

SEM1

Multi-function single phase meter



- Multi-parameter measurements
- Accuracy Class 1 active energy
- Wi-Fi available (SEM1-WL only)
- RS485 Modbus RTU
- Bi-directional measurement
- Easy connection solution
- Compact design

User Manual
V1.00

Statements

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Eastron reserves all legal rights.

Eastron reserves the right to amend the product specifications in this manual without prior notice. Before placing an order, please contact our company or local agent to get the latest specifications.

Content

Version History	1
Risk Information	2
Chapter 1. Introduction	3
1.1 Introduction	3
Chapter 2. Technical Parameters	4
2.1 Specifications	4
2.2 Dimensions	7
2.3 Mounting	7
2.4 RJ12 Terminal Definition	8
2.5 Marking	8
2.6 Wiring Diagram	9
Chapter 3. Operation	10
3.1 Definition of button and LEDs	10
3.2 Maintenance	10
Chapter 4. Communication Protocol	11
4.1 Input Register	11
4.2 Holding Register	12

Version History

Version	Date	Changes
1.00	2025-4-15	Initial issue
1.01	2025-8-7	Add information about SEM1-M/WL

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 meter only in dry surroundings.
- ✧ Do not mount the meter in an explosive area or expose the meter 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 meter.
- ✧ Do not touch the meter 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 meter, and will cause no warranty.
- ✧ Do not drop, or allow strong physical impact on the meter 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 Meter 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 Meter.
- ✧ The Disconnection Device shall be marked as the Disconnection Device for the Multi Function Energy Meter.

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.

Chapter 1. Introduction

1.1 Introduction

Eastron SEM1 is a new generation din rail mounted energy meter, equipped with Wi-Fi and RS485 connectivity. With multi parameters measurement, SEM1 can be used for energy monitoring of various applications, such as solar PV system, smart building, industrial equipment, etc.

Eastron SEM1 measures characteristics of 1P2W network, including voltage, frequency, current, power and active and reactive energy, imported or exported, power factor etc. Energy is measured in terms of kWh and kVArh.

Eastron SEM1 is designed in compact size. To save installation and maintenance cost, all terminals of SEM1 adopt spring terminals or RJ terminals for easy connection.

The measurement mode of SEM1 is total mode. In total mode, import and export energy will be measured separately. Total energy equals to import energy plus export energy.

Chapter 2. Technical Parameters

2.1 Specifications

Table 1

Electrical Characteristics		
Measurement Accuracy	Power	$\pm 1\%$
	Active Energy	$\pm 1\%$ IEC 62053-21 Class 1
	Reactive Energy	$\pm 2\%$
	Frequency	$\pm 0.2\%$
	Current	$\pm 0.5\%$ (4A to 120A) $\pm 1\%$ (1A to 4A) $\pm 3\%$ (0.06A to 1A)
	Voltage	$\pm 0.5\%$
	Power Factor	± 0.1
Data Update Rate		Active Power:50mS(RS485), 100mS(Wi-Fi)
Input-Voltage	Un	230V
	Working Voltage Range	100 to 277 V ac L-N
	Frequency Range	50/60Hz
Mechanical Characteristics		
Net Weight		$\approx 68\text{g}$ (SEM1)
IP Degree of Protection (IEC 60529)		IP51 Front Display IP20 Whole Meter
Dimensions (DxHxW)		68.5*94.5*19mm
Mounting		DIN Rail 35mm
Material of Meter Case		Self-extinguishing UL 94 V-0
Mechanical Environment		M1
Environmental Characteristics		
Operating Temperature		-40 °C to +70°C
Storage Temperature		-40 °C to +85°C
Humidity Rating		$\leq 95\%$ RH , non-condensing
Pollution Degree		2
Altitude		Up to 2000m
Vibration		10Hz to 50Hz, IEC 60068-2-6
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
Safety		
Measurement Category		Per IEC61010-1 CAT III
Current Inputs		Require External Current Transformer for Insulation
Over-voltage Category		CAT III
Protective Class		II
Communications		

Interface 1	RS485 Port
Interface 1 Protocol	MODBUS RTU
Communication Address	1 to 247
Transmission Mode	Half Duplex
Data Type	Floating Point
Transmission Distance	1000m Maximum
Transmission Speed	2400/4800/9600(Default)/19200/38400/115200bps
Parity	NONE(Default)/ ODD / EVEN
Stop Bits	1 or 2
Response Time	<50 ms
Interface 2	Wi-Fi
Interface 2 Protocol	MODBUS TCP
Data Type	Floating Point
RF Band	2.4 GHz to 2.5 GHz
Max. RF Power	<20 dBm
Wi-Fi Protocol	802.11 b/g/n
Wi-Fi Range	Up to 30m / 100ft indoors and 50m / 160ft outdoors (Depends on local conditions)

Table 2

Note: ● = included
— = excluded

Features	Models	
	SEM1-WL (-2)	SEM1-M (-2)
Instantaneous Measurements		
Current	●	●
Voltage L-N	●	●
Voltage L-L	—	—
Frequency	●	●
Active Power	●	●
Reactive Power	●	●
Apparent Power	●	●
Power Factor	●	●
Energy Values		
Active Energy	●	●
Reactive Energy	●	●
Apparent Energy	—	—
Network		
1 Phase 2 Wires	●	●
2 Phase 3 Wires	—	—
3 Phase 3 Wires	—	—
3 Phase 4 Wires	—	—
CT Programmable	●	●
PT Programmable	—	—
Inputs and Outputs		
Alarms	—	—
Communications		

RS485	•	•
Wi-Fi	•	—

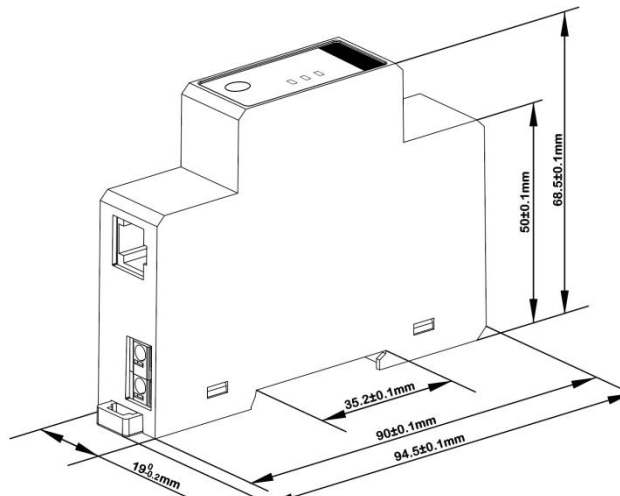
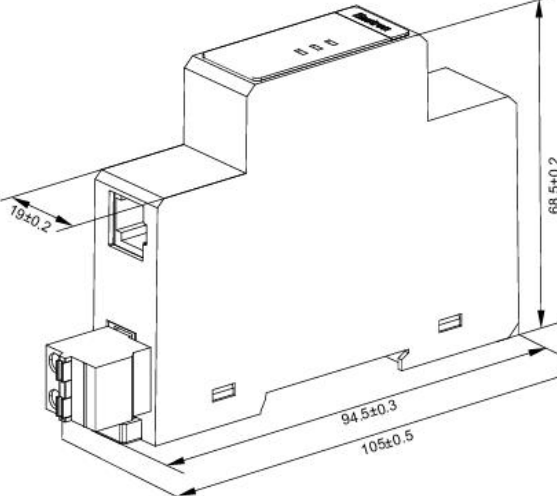
Table 3

Model	Communication	Terminal (AC)
SEM1-WL	RS485+WiFi (Internal antenna)	Spring type
SEM1-WL-2	RS485+WiFi (External antenna)	Plug-in type
SEM1-M	RS485	Spring type
SEM1-M-2	RS485	Plug-in type

Technical Standards:

- [1] EN IEC61326-1: 2021 Electromagnetic Compatibility Directive - Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements
- [2] EN IEC 61326-2-3: 2021 Electromagnetic Compatibility Directive
- [3] EN61010-1:2010+A1:2019 Low Voltage Directive 2014/35/EU - Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements
- [4] EN61010-2-030:2010 Low Voltage Directive 2014/35/EU - Particular requirements for testing and measuring circuits
- [5] EN 50470-3:2022 Electricity metering equipment - Part 3: Particular requirements - Static meters for AC active energy (class indexes A, B and C)
- [6] EN IEC62053-21: 2021 Electricity metering equipment - Particular requirements - Part 21, Static meters for AC active energy (classes 0,5,1 and 2)

2.2 Dimensions

SEM1-M/WL	SEM1-M/WL-2
 Height*Width*Depth=94.5mm*19mm*68.5mm	 Height*Width*Depth=94.5mm*19mm*68.5mm

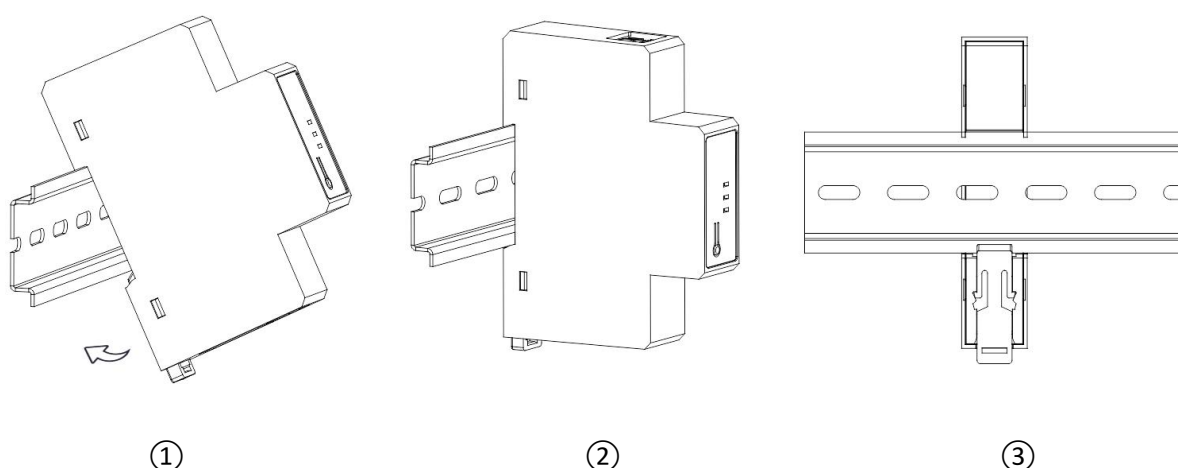
2.3 Mounting

Step 1: Select a 35mm-wide DIN rail, Pull down the back-end clip on the meter to unlock the mounting mechanism.

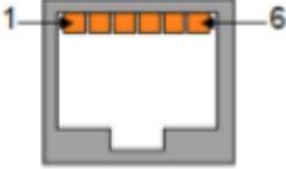
Step 2: Align Upper Slot with DIN Rail. Position the upper slot of the meter's DIN rail groove onto the DIN rail, ensuring full contact (see Figure 1).

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 meter firmly onto the DIN rail (see Figure 3).



2.4 RJ12 Terminal Definition

Interface	Colour-definition
	1.Brown: I_A+
	2.White: I_A-
	3.Black: I_B+
	4.Orange: I_B-
	5.Red: I_C+
	6.Yellow: I_C-

2.5 Marking

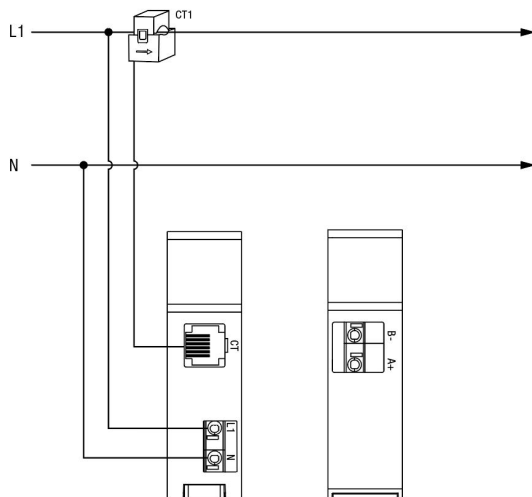


(SEM1-WL-2 nameplate and laser printing)



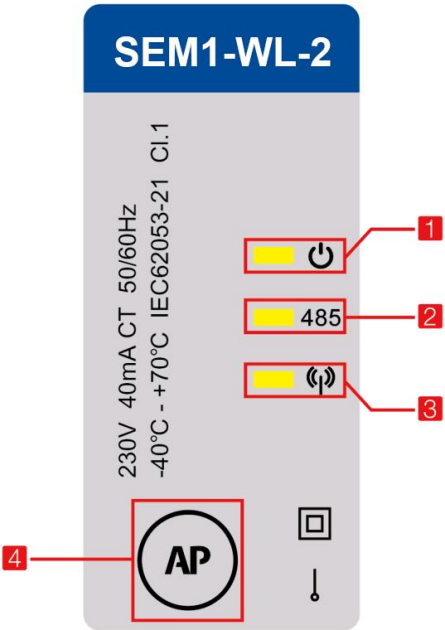
(SEM1-M-2 nameplate and laser printing)

2.6 Wiring Diagram



Chapter 3. Operation

3.1 Definition of button and LEDs

Interface	Definition	Introduction
	1.Power LED (Red)	1.Stay on: Light up when the meter is powered on with no load. 2.Flashing: Blinks when a load is connected.
	2.RS485 LED (Green)	1.Stay on: During the OTA upgrading. 2.Flashing: Blinks when the meter is communicating normally.
	3.Wi-Fi LED (Blue)	In the AP mode: 1.Stay on: Light up when the meter enter the AP mode. 2.Flashing: Blinks when the meter is disconnected to the network. 3.Off: Light off after the meter is connected to the network.
	4.AP Key	Press and hold for 3 seconds to enter/exit AP mode; Press and hold for 10 seconds to reset communication parameters.

3.2 Maintenance

In normal use, little maintenance is required. As appropriate for service conditions, isolate electrical power, inspect the unit and remove any dust or other foreign material present. Periodically check all connections for freedom from corrosion, particularly if vibration is present.

The front of the case should be wiped with a dry cloth only. Use minimal pressure, especially over the viewing window area. If necessary, wipe the case with a dry cloth. Water should not be used. If the case exterior or terminals should be contaminated accidentally with water, the unit must be thoroughly dried before further use. Should it be suspected that water might have entered the unit, factory inspection and refurbishment is recommended.

In the unlikely event of a repair being necessary, it is recommended that the unit be returned to the factory or nearest Eastron distributor.

Chapter 4. Communication Protocol

SEM1-WL / SEM1-M RS485 Modbus RTU

4.1 Input Register

Function code	Description
04	Read Input Register

Address (Register)	Input Register Parameter				Modbus Protocol Start Address Hex	
	Description	Length (bytes)	Data Format	Unit	H bytes	Lo bytes
30001	L1 line to neutral RMS volts	4	Float	Volts	00	00
30007	L1 RMS current	4	Float	Amps	00	06
30013	L1 active power	4	Float	Watts	00	0C
30019	L1 apparent power	4	Float	VA	00	12
30025	L1 reactive power	4	Float	VA _r	00	18
30031	L1 power factor	4	Float	None	00	1E
30071	Frequency	4	Float	Hz	00	46
30073	Import active energy	4	Float	kWh	00	48
30075	Export active energy	4	Float	kWh	00	4A
30077	Import reactive energy	4	Float	kvarh	00	4C
30079	Export reactive energy	4	Float	kvarh	00	4E
30081	Apparent energy	4	Float	kVAh	00	50
30083	Ah	4	Float	Ah	00	52
30085	Total active power demand	4	Float	W	00	54
30087	Maximum total active power demand	4	Float	W	00	56
30259	L1 current demand	4	Float	Amps	01	02
30265	MMaximum L1 current demand	4	Float	Amps	01	08
30343	Total kWh	4	Float	kWh	01	56
30345	Total kVarh	4	Float	Kvarh	01	58
310001	Total import active energy	8	Int64	Wh	27	10
310005	Total export active energy	8	Int64	Wh	27	14
310009	Total import reactive energy	8	Int64	VA _r h	27	18
310013	Total export reactive energy	8	Int64	VA _r h	27	1C

310017	Total apparent energy	8	Int64	VAh	27	20
310021	Total active Energy	8	Int64	Wh	27	24
310025	Total reactive Energy	8	Int64	VArh	27	28
310251	L1 line to neutral volts	4	Int32	0.1V	28	0A
310257	L1 current	4	Int32	0.001A	28	10
310263	L1 active power	4	Int32	0.1W	28	16
310269	L1 apparent power	4	Int32	0.1VA	28	1C
310275	L1 reactive power	4	Int32	0.1VAr	28	22
310281	L1 power factor	4	Int32	0.01	28	28
310309	Frequency	4	Int32	0.01Hz	28	44
310311	CO2	8	Int64	0.001Kg	28	46
315101	L1 Import inductive reactive energy in Q1	4	Float	kVarh	3A	FC
315107	L1 Import capacitive reactive energy in Q2	4	Float	kVarh	3B	02
315113	L1 Export inductive reactive energy in Q3	4	Float	kVarh	3B	08
315119	L1 Export capacitive reactive energy in Q4	4	Float	kVarh	3B	0E
320131	CO2	4	Float	Kg	4E	A2

4.2 Holding Register

Function code	Description
10	Write parameter holding register
03	Read parameter holding register

Address Register	Parameter	Modbus Protocol Start Address Hex		Valid range	Mode (ro: read only wo: write only r/w: read/write)
		High bytes	Low bytes		
40003	Demand Period	00	02	Demand Period time, default 60, unit min. Range: 0 to 60, 0 represents real-time update (demand updated every 1 second). Length : 4 bytes Data Format : Float	r/w

40019	Parity and Stop Bit	00	12	Write the network port parity/stop bits for MODBUS Protocol, where: 0 = One stop bit and no parity 1 = One stop bit and even parity 2 = One stop bit and odd parity 3 = Two stop bits and no parity Default: 0 = One stop bit and no parity Length: 4 bytes Data Format: Float	r/w
40021	Modbus Address	00	14	Write the Modbus Address address: 1 to 247 for MODBUS Protocol, default 1. Length : 4 bytes Data Format : Float	r/w
40029	Baud Rate	00	1C	Write the baud rate for MODBUS Protocol, where: 0 = 2400 baud 1 = 4800 baud 2 = 9600 baud 3 = 19200 baud 4 = 38400 baud 6 = 115200 baud Default: 2 = 9600 baud Length : 4 bytes Data Format : Float	r/w
40071	CO2 RATE	00	46	Carbon emissions per kWh of electricity range: 00.0000~60.0000 kg Default: 0.5703kg/kWh Length : 4 bytes Data Format : hex	r/w
461457	Reset	F0	10	00 00: reset the Maximum demand Length: 2 bytes Data Format: Hex	wo
463777	Measurement mode	F9	20	0001: mode 1 (total = import) 0002: mode 2 (total = import + export) 0003: mode 3 (total = import - export) Default: 0002: mode 2 (total = import + export) Length : 2 byte Data Format : HEX	r/w
464513	Serial Number	FC	00	Serial Number Length : 4 bytes Data Format : unsigned int32	ro
464515	Meter Code	FC	02	Meter Code = 11 04 Length: 2 bytes Data Format: Hex	ro

464785	Signal strength (only for SEM1-WL)	FD	10	00 00: Zero signal 00 01: 1 bar of WiFi signal 00 02: 2 bar of WiFi signal 00 03: 3 bar of WiFi signal 00 04: 4 bar of WiFi signal 00 05: 5 bar of WiFi signal 00 06: 6 bar of WiFi signal 00 07: Unconnected network 00 08: Unconfigured network 00 09: AP Mode Length : 2 byte Data Format : Hex	ro
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IF you have any question, please feel free to contact our sales team.

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