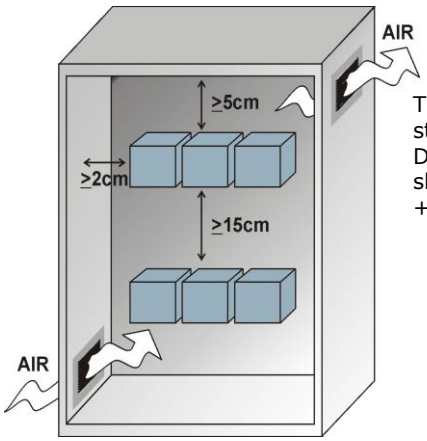
USER'S MANUAL
Rev. 11/2018

000008

STB
Soft Starter
43-100A

1 Mounting



Caution: *Check that no liquids, dust or conductive objects can fall into the starter.*

The STO Soft Starter must be mounted vertically, allow sufficient space above and below the starter for suitable airflow.
Do not mount the starter near other heat sources. Surrounding air temperature in the cabinet should not exceed 40°C, the starter is rated to operate over a temperature range of 0°C to +40°C.

1.1 Environment

Ambient temperature	0°C to +40°C
Storage temperature	-25°C to +70°C
Installation place	Don't install at direct sun light, where there are conductive dust, corrosive gas, vibration or water and also in salty environmental.
Altitude	Up to 1000 meter over sea level. For higher altitude reduce the nominal current of 2% for each 100m over 1000m
Humidity	From 5 to 95% without condense and ice

2 Order Code

	1	2	3	4	5	6		7	8	9	10	11	12	13	14	15	16
ORDERING CODE	S	T	B	_	_	_	-	_	_	_	_	_	_	_	_	_	_

CURRENT	4	5	6	
description	code			note
6 Amp full load current (FLC)	0	0	6	
12 Amp FLC	0	1	2	
22 Amp FLC	0	2	2	
32 Amp FLC	0	3	2	
43 Amp FLC	0	4	3	
50 Amp FLC	0	5	0	
60 Amp FLC	0	6	0	
75 Amp FLC	0	7	5	
100 Amp FLC	1	0	0	

MAIN SUPPLY VOLTAGE	7	
description	code	note
3x200V + 10:-15%	2	
3x440V + 10:-15%	4	

VOLTAGE SUPPLY AUX.	8	
description	code	note
No auxiliary voltage supply unit≤32A	0	
Auxiliary voltage 110-240V (+10: -15%) ac (just for >32A)	1	

INPUT	9	
description	code	note
Start with power up	1	
Start/Stop optoisolated + 24V	2	

OVERLOAD RELAY	10	
description	code	note
No overload relay	0	

CONTROL MODE	11	
description	code	note
Voltage control mode	V	

OPTION & FUSE	12	
description	code	note
No Fuses	0	
External fuse & fuse holder	F	

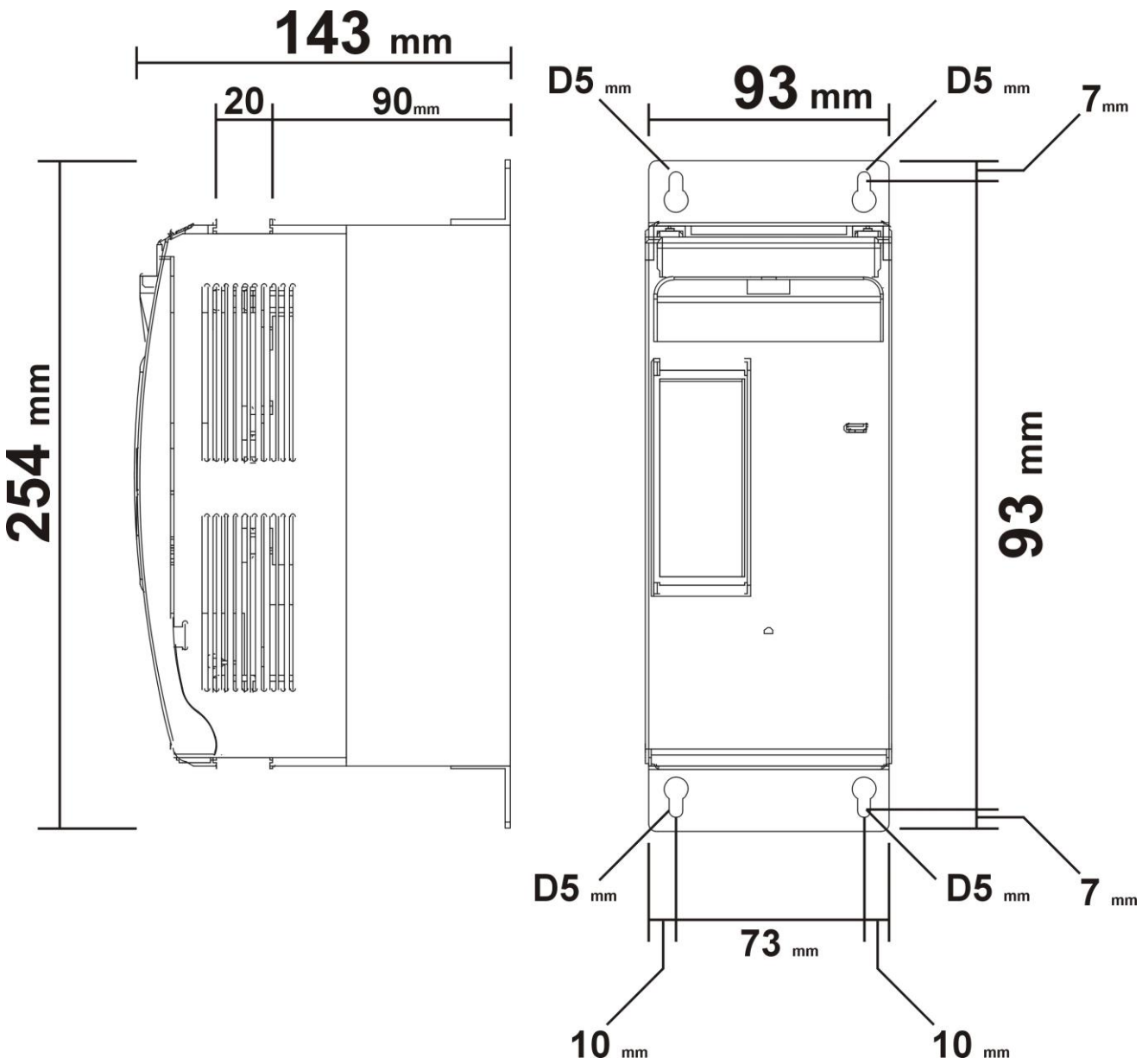
FAN VOLTAGE	13	
description	code	note
No Fan	0	

APPROVALS	14	
description	code	note
CE EMC	0	

MANUAL	15	
description	code	note
None	0	
Italian	1	
English	2	
German	3	
French	4	
Spanish	5	

VERSION	16	
description	code	note
Standard version	1	

2.1 Dimensions and Fixing holes



3 Technical Data

Technical Data

Ramp Time	Kick Start(ms) at 70%	Initial Torque
2-20 Sec	0-100-200-300	30-70%

Model Code	**STO043**	**STO050**	**STO060**	**STO075**	**STO100**
Operational Max Current	43A AC3	50A AC3	60A AC3	75A AC3	100A AC3
Leakage Current	10 mA	10 mA	10 mA	10 mA	10 mA
Minimum working current	600mA	600mA	1000mA	1000mA	1000mA
Start/Hour	6	6	6	6	6
Motor ratings 230V	17,8 HP /13,3Kw	21,3HP/15,9Kw	25,6 HP /19,1Kw	32 HP / 23,9Kw	43,6 HP / 32,5Kw
Motor ratings 400V	31,1 HP/23,2Kw	37 HP/ 27,6Kw	44,5 HP /33,2 Kw	55,8 HP / 41.6Kw	75,8 HP/ 56.5Kw

Digital Input Voltage Range	4-24VDC max	
Relay Output	5A 250VAC max	3A 30VDC max
Control Current	20mA	
Response time max	200 mSec max	

SERVICE		LIGHT	MEDIUM	HEAVY	SEVERE
Start Current		3	3,5	4	4,5
(Multliple of **FLC***)		AC53b 3,0 -10:350<1000m	AC53b 3,5 -15:345<1000m	AC53b 4,0 -20:340<1000m	AC53b 4,5 -30:340<1000m
MODEL		Rating at 40° C for 3xFLC	Rating at 40° C Amps	Rating at 40° C Amps	Rating at 40° C Amps
STB	043	43A	40A	35A	29A
STB	050	50A	44A	38A	30A
STB	060	60A	55A	48A	37A
		AC53b 3,0 -6:590<1000m	AC53b 3,5 -15:585<1000m	AC53b 4,0 -20:580<1000m	AC53b 4,5 -30:570<1000m
STB	075	75A	65A	55A	47A
STB	100	100A	88A	75A	61A

***FLC** Full load current

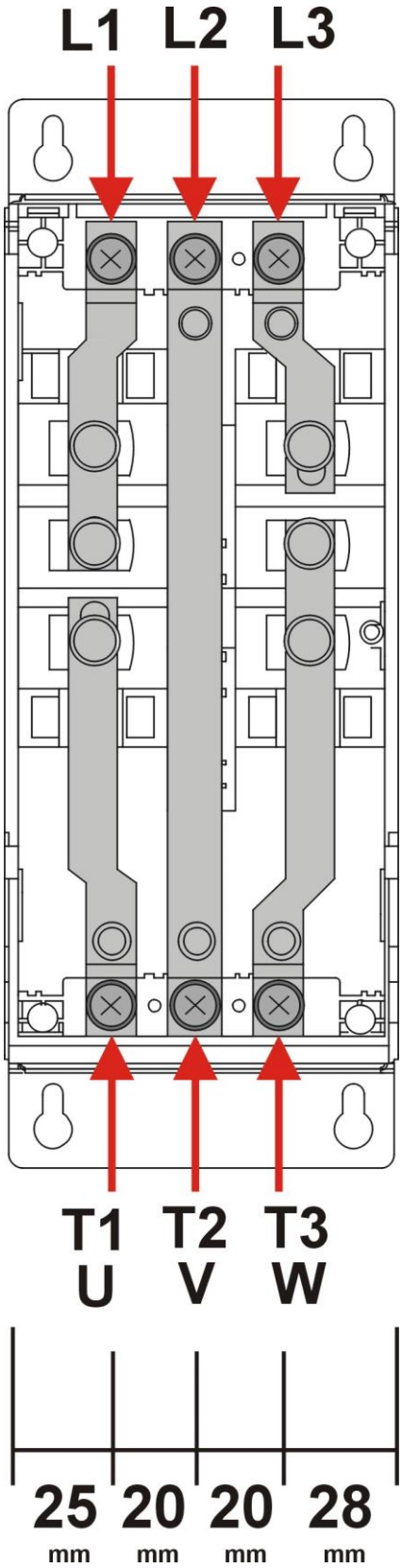
4 Connections

Warning: *Before connecting or disconnecting the unit check that power and control cables are isolated from voltage sources.*

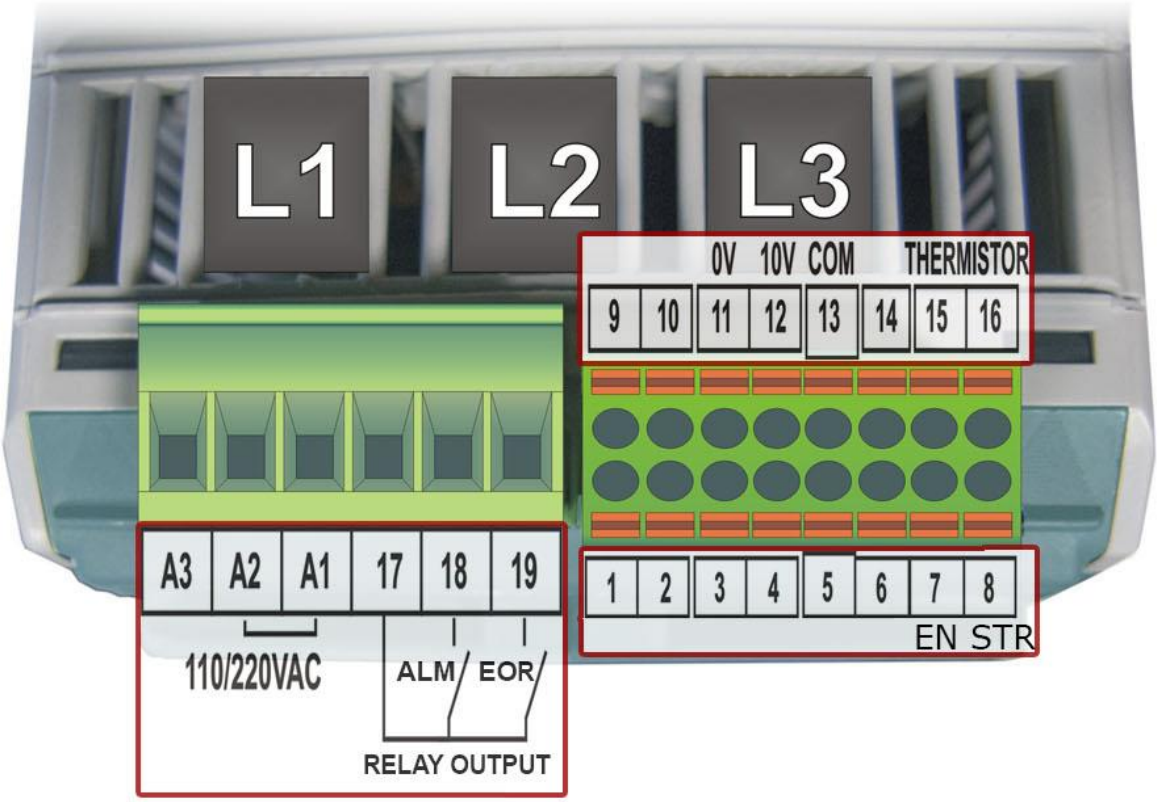
Tightening torque, min 0.5 Nm - max 0.6 Nm
Conductor section max. 6 mm² - AWG 10

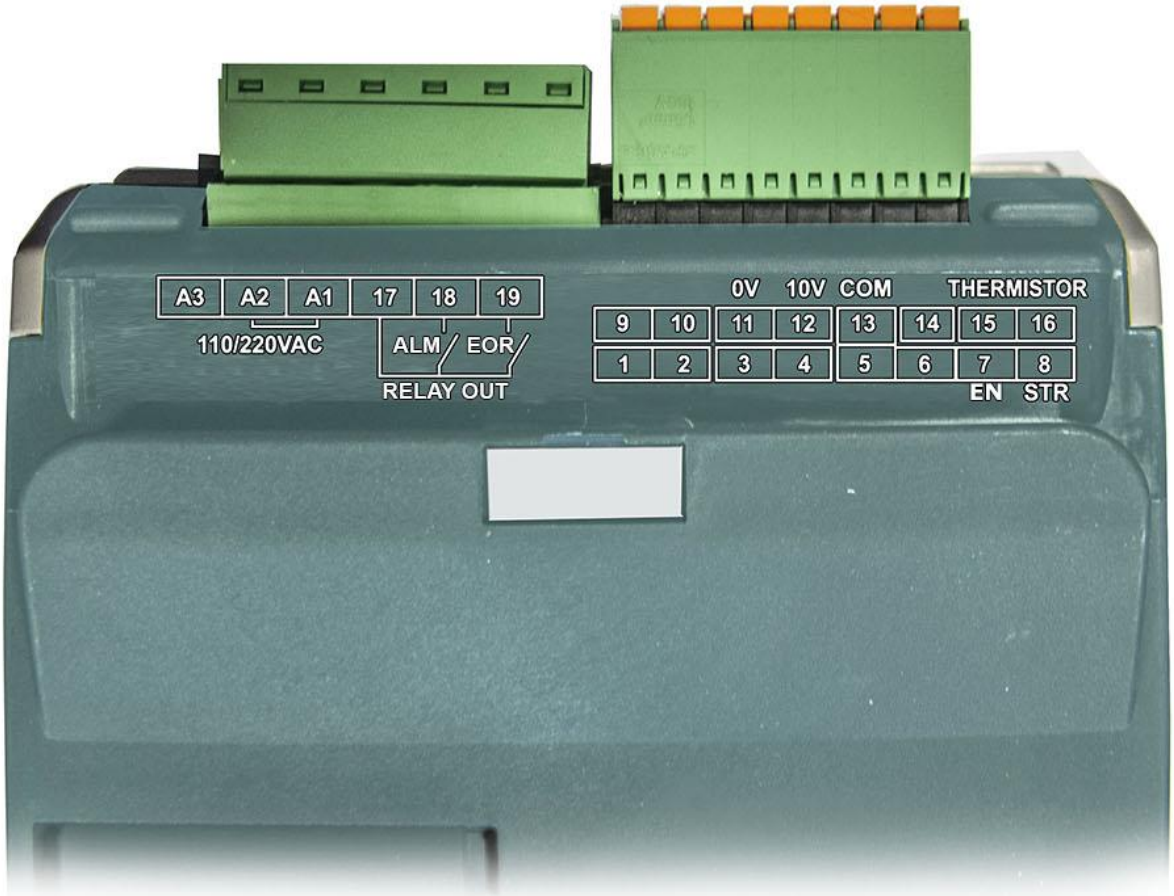
Terminal	Description
L1	Line Input Phase 1
L2	Line Input Phase 2
L3	Line Input Phase 3

U/T1	Motor Output Phase U
V/T2	Motor Output Phase V
W/T3	Motor Output Phase W



4.1 Terminal Block





4.1.1 Terminal description

Terminal	Description
1	RS485 B- serial communication port
2	RS485 A+ serial communication port
3	Not connected
4	Not connected
5	X1 Auxiliary Input 1 (Not used)
6	X2 Auxiliary Input 2 (Not used)
7	EN – Emergency STOP, shut down the soft starter immediately without control when
8	STR - START and STOP are controlled by the logic input: a START is obtained with 5-24Vdc, and a stop is obtained when you remove the 5-24Vdc on the terminals, without the START command the output of the STB Soft Starter will return at zero following the down ramp set.
9	Not connected
10	Not connected
11	0V
12	10V Internal Voltage
13	COM Input Common
14	Not connected
15	Motor Thermistor
16	Motor Thermistor
17	COM Relay common contact
18	ALM relay output - Fault Output ALARM
19	EOR relay output - End Of Ramp output
A1	Common Aux – Voltage Supply for 110/220VAC
A2	Auxiliary – Voltage Supply 110/220VAC
A3	n.c. not connected

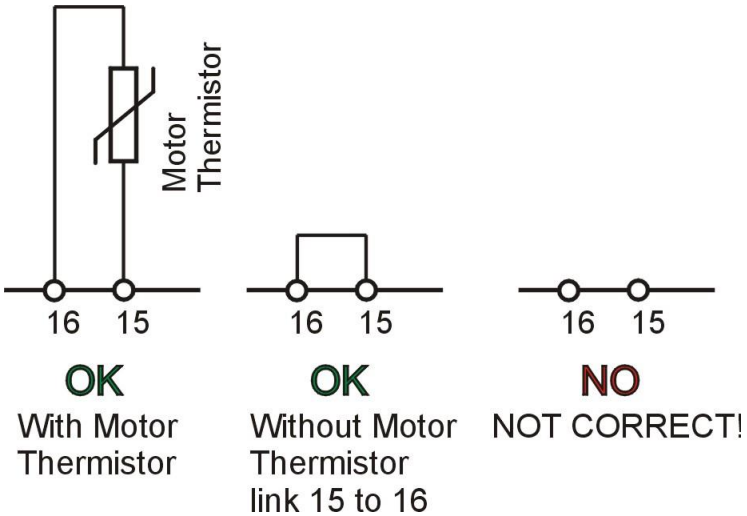
4.1 Diagram of connection

Caution: this procedure must be performed only by qualified persons

Command with External Voltage Supply 5-24V
START STOP
Emergency STOP
COM 10V 0V N.C. N.C. STR EN
13 12 11 10 9 8 7
10Vdc

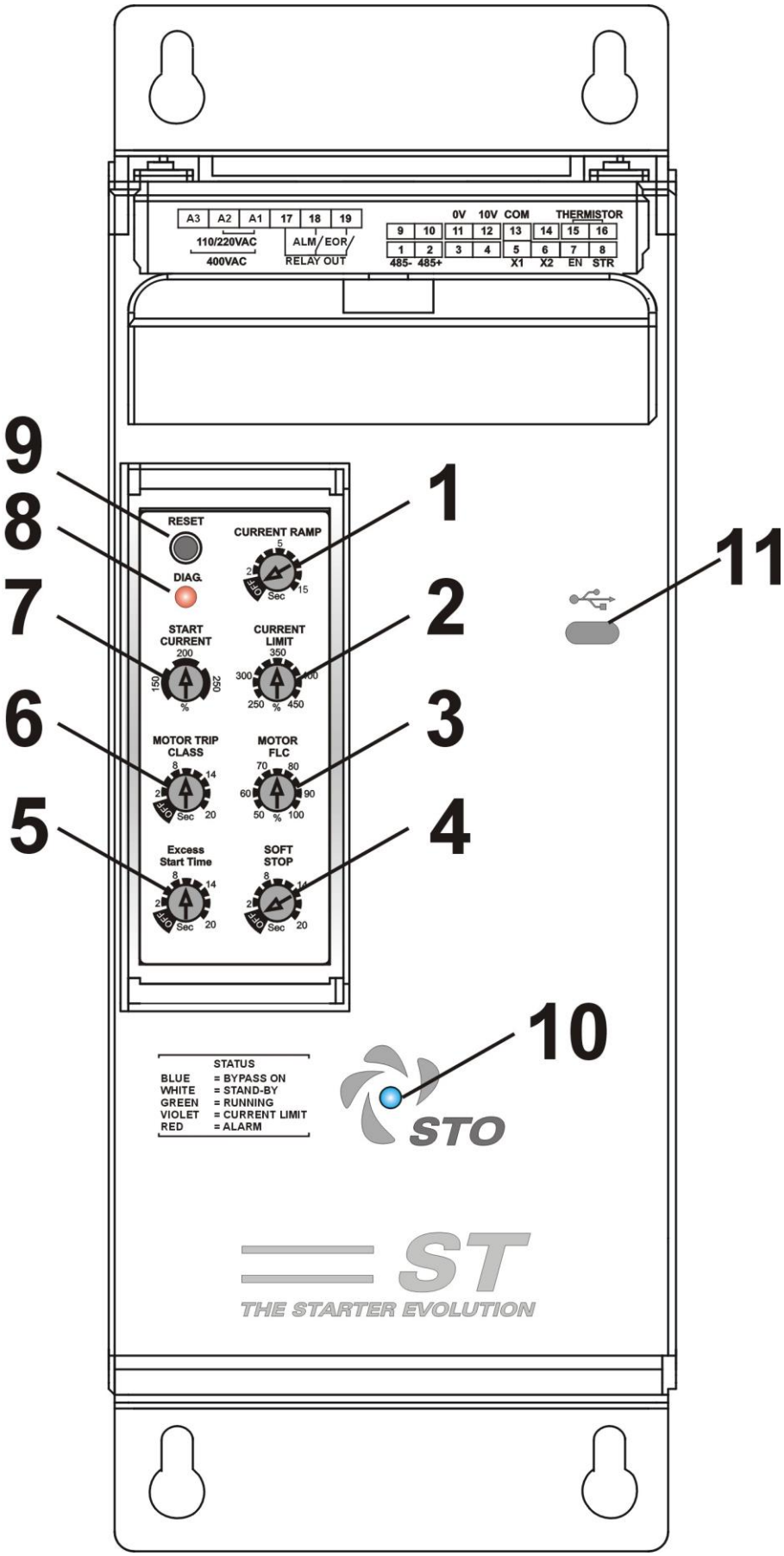
L1 L2 L3
K1
Extra Rapid
Relay Output
EOR ALM
Motor Thermistor
N.C. COM 10V 0V N.C. N.C. STR EN
19 18 17 16 15 14 13 12 11 10 9 8 7
T1 T2 T3
A3 A2 A1
1 2 3 4 5 6
B- A+ N.C. N.C. X1 X2
RS-485
Auxlilary Input 1
Auxlilary Input 2
110/220VAC
U1 V1 W1
M

4.1.1 Motor Thermistor connection



5 Functions and Settings

1	CURRENT RAMP
2	CURRENT LIMIT
3	MOTOR FLC
4	SOFT STOP
5	Excess Start Time
6	Motor Trip Class
7	START CURRENT
8	STATUS LED
9	RESET SWITCH
10	STATUS LED 2
11	USB

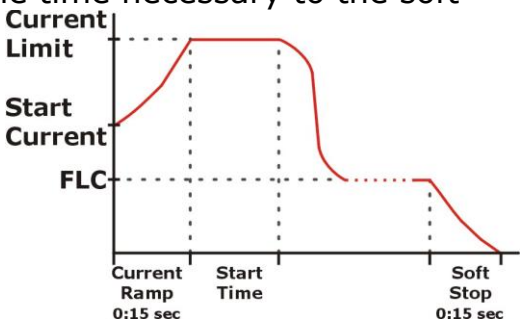


5.1 Trimmer Settings

5.1.1 Current Ramp

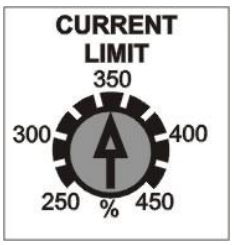
1

The **Current Ramp [off-15sec]** select the ramp time in secconds. The starting current ramp extends the time necessary to the soft starter to reach the current limit.



5.1.2 Current Limit

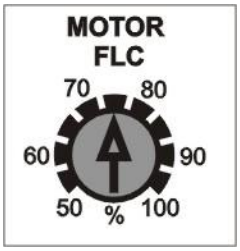
2



The **Current Limit [250-450%]** select the current limit in % of the Full Load Current.
The current limit is the maximum current level that the soft starter provides to the motor during soft start.

5.1.3 Motor Full Load Current

3

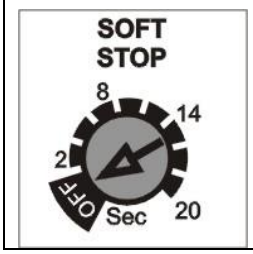


The **Motor Full Load Current [50-100%]** configures the soft starter to the related full-load current (FLC) of the motor in %.
The configuration is performed based on the data plate of the motor. Divide the full load current (FLC) of the motor for the maximum rated current of the soft starter (located on the label of the soft starter).

Sample:
With STO100 (100A) – Motor Full Load Current (80A)
80A/100A=0,8 x 100 = 80%

5.1.4 Soft Stop

4



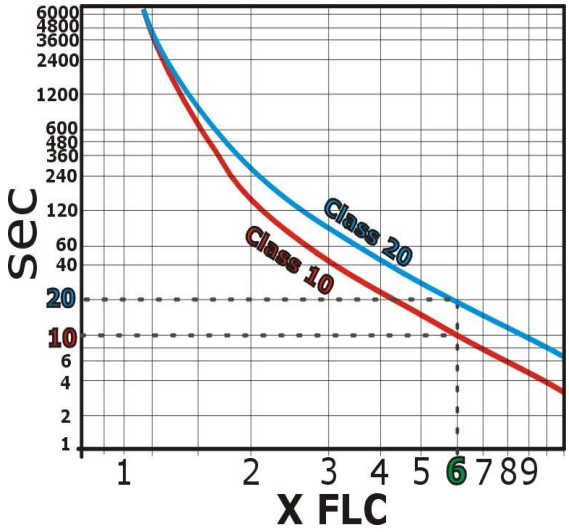
The **Soft Stop [off-20sec]** select the ramp time of Soft Stop.
Stops gradually by delaying the time taken from the soft starter to bring the voltage to zero.
The ramp time does not control the time required for the complete shutdown of the engine.

5.1.5 Excess Start Time

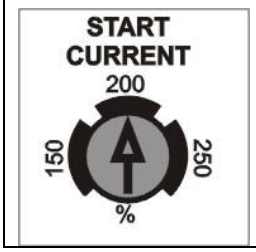
5

The **Excess Start Time [2-20sec]** configure protection against excessive starting time of the soft starter.
Select a time slightly longer than that required by the engine for normal starting conditions. The soft starter will be in alarm mode if the start time is not completed within the selected time.

5.1.6 Motor Trip Class

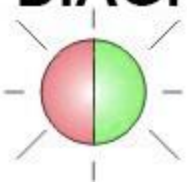
6  	The **Motor Trip Class [0-20sec]** Select the class of alarm for the protection from motor overload. This trip class represents the time in seconds for which the motor can work with current conditions of the rotor blocked. The setting of the class of intervention engine assumes a current in conditions of locked rotor equal to 600%(6x) of Full Load Current. By setting the class of operation of the motor Off deactivates the overload protection of the motor. 

5.1.7 Start Current

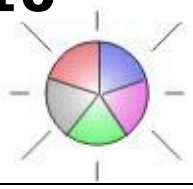
7  	The **Start Current [150-250%]** select the initial current starting in % of Full Load Current.

5.2 Led and Alarm

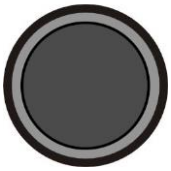
5.2.1 DiagnosticLed

8 DIAG. 	Green ON SlowBlinking - Ready to Start Green ON Fast Blinking - Ramp Active Green ON - At Speed (full Voltage)
	RED ON 1 time blinking - Wrong connection RED ON 2 times blinking – Excess Start time RED ON 3 times blinking – Motor thermal protecion RED ON 4 times blinking – Thermistor Alarm RED ON 5 times blinking – Motor Current unbalanced RED ON 6 times blinking – Frequency out of range RED ON 7 times blinking - Wrong phase rotation RED ON 8 times blinking – Bypass overload protection RED ON 9 times blinking – Motor short circuit current RED ON 10 times blinking – Serial Communication Error (watchdog)

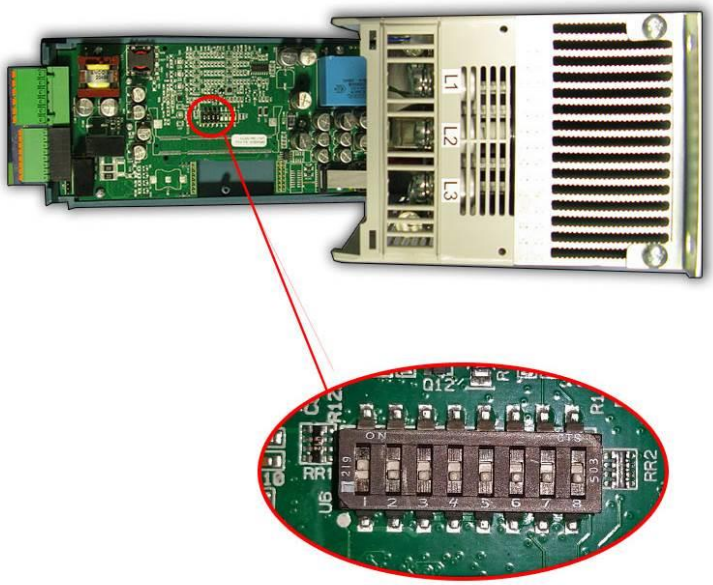
5.2.2 Status Led

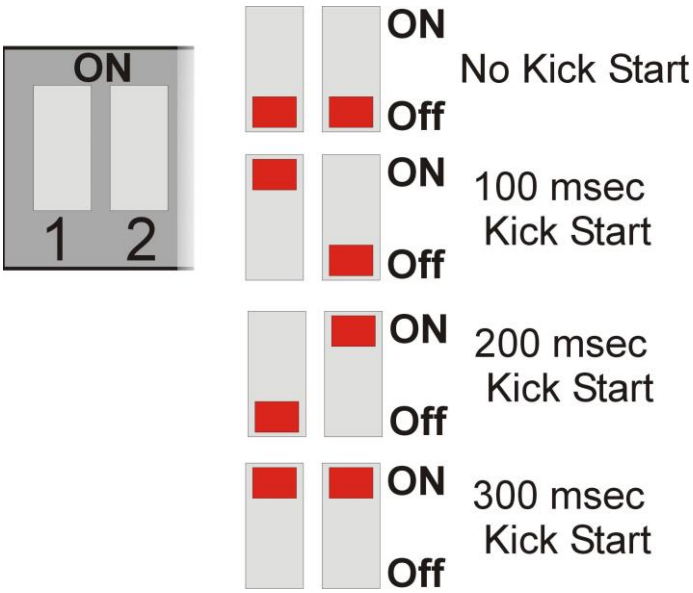
10 	RED ON – Fault!. BLUE ON – End of Ramp. Violet ON – Current Limit. Green ON – Running. White ON – Stand By.

5.1 Reset Switch

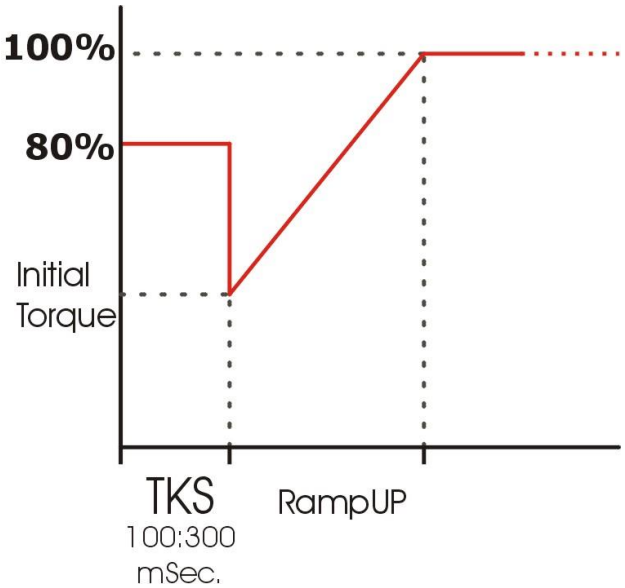
9 **RESET** 	If an alarm occurs, you can start over with the reset button. Obviously the cause of the alarm will go previously resolved otherwise it will return to the alarm mode.
11 	USB only for firmware updgrade

5.2 Kick start settings

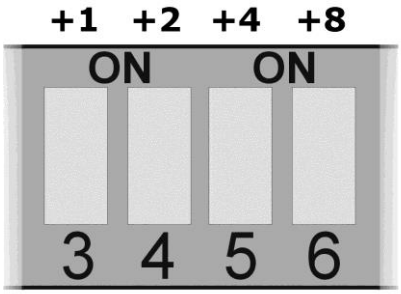




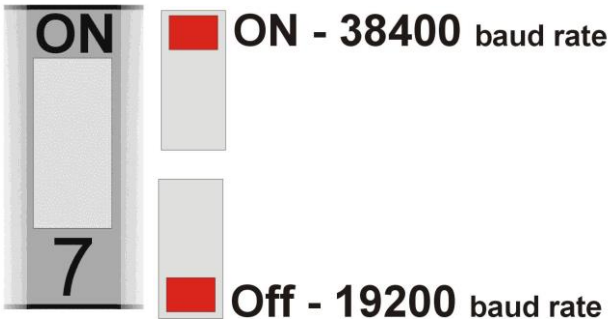
Kick start gives to the motor for 100,200 or 300 msec at 80% of full voltage.



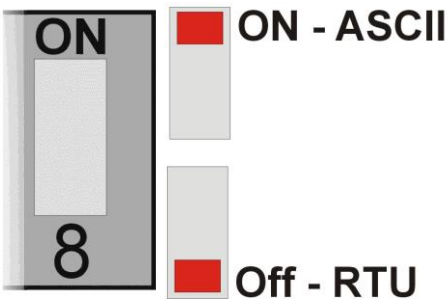
5.3 Modbus Address settings



5.4 Modbus Speed Rating



5.5 Modbus RTU/ASCII protocol



5.6 Standard Modbus Parameter List

Parameter	Bit	Name	Values and Note
40002	0 to 2	Command	1 → START 2 → STOP 3 → RESET 4→ FAST STOP (inertial) 5→ Alarm forced by communication 6→ N.A 7→ N.A
	3 to 7		RESERVED

Parameter	Bit	Name	Values and Note
40003	0 to 3	Starter Status	1 → READY 2 → ON STARTUP 3 → RUNNING 4→ ON SHUTDOWN (with braking) 5→ DELAYED RESTART (With temperature check) 6 → IN ALARM 7 → SETTING MODE 8→ N.A. 9→ N.A.
	4		1 → Positive phase sequence (only if bit 6 = 1)
	5		1 → Current over FLC
	6		0 → NOT INITIALIZED 1 → INITIALIZED
	7		0 → N.A 1 → N.A

Parameter	Bit	Name	Values and Note
40004	0 to 7	Alarm code	See alarm CODE

Parameter	Bit	Name	Values and Note
40005	0 to 7	Motor Current	AVERAGE CURRENT of motor 3PH

Parameter	Bit	Name	Values and Note
40006	0 to 7	Motor Temperature	

Parameter	Bit	Name	Values and Note
40007	0 to 2	Starter INFO	Parameter List version
	3 to 7		Product CODE

Parameter	Bit	Name	Values and Note
40008	0 to 7	Ser.Version	Serial Protocol Version

STO 40-100 FULFILS THE REQUIREMENTS OF THE STANDARD:

Electrical safety Standard EN60947-1 :2008
EN60947-4-3:2001
Generic Emission standard EN60947-4-3:2000
Generic Immunity standard EN60947-4-3:2000
Producers declares that The products above mentioned they am conforming to the directive **EMC 2004/108/CEE** e alla direttiva Bassa Tensione (low Voltage) **2006/95/CEE**