EASY - 4 HALL

Sensor for current measurement through Hall-effect, with RTU ModBus output

USER MANUAL

Warnings and Precautions

-Install the module only as described in this manual, don't violate the rules showed. Before using it, verify limits of applicability.

- Before supplying it, check that the connections correspond to those described on the manual. In addition, before beginning any maintenance, disconnect the electrical connections of the device.

- Don't modify the feature and the module, as: making holes on the case, replacing its accessories with other coming from unknown manufacturers not described on the manual's list, because this operation may compromise the protection degree, causing also a malfunction and a damage of the instrument. In addition, don't modify the layout of the internal components.

- For any calibration and maintenance of the internal circuit, contact Energy Team. In case of malfunction or fault, send the device and include a precise description about the fault.

- Don't expose the module to temperature ranges outside those reported on the data-sheet. Don't install it in sites with strong vibrations, corrosive gases, excessive dirt or high humidity. Use it only in the operating limits.

- Always supply it using the voltage reported on the data-sheet and also check the power supply status. Pay attention to accidental overvoltage on the input or output terminals because it can damage the galvanic insulation.

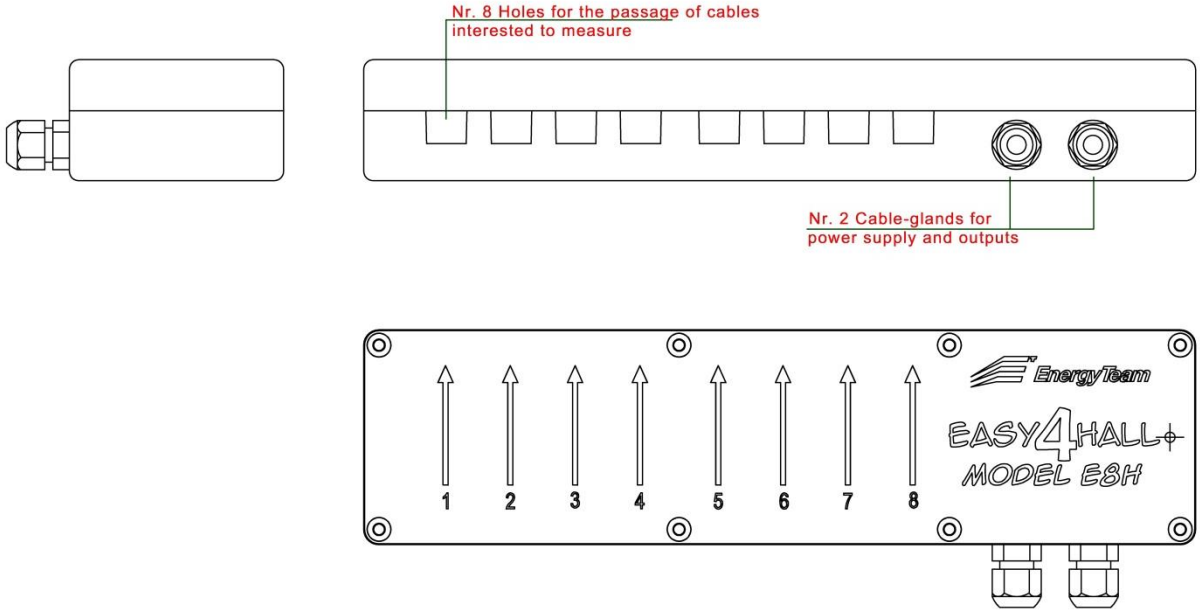
ATTENTION !
During the installation operation, DON'T place the output-signal cables near devices such as: Transformers, Engines, Inverters, Switchboards, capacitor banks, UPS groups and other devices which can generate electromagnetic noise. In addition, DON'T twist them and DON'T place them near cables carrying high currents and voltages.

NOTE: This manual is part of the product and therefore must be carefully preserved.

INTRODUCTION

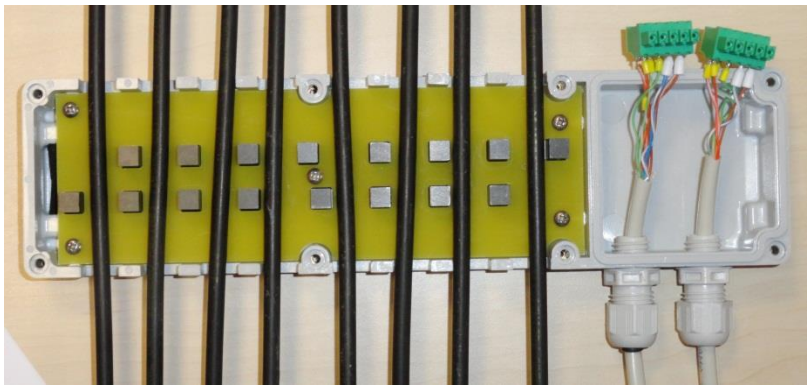
This device can measure up to 8 string currents at the output of a photovoltaic panel and, through the RTU ModBus interface, it sends the values to a RS-485 insulated serial port. The values of direct current are detected by a Hall-effect sensor.
It has the advantage to monitor continuously the level of electrical energy produced by the photovoltaic panels and detect eventual inefficiencies, so as to act promptly when eventual losses occur, caused by anomalies in the system of production. Data sent to a concentrator are suitably made available (through the Web or in local modality) by software Energy-Sentinel-PV, which can display them online, process them, show them in graphics and historicize them, so as to be processed for determining the real efficiency of the plant and know the productivity of it.
Main feature of this module is the insertion of the cables without the interruption of the connection, thanks to its openability and to internal shape of the base which allows the immediate insertion of the cables, as a guide.

MAIN DISPOSITION AND COMPONENTS SUPPLIED

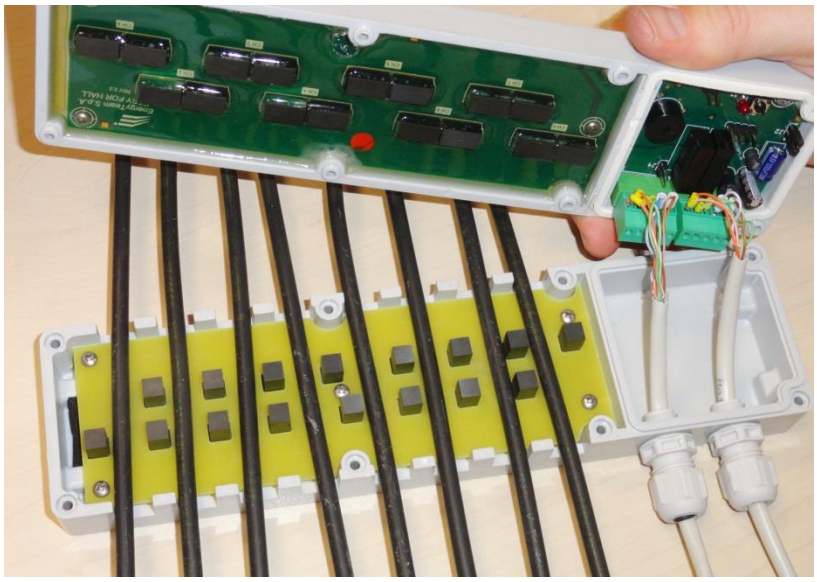


NOTE: Proper sealing of the cable glands is constrained by the presence of the inserted cables.

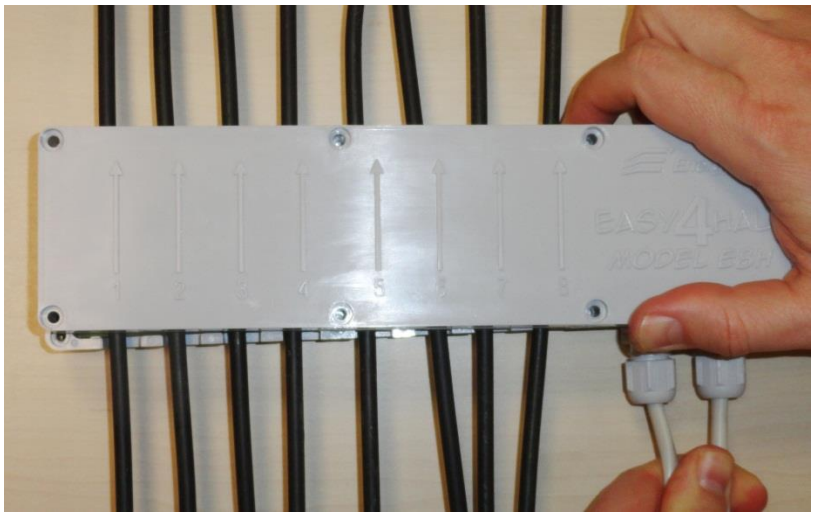
MECHANICAL INSTALLATION



1) As showed on the picture, just open Easy-4 Hall and insert the cables into the guides.



2) Connect the cables to the special connectors on the printed circuit and carefully close the cover, as showed on the picture.



3) When closing the module, exert a light pull on the cables; then tighten by turning the nuts of the cable glands. At the end, close the module tightening the screws.

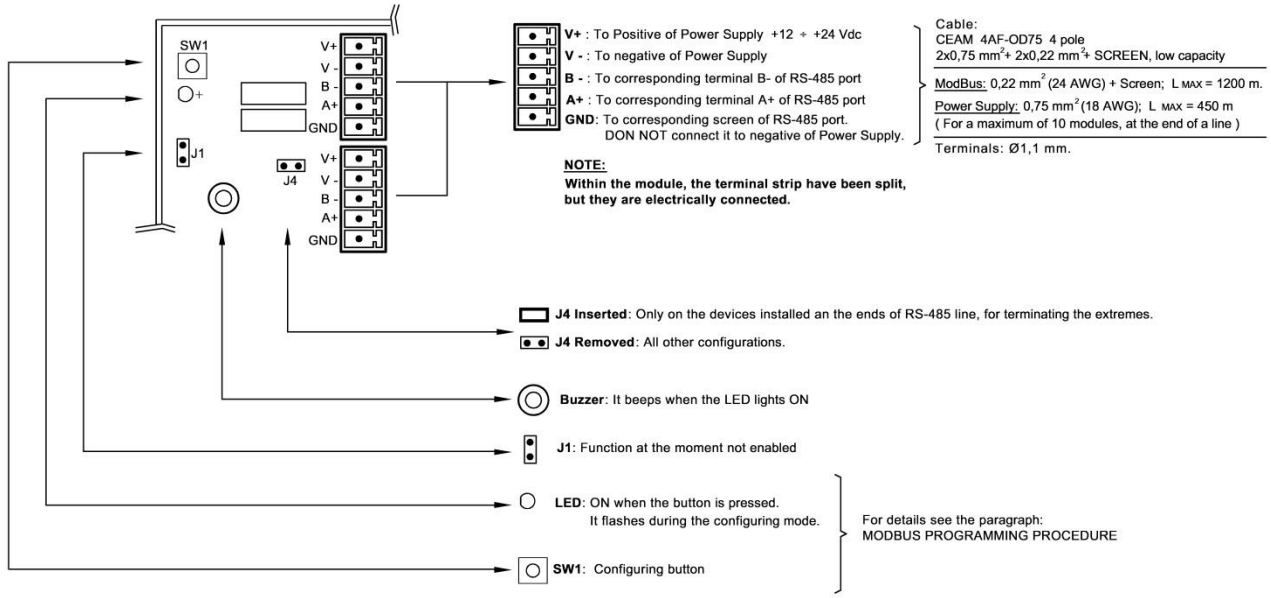
NOTE: For a correct sealing of the Protection Degree IP65, before closing the module ensure that the heads of the inner seal are properly combined and the screws fixing the cover guarantee a perfect tightness. In addition, ensure a perfect tightness of the cable glands in output. Before closing the module, check the correct position of the cables. When only one cable gland is used, close the other hole with a blind plug.

ELECTRICAL ISTALLATION

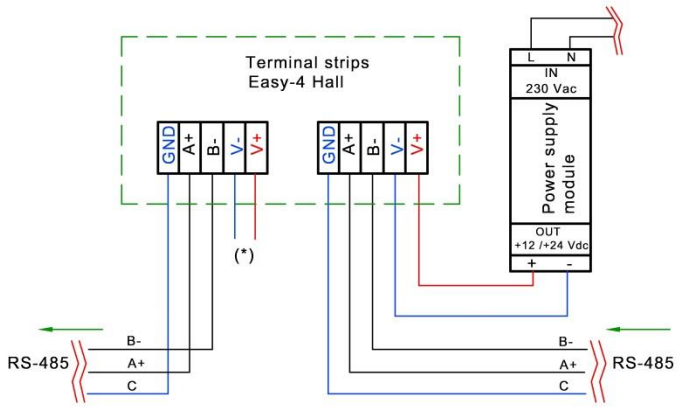
IMPORTANT NOTE:

BEFORE supplying the module, check the correct connection of the cables in the terminal strip: a wrong connection may cause irreversible damages.

To get the access to internal connections, unscrew the 6 fixing screws on the cover. Pay attention when lifting the cover because it is connected with two cables to electronic circuit fixed on the top side of the module.

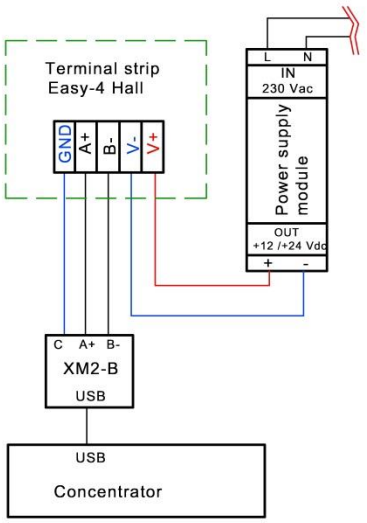


Example of connection to RS-485 ModBus line



(*) Output: +12 / +24 Vdc.
The terminal strips are connected in parallel, so one of them can be used for supplying other modules.

Example of connection to a concentrator, (by using only one terminal strip)



MODBUS PROGRAMMING PROCEDURE

IMPORTANT NOTE:

In order to avoid uncomfortable subsequent configuration operations on the plant, set the module address and the configuration parameters BEFORE installing it on the plant, by means of the supplied Software " Easy-Config ".

Easy-4Hall E8H is equipped by ModBus RTU Slave protocol, implemented on a serial RS-485 interface; bit rate, parity and stop-bit are settable through Software, by means of the same ModBus interface.
It can identify and perform "ModBus Read Holding Register (0x03)" and "Preset Single Register (0x06)" commands.
There are two modes of operation:

1) Measure Mode: "Normal" mode; the currents are measured and the standard ModBus commands are performed.

2) Config Mode: The protocol parameters are set. Default ones are the followings:
38400,8,N,1 ModBus Address=99.

NOTE:
During the operation of installation, you must enter "Config Mode" modality, set the parameters of your network and assign a ModBus address to Easy-4 Hall (See the paragraph "CONFIG MODE").

MEASURE MODE (normal working)

- After switching on the module, the LED lights ON for 0,5 seconds, immediately it emits two flashes and then it stays OFF. It's the condition of Measure Mode which is the modality of normal working, with the communication parameters saved in the memory during the Config Mode state.

NOTE:
If it's the first time that the module is switched on, the parameters inserted in the Config Mode are the default ones: 38400,8,N,1 e MB Address 99.

MODBUS COMMANDS:
Let's show on the table the commands to be inserted in the interfacing software, as numeric values reported in the field "REGISTER", and next is described (DATA) the meaning of the corresponding REGISTER.

By means of the "Read Holding Registers RHR (03)" command if the measured values of Current and Temperature are read (in addition to unique Serial Number S/N), and by means of "Preset Single Register PSR (06)" it's possible to set the LED/Buzzer state.

Example: The Command 03,0004,1 refers respectively to:
03: "Read Holding Registers" Command;
0004: REGISTER to be read
1: Number of REGISTERs to be read consecutively

In this case the answer got from Easy-4 Hall is the current on the Channel 3.
It's possible to read more REGISTERs simultaneously:
By means of the 03,0002,8 command, all the values of the 8 read currents are returned.

- Read Holding Registers RHR (03) .

REGISTER	DATA	RANGE OF VALUES (measure units)	SIZE
(400) 02 (decimal)	current channel 1	-32000 / + 32000 (mA)	signed int
03	current channel 2	-32000 / + 32000 (mA)	signed int
04	current channel 3	-32000 / + 32000 (mA)	signed int
05	current channel 4	-32000 / + 32000 (mA)	signed int
06	current channel 5	-32000 / + 32000 (mA)	signed int
07	current channel 6	-32000 / + 32000 (mA)	signed int
08	current channel 7	-32000 / + 32000 (mA)	signed int
09	current channel 8	-32000 / + 32000 (mA)	signed int
10	Temperature	-40 / +125 °C	signed int
12	Buzzer State / LED	0 = OFF 1 = ON 2 = Flashing	int
13	S/N 1	2 x 0 - 255	2 char cod. ASCII
14	S/N 2	2 x 0 - 255	2 char cod. ASCII
15	S/N 3	2 x 0 - 255	2 char cod. ASCII
16	S/N 4	2 x 0 - 255	2 char cod. ASCII
17	S/N 5	2 x 0 - 255	2 char cod. ASCII
18	S/N 6	2 x 0 - 255	2 char cod. ASCII
19	S/N 7	2 x 0 - 255	2 char cod. ASCII
100	Label 1	2 x 0 - 255	2 char cod. ASCII
101	Label 2	2 x 0 - 255	2 char cod. ASCII
102	Label 3	2 x 0 - 255	2 char cod. ASCII
103	Label 4	2 x 0 - 255	2 char cod. ASCII
104	Label 5	2 x 0 - 255	2 char cod. ASCII
105	Label 6	2 x 0 - 255	2 char cod. ASCII
106	Label 7	2 x 0 - 255	2 char cod. ASCII
107	Label 8	2 x 0 - 255	2 char cod. ASCII

- Preset Single Register PSR (06) .

ADDRESS	DATA	RANGE OF VALUES (measure units)	SIZE
12	LED State (and/or buzzer)	0 = OFF 1 = ON 2 = Flashing	int
100	Label 1	2 x 0 - 255	2 char cod. ASCII
101	Label 2	2 x 0 - 255	2 char cod. ASCII
102	Label 3	2 x 0 - 255	2 char cod. ASCII
103	Label 4	2 x 0 - 255	2 char cod. ASCII
104	Label 5	2 x 0 - 255	2 char cod. ASCII
105	Label 6	2 x 0 - 255	2 char cod. ASCII
106	Label 7	2 x 0 - 255	2 char cod. ASCII
107	Label 8	2 x 0 - 255	2 char cod. ASCII

NOTE:
The negative values are, as always, represented in 2-complement, i.e. they are calculated as:
READ_VALUE - 65535 (mA) or (°C).
(Example: if the corresponding value read is equal to 60000, it means that the value of the current flowing is: 60000-65535= -5535mA = -5,535A).

CONFIG MODE (Procedure for programming network parameters of ModBus)

- To enter the Config Mode: press and hold the button or, when the module is closed, keep the magnet near the circular target on the cover, as shown on the figure, until the internal LED begins to flash and the Buzzer beeps, emitting an intermittent sound. In "Config Mode" the RS485/ModBus communication parameters change as follows:

- Address = 99
- Baudrate = 38400
- Parity: NONE
- Stop Bit: 1

- From now on, only by using of an interfacing software and by setting the network with these parameters, it's possible the communication with Easy-4 Hall.

NOTE: We recommend to carry out the configuration with the module separated from the ModBus network destination.

- From Config Mode it's possible to go back to Measure Mode only by a Reset, through the system software:
By inserting the command 25 (see table below). Alternatively you can switch off physically the module or leaving it waiting for 1 hour, without valid commands.

MODBUS COMMANDS:
Let's show on the table the commands to be inserted in the interfacing software, as numeric values reported in the field "REGISTER", and next is described (DATA) the meaning of the corresponding values valid for the REGISTER. In this modality, for these values, it's possible to carry out both reading and writing operation.

- Preset Single Register PSR (06) e Read Holding Registers RHR (03).

REGISTER	DATA	RANGE OF VALUES	SIZE
(400) 20	Slave Address	1 - 255	int
21	Baudrate	0 = 1200 1 = 2400 2 = 4800 3 = 9600 4 = 14400 5 = 19200 6 = 28800 7 = 38400 8 = 57600 9 = 115200	
22	Parity	0 = None 1 = Even 2 = Odd	int
23	Stop Bits	0 = 1 stop bit 1 = 2 stop bits	int
24	Current Directions	0 = normal 1 = inverted	int
25	Reset SW del sistema	1	int

NOTE: Considering the Data " Current Directions" (Register: 24), enter "0" value if the direction of the currents to be measured is concordant with the one of the arrows designed on the cover. Instead, enter "1" if opposite.

With each new setting, the parameter eventually changed will be saved in the memory, but it will not be used immediately by the Easy-4 Hall, until the next reset.

Example: *Inserting 06,40021,5, the setting of 19200 baud is saved, but in "Config Mode" the Easy-4Hall will continue to work with 38400 baud. We remember that, the only way for going back to Measure Mode is the operation of Reset (physical or through the special command 40025,1) or the waiting time of 1 hour.*

TECHNICAL FEATURES

General	
Dimensions	244x63x40 mm (244x86x40 mm with cable-gland)
Weight	500 gr
Hole for "solar cable"	12x7 mm (2 cable Ø 6 mm)
Case material	Polycarbonate
Protection degree	IP65 Side for components IP20 Side for "solar cables"
Power supply	+12 ÷ +24Vdc, 500mA max
Maximun consumption	3 W
Working Temperature	-20 °C ÷ +70 °C
Features and Performance	
Measurement	8 direct currents +/-10 A, Hall-effect technology
Communication	Slave ModBus-RTU on insulated RS485
Settable parameters	Bit rate: 1200 ÷ 115200 bps; Parity: even, odd, none; stop Bit: 1 o 2; Address: 1 ÷ 255

WARRANTY

Energy Team guarantees that the supplied products are free from defects and suitable for use. If any malfunction occurs and these are due to manufacturing defects, E.T. will respond within the terms and modalities foreseen by General Conditions of Supply, with particular reference to articles 5B (terms and duration), 1C (limits), 5D (other warranties). Whatever operation or manumission made by third parties not expressly authorized determines in each case the immediate termination of the warranty.

DISPOSAL

WASTE OF ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE)
Don't dispose among generic waste but collect separately for recycling and disposal operations according by law.

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