Energy meters

iEM3400 / iEM3500 series

User manual

7EN02-0438-14
08/2023

Legal Information

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 in restricted access locations only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this equipment. 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.

Notices

FCC

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that the interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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 (B) /NMB-3(B).

About this manual

This manual discusses features of the iEM3400 / iEM3500 series energy meters and is intended for use by designers, system builders and maintenance technicians with an understanding of electrical distribution systems and monitoring devices.

Document scope

Throughout the manual, the term “meter / device” refers to all models of the iEM3400 / iEM3500 series. All differences between the models, such as a feature specific to one model, are indicated with the appropriate model number or description.

This manual does not provide configuration information for advanced features where an expert user would perform advanced configuration. It also does not include instructions on how to incorporate meter data or perform meter configuration using energy management systems or software, other than ION Setup. ION Setup is a free configuration tool available for download from www.se.com.

Validity note

Document	Number
iEM3455 / iEM3465 / iEM3555 / iEM3565 instruction sheet	NHA61470
iEM3455C1 / iEM3455C2 instruction sheet	QGH3793201

You can download these technical publications and other technical information from www.se.com.

Table of Contents

Safety precautions

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

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate Personal Protective Equipment (PPE) and follow safe electrical work practices. See NFPA 70E, 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.
- 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.
- Do not install CTs or LPCTs in equipment where they exceed 75% of the wiring space of any cross-sectional area in the equipment.
- Do not install CTs or LPCTs in areas where ventilation openings may be blocked or in areas of breaker arc venting.
- Secure CT or LPCT secondary conductors to ensure they do not contact live circuits.
- Do not use water or any liquid material to clean the product. Use a cleaning cloth to remove dirt. If dirt cannot be removed, contact local Technical Support representative.
- The installer is responsible for co-ordinating the rating and the characteristics of the supply side over current protection devices with the maximum current rating.

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

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

⚠WARNING

UNINTENDED OPERATION

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

INACCURATE DATA RESULTS

- Do not rely solely on data displayed on the display or in software to determine if this device is functioning correctly or complying with all applicable standards.
- Do not use data displayed on the display or in software as a substitute for proper workplace practices or equipment maintenance.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Meter overview

Overview of meter functions

The meters provide the essential measurement capabilities (for example, current, voltage, and energy) required to monitor a 1-phase or 3-phase electrical installation.

The key features of the meters are:

- Measurement of active and reactive energy
- Multi Tariffs (up to 4) controlled by internal clock, digital inputs or communication
- Pulse outputs
- Display (current, voltage, and energy measurements)
- Communications via Modbus or BACnet protocols

Main characteristics

LVCT / Rogowski Coil meters

Function		iEM3455	iEM3465	iEM3555	iEM3565
Measurement inputs through VTs		√	√	√	√
Measurement input through LVCT		√	√	—	—
Measurement input through Rogowski Coil		—	—	√	√
Active Energy measurement accuracy class (total and partial kWh)		0.5%	0.5%	0.5%	0.5%
Four Quadrant Energy measurements		√	√	√	√
Electrical measurements (I, V, P, ...)		√	√	√	√
Multi Tariff	Controlled by internal clock	4	4	4	4
	Controlled by digital input(s)	2	2	2	2
	Controlled by communications	4	4	4	4
Measurement display (number of lines)		3	3	3	3
Digital inputs	Programmable (status, tariff control, or input monitoring)	1	1	1	1
Digital outputs	Programmable (energy pulsing or overload alarm)	1	1	1	1
Overload alarm		√	√	√	√
Communications	Modbus	√	—	√	—
	BACnet	—	√	—	√
Width (18 mm module in DIN rail mounting)		5	5	5	5

Functions

These meters can monitor energy consumption by usage, by zone or by feeder in the cabinet. They can be used to monitor feeders in a main switchboard or to monitor the main in a distribution cabinet.

iEM3400 series

Functions	Advantages
Split core or solid-core LVCT and VT connection	Can be used in low or medium voltage applications LVCTs connect directly to the meter, eliminating the need for shorting blocks required with traditional 1A or 5A CTs Quick, simple retrofit solution for existing equipment
Flexible configuration	Can be adapted to any distribution network with or without neutral

iEM3500 series

Functions	Advantages
Rogowski Coil and VT connection	Can be used in low or medium voltage applications Rogowski coils connect directly to the meter, eliminating the need for shorting blocks required with traditional 1A or 5A CTs Quick, simple retrofit solution for existing equipment
Flexible configuration	Can be adapted to any distribution network with or without neutral

Typical applications

The following table presents some of the functions of the different meters, the advantages and main applications.

Functions	Advantages	Applications	Meter
Total and partial energy counters	Energy usage monitoring	Sub-billing management Metering applications	iEM3400 / iEM3500 series
Internal clock	Saves the date and time of last reset	Provides the timestamp of the last reset of the partial energy accumulation	iEM3400 / iEM3500 series
Manages up to four tariffs, controlled by the digital input(s), internal clock or communications (depending on meter model)	Categorize energy consumption into On Peak and Off Peak, working days and weekends, or by different electricity sources (for example, from the utility and an electrical generator)	Energy demand management Sub-billing management Identification of local energy consumption behavior by zone, by usage or by feeder	iEM3400 / iEM3500 series
Measures essential electrical parameters like current, average voltage and total power	Instantaneous measurements help you monitor the imbalance between phases Total power allows you to monitor the feeder load level	Monitoring of feeders or any sub-cabinet	iEM3400 / iEM3500 series
Modbus communications	Communicate advanced parameters using Modbus protocol	Modbus network integration	iEM3455 / iEM3555
BACnet communications	Communicate advanced parameters using BACnet MS/TP protocol	BACnet network integration	iEM3465 / iEM3565

Functions	Advantages	Applications	Meter
Four quadrant calculation	Identification of imported and exported active and reactive energy allows you to monitor energy flow in both directions: delivered from the utility and produced on-site	Ideal for facilities with back-up generators or green power capabilities (for example, solar panels or wind turbines)	iEM3400 / iEM3500 series
Measurement of active and reactive energy	Allows you to monitor energy consumption and production	Manage energy consumption and make informed investment to reduce your energy bill or penalties (for example, installing capacitor banks)	
Programmable digital input	Can be programmed to: • Count pulses from other meters (gas, water, etc.) • Monitor an external status • Reset the partial energy accumulation and start a new period of accumulation	This allows for monitoring of: • WAGES • Intrusion (for example, doors opening) or equipment status • Energy usage	
Programmable digital output	Can be programmed to: • Be an active energy (kWh) pulse output, with a configurable pulse weight • Alarm on a power overload at a configurable pickup setpoint	This allows you to: • Collect pulses from the meter with a Smartlink system, PLC or any basic acquisition system • Monitor power levels at a detailed level and to help detect an overload before the circuit breaker trips	

Hardware and installation

Safety precautions

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

⚠⚠DANGER

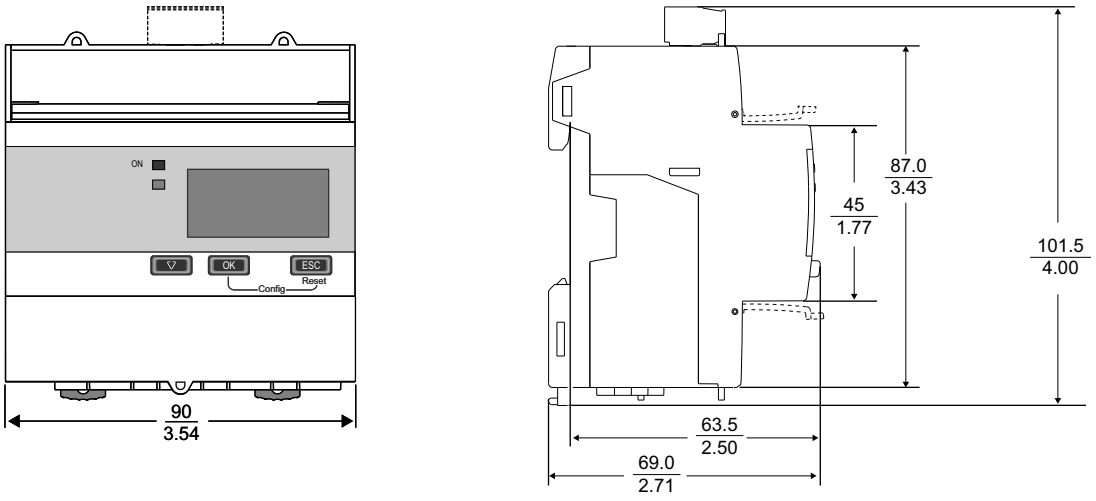
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate Personal Protective Equipment (PPE) and follow safe electrical work practices. See NFPA 70E, 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.
- Use split-core or solid-core LVCT or Rogowski Coil current sensors which provide reinforced insulation rated for the nominal voltage of the system to be measured and measurement category CAT III or CAT IV.
- Use split-core or solid-core LVCT or Rogowski Coil current sensors which comply with the EN/ IEC/ UL/ CSA 61010-1 or EN/ IEC/ UL/ CSA 61010-2-032 standard.
- Always follow the current sensor installation instructions provided by the current sensor manufacturer.
- Always use a properly rated voltage sensing device to confirm that all power is off.
- Replace all devices, doors and covers before turning on power to this equipment.
- Do not exceed the maximum ratings of this device.
- Do not touch the current terminal when the meter is energized.

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

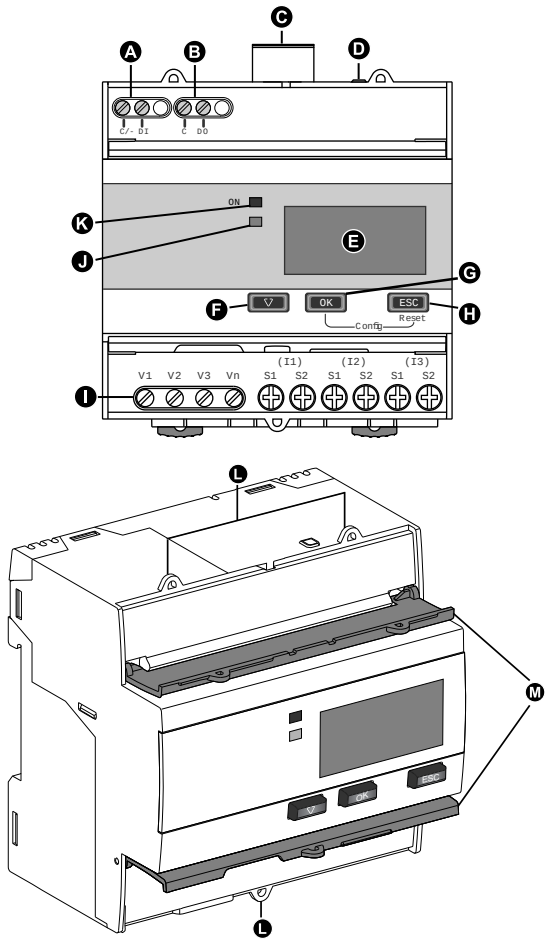
Dimensions

NOTE: Dimensions are in mm/in.



Meter description

Meter overview



A	Digital input
B	Digital output
C	Communication port
D	Communication LED
E	Display with white backlight for measurement and configuration
F	Scroll through screens or a list of options
G	Confirm entry or access more screens
H	Cancel and go back to previous screen
I	V1, V2, V3, Vn, I1, I2, I3
J	Energy pulse LED **NOTE:** • Within 24000/x, x is the primary current for iEM3455 / iEM3465. • The meter constant for iEM3555 / iEM3565 is 5. • For iEM3455C1, x is 2 Wh/pulse. • For iEM3455C2, x is 5 Wh/pulse.
K	Status LED: on / off / error
L	Sealing points (3)
M	Sealable covers (2)

NOTE: The sealable covers must be installed and sealed to the sealing points with the steel cable. Use steel cable with 1.6 mm (1/16 in) diameter and 152.4 mm (6 in) adjustable length for sealing.

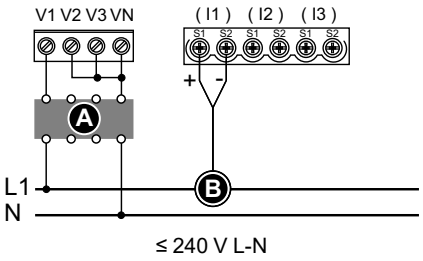
Wiring

Power system wiring

iEM3455 / iEM3465 / iEM3555 / iEM3565

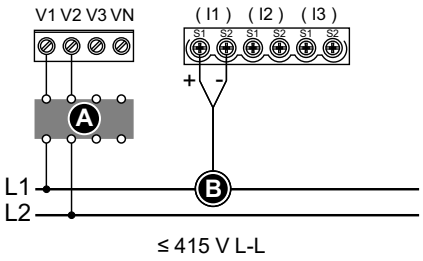
1PH

1PH2W L-N



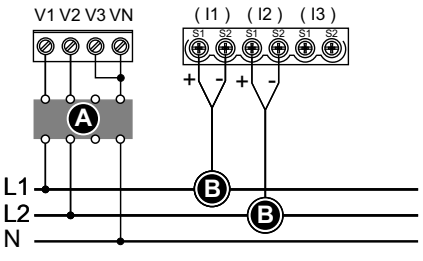
≤ 240 V L-N

1PH2W L-L



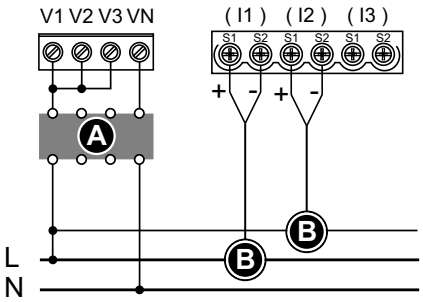
≤ 415 V L-L

1PH3W L-L-N



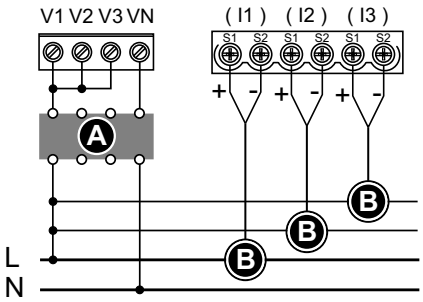
≤ 240 V L-N
≤ 480 V L-L

1PH3W multi L-N 2LVCS



≤ 240 V L-N

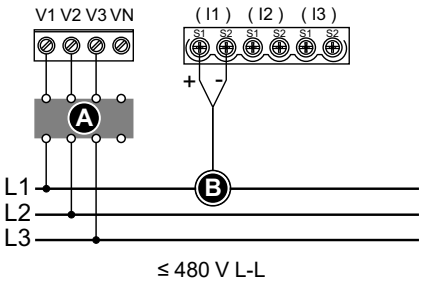
1PH4W multi L-N 3LVCS



≤ 240 V L-N

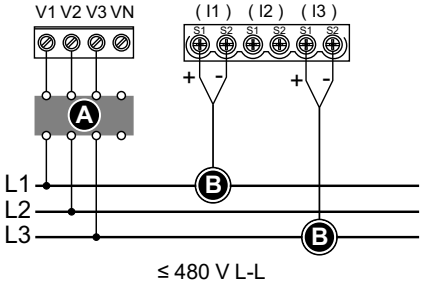
3PH3W

1LVCS♦



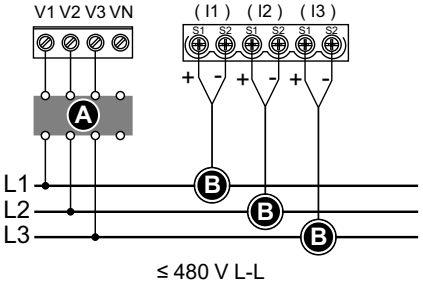
≤ 480 V L-L

2LVCS



≤ 480 V L-L

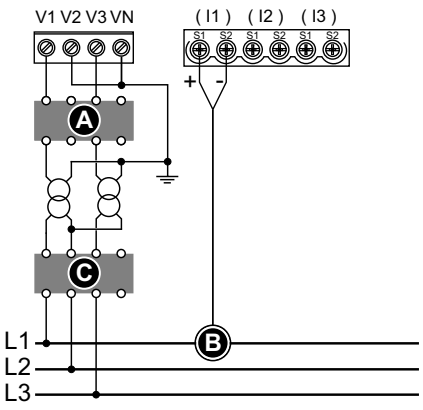
3LVCS



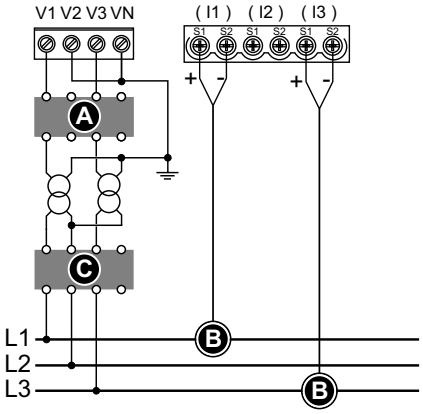
≤ 480 V L-L

3PH3W

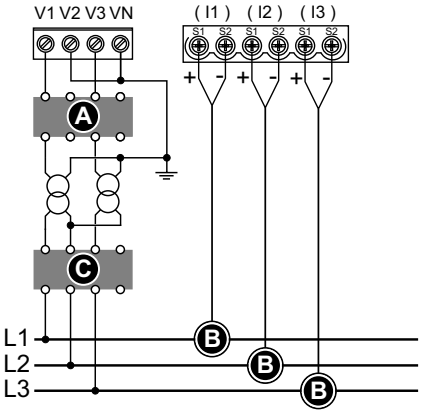
2VT, 1LVCS♦



2VT, 2LVCS

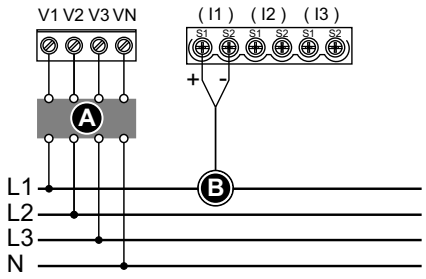


2VT, 3LVCS



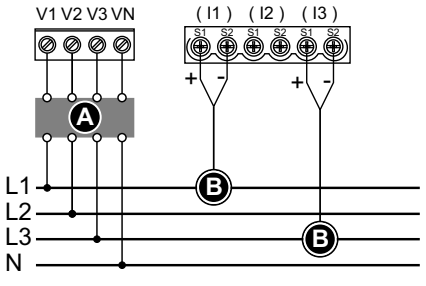
3PH4W

1LVCS♦



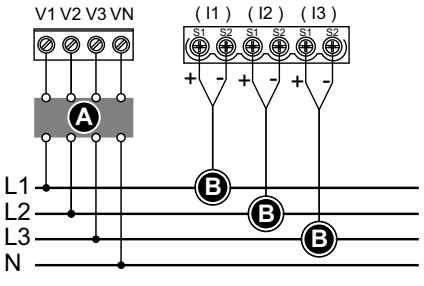
≤ 277 V L-N
≤ 480 V L-L

2LVCS



≤ 277 V L-N
≤ 480 V L-L

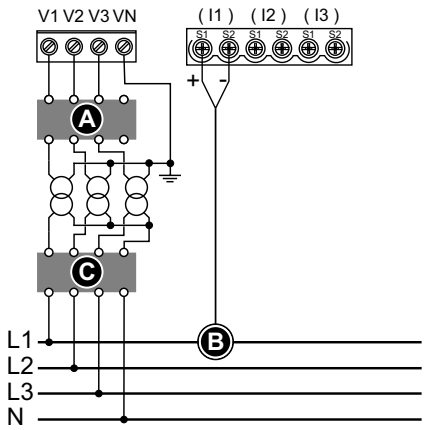
3LVCS



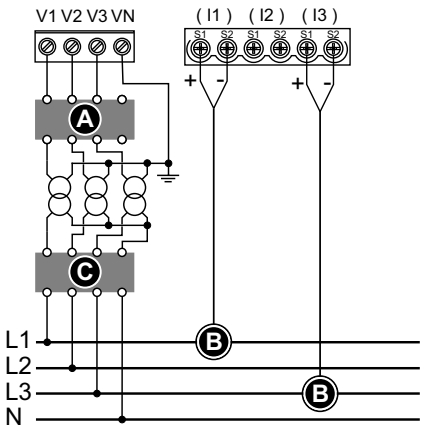
≤ 277 V L-N
≤ 480 V L-L

3PH4W

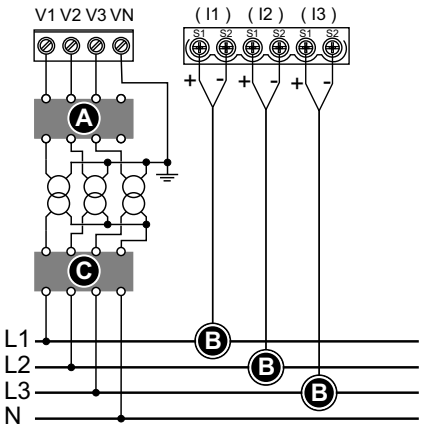
3VT, 1LVCS♦



3VT, 2LVCS♦



3VT, 3LVCS



A 250 mA fuses and disconnect switch

B LVCS with insulation rated for the installation voltage and the installation/ measurement category
NOTE: LVCS refers to both LVCT and Rogowski coil.

C VT primary fuses and disconnect switch

♦ indicates wiring for a balanced system

+ indicates white wire

- indicates black wire

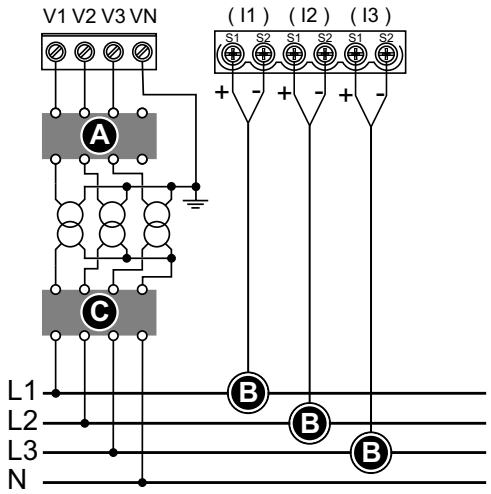
Clearly label the device's disconnect circuit mechanism and install it within easy reach of the operator.

Fuses / circuit breakers must be rated for the installation voltage and sized for the available fault current. Fuse for neutral is required if the source neutral is not grounded.

iEM3455C1 / iEM3455C2

3PH4W

3LVCT



A **250 mA fuses and disconnect switch**

B **LVCT with insulation rated for the installation voltage and the installation/ measurement category**

C **VT primary fuses and disconnect switch**

+ indicates white wire

- indicates black wire

Clearly label the device's disconnect circuit mechanism and install it within easy reach of the operator.

Fuses / circuit breakers must be rated for the installation voltage and sized for the available fault current. Fuse for neutral is required if the source neutral is not grounded.

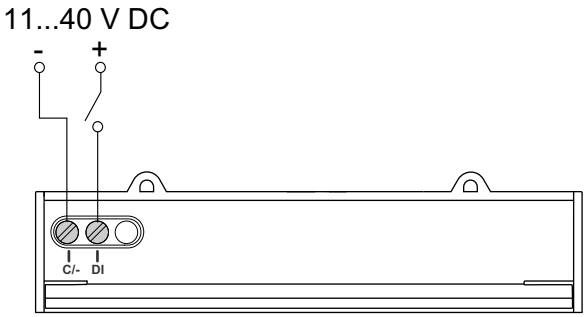
Input, output and communications wiring considerations

The pulse output is compatible with S0 format, and the programmable digital output is compatible with S0 format when configured as a pulse output.

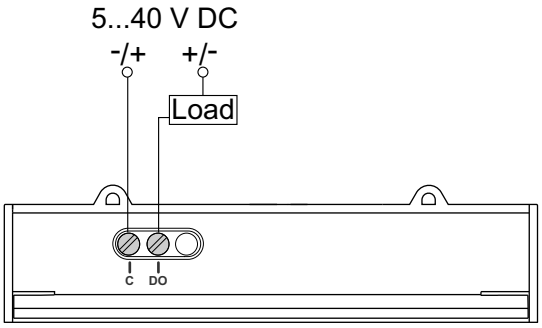
The digital input and output are electrically independent.

The digital output is polarity-independent.

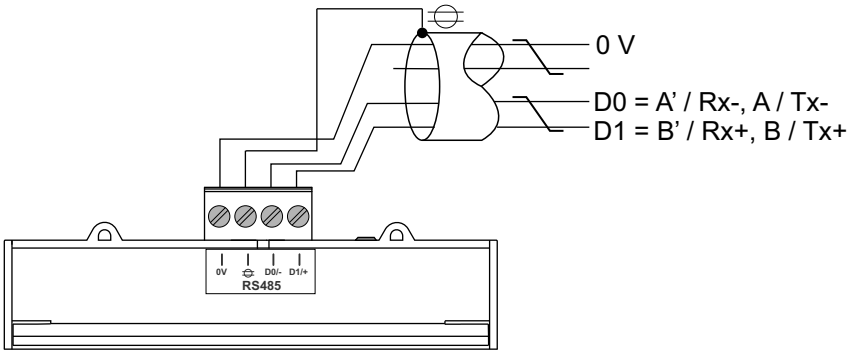
Digital input



Digital output



Modbus / BACnet RS-485 wiring

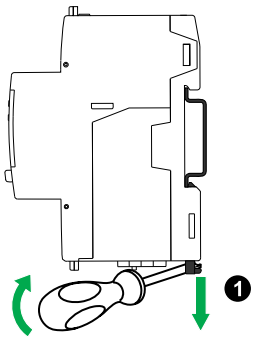


Meter sealing points

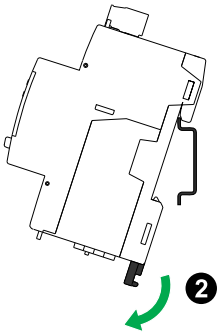
All meters have sealing covers and sealing points to help prevent access to inputs and outputs and current and voltage connections.

Dismounting the meter from a DIN rail

1. Use a flat-tip screwdriver (≤ 6.5 mm / 0.25 in) to lower the locking mechanism and release the meter.



2. Lift the meter out and up to free it from the DIN rail.



LVCT and Rogowski Coil recommendations

Split-core LVCT			
Part Number	**Sensing Current**	**Frequency**	**Output**
LVCT00102S	100 A	50/60 Hz	0 to 1/3 V
LVCT00202S	200 A	50/60 Hz	0 to 1/3 V
LVCT00302S	300 A	50/60 Hz	0 to 1/3 V
LVCT00403S	400 A	50/60 Hz	0 to 1/3 V
LVCT00603S	600 A	50/60 Hz	0 to 1/3 V
LVCT00803S	800 A	50/60 Hz	0 to 1/3 V
LVCT00804S	800 A	50/60 Hz	0 to 1/3 V
LVCT01004S	1000 A	50/60 Hz	0 to 1/3 V
LVCT01204S	1200 A	50/60 Hz	0 to 1/3 V
LVCT01604S	1600 A	50/60 Hz	0 to 1/3 V
LVCT02004S	2000 A	50/60 Hz	0 to 1/3 V
LVCT02404S	2400 A	50/60 Hz	0 to 1/3 V
LVCT00050S	50 A	50/60 Hz	0 to 1/3 V
LVCT00101S	100 A	50/60 Hz	0 to 1/3 V
LVCT00201S	200 A	50/60 Hz	0 to 1/3 V

Solid-core LVCT			
Part Number	**Sensing Current**	**Frequency**	**Output**
LVCT20050S	50 A	50/60 Hz	0 to 1/3 V
LVCT20100S	100 A	50/60 Hz	0 to 1/3 V
LVCT20202S	200 A	50/60 Hz	0 to 1/3 V
LVCT20403S	400 A	50/60 Hz	0 to 1/3 V
UCT-1250-100 (iEM3455C1 only)	100 A	50/60 Hz	0 to 1/3 V
UCT-1250-200 (iEM3455C2 only)	200 A	50/60 Hz	0 to 1/3 V

Rogowski Coil				
Part Number	**Sensing Current**	**Frequency**	**Lead length (m)**	**Approximate Inside Diameter (mm)**
METSECTR25500	5000 A	50/60 Hz	2.35	80
METSECTR30500	5000 A	50/60 Hz	2.35	96

Rogowski Coil				
Part Number	**Sensing Current**	**Frequency**	**Lead length (m)**	**Approximate Inside Diameter (mm)**
METSECTR46500	5000 A	50/60 Hz	2.35	146
METSECTR60500	5000 A	50/60 Hz	2.35	191
METSECTR90500	5000 A	50/60 Hz	2.35	287

Front panel display and meter setup

Overview

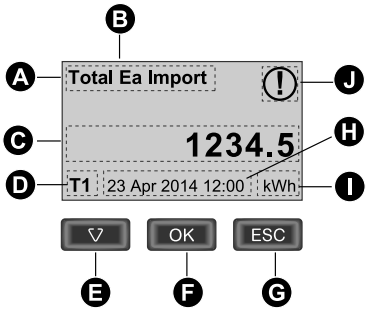
The meter features a front panel with signaling LEDs, a graphical display, and menu buttons that allow you to access the information required to operate the meter and modify parameter settings.

The front panel also allows you to display, configure and reset parameters.

Some meters have the Multi Tariff feature, which allows you to configure different tariffs.

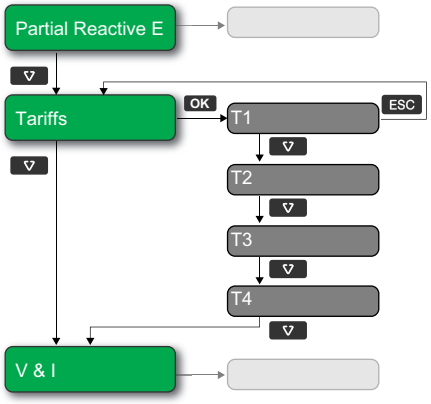
Data display

Data display screen overview



A	Measurement
B	Ea / Er = active / reactive energy (if available)
C	Value
D	Active tariff (if applicable)
E	Scroll through the available screens
F	View more screens related to the measurement category (if available)
G	Go back to previous screen
H	Date and time (if applicable)
I	Unit
J	Icon indicating date / time are not set

Example: navigating the display screens



1. Press ▽ to scroll through the main display screens; then press ▽ to move from **Partial Reactive E** to **Tariffs** to **V & I**.
2. Press OK to access additional screens related to main screen (if available); then press OK to access screens for each of the available tariffs.
3. Press ▽ to scroll through these additional screens.

Meter status information

Two LEDs on the front panel indicate the current status of the device: the green status LED and the yellow energy pulsing LED.

The icons in the table below indicate the LED state:

- = LED is off
- = LED is on
- = LED is flashing

Status LED	Energy pulsing LED	Description
		Off
	1 s >	On, no pulse counting
		On, with pulse counting
		Error, pulse counting stopped
		Abnormal, with pulse counting

Backlight and error / alert icon

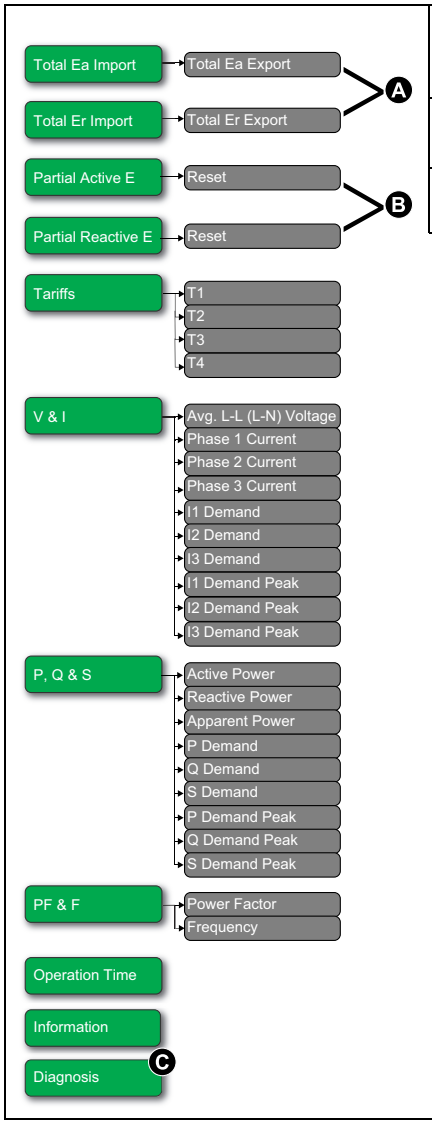
The backlight (display screen) and error / alert icon on the top right corner of the display screen indicate the meter status.

Backlight	Error / Alert icon	Description
OFF	–	Device not powered ON or device is OFF
ON / Dim	OFF	LCD is in power saving mode.
ON / Normal	OFF	Normal working status.
Flashing	Flashing	Alarm / diagnosis is active.
ON / Dim	Flashing	Alarm / diagnosis is active for 3 hours and LCD is in power saving mode.
ON / Normal ON / Dim	ON	Not active alarm. Logged alarms are not acknowledged by the user.

Data display screens

The following sections outline the data display screens available on the various meter models.

Data display screens



A	Import / export indicated for total active (Ea) and total reactive (Er) energy. Other energy measurements are import only
B	Resets all energy measurements except total active energy and total reactive energy
C	Diagnosis screen appears if there is a specific event

Demand readings

Demand readings and related features are available in the models from the below firmware versions. Models with older firmware versions cannot be upgraded.

- iEM3455 and iEM3465 – V1.2.003 and higher
- iEM3555 and iEM3565 – V1.1.001 and higher
- iEM3465 and iEM3565 – BACnet V2.4 and higher

Characteristics	Description
Demand Values	
Current	Per phase and average [1]
Active, reactive, apparent power	Total
Peak Demand Values	
Current	Per phase and average [1]
Active, reactive, apparent power	Total

1. Available only by communications

Demand calculation methods

Power demand is the energy accumulated during a specified period divided by the length of the period. Current demand is calculated using arithmetical integration of the current RMS values during a time period, divided by the length of the period.

How the power meter performs this calculation depends on the selected method.

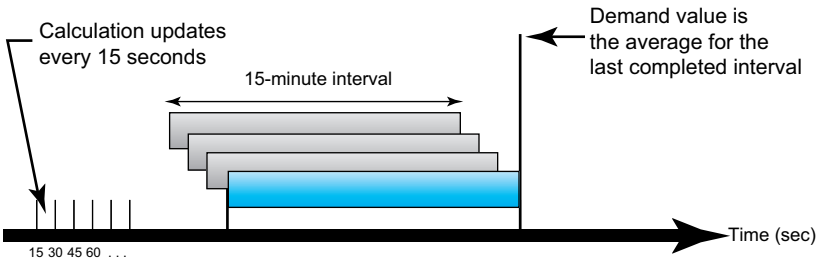
To be compatible with electric utility billing practices, the power meter provides block interval power/current demand calculations.

For block interval demand calculations, you select a block of time (interval) that the power meter uses for the demand calculation and the mode the meter uses to handle the interval. 2 different modes are possible:

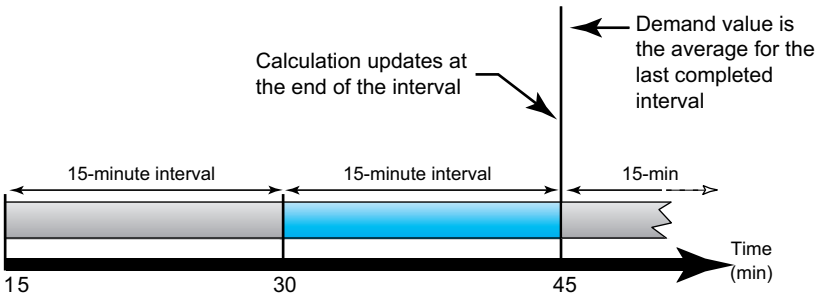
- Fixed block – Select an interval from 10, 15, 20, 30, 60 minutes. The power meter calculates and updates the demand at the end of each interval.
- Sliding block – Select an interval from 10, 15, 20, 30, 60 minutes. For demand intervals less than 15 minutes, the value is updated every 15 seconds. For demand intervals of 15 minutes and greater, the demand value is updated every 60 seconds. The power meter displays the demand value for the last completed interval.

The figures below illustrate the 2 ways to calculate demand power using the block method. For illustration purposes, the interval is set to 15 minutes.

Sliding block



Fixed block



Peak demand

In nonvolatile memory, the power meter maintains a maximum operating demand value called peak demand. The peak is the highest value (absolute value) for each of these readings since the last reset.

You can reset peak demand values from the power meter display. You should reset peak demand after changes to basic power meter setup such as CT ratio or power system configuration.

Resets

The following resets are available:

Reset	Description
Partial energy	Clears all active and reactive energy accumulated since the last reset. This does not reset the total active and reactive energy accumulation.
Input metering	Clears all input metering energy data. You can only reset the input metering accumulation using software.

Resetting accumulated energy using the display

1. Navigate to the **Partial Active E** or **Partial Reactive E** screen. The screen displays the date of the last reset. For example:

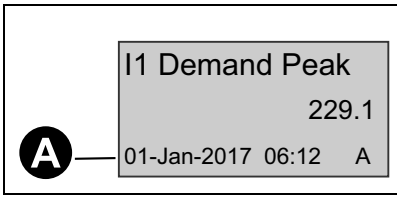
A	Date of last reset

2. Press and hold ESC. The **Reset** screen appears.
3. Press OK to confirm the reset and enter the meter password when prompted.

   NOTE: Regardless of the screen you use to access this reset, accumulations of both Partial Active Energy and the Partial Reactive Energy (if available) are cleared.

Resetting peak demand using the display

1. Navigate to any of the below listed screens:
   - I1 Demand Peak
   - I2 Demand Peak
   - I3 Demand Peak
   - P Demand Peak
   - Q Demand Peak
   - S Demand Peak



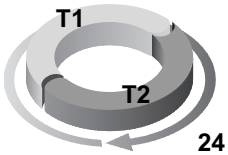
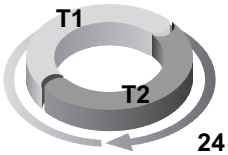
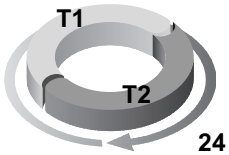
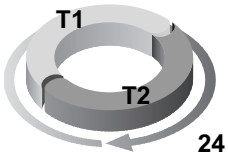
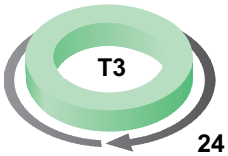
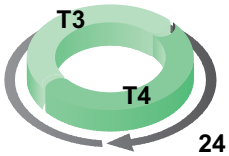
A	Date and time of peak demand

2. Press and hold ESC. The **Reset** screen appears.
3. Press OK to confirm the reset and enter the meter password.

   NOTE: Once the peak demand is reset, the date and time are not displayed till the next peak demand is captured.

Multi Tariff feature

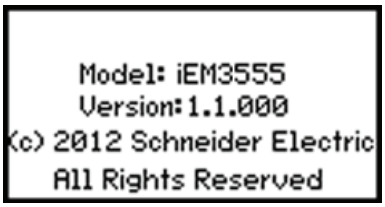
The table below illustrates how the tariffs operate according to the tariff selection (2, 3 or 4 tariffs). These tariffs are stored in 4 different registers: T1, T2, T3 and T4.

	2 tariffs	3 tariffs	4 tariffs
Weekday			
Weekend			

NOTE: If the tariff Control Mode is set to by Internal Clock, the start time of the next tariff is the end time of the current tariff. For example, T2 start equals the end of T1.

Meter information

Meter information (for example, model and firmware version) is available on the information screen. In display mode, press the down arrow until you reach the information screen:



The device clock

You must reset the time to account for any time change (for example, to switch the time from standard time to daylight savings time).

Clock behavior

You are prompted to set the date and time when the meter is powered up. Press ESC to skip this step if you do not want to set the clock (you can enter configuration mode and set the date and time later, if required).

When the power is interrupted, the device retains its date and time information for 3 days. If power is interrupted for longer than 3 days, the device automatically displays the screen to set **Date & Time** when power is restored.

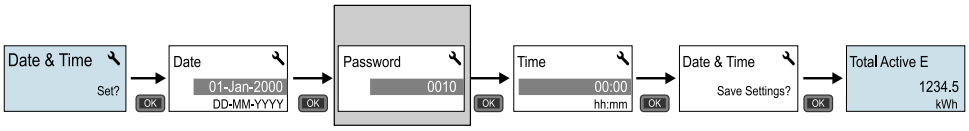
Date/time format

The date is displayed in the following format: DD-MMM-YYYY.

The time is displayed using the 24-hour clock in the following format: hh:mm:ss.

Setting the clock initially

The image below illustrates how to set the clock when you initially power up the device or after a power failure. To set the clock during normal operation, refer to Device configuration, page 30.



NOTE: Password entry is only required for meters that support a password.

Device configuration

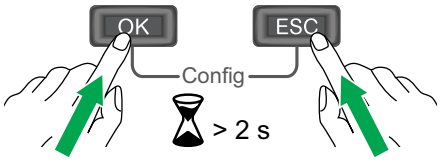
The default factory settings (as applicable based on your model) are listed in the table below:

Menu	Factory settings
Wiring	iEM3400 series: 3PH4W; 3 LVCTs on I1, I2, and I3; Direct-No VT iEM3500 series: 3PH4W; 3 Rogowski Coils on I1, I2, and I3; Direct-No VT
CT Ratio	Varies depending on meter model
CT & VT Ratio	Varies depending on meter model
Frequency	50 Hz
Date	1-Jan-2000
Time	00:00:00
Multi Tariffs	Disable
Overload Alarm	Disable
Digital Output	Disable
Digital Input	Input Status
Pulse Output	100 imp/kWh
Demand	Method = Sliding Interval = 15 mins
Communication	Varies depending on protocol
Com.Protection	Enable
Contrast	5
Password	0010

Entering configuration mode

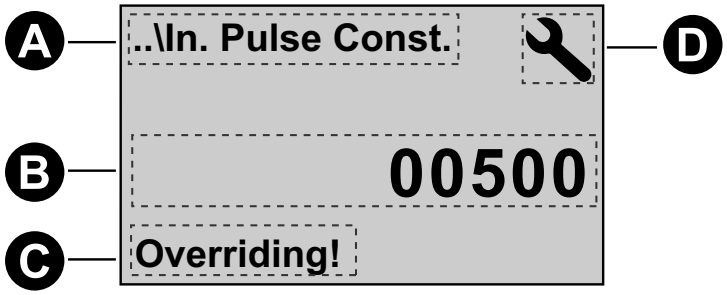
1. Press and hold OK and ESC at the same time for about 2 seconds.

2. Enter the meter password, if prompted. The **Access Counter** screen displays, indicating the number of times the configuration mode has been accessed.



The front panel display in configuration mode

The image below illustrates the various elements of the display in configuration mode:



A	Parameter
B	Setting
C	Indicates that the setting impacts the Multi Tariff feature
D	Configuration mode icon

Com. Protection setting

For meters with communications capabilities, you can enable or disable the Com. Protection setting. If this setting is enabled, you must use the display to configure certain settings (for example, wiring or frequency, etc.) and perform resets; you cannot use communications.

The protected settings and resets are:

- Power system settings (for example, wiring, frequency, CT ratios)
- Date and time settings
- Multi Tariff settings
- Communications settings
- Partial energy reset

Modifying parameters

There are two methods for modifying a parameter, depending on the type of parameter:

- Selecting a value in a list (for example, selecting 1PH2W L-N from a list of available power systems), or
- Modifying a numerical value, digit by digit (for example, entering a value for the date, time or VT primary).

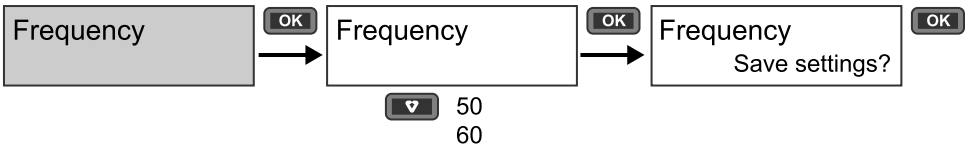
NOTE: Before you modify any parameters, ensure that you are familiar with the HMI functionality and navigation structure of your device in configuration mode.

Selecting a value from a list

1. Use the ▽ button to scroll through the parameter values until you reach the desired value.
2. Press OK to confirm the new parameter value.

Example: Configuring a list value

To set the nominal frequency of the meter:



1. Enter configuration mode and press the ▽ button until you reach **Frequency** then press OK to access the frequency configuration.
2. Press the ▽ button to select the frequency you want then click OK. Press OK again to save your changes.

Modifying a numerical value

When you modify a numerical value, the digit on the far right side is selected by default (except for Date/Time).

The parameters listed below are the only ones for which you set a numerical value (if the parameter is available on your device):

- Date
- Time
- Pick Up Value for an overload alarm
- Voltage Transformer (VT) Primary
- Current Transformer (CT) Primary
- Password
- Address of the meter

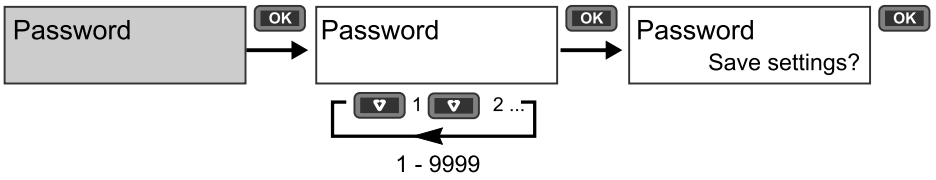
To modify a numerical value:

1. Use the ▽ button to modify the selected digit.
2. Press OK to shift to next digit. Modify the next digit, if needed, or press okay to move to the next digit. Continue to move through the digits until you reach the last digit then press OK again to confirm the new parameter value.

   If you enter an invalid setting for the parameter, when you press OK after setting the left-most number, the cursor shifts back to the right-most number so you can enter a valid value.

Example: configuring a numeric value

To set the password:



1. Enter configuration mode and press the ▽ button until you reach **Password** then press OK to access the password configuration.
2. Press the ▽ button to increment the selected digit or press OK to move to the next digit to the left. When you reach the left-most digit, press OK to move to the next screen. Press OK again to save your changes.

Cancelling an entry

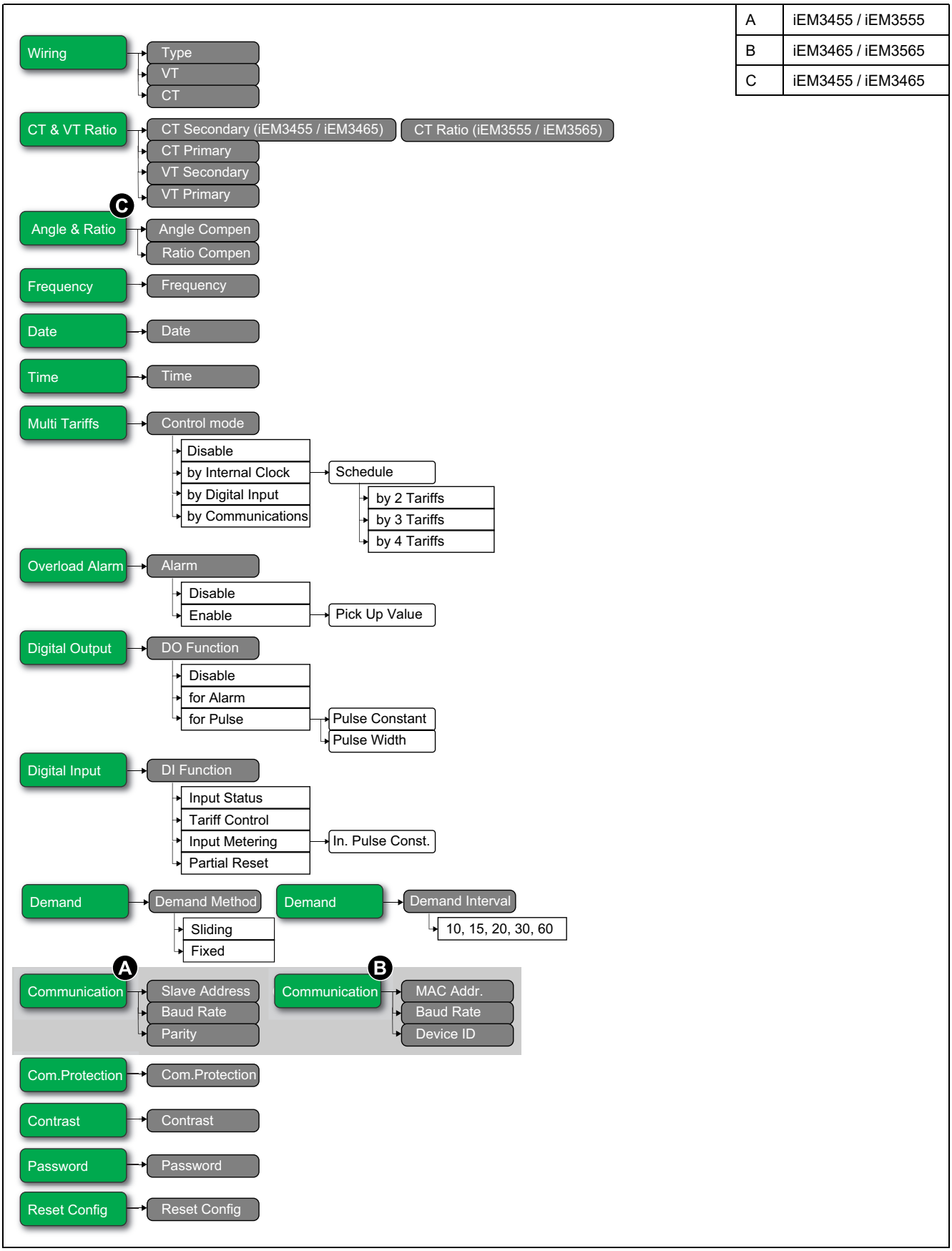
To cancel the current entry, press the ESC button. The change is cancelled and the screen reverts to the previous display.

Configuration mode menus

The images below show the configuration navigation for each device.

Configuration menu for iEM3400 series and iEM3500 series

A	iEM3455 / iEM3555
B	iEM3465 / iEM3565
C	iEM3455 / iEM3465



Section	Parameter	Options	Description
Wiring	Type	3PH3W 3PH4W 1PH2W L-N 1PH2W L-L 1PH3W L-L-N 1PH4W Multi L-N	Select the power system type the meter is wired to.
	VT	Direct-NoVT Wye (3VTs) Delta (2VTs)	Select how many voltage transformers (VT) are connected to the electrical power system.
	CT	3CTs on I1, I2, I3 1 CT on I1 2 CTs on I1, I3	Define how many current transformers (CT) are connected to the meter and which terminals they are connected to.
CT & VT Ratio	CT Secondary	0.333 1	Select the size of the CT secondary, in Amps.
	CT Primary	1 to 32767	Enter the size of the CT primary, in Amps.
	VT Secondary	100 110 115 120	Select the size of the VT secondary, in Volts.
	VT Primary	1 to 1000000	Enter the size of the VT primary, in Volts.
Angle & Ratio (iEM3455 / iEM3465)	Angle Compen	0 – 17000	Enter the phase angle compensation, in rad (radian). **For negative phase shift:** Formula = 10000 - (Angle in rad*1000) Example: For -30° negative phase shift, the value in rad is -0.524 Value to be entered = 10000 - (-0.524*1000), which is equal to 10524 **For positive phase shift:** Formula = Angle in rad*1000 Example: For 30° positive phase shift, the value in rad is 0.524 Value to be entered = 0.524*1000, which is equal to 524
	Ratio Compen	0 – 2000	Enter the ratio compensation. Formula = Ratio value*1000
Frequency	Frequency	50 60	Select the frequency of the electrical power system, in Hz.
Date	Date	DD-MMM-YYYY	Set the current date using the specified format.
Time	Time	hh:mm	Set the time using the 24-hour format.
Multi Tariffs	Control Mode	Disable by Communication by Digital Input by Internal Clock	Select the tariff control mode: • Disable: the Multi Tariff function is disabled. • by Communication: the active tariff is control by communications. See the chapter for the applicable protocol for more information. • by Digital Input: the digital input is associated with the Multi Tariff function. A signal to the digital input changes the active tariff. • by Internal Clock: the device clock controls the active tariff. If you set the Control Mode to by Internal Clock, you must also configure the schedule. Set the time when each tariff period starts, using the 24 hour clock format (00:00 to 23:59). The start time of the next tariff is the end time of the current tariff. For example, T2 start equals the end of T1.

Section	Parameter	Options	Description
Overload Alarm	Alarm	Disable Enable	Select whether or not the Overload Alarm is enabled: • Disable: the alarm is disabled. • Enable: the alarm is enabled. If you enabled the Overload Alarm, you must also configure the Pick Up Value in kW from 1 - 9999999.
Digital Output	DO Function	Disable for Alarm for Pulse (kWh)	Select how the digital output functions: • Disable: the digital output is disabled. • for Alarm: the digital output is associated with the overload alarm. In the event of trigger, the digital output remains in the ON state until the alarm drop out point is crossed. • for Pulse (kWh): The digital output is associated with energy pulsing. When this mode is selected, you can select the energy parameter and set the Pulse Constant (imp/kWh) and the Pulse Width (ms).
Digital Input	DI Function	Input Status Tariff Control Input Metering Partial Reset	Select how the digital input functions: • Input status: the digital input records the status of the input, for example, OF, SD of a circuit breaker. • Tariff Control: the digital input is associated with the Multi Tariff function. A signal to the digital input changes the active tariff. • Input Metering: the digital input is associated with input metering. The meter counts and records the number of incoming pulses. If you set the DI Function to Input Metering, you must also configure In. Pulse Constant. • Partial Reset: a signal to the digital input initiates a partial reset.
Demand	Demand Method	Sliding Fixed	Select the method to use for demand calculation.
	Demand Interval	10 15 20 30 60	Select the demand calculation block interval in minutes.
Communication (iEM3455 / iEM3555)	Slave Address	1 – 247	Set the address for this device. The address must be unique for each device in a communications loop.
	Baud Rate	19200 38400 9600	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. **NOTE:** Number of stop bits = 1.
Communication (iEM3465 / iEM3565)	MAC Addr.	1 – 127	Set the address for this device. The address must be unique for each device in a communications loop.
	Baud Rate	9600 19200 38400 57600 76800	Select the speed for data transmission. The baud rate must be the same for all devices in a communications loop.
	Device ID	0 – 4194303	Set the Device ID for this device. Make sure the Device ID is unique in your BACnet network.
Com.Protection	Com.Protection	Enable Disable	Protects selected settings and resets from configuration via communications.
Contrast	Contrast	1 – 9	Increase or decrease the value to increase or decrease the display contrast.
Password	Password	0 – 9999	Sets the password for accessing the meter configuration screens and resets.
Reset Config	Reset Config	—	Settings are reset to their defaults, except for Password. Meter restarts.

Communications via Modbus

Modbus communication overview

Modbus RTU protocol is available on iEM3455 / iEM3555 meter models.

The information in this section assumes that you have an advanced understanding of Modbus communications, your communications network and the power system that your meter is connected to.

There are three different ways of using Modbus communication:

- By sending commands using the command interface
- By reading the Modbus registers
- By reading Device Identification

Modbus communications settings

Before communicating with the device using Modbus protocol, use the display to configure the following settings:

Settings	Possible values
Baud rate	9600 Baud 19200 Baud 38400 Baud
Parity	Odd Even None **NOTE:** Number of stop bits = 1
Address	1 – 247

Communications LED indicator for Modbus devices

The yellow communications LED indicates the status of communication between the meter and the master as follows:

If...	Then...
The LED is flashing	Communication with the device has been established. **NOTE:** If there is an error online, the LED also flashes.
The LED is off	There is no active communication between the master and the slave

Modbus functions

Function list

The table below lists the supported Modbus functions:

Function code		Function name
Decimal	Hexadecimal	
3	0x03	Read Holding Registers
16	0x10	Write Multiple Registers
43/14	0x2B/0x0E	Read Device Identification

For example:

- To read different parameters from the meter, use function 3 (Read).
- To change the tariff, use function 16 (Write) to send a command to the meter.

Table format

Register tables have the following columns:

Address	Register	Action (R/W/WC)	Size	Type	Units	Range	Description

- ***Address***: A 16-bit register address in hexadecimal. The address is the data used in the Modbus frame.
- ***Register***: A 16-bit register number in decimal (register = address + 1).
- ***Action***: The read/write/write by command property of the register.
- ***Size***: The data size in Int16.
- ***Type***: The encoding data type.
- ***Units***: The unit of the register value.
- ***Range***: The permitted values for this variable, usually a subset of what the format allows.
- ***Description***: Provides information about the register and the values that apply.

Unit table

The following data types appear in the Modbus register list:

Type	Description	Range
UInt16	16 bit unsigned integer	0 to 65535
Int16	16 bit signed integer	-32768 to +32767
UInt32	32 bit unsigned integer	0 to 4 294 967 295
Int64	64 bit unsigned integer	0 to 18 446 744 073 709 551 615
UTF8	8 bit field	Multi byte character encoding for Unicode
Float32	32 bit value	Standard representation IEEE for floating number (with single precision))
Bitmap	—	—
DATETIME	See below table	—

DATETIME format:

Word	Bits															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	Reserved								R4 (0)	Year (0 – 127)						
2	0				Month (1 – 12)				WD (0)			Day (1 – 31)				
3	SU (0)	0		Hour (0 – 23)					iV	0	Minute (0 – 59)					

DATETIME format: (Continued)

Word	Bits															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
4	Millisecond (0 – 59999)															

R4 :	Reserved Bit
Year :	7 bits (year from 2000)
Month :	4 bits
Day :	5 bits
Hour :	5 bits
Minute :	6 bits
Millisecond :	2 octets
WD (day of the week) :	1 – 7: Sunday – Saturday
SU (summer time) :	Bit to 0 if this parameter is not used
iV (validity of received data) :	Bit to 0 if this parameter is not valid or not used

Command interface

Command interface overview

The command interface allows you to configure the meter by sending specific command requests using Modbus function 16.

Command request

The table below describes a Modbus command request:

Slave Number	Function Code	Command block		CRC
		Register Address	Command Description	
1 – 247	16	5250 (up to 5374)	The command is made of a command number and a set of parameters. See the detailed description of each command in the command list. **NOTE:** All the reserved parameters can be considered as any value, e.g. 0.	Checking

The command result can be obtained by reading registers 5375 and 5376.

The table below describes the Command result:

Register Address	Content	Size (Int16)	Data (example)
5375	Requested Command Number	1	2008 (Set Tariff)
5376	Result Command result codes: • 0 = Valid Operation • 3000 = Invalid Command • 3001 = Invalid Parameter • 3002 = Invalid Number of Parameters • 3007 = Operation Not Performed	1	0 (Valid Operation)

Command list

Set Date/Time

Command Number	Action (R/W)	Size	Type	Unit	Range	Description
1003	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	2000 – 2099	Year
	W	1	UInt16	—	1 – 12	Month
	W	1	UInt16	—	1 – 31	Day
	W	1	UInt16	—	0 – 23	Hour
	W	1	UInt16	—	0 – 59	Minute
	W	1	UInt16	—	0 – 59	Second
	W	1	UInt16	—	—	(Reserved)

Set Wiring

Command Number	Action (R/W)	Size	Type	Unit	Range	Description
2000	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	1, 3	Number of phases
	W	1	UInt16	—	2, 3, 4	Number of wires
	W	1	UInt16	—	0, 1, 2, 3, 11,13	Power System Configuration: 0 = 1PH2W L-N 1 = 1PH2W L-L 2 = 1PH3W L-L-N 3 = 3PH3W 11 = 3PH4W 13 = 1PH4W L-N
	W	1	UInt16	Hz	50, 60	Nominal Frequency
	W	2	Float32	—	—	(Reserved)
	W	2	Float32	—	—	(Reserved)
	W	2	Float32	—	—	(Reserved)
	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	—	(Reserved)
	W	2	Float32	V	1000000.0	VT Primary
	W	1	UInt16	V	100, 110, 115, 120	VT Secondary
	W	1	UInt16	—	1, 2, 3	Number of CTs
	W	1	UInt16	A	1 to 32767	CT Primary **NOTE:** For iEM3455
					5000	CT Primary **NOTE:** For iEM3555
	W	1	UInt16	mV	333, 1000	CT Secondary **NOTE:** For iEM3455
				µV/kA/Hz	1167	CT Secondary **NOTE:** For iEM3555
	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	—	(Reserved)

Command Number	Action (R/W)	Size	Type	Unit	Range	Description
	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	—	(Reserved)

Set Demand

Command Number	Action (R/W)	Size	Type	Unit	Range	Description
2002	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	1, 2	Demand method: 1 = Timed interval sliding block 2 = Timed interval fixed block
	W	1	UInt16	Minute	10, 15, 20, 30, 60	Demand Interval
	W	1	UInt16	—	—	(Reserved)

Set Pulse Output

Command Number	Action (R/W)	Size	Type	Unit	Range	Description
2003	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	kWh kVARh	3, 6	Digital Output Control Mode Status: 3 = kWh 6 = kVARh
	W	1	UInt16	—	0, 1	Pulse Output enable / disable: 0 = Disable 1 = Enable
	W	2	Float32	pulse/kWh	0.01, 0.1, 1, 10, 100, 500	Pulse constant
	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	—	(Reserved)
	W	2	Float32	—	—	(Reserved)
	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	—	(Reserved)
	W	2	Float32	—	—	(Reserved)
2038	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	ms	50, 100, 200, 300	Pulse width
2039	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	imp/kWh imp/KVARh	0, 1	LED energy pulse: 0 = kWh 1 = kVARh

Set Tariff

Command Number	Action (R/W)	Size	Type	Unit	Range	Description
2060	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	0, 1, 2, 4	Multi Tariff Mode: 0 = Disable Multi Tariff 1 = Use COM as Tariff Control (maximum 4 tariffs) 2 = Use Digital Input as Tariff Control (2 tariffs) 4 = Use Internal Clock as Tariff Control (maximum 4 tariffs)
2008	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	1 – 4	Tariff: 1 = T1 2 = T2 3 = T3 4 = T4 **NOTE:** You can only set the tariff using this method if the Tariff Mode is set to by Communication.

Set Digital Input as Partial Energy Reset

Command Number	Action (R/W)	Size	Type	Unit	Range	Description
6017	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	0, 1	Digital Input to Associate: 0 = Disable 1 = Enable

Input Metering Setup

Command Number	Action (R/W)	Size	Type	Unit	Range	Description
6014	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	1	Input Metering Channel
	W	20	UTF8	—	String size ≤ 40	Label
	W	2	Float32	—	1 – 10000	Pulse Weight
	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	0, 1	Digital Input Association: 0 = Disable 1 = Enable

Overload Alarm Setup

Command Number	Action (R/W)	Size	Type	Unit	Range	Description
7000	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	9	Alarm ID
	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	—	(Reserved)

Command Number	Action (R/W)	Size	Type	Unit	Range	Description
	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	0, 1	0 = Disable 1 = Enable
	W	2	Float32	—	0.0 – 1e10	Pickup value
	W	2	UInt32	—	—	(Reserved)
	W	2	Float32	—	—	(Reserved)
	W	2	UInt32	—	—	(Reserved)
	W	1	UInt16	—	—	(Reserved)
	W	4	UInt16	—	—	(Reserved)
	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	—	(Reserved)
20000	W	1	UInt16	—	—	(Reserved)
	W	2	Float32	—	—	(Reserved)
	W	2	UInt32	—	—	(Reserved)
	W	1	Bitmap	—	0, 1	Digital Output to Associate: 0 = Unassociated 1 = Associated
20001	W	1	UInt16	—	—	Acknowledge the Overload Alarm

Communications Setup

Command Number	Action (R/W)	Size	Type	Unit	Range	Description
5000	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	—	(Reserved)
	W	1	UInt16	—	1 – 247	Address
	W	1	UInt16	—	0, 1, 2	Baud Rate: 0 = 9600 1 = 19200 2 = 38400
	W	1	UInt16	—	0, 1, 2	Parity: 0 = Even 1 = Odd 2 = None
	W	1	UInt16	—	—	(Reserved)

Reset all Peak Demand

Command Number	Action (R/W)	Size	Type	Unit	Range	Description
2015	W	1	UInt16	—	—	(Reserved)

Reset Partial Energy Counters

Command Number	Action (R/W)	Size	Type	Unit	Range	Description
2020	W	1	UInt16	—	—	(Reserved) Partial Active / Reactive Energy, Energy by tariff and Phase Energy registers will be reset.

Reset Input Metering Counter

Command Number	Action (R/W)	Size	Type	Unit	Range	Description
2023	W	1	UInt16	—	—	(Reserved)

Modbus register list

System

Address	Register	Action (R/W/ WC)	Size	Type	Units	Description
0x001D	30	R	20	UTF8	—	Meter Name
0x0031	50	R	20	UTF8	—	Meter Model
0x0045	70	R	20	UTF8	—	Manufacturer
0x0081	130	R	2	UInt32	—	Serial Number
0x0083	132	R	4	DATETIME	—	Date of Manufacture
0x0087	136	R	5	UTF8	—	Hardware Revision
0x0664	1637	R	1	UInt16	—	Present Firmware Version (DLF format): X.Y.ZTT
0x0734 – 0x0737	1845 – 1848	R/WC	1 X 4	UInt16	—	Date/Time: Reg. 1845: Year (b6:b0) 0 – 99 (year from 2000 to 2099) Reg. 1846: Month (b11:b8), Weekday (b7:b5), Day (b4:b0) Reg. 1847: Hour (b12:b8), Minute (b5:b0) Reg. 1848: Millisecond
0xAFC7	45000	R	1	Bitmap	—	Diagnostics error status 0 = Inactive 1 = Active Bit0 = Code 101 Bit1 = Code 102 Bit2 = Code 201 Bit3 = Code 202 Bit4 = Code 203 Bit5 = Code 204 Bit6 = Code 205 Bit7 = Code 206 Bit8 = Code 207

Meter Setup and Status

Address	Register	Action (R/W/WC)	Size	Type	Units	Description
0x07D3	2004	R	2	UInt32	Second	Meter Operation Timer
0x07DD	2014	R	1	UInt16	—	Number of Phases
0x07DE	2015	R	1	UInt16	—	Number of Wires
0x07DF	2016	R/WC	1	UInt16	—	Power System: 0 = 1PH2W L-N 1 = 1PH2W L-L 2 = 1PH3W L-L with N 3 = 3PH3W 11 = 3PH4W 13 = 1PH4W multi L with N
0x07E0	2017	R/WC	1	UInt16	Hz	Nominal Frequency
0x07E8	2025	R	1	UInt16	—	Number VTs
0x07E9	2026	R/WC	2	Float32	V	VT Primary
0x07EB	2028	R/WC	1	UInt16	V	VT Secondary
0x07EC	2029	R/WC	1	UInt16	—	Number CTs
0x07ED	2030	R/WC	1	UInt16	A	CT Primary
0x07EE	2031	R/WC	1	UInt16	A	CT Secondary
0x07F3	2036	R/WC	1	UInt16	—	VT Connection Type: 0 = Direct Connect 1 = 3PH3W (2 VTs) 2 = 3PH4W (3 VTs)

Energy Pulse Output Setup

Address	Register	Action (R/W/WC)	Size	Type	Units	Description
0x0850	2129	R/WC	1	UInt16	Millisecond	Energy Pulse Duration
0x0852	2131	R/WC	1	UInt16	—	Digital Output Association 0 = Disable 1 = DO1 enable for active energy pulse output
0x0853	2132	R/WC	2	Float32	pulse/kWh	Pulse Weight

Command Interface

Address	Register	Action (R/W/WC)	Size	Type	Units	Description
0x1481	5250	R/W	1	UInt16	—	Requested Command
0x1483	5252	R/W	1	UInt16	—	Command Parameter 001
0x14FD	5374	R/W	1	UInt16	—	Command Parameter 123
0x14FE	5375	R	1	UInt16	—	Command Status
0x14FF	5376	R	1	UInt16	—	Command Result codes: 0 = Valid Operation 3000 = Invalid Command

Address	Register	Action (R/W/ WC)	Size	Type	Units	Description
						3001 = Invalid Parameter 3002 = Invalid Number of Parameters 3007 = Operation Not Performed
0x1500	5377	R/W	1	UInt16	—	Command Data 001
0x157A	5499	R	1	UInt16	—	Command Data 123

Communication

Address	Register	Action (R/W/ WC)	Size	Type	Units	Description
0x1963	6500	R	1	UInt16	—	Protocol 0 = Modbus
0x1964	6501	R/WC	1	UInt16	—	Address
0x1965	6502	R/WC	1	UInt16	—	Baud Rate: 0 = 9600 1 = 19200 2 = 38400
0x1966	6503	R/WC	1	UInt16	—	Parity: 0 = Even 1 = Odd 2 = None **NOTE:** Number of stop bits = 1

Input Metering Setup

Address	Register	Action (R/W/ WC)	Size	Type	Units	Description
0x1B77	7032	R/WC	20	UTF8	—	Label
0x1B8B	7052	R/WC	2	Float32	pulse/unit	Pulse Constant
0x1B8E	7055	R/WC	1	UInt16	—	Digital Input Association: 0 = Disable for input metering 1 = Enable for input metering

Digital Input

Address	Register	Action (R/W/ WC)	Size	Type	Units	Description
0x1C69	7274	R	1	UInt16	—	Digital Input Control Mode: 0 = Normal (Input Status) 2 = Multi Tariff Control 3 = Input Metering 5 = All Energy Reset
0x22C8	8905	R	2	Bitmap	—	Digital Input Status (only Bit 1 is used): Bit 1 = 0, relay open Bit 1 = 1, relay closed

Digital Output

Address	Register	Action (R/W/ WC)	Size	Type	Units	Description
0x25C8	9673	R	1	UInt16	—	Digital Output Control Mode Status: 2 = for Alarm 3 = for Pulse (kWh) 0xFFFF = Disable

Meter Data

Current, voltage, power, power factor and frequency

Address	Register	Action (R/W/ WC)	Size	Type	Units	Description
Current						
0x0BB7	3000	R	2	Float32	A	I1: phase 1 current
0x0BB9	3002	R	2	Float32	A	I2: phase 2 current
0x0BBB	3004	R	2	Float32	A	I3: phase 3 current
0x0BC1	3010	R	2	Float32	A	Current Avg
Voltage						
0x0BCB	3020	R	2	Float32	V	Voltage L1-L2
0x0BCD	3022	R	2	Float32	V	Voltage L2-L3
0x0BCF	3024	R	2	Float32	V	Voltage L3-L1
0x0BD1	3026	R	2	Float32	V	Voltage L-L Avg
0x0BD3	3028	R	2	Float32	V	Voltage L1-N
0x0BD5	3030	R	2	Float32	V	Voltage L2-N
0x0BD7	3032	R	2	Float32	V	Voltage L3-N
0x0BDB	3036	R	2	Float32	V	Voltage L-N Avg
Power						
0x0BED	3054	R	2	Float32	kW	Active Power Phase 1
0x0BEF	3056	R	2	Float32	kW	Active Power Phase 2
0x0BF1	3058	R	2	Float32	kW	Active Power Phase 3
0x0BF3	3060	R	2	Float32	kW	Total Active Power
0x0BFB	3068	R	2	Float32	kVAR	Total Reactive Power
0x0C03	3076	R	2	Float32	kVA	Total Apparent Power
Power Factor						
0x0C0B	3084	R	2	Float32	—	Total Power Factor: -1 < PF < 0 = Quad 2, active power negative, capacitive -2 < PF < -1 = Quad 3, active power negative, inductive 0 < PF < 1 = Quad 1, active power positive, inductive 1 < PF < 2 = Quad 4, active power positive, capacitive
Frequency						
0x0C25	3110	R	2	Float32	Hz	Frequency

Energy, energy by tariff and input metering

Most energy values are available in both signed 64-bit integer and 32-bit floating point format.

The energy and energy by tariff measurements listed below are preserved through power failures.

Energy reset and active tariff information						
Address	**Register**	**Action (R/W/ WC)**	**Size**	**Type**	**Units**	**Description**
0x0CB3	3252	R	4	DATETIME	—	Energy Reset Date and Time
0x0DE1	3554	R	4	DATETIME	—	Input Metering Accumulation Reset Date and Time
0x105E	4191	R/WC	1	UInt16	—	Multi Tariffs Energy Active Rate: 0: Multi Tariff disabled 1 to 4: rate A to rate D **NOTE:** You can only set the tariff using this method if the Tariff Mode is set to by Communication.

Energy values – 64-bit integer						
Address	**Register**	**Action (R/W/ WC)**	**Size**	**Type**	**Units**	**Description**
Total Energy (cannot be reset)						
0x0C83	3204	R	4	Int64	Wh	Total Active Energy Import
0x0C87	3208	R	4	Int64	Wh	Total Active Energy Export
0x0C93	3220	R	4	Int64	VARh	Total Reactive Energy Import
0x0C97	3224	R	4	Int64	VARh	Total Reactive Energy Export
Partial Energy						
0x0CB7	3256	R	4	Int64	Wh	Partial Active Energy Import
0x0CC7	3272	R	4	Int64	VARh	Partial Reactive Energy Import
Phase Energy						
0x0DBD	3518	R	4	Int64	Wh	Active Energy Import Phase 1
0x0DC1	3522	R	4	Int64	Wh	Active Energy Import Phase 2
0x0DC5	3526	R	4	Int64	Wh	Active Energy Import Phase 3
Input Metering Counter						
0x0DE5	3558	R	4	Int64	Unit	Input Metering Accumulation
Demand						
0x0E74	3701	R/WC	1	UInt16	—	Demand method: 1 = Timed interval sliding block 2 = Timed interval fixed block
0x0E75	3702	R/WC	1	UInt16	Minute	Demand Interval Duration
0x0E79	3706	R	4	DATETIME	—	Demand Peak Reset Date/Time
0x0EB5	3766	R	2	Float32	kW	Active Power Demand
0x0EB9	3770	R	2	Float32	kW	Active Power Peak Demand
0x0EBB	3772	R	4	DATETIME	—	Active Power Peak Demand Date Time
0x0EC5	3782	R	2	Float32	kVAR	Reactive Power Demand
0x0EC9	3786	R	2	Float32	kVAR	Reactive Power Peak Demand
0x0ECB	3788	R	4	DATETIME	—	Reactive Power Peak Demand Date Time

Energy values – 64-bit integer						
Address	**Register**	**Action (R/W/ WC)**	**Size**	**Type**	**Units**	**Description**
0x0ED5	3798	R	2	Float32	kVA	Apparent Power Demand
0x0ED9	3802	R	2	Float32	kVA	Apparent Power Peak Demand
0x0EDB	3804	R	4	DATETIME	—	Apparent Power Peak Demand Date Time
0x0EE5	3814	R	2	Float32	A	Current I1 Demand
0x0EE9	3818	R	2	Float32	A	Current I1 Peak Demand
0x0EEB	3820	R	4	DATETIME	—	Current I1 Peak Demand Date Time
0x0EF5	3830	R	2	Float32	A	Current I2 Demand
0x0EF9	3834	R	2	Float32	A	Current I2 Peak Demand
0x0EFB	3836	R	4	DATETIME	—	Current I2 Peak Demand Date Time
0x0F05	3846	R	2	Float32	A	Current I3 Demand
0x0F09	3850	R	2	Float32	A	Current I3 Peak Demand
0x0F0B	3852	R	4	DATETIME	—	Current I3 Peak Demand Date Time
0x0F25	3878	R	2	Float32	A	Current Avg Demand
0x0F29	3882	R	2	Float32	A	Current Avg Peak Demand
0x0F2B	3884	R	4	DATETIME	—	Current Avg Peak Demand Date Time

Energy values – 32-bit floating point						
Address	**Register**	**Action (R/W/ WC)**	**Size**	**Type**	**Units**	**Description**
Demand						
0x9D08	40201	R/WC	1	UInt16	—	Demand method: 1 = Timed interval sliding block 2 = Timed interval fixed block
0x9D09	40202	R/WC	1	UInt16	Minute	Demand Interval Duration
0x9D0B	40204	R	4	DATETIME	—	Demand Peak Reset Date/Time
0x9D0F	40208	R	2	Float32	kW	Active Power Demand
0x9D11	40210	R	2	Float32	kW	Active Power Peak Demand
0x9D13	40212	R	4	DATETIME	—	Active Power Peak Demand Date Time
0x9D17	40216	R	2	Float32	kVAR	Reactive Power Demand
0x9D19	40218	R	2	Float32	kVAR	Reactive Power Peak Demand
0x9D1B	40220	R	4	DATETIME	—	Reactive Power Peak Demand Date Time
0x9D1F	40224	R	2	Float32	kVA	Apparent Power Demand
0x9D21	40226	R	2	Float32	kVA	Apparent Power Peak Demand
0x9D23	40228	R	4	DATETIME	—	Apparent Power Peak Demand Date Time
0x9D27	40232	R	2	Float32	A	Current I1 Demand
0x9D29	40234	R	2	Float32	A	Current I1 Peak Demand
0x9D2B	40236	R	4	DATETIME	—	Current I1 Peak Demand Date Time
0x9D2F	40240	R	2	Float32	A	Current I2 Demand
0x9D31	40242	R	2	Float32	A	Current I2 Peak Demand
0x9D33	40244	R	4	DATETIME	—	Current I2 Peak Demand Date Time
0x9D37	40248	R	2	Float32	A	Current I3 Demand
0x9D39	40250	R	2	Float32	A	Current I3 Peak Demand
0x9D3B	40252	R	4	DATETIME	—	Current I3 Peak Demand Date Time

Energy values – 32-bit floating point						
Address	**Register**	**Action (R/W/ WC)**	**Size**	**Type**	**Units**	**Description**
0x9D47	40264	R	2	Float32	A	Current Avg Demand
0x9D49	40266	R	2	Float32	A	Current Avg Peak Demand
0x9D4B	40268	R	4	DATETIME	—	Current Avg Peak Demand Date Time
Total Energy (cannot be reset)						
0xB02B	45100	R	2	Float32	kWh	Total Active Energy Import
0xB02D	45102	R	2	Float32	kWh	Total Active Energy Export
0xB02F	45104	R	2	Float32	kVARh	Total Reactive Energy Import
0xB031	45106	R	2	Float32	kVARh	Total Reactive Energy Export
Partial Energy						
0xB033	45108	R	2	Float32	kWh	Partial Active Energy Import
0xB035	45110	R	2	Float32	kVARh	Partial Reactive Energy Import
Phase Energy						
0xB037	45112	R	2	Float32	kWh	Active Energy Import Phase 1
0xB039	45114	R	2	Float32	kWh	Active Energy Import Phase 2
0xB03B	45116	R	2	Float32	kWh	Active Energy Import Phase 3
Input Metering Counter						
0xB03D	45118	R	2	Float32	Unit	Input Metering Accumulation

Overload Alarm

Address	**Register**	**Action (R/W/ WC)**	**Size**	**Type**	**Units**	**Description**
0xAFC8	45001	R/WC	1	Bitmap	—	Overload Alarm Setup: 0x0000 = Disabled 0x0100 = Enabled
0xAFC9	45002	R/WC	2	Float32	kW	Pickup Setpoint
0xAFCB	45004	R/WC	1	Bitmap	—	Digital Output to Associate: 0x0000 = Digital Output unassociated to overload alarm 0x0100 = Digital Output associated to overload alarm
0xAFCC	45005	R	1	Bitmap	—	Activated Status: 0x0000 = Alarm is inactive 0x0100 = Alarm is active
0xAFCD	45006	R	1	Bitmap	—	Unacknowledged Status: 0x0000 = Historic alarm is acknowledged by the user 0x0100 = Historic alarm is unacknowledged by the user
0xAFCE	45007	R	4	DATETIME	—	Last Alarm - Time Stamp
0xAFD2	45011	R	2	Float32	kW	Last Alarm - Value

LVCT Angle compensation and Ratio compensation

Address	Register	Action (R/W/ WC)	Size	Type	Units	Description
0xDEB6	57015	R	2	Float32	rad	Angle compensation Range: -7 to 1
0xDEB8	57017	R	2	Float32	—	Ratio compensation Range: 0 to 2

Read Device Identification

The meters supports the Read Device Identification function with the mandatory objects Vendor Name, Product Code, Firmware Revision, Vendor URL, Product Range, Product Model and User Application Name.

Object ID	Name / Description	Length	Value	Note
0x00	Vendor Name	20	Schneider Electric	—
0x01	Product Code	20	Commercial reference	The ProductCode value is identical to the catalog number of each device Ex: A9MEM3x55
0x02	Firmware Revision	06	XXX.YYY.ZZZ	—
0x03	Vendor URL	20	www.se.com	—
0x04	Product Range	20	iEM3000	—
0x05	Product Model	20	Product Model	Ex: A9MEM3x55
0x06	User Application Name	20	User configurable	Default = Product model

The Read Device ID codes 01, 02 and 04 are supported:

- 01 = request to get basic device identification (stream access)
- 02 = request to get regular device identification (stream access)
- 04 = request to get one specific identification object (individual access)

The Modbus request and response are compliant with the Modbus Application Protocol Specification.

Communications via BACnet

BACnet communications overview

Communications via BACnet MS/TP protocol is available on iEM3465 / iEM3565 meter models.

The information in this section is intended for users with an advanced understanding of BACnet protocol, their communications network and their power system.

Key terms

Term	Definition
APDU	Application protocol data unit, that data portion of a BACnet message.
Confirmed message	A message for which the device expects an answer.
COV	Change of value, sets the amount by which a value has to change in order for the meter to send a subscription notification.
Device	A BACnet device is a unit that is designed to understand and use BACnet protocol (for example, a BACnet-enabled meter or software program). It contains information about the device and device data in objects and object properties. Your meter is a BACnet device.
MS/TP	Master-slave/token-passing over RS-485.
Object	Represents the device and device data. Each object has a type (for example, analog input or binary input) and has a number of properties.
Present value	The current value of an object.
Property	The smallest piece of information in BACnet communications, it consists of a name, data type and value.
Service	Messages from one BACnet device to another.
Subscription	Creates a relationship between the server and the meter, so that when the present value property of an object changes by more than the configured COV threshold (COV_Increment), a notification is sent.
Subscription notification	The message the meter sends to indicate a COV event has occurred.
Unconfirmed message	A message for which the device does not expect an answer.

BACnet protocol support

Go to www.se.com and search for your meter model to access the PICS (Protocol Implementation Conformance Statement) for your meter.

The meter supports the BACnet protocol as follows:

BACnet component	Description
Protocol version	1
Protocol revision	6
Standardized device profile (Annex L)	BACnet Application Specific Controller (B-ASC)
BACNet Interoperability Building Blocks (Annex K)	DS-RP-B (Data Sharing - Read Property - B)
	DS-RPM-B (Data Sharing - Read Property Multiple - B)
	DS-WP-B (Data Sharing - Write Property - B)
	DS-COV-B (Data Sharing - COV - B)
	DM-DDB-B (Device Management - Dynamic Device Binding - B)

BACnet component	Description
	DM-DOB-B (Device Management - Dynamic Object Binding - B)
	DM-DCC-B (Device Management - Device Communication Control - B)
Data link layer options	MS/TP master (clause 9) Baud rates 9600, 19200, 38400, 57600, 76800
Character set	ANSI X3.4
Supported services	subscribeCOV readProperty readPropertyMultiple writeProperty deviceCommunicationControl who-HAS who-Is I-Am I-Have Confirmed COV notification Unconfirmed COV notification
Segmentation	The meter does not support segmentation
Static device address binding	The meter does not support static device address binding
Networking options	None

The following standard object types are supported:

Object type	Optional properties supported	Writeable properties supported	Proprietary properties
Device Object	Max_Master Max_Info_Frames Description Location Local_Date Local_Time Active_COV_Subscriptions Profile Name	Object_Name Max_Master Max_Info_Frames Description Location APDU_Timeout Number_Of_APDU_Retries	D_800 ID_801 ID_802
Analog Input Object	COV_Increment		—
Analog Value Object	—		—
Binary Input Object	—	—	—

BACnet communications implementation

Configuring basic communication parameters

Before communicating with the meter via BACnet protocol, use the front panel to configure the following settings:

Setting	Possible values
Baud rate	9600 19200 38400 57600 76800
Mac Address	1 – 127
Device ID	0 – 4194303

Make sure that the Mac Address is unique on the serial loop and the Device ID is unique in your BACnet network.

Communications LED indicator for BACnet meters

The LED indicates the status of the meter's communications with the network.

LED state	Description
The LED is off	Communication is not active.
The LED is flashing	Communication is active. **NOTE:** The LED flashes even if there is a communications error.

Change of Value (COV) subscriptions

The meter supports up to 14 COV subscriptions. You can add COV subscriptions to Analog Input and Binary Input objects using your BACnet-compatible software.

BACnet object and property information

The following sections outline the supported objects and properties available on the meter.

Device object

The following table outlines the properties of the Device object, whether a property is read-only or read-write, and if the value of the property is stored in the meter's non-volatile onboard memory.

Device object property	R/W	Stored	Possible values	Description
Object_Identifier	R	—	configurable	The unique device ID number for the meter, in the format of <device, #>. **NOTE:** You must use the front panel to configure the device ID number.
Object_Name	R/W	√	configurable	A configurable name for the meter. The meter ships from the factory with a name of <model name>_<serial number> (for example, _0000000000).
Object_Type	R	—	Device	The object type for the meter.
System_Status	R	—	Operational	This value of this property is always Operational.
Vendor_Name	R	—	Schneider Electric	Meter manufacturer
Vendor_Identifier	R	—	10	The BACnet vendor identifier for Schneider Electric.

Device object property	R/W	Stored	Possible values	Description
Model_Name	R	—	iEM3X65	Device model (for example, iEM3465) and serial number in the format <model name>_<serial number> (for example, iEM3465_0000000000).
Firmware_Revision	R	—	varies	BACnet firmware version, stored in an x.x.x format (for example, 1.7.2).
Application_Software_ Version	R	—	varies	Meter firmware version, stored in an x.x.xxx format (for example, 1.0.305).
Description	R/W	√	configurable	Optional description of the meter, limited to 64 characters.
Location	R/W	√	configurable	Optional description of the meter's location, limited to 64 characters.
Protocol_Version	R	—	varies	BACnet protocol version (for example, version 1)
Protocol_Revision	R	—	varies	BACnet protocol revision (for example, revision 6)
Protocol_Services_ Supported	R	—	0000 0100 0000 1011 0100 0000 0000 0000 0110 0000	The BACnet services supported by the meter: subscribeCOV, readProperty, readPropertyMultiple, writeProperty, deviceCommunicationControl, who- HAS, who-Is
Protocol_Object_Types_ Supported	R	—	1011 0000 1000 0000 0000 0000 0000 0000	The BACnet object types supported by the meter: analog input, binary input, multi-state input, device.
Object_list	R	—	varies	List of objects in the meter: DE1, AI0 – AI55, AV0, BI0 – BI6
Max_APDU_Length_ Accepted	R	—	480	The maximum packet size (or application protocol data unit) that the meter can accept, in bytes.
Segmentation_Supported	R	—	0x03	The meter does not support segmentation.
Local_Date	R	—	configurable	Date **NOTE:** You must use the front panel to set the meter's date.
Local_Time	R	—	configurable	Time **NOTE:** You must use the front panel to set the meter's date.
APDU_Timeout	R/W	√	1000 – 30000	The amount of time (in milliseconds) before the meter tries to resend a confirmed message that has not been answered.
Number_Of_APDU_ Retries	R/W	√	1 – 10	The number of times the meter tries to resend an unanswered confirmed request.
Max_Master	R/W	√	1 – 127	The highest master address the meter will try to discover when the next node is unknown.
Max_Info_Frames	R/W	√	1 – 14	Maximum number of messages the meter can send before it must pass the token.
Device_Address_Binding	R	—	—	Device address binding table is always blank because the meter does not initiate the who-Is service.
Database_Revision	R	√	varies	A number that increments when the object database on the meter changes (for example, when an object is created or deleted or the ID of an object changes).
Active_COV_ Subscriptions	R	—	varies	List of COV subscriptions currently active on the meter.
Profile_Name	R	—	varies	Device identifier that records the meter manufacturer, the meter family and the specific meter model (for example, 10_iEM3000_ iEM3465).

Device object property	R/W	Stored	Possible values	Description
ID 800	R	—	varies	Date and time of last energy reset
ID 801	R	—	varies	Date and time of last input metering accumulation reset
ID 802	R	—	varies	Date and time of the last alarm (DD/MM/YYYY hh:mm:ss)

Analog Input objects

The following tables list the Analog Input (AI) objects along with the units and default COV value for each AI object (if applicable).

NOTE: The Value Type for all AI objects is Real.

Energy and energy by tariff measurements

The energy and energy by tariff measurements listed below are preserved through power failures.

Object ID	Units	Default COV	Object name / description
27	Wh	100	AI27 - Total active energy import
28	Wh	100	AI28 - Total active energy export
29	Wh	100	AI29 - Total reactive energy import
30	Wh	100	AI30 - Total reactive energy export
31	Wh	100	AI31 - Partial active energy import
32	Wh	100	AI32 - Partial reactive energy import
33	Wh	100	AI33 - Active energy import phase 1
34	Wh	100	AI34 - Active energy import phase 2
35	Wh	100	AI35 - Active energy import phase 3
36	—	10	AI36 - Accumulation Input metering accumulation
37	—	1	AI37 - Tariff Energy Active Rate Denotes the active tariff: 0 = Multi Tariff feature is disabled 1 = Rate A (tariff 1) active 2 = Rate B (tariff 2) active 3 = Rate C (tariff 3) active 4 = Rate D (tariff 4) active
38	Wh	100	AI38 - Rate A (Tariff 1) active energy import
39	Wh	100	AI39 - Rate B (Tariff 2) active energy import
40	Wh	100	AI40 - Rate C (Tariff 3) active energy import
41	Wh	100	AI41 - Rate D (Tariff 4) active energy import

Instantaneous (RMS) measurements

Object ID	Units	Default COV	Object name / description
7	A	50	AI07 - Current Phase 1
8	A	50	AI08 - Current Phase 2

Object ID	Units	Default COV	Object name / description
9	A	50	AI09 - Current Phase 3
10	A	50	AI10 - Current Average
11	V	10	AI11 - Voltage L1-L2
12	V	10	AI12 - Voltage L2-L3
13	V	10	AI13 - Voltage L3-L1
14	V	10	AI14 - Voltage Average L-L
15	V	10	AI15 - Voltage L1-N
16	V	10	AI16 - Voltage L2-N
17	V	10	AI17 - Voltage L3-N
18	V	10	AI18 - Voltage Average L-N
19	kW	10	AI19 - Active Power Phase 1
20	kW	10	AI20 - Active Power Phase 2
21	kW	10	AI21 - Active Power Phase 3
22	kW	10	AI22 - Active Power Total
23	kVAR		AI23 - Reactive Power Total
24	kVA	10	AI24 - Apparent Power Total
25	—	0.2	AI25 - Power Factor Total
26	Hz	10	AI26 - Frequency

Demand measurements

Object ID	Units	Default COV	Object name / description
60	kW	1	AI60 - Demand active power
61	kW	1	AI61 - Demand active power peak
62	kVAR	1	AI62 - Demand reactive power
63	kVAR	1	AI63 - Demand reactive power peak
64	kVA	1	AI64 - Demand apparent power
65	kVA	1	AI65 - Demand apparent power peak
66	A	1	AI66 - Demand current phase 1
67	A	1	AI67 - Demand current phase 1 peak
68	A	1	AI68 - Demand current phase 2
69	A	1	AI69 - Demand current phase 2 peak
70	A	1	AI70 - Demand current phase 3
71	A	1	AI71 - Demand current phase 3 peak

Meter information

The following AI objects display information about the meter and its configuration.

NOTE: You can access the meter's configuration information over BACnet communications. However, you must use the front panel to configure the meter's settings.

Object ID	Units	Default COV	Object name / description
44	Seconds	10	AI44 - Meter operation time The time in seconds since the meter was last powered up
45	—	1	AI45 - Number of phases 1, 3
46	—	1	AI46 - Number of wires 2, 3, 4
47	—	1	AI47 - Power system type 0 = 1PH2W L-N 1 = 1PH2W L-L 2 = 1PH3W L-L with N 3 = 3PH3W 11 = 3PH4W 13 = 1PH4 wire multi L-N
48	Hz	1	AI48 - Nominal frequency 50, 60
49	—	1	AI49 - Number of VTs 0 – 10
50	V	1	AI50 - VT Primary
51	V	1	AI51 - VT Secondary
52	—	1	AI52 - Number of CTs 1, 2, 3
53	A	1	AI53 - CT Primary
54	A	1	AI54 - CT Secondary
55	—	1	AI55 - VT connection type 0 = Direct connection, not VTs 1 = 3PH3W (2VTs) 2 = 3PH4W (3VTs)

Communications settings information

The following AI objects display information about the meter's communications settings.

NOTE: You can access the meter's communications configuration information over BACnet communications. However, you must use the front panel to configure the meter's settings.

Object ID	Units	Default COV	Object name / description
00	—	1	AI00 - BACnet MAC Address
01	—	1	AI01 - BACnet Baud Rate

Digital input and output setting information

The following AI objects display information about the meter's I/O settings.

NOTE: You can access the meter's I/O configuration information over BACnet communications. However, you must use the front panel to configure the meter's settings.

Object ID	Units	Default COV	Object name / description
02	ms	1	AI02 - Pulse Duration The energy pulse duration (or pulse width), in milliseconds, of the digital output. **NOTE:** This information only applies if the digital output mode is set to energy pulsing.
03	—	1	AI03 - Pulse Weight The pulses/unit setting of the digital input when it is configured for input metering. **NOTE:** This information only applies if the digital input mode is set to Input Metering.
04	—	1	AI04 - Pulse Constant The pulses/kWh setting of the digital output. **NOTE:** This information only applies if the digital output mode is set to energy pulsing.
05	—	1	AI05 - Digital Input Mode 0 = Normal (input status) 2 = Multi Tariff control 3 = Input metering 5 = All partial energy logs reset
06	—	1	AI06 - Digital Output Mode 2 = Alarm 3 = Energy 0xFFFF (65535 dec) = Disabled
42	kW	10	AI42 - Pickup Setpoint Active power alarm pickup setpoint in kW
43	kW	10	AI43 - Last Alarm Value

Analog value object

There is one Analog Value (AV) object available on the meter, named AV00 - Command. The available commands are listed in the following table. Enter the number in the Present_Value column in the Present_Value property of the AV object to write the associated command to the meter.

Command	Present_Value entry	Object name / description
Acknowledge Overload Alarm	20001.00	Acknowledge an overload alarm. The alarm indicator disappears from the front panel display after you acknowledge the alarm; however, this does not address the state that caused the alarm.
Reset Partial Energy Counter	2020.00	Reset partial energy accumulation to 0. Partial Active / Reactive Energy, Energy by Tariff and Phase Energy registers are reset.
Reset Input Metering Counter	2023.00	Resets input metering accumulation to 0.

Binary input objects

The following table lists the Binary Input (BI) objects available on the meter.

NOTE: The value type for all BI objects is Boolean.

Object ID	Object name / description
0	BI00 - Digital Output Enable Indicates whether or not the digital output functions as an energy pulse output: 0 = Digital output disabled 1 = Digital output is associated with active energy pulse output
1	BI01 - Digital Input Association Enable Indicates whether or not the digital input is associated with input metering: 0 = Digital input is not associated with input metering 1 = Digital input is associated with input metering
2	BI02 - Digital Input Status 0 = relay open 1 = relay closed **NOTE:** This information only applies if the digital input is set to Input Status.
3	BI03 - Alarm Enable Indicates whether the overload alarm is enabled or disabled: 0 = disabled 1 = enabled
4	BI04 - Digital Output Association Enable Indicates if the digital output is configured for alarming: 0 = digital output disabled 1 = for Alarm (digital output is associated with the overload alarm)
5	BI05 - Alarm Status 0 = Alarm is inactive 1 = Alarm is active
6	BI06 - Unacknowledged status 0 = historic alarm is acknowledged 1 = historic alarm is unacknowledged

Power, energy and power factor

Power (PQS)

A typical AC electrical system load has both resistive and reactive (inductive or capacitive) components. Resistive loads consume real power (P) and reactive loads consume reactive power (Q).

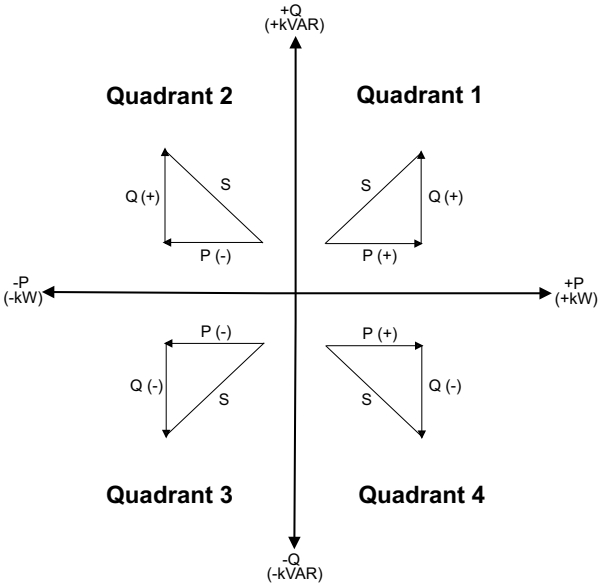
Apparent power (S) is the vector sum of real power (P) and reactive power (Q):

$S = \sqrt{P^2 + Q^2}$

Real power is measured in watt (W or kW), reactive power is measured in var (VAR or kVAR) and apparent power is measured in volt-amp (VA or kVA).

Power and the PQ coordinate system

The meter uses the values of real power (P) and reactive power (Q) on the PQ coordinate system to calculate apparent power.



Power flow

Positive power flow P(+) and Q(+) means power is flowing from the power source towards the load. Negative power flow P(-) and Q(-) means power is flowing from the load towards the power source.

Energy delivered (imported) / energy received (exported)

The meter interprets energy delivered (imported) or received (exported) according to the direction of real power (P) flow.

Energy delivered (imported) means positive real power flow (+P) and energy received (exported) means negative real power flow (-P).

Quadrant	Real (P) power flow	Energy delivered (imported) or received (exported)
Quadrant 1	Positive (+)	Energy delivered (imported)
Quadrant 2	Negative (-)	Energy received (exported)
Quadrant 3	Negative (-)	Energy received (exported)
Quadrant 4	Positive (+)	Energy delivered (imported)

Power factor (PF)

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

PF 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.

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

A purely resistive load has no reactive components, so its power factor is 1 (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

True power factor includes harmonic content.

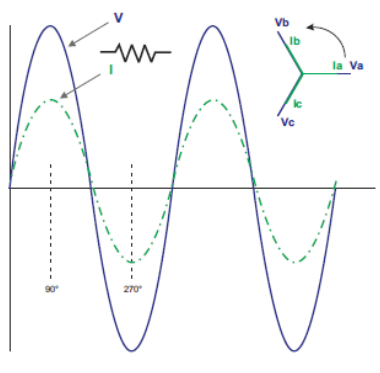
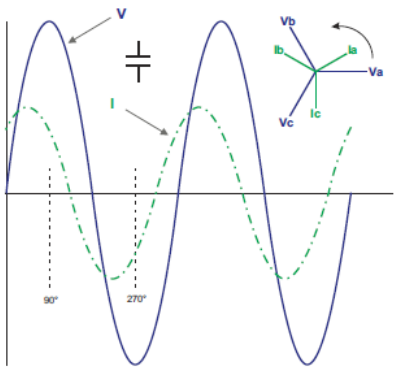
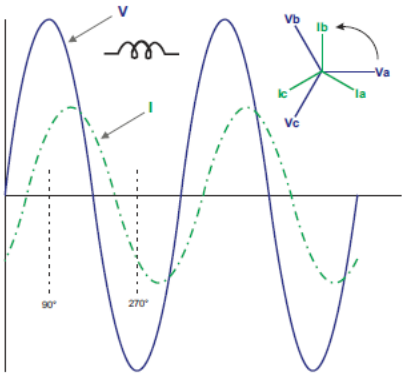
PF lead / lag convention

The meter correlates leading power factor (PF lead) or lagging power factor (PF lag) with whether the current waveform is leading or lagging the voltage waveform.

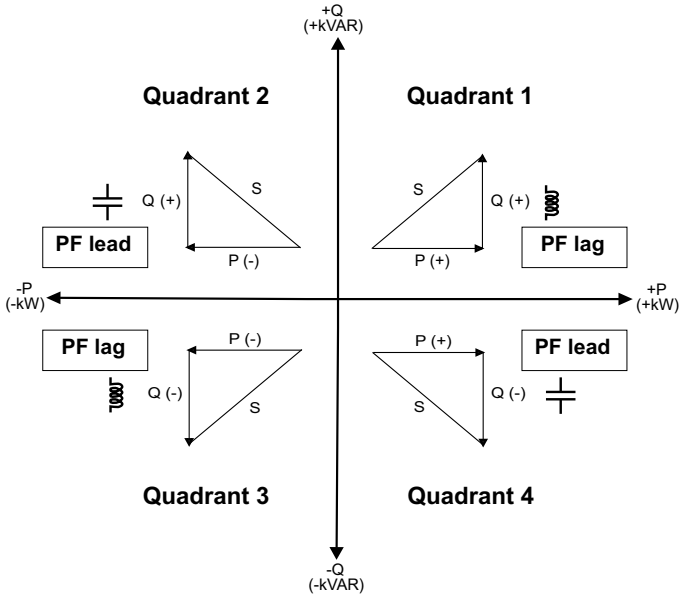
Current phase shift from voltage

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.

Current lead / lag and load type

Current and voltage in phase (resistive)	Current leads voltage (capacitive)	Current lags voltage (inductive)
		

Power and PF lead / lag



PF lead / lag summary

NOTE: The lagging or leading distinction does **NOT** equate to a positive or negative value. Rather, lagging corresponds to an inductive load, while leading corresponds to a capacitive load.

Quadrant	Current phase shift	load type	
Quadrant 1	Current lags voltage	Inductive	PF lag
Quadrant 2	Current leads voltage	Capacitive	PF lead
Quadrant 3	Current lags voltage	Inductive	PF lag
Quadrant 4	Current leads voltage	Capacitive	PF lead

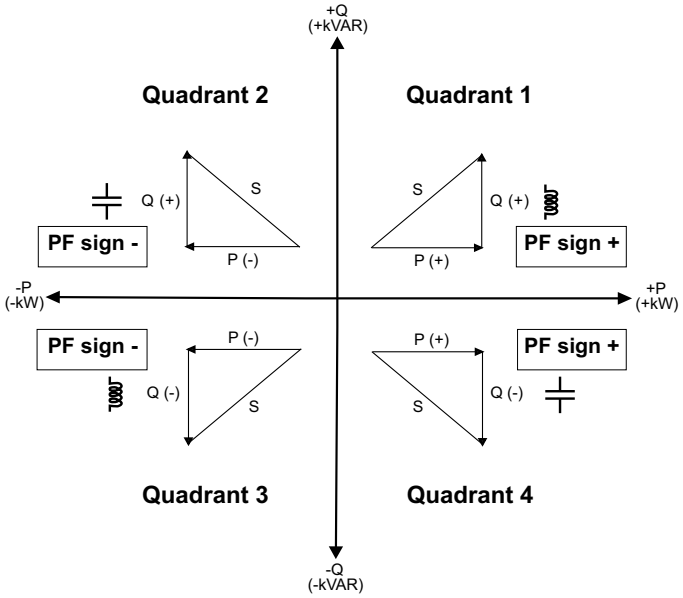
PF sign convention

The meter shows positive or negative power factor according to IEC standards.

PF sign in IEC

The meter correlates power factor sign (PF sign) with the direction of real power (P) flow.

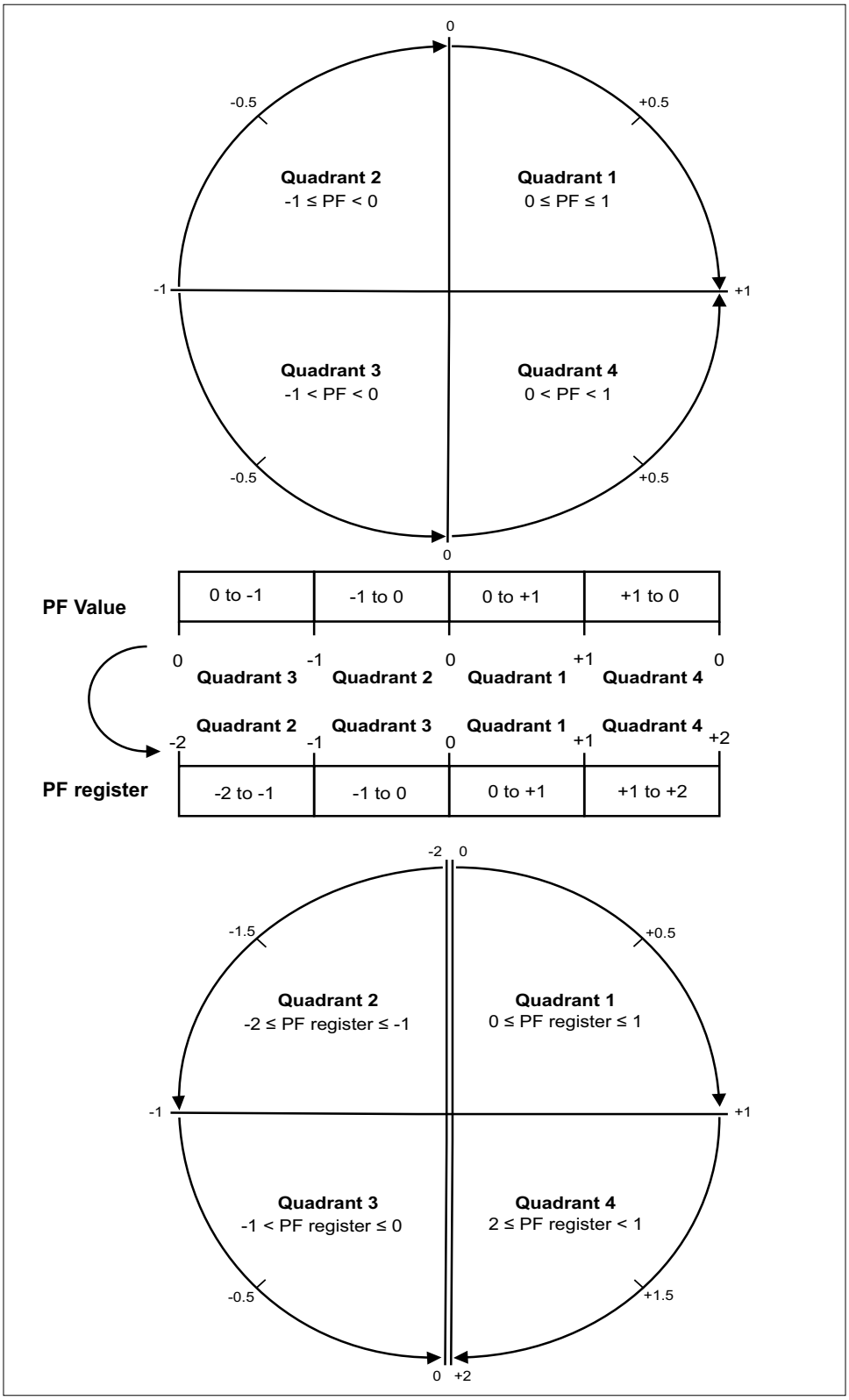
- For positive real power (+P), the PF sign is positive (+).
- For negative real power (-P), the PF sign is negative (-).



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	PF register range	PF formula
Quadrant 1	0 to +1	0 to +1	PF value = PF register value
Quadrant 2	-1 to 0	-2 to -1	PF value = (-2) - (PF register value)
Quadrant 3	0 to -1	-1 to 0	PF value = PF register value
Quadrant 4	+1 to 0	+1 to +2	PF value = (+2) - (PF register value)

Troubleshooting

Overview

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

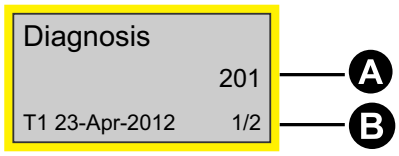
NOTICE
RISK OF DAMAGE TO THE METER • Do not open the meter case. • Do not attempt to repair any components of the meter. **Failure to follow these instructions can result in equipment damage.**

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

Diagnosis screen

The Diagnosis screen lists any current diagnostic codes.

NOTE: The Diagnosis screen only appears if there is a specific event.



A	Diagnostic code
B	Existing events

1. Press the down button to scroll through the main display screens until you reach the **Diagnosis** screen.
2. Press the ▽ button to scroll through any existing events.

Diagnostic codes

If the combination of the backlight and the error / alert icon indicates an error or an abnormal situation, navigate to the diagnostics screen and find the diagnostics code. If the problem persists after following the instructions in the table, please contact Technical Support.

Diagnostic code [2]	Description	Possible solution
—	LCD display is not visible.	Check and adjust LCD contrast.
—	Push buttons do not respond.	Restart the meter by powering off and powering on again.
101	Metering stops due to an EEPROM error. Press **OK** to display total energy consumption.	Enter configuration mode and select **Reset Config**.
102	Metering stops due to a lack of a calibration table. Press **OK** to display total energy consumption.	Enter configuration mode and select **Reset Config**.
201	Metering continues.	Correct the frequency settings according to the nominal frequency of the power system.

2. Not all diagnostic codes apply to all devices.

Diagnostic code [3]	Description	Possible solution
	Mismatch between frequency settings and frequency measurements.	
202	Metering continues. Mismatch between wiring settings and wiring inputs.	Correct the wiring settings according to wiring inputs.
203	Metering continues. Phase sequence reversed.	Check the wire connections and correct the wiring settings if needed.
204	Metering continues. Total active energy is negative due to incorrect voltage and current connections.	Check the wire connections and correct the wiring settings if needed.
205	Metering continues. Date and Time have been reset due to a loss of power.	Set the Date and Time.
206	Metering continues. Pulse is missing due to overload on energy pulse output.	Check the energy pulse output settings and correct if needed.
207	Metering continues. Abnormal internal clock function.	Restart the meter by powering off and powering on again then reset the date and time.

3. Not all diagnostic codes apply to all devices.

Specifications

Electrical characteristics

Power system inputs

Characteristic		Value
Voltage inputs	Measured voltage	Wye: 100...277 V L-N, 173...480 V L-L ±20% Delta: 173...480 V L-L ±20%
	Overload	332 V L-N or 575 V L-L
	Impedance	3 MΩ
	Frequency	50 / 60 Hz ±10%
	Impulse voltage (Uimp)	6 kV for 1.2 µs
	Measurement category	III
	Minimum wire temperature rating required	90 °C (194 °F)
	Burden	< 10 VA
	Wire	2.5 mm^2 / 14 AWG (Recommended: Copper wire)
	Wire strip length	8 mm / 0.31 in
	Torque	0.5 Nm / 4.4 in·lb
Current inputs	Split-core or solid-core LVCTs	0.333 V or 1 V nominal
	Rogowski Coil	U018 Series of Rogowski Coils (up to 5000 A)
	Minimum wire temperature rating required	90 °C (194 °F)
	Frequency	50 / 60 Hz ±10%
	Wire	6 mm^2 / 10 AWG (Recommended: Copper wire)
	Wire strip length	8 mm / 0.31 in
	Torque	0.8 Nm / 7.0 in·lb

Inputs and outputs

Characteristic		Value
Programmable digital output	Number	1
	Type	Form A
	Load voltage	5...40 V DC
	Maximum load current	50 mA
	Output resistance	0.1...50 Ω
	Isolation	3.75 kV rms
	Wire	1.5 mm^2 / 16 AWG
	Wire strip length	6 mm / 0.23 in
	Torque	0.5 Nm / 4.4 in·lb
Programmable digital input	Number	1
	Type	Type 1 (BS/ EN/ IEC 61131-2)

Characteristic			Value
	Maximum input	Voltage	40 V DC
		Current	4 mA
	Voltage OFF		0...5 V DC
	Voltage ON		11...40 V DC
	Nominal voltage		24 V DC
	Isolation		3.75 kV rms
	Wire		1.5 mm^2 / 16 AWG
	Wire strip length		6 mm / 0.23 in
	Torque		0.5 Nm / 4.4 in·lb

Mechanical characteristics

Characteristic	Value		Meters
IP degree of protection	Front panel	IP40	iEM3400 / iEM3500 series
	Meter body	IP20	iEM3400 / iEM3500 series
Impact rating	IK08		iEM3400 / iEM3500 series
Active energy display range	In kWh or MWh up to 99999999 MWh		iEM3400 / iEM3500 series
Energy pulsing LED (yellow [3])	24000/x imp/kWh		iEM3400 series
	5 imp/kWh		iEM3500 series

Environmental characteristics

Characteristic	Value
Operating temperature	-25 to 70 °C (-13 to 158 °F)
Storage temperature	-40 to 85 °C (-40 to 185 °F)
Pollution degree	2
Relative humidity	5% to 95% RH non-condensing Maximum dew point 36 °C (97 °F)
Altitude	< 3000 m (9842 ft) above sea level
Location	For indoor use in a stationary panel Must be permanently connected and fixed
Product life	> 15 years, 45 °C (113 °F) 60% RH

3. The pulses / kWh of the energy pulsing LED cannot be changed.

Safety, EMI/EMC and product standards

Safety	BS/ EN/ IEC/ UL 61010-1: 2010 + A1: 2019
Protective class	II Double insulated for user accessible parts
Standard compliance	BS/ EN/ IEC 62053-22 BS/ EN/ IEC 61557-12

Measurement accuracy

Type of Measurement	Value
BS/ EN/ IEC 62053-22	Class 0.5S
ANSI C12.20	

Internal clock

Characteristic	Value
Type	Quartz crystal based Backup by super capacitor
Time error	< 2.5 s/day (30 ppm) at 25 °C (77 °F)
Backup time	3 days at 25 °C (77 °F)

Modbus communications

Characteristic	Value	Meters
Number of ports	1	iEM3455 / iEM3555
Labels	0V, D0/-, D1/+, ⏚ (shield)	
Parity	Even, Odd, None	
Baud rate	9600, 19200, 38400	
Isolation	4.0 kV rms	
Wire	2.5 mm^2 / 14 AWG shielded twisted pair	
Wire strip length	7 mm / 0.28 in	
Torque	0.5 Nm / 4.4 in·lb	

BACnet communications

Characteristic	Value	Meters
Number of ports	1	iEM3465 / iEM3565
Labels	0V, D0/-, D1/+, ⏚ (shield)	
Baud rate	9600, 19200, 38400, 57600, 76800	

Characteristic	Value	Meters
Isolation	4.0 kV rms	
Wire	2.5 mm^2 / 14 AWG shielded twisted pair	
Wire strip length	7 mm / 0.28 in	
Torque	0.5 Nm / 4.4 in·lb	

China Standard Compliance

This product complies with the following standard(s) in China:

BS/ EN/ IEC/ UL 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements

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As standards, specifications, and design change from time to time, please ask for confirmation of the information given in this publication.

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