Catalog

Softstarters
Type PSR, PSS, PSE, PST and PSTB

Power and productivity
for a better world™

News

Efficient PSE range – world's first compact softstarter with torque control

The latest addition to ABB's softstarter family is the efficient PSE range. This softstarter has been equipped with all the most important features making it a very efficient choice. During the development process, great focus has been put into making sure that both the softstarter and the process are even more reliable. Furthermore, the softstarter has been equipped with built-in by-pass to reduce wiring and a back-lit display to provide a hassle free and easy setup and monitoring.

The complete range of softstarters

ABB's softstarter portfolio now consists of four different ranges making it possible to find a suitable softstarter for almost any possible application and motor size all the way up to 1800 A. The softstarter family consists of the compact PSR, the flexible PSS, the efficient PSE and the advanced PST(B) range.

Semiconductor fuses changed to knife type

The Bussmann semiconductor fuses, recommended to be used together with PSS, PSE and PST(B) softstarters, have been changed from screw fixing (DIN43 653) to knife fixing (DIN43 620). This will make it possible to use the standard OS type switch fuses from ABB.

Contents

Softstarters

From the moment the first electric motor was developed, engineers have tried to come up with ways of avoiding the electrical and mechanical problems that usually occur when starting a motor. High inrush currents, current spikes and excessive mechanical wear are some of the problems that need to be avoided. One way is to use a Star-Delta starter. This method is for many applications an insufficient solution since it handles neither problems with current spikes or torque peaks nor provides a way to perform a soft stop. A softstarter on the other hand, will provide far better performance during the start and allows for soft stops of the motor.

ABB has been producing softstarters since the beginning of the 1980's. Over 30 years' experience has been incorporated into the design of today's product ranges. Modern power electronics matched with smart circuitry and software gives users of ABB's softstarters, with several state-of-the-art design features, superior control of current and voltage levels during motor start and stop.

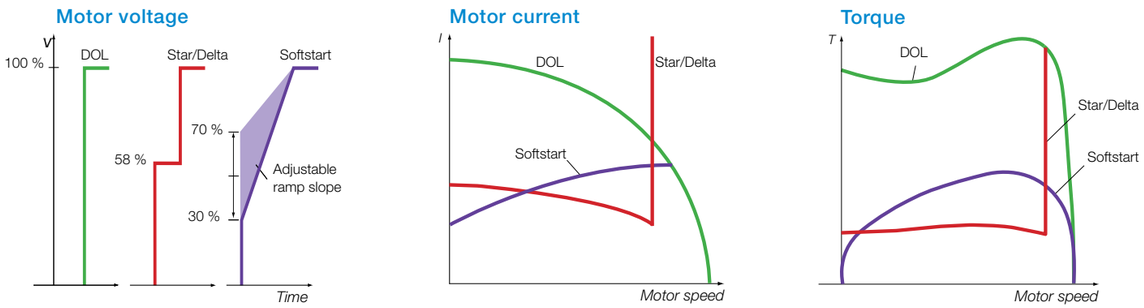
The solution to both mechanical and electrical problems

AC motors, "the workhorses of the industry", are used to drive fans, crushers, agitators, pumps, conveyors and more. Depending on the motor installation, torque and current peaks occur. These peaks are everyday reality for production plants all over the world, causing problems in several ways:

- Electrical problems due to voltage and current transients arising from Direct-On-Line or Star-Delta starts. The transients may overload the local supply network and cause unacceptable voltage variations that interfere with other electrical equipment connected to the network.
- Mechanical problems that address the entire drive chain, from motor to driven equipment, causing a big need for service and repair work.
- Operational problems, such as damage to products on conveyor belts.
- Water hammering and pressure surges in pipe systems when starting and stopping pumps.

The financial consequences of the problems above are considerable. Every technical problem and every breakdown costs money in repairs and lost production.

By choosing ABB's softstarter, all of these problems could be avoided. Whether the choice is the PSR, PSS, PSE or the PST(B), ABB's softstarters all allow smooth start and stops while keeping mechanical and electrical stresses to a minimum.



Graphs showing the basic differences between Direct-On-Line starting (DOL), Star-Delta starting and soft starting in terms of the motor voltage (V), motor current (I) and motor torque (T).

Softstarters
ABB's softstarters – The complete range

ABB offers four different ranges of softstarters to cover every customer need for solutions with motor sizes up to 1800 A. This page describes the main characteristics of the different softstarter ranges.

PSR — The compact range

The PSR softstarter is the most compact of all the softstarter ranges. A compact softstarter also allows for the design of compact starting equipment. A PSR together with a MMS (manual motor starter) makes up a far more compact starting solution than a Star-Delta starter, for instance.

By including a built-in by-pass the energy losses inside the softstarter are reduced. And with only three potentiometers, the setup of the PSR could not be easier. Still, the optimized ramping characteristics will ensure a very smooth start and stop for all applications.

PSS — The flexible range

The PSS is the most flexible of the four softstarter ranges from ABB. It allows both in-line and inside delta connections. As with the PSR, few settings are needed to get it up and running. Connecting an external current transformer makes it possible to activate the current limit function which will allow you to keep the current at a pre-set level also when starting heavy-duty applications. The PSS softstarter is the ideal solution when looking for a robust solid state starting solution where handling many starts per hour is required.

PSE — The efficient range

The PSE softstarter is the world's first compact softstarter with both built-in electronic overload for motor protection and torque control for excellent control of pumps. A compact design, packed with functionality, makes the PSE a very efficient starting solution.

An illuminated, language neutral display and a four button keypad makes it easy to take advantage of all the advanced features of the PSE softstarter. The display provides all the necessary information both during ramping and continuous operation.

PSR18 - 600 - 70

- Softstarter range
- Current rating: 18 A
- Operational voltage: 600 V
- Control supply voltage: 70 = 100-250 V AC, 11 = 24 V AC/DC

PST(B) — The advanced range

The PST(B) softstarter is the most advanced softstarter in the range with almost all imaginable functionality included. Advanced protection of the motor, softstarter and load ensures a trouble-free operation. Problems are detected before the motor needs to be stopped thanks to a pre-warning system that minimizes downtime.

The torque control of the PST(B) was developed in cooperation with well-known pump manufacturers to ensure the best possible stop of pumps, without the risk of water hammering and pressure surges.

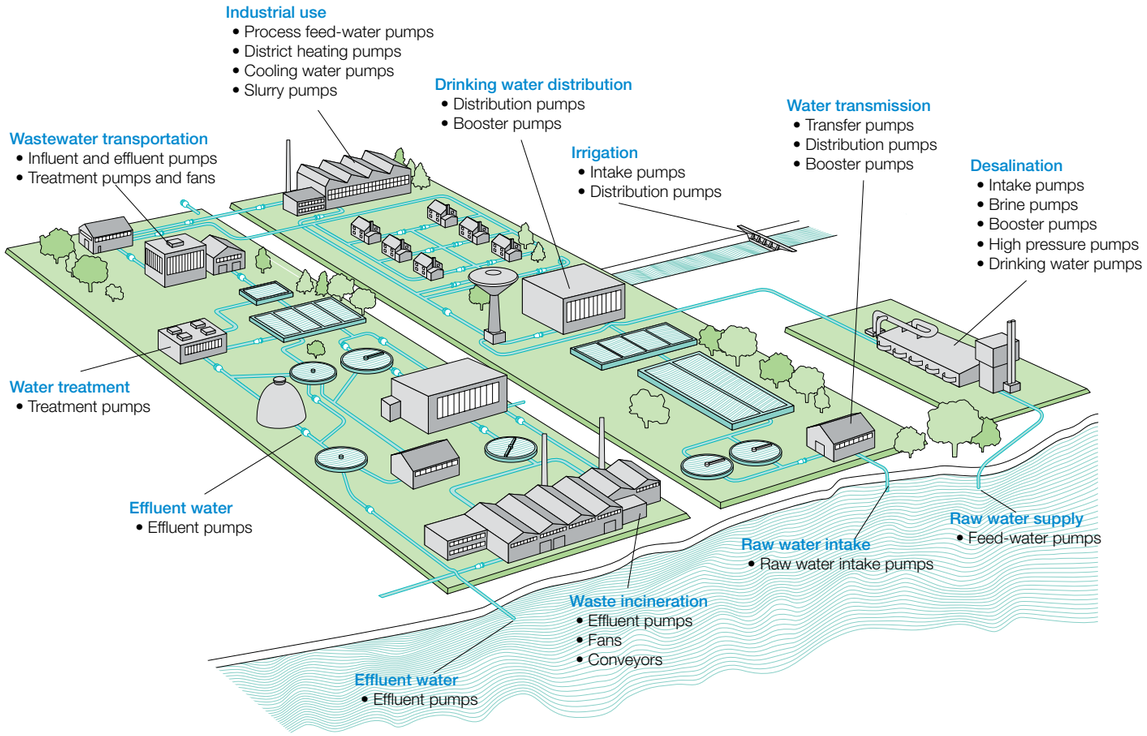
With the full-text LCD display in your own language, pre-programmed application settings and event logging, setup and operation could not be easier.

By using the ABB's FieldBusPlug, you can decide at any time which bus protocol to use. The fieldbus system will allow you to setup, control and monitor the softstarter.

PSR	PSS	PSE	PST(B)	• Standard O Optional – Not available
•	–	•	• 1)	Built-in by-pass 1) on PSTB
–	•	–	•	Inside delta connection
–	–	•	O	Coated PCBs
–	–	•	•	Display and keypad
–	–	•	•	Torque control
–	O	•	•	Settable current limit function
–	–	•	•	Electronic motor overload protection
–	–	–	•	PTC input for motor protection
–	–	–	•	Phase imbalance protection
–	–	–	•	Phase reversal protection
–	–	•	•	Locked rotor protection
–	•	•	•	Thyristor overtemperature protection
–	–	•	•	Underload protection
–	–	–	•	Programmable warning functions
–	–	•	•	Analog output
O	–	O	•	FieldBus communication
–	–	O	•	Event log
–	–	O	O	External keypad

Pumps

Water is the most important resource in the world and water facilities can be found everywhere. Examples of water applications are freshwater and wastewater systems, circulating water for heating, cooling and irrigation.



Common questions:

– How to avoid voltage drops when starting?
– ABB's softstarter will reduce the starting current and thereby avoid the voltage drops.

– How to avoid water hammering when stopping?
– Use our softstarters equipped with an optimized stop ramp. Or even better, with torque control.

– How to ensure high reliability in harsh environments?
– Use our softstarters equipped with coated circuit boards to better withstand those environments.

– How to protect my pumping equipment in the best possible way?
– Use ABB's softstarters equipped with our special designed protections such as overload, underload, and locked rotor protection.

Fans

Common questions:

– How to avoid extended voltage drops due to long starting time?
– Use ABB's softstarter equipped with current limit to keep control of the starting current.

– How to extend the life of the driving belts?
– Our softstarters will reduce the mechanical stress during start, thus avoiding slipping belts.

– How to ensure the operation of the fan?
– A softstarter with underload protection will detect broken belts, making the operator immediately aware of the problem.

Compressors

Common questions:

– How to ensure a long life of the compressor?
– Using a softstarter for starting will reduce the accelerating torque, thereby minimizing the mechanical stress.

– How to build a compact compressor unit?
– Using a compact softstarter like PSR or PSE will allow a much more compact starting equipment than for instance a Star-Delta starter.

Conveyor belts

Common questions:

– How to reduce the need for service and repair of the conveyor belt?
– A softstarter from ABB will ensure starts with minimal mechanical stress on the conveyor belt.

– How to avoid that the conveyor belt is running in the wrong direction?
– Use a softstarter with phase reversal protection.

– How to improve the efficiency of the conveyor belt?
– Using softstarters with high and low current warnings allow you to load on and off the conveyor belt.

– How to ensure a successful start even after longer times without operation?
– A softstarter with kick start function will provide sufficient torque to be able to overcome the initial high friction from a temporary jammed belt.

PSR – The compact range
Description

Product description

- Wide rated operational voltage 208–600 V
- Rated control supply voltage 24 V AC/DC or 100–240 V AC
- Rated operational current 3–105 A
- Wide ambient temperature range, -25 to +60 °C
- Built-in by-pass on all sizes, saving energy and reducing installation time
- Potentiometer settings
- Run signal relay on all devices
- TOR signal relay on PSR25 … PSR105
- Optional fieldbus communication using Profibus, Modbus, Devicenet or CANopen
- DIN rail mounting on PSR3 … PSR45
- Screw mounting on all sizes
- Connection kits for easy connection with ABB's manual motor starters
- Sophisticated algorithm eliminating the DC-component and thereby providing excellent starting performance

The PSR range is the most compact of all ABB's softstarter ranges. The compact PSR range makes it possible to fit many devices into the same enclosure. A PSR together with a MMS (manual motor starter) makes up a far more compact starting solution than a Star-Delta starter, for instance.

Flexible mounting

PSR softstarters from 3 to 45 A are possible to mount on a DIN-rail, ensuring quick and easy mounting. Naturally, all sizes can be screw mounted.

Few settings

The setup of the PSR is easily done and confirmed using the three clearly marked potentiometers on the front.

Built-in by-pass for energy saving

The built-in by-pass on all sizes does not only save energy; it will also ensure the most compact ABB's softstarter design and reduce the installation time. Thanks to the reduced heat generation, the softstarter can be mounted inside high IP class enclosures.

Suitable for stopping pumps

Even without using torque control, the PSR range is designed to reduce water hammering. Compared to the direct stops of a Star-Delta starter or a DOL starter the PSR is superior. See the stop ramp with step-down voltage below.

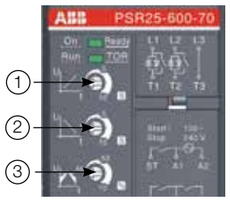
System concept with manual motor starters

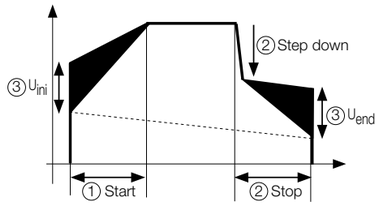
All PSR softstarter sizes can easily be connected to the corresponding manual motor starters from ABB by using the special designed connection kits. This makes both the mounting and the connection easier and will provide a very compact starting solution containing short circuit and thermal protection, isolation function and soft starter - everything that you need.

Settings

① Start = 1 ... 20 sec

Stop = 0 ... 20 sec - including the step down voltage.
② Step down = 2% reduction for each second increased stop ramp
Stop ramp 10 sec -> step down 80% (20% reduction)
③ U_{ini} = 40 ... 70% results in end voltage = 30 ... 60%





PSR – The compact range
Overview




	PSR3 ... PSR16					PSR25 ... PSR30		PSR37... PSR45		PSR60 ... PSR105			
Softstarter, type													
Normal start In-line connected	PSR3	PSR6	PSR9	PSR12	PSR16	PSR25	PSR30	PSR37	PSR45	PSR60	PSR72	PSR85	PSR105
(400 V) kW	1.5	3	4	5.5	7.5	11	15	18.5	22	30	37	45	55
IEC, max. A	3.9	6.8	9	12	16	25	30	37	45	60	72	85	105
(440-480 V) hp	2	3	5	7.5	10	15	20	25	30	40	50	60	75
UL, max FLA	3.4	6.1	9	11	15.2	24.2	28	34	46.2	59.4	68	80	104
400 V, 40 °C													
Manual motor starter (50 kA) type													
Using manual motor starters type 1 coordination will be achieved	MS116			MS132				MS450		MS495			–
Fuse protection (50 kA) gG Fuse													
Using gG fuses type 1 coordination will be achieved	10 A	16 A	25 A	32 A		50 A	63 A	100 A	125 A		200 A		250 A
Switch fuse, type													
Suitable switch fuse for the above gG fuses	OS32GD							OS125GD			OS250D		
Thermal overload relay													
Overload protection is used to protect the motor from over heating	TF42								TF65		TF96		TF140DU
Line contactor, type													
The line contactor is not required for the softstarter itself but often used to open if OL trips	AF9			AF12	AF16	AF26	AF30	AF38	AF52	AF65	AF80	AF96	AF116
By-pass contacts													
Using by-pass will reduce the power loss and allow more starts per hour	Built-in												

PSR – The compact range
Ordering details


PSR3 ... PSR16


PSR25 ... PSR30


PSR37 ... PSR45


PSR60 ... PSR105

PSR3 ... PSR105

Rated operational voltage U_e, 208-600 V AC

Rated control supply voltage, U_s, 100-240 V AC

Motor power 230 V P kW	400 V P kW	500 V P kW	IEC Max rated operational current I_e A	Type	Order code		Weight kg 1 piece
0.75	1.5	2.2	3.9	PSR3-600-70	1SFA896103R7000		0.450
1.5	3	4	6.8	PSR6-600-70	1SFA896104R7000		0.450
2.2	4	4	9	PSR9-600-70	1SFA896105R7000		0.450
3	5.5	5.5	12	PSR12-600-70	1SFA896106R7000		0.450
4	7.5	7.5	16	PSR16-600-70	1SFA896107R7000		0.450
5.5	11	15	25	PSR25-600-70	1SFA896108R7000		0.650
7.5	15	18.5	30	PSR30-600-70	1SFA896109R7000		0.650
7.5	18.5	22	37	PSR37-600-70	1SFA896110R7000		1.000
11	22	30	45	PSR45-600-70	1SFA896111R7000		1.000
15	30	37	60	PSR60-600-70	1SFA896112R7000		2.200
22	37	45	72	PSR72-600-70	1SFA896113R7000		2.270
22	45	55	85	PSR85-600-70	1SFA896114R7000		2.270
30	55	55	105	PSR105-600-70	1SFA896115R7000		2.270

Rated operational voltage U_e, 208-600 V AC

Rated control supply voltage, U_s, 24 V AC/DC

0.75	1.5	2.2	3.9	PSR3-600-11	1SFA896103R1100		0.450
1.5	3	4	6.8	PSR6-600-11	1SFA896104R1100		0.450
2.2	4	4	9	PSR9-600-11	1SFA896105R1100		0.450
3	5.5	5.5	12	PSR12-600-11	1SFA896106R1100		0.450
4	7.5	7.5	16	PSR16-600-11	1SFA896107R1100		0.450
5.5	11	15	25	PSR25-600-11	1SFA896108R1100		0.650
7.5	15	18.5	30	PSR30-600-11	1SFA896109R1100		0.650
7.5	18.5	22	37	PSR37-600-11	1SFA896110R1100		1.000
11	22	30	45	PSR45-600-11	1SFA896111R1100		1.000
15	30	37	60	PSR60-600-11	1SFA896112R1100		2.200
22	37	45	72	PSR72-600-11	1SFA896113R1100		2.270
22	45	55	85	PSR85-600-11	1SFA896114R1100		2.270
30	55	55	105	PSR105-600-11	1SFA896115R1100		2.270

PSR – The compact range
Accessories


PSR16-MS116


PSR30-MS132


PSR45-MS450


PSR105-MS495


PSR-FAN3-45A


PSR-FAN60-105A


PS-FBPA


PSLW

Connection kit

For softstarter type	Type	Order code	Packing piece	Weight kg 1 piece
PSR3...PSR16 with MS116 or MS132	PSR16-MS116	1SFA896211R1001	1	0.022
PSR25...PSR30 with MS132-12...MS132-32	PSR30-MS132	1SFA896212R1001	1	0.040
PSR37...PSR45 with MS450	PSR45-MS450	1SFA896213R1001	1	0.034
PSR60...PSR105 with MS495	PSR105-MS495	1SAM501903R1001	1	0.050

Fan

For softstarter type	Type	Order code	Packing piece	Weight kg 1 piece
PSR3...PSR45	PSR-FAN3-45A	1SFA896311R1001	1	0.010
PSR60...PSR105	PSR-FAN60-105A	1SFA896313R1001	1	0.013

Terminal enlargements

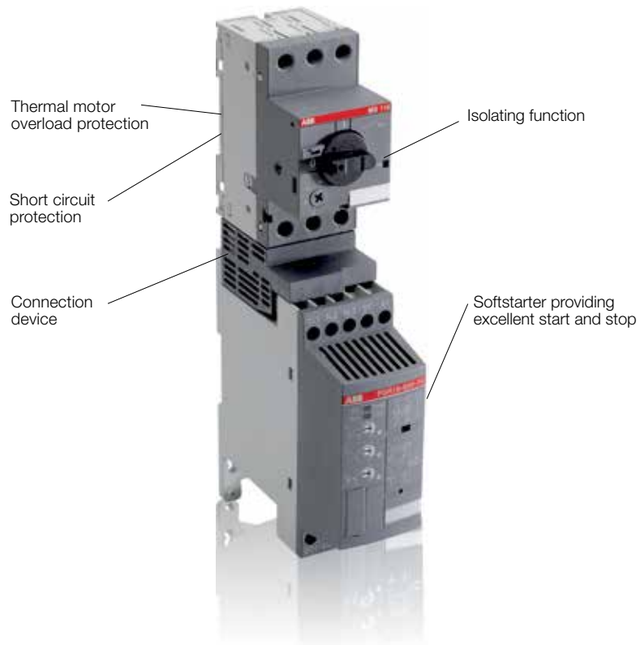
For softstarter type	Type	Order code	Packing piece	Weight kg 1 piece
PSR60...105 Wire range mm2 1x10...50, 2x10...25	PSLW-72	1SFA899002R1072	1	0.150

FieldBusPlug connection accessory

For softstarter type	Type	Order code	Packing piece	Weight kg 1 piece
The same accessory for all sizes	PS-FBPA	1SFA896312R1002	1	0.060

ABB's FieldBusPlug suitable for all sizes. See page 50-53

Connection kit



PSR – The compact range
Technical data

Rated insulation voltage U_i	600 V												
Rated operational voltage U_e	208...600 V +10%/-15%, 50/60 Hz ±5%												
Rated control supply voltage U_s	100...240 V AC, 50/60Hz ±5% or 24 V AC/DC, +10%/-15%,												
Power consumption	**PSR3**	**PSR6**	**PSR9**	**PSR12**	**PSR16**	**PSR25**	**PSR30**	**PSR37**	**PSR45**	**PSR60**	**PSR72**	**PSR85**	**PSR105**
Supply circuit													
at 100-240 V AC	12 VA							10 VA					
at 24 V AC/DC	5 W												
Max. Power loss at rated I_e	**PSR3**	**PSR6**	**PSR9**	**PSR12**	**PSR16**	**PSR25**	**PSR30**	**PSR37**	**PSR45**	**PSR60**	**PSR72**	**PSR85**	**PSR105**
	0.7 W	2.9 W	6.5 W	11.5 W	20.5 W	25 W	36 W	5.5 W	8.1 W	3.6 W	5.2 W	7.2 W	6.6 W
Starting capacity at I_e	4 x Ie for 6 sec.												
Number of starts per hour	See table below for details												
standard	10[1)]												
with aux. fan	20[1)]												
Service factor	100%												
Ambient temperature													
during operation	-25 °C to +60 °C [2)]												
during storage	-40 °C to +70 °C												
Maximum altitude	4000 m [3)]												
Degree of protection	**PSR3**	**PSR6**	**PSR9**	**PSR12**	**PSR16**	**PSR25**	**PSR30**	**PSR37**	**PSR45**	**PSR60**	**PSR72**	**PSR85**	**PSR105**
main circuit	IP20							IP10					
control circuit	IP20												
Connectable cable area	**PSR3-PSR16**					**PSR25-PSR30**		**PSR37-PSR45**		**PSR60-PSR105**			
main circuit	1 x 0.75-2.5mm²					1 x 2.5-10mm²		1 x 6-35mm²		1 x 10-95mm²			
	2 x 0.75-2.5mm²					2 x 2.5-10mm²		2 x 6-16mm²		2 x 6-35mm²			
	PSR3-PSR16					**PSR25-PSR105**							
control circuit	1 x 0.75-2.5mm²					1 x 0.75-2.5mm²							
	2 x 0.75-2.5mm²					2 x 0.75-1.5mm²							
Signal relays	**PSR3-PSR16**					**PSR25-PSR105**							
for run signal													
resistive load	240 V AC, 3 A/24 V DC, 3 A					240 V AC, 3 A/24 V DC, 3 A							
AC-15 (contactor)	240 V AC, 0.5 A/24 V DC, 0.5 A					240 V AC, 0.5 A/24 V DC, 0.5 A							
for top ramp signal													
resistive load	-					240 V AC, 3 A/24 V DC, 3 A							
AC-15 (contactor)	-					240 V AC, 0.5 A/24 V DC, 0.5 A							
LED for On/Ready	green												
for Run/Top of ramp	green												
Settings Ramp time during start	1-20 sec.												
Ramp time during stop	0-20 sec.												
Initial- and end voltage	40-70%												

[1)] Valid for 50% on time and 50% off time. If other data is required, contact your sales office.
[2)] Above 40 °C up to max. 60 °C reduce the rated current with 0.8% per °C.
[3)] When used at high alitudes above 1000 meters up to 4000 meters you need to derate the rated current using the following formula.

$$[\ \% \text{ of } I_e = 100 - \frac{x-1000}{150}\ ]$$ x = actual altitude for the softstarter

Number of starts per hour using PSR softstarters

Motor current I_e	Starts/hour without auxiliary fan								Starts/hour with auxiliary fan							
	10	**20**	**30**	**40**	**50**	**60**	**80**	**100**	**10**	**20**	**30**	**40**	**50**	**60**	**80**	**100**
3 A	PSR3							PSR6	PSR3							
6 A	PSR6						PSR9		PSR6							PSR9
9 A	PSR9				PSR12		PSR16	PSR25	PSR9				PSR12			
12 A	PSR12			PSR16	PSR25		PSR30		PSR12			PSR16	PSR25			
16 A	PSR16	PSR25			PSR30		PSR37		PSR16	PSR25			PSR30			
25 A	PSR25	PSR30	PSR37			PSR45		PSR60	PSR25	PSR30	PSR37				PSR45	
30 A	PSR30	PSR37		PSR45		PSR60		PSR72	PSR30	PSR37		PSR45				
37 A	PSR37	PSR45		PSR60		PSR72	PSR85	PSR105	PSR37	PSR45			PSR60			
45 A	PSR45		PSR60		PSR72	PSR85	PSR105	-	PSR45		PSR60		PSR72			
60 A	PSR60		PSR72	PSR85	PSR105		-	-	PSR60		PSR72	PSR85	PSR105		-	
72 A	PSR72	PSR85	PSR105		-	-	-	-	PSR72		PSR85	PSR105			-	
85 A	PSR85	PSR105		-	-	-	-	-	PSR85	PSR105		-	-	-	-	
105 A	PSR105	-	-	-	-	-	-	-	PSR105	-	-	-	-	-	-	

Data based on an ambient temperature of 40°, starting current of 4 x I_e and ramp time 6 seconds.
For more optimized selections, or to use PSR for heavy-duty starts, please use the softstarter selection tool.

PSR – The compact range
UL ratings

UL ratings

Softstarter	Motor power P (hp) and full load current FLA (A)					
	Max FLA	U_e 200 V/208 V	U_e 220 V/240 V	U_e 440 V/480 V	U_e 550 V/600 V	Max. fuse
Type	**A**	**hp**	**hp**	**hp**	**hp**	**A, Type**
PSR3	3.4	0.5	0.75	2	2	35 A J-Type
PSR6	6.1	1	1.5	3	5	35 A J-Type
PSR9	9	2	2	5	7.5	35 A J-Type
PSR12	11	3	3	7.5	10	35 A J-Type
PSR16	15.2	3	5	10	10	35 A J-Type
PSR25	24.2	7.5	7.5	15	20	60 A J-Type
PSR30	28	7.5	10	20	25	60 A J-Type
PSR37	34	10	10	25	30	90 A J-Type
PSR45	46.2	15	15	30	40	90 A J-Type
PSR60	59.4	20	20	40	50	110 A J-Type
PSR72	68	20	25	50	60	125 A J-Type
PSR85	80	25	30	60	75	150 A J-Type
PSR105	104	30	40	75	100	200 A J-Type