

## SEM Three



**SEM Three** is a three-phase energy meter that allows to monitor electrical parameters of your installation including active energy, reactive energy, voltage, current, power, maximum demand and more. These parameters are measured separately for each phase, what gives SEM Three high versatility to work as a three-phase analyzer or a triple single-phase analyzer.

The design, occupying a single DIN rail module, allows that SEM Three can be placed easily at any installation.

The device has removal connectors for power supply (85-265 Vac), external current transformers (250 mA output) and RS-485 communications.

The communication of measured data works over Modbus RTU standard protocol.

### TECHNICAL CHARACTERISTICS

<b>Power circuit</b>	
Input voltage	110 .... 264 Vac
Frequency	47 .... 63 Hz
Maximum consumption	2,5 .... 4,5 VA
<b>Environmental conditions</b>	
Temperature range	-10 .... +60°C
Humidity range	5 .... 95%
<b>Mechanical characteristics</b>	
Enclosure material	Plastic UL94 – V0 Self-extinguishable
Protection grade	IP30
Unit dimensions (Width x Height x Length)	18 x 70 x 109 mm
Weight	70 g
Mounting	DIN Rail (1 module)
Maximum working altitude	2000 m
<b>Serial interface</b>	
Type	RS-485 three wires
Baud rate	9600 / 19200 / 38400 / 57600 / 115200 bps configurable
Data bits	8
Parity	Without parity / Even configurable
Stop bits	1 / 2 configurable
<b>Characteristics and electrical security</b>	
Security	CAT III 300 V under EN 61010
Protection class	Class II
External current transformers	Series TRC and TRA (In / 0,250 A)
<b>Standards</b>	
Standards	UNE EN 61010-1:2010, UNE-EN 61000-6-2, UNE-EN 61000-6-4

### COMMUNICATION

The device comes equipped with a RS-485 communication port to read and write the parameters of the device or other devices connected. The protocol used is Modbus RTU.

By default the device is configured with **peripheral number 72** (decimal) and **communication mode 4** (9600 bps, 8, N, 1). Using the command for changing the device number it is possible to assign any other number (maximum FF in hexadecimal or 255 in decimal).

In case you don't remember the slave number, you can return to default number and communication mode following this steps:

- Power off the device.
- Press permanently reset button.
- Power on the device and stop pressing the reset button.

## WORKING MODE

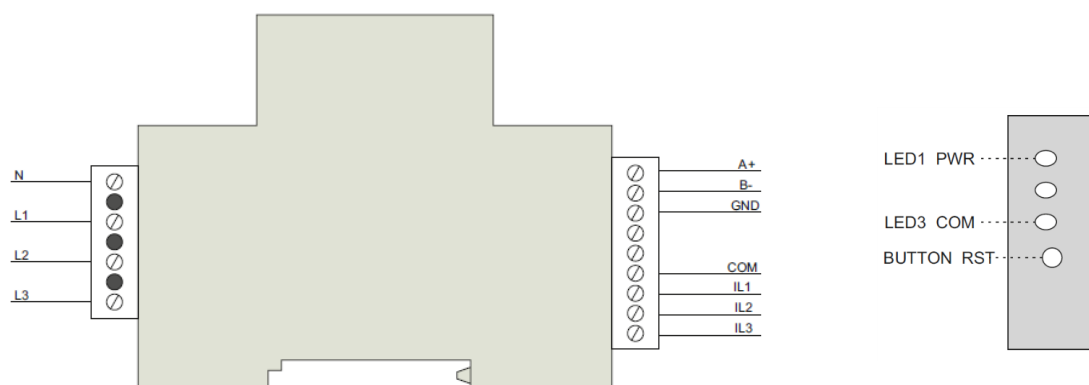
**SEM Three** has 4 different working modes for measuring the electrical parameters of an installation. To change the working mode you must change the value of register "Working mode" between mode 0 (default), 1, 2 or 3. Below are shown the details of each mode:

- Mode 0: L1, L2 and L3 single-phase. Sum of all values measured in three-phase parameters.
- Mode 1: L2 and L3 single-phase. L1 equilibrated three-phase. Sum of all values measured in three-phase parameters.
- Mode 2: L3 single-phase. L1 and L2 equilibrated three-phase. Sum of all values measured in three-phase parameters.
- Mode 3: L1, L2 and L3 equilibrated three-phase. Sum of all values measured in three-phase parameters.

<b>Mode 0</b>	L1	Total three-phase
	L2	
	L3	
<b>Mode 1</b>	L1 (x3)	
	L2	
	L3	
<b>Mode 2</b>	L1 (x3)	
	L2 (x3)	
	L3	
<b>Mode 3</b>	L1 (x3)	
	L2 (x3)	
	L3 (x3)	

## CONNECTIONS AND LEDS

Input voltage of **SEM Three** is connected at terminals L1 and N and external current transformers are used for current metering. Next are detailed all connections and leds:



## INSTALLATION

The SEM Three unit must be installed on an electric panel or enclosure, attached to a DIN rail (IEC 60715).

The unit must be connected to a power circuit that is protected with gI (IEC 269) or M type fuses with a rating of 0.5 to 2 A. It must be fitted with a circuit breaker or equivalent device, in order to be able to disconnect the unit from the power supply network. The power circuit must be connected with cables that have a minimum cross-section of 1mm<sup>2</sup>.

The secondary line for the current transformer shall have a minimum cross section of 2.5 mm<sup>2</sup>.

The temperature rating of insulation of wires connected to the device will be at minimum 62°C.

**MODBUS RTU COMMANDS**

Magnitude	Symbol	Input Registers	Holding Registers	Unity	Function
Peripheral number			0x00		3,6,16(0x10)
Communication parameters			0x01	0: 9600, 8, E, 1 1: 19200, 8, E, 1 2: 9600, 8, N, 2 3: 19200, 8, N, 2 4: 9600, 8, N, 1 5: 19200, 8, N, 1	3,6,16(0x10)
Hardware version			0x07		3
Software version			0x08		3
Serial number			0x09-0x0A		3
Working mode			0x0C	0: L1, L2, L3 1: L1(x3), L2, L3 2: L1(x3), L2(x3), L3 3: L1(x3), L2(x3), L3(x3)	3,6,16(0x10)
Current transformer XX/250mA phase 1			0x32		3,6,16(0x10)
Current transformer XX/250mA phase 2			0xFA		3,6,16(0x10)
Current transformer XX/250mA phase 3			0x1C2		3,6,16(0x10)
Voltage phase 1	VI1	0x02-0x03		V x 10	4
Current phase 1	AI1	0x04-0x05		mA	4
Active power phase 1	API1	0x06-0x07		W	4
Reactive power phase 1	RPI1	0x08-0x09		var	4
Apparent power phase 1	VAI1	0x0A-0x0B		VA	4
Power factor phase 1	PFI1	0x0C-0x0D		x 1000	4
Cos φ phase 1	COSI1	0x26-0x27		x 1000	4
Frequency phase 1	FQI1	0x28-0x29		Hz x 100	4
Active energy phase 1	AE1	0x3C-0x3D		Wh	4
Inductive reactive energy phase 1	IE1	0x3E-0x3F		varLh	4
Capacitive reactive energy phase 1	CE1	0x40-0x41		varCh	4
Apparent energy phase 1	VAE1	0x42-0x43		VAh	4
Maximum demand phase 1	MDI1	0x0E-0x0F		W	4
Voltage phase 2	VI2	0x66-0x67		V x 10	4
Current phase 2	AI2	0x68-0x69		mA	4
Active power phase 2	API2	0x6A-0x6B		W	4
Reactive power phase 2	RPI2	0x6C-0x6D		var	4
Apparent power phase 2	VAI2	0x6E-0x6F		VA	4
Power factor phase 2	PFI2	0x70-0x71		x 1000	4
Cos φ phase 2	COSI2	0x8A-0x8B		x 1000	4
Frequency phase 2	FQI2	0x8C-0x8D		Hz x 100	4
Active energy phase 2	AE2	0xA0-0xA1		Wh	4
Inductive reactive energy phase 2	IE2	0xA2-0xA3		varLh	4
Capacitive reactive energy phase 2	CE2	0xA4-0xA5		varCh	4
Apparent energy phase 2	VAE2	0xA6-0xA7		VAh	4
Maximum demand phase 2	MDI2	0x72-0x73		W	4
Voltage phase 3	VI3	0xCA-0xCB		V x 10	4
Current phase 3	AI3	0xCC-0xCD		mA	4
Active power phase 3	API3	0xCE-0xCF		W	4
Reactive power phase 3	RPI3	0xD0-0xD1		var	4
Apparent power phase 3	VAI3	0xD2-0xD3		VA	4
Power factor phase 3	PFI3	0xD4-0xD5		x 1000	4
Cos φ phase 3	COSI3	0xEE-0xEF		x 1000	4
Frequency phase 3	FQI3	0xF0-0xF1		Hz x 100	4
Active energy phase 3	AE3	0x104-0x105		Wh	4
Inductive reactive energy phase 3	IE3	0x106-0x107		varLh	4
Capacitive reactive energy phase 3	CE3	0x108-0x109		varCh	4
Apparent energy phase 3	VAE3	0x10A-0x10B		VAh	4
Maximum demand phase 3	MDI3	0xD6-0xD7		W	4
Active power III	API	0x132-0x133		W	4

Reactive power III	RPI	0x134-0x135		var	4
Apparent power III	VAI	0x136-0x137		VA	4
Power factor III	PFI	0x138-0x139		x 1000	4
Cos $\phi$ III	COSI	0x152-0x153		x 1000	4
Active energy III	AE	0x168-0x169		Wh	4
Inductive reactive energy III	IE	0x16A-0x16B		varLh	4
Capacitive reactive energy III	CE	0x16C-0x16D		varCh	4
Apparent energy III	VAE	0x16E-0x16F		VAh	4
Maximum demand III	MDI	0x13A-0x13B		W	4

## MODEL REFERENCE


Model	Reference	Current measure	Protocol	Communication
SEM Three	M010	250 mA	Modbus/RTU	RS-485

## CURRENT TRANSFORMERS REFERENCES

PickData recommends the use of efficient transformers from series TRA and TRC for SEM Three:

Model	Reference	Maximum current	Power class	Inner diameter
TRA1 80A	T004	80 A	1	10 mm
TRA1 100A	T005	100 A	1	15 mm
TRC1 100A	T006	100 A	0,5	12 mm
TRC1 250A	T007	250 A	0,5	20 mm

## SAFETY PRECAUTIONS

	<p><b>DANGER</b></p> <p>Warns of a risk, which could result in personal injury or material damage caused by an incorrect handling or installation of the unit. In particular, handling with voltages applied may result in electric shock, which may cause death or serious injury to personnel. Defective installation or maintenance may also lead to the risk of fire. Read the manual carefully prior to connecting the unit. Follow all installation and maintenance instructions throughout the unit's working life. Pay special attention to the installation standards of the National Electrical Code.</p>
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## DISCLAIMER

PickData, SL reserves the right to make modifications to the device or the unit specifications set out in this instruction manual without prior notice.

PickData, SL on its web site, supplies its customers with the latest versions of the device specifications and the most updated manuals.

## MAINTENANCE AND TECHNICAL SERVICE

Device doesn't require maintenance.

In the case of any query in relation to unit operation or malfunction, please contact the PickData, SL technical support service.

**PickData, SL – Technical support service**  
 Calle Innovació, 3  
 08232 – Viladecavalls (Barcelona), SPAIN  
 Tel: (34) 937 362 940 (España)  
 Email: [info@pickdata.net](mailto:info@pickdata.net)