ST10630

6 channels

USER MANUAL

rev. 0.2

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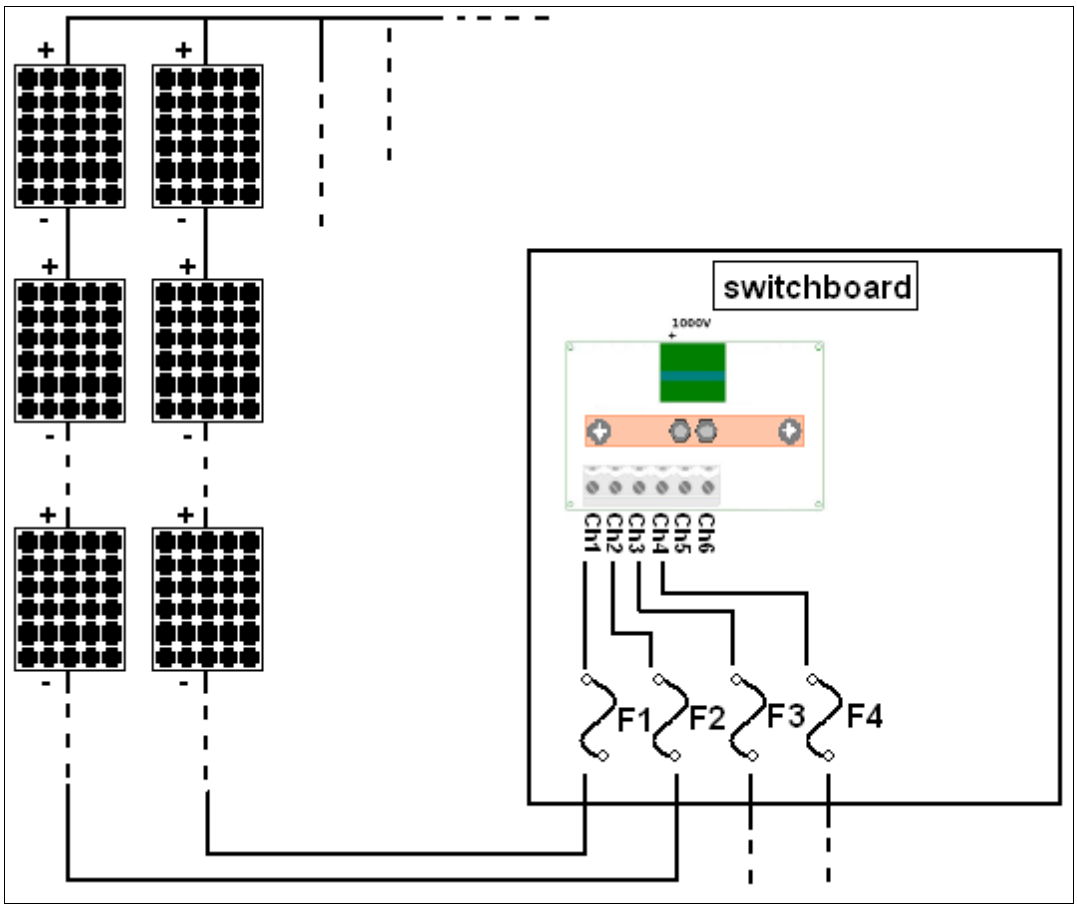
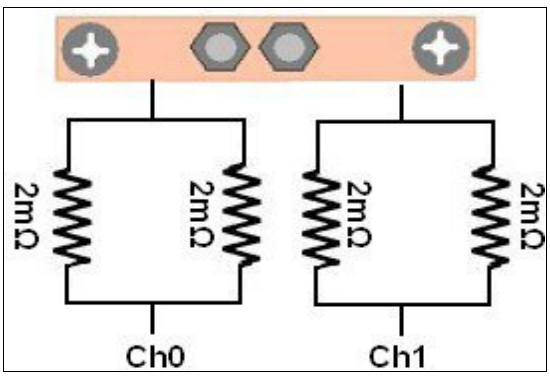
1 GENERAL NOTES

1.1 Introduction

The ST1 module to string control, allow to monitoring current and voltage generated by photovoltaic panels strings. Typically inside a panels system, each string is composed by 15 ÷ 25 panels connected in series with the positive pole connected to each other. The negative pole of each string is brought to the dedicated input, like in the following picture:

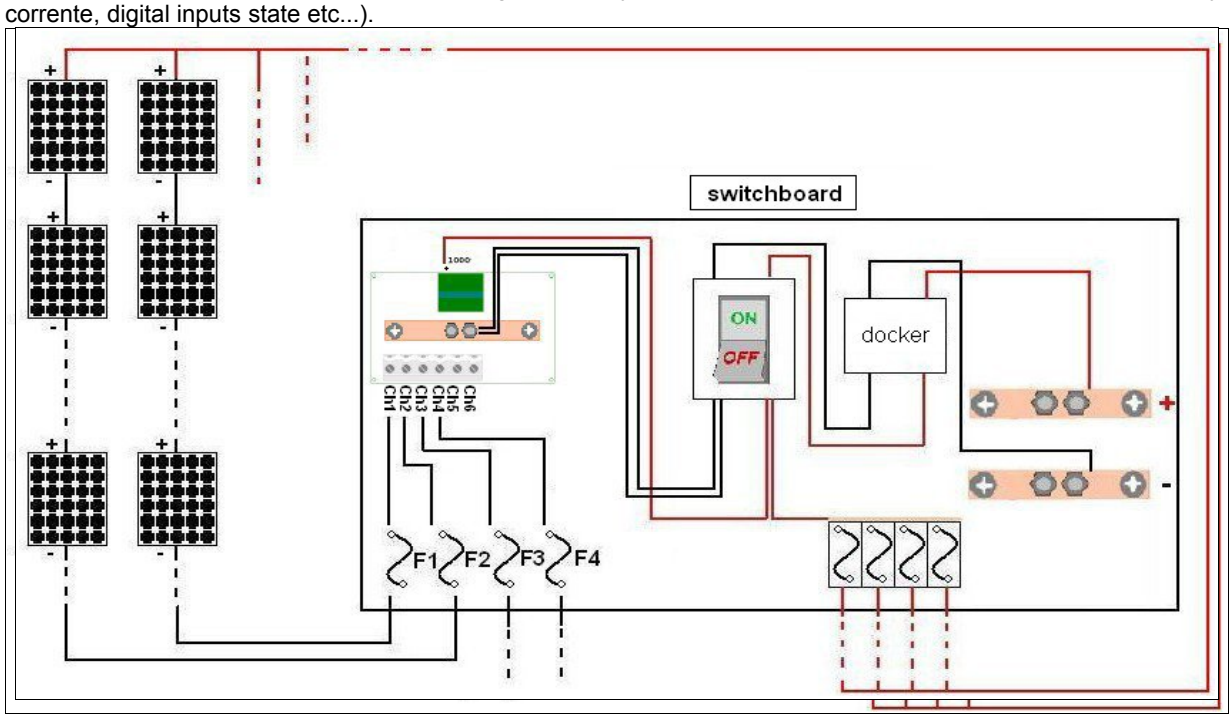


Each channel can read a maximum current of 30A (although typically the current of each string is more or less 7 ÷ 8A). After the strings input connector, on the ST1 board there are two resistors in parallel, they are necessary to detect the current flow:

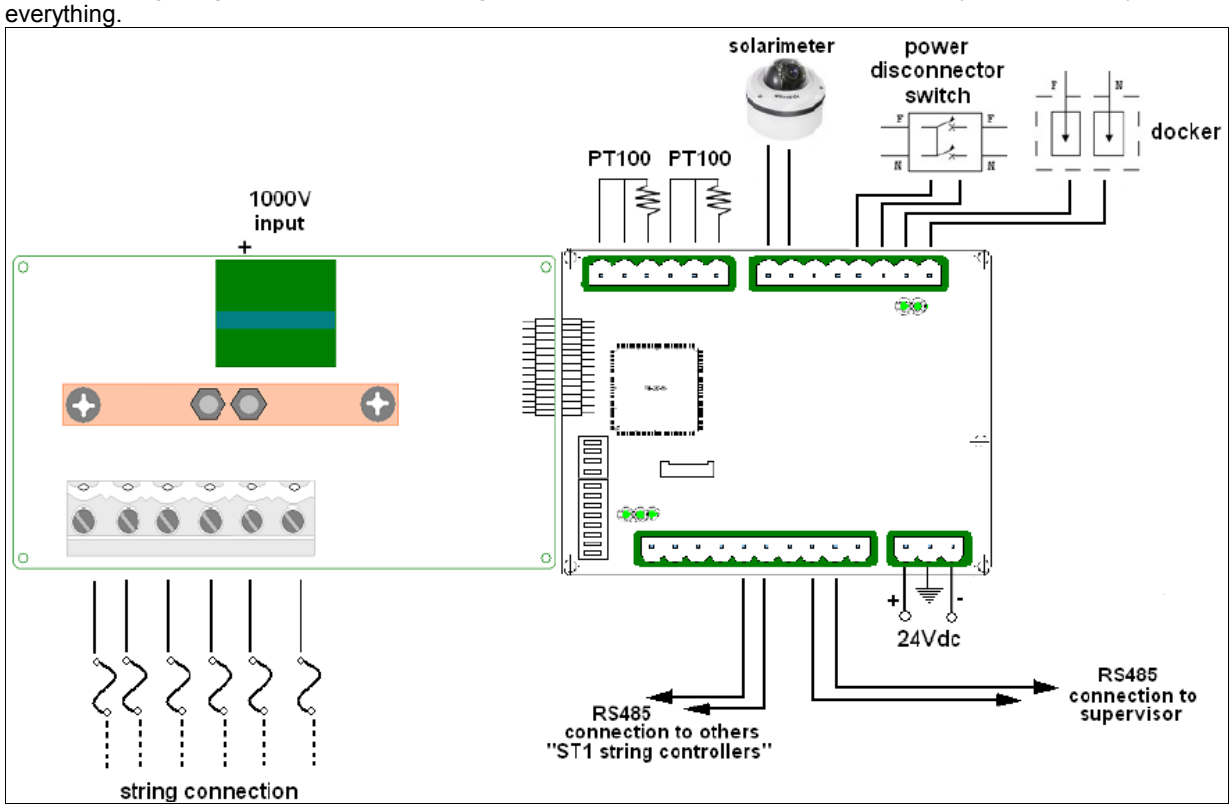


and finally a copper bar connect all the negative poles, thus creating a common 0V.

The ST1 board also provides two digital inputs and four analog inputs. Two analog inputs are for PT100 connection, one analog input may be 0...100mV or 0...10V (typically for solarimeter connection) and the last analog input will be 0...20mA wuth accuracy better than 3%. The digital inputs allows to detect the dockers state. Is possible communicate with the ST1 board with an RS485 serial port. Using Modbus RTU protocol, or with Kernel Sistemi protocol, is possible monitoring all the physical quantities measured (temperature, solar intensity, corrente, digital inputs state etc...).



In the following image there is the “ST1 string controller” with all its connections. Obviously isn't necessary connect everything.

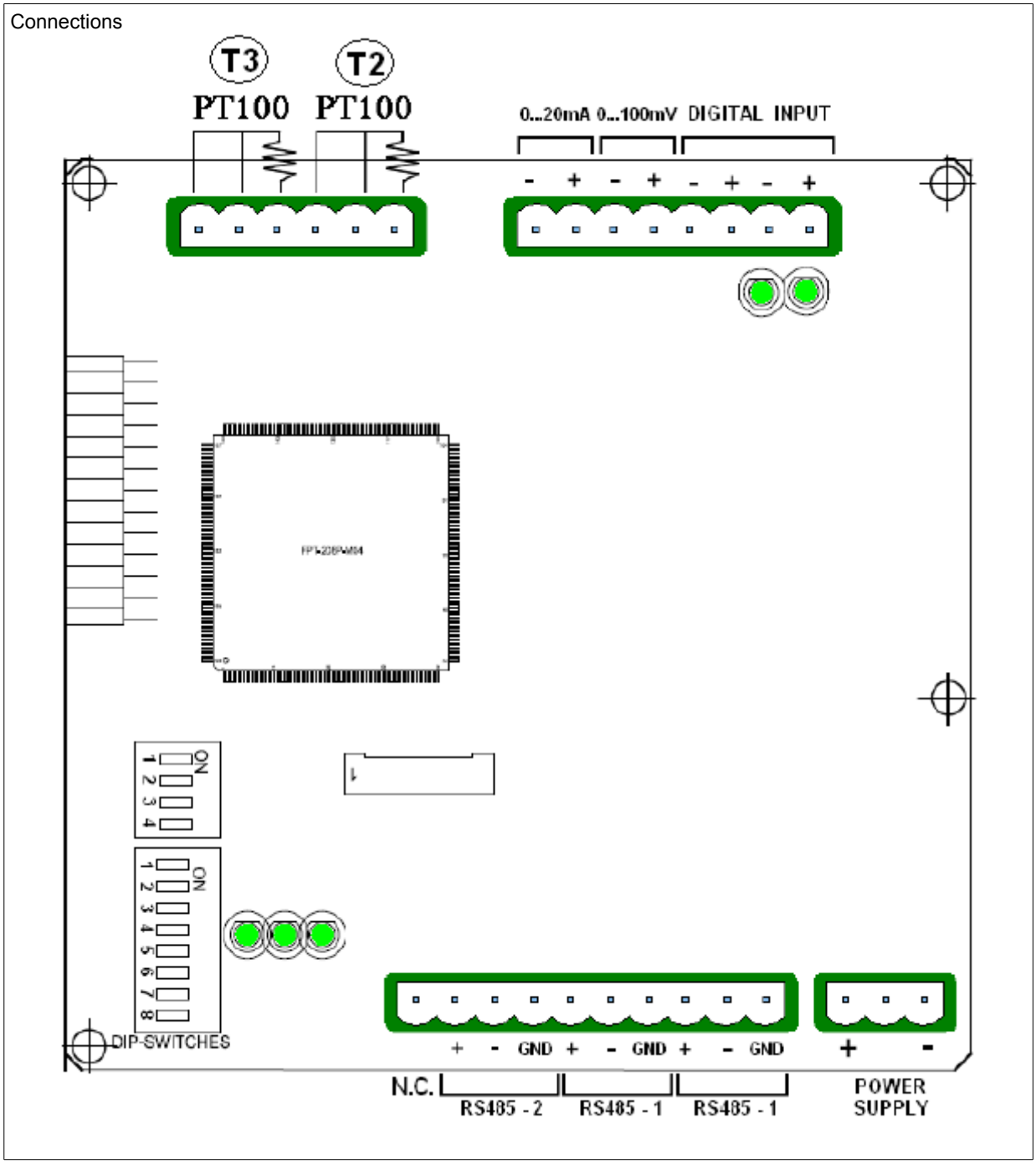


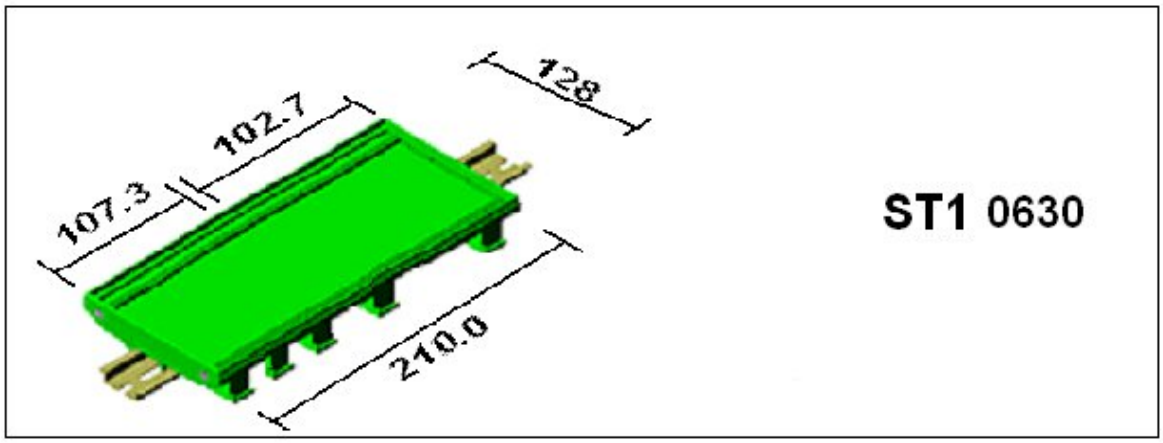
2 HARDWARE CHARACTERISTICS

Microprocessor	Fujitsu MB91467 @ 100MHz
Power supply	24Vdc
Power consumption (W)	< 3W
Muximum number of monitored strings	6
Maximum common voltage	1000V with accuracy better than 3%.
Maximum current for each string	30A
Range of measurement	0...240A
Communication	Modbus RS485 / RS487
Digital inputs	2
Analog inputs	2 PT100 inputs, 1 current input (0...20mA) and 1 voltage input (0...100mV)
Working temperature's range	From -10 to +70 °C
Working atmosphere	Without corrosive gas
ID Address	Defined by dip-switchs
Size	128 x 210,0mm

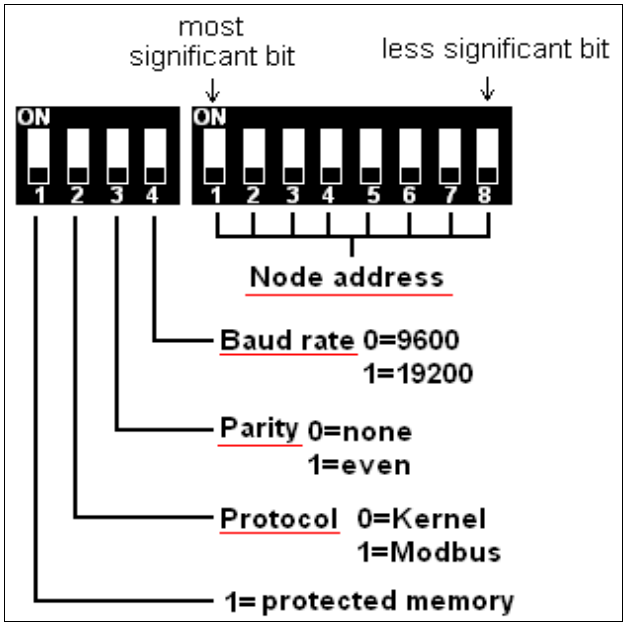
N°	Type of resources
2	PT100 inputs (from 0 to 300 °C) to temperature reading, with accuracy better than 3%.
1	Sensor on board to switch board's temperature reading (accuracy better than 5%).
1	Analogic input from 0 to 100mV or from 0...10V, typically to solarimeter connection.
1	Auxiliary analogic input from 0 to 20mA with accuracy better 3%.
2	PNP digital inputs 24Vdc, typically used to docker connection, switchs or other devices.
2	Serial ports RS485. COM1 and COM2. COM1: this serial port is used to connect many “ST1 string controllers” into a network or to a PC. Is possible select the communication characteristics with a dip-switchs on board (node address, baud rate, parity, and communication protocol, that may be Modbus RTU or Kernel). This COM is divided in two connectors in order to facilitate the wiring. COM2: allow to connect Kernel Sistemi I/O expansions modules.
6	This board can manage the current reading of 6 strings with accuracy better than 1%.

Connections

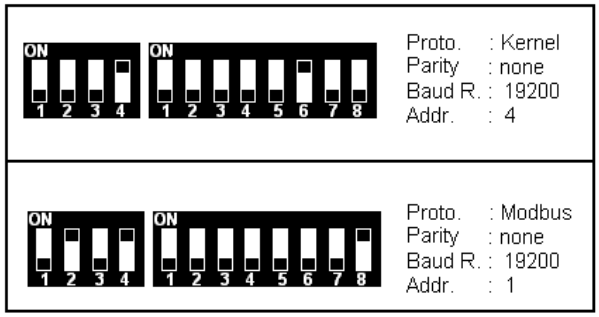




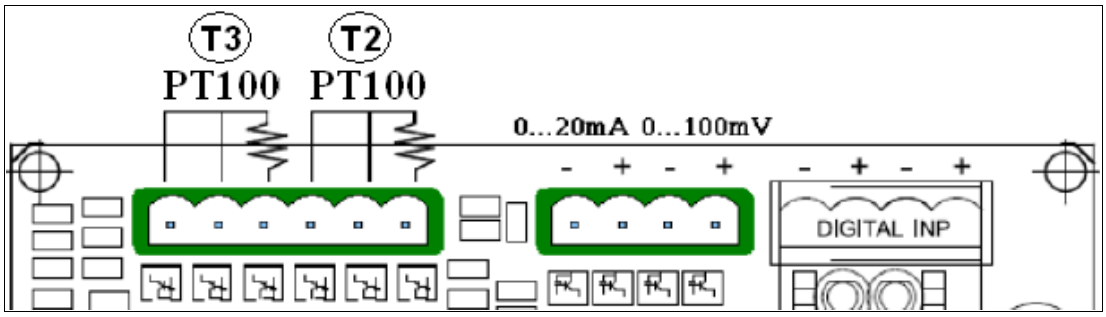
2.1 Dip-switchs



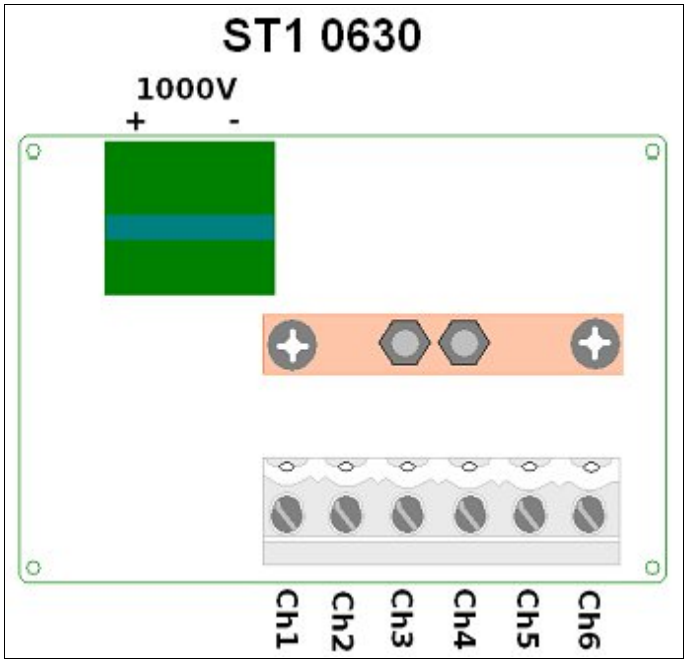
Some dip-swichs examples:



2.2 Analog inputs



2.3 ST1 0630

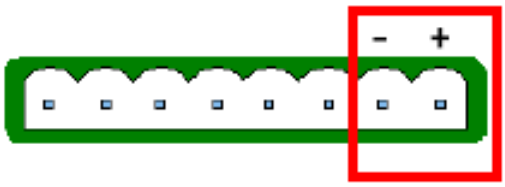
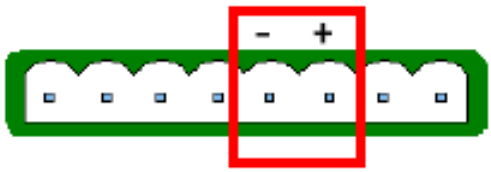


3 MEMORY MAP

The ST1 has the following memory map, it's made of 16 bits locations (1word) called “DATA”. Because each DATA is è composed by 16 bits, its maximum value will be 65535.

proto.Modbus	*proto.Kernel*	*meaning*
DATA.30001	**DATA.49**	Inputs
DATA.30002	**DATA.160**	Inst Curr Str_01 *(mA [0...30000])*
DATA.30003	**DATA.161**	Inst Curr Str_02 *(mA [0...30000])*
DATA.30004	**DATA.162**	Inst Curr Str_03 *(mA [0...30000])*
DATA.30005	**DATA.163**	Inst Curr Str_04 *(mA [0...30000])*
DATA.30006	**DATA.164**	Inst Curr Str_05 *(mA [0...30000])*
DATA.30007	**DATA.165**	Inst Curr Str_06 *(mA [0...30000])*

...

proto.Modbus	*proto.Kernel*	*meaning*
DATA.30034	**DATA.192**	Single input 
DATA.30035	**DATA.193**	Single input 

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proto.Modbus	*proto.Kernel*	*meaning*
DATA.30040	**DATA.240**	Inst V_1 *(V [0...1000])*
DATA.30041	**DATA.241**	Not used
DATA.30042	**DATA.242**	Aux 1 (0...100mV) [0...1000]
DATA.30043	**DATA.243**	Aux 2 (0...20mA) [0...1000]
DATA.30044	**DATA.244**	Inst T_1 *(°C [0...100])*
DATA.30045	**DATA.245**	Inst T_2 *(°C [-22,0...+83,0])*
DATA.30046	**DATA.246**	Inst T_3 *(°C [-22,0...+83,0])*
DATA.30047	**DATA.247**	Sum of all currents (A)
DATA.30048	**DATA.248**	Power (W)

...

proto.Modbus	proto.Kernel	meaning
DATA.30052	DATA.192	RMS Curr Str_01 (average value on last 6 seconds)
DATA.30053	DATA.193	RMS Curr Str_02 (average value on last 6 seconds)
DATA.30054	DATA.194	RMS Curr Str_03 (average value on last 6 seconds)
DATA.30055	DATA.195	RMS Curr Str_04 (average value on last 6 seconds)
DATA.30056	DATA.196	RMS Curr Str_05 (average value on last 6 seconds)
DATA.30057	DATA.197	RMS Curr Str_06 (average value on last 6 seconds)

...

proto.Modbus	proto.Kernel	meaning
DATA.40002	DATA.544	Offset Curr Str_01
DATA.40003	DATA.545	Offset Curr Str_02
DATA.40004	DATA.546	Offset Curr Str_03
DATA.40005	DATA.547	Offset Curr Str_04
DATA.40006	DATA.548	Offset Curr Str_05
DATA.40007	DATA.549	Offset Curr Str_06

...

proto.Modbus	proto.Kernel	meaning
DATA.40040	DATA.576	Offset V_1
DATA.40041	DATA.577	Not used
DATA.40042	DATA.578	Offset Aux_1
DATA.40043	DATA.579	Offset Aux_2
DATA.40044	DATA.580	Offset T_1
DATA.40045	DATA.581	Offset T_2
DATA.40046	DATA.582	Offset T_3

...

proto.Modbus	proto.Kernel	meaning
DATA.40052	DATA.592	Gain Curr Str_1
DATA.40053	DATA.593	Gain Curr Str_2
DATA.40054	DATA.594	Gain Curr Str_3
DATA.40055	DATA.595	Gain Curr Str_4
DATA.40056	DATA.596	Gain Curr Str_5
DATA.40057	DATA.597	Gain Curr Str_6

...

Notes:
Each “offset DATA” has 0 as default value. Each “gain DATA” has 1000 as default value. *The value 1000 means **x1***, in this way, for example, is possible write 500 and make the value **x0,5.**