

SIZING AN SR55 SOFT STARTER



APPENDIX

D

TABLE OF CONTENTS

<i>Appendix D: Sizing an SR55 Soft Starter</i>	D-1
<i>SR55 Soft Starter Selection Steps</i>	D-2
<i>SR55 Soft Starter Overload Trip</i>	D-3
<i>SR55 Index Ratings</i>	D-3
<i>Standard Overload Current Profile and Duty Cycle</i>	D-4
<i>Increased Starts per Hour – Derating</i>	D-5
<i>Derating Examples</i>	D-6

SR55 SOFT STARTER SELECTION STEPS

- 1) Determine the required trip class based on the motor load and required start time. See O/L Trip Classes table below. (Also refer to the definitions of Class 10, 20, and 30 Trip Curves in the “SR55 Soft Starter Overload Trip” section of this chapter.)

SR55 Soft Starters – O/L Trip Classes					
Default	10	Crusher	30	Pump - Submersible Centrifugal	10
Heavy	20	Fan - Low Inertia <85A	10	Pump - Submersible Rotodynamic	10
Agitator	10	Fan - High Inertia >85A	30	Pump - Positive Displacement Reciprocating	20
Compressor - Centrifugal	20	Feeder - screw	10	Pump - Positive Displacement Rotary	20
Compressor - Reciprocating	20	Grinder	20	Pump Jack	20
Compressor - Rotary Screw	20	Hammer mill	20	Rolling mill	20
Compressor - Rotary Vane	10	Lathe machines	10	Roots Blower	20
Compressor - Scroll	10	Mills - Flour, etc.	20	Saw - Band	10
Ball mill	20	Mixer - Unloaded	10	Saw - Circular	20
Centrifuge*	30	Mixer - Loaded	20	Screen - Vibrating	20
Bow Thruster - Zero Pitch	10	Molding Machine	10	Shredder	30
Bow Thruster - Loaded	20	Pelletizers	20	Transformers, Voltage Regulators	10
Conveyor - Unloaded	10	Plastic and textile machines	10	Tumblers	20
Conveyor - Loaded	20	Press, flywheel	20	Wood chipper	30

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

- 2) From the SR55 Soft Starters Selection Table below, select the row with the correct motor full load amps. Then select the correct SR55 soft starter 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.

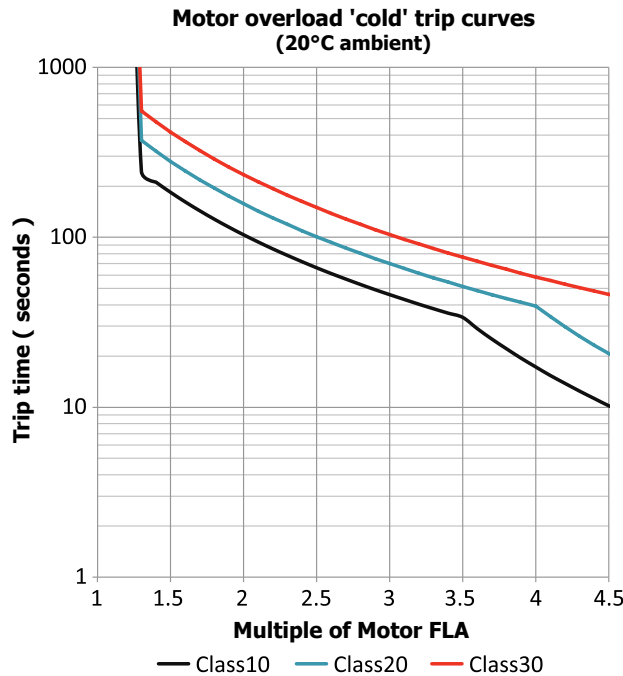
SR55 Soft Starters – Selection Table (per IEC 60947-4-1:2009 Table G.1)												
Motor Size										Soft Starter Size		
In-Line Connection					In-Delta Connection *					Application Trip Class		
I (A)	HP @				I (A)	HP @				Class 10	Class 20	Class 30
	200V	208V	230V	460V		200V	208V	230V	460V			
17	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.

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.

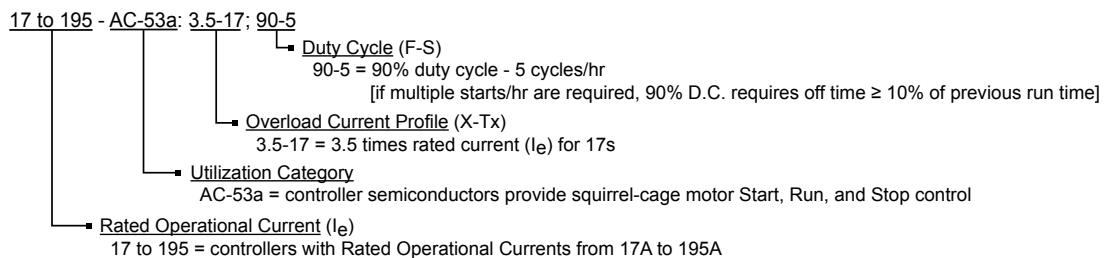
SR55 INDEX RATINGS

(PER IEC 60947-4-2)

SR55 Index Ratings *		
Model Number	I _e (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 (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)



STANDARD OVERLOAD CURRENT PROFILE AND DUTY CYCLE

The SR55 has been designed for a specific Overload Current Profile and Duty Cycle as shown in the previous SR55 Index Ratings section of this chapter.

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, $T_x = 17$ 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.

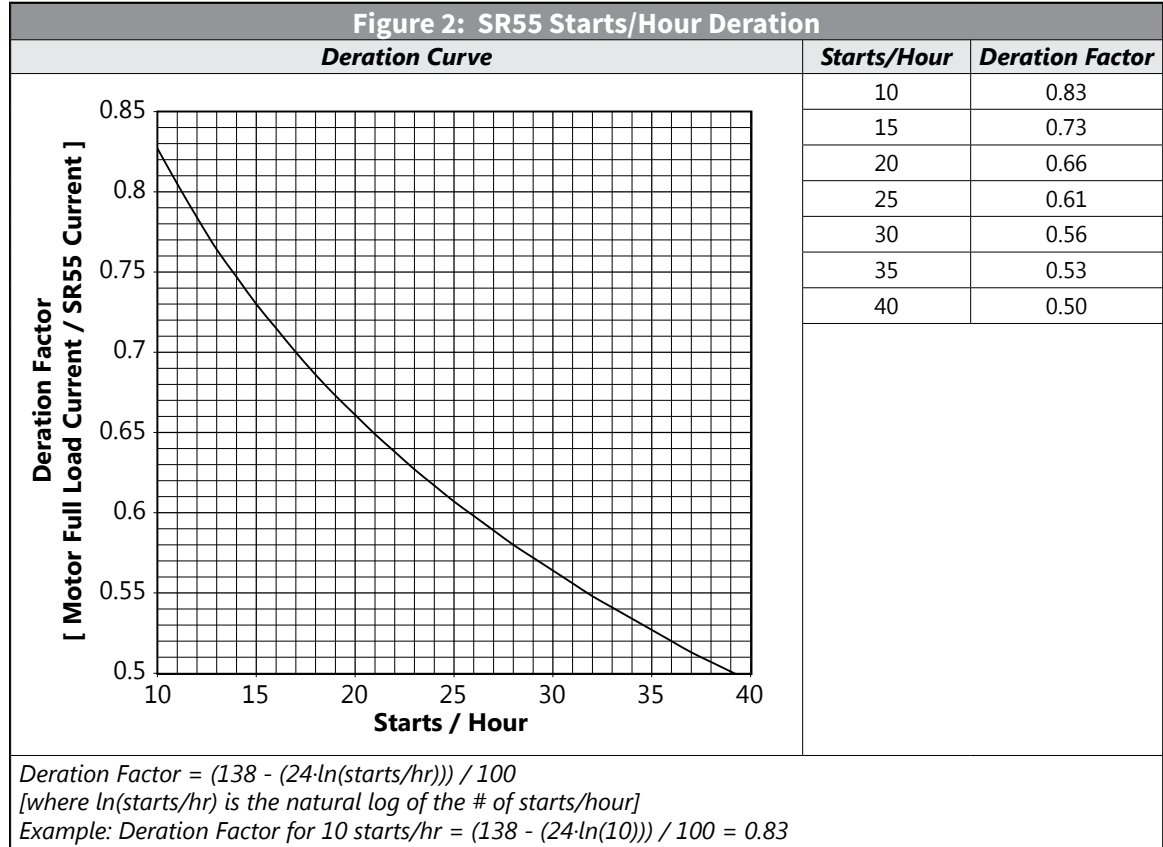
- For example, $S = 5$ means that the soft starter is capable of 5 equally spaced starts per hour.

These characteristics are summarized below 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				

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.



DERATING EXAMPLES

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)