

Watt

Vpk

Var

ENERGY-0-RS

Energy Meter

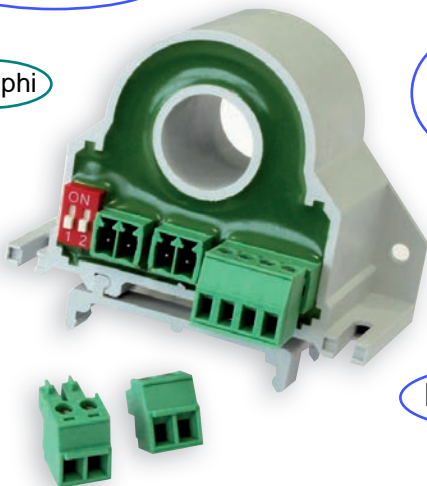
TRMS AC/DC

i RMS
50A ac/dc

COS phi

V rms
800Vac
-/+ 1000Vdc

Energy
bidireccional



Frecuency

User manual

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Introduction

Thank you for choosing is Energy Meter.

The ENERGY-0- is a **Single-phase Power Meter** able to measure the TRMS AC/DC Current and Voltage. On the RS485 Modbus following measuring units are available: Irms, Vrms, Watt, Var, Va, Vpk, Ipk, Frequency, Cos ϕ , Energy bidirectional and THD. The device is fully configurable by RS485, DIN rail mounting, 4kV galvanic isolation for Voltage input.

1 Safety guide lines

Read carefully the safety guidelines and programming instructions contained in this manual before using/connecting the device. Disconnect power supply before proceeding to hardware settings or electrical wirings. Only qualified personnel should be allowed to use the device and/or service it and in accordance to technical data and environmental conditions listed in this manual. Do not dispose electric tools together with household waste material. In observance European Directive 2002/96/EC on waste electrical and electronic equipment and its implementation in accordance with national law, electric tools that have reached the end of their life must be collected separately and returned to an environmentally compatible recycling facility.

2 Model identification

Power supply 9..30 V DC

ENERGY-0-RS	Power / Energy Meter Single Phase AC/DC TRMS - RS485 Modbus
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3 Technical data

3.1 Main features

- TRMS Measure, THD available
- 0,5 % Accuracy
- RS485 Modbus integrated
- Bidirectional Energy metering
- DIN rail mounting in both side
- OEM's design, low cost
- Fully configurable by free interface software EnergyMeter-Programmer
- Bootloader for updating firmware

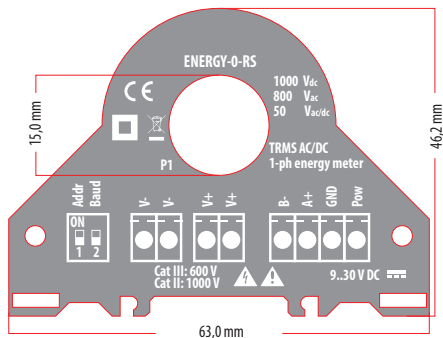
3.2 Hardware and software features

Power supply	9..30 V DC, Protection against polarity reversal and overtemperature
Absorption	1,3 W
Protection index	IP20
Accuracy	Voltage, Current, Active Power, Reactive Power, Apparent

power: < 0,5% F.S.
Frequency: +/- 0,1 Hz
Energy: +/- 1% of reading
V_{peak}, I_{peak}: +/- 5% f.s.

Measurement	I _{rms} , V _{rms} , Watt, Var, V _a , V _{pk} , I _{pk} , Frequency, Cosφ, Energy bidirectional, THD
Temperature coefficient	< 200 ppm/°C
Working temperature	-15..+65°C
Storage temperature	-40°C.. +85°C
Type of measure	TRMS or DC
Range	Current: Up to 50 A AC/DC Voltage: up to 800 V AC or 1000V DC RS485 customize setting with free interface software EnergyMeter-Programmer
Crest factor	1,8 (on current measurement)
Output	RS485 Modbus RTU
Working frequency	DC or 1..400 Hz
Sampling rate	11k Samples per Second
Input impedance	1 M ohm +/-1%
Isolation	3 kV on bare wire for Current measure, 4 kV for Voltage measure (reinforced insulation to power supply and serial output)
Hysteresis	0,15% f.s.
Humidity	10..90% not condensing
Altitude	Up to 2000 m s.l.m.
Weight	80 g.
Filling	Epoxy Resins
Box material	PBT, grey
Mounting	Screw predisposition for vertical/horizontal mounting, DIN rail clips (included) for vertical/horizontal mounting.
Terminals	Removable terminals 3,5mm, n°1 4 poles, n°2 2 poles
Dip-switch	2 poles
Led	N°1 yellow, Power on fixed, data communication blinking
Standards CE	EN61000-6-4/2006 + A1 2011; EN64000-6-2/2005; EN61010-1/2010
Overvoltage category	Cat III up to 600V; Cat II up to 1000V
Dimensions	46,1x 63x 26,4 mm (terminal excluded)

4 Dimensions and Installation

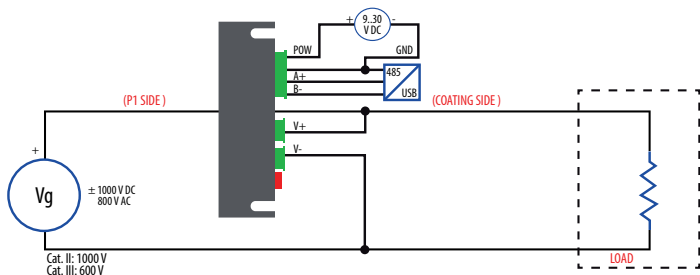


5 Electrical wirings



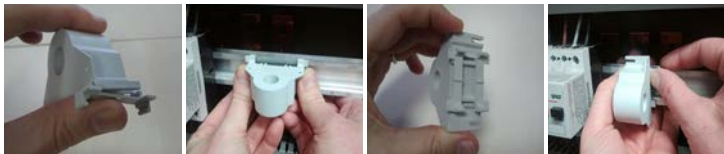
Although this controller was designed to resist electromagnetic interferences in industrial environments, please observe following safety guidelines:

- Separate the control line from the power wires.
- Avoid proximity of remote control switches, electromagnetic contactors, powerful engines and in all instances use specific filters.
- Avoid proximity of power groups, especially those with phase control.



6 Mounting

The Power Meter ENERGY-RS can be mounted in any position (see photo below), horizontal or vertical mounting, horizontal or vertical through the two hooks for DIN rail included in the box.



7 Configuration

Using a serial link RS485-USB you can connect the energy-rs with the interface program EnergyMeter-Programmer. This software allows to set the Modbus address, baudrate, delay, the TV and TA ratio, to modify a filter in order to have fastest response time instead of a more stable measurement (filter range from 1-speed to 5-accuracy). You can download the EnergyMeter-Programmer free of charge from Download Area on our website .

A second way to program the device is by using the Modbus Register Map directly.

7.1 Remarks

- Modbus connections: A+ and B- as per Modbus RTU standards;
- Modbus Register reference: with reference to the logical address, for ex. 40010, corresponds to physical address n°9 as per Modbus RTU standard;
- Modbus functions supported: 3 (Read multiple registers, max 100), 6 (Write single), 16 (Write multiple).
- Any change made by dip-switch requires to switch off the power supply

Energy storage data on flash memory: 4,5 years minimum, 45 years typical

Minimum Current measurement offset: 100mA

Minimum Power measurement offset: 1 W

Measurement refresh: every 50 cycles or 1 second (the faster), programmable by EnergyMeter-Programmer

If you want to set the device by EnergyMeter-Programmer set the dips to 0. If you want to set by RS485 directly, set the first dip to 1 (up) then use the second dip for baudrate setting (0 for 9600 or 1 for 38400). After the settings, please save the configuration by the COMMAND register, then switch off the power supply: Before switching on the power supply set the dips to 0.

Dip-switch settings	1	2
All setting from EEPROM	0	0
Set Address 1- Baud 9600	1	0
Set Address 1 -Baud 38400	1	1

8 EnergyMeter-Programmer

The free interface program EnergyMeter-Programmer is the fastest way to configure the device. The changes made to the program act on the register of the device.

To restore the default configuration, just press the button FACTORY DEFAULT.

Type of measure	Allows the selection of the measure RMS or DC only to define the sign (positive or negative) of reading
Save on energy flash	It is possible to activate the saving of the counters directly on the device's flash memory
Report of transformation	In case you would use the TA and / or TV, you can define the transformation ratio for the current input and voltage input, the default ratio is 1:1
Filter	<p>Allows to insert a filter on reading in order to get more speed in responding (value 1) or a more stable and accurate measurement (value 5). By default the value is set to 2. You can choose between intermediate values already set or manually enter the desired filter by choosing the CUSTOM option from the menu.</p> <p>In this case, you can set the following parameters: filtering in DC, filtering in AC (default value 5), Frequency measurement on Current channel</p>

CAUTION: Magnetic fields of high intensity can vary the values measured by the transformer. Avoid installation near permanent magnets, electromagnets or iron masses that induce strong changes in the magnetic field. If any irregularity, to reorient or move the transformer in the area most appropriate.

9 Modbus Register Map

See paragraph 9, page 15.

9 Modbus Register Map

Register Name	Comment	Register Type	R/W	Default Value	Range	Modbus Address
Machine ID	Machine ID	Unsigned short	R	7		40001
FW version	Firmware version	Unsigned short	R	0		40002
Address	Modbus address	Unsigned short	R/W	1		40003
Delay	Machine answer delay (in characters)	Unsigned short	R/W	1	0..1000	40004
Baudrate	0= 1200, 1= 2400, 2= 4800, 3= 9600, 4= 19200, 5= 38400, 6= 57600, 7= 115200	Unsigned short	R/W	1	0.7	40005
Parity	0= NO, 1= ODD, 2= EVEN	Unsigned short	R/W	0	0..2	40006
DC Filter	Number of tenths of second (1/10) for all RMS calculation in DC	Unsigned short	R/W	10	1..65535	40007
Flag Measurement	bit 0 : [0= TRMS value (without sign); 1 = DC_measurement (with sign)]; bit 1: [0= Energy storing disable; 1= Energy storing enable]; bit 2 : [0= Frequency detect on Voltage channel; 1= Frequency detect on Current channel].	Unsigned short	R/W	0x10		40008
TV_Ratio	Voltage transformer ratio	Float (LSW first)	R/W	1.0		40009 40010
TA_Ratio	Current transformer ratio	Float (LSW first)	R/W	1.0		40011 40012
# of ZX for VI measurement	Number of ZX for AC Meas Number of line cycle Zero Crossings for AC measurement RMS.	Unsigned short	R/W	50	1..65535	40014
STATUS	bit 0: flash settings error; bit1: flash calibration error; bit 2: Voltage Over Range; bit 3: Voltage Under Range; bit [4:5] Reserved; bit 6: Zero crossing detecting; bit [7:9] Reserved; bit 10: Energy storing error; bit 11: Energy initialization error; bit 12: Reserved; bit 13: Current Over Range; bit 14: Current Under Range; bit 15: Reserved.	Unsigned short	R	0		40072
V RMS	Voltage RMS Measurement (V)	Float (LSW first)	R			40073 40074
I RMS	Current RMS Measurement (mA)	Float (LSW first)	R			40075 40076

Register Name	Comment	Register Type	R/W	Default Value	Range	Modbus Address
P	Active Power Measurement (W)	Float (LSW first)	R			40077 40078
Q	Reactive Power Measurement (VAR)	Float (LSW first)	R			40079 40080
S	Apparent Power Measurement (VA)	Float (LSW first)	R			40081 40082
Cosφ	Cosφ Measurement	Float (LSW first)	R			40083 40084
Frequency	Frequency Measurement (Hz)	Float (LSW first)	R			40085 40086
THD	THD Measurement	Float (LSW first)	R			40087 40088
Energy	Totale Energy Measurement (KWh)	Float (LSW first)	R			40089 40090
Energy positive	Only positive Energy Measurement (KWh)	Float (LSW first)	R			40091 40092
Energy negative	Only negative Energy Measurement (KWh)	Float (LSW first)	R			40093 40094
V peak	Instantaneous Voltage Peak (V)	Float (LSW first)	R/W			40095 40096
I peak	Instantaneous Current Peak (mA)	Float (LSW first)	R/W			40097 40098
V MAX	Max RMS Voltage (V)	Float (LSW first)	R/W			40099 40100
V min	Min RMS Voltage (V)	Float (LSW first)	R/W			40101 40102
I MAX	Max RMS Current (mA)	Float (LSW first)	R/W			40103 40104
I min	Min RMS Current (mA)	Float (LSW first)	R/W			40105 40106
P MAX	Max RMS Power (W)	Float (LSW first)	R/W			40107 40108
P min	Min RMS Power (W)	Float (LSW first)	R/W			40109 40110
Q MAX	Max Reactive Power (VAR)	Float (LSW first)	R/W			40111 40112
Q min	Min Reactive Power (VAR)	Float (LSW first)	R/W			40113 40114
S MAX	Max Apparent Power (VA)	Float (LSW first)	R/W			40115 40116
S min	Min Apparent Power (VA)	Float (LSW first)	R/W			40117 40118

Register Name	Comment	Register Type	R/W	Default Value	Range	Modbus Address
Cosφ MAX	Max Cosφ	Float (LSW first)	R/W			40119 40120
Cosφ min	Min Cosφ	Float (LSW first)	R/W			40121 40122
Frequency MAX	Max Frequency (Hz)	Float (LSW first)	R/W			40123 40124
Frequency min	Min Frequency (Hz)	Float (LSW first)	R/W			40125 40126
THD MAX	Max THD	Float (LSW first)	R/W			40127 40128
THD min	Min THD	Float (LSW first)	R/W			40129 40130
STATUS SW	bit 0: flash settings error; bit1: flash calibration error; bit 2: Voltage Over Range; bit 3: Voltage Under Range; bit [4:5] Reserved; bit 6: Zero crossing detecting; bit [7:9] Reserved; bit 10: Energy storing error; bit 11: Energy initialization error; bit 12: Reserved; bit 13: Current Over Range; bit 14: Current Under Range; bit 15: Reserved.	Unsigned short	R			40132
V RMS SW	Voltage RMS measurement (V) swapped	Float (MSW first)	R			40133 40134
I RMS SW	Current RMS measurement (mA) swapped	Float (MSW first)	R			40135 40136
P SW	Power measurement (W) swapped	Float (MSW first)	R			40137 40138
Q SW	Reactive Power measurement Q (VAR) swapped	Float (MSW first)	R			40139 40140
S SW	Apparent Power measurement S (VA) swapped	Float (MSW first)	R			40141 40142
Cosφ SW	Cosφ measurement swapped	Float (MSW first)	R			40143 40144
Frequency SW	Frequency measurement (Hz) swapped	Float (MSW first)	R			40145 40146
THD SW	THD swapped	Float (MSW first)	R			40147 40148

Register Name	Comment	Register Type	R/W	Default Value	Range	Modbus Address
Energy SW	Total Energy measurement (KWh) swapped	Float (MSW first)	R			40149
						40150
Energy positive SW	Only positive Energy Measurement (KWh) swapped	Float (MSW first)	R			40151
						40152
Energy negative SW	Only negative Energy Measurement (KWh) swapped	Float (MSW first)	R			40153
						40154
V peak SW	Instantaneous Voltage Peak (V) swapped	Float (MSW first)	R/W			40155
						40156
I peak SW	Instantaneous Current Peak (mA) swapped	Float (MSW first)	R/W			40157
						40158
V MAX SW	Max RMS Voltage (V) swapped	Float (MSW first)	R/W			40159
						40160
V min SW	Min RMS Voltage (V) swapped	Float (MSW first)	R/W			40161
						40162
I MAX SW	Max RMS Current (mA) swapped	Float (MSW first)	R/W			40163
						40164
I min SW	Min RMS Current (mA) swapped	Float (MSW first)	R/W			40165
						40166
P MAX SW	Max RMS Power (W) swapped	Float (MSW first)	R/W			40167
						40168
P min SW	Min RMS Power (W) swapped	Float (MSW first)	R/W			40169
						40170
Q MAX SW	Max Reactive Power (VAR) swapped	Float (MSW first)	R/W			40171
						40172
Q min SW	Min Reactive Power (VAR) swapped	Float (MSW first)	R/W			40173
						40174
S MAX SW	Max Apparent Power (VA) swapped	Float (MSW first)	R/W			40175
						40176
S min SW	Min Apparent Power (VA) swapped	Float (MSW first)	R/W			40177
						40178
Cosφ MAX SW	Max Cosφ swapped	Float (MSW first)	R/W			40179
						40180
Cosφ min SW	Min Cosφ swapped	Float (MSW first)	R/W			40181
						40182
Frequency MAX SW	Max Frequency (Hz) swapped	Float (MSW first)	R/W			40183
						40184
Frequency min SW	Min Frequency (Hz) swapped	Float (MSW first)	R/W			40185
						40186
THD MAX SW	Max THD swapped	Float (MSW first)	R/W			40187
						40188
THD min SW	min THD swapped	Float (MSW first)	R/W			40189
						40190

Register Name	Comment	Register Type	R/W	Default Value	Range	Modbus Address
STATUS 100	bit 0: flash settings error; bit1: flash calibration error; bit 2: Voltage Over Range; bit 3: Voltage Under Range; bit [4:5] Reserved; bit 6: Zero crossing detecting; bit[7:9] Reserved; bit 10: Energy storing error; bit11: Energy initialization error; bit 12: Reserved; bit 13: Current Over Range; bit 14: Current Under Range;	Unsigned short	R			40192
V RMS 100	Voltage RMS measurement (V/100) in hundredths	Signed long (LSW first)	R			40193 40194
I RMS 100	Current RMS measurement (mA/100) in hundredths	Signed long (LSW first)	R			40195 40196
P 100	Power measurement (W/100) in hundredths	Signed long (LSW first)	R			40197 40198
Q 100	Reactive Power measurement (VAR/100) in hundredths	Signed long (LSW first)	R			40199 40200
S 100	Apparent Power measurement (VA/100) in hundredths	Signed long (LSW first)	R			40201 40202
Cosφ 100	Cosφ measurement in hundredths	Signed long (LSW first)	R			40203 40204
Frequency 100	Frequency measurement (Hz/100) in hundredths	Signed long (LSW first)	R			40205 40206
THD 100	THD in hundredths	Signed long (LSW first)	R			40207 40208
Energy 100	Total Energy measurement (KWh/100) in hundredths	Signed long (LSW first)	R			40209 40210
Energy positive 100	Only positive Energy Measurement (KWh/100) in hundredths	Signed long (LSW first)	R			40211 40212
Energy negative 100	Only negative Energy Measurement (KWh/100) in hundredths	Signed long (LSW first)	R			40213 40214
V peak 100	Instantaneous Voltage Peak (V/100) in hundredths	Signed long (LSW first)	R/W			40215 40216
I peak 100	Instantaneous Current Peak (mA/100) in hundredths	Signed long (LSW first)	R/W			40217 40218
V MAX 100	Max RMS Voltage (V/100) in hundredths	Signed long (LSW first)	R/W			40219 40220
V min 100	Min RMS Voltage (V/100) in hundredths	Signed long (LSW first)	R/W			40221 40222

Register Name	Comment	Register Type	R/W	Default Value	Range	Modbus Address
I MAX 100	Max RMS Current (mA/100) in hundredths	Signed long (LSW first)	R/W			40223 40224
I min 100	Min RMS Current (mA/100) in hundredths	Signed long (LSW first)	R/W			40225 40226
P MAX 100	Max RMS Power (W/100) in hundredths	Signed long (LSW first)	R/W			40227 40228
P min 100	Min RMS Power (W/100) in hundredths	Signed long (LSW first)	R/W			40229 40230
Q MAX 100	Max Reactive Power (VAR/100) in hundredths	Signed long (LSW first)	R/W			40231 40232
Q min 100	Min Reactive Power (VAR/100) in hundredths	Signed long (LSW first)	R/W			40233 40234
S MAX 100	Max Apparent Power (VA/100) in hundredths	Signed long (LSW first)	R/W			40235 40236
S min 100	Min Apparent Power (VA/100) in hundredths	Signed long (LSW first)	R/W			40237 40238
Cosφ MAX 100	Max Cosφ in hundredths	Signed long (LSW first)	R/W			40239 40240
Cosφ min 100	Min Cosφ in hundredths	Signed long (LSW first)	R/W			40241 40242
Frequency MAX 100	Max Frequency (Hz/100) in hundredths	Signed long (LSW first)	R/W			40243 40244
Frequency min 100	Min Frequency (Hz/100) in hundredths	Signed long (LSW first)	R/W			40245 40246
THD MAX 100	Max THD in hundredths	Signed long (LSW first)	R/W			40247 40248
THD min 100	min THD in hundredths	Signed long (LSW first)	R/W			40249 40250
Command	Flash settings save command = 0xC1C0; Reset command = 0xC1A0; Load Energy command = 0xBABA (energy to load must be written in Command_aux); Load Positive Energy command = 0xBABB (positive energy to load must be written in Command_aux); Load Negative Energy command = 0xBABC (negative energy to load must be written in Command_aux);	Unsigned short	R/W	0		40252
Command aux	Auxiliary Register for Energy Command (see command register)	Float (LSW first)	R/W	0		40253 40254



Read carefully the safety guidelines and programming instructions contained in this manual before using/connecting the device.



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