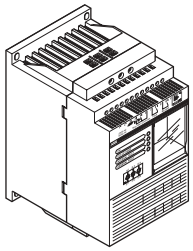
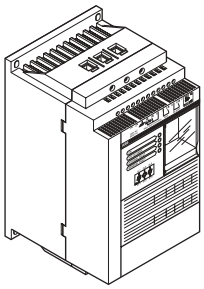
Installation and maintenance manual

Softstarters PS S 18/30…300/515

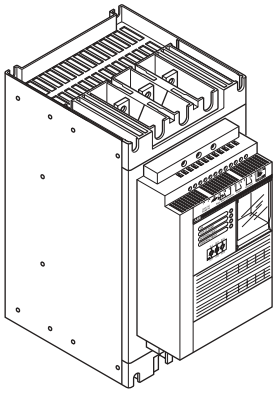
1SFC 388002-en ed.4 2003-04-08



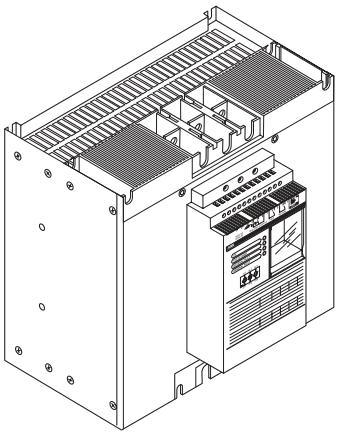
PS S18/30-500…44/76-500



PS S50/85-500…72/124-500
PS S18/30-690…72/124-690



PS S85/147-500…142/245-500
PS S85/147-690…142/245-690



PS S175/300-500…300/515-500
PS S175/300-690…300/515-690

Contents

WARNING

More than one live circuit
- see diagram

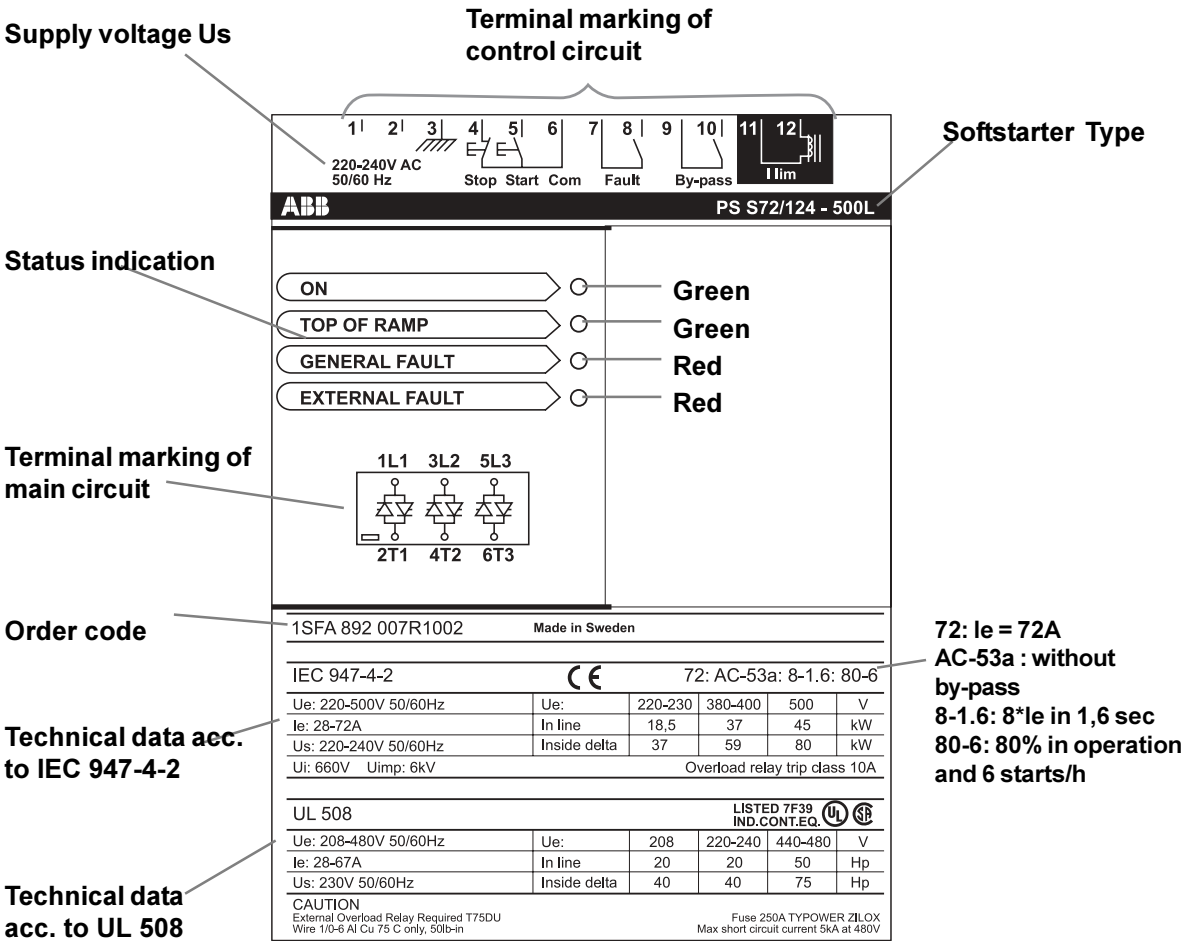
Do not operate machine with the grounding wire disconnected

WARNING

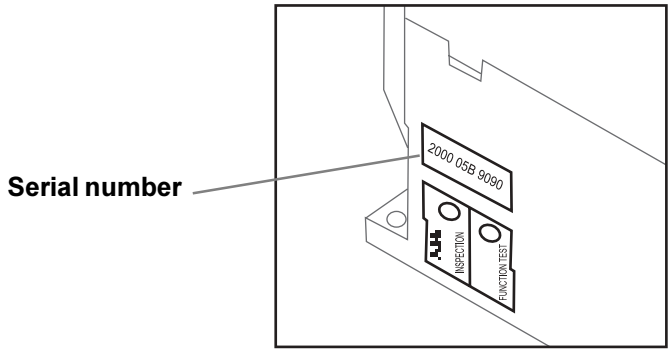
The operation, installation and servicing of this product must be carried out by a qualified electrician, following installation standards and safety regulations. Check that you have the correct softstarter unit in regards to net voltage, rated motor data and type of connection.

1. Softstarter marking

! These softstarters fulfil the demands according to 89/336/EEC and EN 60947-4-2 / IEC 947-4-2, Equipment class A.



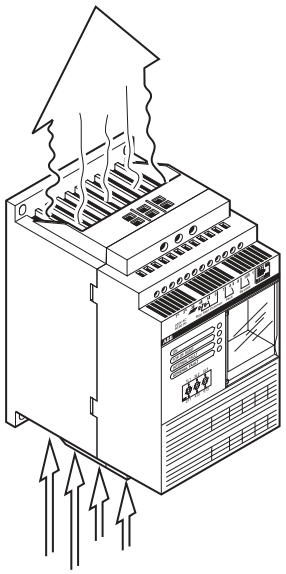
Picture 1.1



2. Mounting

To have a suitable cooling, the softstarter has to be mounted vertically, see picture 2.1.
The softstarter should not be mounted in a way that the airways are blocked. Follow recommended distances acc. to section 2.2.

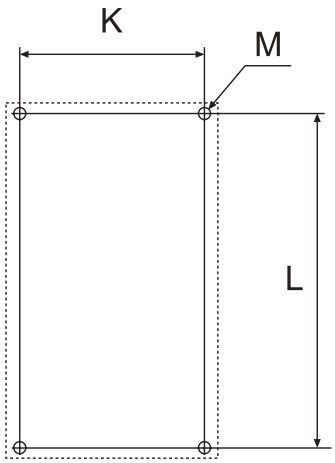
! All technical data for the softstarter are valid for an ambient temperature of 40ºC. For temperatures above of 40ºC, up to max. 60ºC, the rated current has to be derated with 0,8% per ºC.



Picture 2.1

2.1 Drilling plan

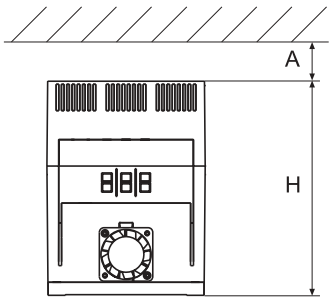
	K	L	M
PS S18/30-500...44/76-500	105	184	M6
PS S50/85-500...72/124-500 **PS S18/30-690...72/124-690**	125	234	M6
PS S85/147-500...142/245-500 **PS S85/147-690...142/245-690**	158	320	M6
PS S175/300-500…300/515-500 **PSS175/300-6900…300/515-690**	333	320	M6



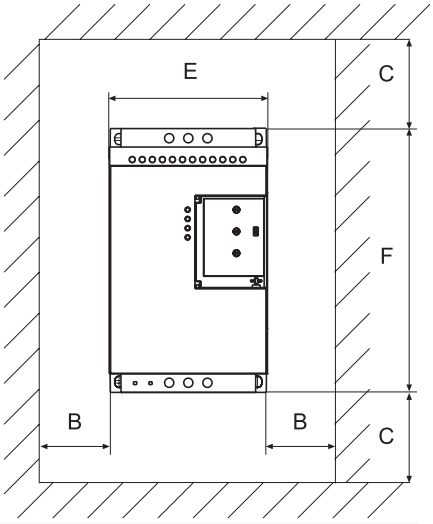
Picture 2.2

2.2 Minimum distance to wall/front

The following distances give enough clearance for airflow around the softstarter for suitable cooling. Please note that the values are minimum distances.



Picture 2.3



Picture 2.4

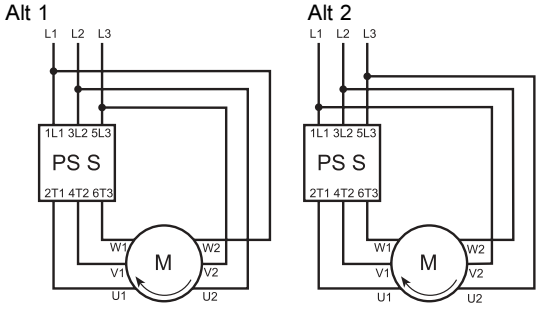
	Air gap			Outer dimensions of the softstarter		
	A	**B**	**C**	**E**	**F**	**H**
PS S18/30-500...44/76-500	20	10	100	120	200	163
PS S50/85-500...72/124-500 **PS S18/30-690...72/124-690**	20	10	100	140	250	163
PS S85/147-500...142/245-500 **PS S85/147-690...142/245-690**	20	10	100	181	340	265
PS S175/300-500…300/515-500 **PS S175/300-690…300/515-690**	20	10	100	356	340	265

3. Connection

3.1 Main circuit, Terminal / Bar 1L1, 3L2, 5L3 as well as 2T1, 4T2, 6T3

All softstarters, PS S 18/30 to PS S 300/515, can be connected both ”In Line” (see picture 3.1) and ”Inside Delta” (see picture 3.2, alt. 1 and 2) with the motor.

Picture 3.1



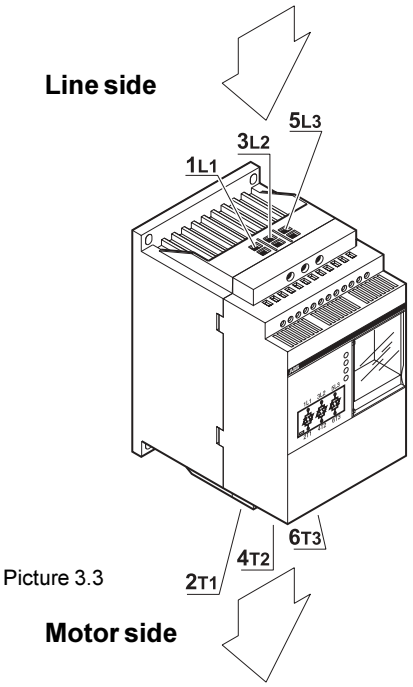
Picture 3.2

! Remember to set the Line/Delta switch S1 in the right position. See further on page 10

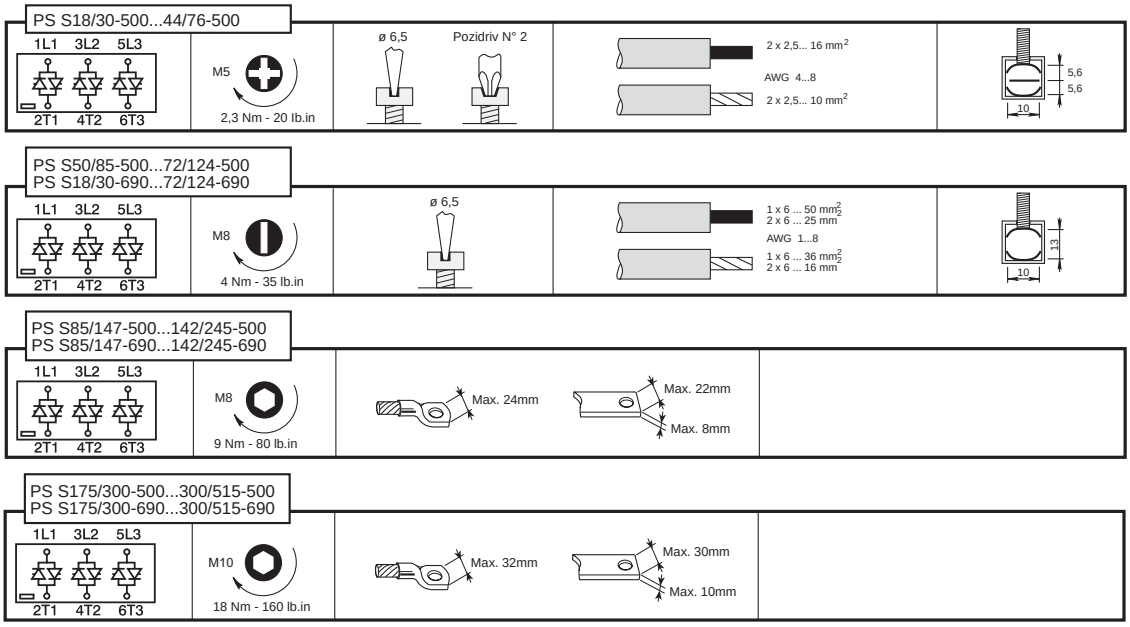
! For mounting of a current transformer for the current limit function, see further instructions section 3.2.6 on page 8.

Connect the line side to terminals / bars 1L1, 3L2, 5L3 and motor side to terminals / bars 2T1, 4T2 and 6T3. The terminal marking is printed on the softstarter front label.

! The softstarter unit is not phase sequence sensitive



Picture 3.3



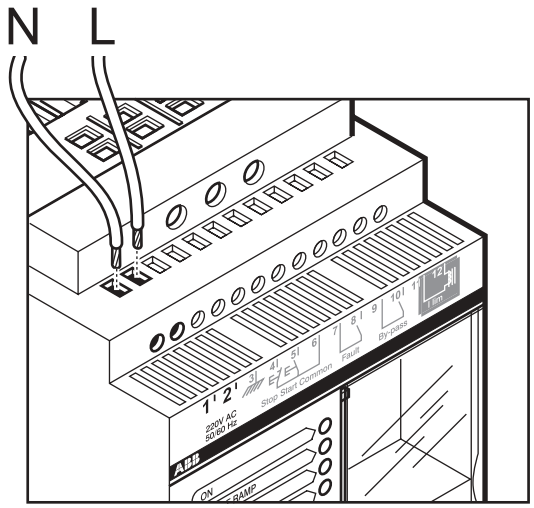
3. Connection

3.2 Control voltage and control circuit

3.2.1 Supply voltage, terminals 1 and 2

Connect neutral and phase to terminal 1 and 2. See picture 3.4

! Check that you have the correct supply voltage Us.

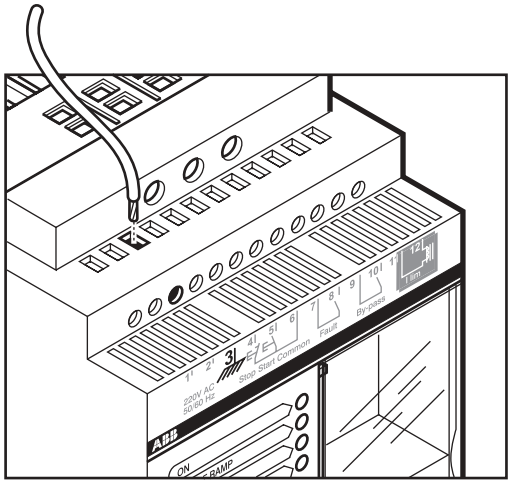


Picture 3.4

3.2.2 Earthing of the unit, terminal 3

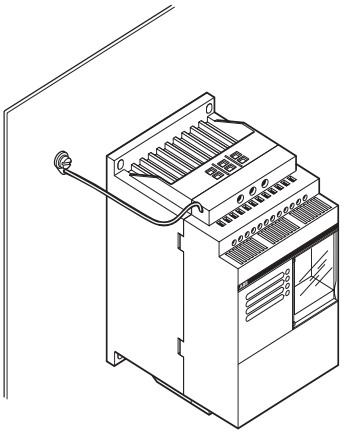
Suitable cable: grey or black 1,5-2,5 mm² AWG12…16

The cable should be as short as possible and shall be connected to an earthing point close to the softstarter. A suitable earthing point would be next to the softstarter on the mounting plate. See picture 3.6. The mounting plate should also be earthed.



Picture 3.5

! This is not a protective earth, it is a function earth. The earthing cable should be as short as possible and shall be connected to an earthing point close to the softstarter.



Picture 3.6

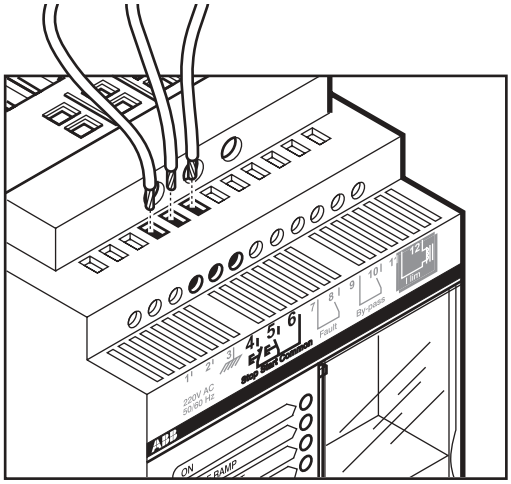
1.....12	M 3 0,5 Nm - 4,3 lb.in	3,5 x 0,6	0,14 ... 2,5 mm² AWG 12...22 0,14 ... 2,5 mm²

3. Connection

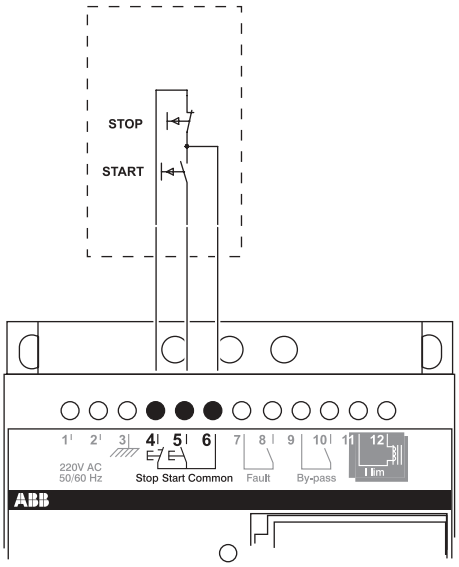
3.2.3 Control circuit for Start and Stop, Terminals 4, 5 and 6

The softstarter has a built in holding circuit, which enables an easy circuit. See picture 3.8

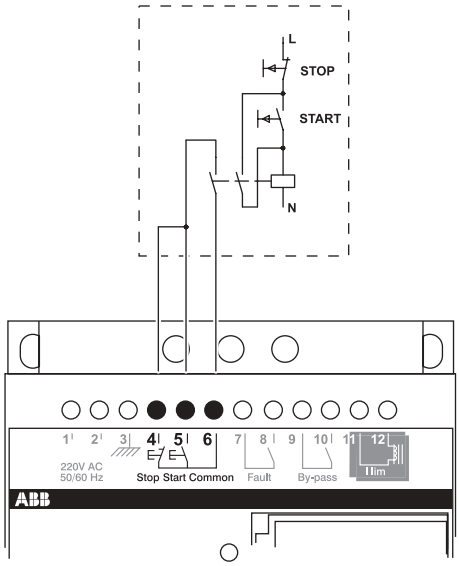
A conventional circuit with aux. relay is also possible. See picture 3.9



Picture 3.7



Picture 3.8



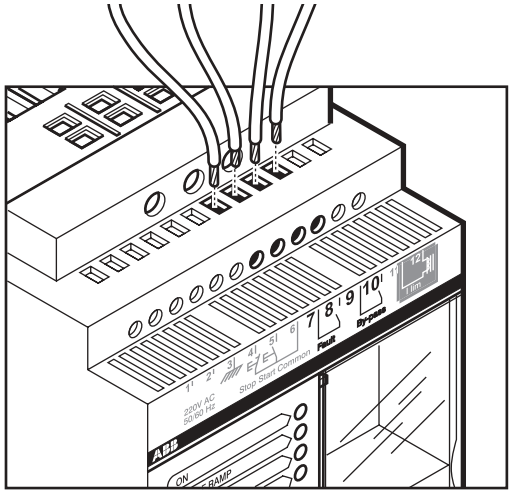
Picture 3.9

3.2.4 Signal relay for fault. Terminals 7 and 8 : Fault

The built in contact gives signal at fault (normally open or normally closed contact). Technical data: max 250V / 1,5A, AC-15.

3.2.5 Signal relay for indication of completed start ramp. Terminals 9 and 10 : By-pass

The built in contact is closed when the start ramp is completed, and opened when a stop signal is given (closed only during continuous operation).



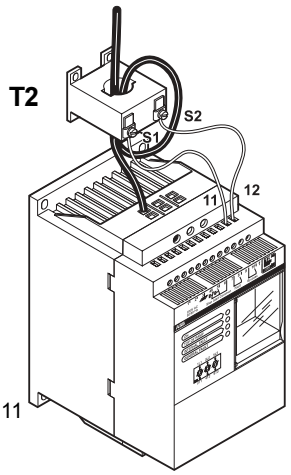
Picture 3.10

3. Connection

3.2.6 Connection of current transformer T2 (accessory), Terminal 11 and 12

The function Current Limit requires a current transformer to be connected to terminals 11 and 12. The current transformer is an accessory, which can be purchased separately (see techn. catalogue)

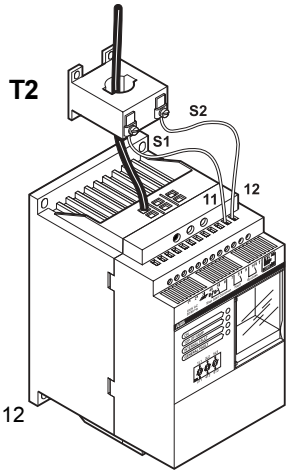
! Check that you have the correct current transformer (correct ratio). See table 3.1



Picture 3.11

Mounting

Mount the current transformer close to the softstarter, see pictures 3.11 and 3.12.



Picture 3.12

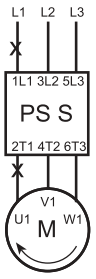
Connection

The current transformer can be connected to a phase of your choice. Picture 3.13 and 3.14 shows alternative position when connected in phase L1.

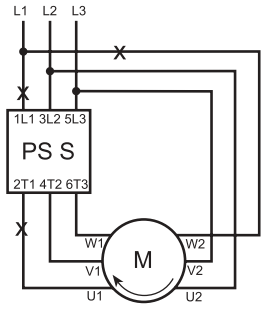
Check in table 3.1 how many turns you need for the primary side of the transformer. Connect the transformer acc. to picture 3.12 for one turn, or acc. to picture 3.11 for two turns.

Smallest cable size which can be used is 1,5mm² AWG 16

A different current transformer from a local supplier can also be used – technical data : min 1VA



Picture 3.13



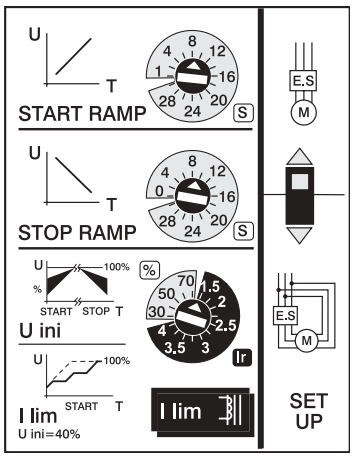
Picture 3.14

Tab 3.1

For softstarter	Ratio	Turns	Order code	Connection see picture
PS S 18/30	60/1	2	1SFA 89 9001 R1060	3.11
PS S 30/52	40/1	1	1SFA 89 9001 R1040	3.12
PS S 37/64	50/1	1	1SFA 89 9001 R1050	3.12
PS S 44/76	60/1	1	1SFA 89 9001 R1060	3.12
PS S 50/85	75/1	1	1SFA 89 9001 R1075	3.12
PS S 60/105	75/1	1	1SFA 89 9001 R1075	3.12
PS S 72/124	100/1	1	1SFA 89 9001 R1100	3.12
PS S 85/147	125/1	1	1SFA 89 9001 R1125	3.12
PS S 105/181	150/1	1	1SFA 89 9001 R1150	3.12
PS S 142/245	200/1	1	1SFA 89 9001 R1200	3.12
PS S 175/300	250/1	1	1SFA 89 9001 R1250	3.12
PS S 250/430	400/1	1	1SFA 89 9001 R1400	3.12
PS S300/515	400/1	1	1SFA 89 9001 R1400	3.12

4. Setting

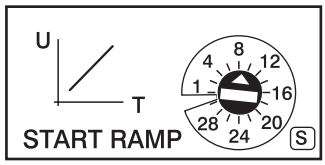
The softstarter has three rotating switches as well as one 2-position switch. Basic settings for different applications are listed in the tables on page 11.



Picture 4.1

4.1 Start ramp

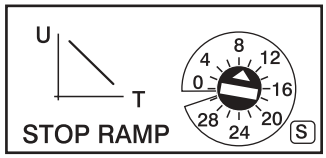
Sets the time for how fast the voltage shall be increased during start. Adjustable in 16 steps between 1 and 30 seconds. See picture 4.2.



Picture 4.2

4.2 Stop ramp

Sets the time for how fast the voltage shall be decreased during stop. Adjustable in 16 steps between 0 and 30 seconds. See picture 4.3.



Picture 4.3

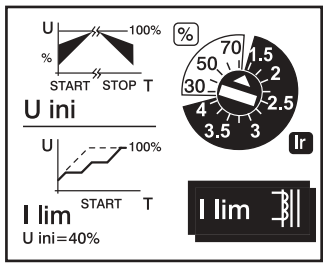
4.3 Initial voltage (UINI) / Current limit function (ILIM)

4.3.1 Initial voltage (UINI)

WHITE scale

Sets the starting voltage level for the start ramp, as well as the end voltage of the stop ramp.

Adjustable in 5 steps between 30% and 70% of full voltage.



Picture 4.4

4.3.2 Current limit function (ILIM)

A softstarter always reduces starting current. The current limit function allows you to pre-set a maximum starting current which will never be exceeded.

BLUE scale

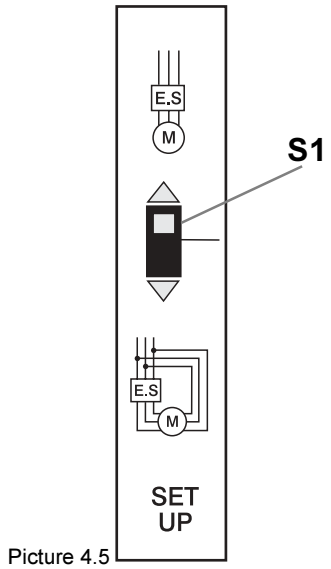
The same rotating switch as for initial voltage (UINI). Sets the current limit, if a current transformer T2 is connected to terminals 11 and 12.

Adjustable in 11 steps between 1,5 and 4 times the current transformers ratio. When setting the parameter (ILIM) on the blue scale, the initial voltage (UINI) will always be a fixed value of 40%.

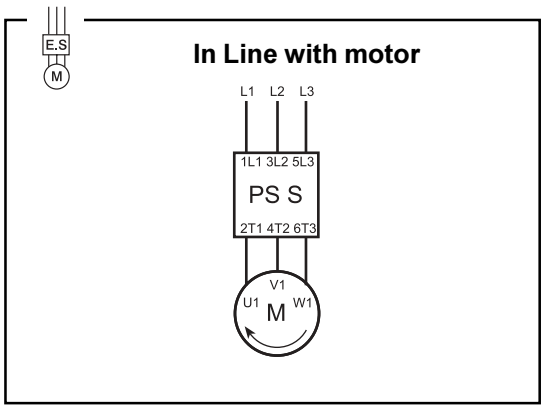
4. Setting

4.4 Switch for selection of connection type, Line/ Delta switch S1

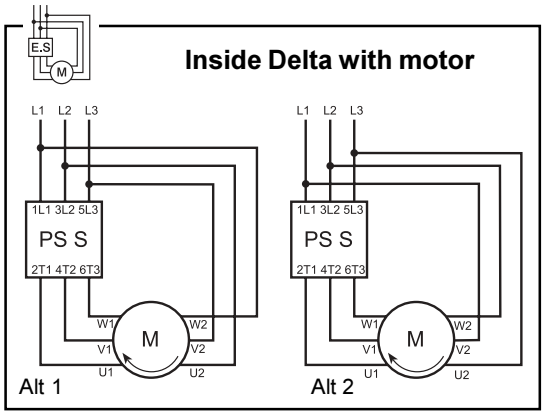
The softstarter can be connected to the main circuit in several different ways. ”In Line” with the motor (see picture 4.6) or ”Inside Delta” with the motor (see picture 4.7). Set this switch in the position corresponding to the chosen connection type.



Picture 4.5



Picture 4.6



Picture 4.7

4.5 Basic settings for different applications

4.5.1 Without current transformer T2 connected

Type of load	Ramp time for start (sec)	Ramp time for stop (sec)	Initial voltage U_{INI}	
Bow thruster	10	0	30%	
Centrifugal fan	10	0	30%	
Centrifugal pump	10	20	30%	
Piston compressor	10	0	30%	
Lifting equipment	10	10	60%	
Rotary converter	10	0	30%	
Stirrer, Mixer	10	0	60%	
Scraper	10	10	40%	
Screw compressor	10	0	40%	
Screw conveyor	10	10	40%	
Unloaded motor	10	0	30%	
Conveyor belt	10	10	40%	
Heat pump	10	20	30%	
Escalator	10	0	30%	
Hydraulic pump	10	0	30%	

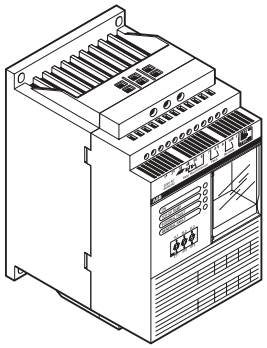
4.5.2 With current transformer T2 connected

Tab 4.2

Type of load	Ramp time for start (sec)	Ramp time for stop (sec)	Initial voltage U_{INI} (Fixed value)	Current limit I_{LIM} (xIe) (start)
Bow thruster	10	0	(40%)	2,5
Centrifugal fan	10	0	(40%)	3,5
Centrifugal pump	10	20	(40%)	3
Piston compressor	10	0	(40%)	3
Lifting equipment	10	10	(40%)	3,5
Rotary converter	10	0	(40%)	2,5
Stirrer, Mixer	10	0	(40%)	3,5
Scraper	10	10	(40%)	3,5
Screw compressor	10	0	(40%)	3,5
Screw conveyor	10	10	(40%)	3,5
Unloaded motor	10	0	(40%)	2,5
Conveyor belt	10	10	(40%)	3,5
Heat pump	10	20	(40%)	3
Escalator	10	0	(40%)	3
Hydraulic pump	10	0	(40%)	2,5

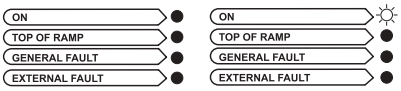
5. Maintenance

Check that the cooling airways of the softstarter unit are free from dirt and dust. Check also that the fan is working and rotating freely. The fan can be checked at voltage free state, so that rotation of blades is possible without resistance. They shall not rotate heavily.

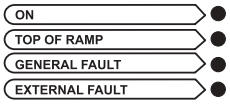
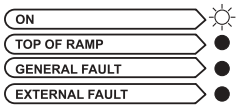
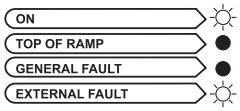
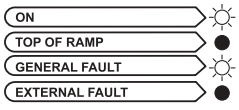


6. Trouble shooting

Motor humming / starts without given start signal

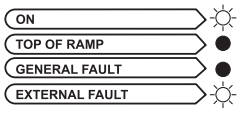
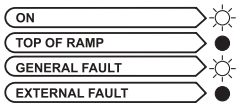
Status / Indication	Check
	•One or several thyristors can be shorted / broken •Is the by-pass contactor stuck in closed opsition

Motor does not start

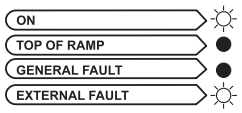
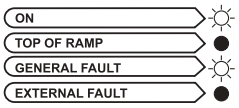
Status / Indication	Check
	•Is supply voltage connected to terminal 1 and 2?
	•Is start signal given (closed circuit between terminals 5 and 6)? •Is the circuit closed between terminals 6 and 4? •Verify that start and stop signals are not given at the same time. •Is the Line/Delta switch S1 in the right position?
	•Is the correct frequency connected? •Is the Line/Delta switch S1 in the right position? •Is the Inside Delta connection done in the right way? •Is main voltage connected to terminals 1L1, 3L2 and 5L3? •Has the thermal overload relay tripped and opened the main contactor? •Check all connections **RESET:**Give stop signal or disconnect voltage from terminals 1 and 2.
	•Is the Line/Delta switch S1 in the right position? •Is there an overtemperature in the softstarter? The same fault will occur again after RESET, if the softstarter is still too warm. Check that the fans are working in a proper way. Also check that cooling airways are free from dirt and dust. •If it is not possible to RESET the fault, then the processor is faulty. •If fault occurs approx. 60-70 sec after start signal is given, then the softstarter tries to ramp up but is not succeeding. Check all connections. If current transformer is used: Is the current limit settings high enough? Is the ratio of the current transformer right? •If inside delta connection is used: Is the motor circuit closed and are the connections carried out correctly. **RESET:**Give stop signal or disconnect voltage from terminals 1 and 2.

6. Trouble shooting

Motor stops during start / continuous operation

Status / Indication	Check
	•Phase loss in the main circuit? Has the thermal overload relay tripped and opened the main contactor? Has a fuse blown? •Check all connections. **RESET:**Give stop signal or disconnect voltage from terminals 1 and 2.
	•Is there an overtemperature in the softstarter? The same fault will occur again after RESET, if the softstarter is still too warm. Check that the fans are working in a proper way. Also check that cooling airways are free from dirt and dust. •If it is not possible to RESET the fault, then the processor is faulty. •If fault occurs approx. 60-70 sec after start signal is given, then the softstarter is trying to ramp up but is not succeeding. Check all connections. •Phase loss between softstarter and motor? Check connections. •One or more thyristor pairs are shorted / broken. •Is the Line/Delta switch S1 in position ”In Line”, even though the softstarter is connected ”Inside Delta”? •If inside delta connectionis used: Is the motor circuit closed and are the connections carried out correctly? **RESET:**Give stop signal or disconnect voltage from terminals 1 and 2.

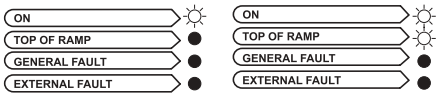
Fault at stop

	•Phase loss main circuit? Has main contactor opened before stop ramp has finished? Has a fuse blow? •Is the by-pass contactor stuck in closed position **RESET:** Give both start and stop signal or disconnect voltage from terminals 1 and 2.
	•Phase loss on load side? Check connections **RESET:** First give start signal, then stop signal or disconnect voltage from terminals 1 and 2.

6. Trouble shooting

Bad motor sound during start and operation

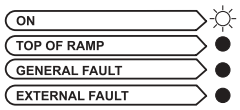
Status / Indication **Check**



- Is the motor too small?
- Is the Line/Delta switch S1 in the right position?
- Is the ”Inside Delta” connection done in the right way?
- Phase loss on line or load side? Check connections.

Bad motor sound during stop or stop ramp finish too early

Status / Indication **Check**

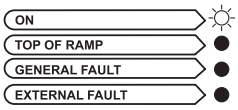


- Try different ramp time for stop (some adjustment can be necessary for best result).
- Phase loss on line or load side? Check connections.
- Is the Line/Delta switch S1 in the right position?

! Soft stop can only be used for applications were the motor stops too quickly with direct stop. See further regarding settings in tables on page 11.

Current limit function not adjustable (only valid for start)

Status / Indication **Check**



- Is a current transformer connected to terminals 11 and 12?
- Is the rotating switch for parameter ILIM turned to the blue scale?
- Is the correct current transformer used?
- Is the current transformer correctly connected?
- Is the motor suitable for the softstarter (too small motor)?

Other combination of LED:s than above:

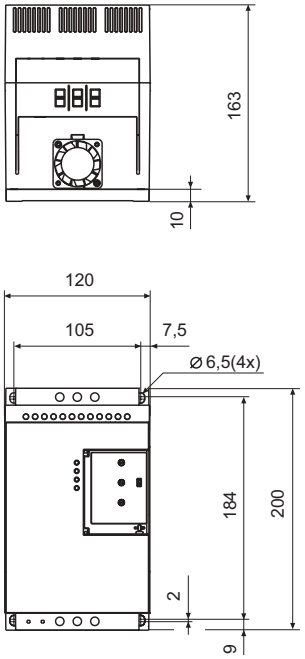
- View LED:s straight from the front, othervise the neighbouring LED seems to be lit.
- The printed circuitboard in the softstarter is faulty

! In some cases the actual ramp time can differ from the set value. If motor starts/stops softly, then everything is OK.

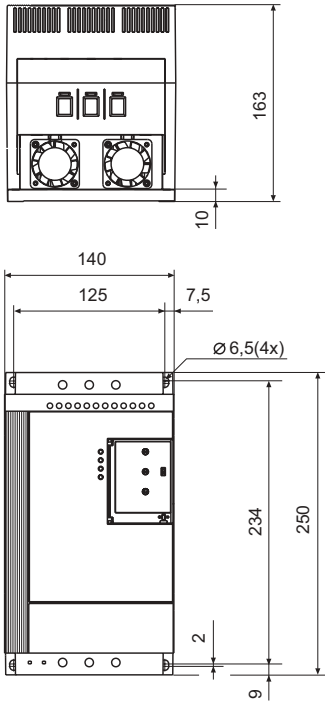
7. Technical data

7.1 Dimensions

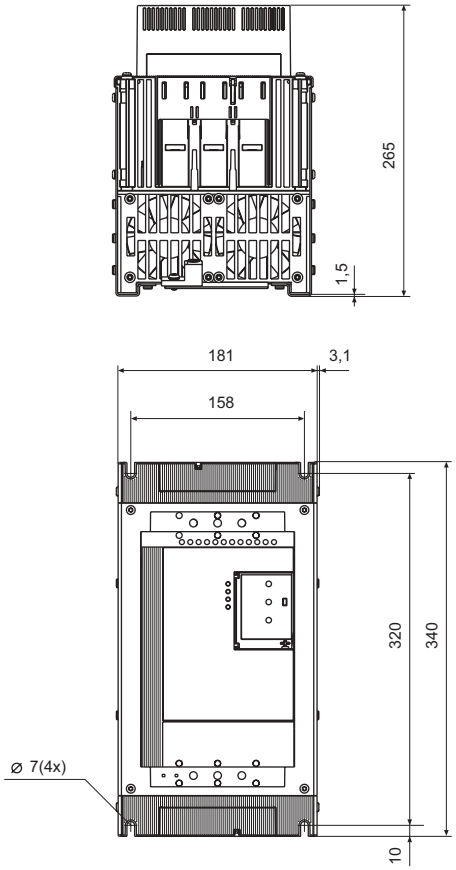
PS S18/30-500…44/76-500



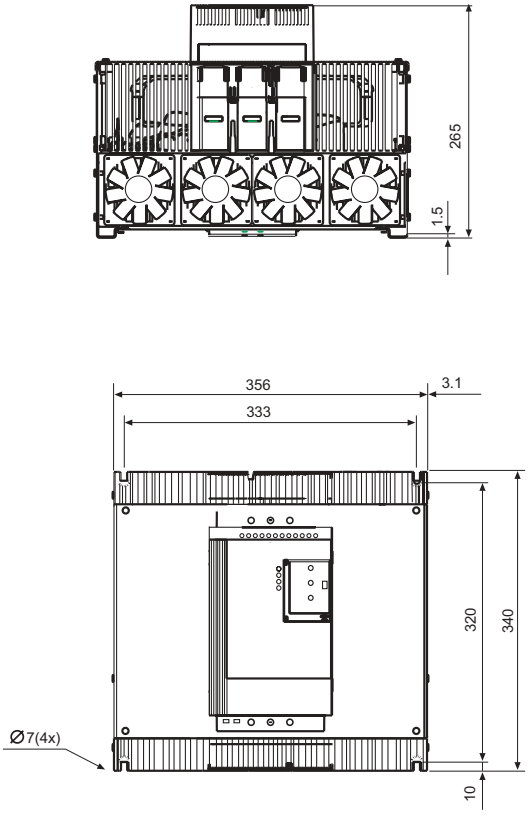
PS S50/85-500…72/124-500
PS S18/30-690...72/124-690



PS S85/147-500…142/245-500
PS S85/147-690…142/245-690



PS S175/300-500…300/515-500
PS S175/300-690…300/515-690



7. Technical data

7.2 Circuit diagram