 3.5 times rated current (I_e) for 17s

Utilization Category
AC-53a = controller semiconductors provide squirrel-cage motor Start, Run, and Stop control

Rated Operational Current (I_e)
17 to 195 = controllers with Rated Operational Currents from 17A to 195A

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.

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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.

Figure 2: SR55 Starts/Hour Deration

<table>
<thead>
<tr>
<th>Starts/Hour</th>
<th>Deration Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>0.83</td>
</tr>
<tr>
<td>15</td>
<td>0.73</td>
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<tr>
<td>20</td>
<td>0.66</td>
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<tr>
<td>25</td>
<td>0.61</td>
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<tr>
<td>30</td>
<td>0.56</td>
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<tr>
<td>35</td>
<td>0.53</td>
</tr>
<tr>
<td>40</td>
<td>0.50</td>
</tr>
</tbody>
</table>

Deration Factor = \( \frac{(138 \cdot (24 \cdot \text{ln(starts/hr)}) / 100} \)

(where ln(starts/hr) is the natural log of the # of starts/hour)

Example: Deration Factor for 10 starts/hr = \( \frac{(138 \cdot (24 \cdot \ln(10))) / 100} = 0.83 \)

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

**Step SR55 Configuration**
1. Select Application (Auto Setup)
2. Leave Motor Current 100A (maximum) (Auto Setup)
3. Set Start Current Limit to 320A (100% 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

**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)