EasyLogic™ EM1350

User manual

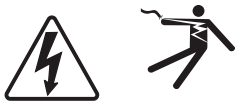
EAV85384-00
05/2014

Schneider Electric

Safety information

Important information

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

Please note

Electrical equipment should be installed, operated, serviced and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

Contents

Chapter 1 Introduction

The EasyLogic™ EM1350 energy meter is a digital energy meter that offers basic energy measurement capabilities to monitor an electrical installation.

This chapter contains descriptions, main features, and operating instructions for the energy meter. The remaining chapters explain the installation and setup steps required before the energy meter is ready for use, and the recommended maintenance and troubleshooting procedures for the energy meter after installation.

Before use, program the SYS (measurement system configuration), and the PT (VT) and CT ratios through the front panel keys. Otherwise, the energy meter may read the system incorrectly. Other settings, such as communication parameters, must also be programmed as required.

Intended use: The EasyLogic™ EM1350 energy meter is designed for use in industrial and commercial installations by trained and qualified professionals, not for domestic use.

Physical description

Front: The front panel has an LCD display, four keys for quick and easy navigation, phase voltage indicators and an optical pulse output LED.
Refer to “Front panel” on page 32 for more information.

Rear: The voltage terminals, current terminals and RS-485 communication port are located on the rear of the energy meter.
Refer to “Meter wiring” on page 18 for more information.

Energy parameters

The energy meter can measure, locally display, and remotely transfer over Modbus RTU protocol the following parameters:

Energy parameters

RMS	VA W PF
	W VAR PF
	VA1 VA2 VA3
	W1 W2 W3
	VAR1 VAR2 VAR3
	PF1 PF2 PF3
Total Energy (T), Partial Energy (P) and History	kVAh
	kWh
	kVARh
	Run Hrs:MM:SS
	On Hrs:MM:SS
	Interrupts

The EasyLogic™ EM1350 energy meter displays:

- Energy (T, P & History): Wh, VAh, VARh, Run hours (input current), On hours (input voltage), and Interrupts (input voltage interruptions or outages).
- Power: W, VA, VAR per phase and total.
- Power factor: Power factor for all the three phases and total.

NOTE:
Energy (T): This is the total energy accumulator.
Energy (P): This is the partial energy accumulator.
History: This stores the energy values that are cleared from the Partial Energy (P) page.

Firmware

This user manual is written to be used with meter firmware 01.00.00 or later.
See “Firmware version and model” on 66 to view your meter’s firmware version.

Chapter 2 Hardware reference

This section supplements the meter's installation sheet and provides additional information about the meter's physical characteristics and capabilities.

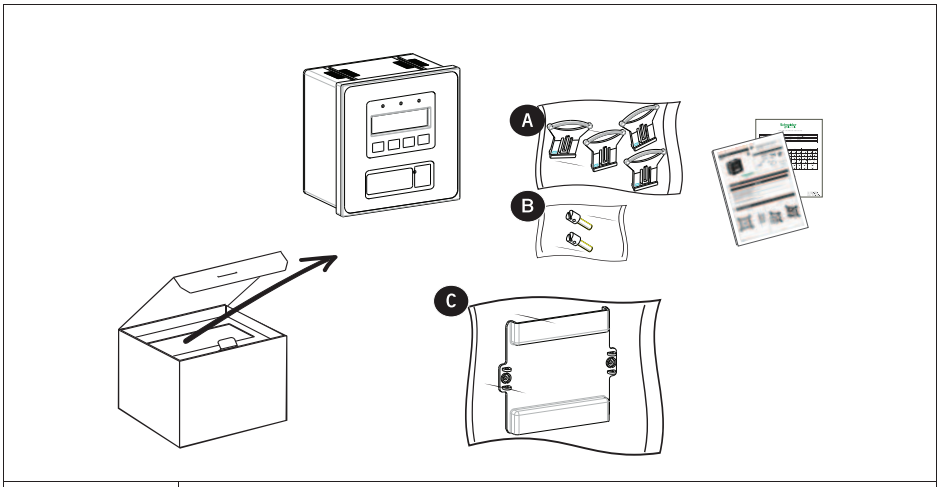
Related topics

- See "Specifications" on page 28 for detailed meter specifications.
- See your product's technical datasheet at www.schneider-electric.com for the most current and complete specifications.

Box contents

EM1350: Panel-mount meter with backlit LCD display, fits in a DIN 43700 panel cutout.

Supplied hardware

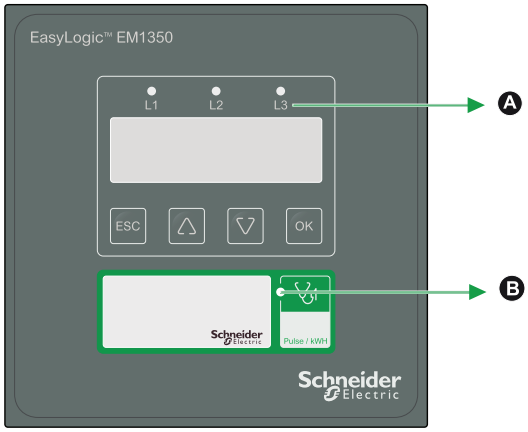


A	Retainer clips
B	Terminal cover screws
C	Terminal cover

LED indicators

The LED indicators alert or inform you about meter activity.

Location of LEDs



A	Phase indicators
B	Optical pulse output LED

Phase indicators

Indicators (L1, L2, L3) light up (in green) when a phase line is ON.

Optical pulse output LED

The optical pulse output LED blinks as per the energy update rate.

Before you begin

Carefully read and follow the safety precautions before working with the meter.

Safety precautions

Installation, wiring, testing, and service must be performed in accordance with all local and national electrical codes.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E in the USA or applicable local standards.
- This equipment must only be installed and serviced by qualified electrical personnel.
- If the equipment is not used in a manner specified by the manufacturer, the protection provided by the equipment may be impaired.
- NEVER work alone.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of back feeding.
- Turn off all power supplying this device and the equipment in which it is installed before working on the device or equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.
- Before closing all covers and doors, inspect the work area for tools and objects that may have been left inside the equipment.
- When removing or installing panels, do not allow them to extend into the energized bus.
- The successful operation of this equipment depends upon proper handling, installation, and operation. Neglecting fundamental installation requirements may lead to personal injury as well as damage to electrical equipment or other property.
- NEVER bypass external fusing.
- NEVER short the secondary of a PT.
- NEVER open circuit a CT; use the shorting block to short circuit the leads of the CT before removing the connection from the energy meter.
- Before performing Dielectric (Hi-Pot) or Megger testing on any equipment in which the energy meter is installed, disconnect all input and output wires to the energy meter. High voltage testing may damage electronic components contained in the energy meter.
- The energy meter should be installed in a suitable electrical enclosure.
- Always use grounded external CTs for current inputs.

Failure to follow these instructions will result in death or serious injury.

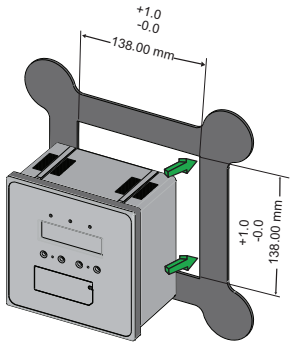
1. Turn off all power supplying this device and the equipment in which it is installed before working on the device or equipment.
2. Always use a properly rated voltage sensing device to confirm power is off.

Meter mounting

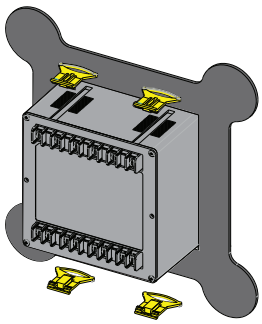
This section describes how to install and mount the meter.

Mounting the integrated display model (EM1350)

1. Insert the meter through the mounting hole.



2. Line up the tabs of the retainer clips with the slots at top of the meter. While holding the retainers at a slight angle, push the retainers in and forward to position them in place.



Installation procedure

Usage

First, decide how the energy meter is to be used. If you do not have an energy management program in operation, then your energy consultant should be able to help you to identify which load(s) offer maximum savings potential. This helps you to decide which point is to be monitored, where the readings are viewed from, who must have access to the instrument, and how often. Otherwise, decide the location of the energy meter and install it. For best performance, choose a location that provides all the required signals with minimum wiring lengths.

Panel considerations and environment

The energy meter is a high-precision measuring instrument, and its operating environment is of utmost importance. For maximum performance, the instrument should be mounted in a dry, dust-free location, away from heat sources and strong electromagnetic fields. To operate reliably, the following conditions must be met:

Environmental conditions

Description	Specification
Storage Temperature	-25 °C to 70 °C (-13 °F to 158 °F)
Operating Temperature	-10 °C to 60 °C (14 °F to 140 °F)
Relative Humidity	5% to 95%, non-condensing

The energy meter should be separated from other equipment, and sufficient space must be provided all around, to allow cooling air to rise vertically past the instrument. The cooling air temperature should be below the specified operating temperature.

The panel or housing, in which the energy meter is mounted, protects it from dust, moisture, oil, corrosive vapors, etc. The panel doors must be easily opened, which enables easy access to the energy meter wiring for troubleshooting.

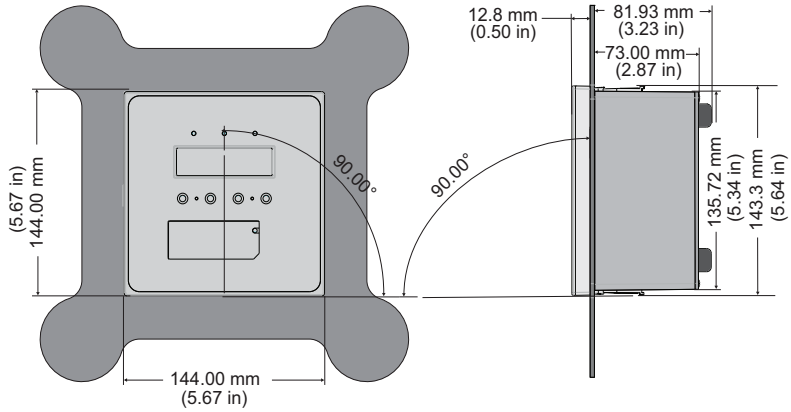
Allow clearance if the unit is going to swing out, as well as adequate slack in the wiring. Allow space for terminal blocks, CT shorting blocks, fuses, auxiliary contactors, and other necessary components.

Viewing

- For ease of operation, choose a mounting location preferably at, or slightly above, eye level.
- For viewing comfort, minimize glare and reflections from any strong light sources.

Meter dimensions

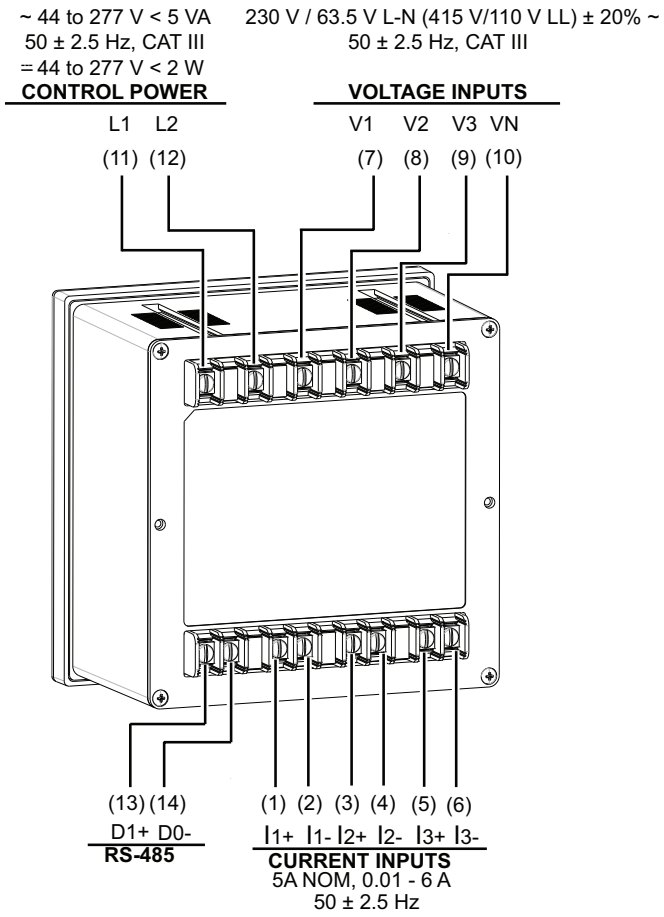
The EasyLogic™ EM1350 energy meters are panel-mounted and have reliable, rear-mounted terminal strips rated at 480 V. The 138 x 138 mm cut-out and 144 x 144 mm bezel dimensions adhere to DIN 43700.



Meter wiring

The energy meter has 14 connection terminals that are located on the rear panel.

- Six terminals for current, one in and one out per phase
- Four terminals for voltage, for three phases and neutral
- Two terminals for auxiliary power supply (control power)
- Two terminals for the RS-485 communications port



For wiring instructions and safety precautions, see the meter installation sheet that was shipped with the meter, or download a copy at www.schneider-electric.com.

• Wire connections to the meter's voltage inputs, control power, digital outputs, digital (status) inputs and RS-485 communications are terminated using the insulated sleeved U lugs.

• When wiring the meter's current inputs, terminate the wire ends with ring or split-ring crimp connectors.

Electrical installation

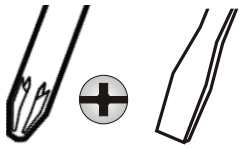
This section describes the following:

- The need for, and selection of, potential transformers (PTs) and current transformers (CTs).
- Auxiliary supply (control power), PT (VT), and CT Connections.

NOTICE
DAMAGE TO THE DEVICE Use only the specified tool for tightening and loosening the screw. Do not over-torque the screw above the specified range. **Failure to follow these instructions can result in equipment damage.**

For best results, ensure the following specifications:

- Torque driver preferred, hand screwdriver OK.
- TIP: Phillips head is preferred, but flat head is acceptable. Do not use Pozidriv tips.



Screw head diameter = 3.5 mm (0.14 in.), TIP shaft diameter < 5 mm (0.2 in.).

Tightening Torque: 0.25 to 1 N.m (2.21 to 8.85 lb-in).

Loosening Torque: 1.2 N.m (10.62 lb-in).

NOTE:
If the diameter of the screwdriver shaft is ≥ 5 mm (0.2 in.) or if the screwdriver shaft is inserted angularly, it will get stuck in the cover.
If the tightening torque is more than 1 N.m (8.85 lb-in), then it may damage the screw or the screw head.

Connecting cable recommendations

	Insulation rating	Current rating	Wire size
Voltage Circuit	> 600 VAC	> 0.1 A	0.82-3.31 mm^2 (18-12 AWG)
Current Circuit	> 600 VAC	> 7.5 A	0.82-3.31 mm^2 (18-12 AWG)

Schneider Electric recommends the use of insulated sleeved U lugs for wiring terminals.

Auxiliary supply (control power)

The energy meter requires a single-phase AC/DC auxiliary (control) power supply to power up its internal electronic circuitry. External surge suppressors are necessary in the auxiliary supply circuit for proper operation during extreme surge conditions, where voltage surges exceed the auxiliary supply limits (e.g., rural areas and outlying areas prone to lightning strikes).

Range:

- 44 to 277 VAC/DC.
- Burden (load) < 3 VA at 240 V, 5 VA max.
- The control power may be derived from the voltage signals.
- If you have a 440 V 3-wire delta system, and a reliable neutral is not available, then use a 440 V: 240 V supply transformer to provide the standard 240 V auxiliary supply.

NOTE: Installations should include a disconnecting device, like a switch or circuit breaker, with clear ON/OFF markings to turn-off the auxiliary supply (control power). The disconnecting device should be placed within the reach of the equipment and the operator.

Voltage signal connections

For proper energy meter operation, the voltage connection must be maintained. The voltage must correspond to the correct terminal. The cable required to terminate the voltage sensing circuit should have an insulation rating greater than 480 VAC and a current rating greater than 0.1 A.

Four input voltage terminals are marked V1, V2, V3, and VN. See “Connection diagrams” on page 23 for more information. For Delta connection, the VN terminal should be left unconnected.

PT connections

The energy meters directly accept LV voltage inputs of up to 480 VAC RMS line to line (277 VLN). Voltages greater than this, typically HV systems, must be connected through potential transformers (PTs). The energy meter allows the user to program both the PT primary and secondary voltages.

- User programmable PT primary range: 0.1 to 999 kVAC RMS LL
- User programmable PT secondary range: 80 to 481 VAC RMS LL
- Energy meters voltage input burden: 0.2 VA per input

NOTE: The PT primary and secondary values must be user programmed before using the energy meter. Otherwise, the readings are incorrect.

Selecting voltage fuses

Fuses are required on each sense voltage (except for neutral) and the auxiliary supply (control power).

Fuse recommendations

Power source	Source voltage	Fuse
Line voltage	80 to 480 VLL	0.25 (slow blow)
Auxiliary supply (Control power)	44 to 277 Vac/Vdc	0.25 (slow blow)

Current signal connections

The energy meter accepts up to 6 A AC RMS per channel directly. Above that, a current transformer must be interposed to scale down the current. Three pairs of current input terminals are marked I1, I2, and I3. Each pair of input terminals is labeled as (+, -) and has an arrow indicating the direction of current flow. For proper measurements, the phase identification and the polarity of the current signals must be correct. The forward flow (import by consumer) current direction must be into the + terminal, and the exit from the - terminal. Maintain the correct sequence and polarity to avoid incorrect readings.

Any unused current input terminals must be shorted together, for example, in delta connection, the terminals I2 (+, -) must be shorted together. The shorted terminals do not need to be grounded.

The current sense circuit should have an insulation rating greater than 480 VAC. The cable connection should be rated for 7.5 A or greater and have a cross-sectional area of 0.82 mm^2 (18 AWG) minimum.

CT connections

Mount the current transformers (CTs) as close as possible to the energy meter for best accuracy. The following table illustrates the maximum recommended distances for various CT sizes, assuming the connection is via 0.82 mm^2/18 AWG cable.

CT size and maximum distance

5 A CT size	Maximum distance in meters (in feet) (CT to EM1350 energy meter)
2.5 VA	3.05 m (10ft/120 in.)
5.0 VA	4.6 m (15 ft/ 181 in.)
7.5 VA	9.15 m (30 ft/ 360 in.)
10.0 VA	12.2 m (40 ft/ 480 in.)
15.0 VA	18.3 m (60 ft/ 720 in.)
30.0 VA	36.6 m (120 ft/ 1441 in.)

- CT primary range: (5 A to 99 kA) AC.
- CT secondary: (5 A) AC.
- Energy meters CT burden: 0.2 VA maximum per input.

Refer to “Front panel display and meter setup” on page 31 for more information.

NOTE:
The PT primary and secondary values must be user programmed before using the energy meter. Otherwise, the readings are incorrect.
For dual-range CTs; select the best range for programming the energy meter. If you change the range without re-programming the energy meter, then the energy meter reads erroneous values.

CT polarity

When the energy meter is connected using the CTs, you must maintain correct CT polarities. CT polarities are dependent upon correct connections of CT leads, and also, on the direction the CTs are facing when they are clamped around the conductors. The dot on the CT must face the line side; the corresponding secondary connection must connect to the appropriate input on the energy meter.

CT connection reversal

To check the polarity of the CT after the energy meter has been installed, go to the Diagnostics page and check the CT / Current Reverse display page. Refer to “Menu tree” on page 37 for more information. Assuming that you are consuming power (import), check for one of the following conditions in the energy meter:

1. If the display shows Line 1 or Line 2 or Line 3, then CT phase 1 or CT phase 2 or CT phase 3 is reversed and the corresponding CT phase must be corrected.
2. If the display shows Line 12 or Line 23 or Line 13, then CT phases (1 and 2) or CT phases (2 and 3) or CT phases (3 and 1) are reversed and the corresponding CT phases must be corrected.
3. If the display shows Line 123, then all the phases are reversed and must be corrected.
4. If the display shows Line - - - , then no CTs are reversed.

System type

The energy meter supports the following system types.

System types supported by the energy meter

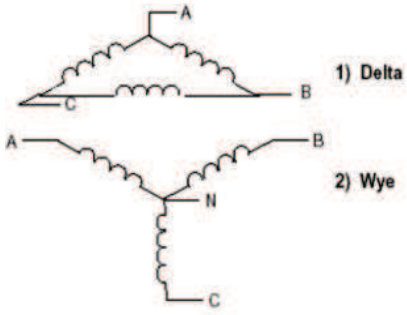
System type	Configuration in energy meter	Connection
Star/Wye Or 3-phase 4-wire Or Three watt-meter Or Three element circuits	**Star** Select this configuration through energy meter’s setup. See “Setup parameters” on page 40. for more information.	All four voltage terminals (V1, V2, V3, VN) and six current terminals (I1, I2, I3 each having + and - terminals) need to be connected.
Delta, Open delta Or 3-phase 3-wire Or Two watt-meter Or Two element circuits	**Delta** Select this configuration through energy meter’s setup. See “Setup parameters” on page 40 for more information.	Three phase voltage terminals (V1, V2, V3) and four current terminals (I1, I2 each having + and -) need to be connected. Leave the neutral voltage terminal unconnected.

NOTE: Each current input I1, I2, I3 has two terminals + and -. For one current input, you need to connect two terminals; for two current inputs, you need to connect four terminals; for three current inputs, you need to connect six terminals.

3-Phase systems

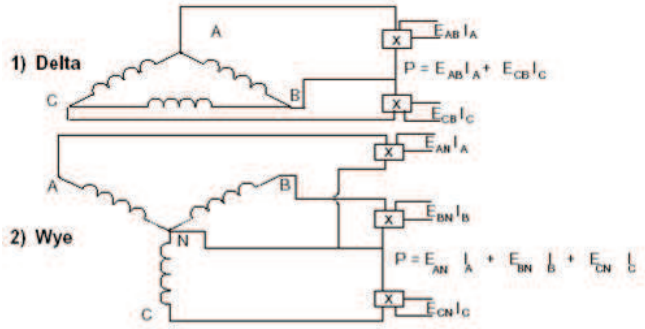
A 3-phase system delivers higher levels of power for industrial and commercial applications. The three phases correspond to three potential lines. A 120° phase shift exists between the three potential lines. A typical configuration has either a Delta connection or a Wye (Star) connection.

In a 3-phase system, the voltage levels between the phases and the neutral are ideally defined by V1 = V2 = V3 = V12 / √3 = V23 / √3 = V31 / √3. In practice, there are some unbalance (difference).



Voltages between the phases vary, depending on loading factors and the quality of distribution transformers.

Power measurement in a poly-phase system is governed by Blondel's Theorem. Blondel's Theorem states that, in a power distribution network, which has N conductors, the number of measurement elements required to determine power is N-1. A typical configuration of a poly-phase system has either a Delta connection or a Wye (Star) connection.



Where E_{AB}= Voltage across points A and B

E_{CB}= Voltage across points C and B

E_{AN}= Voltage across points A and N (Neutral)

E_{BN}= Voltage across points B and N (Neutral)

E_{CN}= Voltage across points C and N (Neutral)

I_A = Current through conductor A

I_B = Current through conductor B

I_C = Current through conductor C

Connection diagrams

Select the connection diagram that best describes your application. Refer to “System type” on page 22 for more information.

Ensure,

- CT phase and the corresponding PT phase are identical.
- The CT polarity is correct.

Connection diagram symbols

Symbol	Description
A	500 mA fuses / circuit breaker #
B	Shorting block #
C	PT primary fuses and disconnect switch #
	Potential Transformer (IEC)
	Potential Transformer (ANSI)
	Current Transformer (IEC)
	Current Transformer (ANSI)

not supplied.

⚠ DANGER

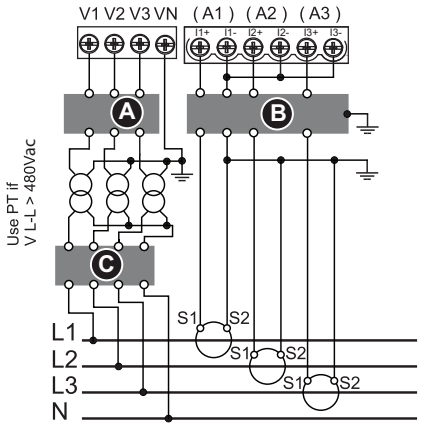
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Do not attempt to service the energy meter. CT and PT or VT inputs may contain hazardous currents and voltages.
- Only authorized service personnel from the manufacturer should service the energy meter.
- Shield conductors may be energized if not properly connected.
- Shield wire should be installed per the device's installation instructions and grounded at one end only.

Failure to follow these instructions will result in death or serious injury.

3-phase 4-wire wye connection

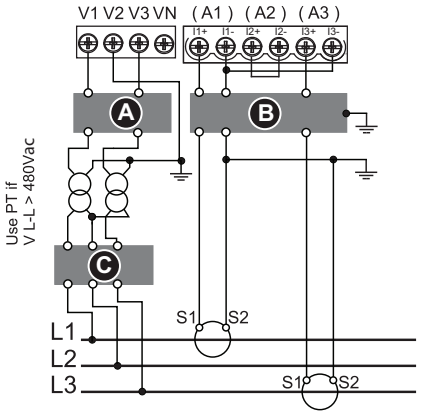
Direct voltage connections for the input voltages L-L up to 480 VAC. Otherwise, use three PTs.



NOTE: Make sure WYE/Star is programmed in the energy meter PROG menu- Setup.
For High-leg (US connection)
L1 – N = 120 V
L2 – N = 208 V
L3 – N = 120 V

3-phase 3-wire delta connection

Direct voltage connections for the input voltages L-L up to 480 VAC. Otherwise, use two PTs.



NOTE: Make sure that Delta is programmed in the energy meter PROG menu-setup. Leave the Vn terminal disconnected.

Communications

This section provides additional information about the communications ports and Modbus device identification.

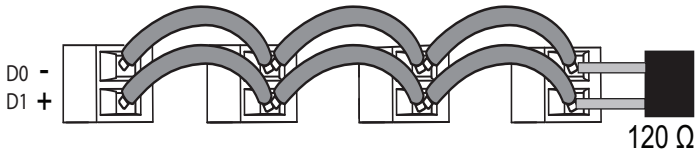
Serial communications

The meter supports serial communications through the RS-485 port. Up to 32 devices can be connected on a single RS-485 bus.

In an RS-485 network, there is one master device, typically an Ethernet to RS-485 gateway. It provides the means for RS-485 communications with multiple slave devices (for example, meters). For applications that require only one dedicated computer to communicate with the slave devices, an RS-232 to RS-485 converter can be used as the master device.

RS-485 wiring

Connect the devices on the RS-485 bus in a point-to-point configuration, with the (+) and (-) terminals from one device connected to the corresponding (+) and (-) terminals on the next device.



RS-485 cable

Use a shielded 1.5 twisted pair or 2 twisted pair RS-485 cable to wire the devices. Use one twisted pair to connect the (+) and (-) terminals.

RS-485 terminals

-	Data minus. This transmits/receives the inverting data signals.
+	Data plus. This transmits/receives the non-inverting data signal.

RS-485 maximum cable length

The total distance for devices connected on an RS-485 bus should not exceed 1200 m (4000 ft).

RS-485 network configuration

After you have wired the RS-485 port and powered up the meter, you must configure the serial communications port in order to communicate with the meter.

Each device on the same RS-485 communications bus must have a unique address and all connected devices must be set to the same protocol, baud rate, and parity (data format).

Modbus standard device identification

Addressing Modbus standard device identification

You can use Modbus command 0x2B/0x0E on these device identification parameters.

Modbus standard device identification parameters

Object ID	Object name	Format	Access	Description
00	Manufacturer name	String	Read	SCHNEIDER ELECTRIC
01	Product code	String	Read	EM1350
02	FW Version	String	Read	V01.00.00

NOTE:
The Read device identification can be read as stream access and as an individual access. The product code is the same file name without version number.

Specifications

Mechanical characteristics

Product weight	550 gms approx
Display resolution	128 x 32
Display type	Monochromatic, FSTN, +ve transflective
Display backlight	White LED
Display viewable area	68 x 18.5 mm
IP degree of protection	IP51 front display, IP20 meter body - Category II (without suction)

Electrical characteristics

Features	NMI M 6-1 Ed 2: For accuracy and type test Accuracy: 1.0
Sensing/measurement	True RMS, two quadrant power and energy, one second update time
Measurement accuracy	Active energy: Class 1.0 as per NMI M 6-1 Ed 2, AS 62053-21 / IEC62053-21 Active power: Class 1.0 Reactive energy: Class 2.0
Control power	AC / DC: 44 to 277 V AC frequency: 50 ± 2.5 Hz AC burden: < 5 VA DC burden: < 2 W Installation category III
Voltage input	Measured voltage 230 V / 63.5 V L-N (415 V / 110 V LL) ± 20% Frequency: 50 ± 2.5 Hz Burden: < 0.2 VA per phase Installation category III
Current inputs	5 A nominal Measured current: 100 mA to 6 A; Starting current 10 mA Withstand: 10 A continuous Burden: < 0.2 VA per phase at 5 A

Environmental characteristics

Pollution degree	Pollution degree 2
Operating temperature	-10 °C to 60 °C (14 °F to 140 °F)
Emission	Emission as per CISPR-22 for Class B
Location	For indoor use only Not suitable for wet locations
Humidity rating	5 to 95% RH non-condensing at 50 °C (122 °F)
Altitude	≤ 2000 m

RS-485 communications

Protocol	Modbus RTU

Baud rate	4800, 9600, 19200

Standards and certifications

Standards and certifications	NMI M 6-1 Ed 2 N998

Safety

Measurement category	Measurement category III
Protective class	Protective class II Double insulated at user accessible area

Chapter 3 Front panel display and meter setup

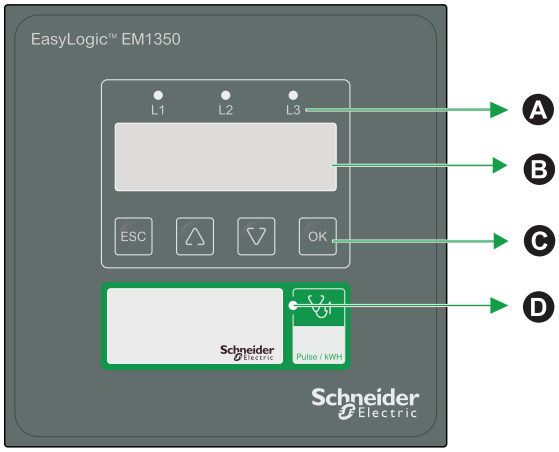
This section contains information on front panel display and meter setup. The front panel display allows you to use the meter to perform various tasks such as setting up the meter, setting up the display, or performing resets.

Front panel

The front panel contains the following indicators and controls:

- Indicators (L1, L2, L3) light up (in green) when a phase line is ON.
- One row of four digits each, displays three RMS parameters simultaneously or one energy parameter. The displayed readings are updated every second.
- Four buttons to navigate through the display pages.
- The optical pulse output LED, blinks as per the energy update rate.

Parts of the display



A	Phase indicators
B	Backlit LCD graphical display
C	Menu selection buttons
D	Optical pulse output LED

See “LED indicators” on page 13 for information on LED indicators.

Backlit LCD graphical display

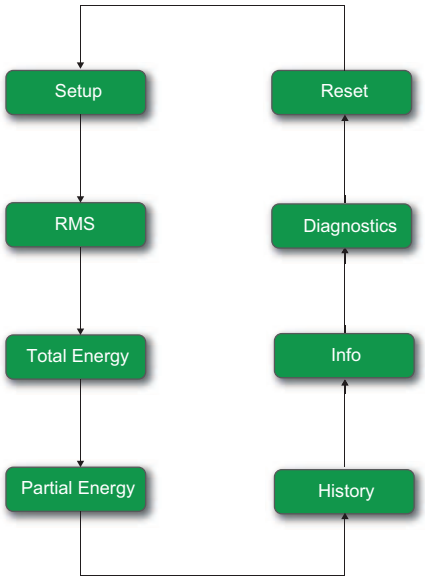
- Simultaneous display of three RMS parameters along with the parameter name and value.
- Resolution: RMS: Four digits for both phase wise and average values. Energy: 10+3 digits.

Energy readings

Energy reading, 3-phase	Range
Active energy (Wh) / Apparent energy (VAh) / Reactive energy (VARh)	0.000 K to 999999999.0 K
	10000000.000 M to 9999999999.000 M

Meter screen menus

All meter screens are grouped logically, according to their function. You can access any available meter screen by first selecting the Level 1 (top level) screen that contains it.



Use the menu selection buttons to navigate the different meter screens. See “Menu selection buttons” on page 35 for the navigation symbols and their functions.

Menu selection buttons

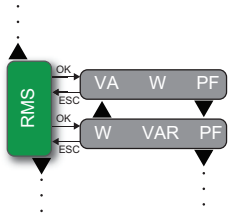
Use the four buttons on the keypad to navigate through menus. The display pages expand as you go to the right, much like the directory or menu tree displayed on any computer.

Menu selection buttons description

Menu selection button	Description
ESC	Exit screen and go back one level.
OK	To validate a new value or selection.
△	Show the next item in the list, or increase the highlighted value.
▽	Show the previous item in the list, or decrease the highlighted value.

Menu selection buttons - operation

This section explains the operation of the four keys (as explained above) and the navigation of the energy meter. The following example explains the navigation from the RMS page to the VA W PF page and back to the RMS page.



1. Press OK from RMS. The display shows **VA W PF**.
2. Press ▽. The display shows **W VAR PF**.
3. Press ESC to return to the **RMS** page.

Menu selection buttons - features

Auto-scroll

- Auto-scroll allows you to view a group of display pages sequentially every four seconds, without requiring manual key operation.
- Auto-scroll is possible only within the page groups, that is, the parameters within the page groups like RMS or Total Energy or Partial Energy or Diagnostic are auto-scrolled sequentially.
- Auto-scroll is not possible within the setup parameters.

The following table explains the auto-scroll operation in the RMS parameter pages in the energy meter.

Auto-scroll

Step	Procedure	Output
1	Press OK from RMS.	The display shows VA W PF.
2	Press and hold △ or ▽ for three seconds	The display flashes AUTO and scrolls through the RMS parameters group.

NOTE: Press any key to revert to manual scrolling

Default display page

- This feature enables you to select any page as the default display page.
- The default display page is displayed two minutes after the manual key operation is stopped.
- You can lock and unlock the default display page.
- You can scroll through the other display pages, when the default display page is active.
- Editing in the Setup page is possible only when the default display page is unlocked.

To set or lock default display page.

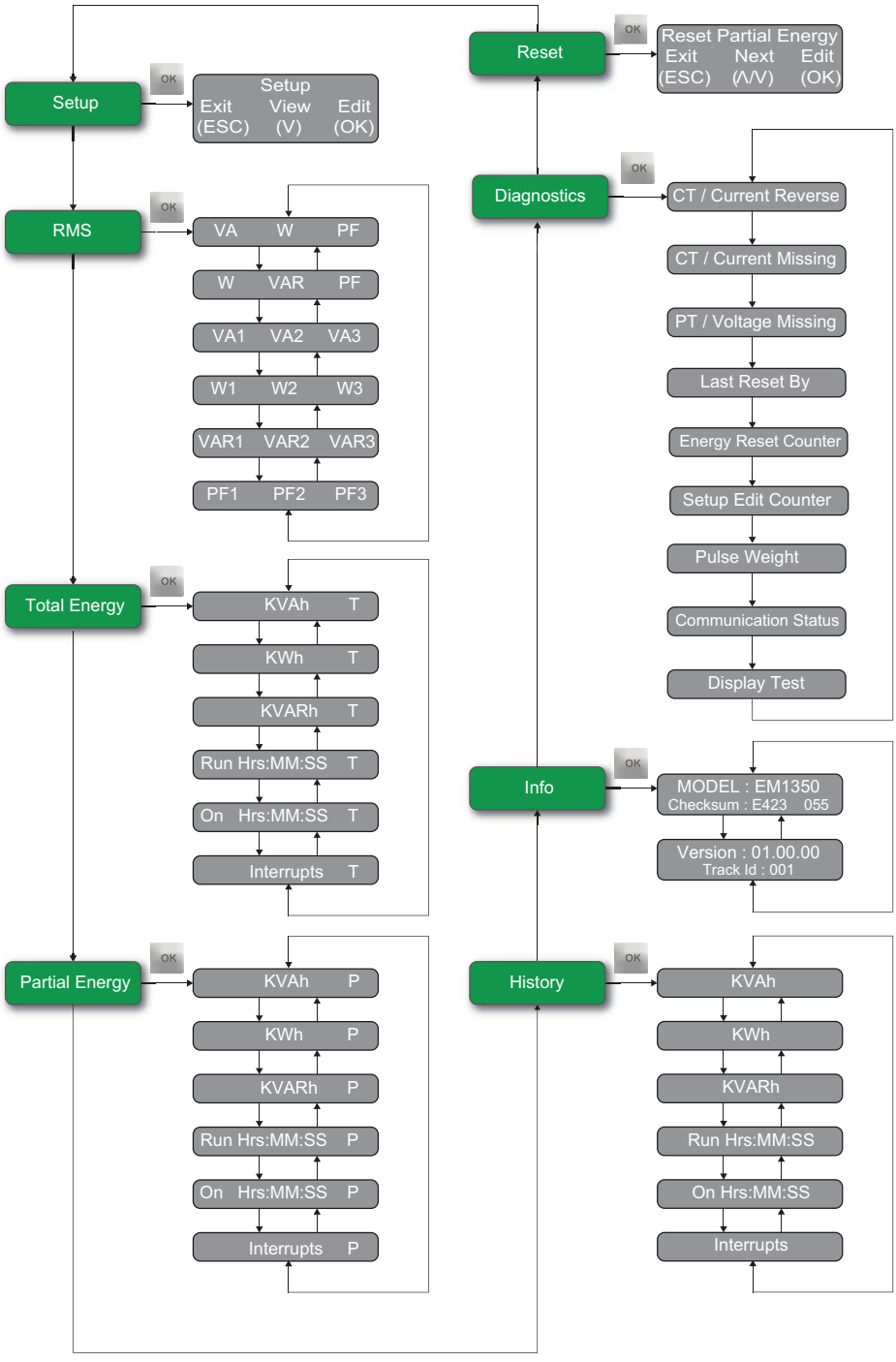
1. Go to the desired page you want to set as default display page.
2. Press △ and ▽ together until the display shows **LOCKED**. The default display page is set or locked.

To unlock default display page

Once the default display page is active, press △ and ▽ together until the display shows **UNLOCK**. The default display page is unlocked.

Menu tree

This summarizes the meter screens.



Front panel meter setup

Meter configuration can be performed directly through the front menu selection buttons. This section contains instructions on setting up the meter using the front panel.

- The energy meter must be configured to match the application settings, before use. Otherwise, the readings are incorrect.
- All the setup values can be re-programmed at any time, using SETUP. However, the settings: SYS (Star/Delta), PT Primary, PT Secondary, CT Primary, CT Secondary determine the scaling of measured readings.
- The scaling can be used to reduce the errors in readings due to Instrument Transformer errors. However, incorrect settings introduce errors in readings of other running systems.

⚠ CAUTION

HAZARD OF UNINTENDED OPERATION

Only qualified personnel are authorized to set up the energy meter.

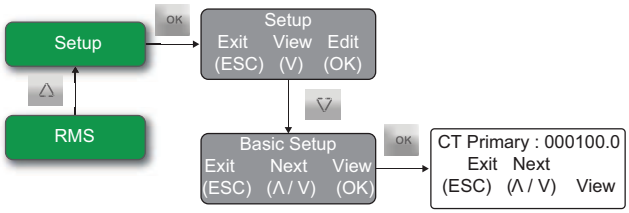
Failure to follow these instructions can result in injury.

You can enter the Setup in the following modes:

- View only mode: To view the set parameters.
- Edit mode: To view or edit the set parameters.

The following diagram explains how to enter the Setup in View Only and Edit Mode.

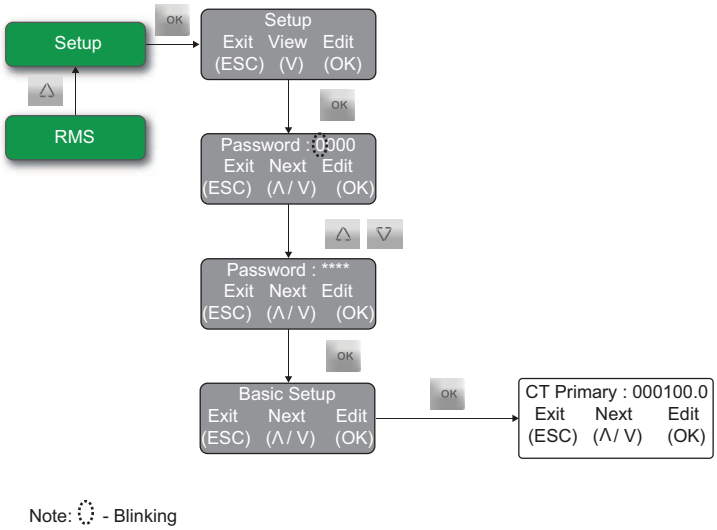
Setup menu in view (read-only) mode



1. From **RMS**, press △ , to go to the **Setup** page.
2. Press OK to enter the **Setup** page with **Exit**, **View** and **Edit** options.
3. Press ▽ to view the **Basic Setup** page.
4. Press OK to view the **Basic Setup** parameters page.
   Or
   Press ▽ to view the **Communication Setup** and **HMI Setup** page.

   Use △ and ▽ to scroll and view the setup parameters and their current settings.

Setup menu in edit mode



Note: ⬚ - Blinking

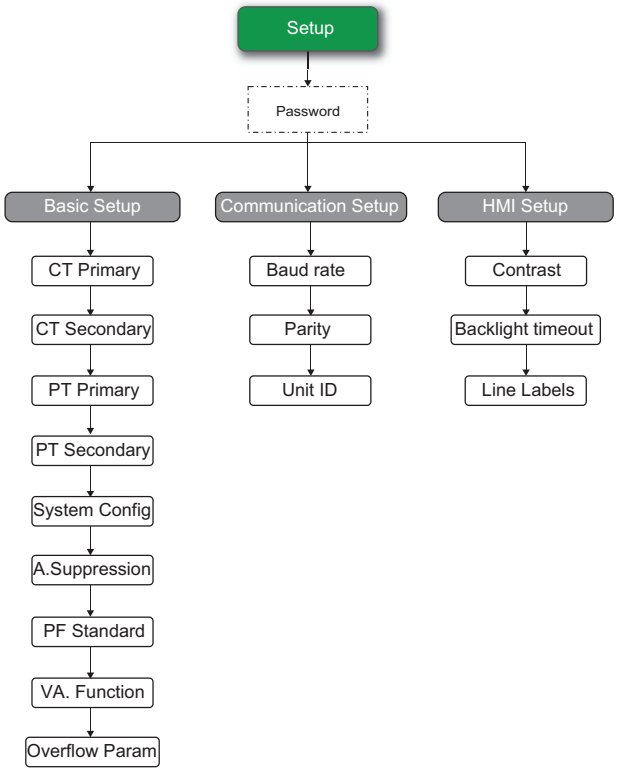
1. From **RMS**, press △ , to go to the **Setup** page.
2. Press OK to enter the **Setup** page with **Exit**, **View** and **Edit** options.
3. Press OK to enter the password.

NOTE: To enter the setup menu in edit mode, you have to enter the password. For meter password, please contact your local Schneider Electric representative.

4. Press OK . The display shows the **Basic Setup** page. This indicates that you have successfully entered the setup menu in edit mode.

NOTE: The display returns to the Setup page, if you enter an incorrect password. Repeat the procedure and make sure that you enter the correct password.

Setup parameters

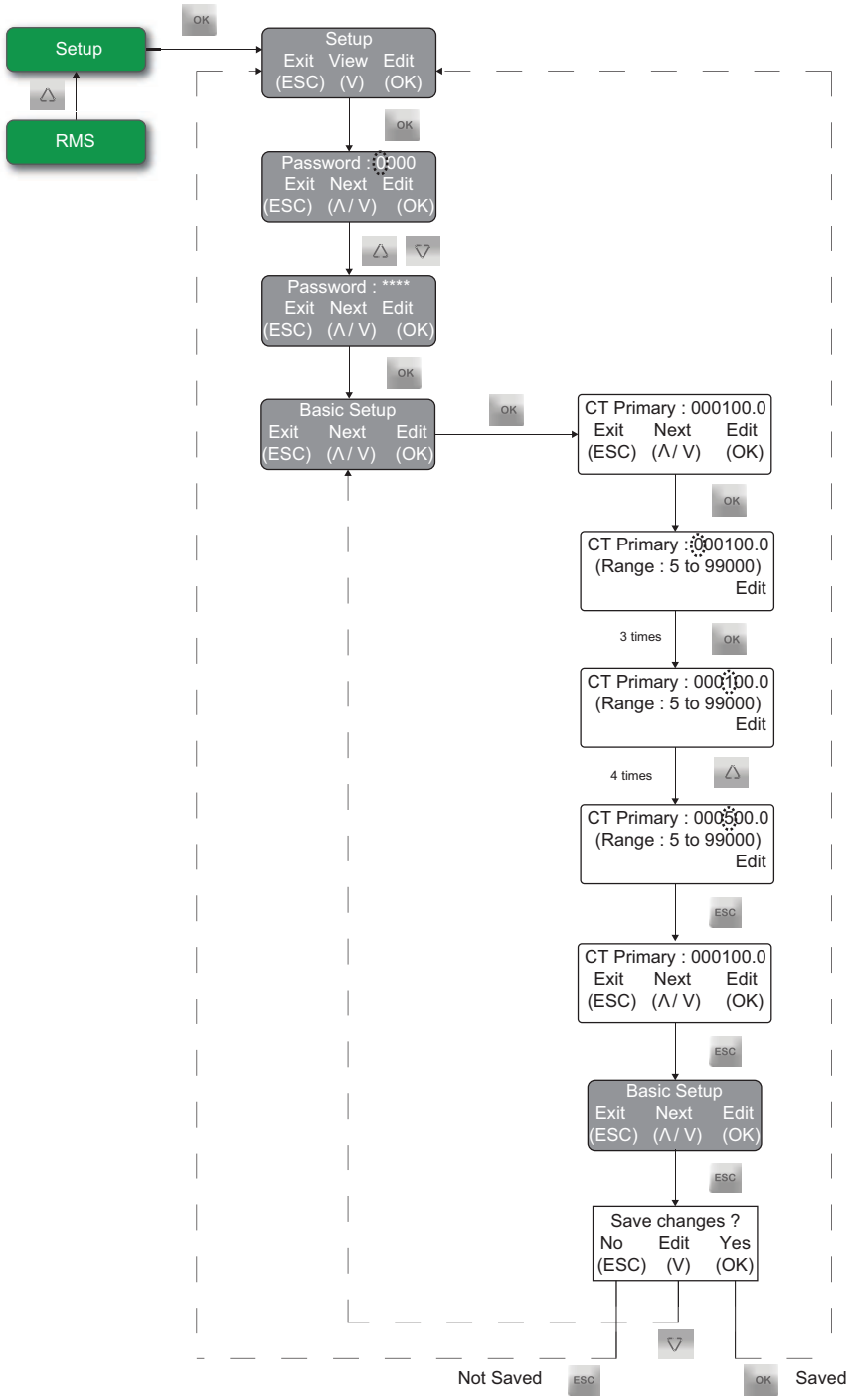


Configuring Basic Setup parameters in setup menu

The following procedure explains how to edit the value of CT Primary from 000100.0 to 000500.0 in the energy meter.

To edit other parameters like PT Primary, PT Secondary, A.Suppression and so on, follow the same procedure example as shown below.

NOTE:
After entering into the setup, if there is no key press for more than 2 minutes, the energy meter automatically exits from the setup.



Note: ⋮ - Blinking

1. After entering the **Basic Setup** page in the edit mode, (Refer to “Setup menu in edit mode” on page 38 for more information) press OK .
2. Press OK three times.
3. Press △ four times.
4. Press ESC three times.
5. The display shows **Save Changes?** page with **No**, **Edit**, and **Yes** options.

– Press **No**, to exit without saving the new value.

– Press **Edit**, to re-edit the value.

– Press **Yes**, to save the new value.

NOTE: You can edit one parameter or required number of parameters at a time and press ESC two times to save the new values.

6. Press OK to save the new value.

Basic Setup parameters

Parameter	Values	Description
CT Primary	5 to 99000A	Enter the required current primary winding value.
CT Secondary	5 A	Enter the required current secondary winding value.
PT Primary	100 to 999000 V	Enter the required potential primary winding value.
PT Secondary	50 to 600 V	Enter the required potential secondary winding value.
System Config	Star	Select the system configuration to which the meter is wired.
	Delta	
A.Suppression	5 to 15 mA	Enter the required current noise suppression value.
PF Standard	IEC	Select the required power factor standard.
	IEEE	
	TRIG	
VA Function	3d	Select the required VA function.
	Arth	
Overflow Param	Wh	Select the required energy over flow parameter.
	VAh	
	VARh	

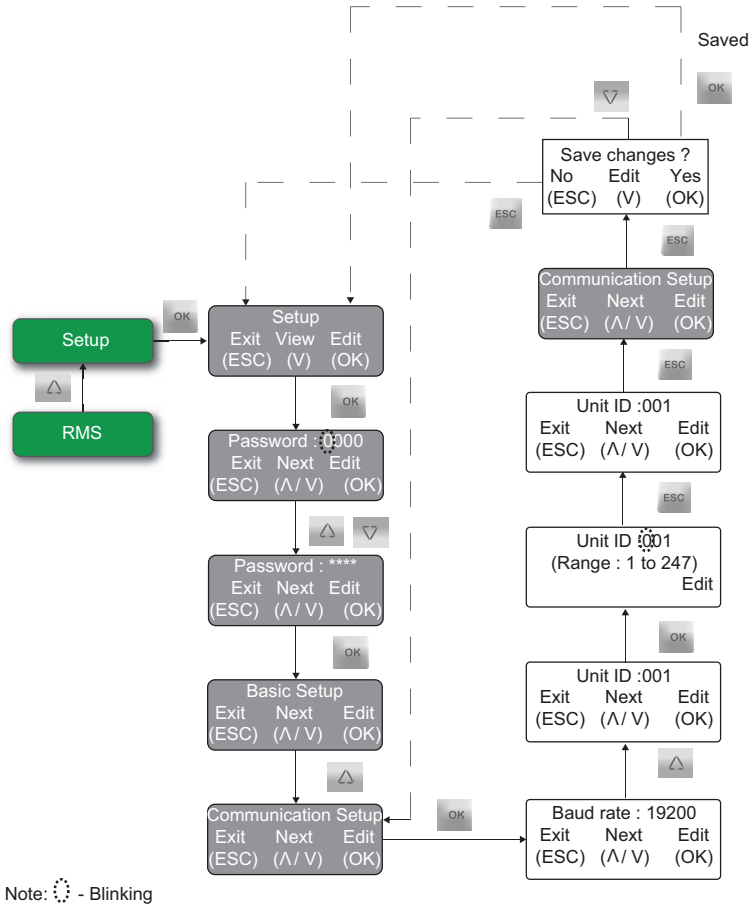
Configuring Communication Setup parameters in setup menu

After you have wired the RS-485 port and powered up the meter, you must configure the serial communications port in order to communicate with the meter. Each device on the same RS-485 communications bus must have a unique address and all connected devices must be set to the same protocol, baud rate, and parity (data format).

The following procedure explains how to edit the value of Unit ID in the energy meter.

To edit other parameters like Baud rate and Parity, follow the same procedure example as shown below.

NOTE:
After entering into the setup, if there is no key press for more than 2 minutes, the energy meter automatically exits from the setup.



1. From **RMS**, press , to go to the **Setup** page.
2. Press to enter the **Setup** page with **Exit, View and Edit** options.
3. Press to enter the password.

NOTE: To enter the setup menu in edit mode, you have to enter the password. For meter password, please contact your local Schneider Electric representative.

4. Press . The display shows the **Basic Setup** page. This indicates that you have successfully entered the setup menu in edit mode.
5. Press . The display shows **Communication Setup**.
6. Press . The display shows **Baud rate**.
7. Press . The display shows **Unit ID**.
   To edit the values, press and set the values as required.
8. Press two times. The display shows **Save Changes?** page with **No, Edit,** and **Yes** options.
   - Press No, to exit without saving the new value.
   - Press Edit, to edit the value.
   - Press Yes, to save the new value.

NOTE: You can edit one parameter or desired number of parameters at a time and press two times to save the new values.

Communication Setup parameters

Parameter	Values	Description
Baud rate	19200	Select the speed for data transmission.
	9600	
	4800	
Parity	Evn1	Select the parity bit.
	no2	
	Odd1	
Unit ID	1 to 247	Enter the required device ID number.

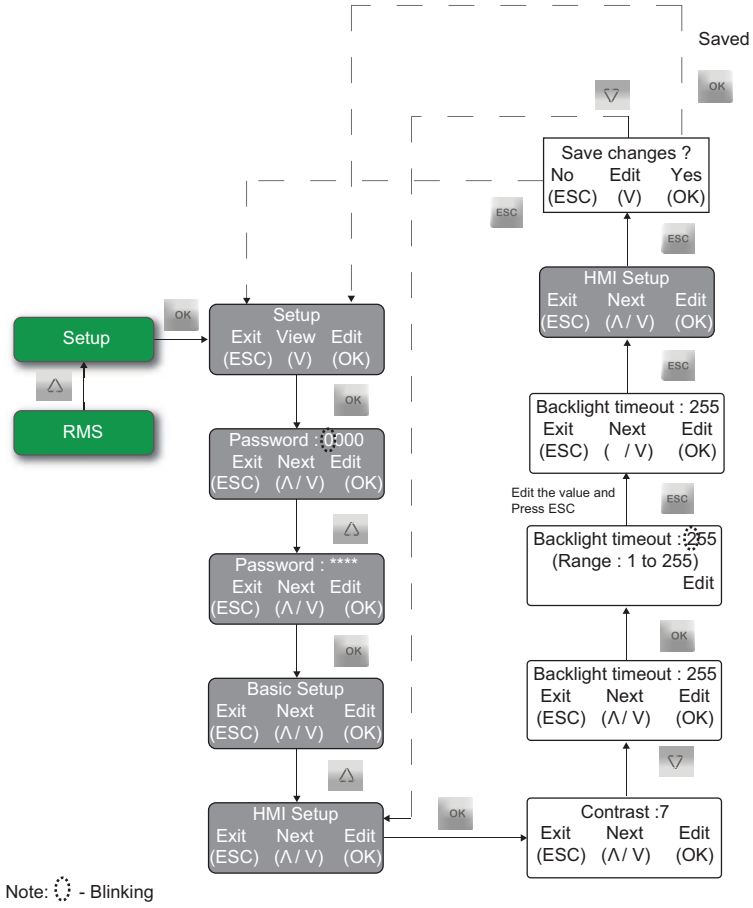
Configuring HMI Setup parameters in setup menu

The HMI (human-machine interface) setup screens allow you to control the general appearance and behavior of the display screens.

The following procedure explains how to edit the value of backlight timeout in the energy meter.

To edit other parameters like Line Labels and Contrast, follow the same procedure example as shown below.

NOTE:
After entering into the setup, if there is no key press for more than 2 minutes, the energy meter automatically exits from the setup.



1. From **RMS**, press △ , to go to the **Setup** page.
2. Press OK to enter the **Setup** page with **Exit, View and Edit** options.
3. Press OK to enter the password.

NOTE: To enter the setup menu in edit mode, you have to enter the password. For meter password, please contact your local Schneider Electric representative.

4. Press OK . The display shows the **Basic Setup** page. This indicates that you have successfully entered the setup menu in edit mode.
5. Press △ . The display shows **HMI Setup**.
6. Press OK . The display shows **Contrast**.
7. Press ▽ . The display shows **Backlight timeout**.
   To edit the values, press OK and set the values as required.
8. Press ESC two times. The display shows **Save Changes?** page with **No, Edit,** and **Yes** options.
   – Press No, to exit without saving the new value.
   – Press Edit, to edit the value.
   – Press Yes, to save the new value.

NOTE: You can edit one parameter or desired number of parameters at a time and press ESC two times to save the new values.

HMI Setup parameters

Parameter	Values	Description
Contrast	1 to 9	Increase or decrease the value to increase or decrease the display contrast.
Backlight timeout	1 to 255	Set backlight turn off time (in seconds).
Line Labels	a to z and 0 to 9	Enter the required phase line value.

Chapter 4 Viewing meter data

You can view meter data from the meter's front panel display.

Viewing meter data from the front panel

The meter displays the default display page when you switch on the meter. You can set the default display page as per your requirement. See “Default display page” on page 36 for more information on default display page.

Related topics

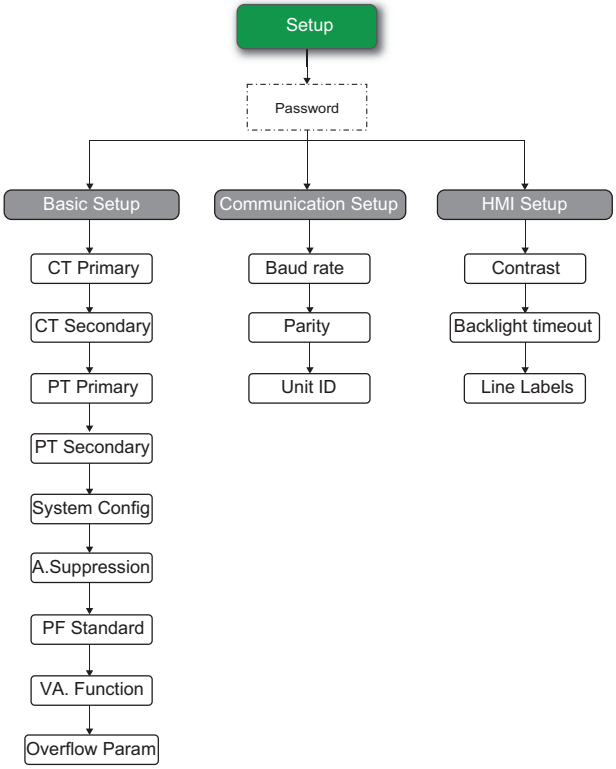
See “Front panel display and meter setup” on page 31 for information on front panel.

Meter data display screens

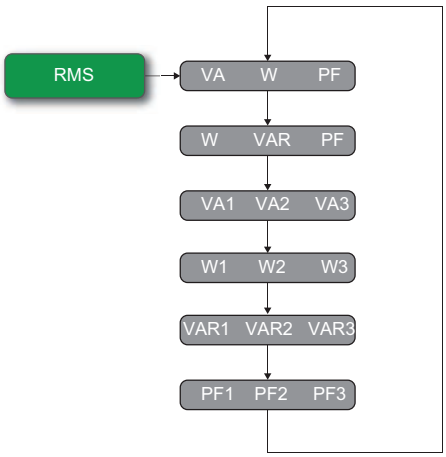
The main menus available in the meter are listed below.

- Setup
- RMS
- Total Energy
- Partial Energy
- History
- Info
- Diagnostics
- Reset

Setup

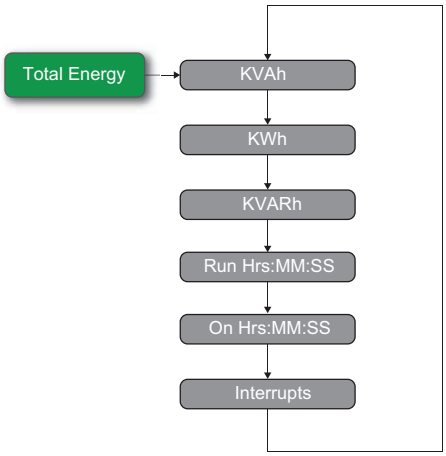


RMS



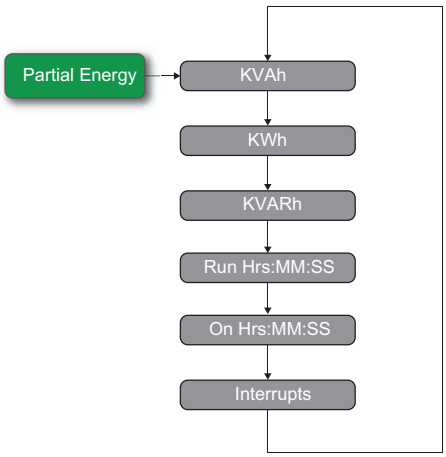
Main menu	Parameter	Description
RMS	VA W PF	Screens to view the RMS parameter values.
	W VAR PF	
	VA1 VA2 VA3	
	W1 W2 W3	
	VAR1 VAR2 VAR3	
	PF1 PF2 PF3	

Total Energy



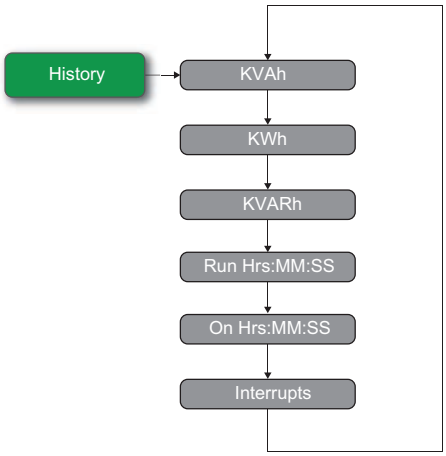
Main menu	Parameter	Description
Total Energy	KVAh	Screens to view the total energy parameter values.
	KWh	
	KVARh	
	Run Hrs:MM:SS	
	On Hrs:MM:SS	
	Interrupts	

Partial Energy



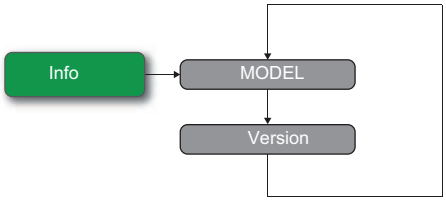
Main menu	Parameter	Description
Partial Energy	KVAh	Screens to view the partial energy parameter values.
	KWh	
	KVARh	
	Run Hrs:MM:SS	
	On Hrs:MM:SS	
	Interrupts	

History



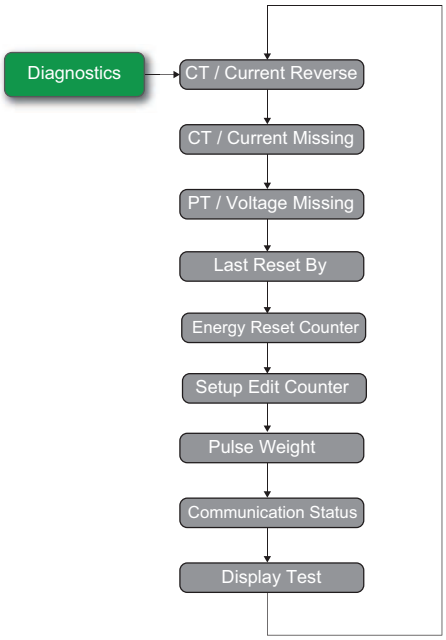
Main menu	Parameter	Description
History	KVAh	Screens to view the History of the parameters.
	KWh	
	KVARh	
	Run Hrs:MM:SS	
	On Hrs:MM:SS	
	Interrupts	

Info



Main menu	Parameter	Description
Info	MODEL	Screens to view the model and version of the meter.
	VERSION	

Diagnostics



Main menu	Parameter	Description
Diagnostics	CT / Current Reverse	Screens to view the line current reverse, line current missing, line voltage missing, last reset by status, energy reset counter, setup edit counter, pulse weight, communication status, and display test.
	CT / Current Missing	
	PT / Voltage Missing	
	Last Reset By	
	Pulse Weight	
	Communication Status	
	Display Test	

Viewing Pulse Weight (Meter constant)

Navigate to **Diagnostics** > **Pulse Weight** to view the Pulse weight.

Reset

Main menu	Parameter	Description
Reset	Reset Partial Energy	Screen to reset partial energy.

Chapter 5 Meter logging

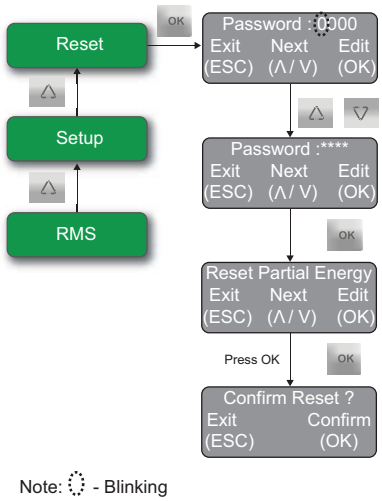
This section describes the meter's History feature. Since the cleared Partial Energy (P) values (manually / P overflow) are stored in history, they are not lost even after they are cleared and can be viewed in the History page.

NOTE:
For energy studies, clear the Partial Energy (P) at the end of each observation. This transfers all the stored energy values to the History page, where they are stored, while the Partial Energy (P) begins accumulating data for the next observation.
When the Partial Energy (P) is cleared next time, the History values are overwritten.

Chapter 6 Meter resets

This section explains how to clear the Partial Energy values in the energy meter.

Refer to “Total Energy (T) and Partial Energy (P)” on page 58 for more information.



1. Press △ two times from the **RMS** page. The display shows the **Reset** page. You are required to enter the **Password** to clear the **Partial Energy** values.
2. Press OK to enter the password.

NOTE: To enter the setup menu in edit mode, you have to enter the password. For meter password, please contact your local Schneider Electric representative.

3. Press OK . The display shows **Reset Partial Energy** page with **Exit, Next**, and **Edit** options.
4. Press OK . The display shows **Confirm Reset?** page with **Exit** and **Confirm** options.
   - Press **Exit (ESC)**, to retain the Partial Energy values.
   - Press **Confirm (OK)**, to reset the Partial Energy values.
5. Press OK to reset the **Partial Energy** values. The display shows **Reset Done** and returns to the **Reset Partial Energy** page.

NOTE:
After entering into the Reset page, if there is no key press for more than 2 minutes, the energy meter automatically exits from the Reset page.

Total Energy (T) and Partial Energy (P)

The energy meter is equipped with Total Energy (T) and Partial Energy (P) functions.

Total Energy (T) accumulates the energy values continuously until it reaches the overflow limit See the table “Partial energy (P) overflow” on page 58; when it reaches the overflow limit, the Total Energy (T) get reset to 0.

The following Energy Management parameters are provided:

- VAh – Apparent Energy
- Wh – Active Energy
- VARh – Reactive Energy
- Run – Indicates the period the load has been ON and has run. This counter accumulates as long as the load is ON.
- On – The period for which the input voltage is ON.
- Interrupts – The number of supply outages, or number of input voltage interruptions.

All the above values are direct readings and have a high resolution (10+3 digits).

Partial Energy (P) overflow

- Partial Energy accumulates values same as Total Energy (T). However, the user can clear the Partial Energy (P) values at anytime.
- The energy values stored in the Partial Energy (P) values can be cleared using the front panel keys. The cleared Partial Energy (P) values are transferred to the history page.
- The energy value readings overflow is based on PT Primary x CT Primary of the primary settings in the setup.
- The energy parameter for overflow is user selectable (Wh or VAh or VARh) through setup. By default, it is Wh. See “Setup parameters” on page 40 for more information.

Partial energy (P) overflow

PT primary x CT primary x 1.732	Overflow value (Wh/VAh/ VARh)	Min time to overflowat full scale (in months)
< 100000 K	999999999.000 K	~ 11.56
< 100000 M	999999999.000 M	~ 11.56

Chapter 7 Measurements and calculations

This section describes how the energy meter processes measured and calculated data.

Consumption and poor power factor

Consumption: Wh = W x T, where W = instantaneous power, T = time in hours.

The total electric energy usage over a time period is the consumption of Wh. Typically, the unit in which consumption is specified is the kilowatt-hour (kWh) (one thousand watts consumed over one hour). Utilities use the Wh equation to determine the overall consumption in a billing period.

Poor power factor: Results in reactive power consumption. Transferring reactive power over a distribution network causes energy loss. To force consumers to correct their power factor, utilities monitor reactive power consumption and penalize the user for poor power factor.

kVA measurement

The energy meters have two different kVA measurements, 3D and Arithmetic. The required kVA measurement method can be selected through setup. See “Setup parameters” on page 40 for more information.

- 3D measurement (factory default): An advanced method which provides the most accurate and predictable measurement under unbalanced as well as distorted waveform conditions.
- Arithmetic measurement: It is used when the energy meter needs to match the readings of older or simpler meters.

kVA measurement selection

kVA function	Formula	Other names
3D Factory setting	$kVA_{3D} = \sqrt{\sum W^2 - \sum VAR^2 + \sum D^2}$ Where D = Distortion power per IEEE 100	U, Apparent, Vector kVA
Arth	$kVA_{Arth} = kVA_1 + kVA_2 + kVA_3$	Arithmetic, Scalar kVA

Chapter 8 Maintenance and upgrades

This chapter provides energy meter maintenance information.

The energy meter does not contain any user-serviceable parts. If the energy meter requires service, contact your local sales representative. Do not open the energy meter. Opening the energy meter voids the warranty.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Do not attempt to service the meter. CT and PT inputs may contain hazardous currents and voltages.
- Do not perform a Dielectric (Hi-Pot) or Megger test on the energy meter, test voltages may damage the energy meter.
- Before performing Hi-Pot or Megger testing on any equipment in which the energy meter is installed, disconnect all the input and output wires connected to the energy meter.

Failure to follow these instructions will result in death or serious injury.

Troubleshooting

The information in table “Troubleshooting” on page 65 describes potential problems and their possible causes. It also includes possible checks to perform or provides solutions to the problem. After referring to this table, if you cannot resolve the problem, contact your local Schneider Electric sales representative for assistance.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical practices. For example, in the United States, see NFPA 70E.
- This equipment must be installed and serviced only by qualified personnel.
- Turn off all power supplying this equipment before working on or inside.
- Always use a properly rated voltage sensing device to confirm that all power is off.
- Carefully inspect the work area for tools and objects that may have been left inside the equipment.
- Use caution while removing or installing panels so that they do not extend into the energized bus; avoid handling the panels, which could cause personal injury.

Failure to follow these instructions will result in death or serious injury.

Troubleshooting

Potential problem	Possible cause	Possible solution
The data being displayed is inaccurate or not what you expect	Incorrect setup values	Check that the correct values have been entered for energy meter setup parameters (CT and PT ratings, system type, and so on). See “Front panel display and meter setup” on page 31 for setup instructions.
	Usage of protection class (10P10 etc.) CTs/PTs	Use instrument class 1 or better CTs/PTs, which have better accuracy than the protection class CTs/PTs.
	Improper wiring	Check whether all the PTs and CTs are connected properly (proper polarity is observed) and that they are energized. Check the shorting terminals. See “Connection diagrams” on page 23 for more information.
Active Power (W) reading is negative	CT may be reversed	Check and correct the CT connections.
	Power may be in export mode	Check the mode. If the mode is in import, then + and - need to be interchanged in one or two or in all the three phases. Under this condition, the energy updates in INTG Rev. Check the mode. If it is in export, then the energy updates in INTG Rev.
The display went blank suddenly	Over voltage/temperature	Interrupt the power supply or reduce the voltage or temperature within the allowable limits.
	Fuse connection	Check whether a fuse with rating of 0.25 A is connected on each voltage input. If not connect the 0.25 A rated fuse to the voltage input.
The energy meter stopped communication abruptly	Communications lines are improperly connected.	Verify the energy meter communications connections. See “Communications” on page 26 for more information.
	Over voltage/temperature	Interrupt the power supply or reduce the voltage or temperature within the allowable limits.
Wrong Load bar indication	Incorrect F.S% selection	Select the full scale load percentage setting as per your circuit.

Potential problem	Possible cause	Possible solution
The energy meter is over heated	Lack of sufficient air for cooling	Provide sufficient space all around the energy meter. Separate the energy meter from other equipment for cooling air.
The Energy meter gets switched off	The voltage has over flown beyond 300 V RMS	Interrupt the auxiliary power i.e. Turn Off and On the meter.

Pulse weight settings for verifying accuracy

Before you verify the meter accuracy through the optical pulse output, ensure that you select the correct pulse weight (meter constant) for the external reference meter. The following table shows the meter constant on the display and the corresponding meter constant that should be set on the reference meter for different internal CT and PT ratio.

Internal CT Ratio Setting		Internal PT ratio Setting		Pulse weight (meter constant) on display. Wh/Pulse	Pulse weight settings for external reference meter. Wh/Pulse
CT Primary	CT Secondary	PT Primary	PT Secondary		
5	5	415	415	0.25	0.25
100	5	415	415	5	0.25
5	5	110	110	0.1	0.1
100	5	110	110	2	0.1

Firmware version and model

You can view the meter's firmware version from the display panel.

Using the display panel:

1. Navigate to **Info**, and press OK. The **MODEL** information is displayed.
2. Press ▽ to view the **Version** and **TrackId**.

Technical assistance

Visit www.schneider-electric.com for support and assistance on technical problems with the meter.

Make sure you include your meter's model and firmware version in your email or have it readily available if calling Technical Support.

Diagnostics screen

For meters equipped with a display screen, you can use the **Diagnostics** screens to obtain information that may help you troubleshoot meter problems.

Disposal and recycle

Dispose of or recycle the device in accordance with the applicable laws and regulations in your country.

Meter removal

1. Turn off all power supplying the meter and the equipment in which it is installed.
2. Disconnect all wiring from the meter.
3. Remove the retainer clips of the meter.
4. Carefully remove the meter from the panel.

NOTE: For recommended tools, refer to “Electrical installation” on page 19.

Chapter 9 Power factor

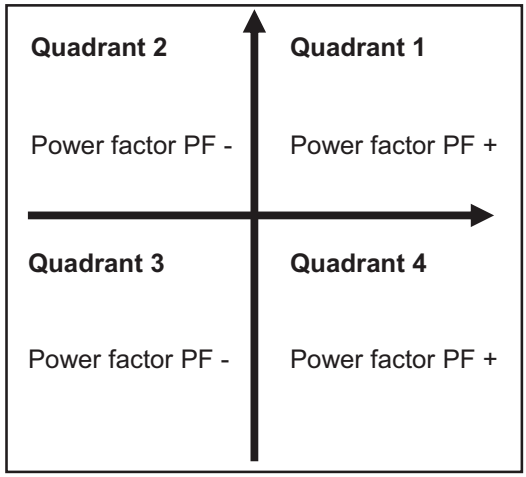
The energy meter offers three different sign conventions for power factor (PF):

1. IEC standard sign convention (default)
2. Trigonometry (TRIG) sign convention
3. IEEE standard sign convention

You can select the required PF Standard through Setup menu.

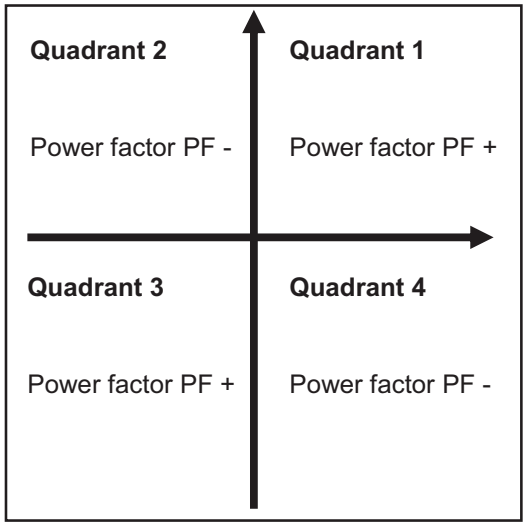
IEC standard sign convention

The following figure explains the IEC sign convention for PF.



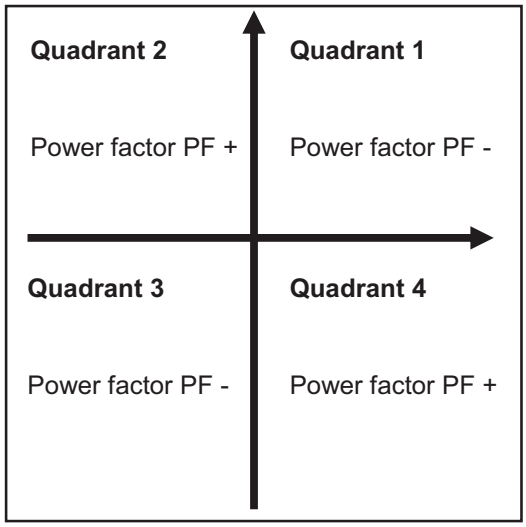
Trigonometry (TRIG) sign convention

The following figure explains the TRIG sign convention for PF.



IEEE standard sign convention

llllThe following figure explains the IEEE sign convention for PF.


Quadrant 2
Power factor PF +
Quadrant 1
Power factor PF -
Quadrant 3
Power factor PF -
Quadrant 4
Power factor PF +

A Glossary

Terms

Baud rate: Specifies how fast data is transmitted across a serial network port.

Communications link: A chain of devices connected by a communications cable to a communications port.

Current Transformer (CT): Current transformers for current inputs.

Firmware: Operating system within the energy meter.

Float: A 32-bit floating point value returned by a register.

Forward: Importing the power into the plant/grid.

Frequency: Number of cycles in one second.

Line-to-line voltages: Measurement of the RMS line-to-line voltages of the circuit.

Line-to-neutral voltages: Measurement of the RMS line-to-neutral voltages of the circuit.

LOCK: Default display page lock.

Long: A 32-bit value returned by a register.

Nominal: Typical or average

Parity: Refers to binary numbers sent over the communications link. An extra bit is added so that the number of ones in the binary number is either even or odd, depending on your configuration. It is used to detect errors in the transmission of data.

PT: Potential Transformers are used to control the large values of voltage.

Power factor: True power factor is the ratio of real power to apparent power using the complete harmonic content of real and apparent power.

Reverse: Exporting the power from the plant/grid.

RMS: Root mean square. The energy meters are true RMS sensing devices.

Run mode: This is the normal operating mode of the energy meter, where the readings are taken.

ULOCK: Default display page unlock.

Abbreviations

%A FS	% Amperes full scale
A, Amps	Amperes
A.PRI	Current primary winding
A.SEC	Current secondary winding
Avg	Average
CLR	Clear
CT	Current transformer

Dia, DIAG	Diagnostic
ft	Feet/foot
FW	Firmware
FWD	Forward
Hz	Hertz
ID	Identity
in.	Inch
IP	Ingress protection
kVAh	Kilo volt-ampere hour
kVARh	Kilo volt-ampere reactive hour
kWh	Kilo watt hour
LSB	Least significant bit
Min	Minimum
ms	Milliseconds
MSB	Most significant bit
O.F	Overflow
P	Partial Energy
PF	Power factor
PT	Potential transformer
SYS	System configuration
T	Total Energy
ULOC	Unlock
V	Voltage
VA	Apparent power
VAh	Apparent energy
VAR	Reactive power
VARh	Reactive energy
V.PRI	Voltage primary winding
V.SEC	Voltage secondary winding
VT	Voltage transformer
W	Watt (Active power)
Wh	Watt Hour (Active energy)

Schneider Electric

35, rue Joseph Monier
CS 30323
F - 92506 Rueil Malmaison Cedex
www.schneider-electric.com

EAV85384-00 05/2014