



ST1 1630

16 channels



USER MANUAL

Internal version
rev. 0.7

11 December 2014

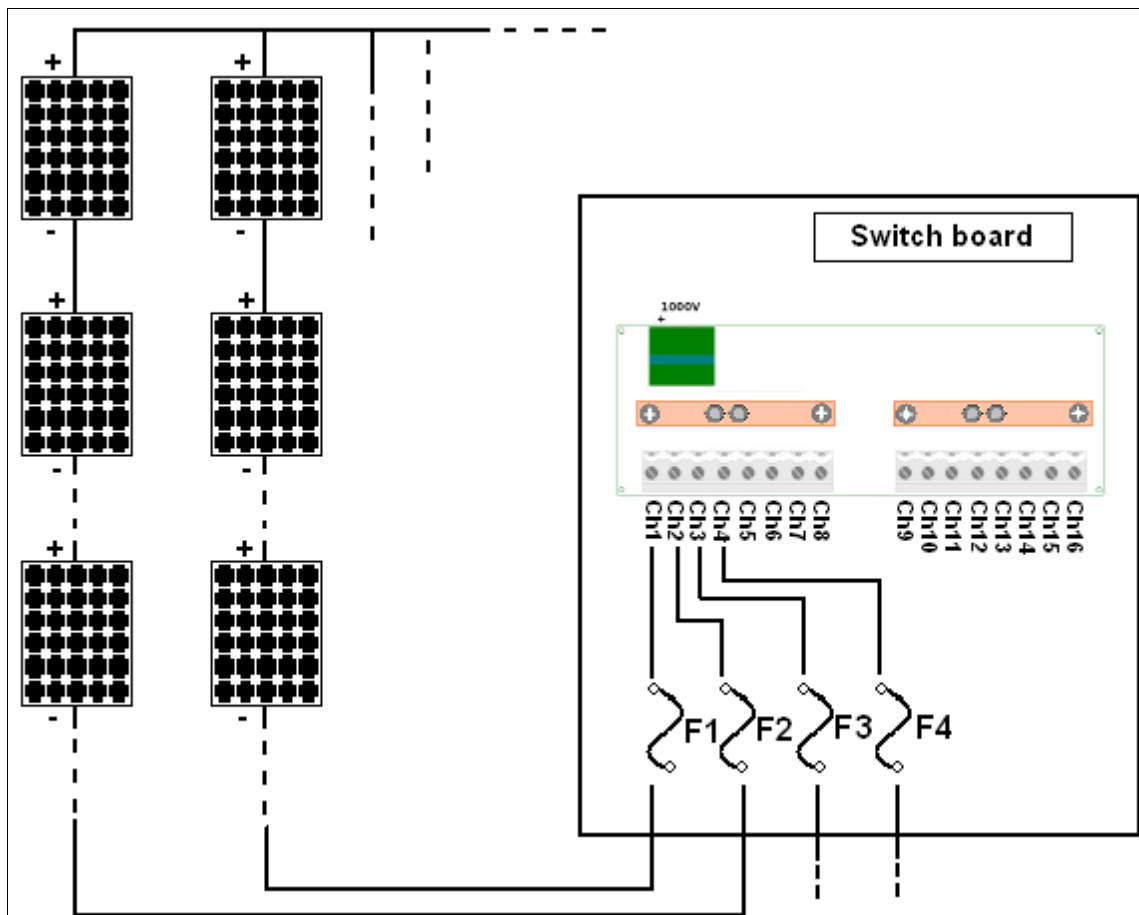
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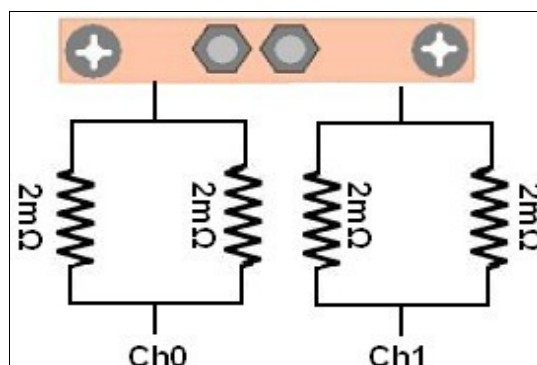
1 GENERAL NOTES

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:

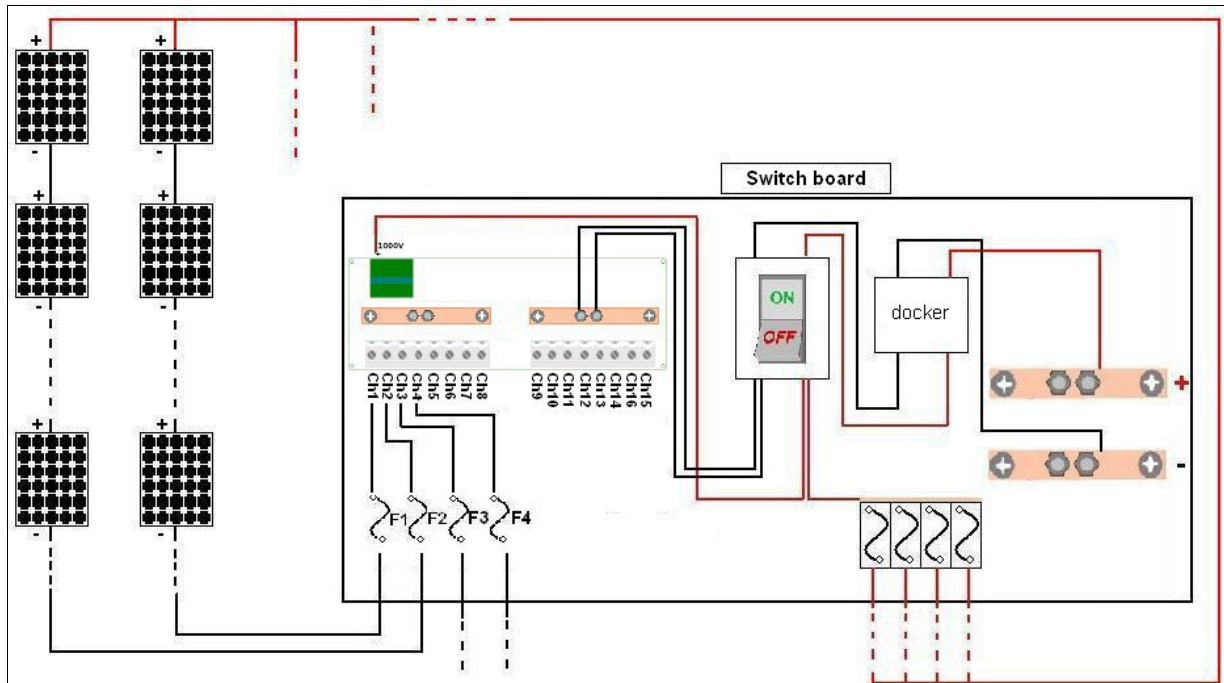


and finally a copper bar connect all the negative poles, thus creating a common 0V.

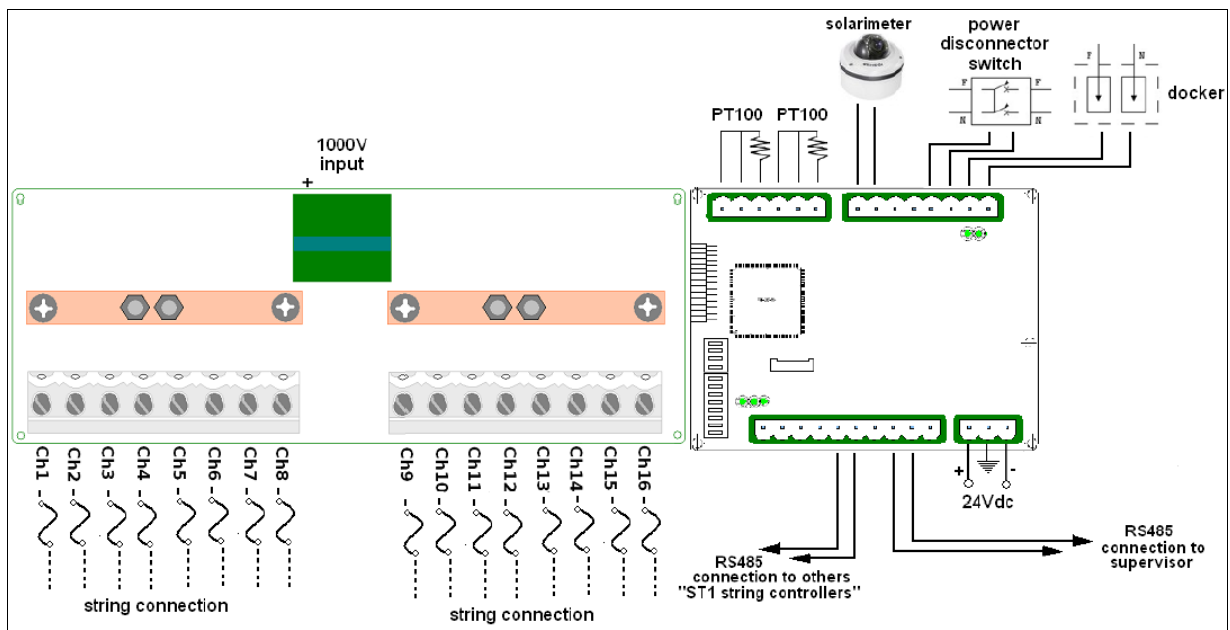
The ST1 board also provides two digital inputs and four analog inputs. Two analog inputs are for PT100 connection, one analog input 0...10V (typically for solarimeter connection) and the last analog input will be 0...20mA with accuracy better than 3%. The digital inputs allows to detect the dockers state.



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 ecc...).



In the following image there are the "ST1 string controller" with all the wiring. Obviously isn't necessary connect all the specified devices, they are indicated to give a connection general idea.

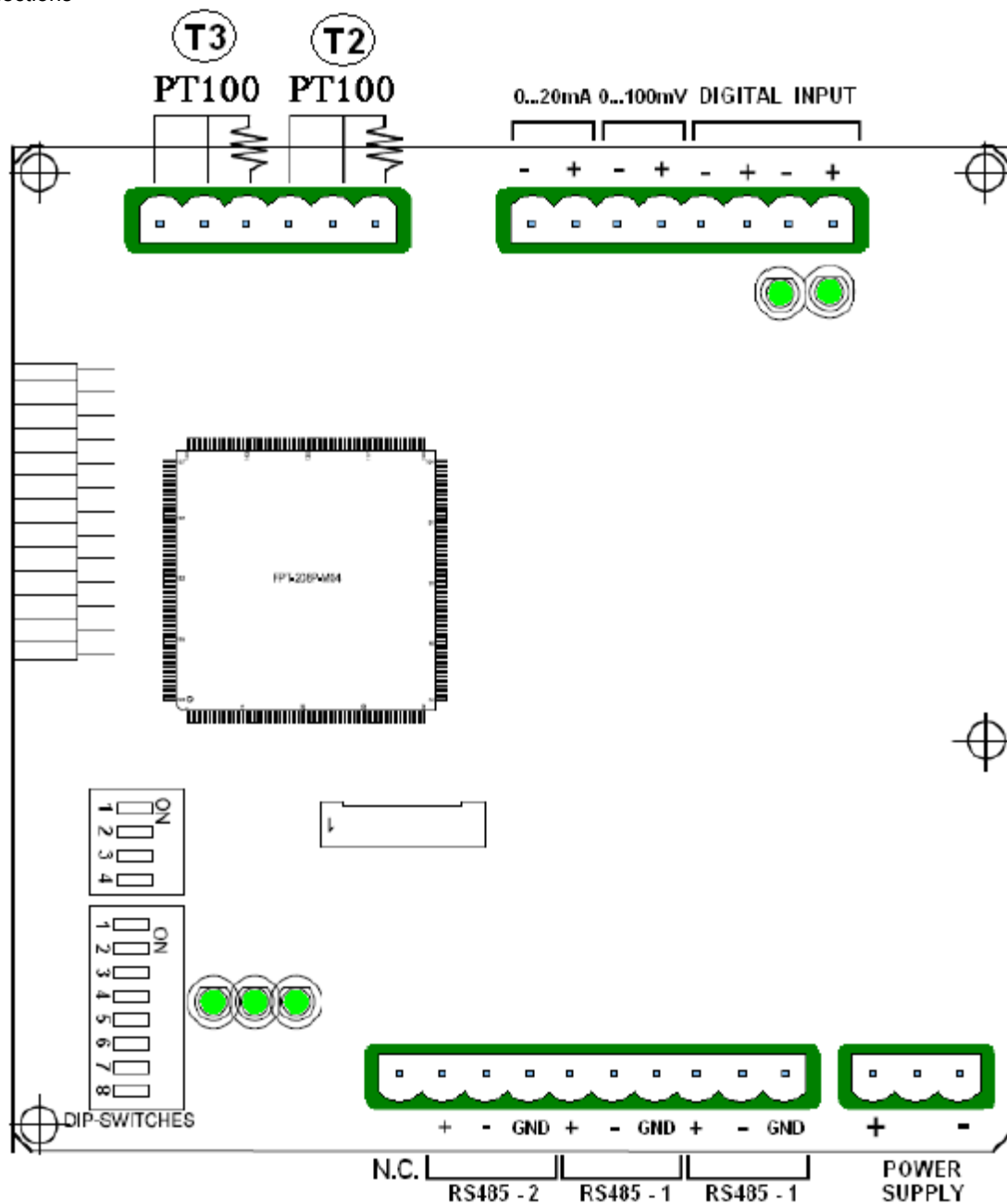


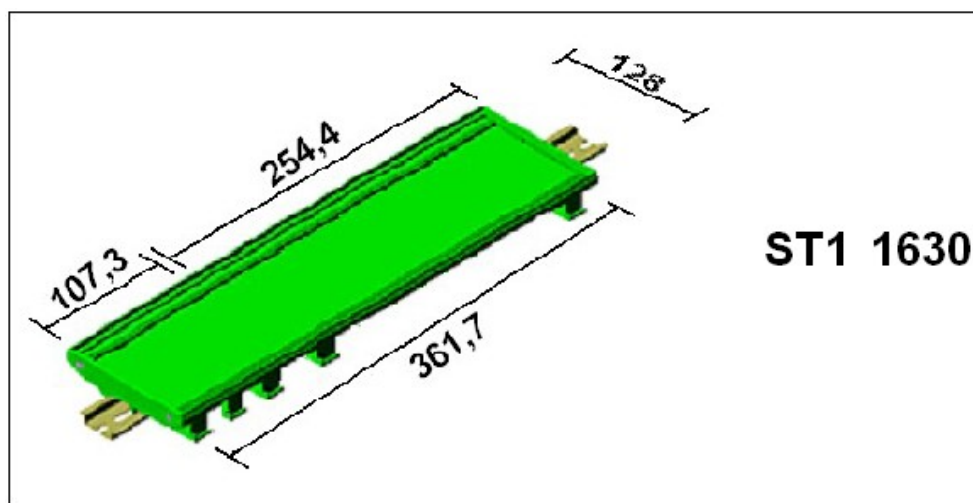
2 HARDWARE CHARACTERISTICS

Microprocessor	Fujitsu MB91467 @ 100MHz
Power supply	24Vdc
Power consumption (W)	< 3W
Muximum number of monitored strings	16
Maximum common voltage	1000V with accuracy better than 3%.
Maximum current for each string	30A
Range of measurement	0...480A
Communication	Modbus RS485 / RS487
Digital inputs	2
Analog inputs	2 PT100 inputs, 1 current input (0...20mA) and 1 voltage input (0...10V)
Working temperature's range	From -10 to +70 °C
Working atmosphere	Without corrosive gas
ID Address	Defined by dip-switchs
Size	362 x 128 mm

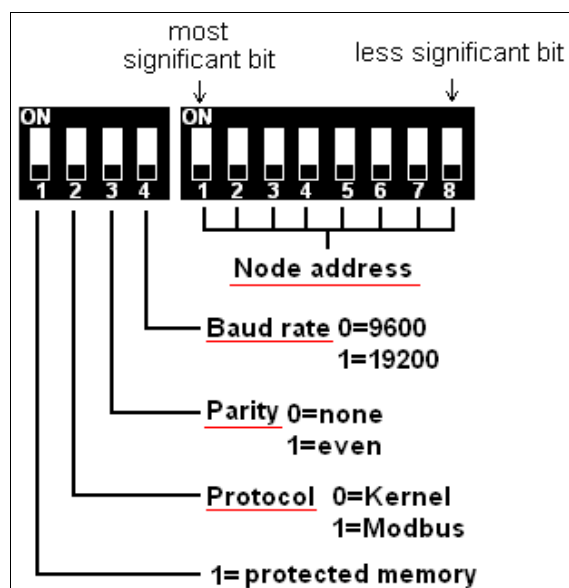
N°	Type of resources
2	PT100 inputs (from 0 to 300 °C) to temperature reading, with accuracy better than 3%.
1	Sensor on board to switch board's temperature reading (accuracy better than 5%).
1	Analogic input from 0 to 10V, typically to solarimeter connection.
1	Auxiliary analogic input from 0 to 20mA 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.
16	This board can manage the current reading of 16 strings with accuracy better than 1%.

Connections

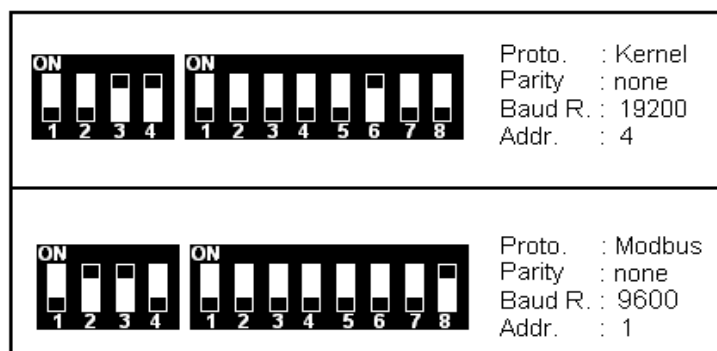




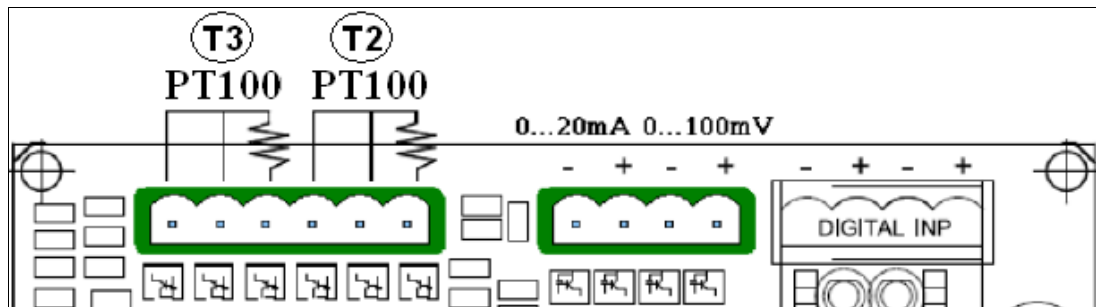
2.1 Dip-switchs



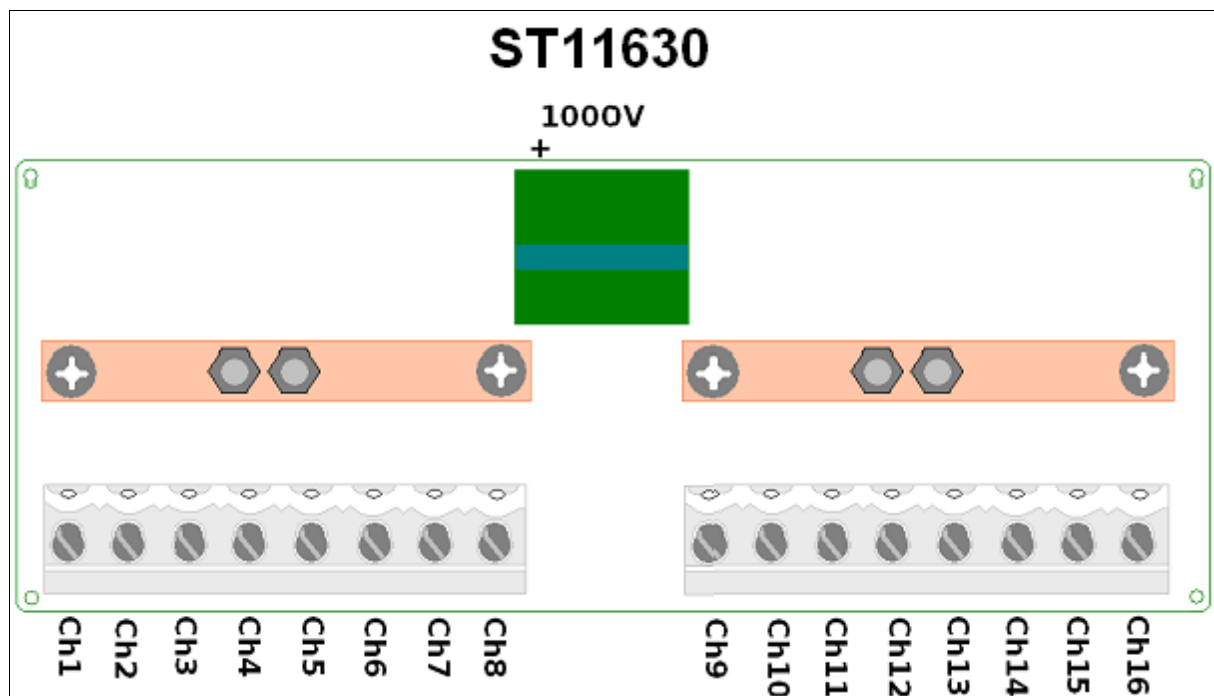
Some dip-switchs examples:



2.2 Analog inputs



2.3 ST1 1630



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.

DATA.30001	Inputs
DATA.30002	Inst Curr Str_01 (mA [0...30000])
DATA.30003	Inst Curr Str_02 (mA [0...30000])
DATA.30004	Inst Curr Str_03 (mA [0...30000])
DATA.30005	Inst Curr Str_04 (mA [0...30000])
DATA.30006	Inst Curr Str_05 (mA [0...30000])
DATA.30007	Inst Curr Str_06 (mA [0...30000])
DATA.30008	Inst Curr Str_07 (mA [0...30000])
DATA.30009	Inst Curr Str_08 (mA [0...30000])
DATA.30010	Inst Curr Str_09 (mA [0...30000])
DATA.30011	Inst Curr Str_10 (mA [0...30000])
DATA.30012	Inst Curr Str_11 (mA [0...30000])
DATA.30013	Inst Curr Str_12 (mA [0...30000])
DATA.30014	Inst Curr Str_13 (mA [0...30000])
DATA.30015	Inst Curr Str_14 (mA [0...30000])
DATA.30016	Inst Curr Str_15 (mA [0...30000])
DATA.30017	Inst Curr Str_16 (mA [0...30000])

...

DATA.30040	Inst V_1 (V [0...1000])
DATA.30041	Not used
DATA.30042	Aux 1 (0...10V) [0...1000]
DATA.30043	Aux 2 (0...20mA) [0...1000]
DATA.30044	Inst T_1 (°C [0...100])
DATA.30045	Inst T_2 (°C [-22,0...+83,0])
DATA.30046	Inst T_3 (°C [-22,0...+83,0])
DATA.30047	Sum of all currents (A)
DATA.30048	Power (W)

...

DATA.30052	RMS Curr Str_01 (average value on last 6 seconds)
DATA.30053	RMS Curr Str_02 (average value on last 6 seconds)
DATA.30054	RMS Curr Str_03 (average value on last 6 seconds)
DATA.30055	RMS Curr Str_04 (average value on last 6 seconds)
DATA.30056	RMS Curr Str_05 (average value on last 6 seconds)
DATA.30057	RMS Curr Str_06 (average value on last 6 seconds)
DATA.30058	RMS Curr Str_07 (average value on last 6 seconds)
DATA.30059	RMS Curr Str_08 (average value on last 6 seconds)



DATA.30060	RMS Curr Str_09 (average value on last 6 seconds)
DATA.30061	RMS Curr Str_10 (average value on last 6 seconds)
DATA.30062	RMS Curr Str_11 (average value on last 6 seconds)
DATA.30063	RMS Curr Str_12 (average value on last 6 seconds)
DATA.30064	RMS Curr Str_13 (average value on last 6 seconds)
DATA.30065	RMS Curr Str_14 (average value on last 6 seconds)
DATA.30066	RMS Curr Str_15 (average value on last 6 seconds)
DATA.30067	RMS Curr Str_16 (average value on last 6 seconds)

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DATA.40002	Offset Curr Str_01
DATA.40003	Offset Curr Str_02
DATA.40004	Offset Curr Str_03
DATA.40005	Offset Curr Str_04
DATA.40006	Offset Curr Str_05
DATA.40007	Offset Curr Str_06
DATA.40008	Offset Curr Str_07
DATA.40009	Offset Curr Str_08
DATA.40010	Offset Curr Str_09
DATA.40011	Offset Curr Str_10
DATA.40012	Offset Curr Str_11
DATA.40013	Offset Curr Str_12
DATA.40014	Offset Curr Str_13
DATA.40015	Offset Curr Str_14
DATA.40016	Offset Curr Str_15
DATA.40017	Offset Curr Str_16

...

DATA.40040	Offset V_1
DATA.40041	Not used
DATA.40042	Offset Aux_1
DATA.40043	Offset Aux_2
DATA.40044	Offset T_1
DATA.40045	Offset T_2
DATA.40046	Offset T_3

...

DATA.40052	Gain Curr Str_1
DATA.40053	Gain Curr Str_2
DATA.40054	Gain Curr Str_3
DATA.40055	Gain Curr Str_4

DATA.40056	Gain Curr Str_5
DATA.40057	Gain Curr Str_6
DATA.40058	Gain Curr Str_7
DATA.40059	Gain Curr Str_8
DATA.40060	Gain Curr Str_9
DATA.40061	Gain Curr Str_10
DATA.40062	Gain Curr Str_11
DATA.40063	Gain Curr Str_12
DATA.40064	Gain Curr Str_13
DATA.40065	Gain Curr Str_14
DATA.40066	Gain Curr Str_15
DATA.40067	Gain Curr Str_16

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DATA.40090	Gain V_1
DATA.40091	Not used
DATA.40092	Gain Aux_1
DATA.40093	Gain Aux_2
DATA.40094	Gain T_1
DATA.40095	Gain T_2
DATA.40096	Gain T_3

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**.