S501-45-MOD-MID

Single-Phase Multi-function energy counter



USER MANUAL

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SENECA srl **17**

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Risk Information

Information for Your Own Safety
This manual does not contain all of the safety measures operating the equipment (module, device) for different conditions and requirements. However, it does contain information which you must know for your own safety and to avoid damages. These information are highlighted by a warning triangle indicating the degree of potential danger.



Warning
This means that failure to observe the instruction can result in death, serious injury or considerable material damage.



Caution
This means hazard of electric shock and failure to take the necessary safety precautions will result in death, serious injury or considerable material damage.

Qualified personnel
Operation of the equipment (module, device) described in this manual may only be performed by qualified personnel. Qualified personnel in this manual means person who are authorized to commission, start up, ground and label devices, systems and circuits according to safety and Regulatory standards.

Proper handling
The prerequisites for perfect, reliable operation of the product are proper transport, proper storage, installation and proper operation and maintenance. When operating electrical equipment, parts of this equipment automatically carry dangerous voltages. Improper handling can therefore result in serious injuries or material damage.

- Use only insulating tools.
- Do not connect while circuit is live (hot).
- Place the energy counter only in dry surroundings.
- Do not mount the energy counter in an explosive area or expose the energy counter to dust, mildew and insects.
- Make sure the wires are suitable for the maximum current of this meter.
- Make sure the AC wires are connected correctly before activating the current/voltage to the energy counter.
- Do not touch the energy counter connecting clamps directly with metal, blank wire and your bare hands as you may get electrical shock.
- Make sure the protection cover is placed after installation.
- Installation, maintenance and reparation should only be done by qualified personnel.
- Never break the seals and open the front cover as this might influence the function of the energy counter, and will cause no warranty.
- Do not drop, or allow strong physical impact on the energy counter as the high precisely components inside may be damaged.
- Designed to be mounted inside of switchboards or cabinet on DIN rail.
- This device must have a suitable sized Circuit Breaker feeding the Multi Function energy counter so it
- does not exceed the maximum rated current.
- The supply wiring of this device shall be suitable sized cable to match the installed circuit breaker.
- A Disconnection Device (Circuit Breaker) should be installed close to the Multi Function energy counter.

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- The Disconnection Device shall be marked as the Disconnection Device for the Multi Function energy counter.

Disclaimer

We have checked the contents of this publication and every effort has been made to ensure that the descriptions are as accurate as possible.

However, deviations from the description cannot be completely ruled out, so that no liability can be accepted for any errors contained in the information given. The data in this manual is checked regularly and the necessary corrections are included in subsequent editions. We are grateful for any improvements that you suggest.

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Chapter 1. Introduction

1.1 Product introduction

The energy counter measures and displays the characteristics of single phase two wire (1p2w), including voltage, frequency, current, power, active and reactive energy, imported or exported. Energy is measured in terms of kWh, kVArh. Maximum demand current can be measured over preset periods of up to 60 minutes. The energy counter is Max. 45A direct connected and does not need to connect with external current transformers(CT). n RS485 communication port is available for remote data transmission.

1.2 Product Characteristics

- Bi-directional measurement IMP & EXP
- RS485 Modbus RTU
- Multi-parameters measurement

Measurements:

- Phase voltage: V
- Current: A
- Active power: W
- Frequency: Hz
- Power factor: PF
- Active energy: Ep_imp (import active energy), Ep_exp (export active energy), Ep_total (total active energy)
- Reactive energy: Eq_total (total reactive energy)

Setup:

- RS485 Modbus RTU

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Chapter 2. Technical Parameters

2.1 Technical Parameters

Voltage AC (Un)	230V AC
Voltage Range	100 - 277V AC
Current Input	0.15-5(45)A
Starting Current (Ist)	0.02A
Transition Current (Itr)	0.5A
Over Current Withstand	30Imax for 0.01S
Frequency Rating Value	50/60Hz
AC Voltage Withstand	4KV/1min
Impulse Voltage Withstand	6kV – 1.2/50μS waveform
Voltage Circuit Power Consumption	≤ 2W/10VA
Current Circuit Power Consumption	≤0.05VA
Display	LCD with white backlit
Max. reading	99999.9 kWh/kVArh

2.2 Mechanical Characteristics

Net Weight	≈77g
IP Degree of Protection (IEC 60529)	IP51 front display IP20 whole meter
Dimensions (DxHxW)	64*118*18mm
Mounting	DIN Rail 35mm
Material of Meter Case	Self-extinguishing UL 94 V-0
Mechanical Environment	M1

2.3 Performance Criteria

Operation Humidity	≤90% Non-condensing
Storage Humidity	≤95% Non-condensing
Operating Temperature	-40℃~+70℃
Storage Temperature	-40℃~+80℃
Pollution Degree	2
Altitude	≤2000m
Vibration	10Hz to 50Hz, IEC 60068-2-6

2.4 Electromagnetic Compatibility

Electrostatic Discharge	IEC 61000-4-2
Immunity to Radiated Fields	IEC 61000-4-3
Immunity to Fast Transients	IEC 61000-4-4
Immunity to Impulse Waves	IEC 61000-4-5
Conducted Immunity	IEC 61000-4-6
Immunity to Magnetic Fields	IEC 61000-4-8
Immunity to Voltage Dips	IEC 61000-4-11
Radiated Emissions	EN55032 Class B
Conducted Emissions	EN55032 Class B

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2.5 Safety

Over-voltage Category	CAT III
Installation Category	CAT III
Insulating Encased Meter of Protective Class	II

2.6 Accuracy

Parameters	Accuracy	Resolution
Voltage	±0.5%	0.1V
Current	±0.5%	0.01A
Frequency	±0.2%	0.01Hz
Power Factor	±0.01	0.01
Active Power	±1%	0.01kW
Reactive Power	±1%	NA
Apparent Power	±1%	NA
Active Energy	Class 1 or 0.5 IEC62053-21 Class B or C EN50470-3:2022	0.01kWh
Reactive Energy	Class 2 IEC 62053-23	0.01kVArh

2.7 Outputs

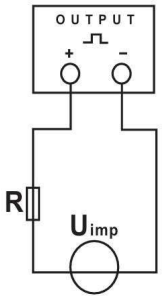
Communication

The following RS485 communication parameters can be configured from the Set-up menu:

Bus Type	RS485
Communication Protocol	Modbus RTU
Baud Rate	2.4k/4.8k/9.6k(default)/19.2k /38.4k bps
Address Range	001 to 247
Bus Load	64 PCS
Communication Distance	1000m
Parity Bit	none(default)/ odd / even
Stop Bit	1 or 2
Data Bits	8

Pulse Output

The energy counter is equipped with two pulse outputs, which is fully isolated from the inside circuit. That generates pulses in proportion to the measured energy. The pulse output is polarity dependent, passive transistor output requiring an external voltage source for correct operation. For this external voltage source, the voltage shall be 5-27V DC, and the maximum input current shall be 27mA DC.

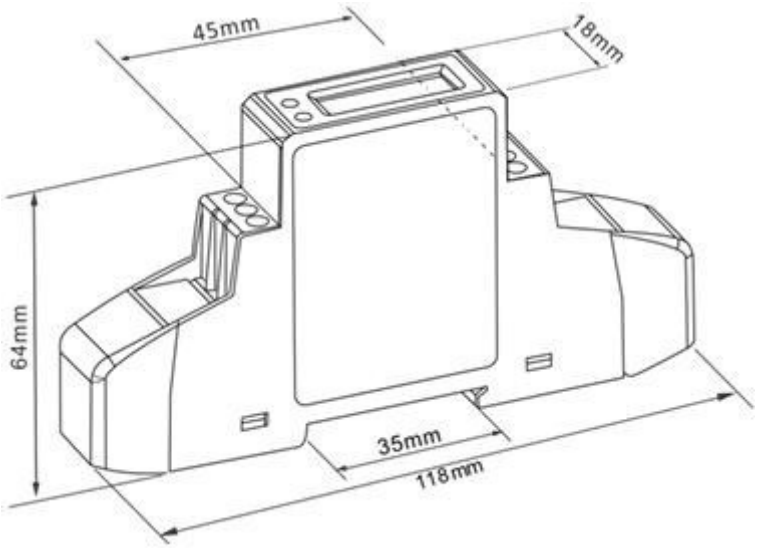


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ATTENTION: Pulse output must be fed as shown in the wiring diagram on the left.
Scrupulously respect polarities and the connection mode. Opto-coupler with potential-free SPST-NO Contact.
Contact range: 5~27VDC Max. current Input: 27mA DC

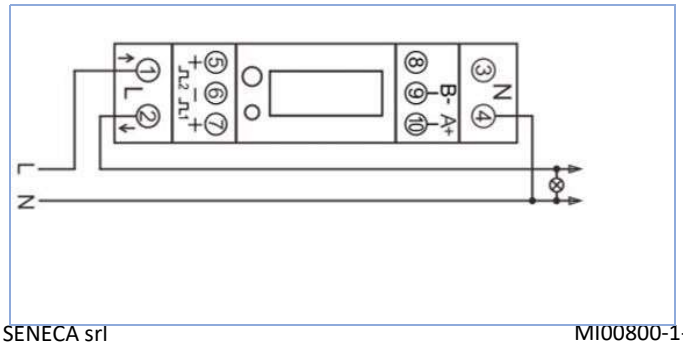
Pulse outputs type	Two independent channels of optocoupler passive pulse outputs	
Pulse output 1 (configurable)	Type	Total kWh/kVArh; Default: total kVArh
	Constant	0.001, 0.01, 0.1, 1 kWh/kVArh per imp Default: 0.001 kVArh/imp
	Width	200, 100, 60mS Default: 200mS
Pulse output 2 (fixed)	Type	Total kWh
	Constant	1000 imp/kWh
	Width	100mS

2.8 Dimensions



Height: 118mm Width: 18mm Depth: 64mm

2.9 Wiring diagram



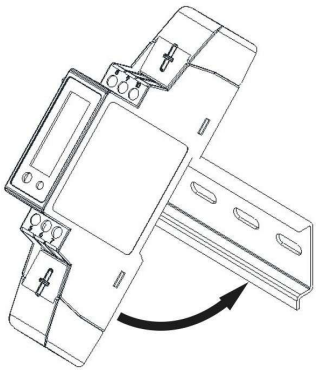
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Wiring Guide

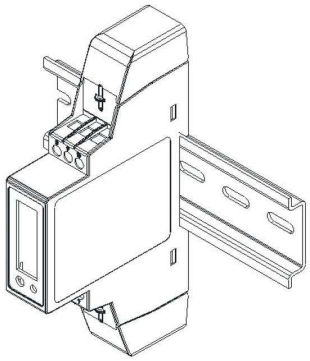
Terminal ①~④	Measurement Connection	Screw Connection
	Strip Length	11-12mm
	Screw	M7
	Rigid/Supple	4-35mm² (11~2AWG)
	Tightening Torque	3Nm
	Model	PH3
Terminal ⑤~⑩	Measurement Connection	Screw Connection
	Strip Length	6-7mm
	Rigid/Supple	0.5-1.5mm² (22 ~ 14AWG)
	Tightening Torque	0.4Nm
	Model	PH0

Installation

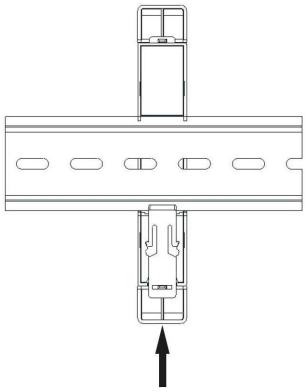
- Step 1: Select a 35mm-wide DIN rail, Pull down the back-end clip on the energy counter to unlock the mounting mechanism.
- Step 2: Align Upper Slot with DIN Rail. Position the upper slot of the energy counter's DIN rail groove onto the DIN rail, ensuring full contact (see Figure 1).
- Step 3: Following the direction indicated in Figure 1, engage the lower slot of the DIN rail groove onto the DIN rail until audibly seated (see Figure 2).
- Step 4: Push up the back-end clip to lock the energy counter firmly onto the DIN rail (see Figure 3).



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②



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Chapter 3. Operation

3.1 Installation Display

	The first screen lights up all display segments and can be used as a display check.
	The second screen show software version.
	The third screen show program number. Note： the actual display might be different with the left one here.
	Cyclic redundancy check code-high bytes Note： the actual display might be different with the left one here.
	Cyclic redundancy check code-low bytes Note： the actual display might be different with the left one here.

3.2 Button Functions

	In measurement mode: Short press: switch display screen Long press: enter setup mode In setup mode: Short press: next page or increase value Long press: setup parameters

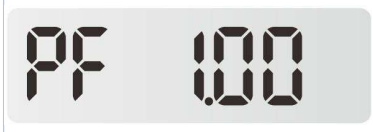
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3.3 Measurements

Each successive pressing of the button selects a new range:
Can be viewed by pressing the button：
Total active energy in kWh → Imported active energy in kWh → Exported active energy in kWh → Total reactive energy in kVArh → Phase to neutral voltage → Current of phase → Instantaneous active power KW → Frequency → Power factor → address → Baud rate → Parity bit → Stop bit → Secondary address-high address
→ Secondary address-low address

	Total active energy in kWh
	Imported active energy in kWh
	Exported active energy in kWh
	Total reactive energy in kVArh
	Phase to neutral voltage

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	Current of phase
	Instantaneous active power KW
	Frequency
	Power factor
	Address
	Baud rate
	Parity bit

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	Stop bit

3.4 Setup Mode

The user need keep pressing the button  seconds to enter into the Set-up Mode. Some menu items, such as address, require to input the digit numbers for setting while the others, such as baud rate, require selection from a number of menu options.
Long press button to enter into the setup mode;
Short press the button to select the setting menu.
Long press the button again to access to the edit interface. Short press button to select the required digits or selections from the menu option. After setting, please remember to wait 3 seconds to confirm the setting;
If it is the digit number setting, after setting the first digit and waiting 3s, the next digit will flash and repeat the 3rd option until all the settings are done.
short press the button to move to the next setting page. If without any operation, waiting for 10 seconds to return to the display menu.

Settings interface	Set status	Optional configuration
		**Address setting** S501-45-MOD-MID Range: 001~250 Range: 001~247 Default: 001
		**Baud rate setting** **- S501-45-MOD-MID** Option: 2.4k, 4.8k, 9.6k, 19.2k, 38.4kbps Default: 9600bps
		**Parity bit setting** Option: EVEN, ODD, NONE S501-45-MOD-MIDB default: EVEN S501-45-MOD-MID default: NONE
		**Stop bit setting** Option: 1, 2 Default: 1

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3.5 Modbus register Map

Function code	
04	to read input parameters

Address (Register)	Input Register Parameter			Modbus Protocol Start Address Hex	
	Parameters	**Unit**	**Format**	**Hi byte**	**Low Byte**
30001	Voltage	Volts	Float	00	00
30007	Current	Amps	Float	00	06
30013	Active power	Watts	Float	00	0C
30019	Apparent power	VA	Float	00	12
30025	Reactive power	VAr	Float	00	18
30031	Power factor	None	Float	00	1E
30071	Frequency	Hz	Float	00	46
30073	Import active energy	kWh	Float	00	48
30075	Export active energy	kWh	Float	00	4A
30077	Import reactive energy	kVArh	Float	00	4C
30079	Export reactive energy	kVArh	Float	00	4E
30081	VAh	kVAh	Float	00	50
30083	Ah	Ah	Float	00	52
30085	Total system power demand	W	Float	00	54
30087	Maximum total system power demand	W	Float	00	56
30089	Import system power demand	W	Float	00	58
30091	Maximum Import system power demand	W	Float	00	5A
30093	Export system power demand	W	Float	00	5C
30095	Maximum Export system power demand	W	Float	00	5E
30259	current demand.	Amps	Float	01	02
30265	Maximum current demand.	Amps	Float	01	08
30343	Total active energy	kWh	Float	01	56
30345	Total reactive energy	kVArh	Float	01	58
320131	CO2	Kg	Float	4E	A2
310001	Total import active energy	Wh	Int64	27	10
310005	Total export active energy	Wh	Int64	27	14
310009	Total import reactive energy	VArh	Int64	27	18
310013	Total export reactive energy	VArh	Int64	27	1C
310017	Total apparent energy	VAh	Int64	27	20
310021	Total active Energy	Wh	Int64	27	24
310025	Total reactive Energy	VArh	Int64	27	28

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310251	Phase 1 line to neutral volts	0.1V	Int32	28	0A
310257	Phase 1 current	0.001A	Int32	28	10
310263	Phase 1 active power	0.1W	Int32	28	16
310269	Phase 1 apparent power	0.1VA	Int32	28	1C
310275	Phase 1 reactive power	0.1VAr	Int32	28	22
310281	Phase 1 power factor	0.01	Int32	28	28
310309	Frequency	0.01Hz	Int32	28	44
310311	CO2	0.001Kg	Int64	28	46

Function code	
10	to set holding parameter
03	to read holding parameter

40021	Meter ID	Float	00	14	Ranges from:1 to 247, Default ID is 1. **Length : 4 byte** **Data Format : Float**
40023	Pulse 1 Rate	Float	00	16	Write pulse rate index: N = 0 to 6 0-- 0.001 kwh/imp 1-- 0.01kwh/imp 2--0.1kwh/imp 3--1kwh/imp **Length : 4 byte** **Data Format : Float**
40029	Baud rate	Float	00	1C	Write baud rate for Modbus Protocol, where: 0 = 2400 baud 1 = 4800 baud 2 = 9600 baud (default) 3=19200 baud 4=38400 baud **Length : 4 byte** **Data Format : Float**
40059	Time of scroll display	Float	00	3A	Time of scroll display Default 0:does not display in turns， units:s Range from 0~255, **Length : 4 byte Data Format : Float**

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40071	CO_2 RATE	hex	00	46	Carbon emissions per kWh of electricity 00.0000~60.0000 kg Example:0x01 = 0.0001 Default:0.5703(0X00001647) **Length : 4 byte** **Data Format : hex**
40087	Pulse 1 output mode	Float	00	56	Write Modbus Protocol input parameter for pulse out 1: 0001: Import active energy, 0002: Total active energy (Imp + exp) 0004: Export active energy (default). 0005: Import reactive energy 0006:Total reactive energy (Imp+ exp) 0008: Export reactive energy **Length : 4 byte** **Data Format : Float**
461457	Reset historical data	Hex	F0	10	00 00: reset demand info **Length : 2 byte Data Format : Hex**
463745	Time of scroll display	BCD	F9	00	Time of scroll display Default 0:does not display in turns Range from:0-30s **Length : 2 byte** **Data Format : BCD**
463761	Pulse 1 output	Hex	F9	10	0000:0.001kWh/imp(default) 0001:0.01kWh/imp 0002:0.1kWh/imp 0003:1kWh/imp **Length : 2 byte** **Data Format : HEX**
463777	Measurement mode	Hex	F9	20	Measurement mode 0001:mode 1 (total = import) 0002:mode 2 (total = import + export） (default) 0003:mode 3 (total = import - export) **Length : 2 byte Data Format : HEX**
464513	Serial number	Unsigned int32	FC	00	Serial Number **Length : 4 byte** **Data Format: Unsigned int32**
464515	Meter code	Hex	FC	02	Meter code = 00 20 **Length: 2 bytes Data Format: Hex** Note: read only

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464645	Software version	Hex	FC	84	Software version:XX.YY First byte=XX,Second byte=YY **Length : 2 byte Data Format : Hex** Note: read only

Chapter 4. Declaration of Conformity MID

SENECA declares under our sole responsibility as the manufacturer that the three phase multi-function electrical energy counter **S501-45-MOD-MID** correspond to the production model described in the EU-type examination certificate and the requirements of the Directive 2014/32/EU.
Type examination certificate number MID/B/25/139
Identification number of the Notified Body: 0598.

If you have any question, please feel free to contact our sales team.

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