

EasyLogic™ PM1125H

User manual

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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 manual 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 accompany 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**.

Failure to follow these instructions 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.

Notice

FCC

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The user is cautioned that any changes or modifications not expressly approved by Schneider Electric could void the user's authority to operate the equipment.

This digital apparatus complies with CAN ICES-3 (A) /NMB-3(A).

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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 |
| <ul style="list-style-type: none">• Apply appropriate Personal Protective Equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462 or other local standards.• Turn off all power supplying this device and the equipment in which it is installed before working on or in the equipment.• Always use a properly rated voltage sensing device to confirm that all power is off.• Follow guidelines in the Wiring section of the related Installation Sheet.• Assume communications and I/O wiring are hazardous live until determined otherwise.• Do not exceed the maximum ratings of this device.• Do not short secondary terminals of Voltage Transformer (VT).• Do not open secondary terminals of Current Transformer (CT).• Ground secondary circuit of CTs.• Do not use the data from the meter to confirm power is off.• Replace all devices, doors and covers before turning on power to this equipment. |
| Failure to follow these instructions will result in death or serious injury. |

NOTE: See IEC 60950-1 for more information on communications and I/O wiring connected to multiple devices.

| ⚠️ WARNING |
|---|
| UNINTENDED OPERATION |
| <ul style="list-style-type: none">• Do not use this device for critical control or protection of persons, animals, property or equipment. |
| Failure to follow these instructions can result in death, serious injury, or equipment damage. |

| ⚠️ WARNING |
|---|
| POTENTIAL COMPROMISE OF SYSTEM AVAILABILITY, INTEGRITY, AND CONFIDENTIALITY |
| <ul style="list-style-type: none">• Change default passwords/passcodes to help prevent unauthorized access to device settings and information.• Disable unused ports/services and default accounts, where possible, to minimize pathways for malicious attacks.• Place networked devices behind multiple layers of cyber defenses (such as firewalls, network segmentation, and network intrusion detection and protection).• Use cybersecurity best practices (for example: least privilege, separation of duties) to help prevent unauthorized exposure, loss, modification of data and logs, interruption of services, or unintended operation. |
| Failure to follow these instructions can result in death, serious injury, or equipment damage. |

Introduction

Meter overview

The PM1125H meter offers comprehensive 3-phase electrical instrumentation and load management facilities in a compact and rugged package.

The PM1125H meter offers value for the demanding needs of your energy monitoring and cost management applications. Meters in the series range comply with Class 0.5S / Class 0.2 / Class 1.0 accuracy standards and feature high quality, reliability and affordability in a compact and easy to install format.

Meter features

The meter supports many features, a few of the features are listed below:

- LED display screen: Intuitive self-guided navigation using four buttons LED display, with three lines of concurrent values, and load bar that indicates current loading
- Energy accounting and balancing
- Time counter: Meter provide On hours and Load run hours to advise regarding maintenance requirements
- Protective cover to ensure terminal screws do not detach from housing and for safety against unintentional finger contacts with terminals
- Active, reactive, and apparent energy readings
- Cyber security: The meter enables disabling the RS-485 port through front panel keys against unauthorized access. This feature can also be used for toggling between the RTU devices in case of limited availability of nodes in software system
- Measurement of True PF
- Suppression current: The meter can be configured to disregard the measurement of induced / auxiliary load current in the circuit (can be set from 5 to 99 mA).

You can use the meter as a stand-alone device, but its extensive capabilities are fully realized when used as part of an energy management system.

For applications, feature details, and the most current and complete specifications of the PM1125H meter, see the technical datasheet at www.se.com.

Applications

The meters can be used in various cost management and network management application. Some of the import applications are mentioned below.

Cost management

- Energy accounting and balancing
- Control panels
- Power distribution boards
- Original equipment manufacturers (OEMs)
- Building management system
- Panel instrumentation
- Energy management system

Network management

- Power quality analysis (THD%)
- Measurement of power factor
- Phase angle between the voltage and current
- % unbalance among voltage and current
- Modbus RTU protocol RS-485 port for integration with energy management system

Main characteristics

- Easy to install: The device can be mounted on a panel using two retainer clips. This is a compact meter with 49 mm meter depth behind the panel that can connect up to 480 V \pm 10% AC L-L without voltage transformers for installation compliant with measurement category III, and double insulated.
- Easy to operate: The device has intuitive navigation with self-guided menus and heartbeat LED that indicate normal functioning of your device. It also conveys the communication status when connected to an RS-485 network.
- LED display: The device has intuitive navigation with self-guided four buttons, 8 segment alpha-numeric LED, and three lines of concurrent values with Kilo and Mega value indicator.
- Power and energy: Measurement, display and recording of three power and corresponding energy parameters simultaneously - W/Wh, VA/VAh, and VAR/VARh.
- Demand: Measurement of Peak, present, and last demand values of either W or VA or VAR parameters with the option to select demand parameter, demand interval, and demand technique.
- Standard compliance:
 - Class 1.0 for active energy as per the test limits given in IEC 62053-21
 - Class 0.5S for active energy as per the test limits given in IEC 62053-22
 - Class 2.0 for reactive energy as per the test limits given in IEC 62053-23
 - Tested in accordance with IEC 62052-11 for energy test requirements
 - EMI / EMC tests as per IEC 61326-1
- CT nominal: 5 A or 1 A nominal current (field selectable). CT reversal auto correction for energy consumption.
- Password: Field configurable password to secure set up information and prevent tampering of integrated values.
- Cyber security: The device provides an option for disabling RS-485 port through front panel keys to prevent unauthorized access. This feature can also be used for maintenance and troubleshooting of complex communication network.
- Display: The device has an auto scale and auto range display capability that provides 4 digits for instantaneous parameters and 5+3 digits for energy parameters.
- Analog load bar: The device's front panel has a colour-coded analogue load bar that indicates the percentage of load through 12 LED with the option to select full scale based on connected load.
- Suppression current: The meter can be configured to disregard the measurement of induced / auxiliary load current in the circuit (can be set from 5 to 99 mA).
- Favourite page : The device enables user with the option to select parameters to be set in favourite page.
- Protective cover to ensure terminal screws do not detach from housing and for safety against unintentional finger contacts with terminals

- Time counter: Meter ON hours and Load RUN hours advise maintenance requirements

Feature summary

| Parameter | PM1125H |
|---|--|
| Accuracy Class for Wh | Class 1 Class 0.5S |
| Accuracy Class for VARh | 2.0 |
| Accuracy Class for VAh | ± 1% ± 0.5% |
| Sampling rate per cycle | 32 |
| Current: <ul style="list-style-type: none"> • Per-phase and 3 phase average • Calculated neutral current | ✓ |
| Voltage: <ul style="list-style-type: none"> • V L-N - per-phase and 3 phase average • V L-L - per-phase and 3 phase average | ✓ |
| Power Factor Per-phase and average | ✓ |
| Frequency | ✓ |
| Power: <ul style="list-style-type: none"> • Active power (kW) - Per-phase and total • Apparent power (kVA) - Per-phase and total • Reactive power (kVAR) - Per-phase and total | ✓ |
| Energy: kWh, kVAh, kVARh (4 Quadrant) <ul style="list-style-type: none"> • Delivered (Import / Forward) • Received (Export / Reverse) | Delivered Received Total ¹ Last cleared (Old) ¹ |
| Demand parameters (kW, kVA, kVAR) <ul style="list-style-type: none"> • Last demand • Present demand • Peak demand: Occurrence time in counter format for peak demand <p>NOTE: The meter allows setting of only one demand parameter at a time .</p> | ✓ |
| % unbalance: Maximum 3-phase for voltage and current | ✓ |
| Meter On hours Load Run hours Power Interruptions | ✓ |
| Phase angle <ul style="list-style-type: none"> • Per-phase (between Voltage and Current) | ✓ |
| Communication | RS-485 Modbus RTU |
| Revolutions per minute (RPM) | ✓ |
| Old registers: Retrieval of last cleared values of energy and Run hours | ✓ |
| Retrofit (RtFt) For configuring legacy communication data models | ✓ |

1. Indicates features that can be read through communication only

Measured parameters

Energy

The meter provides bi-directional, 4-quadrant, Class 1 / Class 0.5S / Class 0.2 accurate energy metering.

The meter stores all accumulated active, reactive, and apparent energy parameters in nonvolatile memory:

- kWh, kVARh, kVAh (delivered)
- kWh, kVARh, kVAh (received)
- kWh, kVARh, kVAh (delivered + received)

All energy parameters represent the total for all three phases.

Applicable for METSEPM1125HCL1LVD / METSEPM1125HCL5LDD

NOTE: Based on the energy scale selection, when kWh, kVARh, kVAh (delivered) or kWh, kVARh, kVAh (received) of the energy parameters overflow at 99999.999 all energy parameter value resets.

Instantaneous

The meter provides highly accurate 1-second measurements, average values, including true RMS, per phase and total for:

- Per-phase and average voltage (line-to-line, line-to-neutral)
- Per-phase and average current, and neutral current (calculated)
- Per-phase and average power factor
- Per-phase and total power (VA, W, VAR)
- System frequency
- Revolutions per minute (RPM)
- Unbalance (voltage, current)
- Load percentage
- Phase angle, per-phase (between voltage and current)

Data display and analysis tools

Power Monitoring Expert

EcoStruxure™ Power Monitoring Expert is a complete supervisory software package for power management applications.

The software collects and organizes data gathered from your facility's electrical network and presents it as meaningful, actionable information via an intuitive web interface.

Power Monitoring Expert communicates with devices on the network to provide:

- Real-time monitoring through a multi-user web portal
- Trend graphing and aggregation
- Power quality analysis and compliance monitoring
- Preconfigured and custom reporting

See the EcoStruxure™ Power Monitoring Expert online help for instructions on how to add your device into its system for data collection and analysis.

Power SCADA Operation

EcoStruxure™ Power SCADA Operation is a complete real-time monitoring and control solution for large facility and critical infrastructure operations.

It communicates with your device for data acquisition and real-time control. You can use Power SCADA Operation for:

- System supervision
- Real-time and historical trending, event logging
- PC-based custom alarms

See the EcoStruxure™ Power SCADA Operation online help for instructions on how to add your device into its system for data collection and analysis.

Meter configuration

Meter configuration can be performed through the display (if your meter is equipped with one), the meter webpages or PowerLogic™ ION Setup.

ION Setup is a meter configuration tool that can be downloaded for free at www.se.com.

See the ION Setup online help or in the ION Setup device configuration guide. To download a copy, go to www.se.com and search for ION Setup device configuration guide.

Hardware reference

Meter types

The meter is available in one physical form factor.

| Commercial reference | Description |
|----------------------|---|
| METSEPM1125HCL10RS | Class 1 panel mount meter with RS-485 and integrated display. |
| METSEPM1125HCL10RD | |
| METSEPM1125HCL05RD | Class 0.5S panel mount meter with RS-485 and integrated display. |
| METSEPM1125HCL02RD | Class 0.2 panel mount meter with RS-485 and integrated display. |
| METSEPM1125HCL1LVD | Class 1 panel mount meter with RS-485, low voltage DC with integrated display |
| METSEPM1125HCL5LDD | Class 0.5 panel mount meter with RS-485, low voltage DC with integrated display |

Supplemental information

This document is intended to be used in conjunction with the installation sheet that ships in the box with your device and accessories.

See your device's installation sheet for information related to installation.

See your product's catalog pages at www.se.com for information about your device, its options and accessories.

You can download updated documentation from www.se.com or contact your local Schneider Electric representative for the latest information about your product.

Physical description

Front

The front panel has three rows of four digits/characters each, with auto scaling Kilo (K), Mega (M), and minus (-) indications. The **K** and **M** indicators are lit together to show Giga readings. The load bar graph to the right of the display gives the indication of consumption in terms of the % ampere load with respect to the full scale (FS) selected. Four smart keys make navigating through parameters very quick and intuitive for viewing data and configuring the meter.

Rear

The voltage, current terminal, and RS-485 communication port are located on the back of the meter.

Front panel

The front panel contains the following indicators and controls:

- **Eight-segment LED display:** Three rows of alphanumeric displays, four digits each, display three RMS parameters simultaneously or one energy parameter. The displayed readings update every second.
- **Analog load bar:** Unique indication of % load with respect to the full scale (FS).

- **Indicators:** Each row displays Kilo, Mega (Kilo + Mega = Giga) indicators, and a negative (-) indicator.
- **Keys:** Four smart keys to scroll through the display pages.

Analog load bar

- Unique indication of total load % with respect to the full scale through the 12 LED at the right side of the display.
- A bar graph indicating 10% load through each LED.
- The load bar help in finding the total load. To calculate total load, count the number of illuminated LED, and multiply by 10.

Load percentage and bar graph indication

| Load percentage | Bar graph display |
|--------------------|--|
| Less than 10% | No LED is lit. |
| Between 10% to 40% | Amber LED get lit. |
| Between 50% to 80% | Green LED get lit to indicate that the load is acceptable and should not be increased further. |
| Above 80% | Red LED get lit to indicate that the load has exceeded the sanctioned limit and is dangerous. |

Indicators

Kilo, Mega, and negative

| | |
|---|---|
|  | Kilo: When lit, indicates that the reading is in Kilo (10^3). 10,000 is displayed as 10.00 K and 1000 as 1000. |
|  | Mega: When lit, indicates that the reading is in Mega (10^6). 10,000 K is shown as 10.00 M and 1000 K as 1000 K. |
|  | Giga: When Kilo and Mega are lit together, the reading is in Giga (10^9). 10,000 M is shown as 10.00 G and 1000 M as 1000 M. |
|  | Negative: When lit, indicates a negative reading. <ul style="list-style-type: none"> • VAR (reactive power) displays negative indication based on quadrant of operation. • When current is reversed: W (active power) and PF (power factor) display negative indication. |

Decimal point scaling

Giga (M+K), Mega (M), Kilo (K), and decimal point scaling – RMS, Current, Voltage and Energy

| RMS Reading | Indicator |
|-----------------|---------------------------------|
| Less than 0.001 | K, M OFF, displays 0.000 |
| Less than 9999 | K, M OFF |

Giga (M+K), Mega (M), Kilo (K), and decimal point scaling – RMS, Current, Voltage and Energy (Continued)

| RMS Reading | Indicator |
|--------------|----------------------------|
| Above 9999 | K ON, M OFF |
| Above 9999 K | M ON, K OFF |
| Above 9999 M | Giga (K + M indicators ON) |
| Up to 9999 G | Giga |
| Above 9999 G | Display shows Hi |

RMS readings are four digits. Energy readings have eight digits (5+3), including three fractional digits. The maximum number the meter handles is 9,999 G for RMS and 99,999.999 G for energy values.

Energy readings of the power meter will overflow when energy reaches 99,999.999 G. This depends on PT (VT) and CT ratios programmed in the meter.

Giga (M+K), Mega (M), Kilo (K), and decimal point scaling – Power

| RMS Reading | Indicator |
|-----------------|---------------------------------|
| Less than 0.001 | K, M OFF, displays 0.000 |
| Less than 9999 | K ON, M OFF |
| Above 9999 | K OFF, M ON |
| Above 9999 K | M ON, K ON |
| Above 9999 M | Giga (K + M indicators ON) |
| Up to 9999 G | Giga |
| Above 9999 G | Display shows Hi |

RMS readings are four digits.

Smart keys

Operating the meter is easy, using the four smart keys to navigate through the display pages. The display pages expand as you go to the right, much like the directory or explorer tree displayed on any computer. The display shows where you are headed.

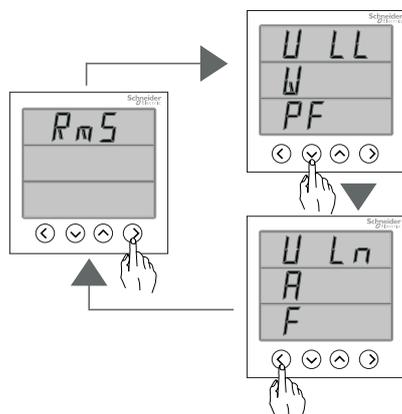
Smart keys description

| | |
|---|--|
|  | <p>Right key / OK key</p> <ul style="list-style-type: none"> • Going forward into sub-parameter pages. • To enter into Setup page. This action requires password. • Selecting the parameter to edit under Setup. |
|  | <p>Left key</p> <ul style="list-style-type: none"> • Going back to the main parameter pages. • Selecting previous digit on the left, under setup. • Exiting from editing Setup page. |
|  | <p>Up key</p> <ul style="list-style-type: none"> • Scrolling up through display pages at the same level, within the same function. • Increasing the value of the selected digit or navigating to the next available selection. |
|  | <p>Down key</p> <ul style="list-style-type: none"> • Scrolling down through other display pages at the same level, through all functions. • Decreasing the value of the selected digit or navigating to the next available selection. |

Keypad operation

Press a key in the direction you want to go. The display shows the next parameter as per navigation. Press OK to enter a parameter setup.

The following steps explain how to navigate from the **RMS** page to the **VLN A F** page and back to **RMS** page.



1. From the **RMS** page, press right button. The display shows **VLL W PF**.
2. Press down button. The display shows **VLN A F**.
3. To return to **RMS**, press left button. The display shows **RMS**.

NOTE: Use right button to go forward to the sub-parameter page and use left button to go backward to the main parameter pages. Use up button and down button to scroll up and down through the display pages.

Auto scroll

Auto-scroll allows you to monitor a group of display pages sequentially, every eight seconds, without manual key operation. This is convenient for viewing from a distance. The meter shows the parameter name for two seconds followed by the value for eight seconds.

Panel meter

LED indicators

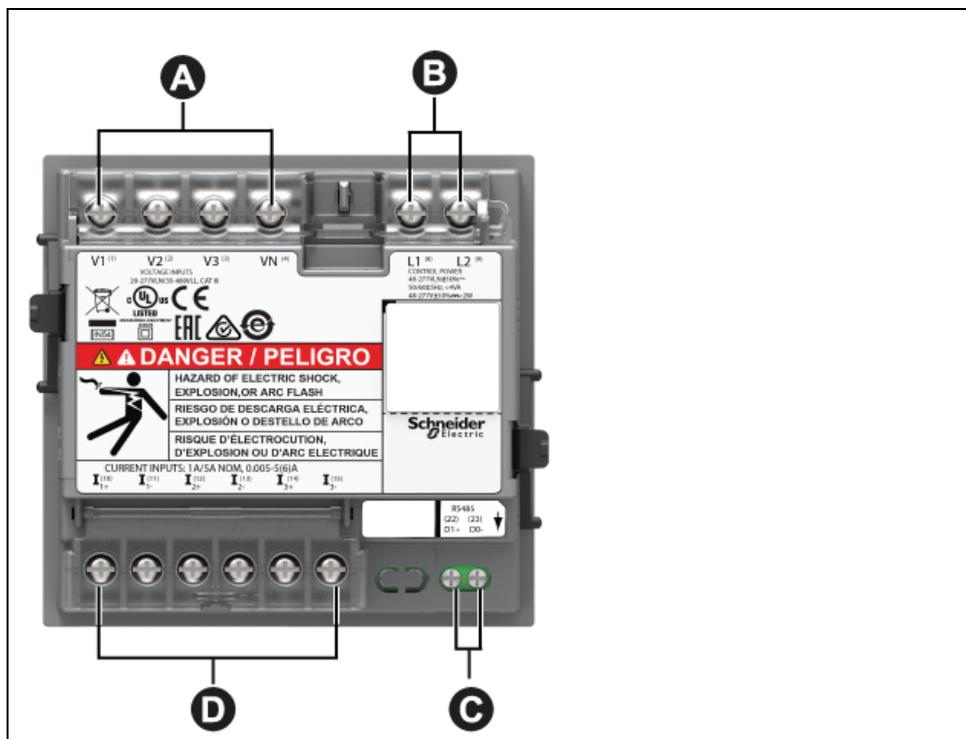
The LED indicators alert or inform you of meter activity or status. Refer to the following image for the various LED indicators the meter provides.



| | |
|---|---|
| A | Energy pulsing LED (Red) |
| B | Heartbeat / serial communications LED (Green) |

Rear wiring

The meter provides current and voltage inputs along with other wiring options. Refer to following image for various wiring options the meter provides.



| | |
|---|---|
| A | Input voltage terminals (V1, V2, V3, VN) |
| B | Auxiliary power supply (control power) terminals (L1, L2) |
| C | RS-485 communications terminals (D1+, D0-) |
| D | Input current terminals (I1+, I1-, I2+, I2-, I3+, I3-) |

Protective cover

The voltage and current terminal covers help prevent tampering with the meter's voltage and current measurement inputs.

The terminal covers enclose the terminals, the conductor fixing screws and a length of the external conductors and their insulation. Ensure you use a device (screwdriver recommended) to push the cover upwards till you hear a click to make the cover stand. These covers are included for meter models where sealable voltage and current covers are required to protect against tampering of current and voltage input signals. Refer to your meter's installation sheet or the instructions that came with your terminal covers for instructions on installing the terminal covers.

Meter mounting

For mounting instructions and safety precautions, see the installation sheet that was shipped with your device, or download a copy at www.se.com.

Meter wiring

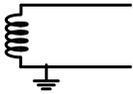
For wiring instructions and safety precautions, see the meter installation sheet that was shipped with your meter, or download a copy at www.se.com.

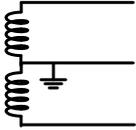
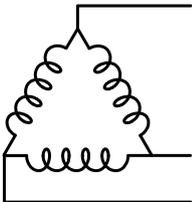
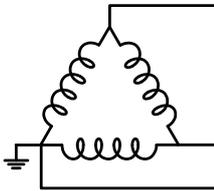
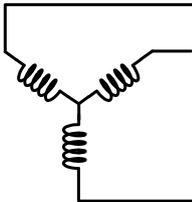
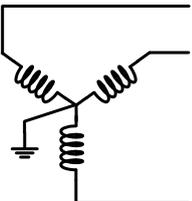
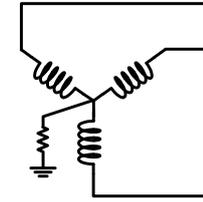
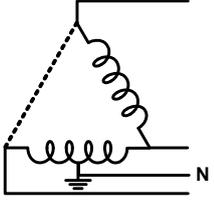
Measuring voltage limit

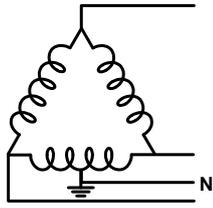
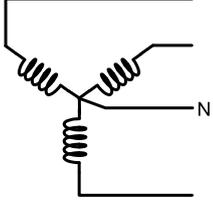
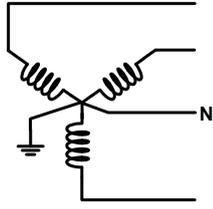
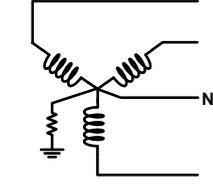
You can connect the meter's voltage inputs directly to the phase voltage lines of the power system if the power system's line-to-line or line-to-neutral voltages do not exceed the meter's direct connect maximum voltage limits.

The meter's voltage measurement inputs are rated by the manufacturer for up to 277 V L-N / 480 V L-L. However, the maximum voltage allowed for direct connection may be lower, depending on the local electrical codes and regulations. As per installation category III the maximum voltage on the meter voltage measurement inputs should not exceed 277 V L-N / 480 V L-L.

If your system voltage is greater than the specified direct connect maximum voltage, you must use VTs (voltage transformers) to step down the voltages.

| Power system description | Meter setting | | Symbol | Direct connect maximum (UL / IEC) | # of VTs (if required) |
|-------------------------------------|-----------------|-------------------------|---|-----------------------------------|------------------------|
| | Display (meter) | Display (communication) | | Installation category III | |
| Single-phase 2-wire line-to-neutral | 1P.LN | 1PH 2Wire L-N |  | ≤ 277 V L-N | 1 VT |
| Single-phase 2-wire line-to-line | 1P.LL | 1PH 2Wire L-L |  | 480 V L-L | 1 VT |

| Power system description | Meter setting | | Symbol | Direct connect maximum (UL / IEC) | # of VTs (if required) |
|---|-----------------|------------------------------------|---|-----------------------------------|------------------------|
| | Display (meter) | Display (communication) | | Installation category III | |
| Single-phase 3-wire line-to-line with neutral | 1P.3L | 1PH 3Wire L-L with N |  | ≤ 277 V L-N / 480 V L-L | 2 VT |
| 3-phase 3-wire Delta ungrounded | 3P.3L | 3PH 3Wire Ungrounded Delta |  | 480 V L-L | 2 VT |
| 3-phase 3-wire Delta corner grounded | | 3PH 3Wire Corner Grounded Delta |  | 480 V L-L | 2 VT |
| 3-phase 3-wire Wye ungrounded | | 3PH 3Wire Ungrounded Wye |  | 480 V L-L | 2 VT |
| 3-phase 3-wire Wye grounded | | 3PH 3Wire Grounded Wye |  | 480 V L-L | 2 VT |
| 3-phase 3-wire Wye resistance-grounded | | 3PH 3Wire Resistance Grounded Wye |  | 480 V L-L | 2 VT |
| 3-phase 4-wire open Delta center-tapped | 3P.4L | 3PH 4Wire Center-Tapped Open Delta |  | 240 V L-N / 480 V L-L | 3 VT |

| Power system description | Meter setting | | Symbol | Direct connect maximum (UL / IEC) | # of VTs (if required) |
|--|-----------------|-----------------------------------|---|-----------------------------------|------------------------|
| | Display (meter) | Display (communication) | | Installation category III | |
| 3-phase 4-wire Delta center-tapped | | 3PH 4Wire Center-Tapped Delta |  | 240 V L-N / 480 V L-L | 3 VT |
| 3-phase 4-wire ungrounded Wye | | 3PH 4Wire Ungrounded Wye |  | ≤ 277 V L-N / 480 V L-L | 3 VT or 2 VT |
| 3-phase 4-wire grounded Wye | | 3PH 4Wire Grounded Wye |  | ≤ 277 V L-N / 480 V L-L | 3 VT or 2 VT |
| 3-phase 4-wire resistance-grounded Wye | | 3PH 4Wire Resistance Grounded Wye |  | ≤ 277 V L-N / 480 V L-L | 3 VT or 2 VT |

Balanced system considerations

In situations where you are monitoring a balanced 3-phase load, you may choose to connect only one or two CTs on the phase(s) you want to measure, and then configure the meter so it calculates the current on the unconnected current input(s).

NOTE: For a balanced 4-wire Wye system, the meter's calculations assume that there is no current flowing through the neutral conductor.

Balanced 3-phase Wye system with 2 CTs

The current for the unconnected current input is calculated so that the vector sum for all three phases equal zero.

Balanced 3-phase Wye or Delta system with 1CT

The currents for the unconnected current inputs are calculated so that their magnitude and phase angle are identical and equally distributed, and the vector sum for all three phase currents equal zero.

NOTE: You must always use 3 CTs for 3-phase 4-wire center-tapped Delta or center-tapped open Delta systems.

Serial communications

The meter supports serial communication through the RS-485 port.

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. In master device, recommended response time-out setting should be minimum 1 second.

RS-485 configuration

Before connecting your device to the RS-485 bus, use the meter's display, or ION Setup to configure your meter's default RS-485 settings.

Your meter has one RS-485 connection.

Your meter must have a unique unit identifier (address) and have the following settings match the rest of the devices on the RS-485 bus:

- Protocol
- Baud rate
- Parity

You can use a communications converter (USB to RS-485 or RS-232 to RS-485) to connect to your meter.

Serial protocols

Your meter supports the serial communication protocol on its RS-485 port.

- Modbus RTU

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 2 wire or 1 twisted pair RS-485 cable to wire the devices. Use either shielded 2 wire or 1 twisted pair to connect the (+) and (-) terminals.

The total distance for devices connected on an RS-485 bus should not exceed 900 m (2953 ft).

NOTE: You can connect a maximum of 32 devices to a single RS-485 bus.

RS-485 terminals

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

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).

NOTE: To communicate with the meter using ION Setup, you must set the serial site and all connected devices in the RS-485 network to the same parity setting.

For meters that do not have a display, you must first wire and configure each one separately before connecting these meters to the same RS-485 bus.

Display and meter setup

Display overview

The display lets you use the meter to perform various tasks such as setting up the meter, displaying data screens, or performing resets.



| | |
|---|---------------------------|
| A | Analog load bar |
| B | Retainer clip |
| C | Alpha numeric LED display |
| D | LED indicators |
| E | Menu selection buttons |

Energy pulsing LED

The meter supports LED that can be configured for energy pulsing.

When configured for energy pulsing, this LED flashes at a rate proportional to the amount of energy consumed. This is typically used to verify the meter's accuracy.

Heartbeat / serial communications LED

The heartbeat / serial communications LED blinks to indicate the meter's operation and serial Modbus communications status.

The LED blinks at a slow, steady rate to indicate the meter is operational. The LED flashes at a variable, faster rate when the meter is communicating over a Modbus serial communications port.

You cannot configure this LED for other purposes.

NOTE: A heartbeat LED that remains lit and does not blink (or flash) can indicate a problem. In this case, power down the meter and reapply power. If the LED still does not blink or flash, contact Technical Support.

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.

With the meter front panel, you can view parameter values; configure parameters; perform demand resets; perform LED checks; and view meter information. Each of these functions can be accomplished by pressing the Up, Down, and OK buttons on the front panel.

These button actions achieve different results according to the mode that the meter is in:

- Display mode (default): view parameter measurements
- Setup mode: configure a parameter
- Clear mode: reset measurements
- Lock mode: lock or unlock a screen

Viewing parameters

The meter's display screen and buttons allow you to view the required parameters.

To view display parameters:

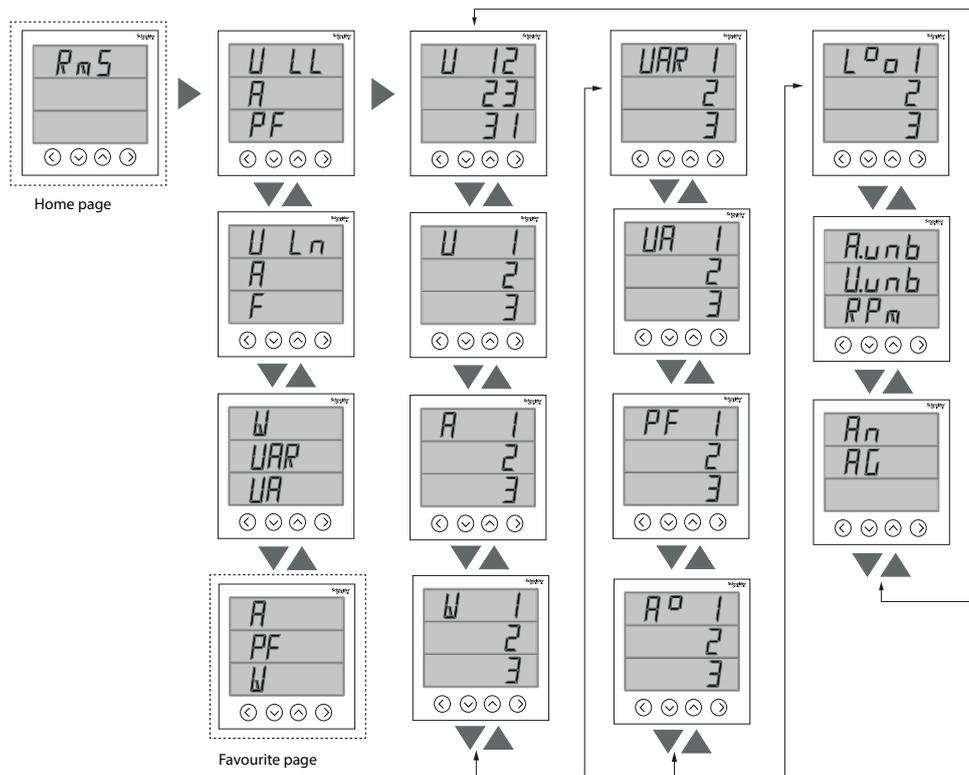
1. Press the **Up** or **Down** button to navigate to **RMS** menu.
2. Press **OK**.
3. Press the **Up** or **Down** button to navigate to the previous or next parameter page.

Display screen menu tree

Use the menu tree to navigate to the setting you want to view.

parameter navigation

The following image summarizes the **RMS** parameters under meter:



Favourite page

The meter allows you to select 3 parameters and arrange them in required order to be displayed in favourite page. These parameters can be selected only through communication and are based customer requirements. Some parameter logs are of utmost importance and navigating to those parameters takes time. For ease of navigation and accessibility, the meter allows you to chose 3 parameters and lock the page for easy reading. The selectable parameters are:

- V L-L
- V L-N
- A
- F
- W
- PF
- VA
- VAR

Button functions in viewing parameters

| Mode | Button | Description | Function |
|---|--------|--|---------------------------------------|
| Display mode NOTE: Display mode is view-only and displays the parameter values. | | Down key: To navigate down | To view the next parameter value. |
| | | Up key: To navigate up | To view the previous parameter value. |
| | | Right / OK key: To navigate right / Enter key | To move from one page to the next. |

Setup screen menus

Setup screen enables you to configure various setup parameters.

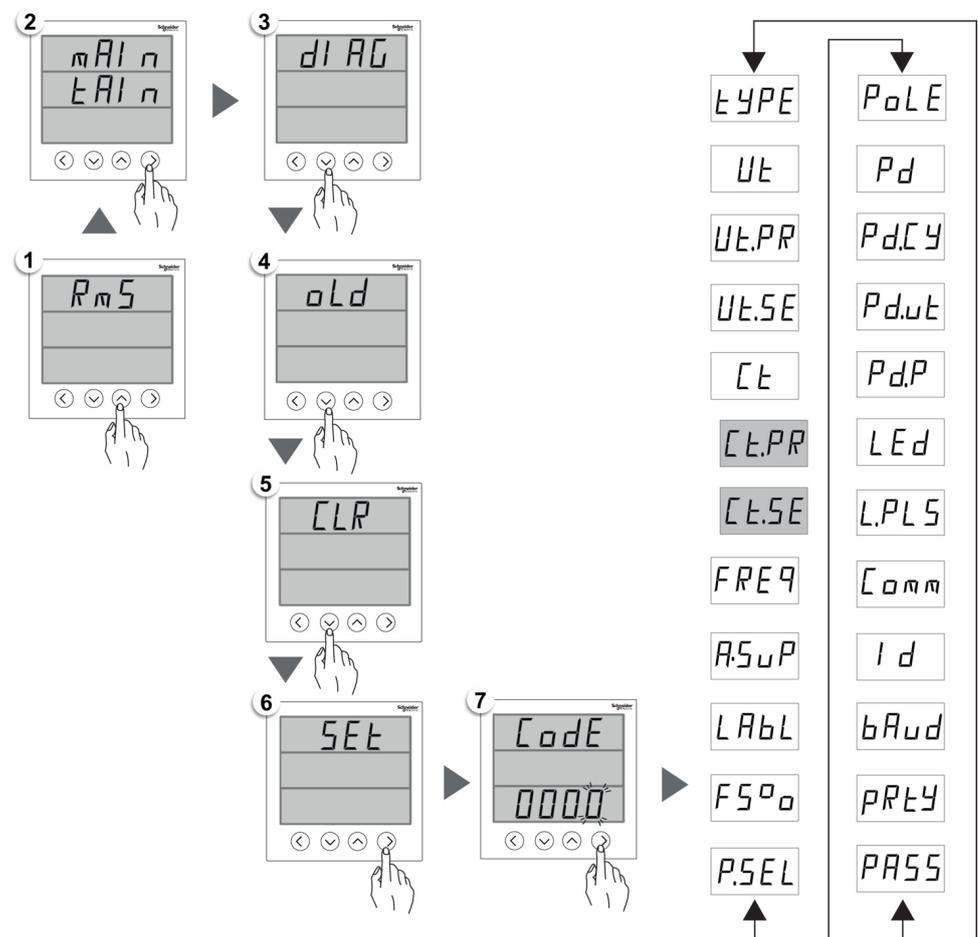
The meter's display screen and buttons allow you to navigate to and edit the required parameters.

To enter into setup:

1. From the **Home** page, use **Up** or **Down** button to navigate to **Maintain**.
2. Press **OK**.
3. Use **Up** or **Down** button to navigate to **Set**.
4. Press **OK**.
5. Enter the password. Default password is 0000.
6. Press **OK** to enter **Setup**.
7. Press **Left** button to exit **Setup** after viewing parameters.

The list of setup parameters and the configurations it supports.

Meter setup menus:



Setup parameters

| Name on display | Description | Input range | Default value |
|-----------------|-----------------------------------|---|---------------|
| TYPE | TYPE: Power System Configurations | [1P.Ln, 1P.LL, 1P.3L, 3P.3L, 3P.4L] NOTE: Other power system configurations can be set through ION setup. | 3P.4L |
| VT | VT: Voltage Transformer | [no.Vt, 2.VT, 3.VT, 1.VT] NOTE: The VT Connect parameters are enabled | no.Vt |

| Name on display | Description | Input range | Default value |
|-----------------|---|--|---------------|
| | | based on selected power system configuration. | |
| VT.PR | Vt.Pr: Primary Voltage (V L-L) | [0100 V to 999000 V] NOTE: VT.PR will not be enabled if VT Connect is no. VT. | 415 |
| VT.SE | Vt.SE: Secondary Voltage (V L-L) | [100, 110, 115, 120, 415] NOTE: VT.SE will not be enabled if VT Connect is no. VT. | 415 |
| CT | Ct: Current Transformer | [A.1, A.2, A.3, A.12, A.23, A.31, A.123] NOTE: The CT terminal parameters are enabled based on the selected power system and VT connect configuration. | A.123 |
| CT.PR | Ct.Pr: CT Primary | [1 A to 32760 A] NOTE: CT primary can be set to 32767 A through communication. | 100 |
| CT.SE | Ct.SE: CT Secondary | [1 A, 5 A] | 5 |
| FREQ | FrEq: System Frequency | [50 Hz, 60 Hz] | 50 |
| A.SUP | A.SUP: A.Suppression (Minimum current at which meter starts functioning) | [5 to 99 mA] | 005 |
| LABL | LABL: Phase labeling | [123, Abc, rst, pqr, ryb] | 123 |
| FS% | FS%: Full scale value (Rescaling analog load bar with respect to CT loading) | [1 to 100] | 100 |
| P.SEL | P.SEL: Parameter selection | [VA, W, VAR] | W |
| POLE | POLE: To determine RPM of alternator / generator based on number of poles and network frequency | [2, 4, 6, 8, 10, 12, 14, 16] | 4 |
| PD | PD: Power demand | [t.sb, t.b, t.rb] | t.b |
| PD.CY | PD.CY: Demand period | [1-60 min] | 15 |
| PD.UT | PD.UT: Demand update time | [1-60 min] | 15 |
| PD.P | PD.P: Demand parameter | [VA, W,VAR] | VA |
| LED | LED: LED parameter | [OFF, INTG] | OFF |
| L.PLS | L.PLS: Pulses per energy | [1 to 9999000] | 1 |
| COMM | COMM: Communication <ul style="list-style-type: none"> ON / OFF: To enable / disable communications port. Retrofit (RTFT): For configuring legacy communication data models. | [ON, RTFT, OFF] | ON |
| ID | ID: Unit ID | [1-247] | 1 |
| BAUD | BAUD: BPS (Baud rate per second) | [4800, 9600, 19200, 38400] | 19200 |
| PRTY | PRTY: Parity | [Even, Odd, None] | Even |
| PASS | PASS: Password | Can be configured from 0000 to 9999 NOTE: Record your password in a secure location. | 0000 |

Button functions in viewing setup parameters

| Mode | Button | Description | Function |
|------------|---|--|--|
| Setup menu |  | Down key: To navigate down | To navigate to the next parameter configuration screen. |
| |  | Up key: To navigate up | To navigate to the previous parameter configuration screen. |
| |  | Right / OK key: To navigate right / Enter key | Enter setup mode to configure the displayed parameter value. |

Button functions in editing setup parameters

| Mode | Button | Function |
|------------|---|--|
| Setup menu |  | <i>Flashing digit:</i> To decrease the numeric value. <i>Flashing value:</i> To view the previous value from the list. <i>Flashing decimal point:</i> To move decimal point to left. |
| |  | <i>Flashing digit:</i> To increase the numeric value. <i>Flashing value:</i> To view the next value from the list. <i>Flashing decimal point:</i> To move decimal point to right. |
| |  | Long press: Press and hold for 2 seconds. <i>Flashing digit:</i> To move the position of the cursor to left. |
| |  | To select a parameter to edit the values. To save the changes made to setup parameter. |

Editing setup parameters

The following steps describe how to edit parameters in setup mode.

1. From the **Home** page, use **Up** or **Down** button to navigate to **Maintain**.
2. Press **OK**.
3. Use **Up** or **Down** button to navigate to **Set**.
4. Press **OK**.
5. Enter password. Default password is 0000.
6. Press **OK**.
7. Press the **Up** or **Down** button to select a parameter to edit. The selected parameter flashes the digit, value, or decimal point that is required to be set (the meter automatically determines which option to flash for editing, depending on the parameter).
8. Increase or decrease the digit value, move the decimal point, or select a value from a pre-programmed list using the **Up** or **Down** button.
9. Press **OK** after making the required changes.
10. Press **Left** button.
11. Select **Yes** to save your settings.

NOTE: Select **No** to exit setup mode without saving any settings.

Demand setup

Demand is a measure of average consumption (power) over a fixed programmed time interval.

You can view the demand values provided in **Demand** page by navigating through display parameters. The meter supports editing power demand through **Setup** mode.

To view demand setup values, follow these steps:

1. From the **Home** page, use **Up** or **Down** button to navigate to **Maintain**.
2. Press **OK**.
3. Use **Up** or **Down** button to navigate to **Set**.
4. Press **OK**.
5. Enter password. Default password is 0000.
6. Press **OK**.
7. Select the parameter from the list. Press the **Down** button to select **Pd** (power demand method), **Pd.Cy** (demand period), **Pd.ut** (demand update time), or **Pd.P** (demand parameter).
8. Press **OK**.
9. Press the **Down** button to select required values from the list.
10. Press **OK**.
11. Press **Left** button.
12. Select **Yes** (Press **OK** button) to save your settings.

Communications setup

After wiring the meter's serial communications ports, you can configure these ports so you can connect to the meter remotely and use device configuration software such as ION Setup to configure the meter.

The setup screen allows you to configure the meter's RS-485 communications port so you can use software to access the meter's data or configure the meter remotely.

To turn on communication in setup screen, follow these steps:

1. From the **Home** page, use **Up** or **Down** button to navigate to **Maintain**.
2. Press **OK**.
3. Use **Up** or **Down** button to navigate to **Set**.
4. Press **OK**.
5. Enter password. Default password is 0000.
6. Press **OK**.
7. Use **UP** or **Down** button to select **Comm** (communication).
8. Press **OK**.
9. Press the **Down** button to select **ON** from the list.
10. Press **OK**.

11. Press **Left** button.
12. Select **Yes** (press **OK** button) to save your settings.

RS-485 communication parameters

| Parameter | Values | Description |
|-----------|--------------------------|---|
| Unit ID | 1 to 247 | Set the address for this device. The address must be unique for each device in a communications loop. |
| Baud Rate | 4800, 9600, 19200, 38400 | Select the speed for data transmission. The baud rate must be the same for all devices in a communications loop. |
| Parity | Even Odd None | Select None if the parity bit is not used. The parity setting must be the same for all devices in a communications loop. Parity is measured in number of stop bits. |

NOTE: Communication parameters display ON / OFF / Retrofit (RTFT). Retrofit provides you an option of configuring legacy data models for your device to communicate with newer models.

Password setup

The meter password can only be configured through the front panel. The factory-default setting for all passwords is “0000” (zero). Changing the default password for screens that are password protected prevents unauthorized personnel from accessing certain screens such as the Setup and Clear screens. To change the meter password using Setup, follow these steps:

1. From the **Home** page, use **Up** or **Down** button to navigate to **Maintain**.
2. Press **OK**.
3. Use **Up** or **Down** button to navigate to **Set**.
4. Press **OK**.
5. Enter password. Default password is 0000.
6. Press **OK**.
7. Press the **Up** button to select **PASS** (password) parameter.
8. Press **OK**.
9. Press the **Down** or **Up** button to change the digits.

NOTE: Use the Left button to move the cursor to the next digit.
10. Press **OK**.
11. Press **Left** button.
12. Select **Yes** (press **OK** button) to save your settings.

Password settings

| Parameter | Values | Description |
|-----------|-------------|--|
| Pass | 0000 - 9999 | Sets the password for accessing the meter setup screen. NOTE: Common password applies across all parameters. |

Lost password

Visit www.se.com for support and assistance with lost passwords or other technical problems with the meter. Make sure you include your meter's model, serial number, and firmware version in your email or have it readily available if calling Technical Support.

Diagnostics (Diag) screen menus

In Diag, you can verify the front panel LEDs, and view meter information.

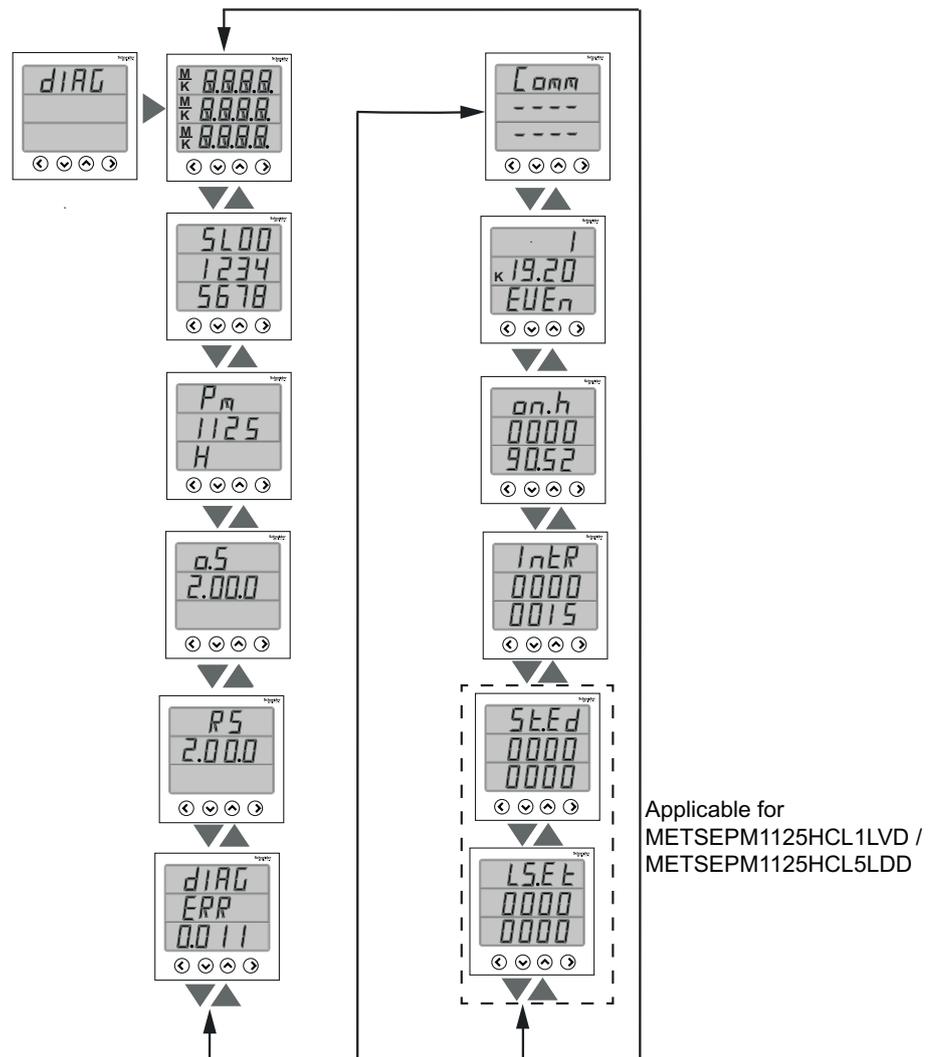
The meter's display screen and buttons allow you to navigate to the Diag.

To view Diag screens, follow these steps:

1. From the **Home** page, use **Up** or **Down** button to navigate to **Maintain**.
2. Press **OK**.
3. Use **Up** or **Down** button to navigate to **Diag**.
4. Press **OK**.
5. Press the **Down** button to navigate to the next **Diag** screen.
6. Press **Left** button to exit.

Diag menus

Diag parameters that are displayed on the meter screen.



| Screens | Description |
|-----------------------------|---|
| All LED on | On entering Diag screen, all LED on the front panel light up. This indicates that the front panel LED and display are operating correctly. <ul style="list-style-type: none"> The display for each line shows four eights (8888), four decimal points (....) , negative indicators(-), M and K indicators lit up. All Load bar LED and Energy LED lit up. |
| Serial number | Displays the meter serial number, for example SL1200005174. NOTE: Ensure you have your meter's serial number information available while contacting Technical Support for help. |
| Meter Model | Displays the meter model number. |
| OS version | Displays the operating system version number, for example OS 1.00.0. |
| RS version | Displays the reset (boot code) version number, for example RS 1.00.0. |
| Diagnostics error code | Displays the error codes of the meter for diagnostics. For example: 0041 is the error code for Over-Running energy pulse output. |
| Communication error code | Displays the communication errors of the meter. |
| ID, BAUD, Parity | Displays the unit ID, baud rate, and parity values of the meter. |
| Meter On hours | Displays the meter on (auxiliary / control power ON) duration, for example hhhhhh:mm NOTE: Meter On hours are displayed with 6 digit Hours and 2 digit Minutes. |
| Power interruptions | Displays the power interruptions counter. |
| Setup edit ² | Displays the number of setup edit performed. |
| Last edit time ² | Displays the last edit time of setup edit performed, for example hhhhhh:mm NOTE: Last edit time are displayed with 6 digit Hours and 2 digit Minutes. |

Button functions in viewing Diag screen

| Mode | Button | Function |
|-----------|---|--|
| Diag menu |  | To navigate to the next screen. |
| |  | To navigate to the previous screen. |
| |  | Press the Left button to exit Diag screen. |

Clear screen menus

Clear screen enables you to reset energy (Enrg) and max demand (MD) values.

2. Applicable for METSEPM1125HCL1LVD / METSEPM1125HCL5LDD

Clear parameters

| Parameters | Description |
|------------------------------|--|
| MD (HMI and Communication) | Resets the maximum demand values under Demand. <ul style="list-style-type: none"> W, VA, and VAR with timestamp |
| Enrg (HMI and Communication) | Resets the Energy values and Run Hours under INTG. |

Lock / unlock

Lock enables you to set the meter screen to default screen. You can scroll to other display screens while a screen is locked. Once the manual scrolling is stopped, the meter displays the default (lock) screen after 4 minutes.

Locking / unlocking meter screen

The meter’s display screen and buttons allow you to lock or unlock any screen.

Press and hold the **Up** and **Down** buttons simultaneously for 2 seconds to lock or unlock a meter screen.

NOTE:

You can only lock the display parameters. You cannot enter the **Setup** or **Reset** when a meter screen is locked.

You cannot enter the **Setup** or **Clear** when a meter screen is locked.

Button functions in locking / unlocking meter screen

| Mode | Button | Function |
|---------------|---|---|
| Lock / Unlock |  +  | Press and hold the Up and Down buttons simultaneously for 2 seconds to lock or unlock a meter screen. |

Security

Security overview

Your Schneider Electric product is equipped with security-enabling features.

These features arrive in a default state and can be configured for your installation needs. Please note that disabling or modifying settings within the scope of these individual features can impact the overall security robustness of the device and ultimately the security posture of your network in either positive or negative ways. Review the security intent and recommendations for the optimal use of your device's security features.

Products are hardened to increase security robustness. This is an ongoing process consisting of secure development practices, inclusion of security features and testing at our security test facilities. Following system hardening best practices is also necessary to help ensure your overall system security.

See the [Cybersecurity Hardening Best Practices](#) white paper for suggested best practices.

Security features on your device

Your device comes with security features that you can configure to help protect against unauthorized configuration and access to your device's data through its user interfaces or communications.

Passwords and user accounts

The meter has configurable password for the display.

Leaving the password at the default value makes it easier for a potential attacker to gain unauthorized access to your device. It is recommended that you change your password from the default value.

Password best practices

Recommended password best practices help to improve security on your meter.

- Change your meter's password from the default value.
- Make your meter's passwords as complex as possible.

NOTE: Make sure that the user password you enter is compatible with the software used to communicate with your device.

- Schedule regular changes to your meter's passwords.
- Record your meter's passwords in a secure location.

If your meter's user access information is lost, you must return the meter to the factory, where your meter is reset to its factory defaults and all logged data is lost.

NOTICE

DATA LOSS

Record your device's user and password information in a secure location.

Failure to follow these instructions can result in equipment damage.

Remote meter setup

Overview

You can configure the meter's setup parameters through the meter's RS-485 communications port.

The meter is factory-configured with default RS-485 communications port settings. You must modify the default settings before connecting the meter to your RS-485 network. To configure the RS-485 port, you need:

- ION Setup

NOTE: Remote meter setup is applicable only for meter models supporting RS-485 communication.

ION setup

Go to www.se.com and search for ION Setup to download a copy of the installation file.

If you already have an existing installation of ION Setup, it is recommended that you upgrade to the latest version in order to access new features or enhancements and properly configure features available on your device.

Refer to the online help to learn how to use ION Setup.

RS-485 port setup

The meter is factory-configured with default serial communications settings that you may need to modify before connecting the meter to the RS-485 bus.

The meter is factory-configured with the following default serial communications settings:

- Protocol = Modbus RTU
- Address = 1
- Baud rate = 19200
- Parity = Even

You can use a communications converter (USB to RS-485 or RS-232 to RS-485) device to connect to the meter.

Meter setup through RS-485

After the meter's RS-485 port is configured and connected to the RS-485 network, you can use ION Setup to configure all other meter setup parameters.

Using a serial communications converter to set up RS-485

You can use a communications converter (USB to RS-485 or RS-232 to RS-485) to connect to the meter.

NOTE: Configuring the serial communications settings using this method may cause ION Setup to lose communications when the changes are sent to your meter. You must reconfigure ION Setup to match the new settings to re-establish communications with your meter.

1. Configure the serial communications converter's settings to be compatible with the meter's default communications settings.
2. Connect the meter's RS-485 port to the serial communications converter.

3. Connect the communications converter to the computer.
4. Start ION Setup in Network mode.
5. Add a serial site and set its properties:
 - Comm link = Serial
 - Comm port = select which serial (or USB) port the communications converter is attached to
 - Baud rate = 19200
 - Format = select a format with even parity
6. Add a meter to the site and set its properties:
 - Type = Device name
 - Unit ID = 1
7. Use the setup screens to modify the meter's setup parameters.
8. Use the **RS-485 Base Comm** setup screen to modify the meter's serial communication settings.
9. Click **Send** to save your changes to the meter. You need to reconfigure ION Setup to match the changed settings in order to re-establish communications with your meter.
10. Exit ION Setup.

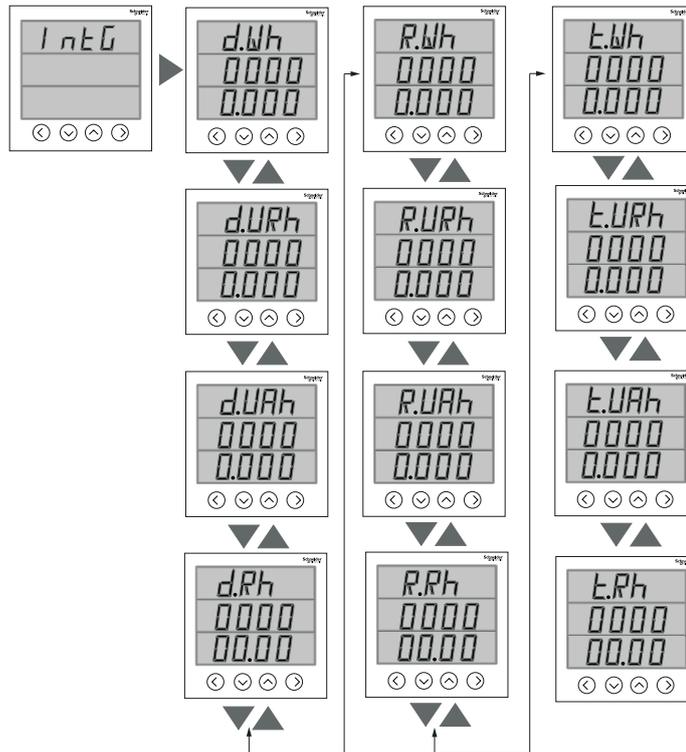
RS-485 port settings

| Parameter | Values | Description |
|-----------|--------------------------|---|
| Protocol | Modbus RTU | Select the communications format used to transmit data. The protocol must be the same for all devices in a communications loop. ION Setup does not support ASCII 8, ASCII 7 or JBus protocols. |
| Address | 1 to 247 | Set the address for this device. The address must be unique for each device in a communications loop. |
| Baud rate | 4800, 9600, 19200, 38400 | Select the speed for data transmission. The baud rate must be the same for all devices in a communications loop. |
| Parity | Even, Odd, None | Select None if the parity bit is not used. The parity setting must be the same for all devices in a communications loop. |

Meter configuration using ION Setup

Start ION Setup, create a site (or if applicable, use an existing site), then add your meter to the site.

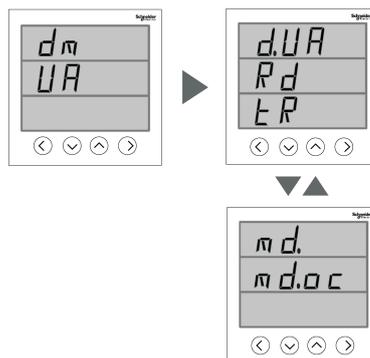
Refer to the ION Setup device configuration guide for information about your meter. To download a copy, go to www.se.com and search for ION Setup device configuration guide.



DM page

To view DM parameters:

1. From the **Home** page, use **Up** or **Down** button to navigate to **DM**.
2. Press **OK**.
3. Press the **Up** or **Down** button to navigate to the next **DM** parameter.
4. Press **Left** button to exit.



| Name on display | Description |
|-----------------|---|
| d.W | Displays the last demand value for active power. |
| d.VA | Displays the last demand value for apparent power. |
| d.VAR | Displays the last demand value for reactive power. |
| Rd | Displays the raising demand value. |
| tR | Displays the time remaining, for example mm:ss. NOTE: Maximum demand occurrence are displayed with 2 digit Minutes and 2 digit Seconds. |

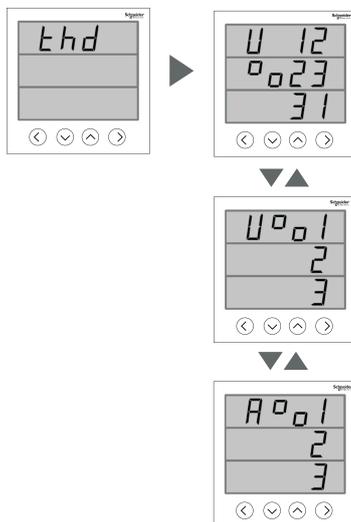
| Name on display | Description |
|-----------------|---|
| md | Displays the maximum demand value. |
| md.oc | Displays the Maximum demand occurrence time, for example hhhhhh:mm. NOTE: Maximum demand occurrence are displayed with 6 digit Hours and 2 digit Minutes. |

NOTE: Based on the selected power type under **Demand** setup, the **DM** page displays either **DM W**, **DM VA**, or **DM VAR**.

THD% page

To view THD% parameters:

1. From the **Home** page, use **Up** or **Down** button to navigate to **THD**.
2. Press **OK**.
3. Press the **Up** or **Down** button to navigate to the next **THD** parameter.
4. Press **Left** button to exit.

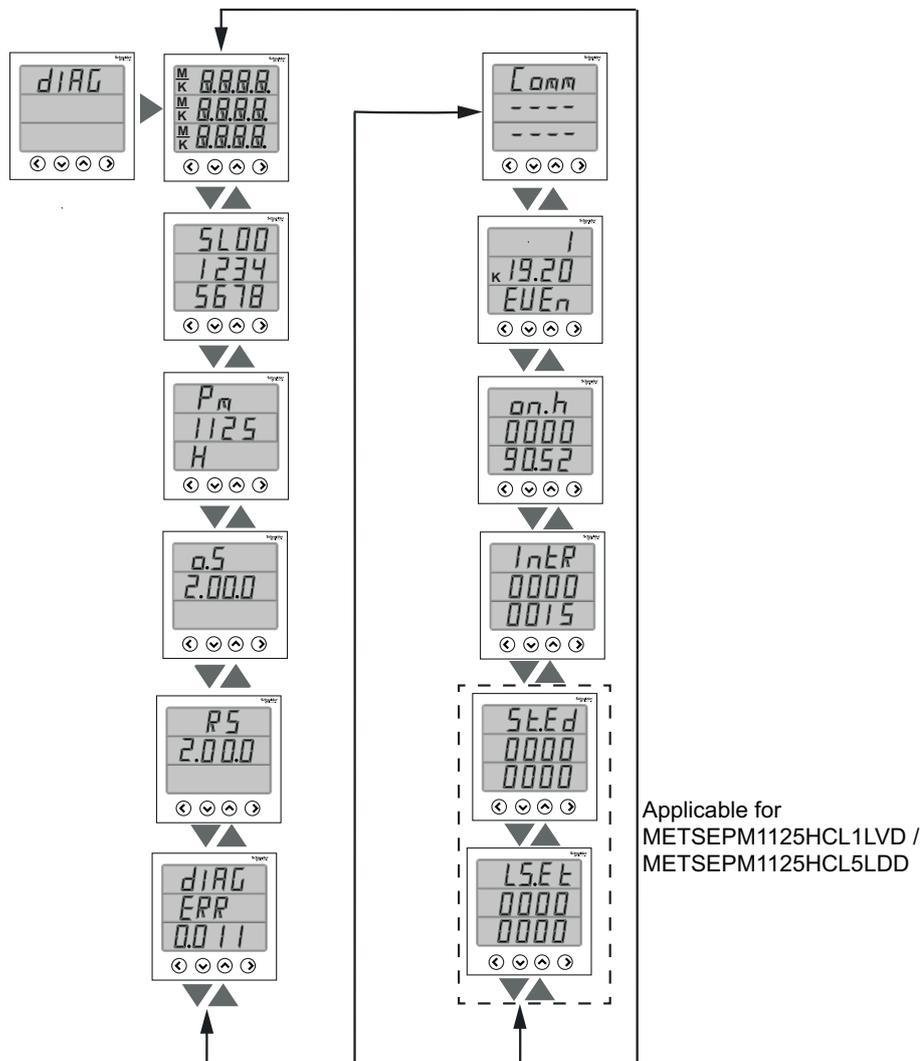


| Name on display | Description |
|-----------------|--|
| V% 12, 23, 31 | Displays the voltage for THD% for Voltage lines 12, 23, and 31 respectively |
| V% 1, 2, 3 | Displays the voltage for THD% for Voltage lines 1, 2, and 3 respectively |
| A% 1, 2, 3 | Displays the voltage for Current THD% for current lines 1, 2, and 3 respectively |

Diag page

To view Diag parameter:

1. From the **Home** page, use **Up** or **Down** button to navigate to **Diag**.
2. Press **OK**.
3. Press the **Up** or **Down** button to navigate to the next **Diag** parameter.
4. Press **Left** button to exit.

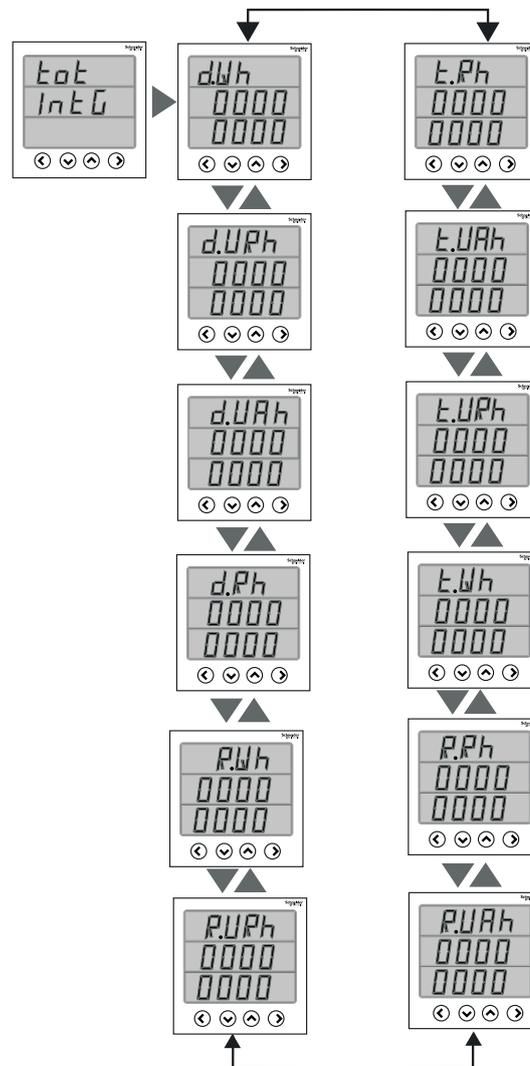


Tot INTG

Applicable for METSEPM1125HCL1LVD / METSEPM1125HCL5LDD

To view tot INTG parameters:

1. From the **Home** page, use **Up** or **Down** button to navigate to **Tot INTG**.
2. Press **OK**.
3. Press the **Up** or **Down** button to navigate to the next **Tot INTG** parameter.
4. Press **Left** button to exit.



| Name on display | Description |
|-----------------|--|
| d. wh | Displays the delivered active energy |
| d. VRh | Displays the delivered reactive energy |
| d. VAh | Displays the delivered apparent energy |
| d. Rh | Displays the delivered run hours, for example hhhhh:mm NOTE: Run Hours are displayed with 6 digit Hours and 2 digit Minutes. |
| R. wh | Displays the received active energy |
| R. VRh | Display the received reactive energy |
| R. VAh | Displays the received apparent energy |
| R. Rh | Displays the received run hours, for example hhhhh:mm NOTE: Run Hours are displayed with 6 digit Hours and 2 digit Minutes. |
| t. wh | Display the total active energy |
| t. VRh | Displays the total reactive energy |
| t. VAh | Displays the total apparent energy |
| t. Rh | Displays the total run hours, for example hhhhh:mm NOTE: Run Hours are displayed with 6 digit Hours and 2 digit Minutes. |

Using ION Setup to view or modify configuration data

You can use ION setup to view or modify the meter setup parameters.

Using software to view meter data

There are different software systems and methods you can use to access or display the meter data. This can range from using a simple Modbus register interface to read stored values in the meter's registers, to viewing intelligent information from the meter through an energy management system.

Power Monitoring Expert

EcoStruxure™ Power Monitoring Expert is a complete supervisory software package for power management applications.

The software collects and organizes data gathered from your facility's electrical network and presents it as meaningful, actionable information via an intuitive web interface.

Power Monitoring Expert communicates with devices on the network to provide:

- Real-time monitoring through a multi-user web portal
- Trend graphing and aggregation
- Power quality analysis and compliance monitoring
- Preconfigured and custom reporting

See the EcoStruxure™ Power Monitoring Expert online help for instructions on how to add your device into its system for data collection and analysis.

Power SCADA Operation

EcoStruxure™ Power SCADA Operation is a complete real-time monitoring and control solution for large facility and critical infrastructure operations.

It communicates with your device for data acquisition and real-time control. You can use Power SCADA Operation for:

- System supervision
- Real-time and historical trending, event logging
- PC-based custom alarms

See the EcoStruxure™ Power SCADA Operation online help for instructions on how to add your device into its system for data collection and analysis.

Modbus command interface

Most of the meter's real-time and logged data, as well as basic configuration and setup of meter features, can be accessed and programmed using a Modbus command interface as published in the meter's Modbus register list.

This is an advanced procedure that should only be performed by users with advanced knowledge of Modbus, their meter, and the power system being monitored. For further information on the Modbus command interface, contact Technical Support.

See your meter's Modbus register list at www.se.com for the Modbus mapping information and basic instructions on command interface.

Measurements and calculations

Meter initialization

Meter Initialization is a special command that clears the meter's energy, power, demand values, and meter operation timer.

It is common practice to initialize the meter after its configuration is completed, before adding it to an energy management system.

After configuring all the meter setup parameters, navigate through the different meter display screens and make sure the displayed data is valid then perform meter initialization.

NOTE: You can perform meter initialization using ION setup and secured command interface.

Real-time readings

The meter measures currents and voltages, and reports in real time the RMS (Root Mean Squared) values for all three phases and neutral.

The voltage and current inputs are continuously monitored at a sampling rate of 64 samples per cycle. This amount of resolution helps enable the meter to provide reliable measurements and calculated electrical values for various commercial, buildings and industrial applications.

Power and Energy measurements

The meter measures, displays and records three power and corresponding energy parameters simultaneously - W/Wh, VA/VAh and VAR/VARh.

Energy

The meter provides bi-directional, 4-quadrant, Class 1 / Class 0.5S / Class 0.2 accurate energy metering.

The meter stores all accumulated active, reactive, and apparent energy parameters in nonvolatile memory:

- kWh, kVARh, kVAh (delivered)
- kWh, kVARh, kVAh (received)
- kWh, kVARh, kVAh (delivered + received)

All energy parameters represent the total for all three phases.

Applicable for METSEPM1125HCL1LVD / METSEPM1125HCL5LDD

NOTE: Based on the energy scale selection, when kWh, kVARh, kVAh (delivered) or kWh, kVARh, kVAh (received) of the energy parameters overflow at 99999.999 all energy parameter value resets.

Power demand

Power demand is a measure of average power consumption over a fixed time interval.

Only one demand parameter can be set at a given time. You can set it using the meter's display, through communication using ION setup, or by using any Modbus tool that supports FC16.

The list of demand parameters that can be configured are :

- VA demand
- VAR demand
- W demand

Last demand: This demand updates in the NVRAM of the meter at the end of a demand interval. The present value at the end of the demand interval updates to last demand.

Present demand: The demand calculated by dividing energy accumulated during a specified period by length of that period.

Peak demand: Peak Demand is the highest recorded demand value in NVRAM. It is not dependent on any interval or cycle. Unless there is no value recorded higher than the current value of the peak demand, the peak demand value will not update. The meter displays the peak demand occurrence time. The meter takes a snapshot of meter On hours at which the peak demand occurred.

NOTE: This value gets cleared or reset when demand configuration is changed to other configuration parameter or when the demand parameter is reset in the meter.

The meter measures instantaneous consumption and can calculate demand using various methods.

Power demand calculation methods

Power demand is calculated by dividing the energy accumulated during a specified period by the length of that period.

How the meter performs this calculation depends on the method and time parameters you select (for example, timed rolling block demand with a 15 - minute interval and 5 - minute subinterval).

To be compatible with electric utility billing practices, the meter provides the following types of power demand calculations:

- Block interval demand

You can configure the power demand calculation method from the display or software.

Block interval demand

For block interval demand method types, you specify a period of time interval (or block) that the meter uses for the demand calculation.

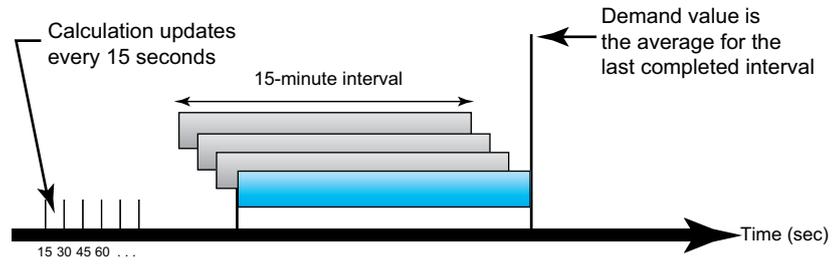
Select/configure how the meter handles that interval from one of these different methods:

| Type | Description |
|---------------------|---|
| Timed Sliding Block | Select an interval from 1 to 60 minutes (in 1-minute increments). If the interval is between 1 and 15 minutes, the demand calculation <i>updates every 15 seconds</i> . If the interval is between 16 and 60 minutes, the demand calculation <i>updates every 60 seconds</i> . The meter displays the demand value for the last completed interval. |
| Timed Block | Select an interval from 1 to 60 minutes (in 1-minute increments). The meter calculates and updates the demand at the end of each interval. |
| Timed Rolling Block | Select an interval and a subinterval. The subinterval must divide evenly into the interval (for example, three 5-minute subintervals for a 15-minute interval). Demand is <i>updated at the end of each subinterval</i> . The meter displays the demand value for the last completed interval. |

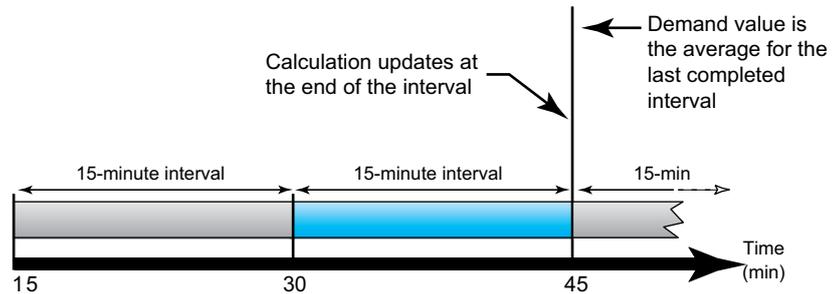
Block interval demand example

The following illustration shows the different ways power demand is calculated using the block interval method. In this example, the interval is set to 15 minutes.

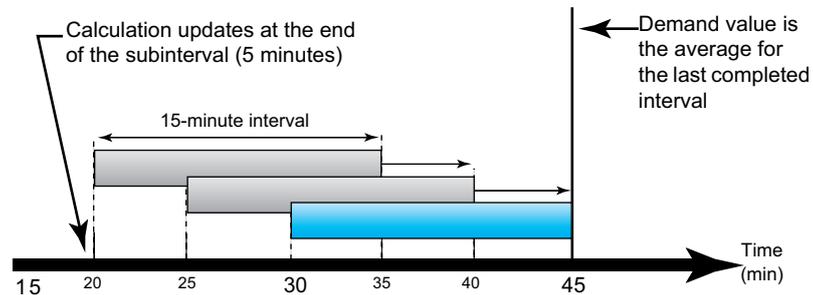
Timed Sliding Block



Timed Block



Timed Rolling Block



Peak demand

The meter records the peak (or maximum) values for kWd, kVARD, or kVAD power (or peak demand).

The peak for each value is the highest average reading since the meter was last reset. These values are maintained in the meter's non-volatile memory.

The meter also stores the date and time when the peak demand occurred.

Timer

The meter supports meter on hours and load run hours.

The timer data can be read through register map.

Meter on hours

Meter on hours show how long the meter has been powered up.

Load run hours

Load run hours show how much time a load has been running, based on accumulated energy.

Power quality

Harmonics overview

This section describes the meter's power quality features and how to access power quality data. The meter measures voltage and current harmonics up to the 15th harmonic to calculate Total Harmonic Distortion (THD%).

Harmonics are integer multiples of the fundamental frequency of the power system. Harmonics information is required for compliance to system power quality standards such as EN50160 and meter power quality standards such as IEC 61000-4-30.

The meter measures fundamental and higher harmonics relative to the fundamental frequency. The meter's power system setting defines which phases are present and determines how line-to-line or line-to-neutral voltage harmonics and current harmonics are calculated.

Harmonics are used to identify whether the supplied system power meets required power quality standards, or if non-linear loads are affecting your power system. Power system harmonics can cause current flow on the neutral conductor, and damage to equipment such as increased heating in electric motors. Power conditioners or harmonic filters can be used to minimize unwanted harmonics.

Total harmonic distortion %

Total harmonic distortion (THD%) is a measure of the total per-phase voltage or current harmonic distortion present in the power system.

THD% provides a general indication of the quality of a waveform. THD% is calculated for each phase of both voltage and current.

THD% calculations

THD% is a quick measure of the total distortion present in a waveform and is the ratio of harmonic content (H_C) to the fundamental harmonic (H_1).

By default, the meter uses the following equation to calculate THD%:

$$\text{THD} = \frac{H_C}{H_1} \times 100\%$$

Displaying harmonics data

The meter displays voltage and current THD%. Phase wise THD% data can be read through communication also.

1. From the **Home** page, use **Up** or **Down** button to navigate to **THD**.
2. Press **OK**.
3. Use **Up** or **Down** button to navigate to next **THD** screen.
4. Press **Left** button to exit.

NOTE:

The LED rows display $V1_{\text{THD}\%}$, $V2_{\text{THD}\%}$, and $V3_{\text{THD}\%}$ for $V_{\text{THD}\%}$ values, and $V12_{\text{THD}\%}$, $V23_{\text{THD}\%}$, $V31_{\text{THD}\%}$, and $A1_{\text{THD}\%}$, $A2_{\text{THD}\%}$, and $A3_{\text{THD}\%}$ for $I_{\text{THD}\%}$ values.

Maintenance and upgrades

Maintenance overview

The meter does not contain any user-serviceable parts. If the meter requires service, contact your local Schneider Electric Technical Support representative.

NOTICE

METER DAMAGE

- Do not open the meter case.
- Do not attempt to repair any components of the meter.

Failure to follow these instructions can result in equipment damage.

Do not open the meter. Opening the meter voids the warranty.

Troubleshooting LED indicators

Abnormal heartbeat / serial communications LED behavior could mean potential problems with the meter.

| Problem | Probable causes | Possible solutions |
|---|--|---|
| LED flash rate does not change when data is sent from the host computer. | Communications wiring | If using a serial-to-RS-485 converter, trace and check that all wiring from the computer to the meter is properly terminated. |
| | Internal hardware problem | Perform a hard reset: turn off control power to the meter, then re-apply power. If the problem persists, contact Technical Support. |
| Heartbeat / serial communications LED remains lit and does not flash ON and OFF | Internal hardware problem | Perform a hard reset: turn off control power to the meter, then re-apply power. If the problem persists, contact Technical Support. |
| Heartbeat / serial communications LED flashes, but the display is blank. | Display setup parameters incorrectly set | Review display parameter setup. |

If the problem is not fixed after troubleshooting, contact Technical Support for help and ensure you have your meter's firmware version, model and serial number information available.

Meter memory

The meter stores configuration and logging information in non-volatile memory and a long-life memory chip.

The meter uses its non-volatile memory (NVRAM) to retain all data and metering configuration values.

Firmware version, model, and serial number

You can view the meter's firmware version, model and serial number from the display panel.

1. From the **Home** page, use **Up** or **Down** button to navigate to **Maintain**.
2. Press **OK**.
3. Use **Up** or **Down** button to navigate to **Diag**.
4. Press **OK**.
5. Meter display shows all LED turned on.
6. Press **Down** button to view meter model, serial number, OS version, and RS version.
7. Press **Left** button to exit **Diag** page.

Firmware upgrades

There are a number of reasons why you may want to upgrade your meter's firmware.

Some of the reasons are mentioned below. It is suggested to keep your meter firmware upgraded for optimum performance.

- Improve meter performance (e.g., optimize processing speed)
- Enhance existing meter features and functions
- Add new functionality to the meter
- Achieve compliance to new industry standards

Firmware upgrade using DLF3000

The meter contains firmware that can be upgraded using DLF3000.

1. Download the latest version of DLF3000 from www.se.com, then install it on your computer.
NOTE: DLF3000 is a free Schneider Electric utility for downloading firmware to your meter.
2. Download your meter's firmware from www.se.com.
3. Start DLF3000.
4. Click **Add**. Navigate to the folder where you saved your meter's firmware.
5. Select the firmware file and click **Open**.
6. Select the firmware, then click **Next**.
7. If you haven't defined an upgrade system yet:
 - Click **New**, then type in the box to assign a system name.
 - Click **Add**, then type in the box to assign a communications connection name.
 - Select the communications driver as Serial Driver.
8. Click **Continue**.
9. Click **Add Device**.
 - Type in the box to assign a device name.
 - Select the device type from the list.
 - Select the connection name, i.e., the one you defined in the previous step.
10. Click **Next**.

11. Make sure the connection name, i.e., the one you defined in the previous step, is still selected. Enter the device address.
12. Select the protocol (e.g., Modbus).
13. Click **OK**.
14. Click **Next**.
15. Select the device name from the **Download Candidate Devices** pane, then click the right arrow button to move the selection to the **Download Target Devices** pane.
16. Select the meter firmware in the **Firmware to** field.
17. Click **Next**.
18. Click **Health Check** to confirm the meter is communicating. The Health Status shows **Passed** to indicate successful communications.
19. Click **Next**.
20. The Firmware Update Group shows the connection name, the firmware version and status (should be "Queued"). The Group Device List shows the device or devices being upgraded. Click **Download**.

NOTE: A warning message displays, "Warning: Relays on PowerLogic™ Metering Devices will be de-energized if selected for download and will remain in this mode until a successful download is completed. Press **OK** to start the download."
21. Click **OK**.
 - The Firmware Upgrade Group status changes to Active, then updates to show the current upgrade progress (in percent complete).
 - The Group Device List status shows "Entering Download Mode", then changes to "Downloading" when the firmware is being downloaded to the meter. "Estimated Time Remaining" shows the firmware download progress.
 - You can also check the progress on meters display panel. The meter display shows "Download in progress" and a shows a dynamically increasing number for "Percent Complete" (up to 100%).
22. When the firmware upgrade is complete, the Firmware Update Group status shows Complete (Passed). The Group Device List status shows Successful Download. Click **Finished**.
23. To exit the download firmware program, click **Yes** when prompted to quit DLF.

NOTE: A maximum of 6 devices can be upgraded in parallel through DLF.

Technical assistance

Visit www.se.com for support and assistance with lost passwords or other technical problems with the meter.

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

Verifying accuracy

Overview of meter accuracy

All meters are tested and verified at the factory in accordance with International Electrotechnical Commission (IEC) and Institute of Electrical and Electronics Engineers (IEEE) standards.

Your meter typically does not require re-calibration. However, in some installations a final accuracy verification of the meters is required, especially if the meters will be used for revenue or billing applications.

Accuracy test requirements

The most common method for testing meter accuracy is to apply test voltages and currents from a stable power source and compare the meter's readings with readings from a reference device or energy standard.

Signal and power source

The meter maintains its accuracy during voltage and current signal source variations but its energy pulsing output needs a stable test signal to help produce accurate test pulses. The meter's energy pulsing mechanism needs approximately 10 seconds to stabilize after every source adjustment.

The meter must be connected to control power in order to conduct accuracy verification testing. Refer to your meter's installation documentation for power supply specifications.

⚠️ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Verify the device's power source meets the specifications for your device's power supply.

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

Control equipment

Control equipment is required for counting and timing the pulse outputs from an energy pulsing LED.

- Most standard test benches have an arm equipped with optical sensors to detect LED pulses (the photodiode circuitry converts detected light into a voltage signal).
- The reference device or energy standard typically has digital inputs that can detect and count pulses coming from an external source (i.e., the meter's pulse output).

NOTE: The optical sensors on the test bench can be disrupted by strong sources of ambient light (such as camera flashes, florescent tubes, sunlight reflections, floodlights, etc.). This can cause test errors. Use a hood, if necessary, to block out ambient light.

Environment

The meter should be tested at the same temperature as the testing equipment. The ideal temperature is about 23 °C (73 °F). Make sure the meter is warmed up sufficiently before testing.

A warm-up time of 30 minutes is recommended before beginning energy accuracy verification testing. At the factory, the meters are warmed up to their typical operating temperature before calibration to help ensure that the meters will reach their optimal accuracy at operating temperature.

Most high precision electronic equipment requires a warm up time before it reaches its specified performance levels. Energy meter standards allow the manufacturers to specify meter accuracy derating due to ambient temperature changes and self-heating.

Your meter complies with and meets the requirements of these energy metering standards.

For a list of accuracy standards that your meter complies to, contact your local Schneider Electric representative or download the meter brochure from www.se.com.

Reference device or energy standard

To help ensure the accuracy of the test, it is recommended that you use a reference device or reference energy standard with a specified accuracy that is 6 to 10 times more accurate than the meter under test. Before you start testing, the reference device or energy standard should be warmed up as recommended by its manufacturer.

NOTE: Verify the accuracy and precision of all measurement equipment used in accuracy testing (for example, voltmeters, ammeters, power factor meters).

Verifying accuracy test

The following tests are guidelines for accuracy testing your meter; your meter shop may have specific testing methods.

DANGER

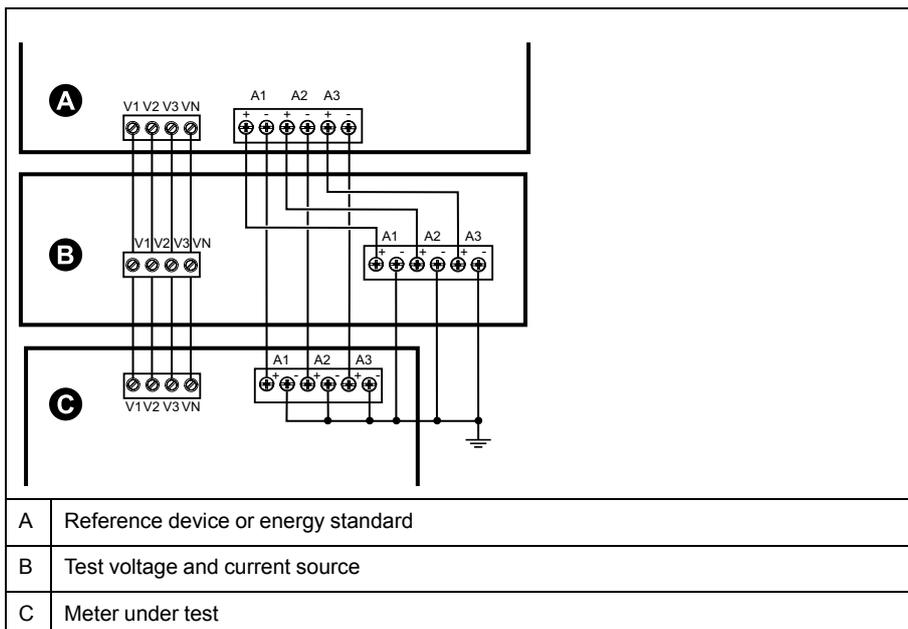
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate Personal Protective Equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462 or other local standards.
- Turn off all power supplying this device and the equipment in which it is installed before working on or in the equipment.
- Always use a properly rated voltage sensing device to confirm that all power is off.
- Do not exceed the maximum ratings of this device.
- Verify the device's power source meets the specifications for your device's power supply.

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. Use a properly rated voltage sensing device to confirm that all power is off.

3. Connect the test voltage and current source to the reference device or energy standard. Ensure all voltage inputs to the meter under test are connected in parallel and all current inputs are connected in series.



4. Connect the control equipment used for counting the standard output pulses using one of these methods:

| Option | Description |
|--------------------|---|
| Energy pulsing LED | Align the red light sensor on the standard test bench armature over the energy pulsing LED. |
| Pulse output | Connect the meter's pulse output to the standard test bench pulse counting connections. |

NOTE: When selecting which method to use, be aware that energy pulsing LEDs and pulse outputs have different pulse rate limits.

5. Before performing the verification test, let the test equipment power up the meter and apply voltage for at least 30 seconds. This helps stabilize the internal circuitry of the meter.
6. Configure the meter's parameters for verifying accuracy testing.
7. Depending on the method selected for counting the energy pulses, configure the meter's energy pulsing LED or one of the pulse outputs to perform energy pulsing. Set the meter's energy pulse constant so it is in sync with the reference test equipment.
8. Perform accuracy verification on the test points. Run each test point for at least 30 seconds to allow the test bench equipment to read an adequate number of pulses. Allow 10 seconds of dwell time between test points.

Required pulses calculation for accuracy verification testing

Accuracy verification test equipment typically requires you to specify the number of pulses for a specific test duration.

The reference test equipment typically requires you to specify the number of pulses required for a test duration of "t" seconds. Normally, the number of pulses required is at least 25 pulses, and the test duration is greater than 30 seconds.

Use the following formula to calculate the required number of pulses:

$$\text{Number of pulses} = P_{\text{tot}} \times K \times t / 3600$$

Where:

- P_{tot} = total instantaneous power in kilowatts (kW)
- K = the meter's pulse constant setting, in pulses per kWh
- t = test duration, in seconds (typically greater than 30 seconds)

Total power calculation for accuracy verification testing

Accuracy verification testing supplies the same test signal (total power) to both the energy reference/standard and the meter under test.

Total power is calculated as follows, where:

- P_{tot} = total instantaneous power in kilowatts (kW)
- V_{LN} = test point line-to-neutral voltage in volts (V)
- I = test point current in amps (A)
- PF = power factor

The result of the calculation is rounded up to the nearest integer.

For a balanced 3-phase Wye system:

$$P_{tot} = 3 \times V_{LN} \times I \times PF \times 1 \text{ kW}/1000 \text{ W}$$

NOTE: A balanced 3-phase system assumes that the voltage, current and power factor values are the same for all phases.

For a single-phase system:

$$P_{tot} = V_{LN} \times I \times PF \times 1 \text{ kW}/1000 \text{ W}$$

Percentage error calculation for accuracy verification testing

Accuracy verification testing requires you to calculate the percentage error between the meter being tested and the reference/standard.

Calculate the percentage error for every test point using the following formula:

$$\text{Energy error} = (EM - ES) / ES \times 100\%$$

Where:

- EM = energy measured by the meter under test
- ES = energy measured by the reference device or energy standard.

NOTE: If accuracy verification reveals inaccuracies in your meter, they may be caused by typical sources of test errors. If there are no sources of test errors present, please contact your local Schneider Electric representative.

Accuracy verification test points

The meter should be tested at full and light loads and at lagging (inductive) power factors to help ensure testing over the entire range of the meter.

The test amperage and voltage input rating are labeled on the meter. Refer to the installation sheet or data sheet for your meter's nominal current, voltage and frequency specifications.

| Watt-hour test point | Sample accuracy verification test point |
|---------------------------------------|---|
| Full load | 100% to 200% of the nominal current, 100% of the nominal voltage and nominal frequency at unity power factor or one (1). |
| Light load | 10% of the nominal current, 100% of the nominal voltage and nominal frequency at unity power factor or one (1). |
| Inductive load (lagging power factor) | 100% of the nominal current, 100% of the nominal voltage and nominal frequency at 0.50 lagging power factor (current lagging voltage by 60° phase angle). |

| VAR-hour test point | Sample accuracy verification test point |
|---------------------------------------|---|
| Full load | 100% to 200% of the nominal current, 100% of the nominal voltage and nominal frequency at zero power factor (current lagging voltage by 90° phase angle). |
| Light load | 10% of the nominal current, 100% of the nominal voltage and nominal frequency at zero power factor (current lagging voltage by 90° phase angle). |
| Inductive load (lagging power factor) | 100% of the nominal current, 100% of the nominal voltage and nominal frequency at 0.87 lagging power factor (current lagging voltage by 30° phase angle). |

Energy pulsing considerations

The meter’s energy pulsing LED and pulse outputs are capable of energy pulsing within specific limits.

| Description | Energy pulsing LED | Pulse output |
|-------------------------|--------------------------|--------------|
| Maximum pulse frequency | 35 Hz | 20 Hz |
| Minimum pulse constant | 1 pulse per k_h | |
| Maximum pulse constant | 9,999,000 pulses per k_h | |

The pulse rate depends on the voltage, current and PF of the input signal source, the number of phases, and the VT and CT ratios.

If Ptot is the instantaneous power (in kW) and K is the pulse constant (in pulses per kWh), then the pulse period is:

$$\text{Pulse period (in seconds)} = \frac{3600}{K \times P_{tot}} = \frac{1}{\text{Pulse frequency (Hz)}}$$

VT and CT considerations

Total power (Ptot) is derived from the values of the voltage and current inputs at the secondary side, and takes into account the VT and CT ratios.

The test points are always taken at the secondary side, regardless of whether VTs or CTs are used.

If VTs and CTs are used, you must include their primary and secondary ratings in the equation. For example, in a balanced 3-phase Wye system with VTs and CTs:

$$P_{tot} = 3 \times V_{LN} \times \frac{V_{T_p}}{V_{T_s}} \times I \times \frac{C_{T_p}}{C_{T_s}} \times PF \times \frac{1 \text{ kW}}{1000 \text{ W}}$$

where Ptot = total power, VT_p = VT primary, VT_s = VT secondary, CT_p = CT primary, CT_s = CT secondary and PF = power factor.

Example calculations

This example calculation shows how to calculate power, pulse constants and maximum pulse frequency, and how to determine a pulse constant that reduces the maximum pulse frequency.

A balanced 3-phase Wye system uses 480:120 volt VTs and 120:5 amp CTs. The signals at the secondary side are 119 volts line-to-neutral and 5.31 amps, with a power factor of 0.85. The desired pulse output frequency is 20 Hz (20 pulses per second).

1. Calculate the typical total output power (P_{tot}):

$$P_{tot} = 3 \times 119 \times \frac{480}{120} \times 5.31 \times \frac{120}{5} \times 0.85 \times \frac{1 \text{ kW}}{1000 \text{ W}} = 154.71 \text{ kW}$$

2. Calculate the pulse constant (K):

$$K = \frac{3600 \times (\text{pulse frequency})}{P_{tot}} = \frac{3600 \text{ seconds/hour} \times 20 \text{ pulses/second}}{154.71 \text{ kW}}$$

$$K = 465.5 \text{ pulses / kWh}$$

3. At full load (120% of nominal current = 6 A) and power factor (PF = 1), calculate the maximum total output power (P_{max}):

$$P_{max} = 3 \times 119 \times \frac{480}{120} \times 6 \times \frac{100}{5} \times 1 \times \frac{1 \text{ kW}}{1000 \text{ W}} = 205.6 \text{ kW}$$

4. Calculate the maximum output pulse frequency at P_{max}:

$$\text{Maximum pulse frequency} = \frac{K \times P_{max}}{3600} = \frac{465.5 \text{ pulses / kWh} \times 205.6 \text{ kW}}{3600 \text{ seconds/hour}}$$

$$\text{Maximum pulse frequency} = 26.6 \text{ pulses/second} = 26.6 \text{ Hz}$$

5. Check the maximum pulse frequency against the limits for the LED and pulse outputs:

- 26.6 Hz ≤ LED maximum pulse frequency (35 Hz)
- 26.6 Hz > pulse output maximum pulse frequency (20 Hz)

NOTE: The maximum pulse frequency is within the limits for LED energy pulsing. However, the maximum pulse frequency is greater than the limits for pulse output energy pulsing. Pulse output frequencies greater than 20 Hz will saturate the pulse output and cause it to stop pulsing. Therefore in this example, you can only use the LED for energy pulsing.

Adjustments to allow energy pulsing at the pulse outputs

If you want to use the pulse output, you must reduce the output pulse frequency so it is within the limits.

Using the values from the above example, the maximum pulse constant for the pulse output is:

$$K_{max} = \frac{3600 \times (\text{pulse output maximum pulse frequency})}{P_{max}} = \frac{3600 \times 20}{205.6}$$

$$K_{max} = 350.14 \text{ pulses per kWh}$$

1. Set the pulse constant (K) to a value below K_{max}, for example, 300 pulses/kWh. Calculate the new maximum output pulse frequency at P_{max}:

$$\text{New maximum pulse frequency} = \frac{K \times P_{max}}{3600} = \frac{300 \text{ pulses/kWh} \times 205.6 \text{ kW}}{3600 \text{ seconds/hour}}$$

$$\text{New maximum pulse frequency} = 17.1 \text{ pulses/second} = 17.1 \text{ Hz}$$

2. Check the new maximum pulse frequency against the limits for the LED and pulse outputs:
 - $17.1 \text{ Hz} \leq \text{LED maximum pulse frequency (35 Hz)}$
 - $17.1 \text{ Hz} \leq \text{pulse output maximum frequency (20 Hz)}$As expected, changing K to a value below Kmax allows you to use the pulse output for energy pulsing.
3. Set the new pulse constant (K) on your meter.

Typical sources of test errors

If you see excessive errors during accuracy testing, examine your test setup and test procedures to eliminate typical sources of measurement errors.

Typical sources of accuracy verification testing errors include:

- Loose connections of voltage or current circuits, often caused by worn-out contacts or terminals. Inspect terminals of test equipment, cables, test harness and the meter under test.
- Meter ambient temperature is significantly different than 23 °C (73 °F).
- Floating (ungrounded) neutral voltage terminal in any configuration with unbalanced phase voltages.
- Inadequate meter control power, resulting in the meter resetting during the test procedure.
- Ambient light interference or sensitivity issues with the optical sensor.
- Unstable power source causing energy pulsing fluctuations.
- Incorrect test setup: not all phases connected to the reference device or the energy standard. All phases connected to the meter under test should also be connected to the reference meter/standard.
- Moisture (condensing humidity), debris or pollution present in the meter under test.

Power and power factor

Power and power factor

The sampled measurements taken at the meter's voltage and current inputs provide data for calculating power and power factor.

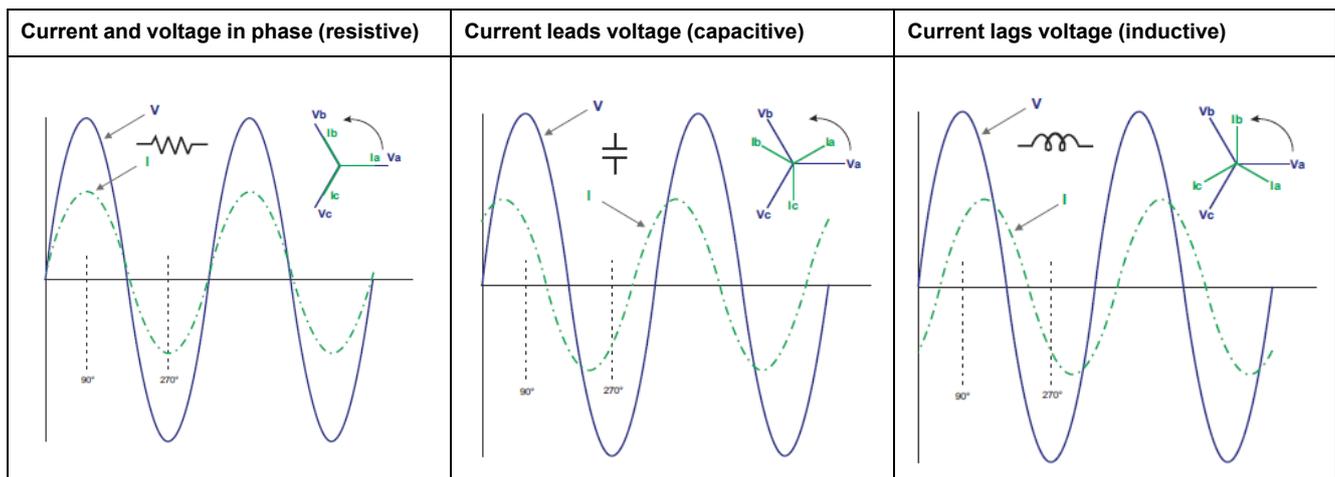
In a balanced 3-phase alternating current (AC) power system source, the AC voltage waveforms on the current-carrying conductors are equal but offset by one-third of a period (a phase angle shift of 120 degrees between the three voltage waveforms).

Current phase shift from voltage

Electrical current can lag, lead, or be in phase with the AC voltage waveform, and is typically associated with the type of load — inductive, capacitive or resistive.

For purely resistive loads, the current waveform is in phase with the voltage waveform. For capacitive loads, current leads voltage. For inductive loads, current lags voltage.

The following diagrams show how voltage and current waveforms shift based on load type under ideal (laboratory) conditions.



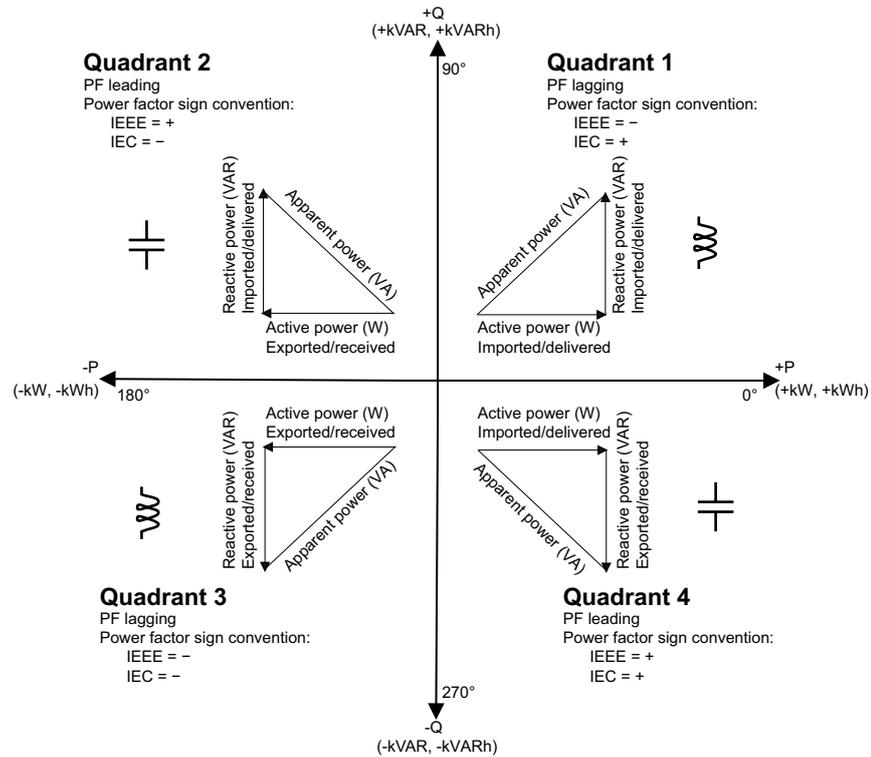
Real, reactive and apparent power (PQS)

A typical AC electrical system load has both resistive and reactive (inductive or capacitive) components.

Real power, also known as active power (P) is consumed by resistive loads. Reactive power (Q) is either consumed by inductive loads or generated by capacitive loads.

Apparent power (S) is the capacity of your measured power system to provide real and reactive power.

The units for power are watts (W or kW) for real power P, vars (VAR or kVAR) for reactive power Q, and volt-amps (VA or kVA) for apparent power S.



Power flow

Positive real power P(+) flows from the power source to the load. Negative real power P(-) flows from the load to the power source.

Power factor (PF)

Power factor (PF) is the ratio of real power (P) to apparent power (S).

Power factor is provided as a number between -1 and 1 or as a percentage from -100% to 100%, where the sign is determined by the convention.

$$PF = \frac{P}{S}$$

An ideal, purely resistive load has no reactive components, so its power factor is one (PF = 1, or unity power factor). Inductive or capacitive loads introduce a reactive power (Q) component to the circuit which causes the PF to become closer to zero.

True PF

The meter supports true power factor values:

- True power factor includes harmonic content.

Power factor sign convention

Power factor sign (PF sign) can be positive or negative, and is defined by the conventions used by IEC standards.

PF sign convention: IEC

PF sign correlates with the direction of real power (kW) flow.

- Quadrant 1 and 4: Positive real power (+kW), the PF sign is positive (+).

- Quadrant 2 and 3: Negative real power (-kW), the PF sign is negative (-).

IEC -1 to +1 format

| Quadrant | PF Range | HMI Representation with sign | PF in RS-485 Comm (Reg IEC format) |
|------------|----------|------------------------------|------------------------------------|
| Quadrant 1 | 0 to +1 | Inductive (+) | Positive Sign |
| Quadrant 2 | -1 to 0 | Capacitive (-) | Negative sign |
| Quadrant 3 | 0 to -1 | Inductive (-) | Negative Sign |
| Quadrant 4 | +1 to 0 | Capacitive(+) | Positive Sign |

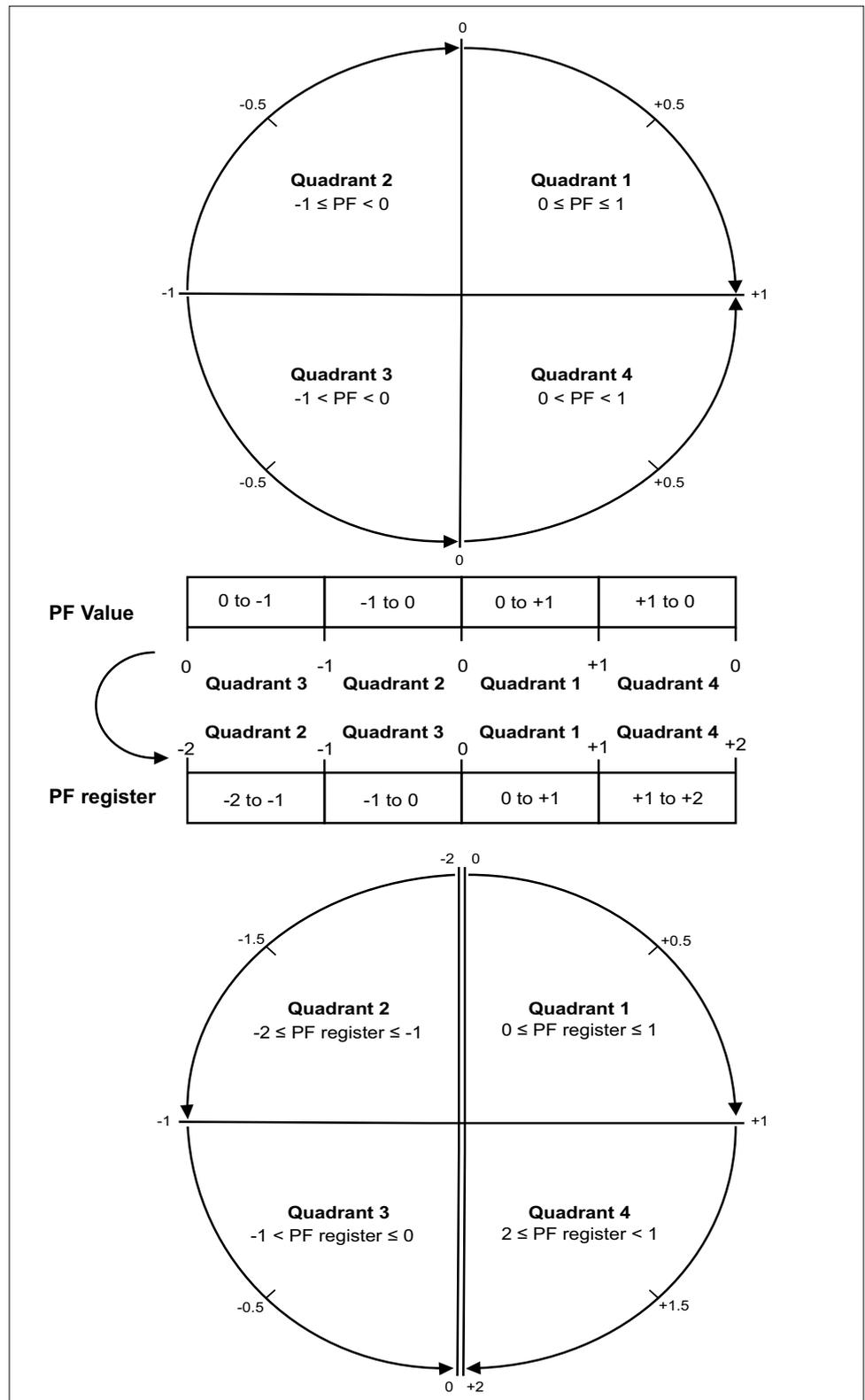
Sample screen



Power factor register format

The meter performs a simple algorithm to the PF value then stores it in the PF register.

Each power factor value (PF value) occupies one floating point register for power factor (PF register). The meter and software interpret the PF register for all reporting or data entry fields according to the following diagram:



The PF value is calculated from the PF register value using the following formulae:

| Quadrant | PF range (in display) | PF register range (through communication) | PF formula |
|------------|-----------------------|---|------------------------------|
| Quadrant 1 | 0 to +1 | 0 to +1 | PF value = PF register value |
| Quadrant 2 | -1 to 0 | -1 to 0 | PF value = PF register value |

| Quadrant | PF range (in display) | PF register range (through communication) | PF formula |
|------------|-----------------------|---|---------------------------------------|
| Quadrant 3 | 0 to -1 | -2 to -1 | PF value = (-2) - (PF register value) |
| Quadrant 4 | +1 to 0 | +1 to +2 | PF value = (+2) - (PF register value) |

Command interface

Command interface

The command interface allows you to configure the power meter by sending specific commands using Modbus protocol. Reference the online Modbus register list for meter commands, results, and data types.

| |
|--|
|  WARNING |
| <p>UNINTENDED OPERATION</p> <p>Do not use this device for critical control or protection of persons, animals, property or equipment.</p> <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p> |

| | Command block | Protected command interface | Unprotected command interface |
|----------|----------------------|-----------------------------|-------------------------------|
| | | Register number | Register number |
| A | Command | 5000 | 5250 |
| B | Semaphore | 5001 | 5251 (Ignored) |
| C | Parameters | 5002 - 5124 | 5252 - 5374 |
| | Meter results | Register number | Register number |
| D | Status | 5125 | 5375 |
| E | Result | 5126 | 5376 |
| F | Data | 5127 - 5249 | 5377- 5499 |

- **A:** In the **Command** register, enter a meter command.
- **B:** In the **Semaphore** register, when using the protected command interface, enter the semaphore you are given (refer “Using the Protected Command Interface”). The semaphore register cannot be used with unprotected command interface.
- **C:** In the **Parameters** register, enter all parameters for a meter command.
- **D:** The **Status** register displays 0 when the power meter receives a command. Once the command is completed, the status register displays the same value as the command register.
- **E:** The **Result** register indicates if the command was successful, and if not, what is the error that occurred.
- **F:** The **Data** register displays the executed parameters of a successful command and the invalid parameters based on data type of an unsuccessful command.

There are two command interfaces, protected and unprotected, described in the following sections.

Using protected command interface

To issue a meter command using the protected command interface, you must have a command semaphore.

To get a semaphore, read the semaphore Modbus register. The power meter will return a zero or a nonzero number.

- If the meter shows zero, someone else owns the semaphore. You must wait for the semaphore to be available before sending a command.

- If the meter shows a nonzero number, you own the semaphore. Semaphore is provided once until it is released or has been inactive for approximately 4 minutes. Once you have the semaphore, subsequent reads of the semaphore register will return zero until you release the semaphore or it times out.

To send a meter command using the protected command interface:

1. Read the semaphore register and record the meter response. This is your semaphore.
2. Build the packet to be written to the command block.
3. Write the packet as a Modbus block write (enter the command number, semaphore, and parameters at the same time).

Protected command block example

| Command block | Register number |
|---------------|-----------------|
| Command | 2039 |
| Semaphore | 5 |
| Parameters | 1 |

4. Monitor the meter response registers for validity and completion.

Protected meter response example

| Meter response | Register number |
|----------------|-----------------|
| Status | 2039 |
| Result | 0 |
| Data | 1 |

5. Write the semaphore back to the semaphore register to release it for another master to use.

Specifications

Device specifications

The specifications contained in this section are subject to change without notice.
 For installation and wiring information, refer to the meter installation sheet.

Mechanical characteristics

| | |
|---------------------------------------|---|
| IP degree of protection (IEC 60529-1) | Front Display: IP51 Front Display: IP54 with gasket (optional accessory) Meter body: IP30 (excluding terminals) |
| Panel thickness | 5.0 mm (0.196 in) maximum |
| Mounting position | Vertical |
| Display type | 8 segment alpha-numeric LED, 3 rows with 4 digits per row, 1 column of 12 LEDs to indicate percentage of load connected in system. 4 digits for V AF PF parameters with auto scrolling and auto range |
| Keypad | 4 button |
| Front panel LED indicators | Red LED (energy pulse output) Green LED (heartbeat / serial communications activity) |
| Dimensions W x H x D | 96 (H) x 96 (W) x 49 (D) mm |

Electrical characteristics

Measurement accuracy

- IEC 61557-12: PMD/[SD|SS]/K55/1 (for firmware version 1.3.0 and higher)

| Measurement type | Class of accuracy as per IEC 61557-12 | Error |
|------------------|--|--|
| Active energy | Class 1 (Class 1 ³ as per IEC 62053-21) | ±1% |
| Reactive energy | Class 2 (Class 2 as per IEC 62053-23) | ±2% |
| Apparent energy | Class 1 | ±1% |
| Active power | Class 1 | ±1% |
| Reactive power | Class 1 | ±1% |
| Apparent power | Class 1 | ±1% |
| Current | Class 1 | ±0.5% |
| Voltage (L-L) | Class 1 | ±0.5% |
| Voltage (L-N) | Class 1 | ±0.5% |
| Frequency | Class 0.05 | ±0.05% ⁴ and ±0.2% ⁵ |
| Power factor | Class 1 | ±0.01 Count |
| THD | Class 5 | ±5% |

Measurement accuracy

- IEC 61557-12: PMD/[SD|SS]/K55/0.5 (for firmware version 1.3.0 and higher)

| Measurement type | Class of accuracy as per IEC 61557-12 | Error |
|------------------|---------------------------------------|-------|
|------------------|---------------------------------------|-------|

3. Additional error of ± 2% between 10 mA to 50 mA, ± 1 % between 50 mA to 100 mA
 4. For frequency nominal 50 / 60 Hz ± 2 Hz
 5. For frequency range from 30 to 48 Hz, 52 to 58 Hz and 62 to 70 Hz

Measurement accuracy (Continued)

| | | |
|-----------------|--|---|
| Active energy | Class 0.5S (Class 0.5S ⁶ as per IEC 62053-22) | ±0.5% |
| Reactive energy | Class 2 (Class 2 as per IEC 62053-23) | ±2% |
| Apparent energy | Class 0.5 | ±0.5% |
| Active power | Class 0.5S | ±0.5% |
| Reactive power | Class 1 | ±2% |
| Apparent power | Class 0.5S | ±0.5% |
| Current | Class 0.5 | ±0.5% |
| Voltage (L-L) | Class 0.5 | ±0.5% |
| Voltage (L-N) | Class 0.5 | ±0.5% |
| Frequency | Class 0.05 | ±0.05% ⁷ and ± 0.2% ⁸ |
| Power factor | Class 0.5 | ±0.01 Count |
| THD | Class 5 | ±5% |

Voltage inputs

| | |
|---------------------------------------|--|
| VT primary | 100 V L-L to 999 kV L-L maximum, starting voltage depends on the VT ratio |
| V nominal | Up to 277 V L-N / 480 V L-L (selectable VT secondary from 100, 110, 115, 120 to 415 V L-L) |
| Measured voltage with full range | 35 to 600 V AC L-L |
| Permanent overload (withstand) | 750 V L-L, continuous |
| Operating voltage range | 35-480 V L-L ± 10%, Category III |
| Operating voltage range with accuracy | 80-480 V L-L ± 10%, Category III |
| Impedance | ≥ 5 MΩ |
| Frequency | 50 / 60 Hz nominal ± 2 Hz |
| VA burden | ≤ 0.2 VA at 240 V AC L-N at 50Hz |

Current inputs

| | |
|--|---|
| CT primary | 1 A to 32767 A, programmable |
| CT secondary | 1 A or 5 A |
| Operating current range with accuracy | 10 mA to 6 A <i>Additional error of ± 2% between 10 mA to 50 mA, ± 1% between 50 mA to 100 mA)</i> |
| Measured Amps with full range | 5 mA to 10 A |
| Suppression current (to disregard negligible load) | 5 mA to 99 mA |
| Permanent overload (withstand) | Continuous 10 A, 10 s/hr 50 A, 1 s/hr 500 A |
| Impedance | 0.3 mΩ |
| Frequency range | 50 / 60 Hz ± 2 Hz |
| VA burden | ≤ 0.1 VA at 5 A, 50 Hz |

AC control power

| | | |
|-----------------|--|--|
| Operating range | METSEPM1125HCL10RS / METSEPM1125HCL10RD / METSEPM1125HCL05RD / METSEPM1125HCL02RD | 48 to 277 V L-N AC ± 10% |
| Burden | | <4 VA at 240 V L-N, 50 Hz |
| Frequency | | 50 / 60 Hz nominal (45 to 65 Hz operating range) |

6. Additional error of ± 2% between 10 mA to 50 mA, ± 1 % between 50 mA to 100 mA

7. For frequency nominal 50 / 60 Hz ± 2 Hz

8. For frequency range from 30 to 48 Hz, 52 to 58 Hz and 62 to 70 Hz

AC control power (Continued)

| | | |
|-------------------|--|--|
| Ride-through time | | 200 ms at 240 V L-N, 50Hz (at Ambient condition) |
|-------------------|--|--|

DC control power

| | | |
|-------------------|--|--|
| Operating range | METSEPM1125HCL10RS / METSEPM1125HCL10RD / METSEPM1125HCL05RD / METSEPM1125HCL02RD | 48 to 277 V DC ± 10% |
| Burden | | <2 W at 240 V DC |
| Ride-through time | | 200 ms at 240 V, 50Hz (at Ambient condition) |
| Operating range | METSEPM1125HCL1LVD / METSEPM1125HCL5LDD | 10 to 32 V DC ± 10% |
| Burden | | <2 W at 24 V DC |

Displays update

| | |
|--------------------------------|-----|
| Instantaneous / RMS parameters | 1 s |
| Demand parameters | 5 s |
| THD%, voltage and current | 5 s |

Power system configuration

| | | |
|----------------------|---|---|
| Phase labelling | Configurable to 123, ABC, rst, pqr or ryb | |
| Wiring configuration | Configuration through both HMI and ION setup | Configuration through only ION setup |
| | 1PH, 2W, LN 1PH, 2W, LL 1PH, 3W, LL with N (2-phase) 3PH, 3W, Delta, Ungrounded 3PH, 4W, Wye Grounded | 3PH, 3W, Delta, Corner Grounded 3PH, 3W, Wye, Ungrounded 3PH, 3W, Wye Grounded 3PH, 3W, Wye, Resistance Grounded 3PH, 4W, Open Delta, Center-Tapped 3PH, 4W, Delta, Center-Tapped 3PH, 4W, Wye, Ungrounded 3PH, 4W, Wye, Resistance Grounded |

Environmental characteristics

| | |
|-----------------------|--|
| Operating temperature | -10° to +60° C (+14° to +140° F) |
| Storage temperature | -20° to +70° C (-4° to +158° F) |
| Humidity rating | 5 to 95 % RH non-condensing |
| Pollution degree | 2 |
| Attitude | ≤ 2000 meters (6561 ft), Category III |
| Product life | 7 years |
| Insulation category | Double insulation for user accessible parts |
| Location / mounting | Not suitable for wet locations For indoor use only Must be permanently connected and fixed |

EMC (electromagnetic compatibility)

NOTE: Tested as per IEC 61326-1 standard

| | |
|-----------------------------|--------------------------|
| Electrostatic discharge | IEC 61000-4-2 |
| Immunity to radiated field | 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 field | IEC 61000-4-8 |
| Immunity to voltage dips | IEC 61000-4-11 |
| Emissions | FCC Part 15 and CISPR 11 |

Safety

| | |
|---|---|
| Europe | CE, as per IEC 61010-1 Edition-3 |
| US and Canada | cULus per UL 61010-1 CAN / CSA-C22.2 IEC 61010-1 Edition-3, for 480 V AC L-L |
| Measurement category (Voltage and Current inputs) | CAT III up to 480 V L-L |
| Overvoltage category (Control power) | CAT III up to 300 V L-N |
| Dielectric | As per IEC / UL 61010-1 Edition-3 |
| Protective Class | II, Double insulated for user accessible parts |
| Green premium | EOL, REACH , PEP, RoHS complied |

Communications

| | |
|-------------|---|
| RS-485 port | Modbus RTU: 2-Wire, 4800, 9600, 19200 or 38400 baud Parity - Even, Odd, None 1 stop bit if parity is Odd or Even, 2 stop bits if none |
| Isolation | 2.5 kV RMS, double insulated |

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As standards, specifications, and design change from time to time,
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