SEM3

Multi-function 3-phase energy meter

- Multi-parameter measurements
- Accuracy Class 1 active energy
- Wi-Fi available (SEM3-WL only)
- RS485 Modbus RTU
- Modbus TCP(SEM3-WL only)
- 2 Measurement modes
- Easy connection solution
- Compact design
- Support 1x3p or 3x1p load measurements
- Phase sequence error warning
- Phase sequence switchable
- Current Reverse Setting
- Four-quadrants reactive energy

User Manual
V1.02

 www.eastrongroup.com

Statements

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

Version	Date	Changes
1.00	2024-8-30	Initial issue
1.01	2025-2-12	Modifiy Communication Protocol
1.02	2025-8-6	Modifiy Communication Protocol Add Product Characteristics

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, b1lank 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 SEM3 is a new generation din rail mounted energy meter, equipped with Wi-Fi and RS485 connectivity. With multi parameters measurement, SEM3 can be used for energy monitoring of various applications, such as PV energy management, smart building, industrial equipment, etc. The meter can be used as 1x 3phase energy meter or 3 individual single phase energy meter. In single phase mode, 3 external CTs can be set with different CT ratio for three independent loads.

Eastron SEM3 measures and displays the characteristics of 1P2W, 3P4W and 3P3W supplies, including voltage, frequency, current, power and active and reactive energy, imported or exported, power factor, Max. demand etc. Energy is measured in terms of kWh, kVArh and kVAh. It provides 4 quadrant measurement.

Eastron SEM3 is designed in compact size. To save installation and maintenance cost, all terminals of SEM3 adopt spring terminals or RJ terminals for easy connection. Warning is also available in case the phase sequence error happens.

Eastron SEM3 provides two measurement modes: Total mode and PV mode. In total mode, import and export energy will be measured separately. In PV mode, import and export energy will be balanced first, and the balanced value will be counted in import or export energy.

Chapter 2. Technical Parameters

2.1 Specifications

Table 1

Electrical Characteristics		
Type of Measurement		RMS Including Harmonics on Three Phase AC System (3P, 3P+N)
Measurement Accuracy	Power	± 1% IEC 61557-12 Class 1
	Active Energy	± 1%
	Reactive Energy	± 2%
	Frequency	± 0.2%
	Current	± 0.5% (4A to 120A) ± 1% (1A to 4A) ± 3% (0.06A to 1A)
	Voltage	± 0.5%
	Power Factor	± 0.1
Data Update Rate		Active Power:50mS(RS485), 100mS(Wi-Fi)
Input-Voltage	Un	3*230V(L-N)/400V(L-L)
	Working Voltage Range	90 to 277 V ac L-N 156 to 480 V ac L-L
	Frequency Range	50/60Hz
Mechanical Characteristics		
Weight		≈100g (SEM3)
IP Degree of Protection (IEC 60529)		IP51 Front Display IP20 Whole Meter
Dimensions (DxHxW)		68.5*90*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		≤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	2400/4800/9600/19200/38400/115200bps
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	
	SEM3-WL	SEM3-M
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	●	●
Demand Values		
Current	●	●
Active, Reactive, Apparent Power	●	●
Maximum Demand Values		
Maximum Current	●	●
Maximum Active Power	●	●
Maximum Reactive Power	—	—

Maximum Apparent Power	—	—
Min. and Max. Value		
Active Power Per Phase and Total	—	—
Reactive Power Per Phase and Total	—	—
Apparent Power Per Phase and Total	—	—
PF Per Phase and Total	—	—
Current Per Phase and Average	—	—
THDi Per Phase	—	—
THDu L-L and L-N	—	—
Power-Quality Values		
Total Harmonic Distortion	●	●
Individual Harmonic Distortion	—	—
Running Hour	●	●
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	●	—

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

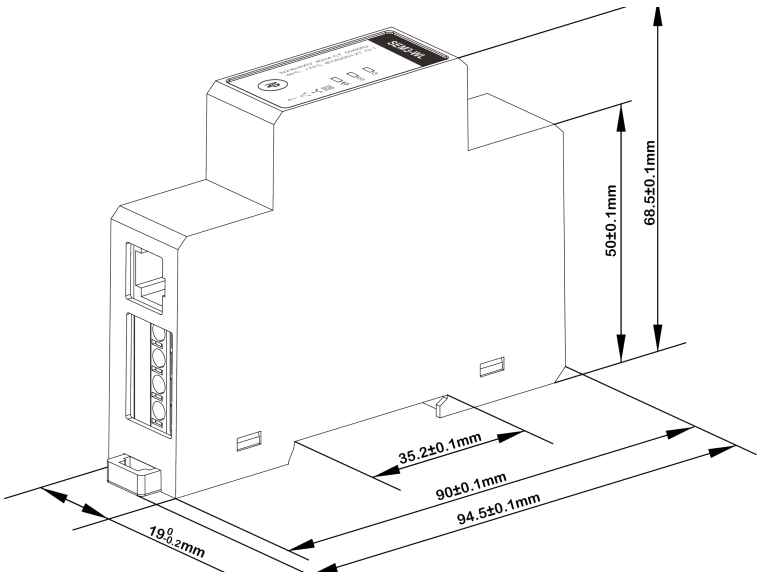
[3] EN61010-1:2010+A1:2019 Low Voltage Directive 2014/35/EU - Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements

[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] IEC62053-21:

2.2 Dimensions



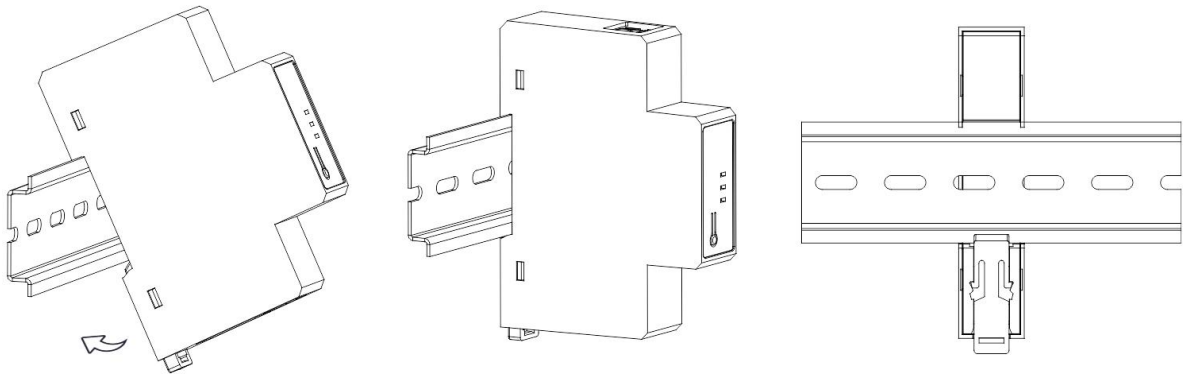
Depth: 68.5mm

Height: 90mm

Width: 19mm

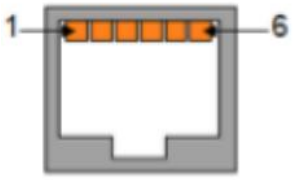
2.3 Mounting

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).

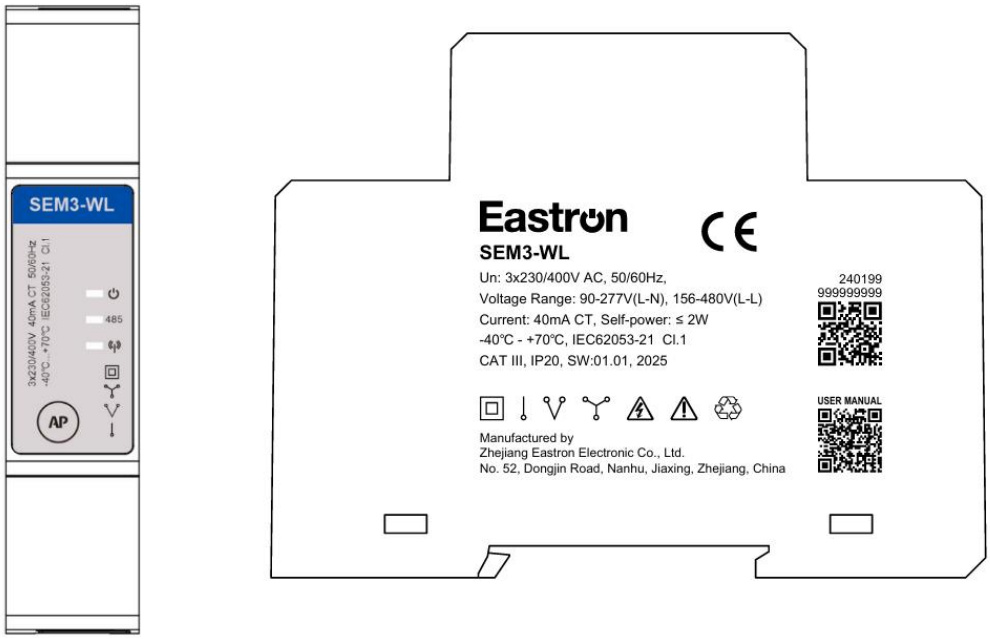


① ② ③

2.4 RJ12 Terminal Definition

Interface	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-

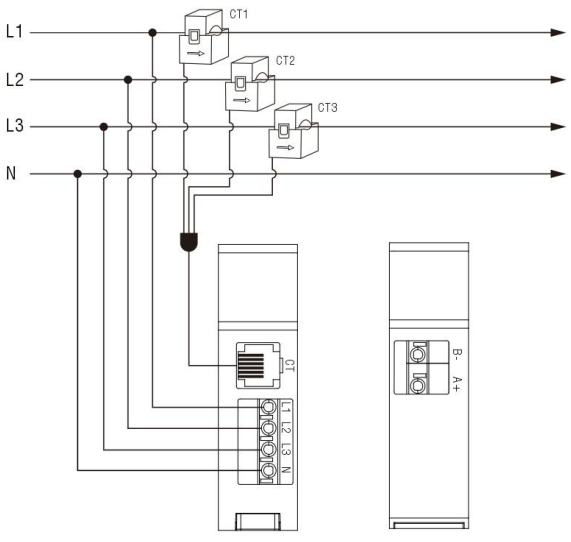
2.5 Marking



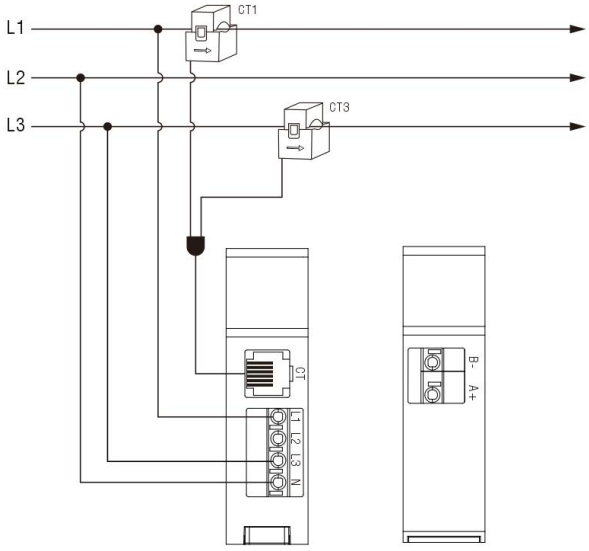
(SEM3-WL nameplate and laser printing)

(SEM3-M nameplate and laser printing)

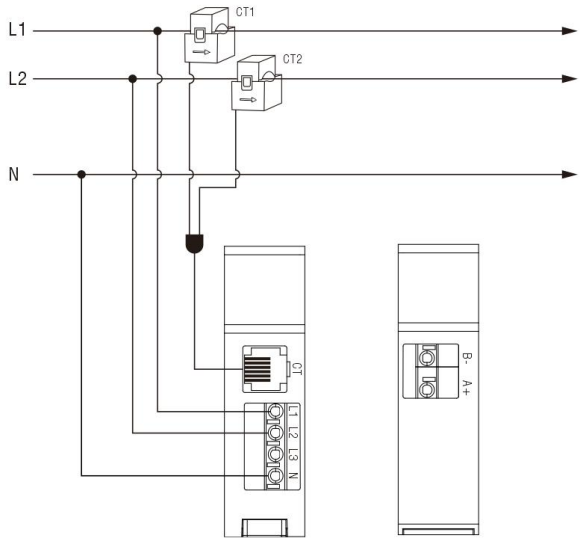
2.6 Wiring Diagram



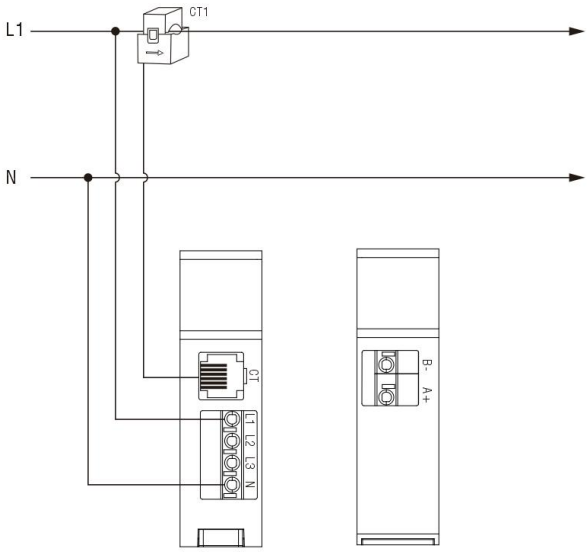
3P4W 3CTs



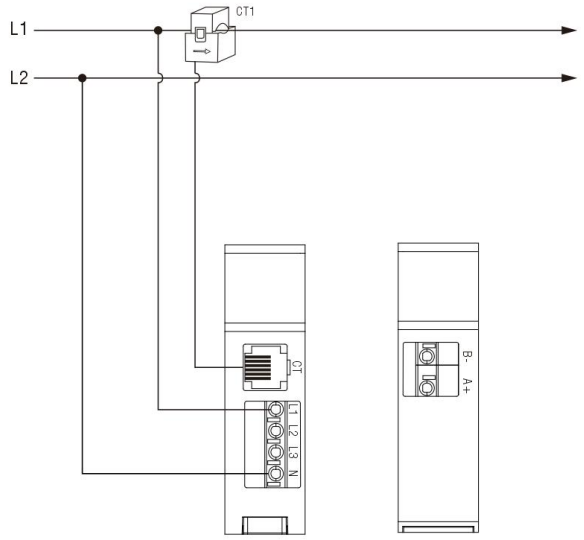
3P3W 2CTs



1P3W(L+L+N) 2CTs



1P2W(L+N) 1CT

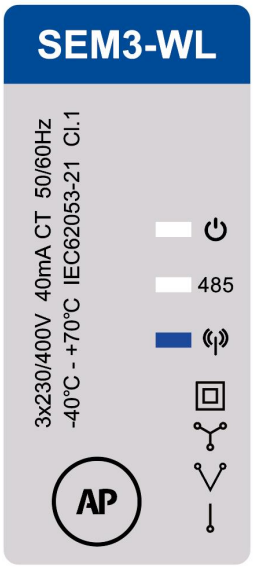


1P2W(L+L) 1CT

Chapter 3. Operation

3.1 Operation of Wi-Fi Communication

The meter is equipped with built-in Wi-Fi functionality. When powered on, the three LEDs on the front panel will flash during the self-check. Afterward, the Wi-Fi indicator will light up in blue, and the meter will enter AP mode, with the AP name formatted as "EM-serial number".



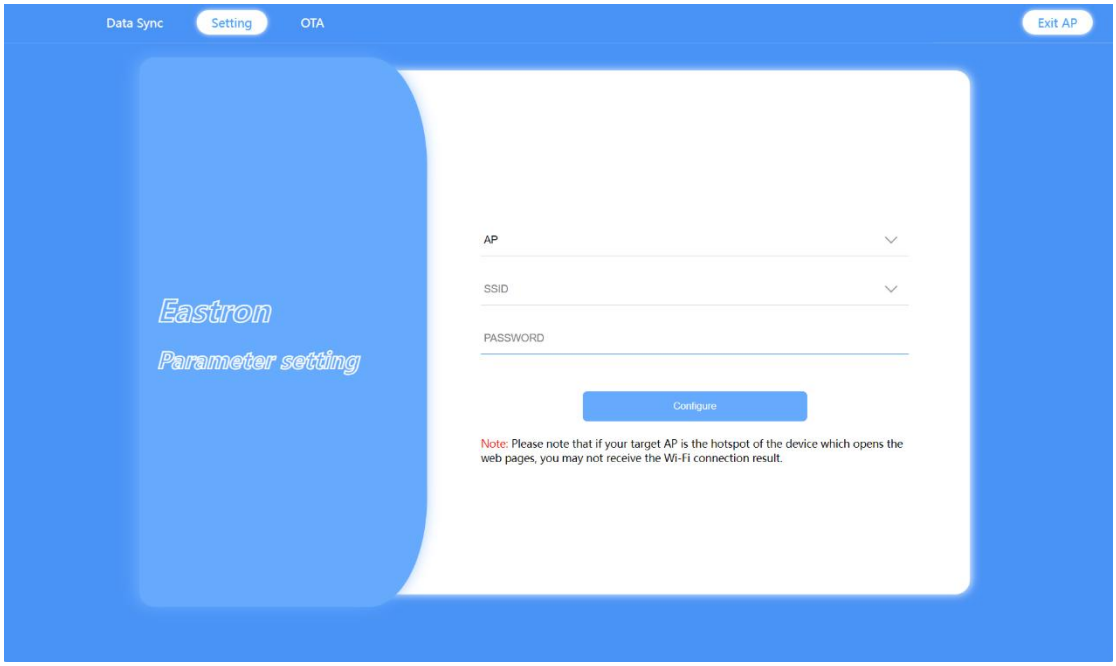
User can search all avaliable Wi-Fi AP by PC or Phone, in which the AP of the meter is listed.
For example:

Double click the AP of the meter “EM-240460817”, and enter the password to build the connection. Default password is the same as serial number, i.e. 240460817.

After a successful connection, the user can access the meter's built-in web server by entering 192.168.4.1 in a web browser.

The web-server including 3 pages: Data Sync, Setting and OTA (Over-The-Air Technology).

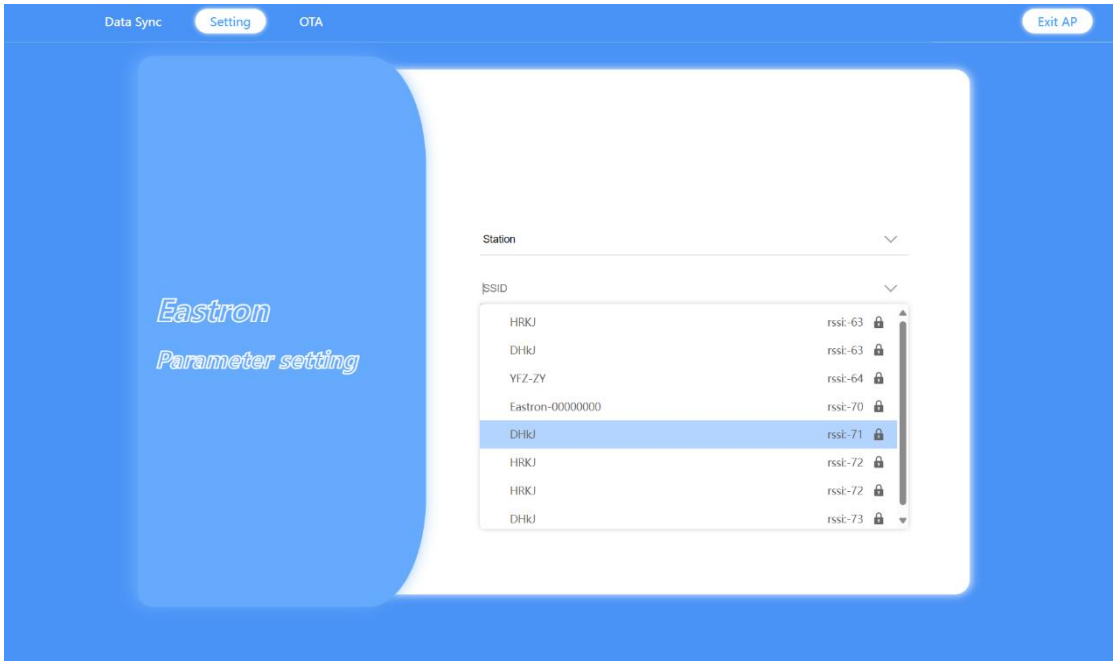
Data Sync: read instantaneous value of the energy meter.



Setting: set up Wi-Fi of the energy meter in AP mode and in station mode.

After a successful connection, the user can configure the meter to station mode and connect it to another available Wi-Fi network. The specific steps are as follows:

1.Select Station Mode: Choose "Station" mode in the settings interface.
2.Select Wi-Fi Network: Select the Wi-Fi network you wish to connect to from the list.
3.Enter Wi-Fi Password: Enter the password for the selected Wi-Fi network to complete the connection.

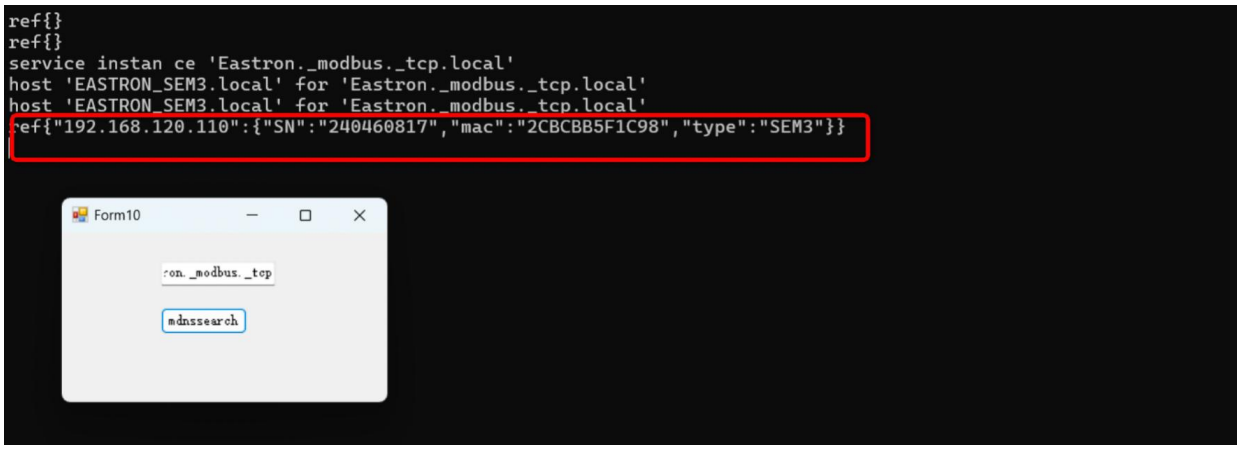


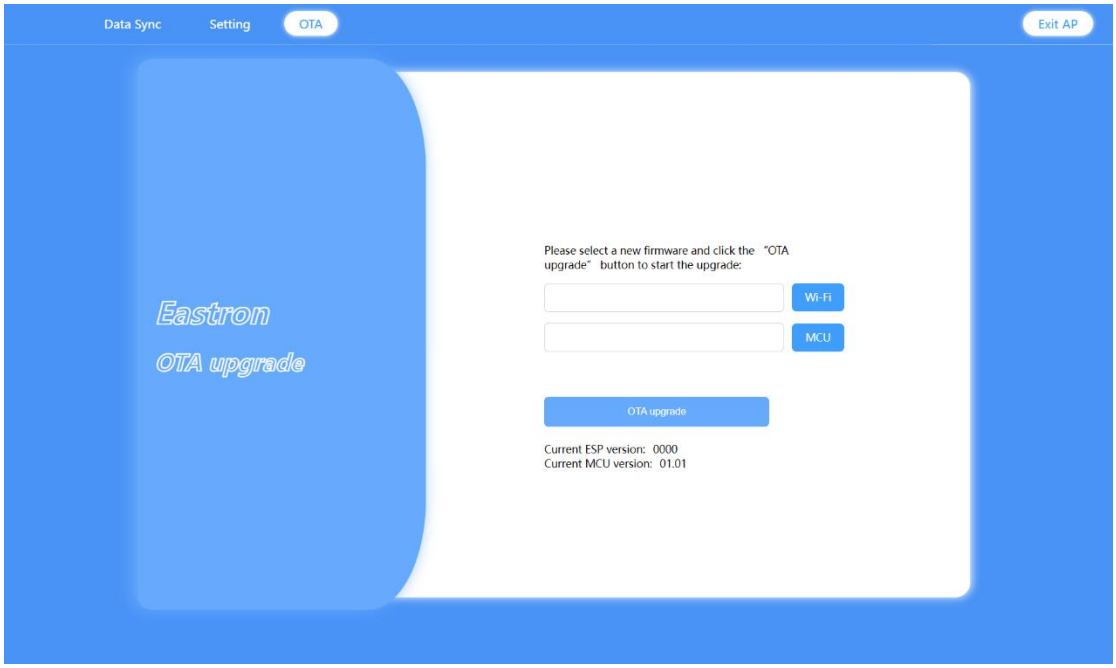
Wi-Fi Connection Status Indicator

During the connection process, the Wi-Fi LED on the front panel of the meter will keep flashing until the connection is established. Once the LED stops flashing and remains steadily lit, it indicates a successful connection.

Using MDNS to Retrieve Meter Information

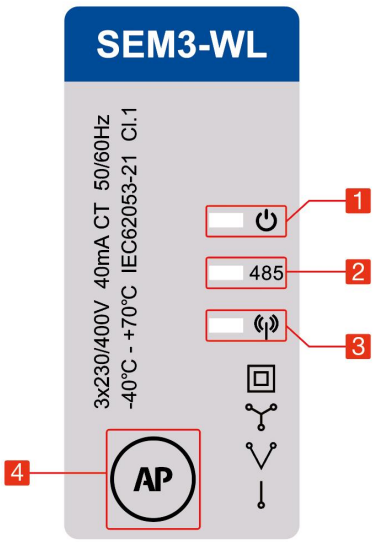
The user can use MDNS (Multicast DNS) to retrieve the meter's IP address, serial number (SN), MAC address, and model information. If multiple meters are presented on the same network, MDNS will list the information of all meters.





OTA: update the firmware of the meter over-the-air.

3.2 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.
		In the station mode: 1.Stay on: Light up when the Wi-Fi module malfunctions. 2.Flashing: Blinks during the meter wireless communicating.
	4.AP Key	Press and hold for 3 seconds to enter/exit AP mode; Press and hold for 10 seconds to reset communication parameters.

*Phase sequence error warning:
When the phase sequence is abnormal, all LED lights remain stay on; when initializing communication recovery by holding the button, the lights stay on for 3 seconds as a prompt and then turn off.
(Note: Abnormal phase sequence state refers to incorrect connections in the voltage and current sampling lines, such as connecting the A-phase line to the C-phase line.)

3.3 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

SEM3-Wi-Fi / SEM3-M RS485 Modbus RTU

4.1 Summary

Modbus RTU is a protocol based on serial communication, its frame structure is compact and efficient. A complete Modbus RTU frame includes the following parts:

Field	Length	Explain
Device address	One byte	The address of the machine is 1 to 247, with 0 reserved for broadcast addresses.
Function code (1)	One byte	Indicates the type of operation requested by the master device (such as reading registers, writing coils, etc.).
Data fields	Variable	Contains specific data such as register addresses and register values that are requested or responded to.
CRC check	Two bytes	Used to verify the integrity of frames and ensure the reliability of data transmission.

(1): Common function codes:
01: Read Coils
02: Read Discrete Inputs
03: Read the Holding register
04: Read the Input register
05: Write to Single Coil
16: Write to Multiple register

5.2 Modbus Frame Format
(1)Request frame

First byte							Last byte
rom the machine device address	Function code	The starting address of the register (high byte)	The starting address of the register (lower byte)	Number of registers (high byte)	Number of registers (lower byte)	CRC check (low byte)	CRC check (high byte)

The meaning of each byte is as follows:

1. Device address (byte 1): The host device specifies which slave device to communicate with through this address.
2. Function code (byte 2): Defines the type of operation requested by the host device.
3. Register starting address (bytes 3 and 4): indicates the starting address of the register to be operated. Byte 3 is the high byte, and byte 4 is the low byte. For example, 00 01 indicates that the register address is 0x00 01 .
4. Register number (byte 5 and byte 6): indicates the number of registers to be read or written. Byte 5 is the high byte and byte 6 is the low byte. For example, 00 02 indicates that two registers are read.
5. CRC check (bytes 7 and 8): Used to verify the integrity of a frame. CRC check is based on all bytes in the frame (from the device address to the data field). Byte 7 is the low byte (the lowest valid bit), and byte 8 is the high byte (the highest valid bit).

(2)Normal response frame

First byte							Last byte	
From the machine device	Function code	Number of bytes	First register data (high	First register data (low	Second register data (high	Second register data (low	CRC check (low byte)	CRC check (high byte)

address			byte)	byte)	byte)	byte)		

The meaning of each byte is as follows:

1. Device address (byte 1): Consistent with the device address in the request frame, indicating the slave device address of the response.

2. Function code (byte 2): Consistent with the function code in the request frame, indicating the operation type.

3, number of bytes (bytes 3): indicates the number of bytes returned by the data. For example, if two registers are read and each register is 2 bytes, then the number of bytes is 4.

4. Data Fields (Bytes 4 to 7): These contain the register data returned by the slave device. Floating-point numbers (Float) are split into two 16-bit registers (4 bytes), with each register occupying 2 bytes. Eastron uses big-endian (Big-Endian) format, where Register 1 represents the high 16 bits (Bytes 1 and 2), and Register 2 represents the low 16 bits (Bytes 3 and 4). For example: the return data is 12 345678, where 12 34 indicates the value of the first register is 0x12 34 , and 56 78 indicates the value of the second register is 0x56 78 .

5. CRC check (bytes 8 and 9): Used to verify the integrity of the response frame. The CRC check is based on all bytes in the frame (from the device address to the data field).

(3)Abnormal response frame

First byte			Last byte	
From the machine device address	Abnormal function code (Feature code + 0x80)	Exception code	CRC check (low byte)	CRC check (high byte)

The meaning of each byte is as follows:

1. Device address (byte 1): Confirm whether the slave device address is consistent with the request frame.

2. Abnormal function code (byte 2): Check whether the highest bit of the function code is 1. Abnormal function code = normal function code + 0x80.

3. Exception code (byte 3): Illegal request.

4. CRC check (bytes 4 and 5): Used to verify the integrity of the response frame. CRC check is based on all bytes in the frame (from the device address to the data field).

4.2 Input Register

Function code	Description
04	Read Input Register

Address (Register)	Input Register Parameter				Modbus Protocol Start Address Hex		3 Ø 4 W	3 Ø 3 W	1 Ø 3 W	1 Ø 2 W	1 Ø 2 W 3CT
	Description	Length (bytess)	Data Format	Uint	H bytes	Lo bytes					
30001	L1 line to neutral RMS volts	4	Float	V	00	00	√	X	√	√	√
30003	L2 line to neutral RMS volts	4	Float	V	00	02	√	X	√	X	√
30005	L3 line to neutral RMS volts	4	Float	V	00	04	√	X	X	X	√
30007	L1 RMS current	4	Float	A	00	06	√	√	√	√	√
30009	L2 RMS current	4	Float	A	00	08	√	√	√	X	√

30011	L3 RMS current	4	Float	A	00	0A	√	√	X	X	√
30013	L1 active power	4	Float	W	00	0C	√	X	√	√	√
30015	L2 active power	4	Float	W	00	0E	√	X	√	X	√
30017	L3 active power	4	Float	W	00	10	√	X	X	X	√
30019	L1 apparent power	4	Float	VA	00	12	√	X	√	√	√
30021	L2 apparent power	4	Float	VA	00	14	√	X	√	X	√
30023	L3 apparent power	4	Float	VA	00	16	√	X	X	X	√
30025	L1 reactive power	4	Float	VAr	00	18	√	X	√	√	√
30027	L2 reactive power	4	Float	VAr	00	1A	√	X	√	X	√
30029	L3 reactive power	4	Float	VAr	00	1C	√	X	X	X	√
30031	L1 power factor	4	Float	None	00	1E	√	X	√	√	√
30033	L2 power factor	4	Float	None	00	20	√	X	√	X	√
30035	L3 power factor	4	Float	None	00	22	√	X	X	X	√
30037	L1 phase angle	4	Float	Degrees	00	24	√	X	√	√	√
30039	L2 phase angle	4	Float	Degrees	00	26	√	X	√	X	√
30041	L3 phase angle	4	Float	Degrees	00	28	√	X	X	X	√
30043	Average line to neutral RMS volts	4	Float	V	00	2A	√	X	√	√	X
30047	Average line RMS current	4	Float	A	00	2E	√	√	√	√	X
30049	Sum of line RMS currents	4	Float	A	00	30	√	√	√	√	√
30053	Total active power	4	Float	W	00	34	√	√	√	√	√
30057	Total apparent power	4	Float	VA	00	38	√	√	√	√	√
30061	Total reactive power	4	Float	VAr	00	3C	√	√	√	√	√
30063	Total power factor	4	Float	None	00	3E	√	√	√	√	X
30067	Total system phase angle	4	Float	Degrees	00	42	√	√	√	√	X
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	√	√	√	√	X
30085	Total active power demand	4	Float	W	00	54	√	√	√	√	√
30087	Maximum total active power demand	4	Float	W	00	56	√	√	√	√	√

30201	L1 to L2 volts	4	Float	V	00	C8	√	√	√	X	X
30203	L2 to L3 volts	4	Float	V	00	CA	√	√	X	X	X
30205	L3 to L1 volts	4	Float	V	00	CC	√	√	X	X	X
30207	Average line to line volts	4	Float	V	00	CE	√	√	X	X	X
30225	Neutral current	4	Float	A	00	E0	√	X	√	X	X
30235	L1 L/N volts THD	4	Float	%	00	EA	√	X	√	√	√
30237	L2 L/N volts THD	4	Float	%	00	EC	√	X	√	X	√
30239	L3 L/N volts THD	4	Float	%	00	EE	√	X	X	X	√
30241	L1 Current THD	4	Float	%	00	F0	√	√	√	√	√
30243	L2 Current THD	4	Float	%	00	F2	√	X	√	X	√
30245	L3 Current THD	4	Float	%	00	F4	√	√	X	X	√
30249	Average line to neutral volts THD	4	Float	%	00	F8	√	X	√	√	X
30251	Average line current THD	4	Float	%	00	FA	√	√	√	√	X
30255	Total system power factor	4	Float	None	00	FE	√	√	√	√	X
30259	L1 current demand	4	Float	A	01	02	√	√	√	√	√
30261	L2 current demand	4	Float	A	01	04	√	√	√	X	√
30263	L3 current demand	4	Float	A	01	06	√	√	X	X	√
30265	Maximum L1 current demand	4	Float	A	01	08	√	√	√	√	√
30267	Maximum L2 current demand	4	Float	A	01	0A	√	√	√	X	√
30269	Maximum L3 current demand	4	Float	A	01	0C	√	√	X	X	√
30335	L1 to L2 volts THD	4	Float	%	01	4E	X	√	√	X	X
30337	L2 to L3 volts THD	4	Float	%	01	50	X	√	X	X	X
30339	L3 to L1 volts THD	4	Float	%	01	52	X	X	X	X	X
30341	Average line to line volts THD	4	Float	%	01	54	X	√	X	X	X
30343	Total kWh	4	Float	kWh	01	56	√	√	√	√	√
30345	Total kVarh	4	Float	kVArh	01	58	√	√	√	√	√
30347	L1 import kWh	4	Float	kWh	01	5A	√	X	√	√	√
30349	L2 import kWh	4	Float	kWh	01	5C	√	X	√	X	√
30351	L3 import kWh	4	Float	kWh	01	5E	√	X	X	X	√
30353	L1 export kWh	4	Float	kWh	01	60	√	X	√	√	√
30355	L2 export kWh	4	Float	kWh	01	62	√	X	√	X	√
30357	L3 export kWh	4	Float	kWh	01	64	√	X	X	X	√
30359	L1 total kWh	4	Float	kWh	01	66	√	X	√	√	√

30361	L2 total kWh	4	Float	kWh	01	68	√	X	√	X	√
30363	L3 total kWh	4	Float	kWh	01	6A	√	X	X	X	√
30365	L1 import kVArh	4	Float	kVArh	01	6C	√	X	√	√	√
30367	L2 import kVArh	4	Float	kVArh	01	6E	√	X	√	X	√
30369	L3 import kVArh	4	Float	kVArh	01	70	√	X	X	X	√
30371	L1 export kVArh	4	Float	kVArh	01	72	√	X	√	√	√
30373	L2 export kVArh	4	Float	kVArh	01	74	√	X	√	X	√
30375	L3 export kVArh	4	Float	kVArh	01	76	√	X	X	X	√
30377	L1 total kVArh	4	Float	kVArh	01	78	√	X	√	√	√
30379	L2 total kVArh	4	Float	kVArh	01	7A	√	X	√	X	√
30381	L3 total kVArh	4	Float	kVArh	01	7C	√	X	X	X	√
30385	Resettable total active energy	4	Float	kWh	01	80	√	√	√	√	X
30387	Resettable total reactive energy	4	Float	kVArh	01	82	√	√	√	√	X
30389	Resettable import active energy	4	Float	kWh	01	84	√	√	√	√	X
30391	Resettable export active energy	4	Float	kWh	01	86	√	√	√	√	X
30393	Resettable import reactive energy	4	Float	kVArh	01	88	√	√	√	√	X
30395	Resettable export reactive energy	4	Float	kVArh	01	8A	√	√	√	√	X
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	VArh	27	18	√	√	√	√	√
310013	Total export reactive energy	8	Int64	VArh	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	√	√	√	√	√
315001	Total kWh - PV	4	Float	kWh	3A	98	√	X	X	X	X
315003	Total kVarh - PV	4	Float	kVarh	3A	9A	√	X	X	X	X
315005	Import kwh-PV	4	Float	kWh	3A	9C	√	X	X	X	X
315007	Export kwh-PV	4	Float	kWh	3A	9E	√	X	X	X	X
315009	Import kVArh-PV	4	Float	kVarh	3A	A0	√	X	X	X	X
315011	export kVArh-PV	4	Float	kVarh	3A	A2	√	X	X	X	X
315101	L1 Import inductive reactive energy in Q1	4	Float	kVarh	3A	FC	√	X	√	√	√
315103	L2 Import inductive reactive energy in Q1	4	Float	kVarh	3A	FE	√	X	√	X	√

315105	L3 Import inductive reactive energy in Q1	4	Float	kVarh	3B	0	√	X	X	X	√
315107	L1 Import capacitive reactive energy in Q2	4	Float	kVarh	3B	2	√	X	√	√	√
315109	L2 Import capacitive reactive energy in Q2	4	Float	kVarh	3B	4	√	X	√	X	√
315111	L3 Import capacitive reactive energy in Q2	4	Float	kVarh	3B	6	√	X	X	X	√
315113	L1 Export inductive reactive energy in Q3	4	Float	kVarh	3B	8	√	X	√	√	√
315115	L2 Export inductive reactive energy in Q3	4	Float	kVarh	3B	A	√	X	√	X	√
315117	L3 Export inductive reactive energy in Q3	4	Float	kVarh	3B	C	√	X	X	X	√
315119	L1 Export capacitive reactive energy in Q4	4	Float	kVarh	3B	E	√	X	√	√	√
315121	L2 Export capacitive reactive energy in Q4	4	Float	kVarh	3B	10	√	X	√	X	√
315123	L3 Export capacitive reactive energy in Q4	4	Float	kVarh	3B	12	√	X	X	X	√
315301	L1 capacitive reactive energy	4	Float	kVarh	3B	C4	√	X	√	√	√
315303	L2 capacitive reactive energy	4	Float	kVarh	3B	C6	√	X	√	X	√
315305	L3 capacitive reactive energy	4	Float	kVarh	3B	C8	√	X	X	X	√
315307	L1 inductive reactive energy	4	Float	kVarh	3B	CA	√	X	√	√	√
315309	L2 inductive reactive energy	4	Float	kVarh	3B	CC	√	X	√	X	√
315311	L3 inductive reactive energy	4	Float	kVarh	3B	CE	√	X	X	X	√

Notes:
1. The power factor has its sign adjusted to indicate the direction of the current. Positive refers to forward current, negative refers to reverse current.
2. The power sum demand calculation is for import–export.
3. Total kWh / kVarh equals to Import + export.

4.3 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	Low		

		bytes	bytes		
40001	Demand Time	00	00	Read minutes into first demand calculation. When the Demand Time reaches the Demand Period then the demand values are valid. Length: 4 bytes Data Format: Float	ro
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
40011	System Type	00	0A	Write system type: 1 = 1p2w 2 = 3p3w_2ct 3 = 3p4w 4 = 1p3w 10 = 1p2w_3ct 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
40051	CT1	00	32	CT1 range: 0005 to 9999A Default:120A Length : 4 bytes Data Format : Float	r/w

40057	Current Reverse Setting (Used when the transformer is reversed)	00	38	Set current reverse 0 = A import,B import,C import 1 = A export,B import,C import 2 = A import,B export,C import 3 = A export,B export,C import 4 = A import,B import,C export 5 = A export,B import,C export 6 = A import,B export,C export 7 = A export,B export,C export Default: 0 = A import,B import,C import (3p3w mode: only 0 and 7 available) (1P3w mode: only 0-3 available) (1P2w mode: only 0 and 1 available) Length : 4 bytes Data Format :Float Each time the wiring system of the meter is switched, the current reverse setting will be automatically revert to mode "0".	r/w
40257	CT1 of L1	01	00	CT1 range: 0005 to 9999A Default: 120A Length : 4 bytes Data Format : Float Note: Only for 1p2w_3ct mode	r/w
40259	CT1 of L2	01	02	CT1 range: 0005 to 9999A Default: 120A Length : 4 bytes Data Format : Float Note: Only for 1p2w_3ct mode	r/w
40261	CT1 of L3	01	04	CT1 range: 0005 to 9999A Default: 120A Length : 4 bytes Data Format : Float Note: Only for 1p2w_3ct mode	r/w
41155	Current Transformer Phase Sequence Setting (1)	04	82	Writes four bytes to switch the current phase sequence. L1-L2-L3: 01 02 03 00 L1-L3-L2: 01 03 02 00 L2-L1-L3: 02 01 03 00 L2-L3-L1: 02 03 01 00 L3-L1-L2: 03 01 02 00 L3-L2-L1: 03 02 01 00 automatic switching: 00 00 00 00 Length : 4 bytes Data Format:Hex	r/w
461457	Reset	F0	10	00 00: reset the Maximum demand 00 03: reset the resettable energy Length: 2 bytes Data Format:Hex	wo

463781	Special Mode	F9	24	BIT1 = 1: Enable phase sequence alarm BIT1 = 0: Disable phase sequence alarm Length : 4 bytes Data Format:Hex	wo
463783	Alarm Parameter	F9	26	BIT0 = 1: Abnormal Phase sequence BIT0 = 0: Normal phase sequence Length : 4 bytes Data Format:Hex	ro
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
464545	LED Control	FC	20	Set the LED light status: xx yy zz ww xx: LED number: 1 to 255; Wi-Fi blue light number: 3 RS485 green light number: 4 yy: LED status: 1 = flashing 2 = stay on 3 = light off Flashing time interval setting: zz: light on duration: 1 = 500mS 2 = 1S 3 = 1.5S 4 = 2S ww: light off duration: 1 = 500mS 2 = 1S 3 = 1.5S 4 = 2S Length : 4 bytes Data Format: Hex	wo
464785	Signal Strength	FD	10	00 00: Zero signal 00 01: 1 bar of Wi-Fi signal 00 02: 2 bar of Wi-Fi signal 00 03: 3 bar of Wi-Fi signal	

				00 04: 4 bar of Wi-Fi signal 00 05: 5 bar of Wi-Fi signal 00 06: 6 bar of Wi-Fi signal 00 07: Unconnected network 00 08: Unconfigured network 00 09: AP Mode Length: 2 bytes Data Format: Hex (Only for SEM3-WL)	ro

Note:
(1):
In CT (Current Transformer) phase sequence configuration, should there be an error in the CT wiring phase s equence, please adjust the CT connections according to the following rules to ensure proper correspondenc e with the respective power lines.
First Byte: Indicates on which phase current the CT from the L1 phase power line is currently connected to o ur meter.
01: Represents the CT is connected on the L1 phase (correct position)
02: Represents the CT is connected on the L2 phase
03: Represents the CT is connected on the L3 phase
Second Byte: Indicates on which phase current the CT from the L2 phase power line is currently connected t o our meter.
01: Represents the CT is connected on the L1 phase
02: Represents the CT is connected on the L2 phase (correct position)
03: Represents the CT is connected on the L3 phase
Third Byte: Indicates on which phase current the CT from the L3 phase power line is currently connected to our meter.
01: Represents the CT is connected on the L1 phase
02: Represents the CT is connected on the L2 phase
03: Represents the CT is connected on the L3 phase (correct position)

For example:
If the first byte is 03, it indicates that the CT from the L1 phase power line is currently connected to our met er's L3 phase.

The fourth byte is fixed to 0.
Note: This parameter cannot be set in 1P2W mode.
All bytes written 00 indicates automatic switching (current must be greater than 10% IB to take effect).

Example:
The host sends a request frame and reads the demand period(register: 40003):

field	Value (hexadecimal)	explain
Device address	0x01	The address of the meter is 1
Function code	0x03	Read the hold register
Start address high byte	0x00	The high byte of the starting address of the register
Start address low byte	0x02	The low byte of the starting address of the register
Register count high byte	0x00	Read the high byte of the register count
Register count low byte	0x02	Read the low byte of the register count
The CRC check the low byte	0x65	The CRC check the low byte
The CRC check the high byte	0xCB	The CRC check the high byte

After receiving the request, the meter returns the data in the register. Suppose the demand period stored in the register is 60 minutes:

field	Value (hexadecimal)	explain
Device address	0x01	The address of the meter is 1
Function code	0x03	Read the hold register
Number of bytes	0x04	Number of bytes of data returned (2 registers x 2 bytes)
Data high byte 1	0x42	The high byte of the first register
Data low byte 1	0x70	The low byte of the first register
Data high byte 2	0x00	The high byte of the second register
Data low byte 2	0x00	The low byte of the second register
The CRC check the low byte	0xEF	The CRC check the low byte
The CRC check the high byte	0x90	The CRC check the high byte

The host sends out a request frame and sets the demand period to 15 minutes (register: 40003):

field	Value (hexadecimal)	explain
Device address	0x01	The address of the meter is 1
Function code	0x10	Write to multiple registers
Start address high byte	0x00	The high byte of the starting address of the register
Start address low byte	0x02	The low byte of the starting address of the register
Register count high byte	0x00	Write the high byte of the number of registers
Register count low byte	0x02	Write the low byte of the number of registers
Number of bytes	0x04	Number of bytes written into data (2 registers x 2 bytes)
Data high byte 1	0x41	The high byte of the first register
Data low byte 1	0x70	The low byte of the first register
Data high byte 2	0x00	The high byte of the second register
Data low byte 2	0x00	The low byte of the second register
The CRC check the low byte	0x67	The CRC check the low byte
The CRC check the high byte	0x91	The CRC check the high byte

After receiving the request, the machine sets the demand cycle to 15 minutes and returns a response frame:

field	Value (hexadecimal)	explain
Device address	0x01	The address of the machine is 1
Function code	0x10	Write to multiple registers
Start address high byte	0x00	The high byte of the starting address of the register
Low byte of starting address	0x02	The low byte of the starting address of the register
Register count high byte	0x00	Write the high byte of the number of registers
Register count low byte	0x02	Write the low byte of the number of registers
The CRC check the low byte	0xE0	The CRC check the low byte
The CRC check the high byte	0x08	The CRC check the high byte

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

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