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	Ie	(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	Iq	(kA)	5							10	
SR55 Model Number (SR55-XXX)			124	156	180	242	302	361	414	477	–
Rated Operational Current	Ie	(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	Iq	(kA)	10			18					

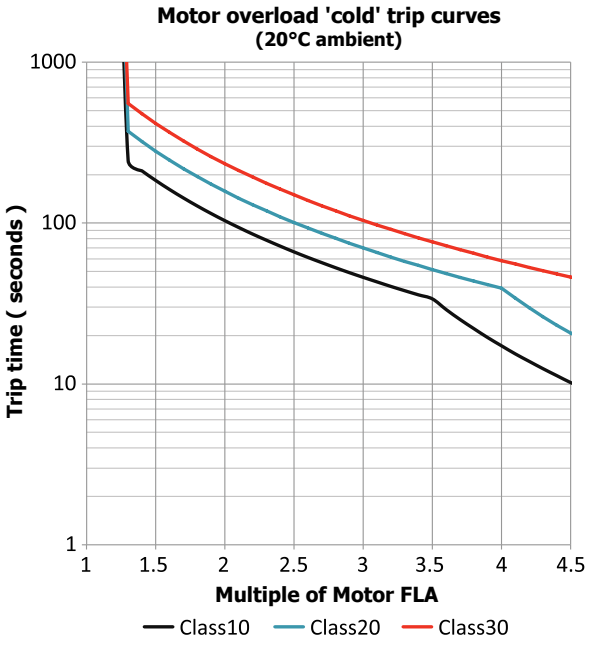
#1 Correctly selected semiconductor fuses can provide additional protection against damage to the SR55 unit (this is sometimes referred to as type 2 coordination). These semiconductor fuses are recommended to provide this increased protection.

#2 Suitable for use in a circuit capable of delivering not more than Iq 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 Iq 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

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

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-26).

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.

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.**

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

SR55 Index Ratings *		
Model Number	***Ie (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 (Ie), 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 Ie 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				

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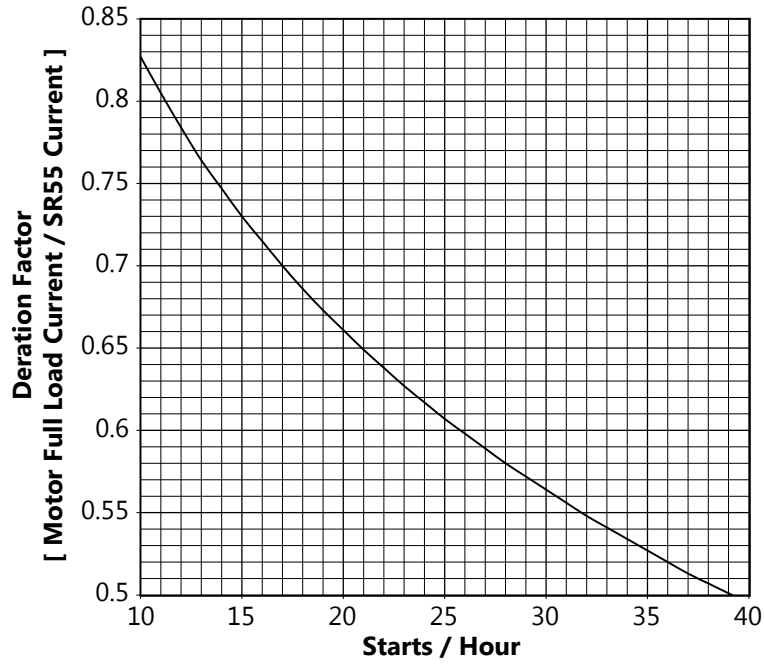
SR55 Increased Starts per Hour – Derating

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

Deration Curve



Starts/Hour	*Deration Factor*
10	0.83
15	0.73
20	0.66
25	0.61
30	0.56
35	0.53
40	0.50

Deration Factor = (138 - (24·ln(starts/hr))) / 100
[where ln(starts/hr) is the natural log of the # of starts/hour]
Example: Deration Factor for 10 starts/hr = (138 - (24·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)