

EasyLogic™ EM7230 / EM7280 / EM7290

User manual

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12/2023



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Safety information

Important information

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



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



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

DANGER

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

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

WARNING

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

CAUTION

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

NOTICE

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

Please note

Electrical equipment should be installed, operated, serviced and maintained 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.

Notice

FCC

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

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

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

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Safety precautions

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

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

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

 WARNING
<p>UNINTENDED OPERATION</p> <ul style="list-style-type: none"> • Do not use this device for critical control or protection of persons, animals, property or equipment. • Do not use this device if a wrench icon  appears on the top left corner of the display screen. <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p>

▲ WARNING**POTENTIAL COMPROMISE OF SYSTEM AVAILABILITY, INTEGRITY, AND CONFIDENTIALITY**

- Change default passwords/passcodes to help prevent unauthorized access to device settings and information.
- Disable unused ports/services and default accounts, where possible, to minimize pathways for malicious attacks.
- Place networked devices behind multiple layers of cyber defenses (such as firewalls, network segmentation, and network intrusion detection and protection).
- Use cybersecurity best practices (for example: least privilege, separation of duties) to help prevent unauthorized exposure, loss, modification of data and logs, interruption of services, or unintended operation.

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

Introduction

Meter overview

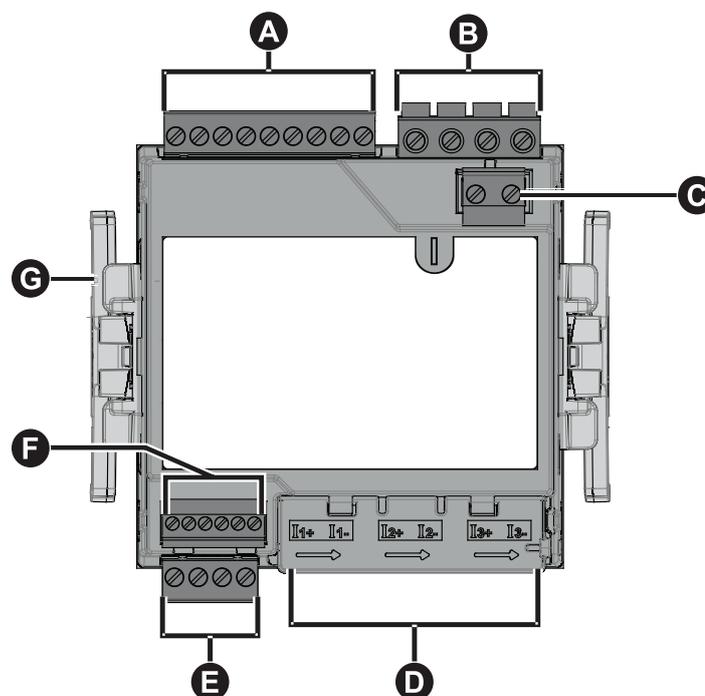
EM7230 / EM7280 / EM7290 is a smart demand controller. It replaces over 20 individual transducers and meters for comprehensive load management in 3-phase commercial and industrial applications.

EM7230 / EM7280 / EM7290 model information

Model	Class	Communication
EM7230	Class 1.0	RS-485
EM7280	Class 0.5S	RS-485
EM7290	Class 0.2	RS-485

Smart demand controller hardware

Parts of the smart demand controller (rear view)



A	Control output relays
B	Voltage inputs
C	Auxiliary power supply
D	Current inputs
E	RS-485 port
F	Digital inputs
G	Retainer clips

Smart demand controller parts and accessories

Smart demand controller models

Description	Model Number
Smart demand controller with integrated display	EasyLogic™ EM7230 / EM7280 / EM7290

Box contents

- Smart demand controller (1)
- Installation guide (1)
- Test and calibration certificate (1)
- Accessories and spares
 - Pluggable blocks (5 types, one piece each)
 - Retainer clips (2)
 - Current terminals screws (2 spare)

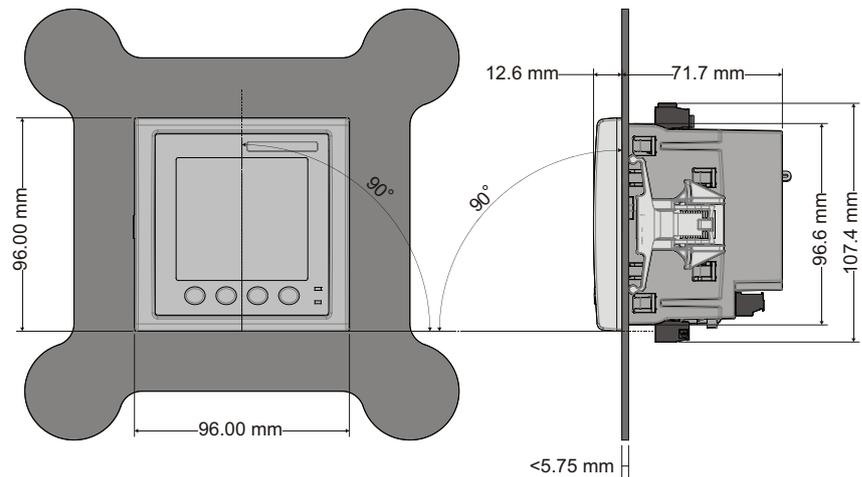
Installation

Mechanical installation

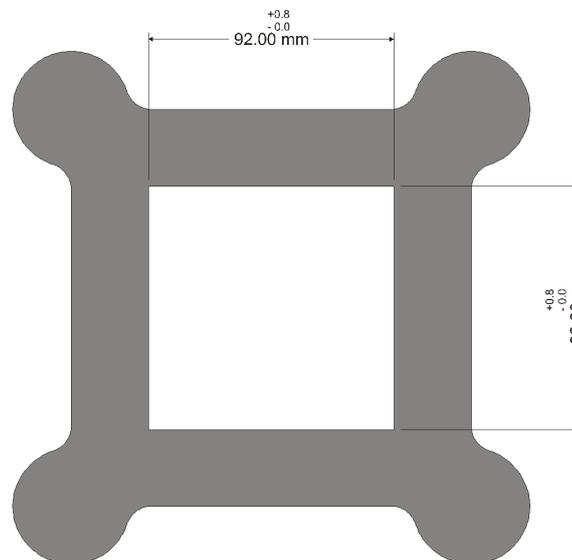
The smart demand controllers are panel-mounted and have reliable, rear-mounted pluggable connectors. The 92 x 92 mm (3.62 x 3.62 in) cut-out and 96 x 96 mm (3.78 x 3.78 in) bezel dimensions adhere to IEC 61554.

The diagram below displays the various dimensions of mechanical installations.

Mechanical dimensions



Recommended panel Cut-Out

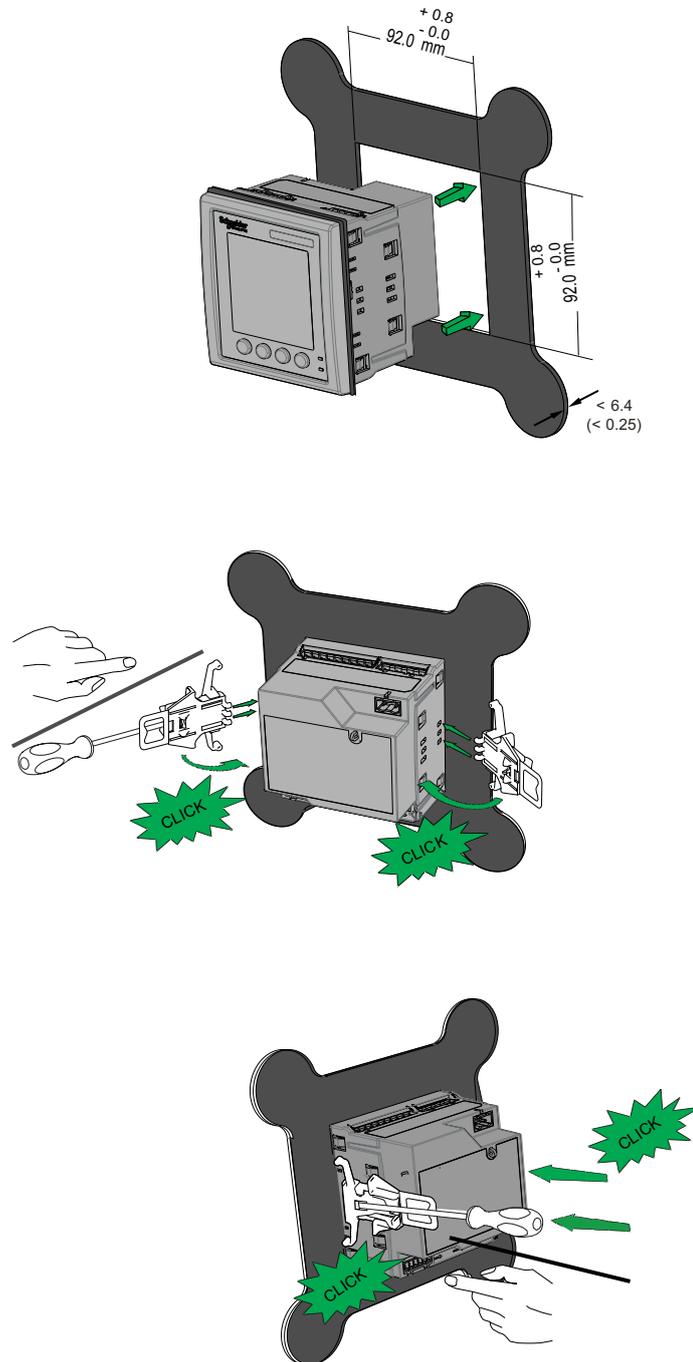


Mounting

The smart demand controllers are panel mountable.

The cut-out should be punched with the proper tool and should be free from burrs. The following figure explains the mounting of the smart demand controller.

Mounting

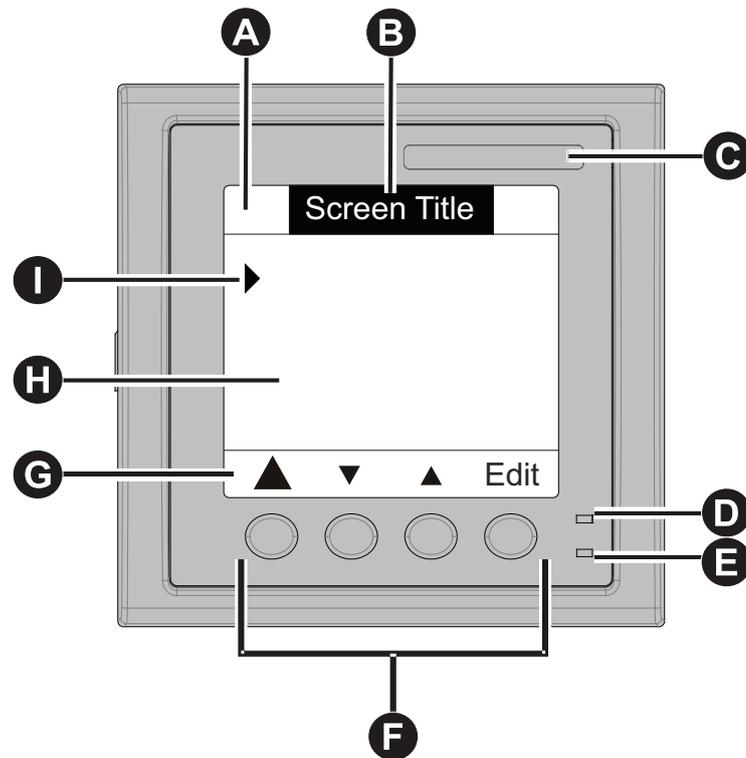


Operation

Operating the display

The smart demand controller is equipped with a large, back-lit LCD display. It is designed to display up to six lines of information plus a row of menu options.

Parts of the smart demand controller



A	Wrench icon (Maintenance) –  or, Heartbeat icon – 
B	Screen title
C	Product model number
D	CAL LED (Orange)
E	Heartbeat / communication LED (Green)
F	Menu selection buttons
G	Navigation and menu selections
H	Data area
I	Cursor

How the buttons work

Four buttons are located below the LCD display. The menu options determine the button's functions.

Button symbols

Navigation	
	Return to the previous screen. For setup screens: <ul style="list-style-type: none"> • If setup changes are made, a confirmation screen is displayed. • If editing a value, exits edit mode and restores previous value.
	Move cursor down the list of items or go to the next item in the list.
	Move cursor up the list of items or go to the previous item in the list.
	Move cursor one character to the left.
	Move cursor one character to the right or scroll right and display more menu items.
	Increase the highlighted value or show the next item in the list.
	Show the previous item in the list.
Edit	Select parameter or item to edit.
Select	Select / deselect item for association.
OK	Enter change to a parameter.
Yes	Accept.
No	Reject.
Reset	Reset selected item.

- To differentiate between menu items and parameters, menu items are placed in brackets. For example, “[Phase]” denotes a phase menu item, and “Phase” denotes a phase parameter.
- Each time you read “press” in this manual, press and release the appropriate button beneath a menu item. For example, if you are asked to “Press [Phase],” you would press and release the button below the phase menu item.

Changing values

When you enter a setup screen, the cursor points to the first setup item or parameter on the screen. Press  or  to move to the item or parameter you wish to edit. Press **[Edit]** to select a parameter. The value to be edited is displayed in the edit field, with the active digit of the setup value.

To change a text value:

- Press  to enter the selected value for the active digit and move to the next digit to the right. At the maximum number of digits, the  takes you back to the first digit.
- Press **+** to increase and **-** to decrease the active digit through the numerals 0-9, the letters A-Z, the “.” or any other possible selections.

To change a numerical value:

- Press  to enter the selected value for the active digit and move to the next digit to the left. At the maximum number of digits, the  takes you back to the first digit.
- Press **+** to increase the active digit through the numerals 0-9, and “.”, “+”, and “-”.

To select a value from a list:

- Press **+** to scroll up and **-** to scroll down through the list of available selections.
- Press **[OK]** to enter the selected value.

Icons

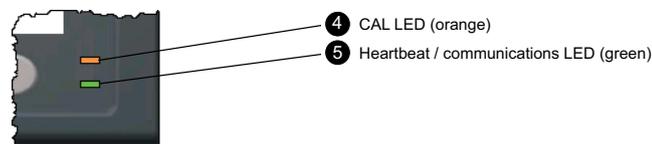
The icons flash to indicate the smart demand controller LCD is operational.

- **Wrench Icon (🔧)** – The smart demand controller requires maintenance.
- **Heartbeat Icon (●)** – The smart demand controller LCD is operational.

LED indicators

The meter has two LED indicators on the front panel.

LED indicators



Heartbeat / communications LED

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

You cannot configure this LED for other purposes.

NOTE: A heartbeat LED that remains lit and does not blink (or flash) or it remains no lit, indicates a possible hardware problem. Please contact Technical Support.

CAL LED modes

The (orange) CAL LED can be configured for energy pulsing.

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

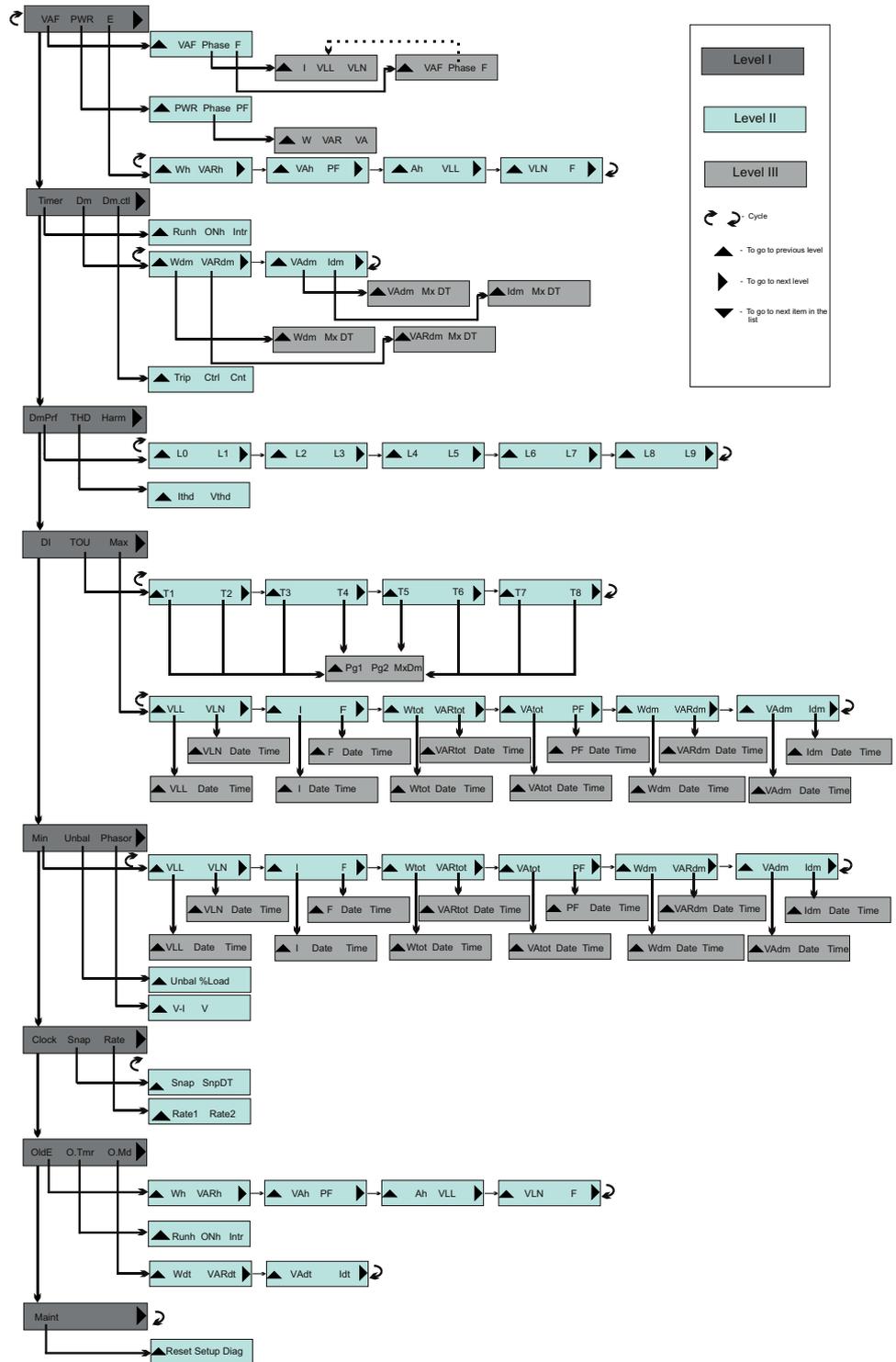
Related topics

- See [Setting up the CAL LED](#), page 67 for details on using the front panel to switch the LED mode for energy pulsing applications.
- See [Configuring the CAL LED for energy pulsing using ION Setup](#), page 68 for details on using ION Setup to switch the LED mode for energy pulsing applications.

Menu overview

Menu items are displayed below the horizontal line at the bottom of the screen. **Menu Tree**, page 18 below shows the menu items of the smart demand controller menu hierarchy. Selecting a Level 1 menu item takes you to the Level 2 menu items. Some Level 2 items have Level 3 items. The navigation buttons work consistently across all menu levels. Press ► to scroll through all menu items on a level.

Menu Tree



Setting up the smart demand controller

The smart demand controller ships with many default values already set up. To change values, navigate to the appropriate screen and enter new values. Use the instructions in the following sections to change values. New values are automatically saved when you exit the screen and accept the confirmation request.

NOTE: On power up, the meter opens to the same menu page that was last accessed.

Smart demand controller configurations

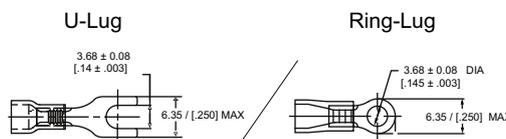
The smart demand controller supports several power system configurations.

Wire Sizes and Torque

Connector	Wire size		Wire strip length		Torque		Screwdriver type
Auxiliary Power*, Voltage Inputs* and Control Output Relays*	18-12 AWG	0.82-3.31 mm ²	0.28 in	7 mm	4.4-5.3 in·lb	0.5-0.6 N·m	M3 (Flat Screwdriver)
Current Inputs**	18-12 AWG	0.82-3.31 mm ²	—	—			PH1 (Cross-slotted)
Digital Inputs*	22-14 AWG	0.33-2.08 mm ²	0.24 in	6 mm			M2 (Flat Screwdriver)
RS-485	22-12 AWG	0.33-3.31 mm ²	0.24 in	6 mm			M3 (Flat Screwdriver)

*Wire ferrules recommended. Wire ferrule determines stripping length.

**Current inputs (CTs) must have U or Ring terminal connections.

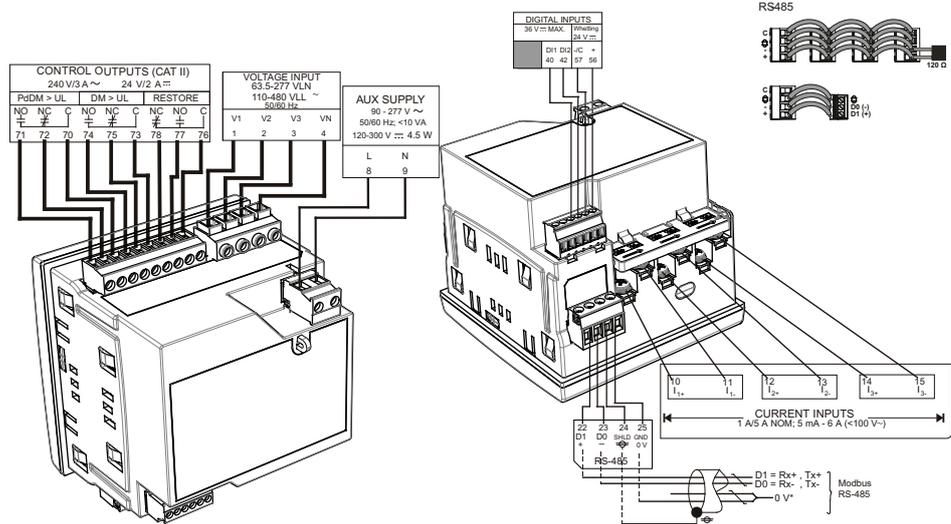


NOTICE

DAMAGE TO THE DEVICE

- Use only the specified tool for tightening and loosening the screw.
- Do not over-torque the screw above the specified range.
- The external peripherals must be interfaced to the appropriate connectors in line with the mentioned specifications.

Failure to follow these instructions can result in equipment damage.



NOTE: *Connect both the wires from the second twisted pair on the terminating end to ensure all the wires are connected.

⚡ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- NEVER bypass external fusing.
- NEVER short the secondary of a PT.
- NEVER open circuit a CT; use the shorting block to short circuit the leads of the CT before removing the connection from the demand controller.
- Always use grounded external CTs for current inputs.
- Do not use this device for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.
- Do not open the demand controller.
- Use appropriate fuse for the control output relays.

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

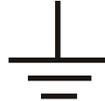
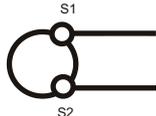
Power system wiring

<p>1PH2W</p> <p>1PH2W 1CT</p> <p>Use PT if $V_{L-L} > 277 \text{ Vac}$</p>	<p>3PH4W</p> <p>3PH4W (STAR) 3CT 3PT</p> <p>Use PT if $V_{L-L} > 480 \text{ Vac}$</p>
<p>3PH3W</p> <p>3PH3W (Open Delta) 2CT 2PT</p> <p>Use PT if $V_{L-L} > 480 \text{ Vac} / V_{L-L} > 277 \text{ Vac}$</p>	<p>2PH3W</p> <p>2PH3W 2CT 2PT</p> <p>Use PT if $V_{L-L} > 480 \text{ Vac}$</p>
<p>NOTE: Clearly label the device's disconnect circuit mechanism and install it within easy reach of the operator.</p>	

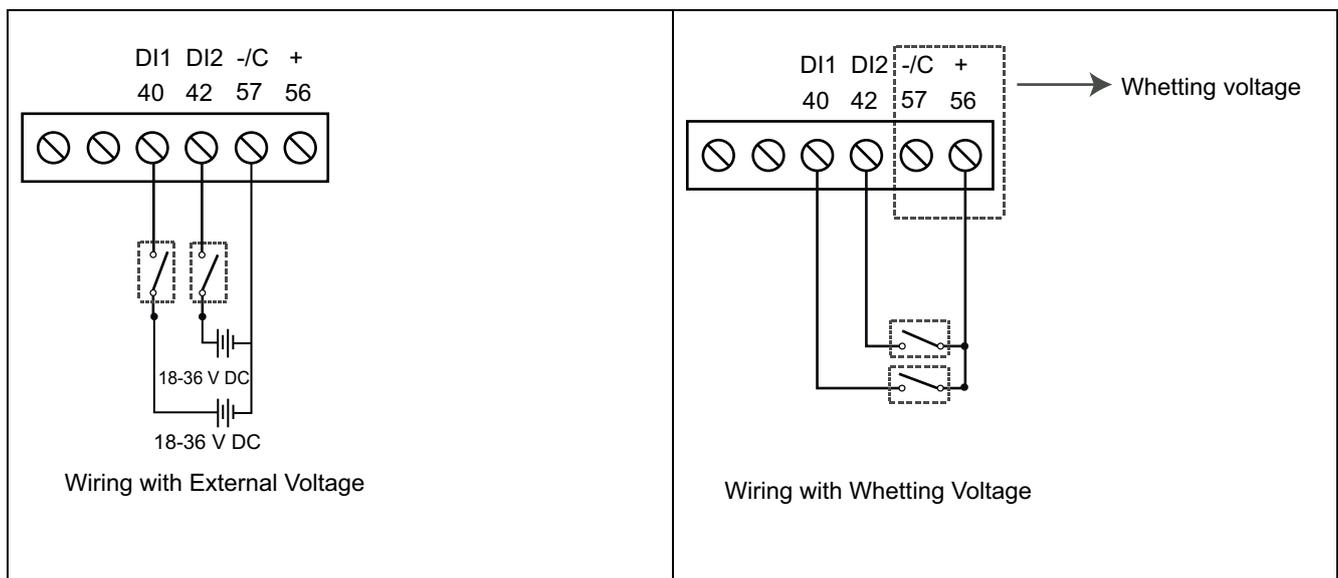
Control power wiring

<p>AC: 90-277 V L-N \pm 10% DC: 125-250 V \pm 20%</p>	<p>If using a control power transformer, fuse both primary and secondary sides of the transformer. The fuses / circuit breakers must be rated for the installation voltage and sized for the available fault current. Fuse for neutral terminal is required if the source neutral connection is not grounded.</p>
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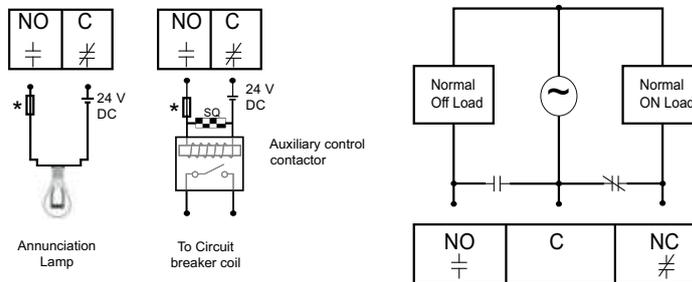
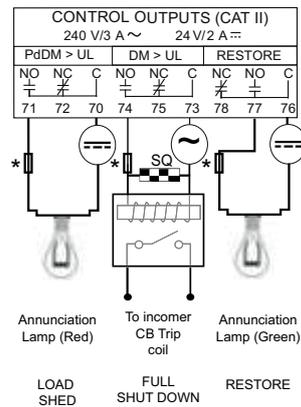
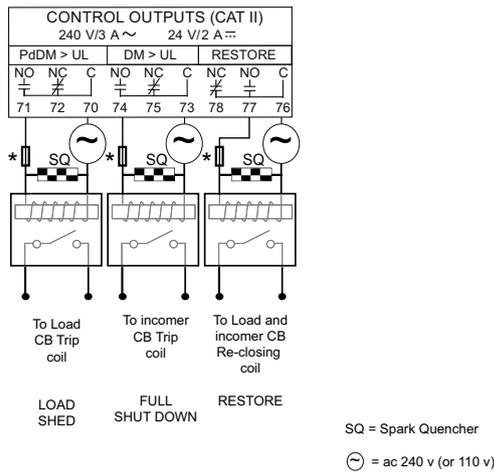
Wiring Diagram Symbols

Symbol	Description
	Voltage disconnect switch
	Fuse
	Ground
	Current transformer
	Potential or voltage transformer
	500 mA fuses/circuit breaker #
	Shorting block #
	PT primary fuses and disconnect switch #
Note: # Not supplied	

Status Digital Input Connections



Control Output Relays



Relay Schematic Diagram

Note:

The Control Output Relays diagram is for illustration purpose only, configuration may change based on the field condition.

It is recommended to connect spark quencher of appropriate rating across relay terminals.

* The overcurrent protective device must be rated for the short-circuit current at the connection point.

Smart demand controller basic setup

To begin smart demand controller basic setup:

1. Press ► to navigate to **[Maint]** in the menu list.
2. Press **[Maint]**.
3. Press **[Setup]**.
4. Enter your setup password.

NOTE: The default password is 0000. See Smart demand controller password setup, page 30 for information on changing passwords.

5. Press **[OK]**.
6. Press **[Meter]**. The basic setup screen appears.

Use the directions in the following sections to set up basic smart demand controller values.

Setting up the System Configuration

To set up the System Configuration:



1. Press ▼ or ▲ to move the cursor ► to point to the parameter you want to modify.
2. Press **[Edit]** to update the selected **System Configuration**.
3. Press - or + to scroll through a list of different **System Configuration** values.

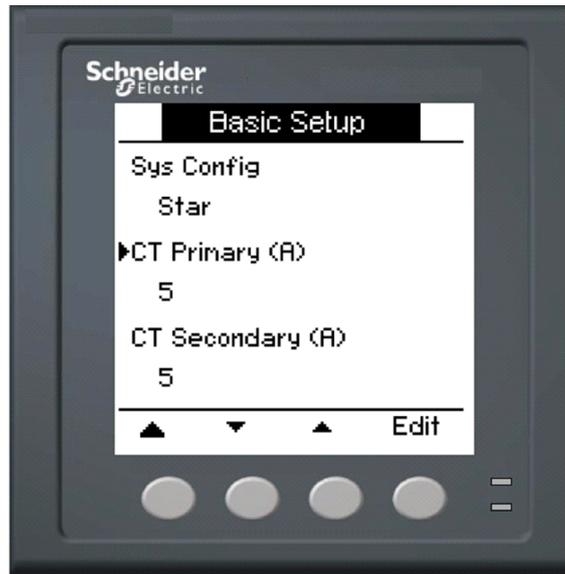
Parameter	Values	Description
Sys Config	Star, Delta, 2 Phase, 1 Phase	Select the appropriate system configuration value you want the meter to display.

4. Press **[OK]** to select the **System Configuration**.

Setting up the CT options

The CT Primary and CT Secondary are set in Amps (A).

To set up the CTs:



1. Press ▼ to select **CT Primary (A)**, then press **[Edit]** to modify the parameter.
2. Press + to increase the active digit through the numerals 0-9.
3. Press ◀ to enter the selected value for the active digit and move to the next digit to the left.

Parameter	Values	Description
CT Primary (A)	00001 to 32767	Enter the size of the CT Primary, in Amps.

4. Continue until all values are selected, then press **[OK]** to enter the **CT Primary (A)**.
5. Press ▼ to select **CT Secondary (A)**, then press **[Edit]** to modify the parameter.
6. Press - or + to scroll through a list of **CT Secondary (A)** values.

Parameter	Values	Description
CT Secondary (A)	1 or 5	Select the size of the CT Secondary, in Amps.

7. Press **[OK]** to select the **CT Secondary (A)**.

Setting up the PT options

The PT Primary and PT Secondary are set in Volts (V).

To set up the PTs:



1. Press ▼ to select **PT Primary (V)**, then press **[Edit]** to modify the parameter.
2. Press + to increase the active digit through the numerals 0-9.
3. Press ◀ to enter the selected value for the active digit and move to the next digit to the left.

Parameter	Values	Description
PT Primary (V)	000100 to 999000	Enter the size of the PT Primary, in Volts.

4. Continue until all values are selected, then press **[OK]** to enter the **PT Primary (V)**.
5. Press ▼ to select **PT Secondary (V)**, then press **[Edit]** to modify the parameter.
6. Press + to increase the active digit through the numerals 0-9.
7. Press ◀ to enter the selected value for the active digit and move to the next digit to the left.

Parameter	Values	Description
PT Secondary (V)	050 to 480	Enter the size of the PT Secondary, in Volts.

8. Continue until all values are selected, then press **[OK]** to enter the **PT Secondary (V)**.

Setting up the System Frequency

To set up the System Frequency:



1. Press ▼ to select **Sys Frequency (Hz)**, then press **[Edit]** to modify the parameter.
2. Press - or + to scroll through a list of **Sys Frequency (Hz)** values.

Parameter	Values	Description
Sys Frequency (Hz)	50, 60	Select the frequency of the electrical power system, in Hz.

3. Press **[OK]** to select the **Sys Frequency (Hz)**.

Setting up the Start Current

To set up the Start current:



1. Press ▼ to select **Start current (mA)**, then press **[Edit]** to modify the parameter.
2. Press + to increase the active digit through the numerals 0-9.

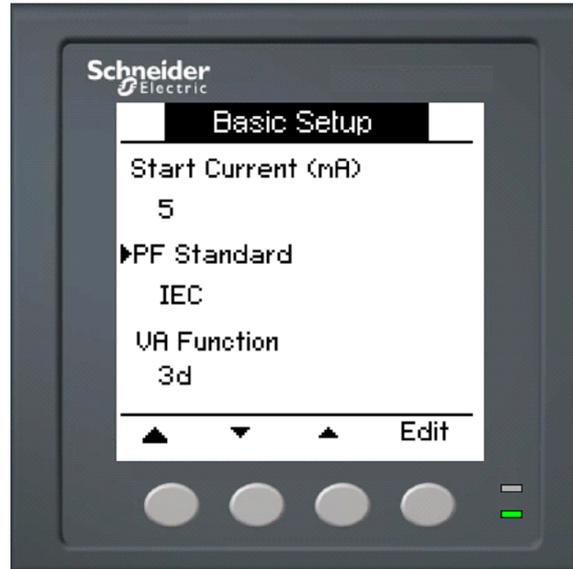
- Press ◀ to enter the selected value for the active digit and move to the next digit to the left.

Parameter	Values	Description
Start current (mA)	05 to 15	Enter the Start current, in Milliampere.

- Continue until all values are selected, then press **[OK]** to enter the **Start current (mA)**.

Setting up the PF Standard

To set up the PF Standard:



- Press ▼ to select **PF Standard**, then press **[Edit]** to modify the parameter.
- Press - or + to scroll through a list of **PF Standard** values.

Parameter	Values	Description
PF Standard	IEC, IEEE	Select the PF Standard as required.

- Press **[OK]** to select the **PF Standard**.

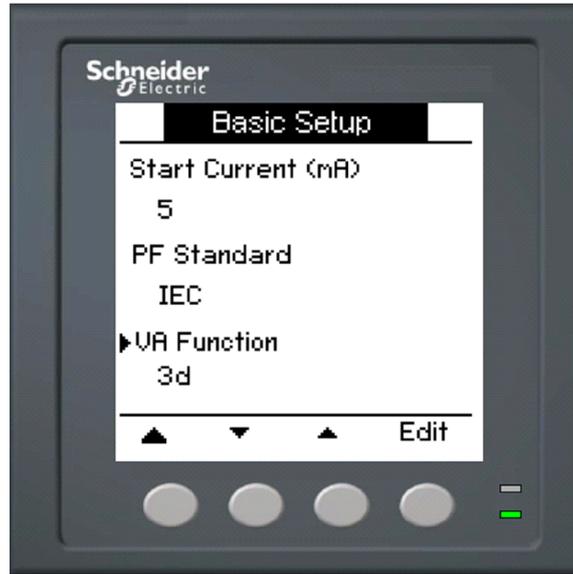
Setting up the VA Function

The smart demand controller enables the user to select a VA calculation method between 3d (default) and arithmetic through setup. The VA calculation methods are explained in the following table.

VA calculation method

VA function display in setup	Formula	Other Names	Suited applications
3d (default)	$\sqrt{\Sigma W1^2 + \Sigma VAR1^2 + \Sigma D1^2}$	U, Apparent, Vectors	Best All round
Arith	$\sqrt{\Sigma V1 * A1}$	Arithmetic	Good under low unbalance

To set up the VA Function:



1. Press ▼ to select **VA Function**, then press **[Edit]** to modify the parameter.
2. Press - or + to scroll through a list of **VA Function** values.

Parameter	Values	Description
VA Function	3d, Arith	Select the VA function.

3. Press **[OK]** to select the **VA Function**.

Setting up the PF Lock

Internationally, capacitive loading is permitted, to varying extents, in tariff metering. This is done by locking the accumulation of selected energy parameters, while the load power is capacitive. The EM72xx smart demand controller handles this situation with power factor (PF) lock.

In **Main>Setup>Meter**, PF Lock = 0 by default. The different levels and their effects are explained below. The levels can be changed using the partial-setup procedure.

The locking levels and their effects are:

- 0 = None.
- 1 = kVARh is locked.
- 2 = kVARh and kVAh are locked.
- 3 = kVARh, kVAh and DM (kVA) are locked.

If the smart demand controller is not connected with tariff related measurements, then a lock level of 0 is recommended. In tariff related applications, the local electricity supply authority will provide the current regulations.

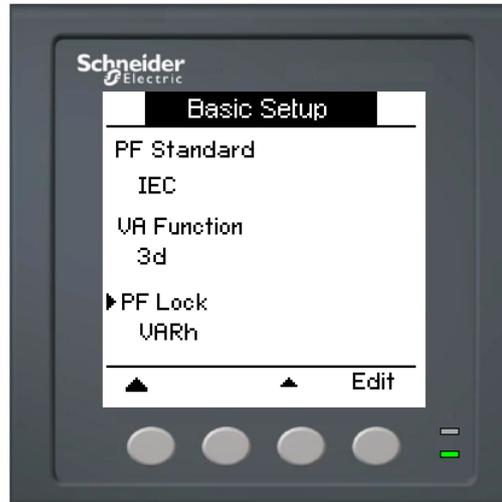
With reference to the four quadrant polarities, the effect of locking on each of the above parameters is,

- kVARh is accumulated only for quadrant Q1 and Q3.
- KVAh: kVA is clamped to kW (whereas normally kVA > kW) while the system is in Q4 or Q2, for accumulating kVAh.
- kVA demand (DM): The locked kVA as above is used for demand computation while in Q4. Note that Q2 is not processed here, since demand computation is already locked for reverse flow (Q2 and Q3) whether D.PAR is kW or kVA. This lock is not meaningful, when the D.PAR is kW.

NOTE: Locking has no effect on the computation or display of instantaneous parameters. It affects only the computation and display of integrated parameters. Q2 and Q3 energy parameters are also available by default as the product works for both IE modes.

For PF lock, navigate **Main>Setup>Meter>PF Lock**. If the Locking Level is re-programmed, the smart demand controller will re-compute kVARh and kVAh according to the new locking level. In the smart demand controller, adding or removing lock level 3 will take 1 to 30 minutes (d.Prd) for demand to approach its new locked value, and should not be done during critical demand peaks. Maximum demand (MD) is not re-adjusted.

To set up the PF Lock:



1. Press ▼ to select **PF Lock**, then press **[Edit]** to modify the parameter.
2. Press - or + to scroll through a list of **PF Lock** values.

Parameter	Values	Description
PF Lock	None, VARh VARh + VAh, VARh + VAh + VAdm,	Select the PF Lock as required.

3. Press **[OK]** to select the **PF Lock**.

Smart demand controller password setup

The password to setup and reset are configurable. Passwords must use four numeric characters. The characters are from the US ASCII character set and are not translated or affected by language selection.

To set up a password:



1. Press ► to navigate to **[Maint]** in the menu list.
2. Press **[Maint]**.
3. Press **[Setup]**.
4. Enter your setup password. Then press **[OK]**.
NOTE: The default password is 0000.
5. Press ► to navigate to **[Pwd]** in the menu list.
6. Press **[Pwd]**.
7. Press ▼ or ▲ to move the cursor ► to point to the parameter you want to modify, then press **[Edit]**.
8. Press + to increase the active digit through the numerals 0-9.
9. Press ◀ to enter the selected value for the active digit and move to the next digit to the left.

Parameter	Values	Description
Setup	0000 to 9999	Sets the password for accessing the meter setup screens.
Reset	0000 to 9999	Sets the password for resetting the meter's values.

10. Continue until all the values are selected, then press **[OK]** to set the password.

Smart demand controller demand setup

To begin smart demand controller demand setup:

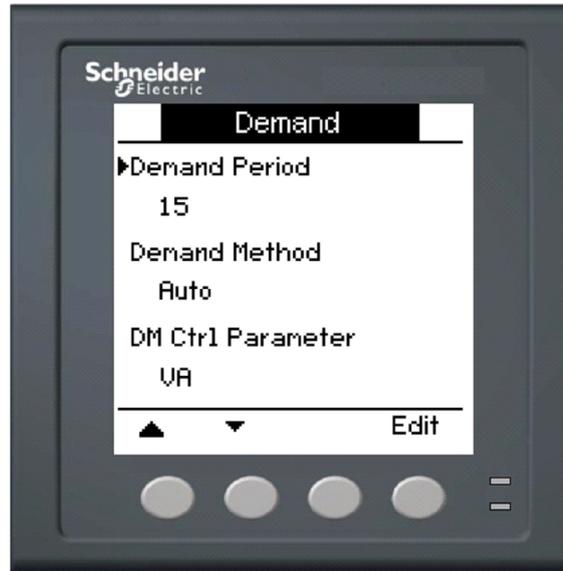
1. Press ► to navigate to **[Maint]** in the menu list.
2. Press **[Maint]**.
3. Press **[Setup]**.
4. Enter your setup password.
NOTE: The default password is 0000. See *Smart demand controller password setup*, page 30 for information on changing passwords.
5. Press **[OK]**.
6. Press ► to navigate to **[Dm]** in the menu list.

- Press **[Dm]**. The demand setup screen appears.

Use the directions in the following sections to set up smart demand controller demand values.

Setting up the Demand

To set up the Demand:



- Press ▼ or ▲ to move the cursor ► to point to the parameter you want to modify.
- Press **[Edit]** to update the selected **Demand period**.
- Press + to increase the active digit through the numerals 0-9.
- Press ◀ to enter the selected number for the active digit and move to the next digit to the left.

Parameter	Values	Description
Demand Period	01 to 30	Enter the Demand period value as required.

- Continue until all the values are selected, then press **[OK]** to set the **Demand Period**.
- Press ▼ to select the **Demand Method**, then press **[Edit]**.
- Press - or + to scroll through a list of supported Demand Methods.

Parameter	Values	Description
Demand Method	Auto, User, RTC	Select the supported Demand Method from the list.

- Press **[OK]** to select the **Demand Method**.
- Press ▼ to select the **Demand Control Parameter**, then press **[Edit]**.

10. Press - or + to scroll through the list of Demand Control Parameter.

Parameter	Values	Description
Demand Control Parameter	VA, W, A	Select the Demand Control Parameter from the list.

11. Press [OK] to select the Demand Control Parameter.

12. Press ▼ to select Pr.dm Interval, then press [Edit].

13. Press + to increase the active digit through the numerals 0-9.

Parameter	Values	Description
Pr.dm Interval	0 to 9	Enter the Profile Demand Interval value as required.

14. Press [OK] to set the Pr.dm Interval.

15. Press ▼ to select Essential Load (K), then press [Edit].

16. Press + to increase the active digit through the numerals 0-9.

17. Press ◀ to enter the selected number for the active digit and move to the next digit to the left.

Parameter	Values (Default)	Description
Essential Load (K)	0.000 to 1.174	Enter the Essential Load value as required.

18. Continue until all values are selected, then press [OK] to set the Essential Load.

19. Press ▼ to select Demand Profile L0 (K), then press [Edit].

20. Press + to increase the active digit through the numerals 0-9.

21. Press ◀ to enter the selected number for the active digit and move to the next digit to the left.

Parameter	Values (Default)	Description
Demand Profile L0 (K)	0.119 to 1.186	Enter the Demand Profile L0 value as required.

22. Continue until all values are selected, then press [OK] to set the Demand Profile L0 (K).

23. Press ▼ to select Demand Profile Step (K), then press [Edit].

24. Press + to increase the active digit through the numerals 0-9.

25. Press ◀ to enter the selected number for the active digit and move to the next digit to the left.

Parameter	Values (Default)	Description
Demand Profile Step (K)	0.011 to 0.059	Enter the Demand Profile Step value as required.

26. Continue until all values are selected, then press [OK] to set the Demand Profile Step (K).

27. Press ▼ to select Demand UL (K), then press [Edit].

28. Press + to increase the active digit through the numerals 0-9.

29. Press ◀ to enter the selected number for the active digit and move to the next digit to the left.

Parameter	Values (Default)	Description
Demand UL (K)	0.011 to 1.198	Enter the Demand UL value as required.

30. Continue until all values are selected, then press [OK] to set the **Demand UL (K)**.
31. Press ▼ to select **Demand LL (K)**, then press [Edit].
32. Press + to increase the active digit through the numerals 0-9.
33. Press ◀ to enter the selected number for the active digit and move to the next digit to the left.

Parameter	Values (Default)	Description
Demand LL (K)	0.119 to 1.186	Enter the Demand LL value as required.

34. Continue until all values are selected, then press [OK] to set the **Demand LL (K)**.
35. Press ▼ to select **Demand control**, then press [Edit].
36. Press - or + to scroll through a list of supported Demand control.

Parameter	Values	Description
Demand control	Basic, TOU, Disable	Select the supported Demand control from the list.

37. Press [OK] to select the **Demand control**.
38. Press ▲ to return to the previous screen.

NOTE: If existing associations will be lost by making the new selection, a confirmation screen appears.

- Press [Yes] to accept the changes and return to the previous screen.
- Press [No] to keep the existing configuration and return to the previous screen.

NOTE:

- In front display, if you change the CT PT ratio and Sys Configuration, then the entire Demand upper limit and lower limit values will change according to the full scale value and also, these parameters values will change; Essential load, Profile L0 value, Profile Step, Upper limit, and Lower limit.
 - If you change the Demand Control Parameter (for example, from VA to A), then ensure to edit these parameters: Essential load, Profile L0 value, Profile Step, Upper limit, and Lower limit.
 - Press OK to reach the maximum value of the above parameters.
- In communication, while writing through communication ensure the below listed parameter values must be within the specified range.

Parameter	Description	Range
Essential load	Essential load allows for critical loads like Numerically Controlled Machines, which cannot be included in the load shedding exercise. The Demand Controller ensures that this Essential Load will be allowed to run with minimum interference. Typically, EsLD should be below 10% of Upper Limit. Programming a high value will unnecessarily advance the load Shed action to protect the large Essential Load.	0 to 99% of Lower Limit value of Demand

Profile L0 value	Level 0 is the Demand Profile mid band with levels L1 to L9 above and L - 1 to L - 9 below, separated by the step size. When changing the demand values in Dm setup, the demand page values will not reset if you change the Profile L0 value, and Profile Step.	10% to 99% of Full scale value
Profile Step	Profile Step sets the spacing of the profile levels.	1% to 5% of Profile L0 value
Upper limit	When the load peaks are more than twice the Upper Limit (UL), then the Demand Control Trip Point will be slightly above the UL due to the 15 Second Demand Control cycle. UL should be set around 90% of contract Demand to start with. The UL setting is used only for Demand Profile generation. The Min-Max value depends upon the CT and PT ratio. The maximum value of Energy UL can be set up to 649 MW/MVA/MVAR.	1 to 100% of Full scale value)
Lower limit	Demand Control Lower Limit (LL) should be set roughly to 90% of UL. This determines the point for restoration of loads. NOTE: The closer LL is to UL, the more frequent will be the load shedding cycles, but the loads shed are likely to be smaller. This suits plants comprising several small loads. If on the other hand you have a few large loads, increase the spacing of LL below UL suitably.	10 to 99% of Upper limit value

- Power Full scale value = (PT Primary x CT Primary x Sys Config) / 1.732
- Amps Full scale value = CT Primary

NOTE: When a user changes the Demand Upper Limit (UL) and Lower Limit (LL) values in Demand setup or TOU setup page the change will take effect at the end of immediate Dm Interval Period (DIP) of that hour (or) the following tariff, in case of TOU based Dm Control. This will happen in sequence of whichever is earlier.

Smart demand controller communication setup

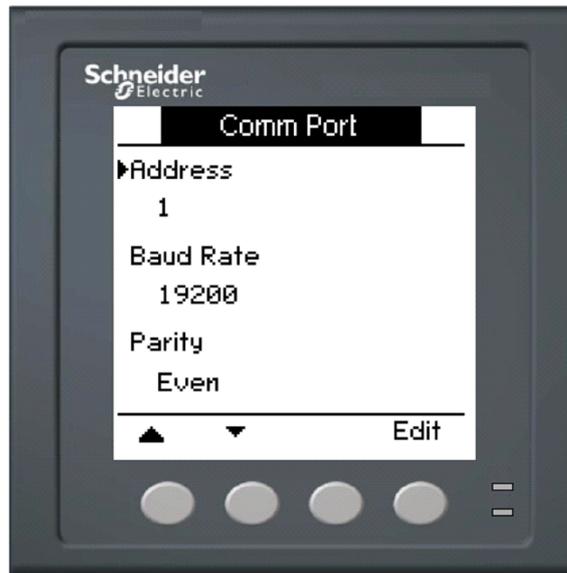
To begin smart demand controller communication setup:

1. Press ► to navigate to **[Maint]** in the menu list.
2. Press **[Maint]**.
3. Press **[Setup]**.
4. Enter your setup password.
NOTE: The default password is 0000. See Smart demand controller password setup, page 30 for information on changing passwords.
5. Press **[OK]**.
6. Press ► to navigate to **[Comm]** in the menu list.
7. Press **[Comm]**. The communication setup screen appears.

Use the directions in the following sections to set up smart demand controller communications values.

Setting up the Communications

To set up communications:



1. Press ▼ or ▲ to move the cursor ► to point to the parameter you want to modify.
2. Press **[Edit]** to update the **Address**.
3. Press + to increase the active digit through the numerals 0-9.
4. Press ◀ to enter the selected number for the active digit and move to the next digit to the left.

Parameter	Values	Description
Address	001 to 247	Enter the Address value as required.

5. Continue until all the values are selected, then press **[OK]** to set the **Address**.
6. Press ▼ to select **Baud Rate**, then press **[Edit]**.
7. Press - or + to scroll through the Baud Rate options.

Parameter	Values	Description
Baud Rate	4800, 9600, 19200, 38400	Select the supported Baud Rate from the list.

8. Press **[OK]** to set the **Baud Rate**.
9. Press ▼ to select **Parity**, then press **[Edit]**.
10. Press - or + to scroll through the Parity options.

Parameter	Values	Description
Parity	Odd, Even, None	Select the supported Parity from the list.

11. Press **[OK]** to set the **Parity**.

Smart demand controller HMI setup

To begin smart demand controller HMI setup:

1. Press ► to navigate to **[Maint]** in the menu list.
2. Press **[Maint]**.
3. Press **[Setup]**.
4. Enter your setup password.

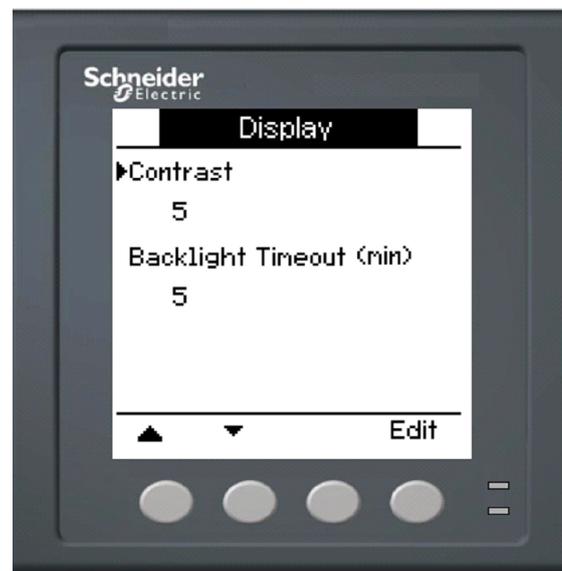
NOTE: The default password is 0000. See Smart demand controller password setup, page 30 for information on changing passwords.

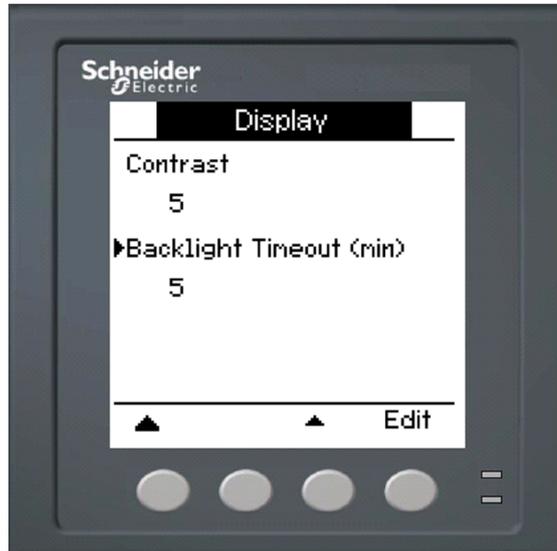
5. Press **[OK]**.
6. Press ► to navigate to **[HMI]** in the menu list.
7. Press **[HMI]**. The HMI setup screen appears.

Use the directions in the following sections to set up smart demand controller HMI values.

Setting up the HMI

To set up the HMI:





1. Press ▼ or ▲ to move the cursor ► to point to the parameter you want to modify.
2. Press **[Edit]** to update the selected **Contrast**.
3. Press + to increase the active digit through the numerals 0-9.

Parameter	Values	Description
Contrast	1 to 9	Enter the contrast values range as required.

NOTE: The contrast values range between 1 to 9.

4. Press **[OK]** to set the **Contrast**.
5. Press ▼ to select **Backlight Timeout (min)**, then press **[Edit]**.
6. Press + to increase the active digit through the numerals 0-9.
7. Press ◀ to enter the selected value for the active digit and move to the next digit to the left.

Parameter	Values	Description
Backlight Timeout (min)	0 to 60	Enter the backlight timeout values range as required.

NOTE: The backlight timeout values range between 0 to 60 minutes. 0 disables the timeout.

8. Continue until all values are selected, then press **[OK]** to set the **Backlight Timeout (min)**.
9. Press ▲ to return to the previous screen.

NOTE: If existing associations will be lost by making the new selection, a confirmation screen appears.

- Press **[Yes]** to accept the changes and return to the previous screen.
- Press **[No]** to keep the existing configuration and return to the previous screen.

Smart demand controller clock setup

To begin smart demand controller clock setup:

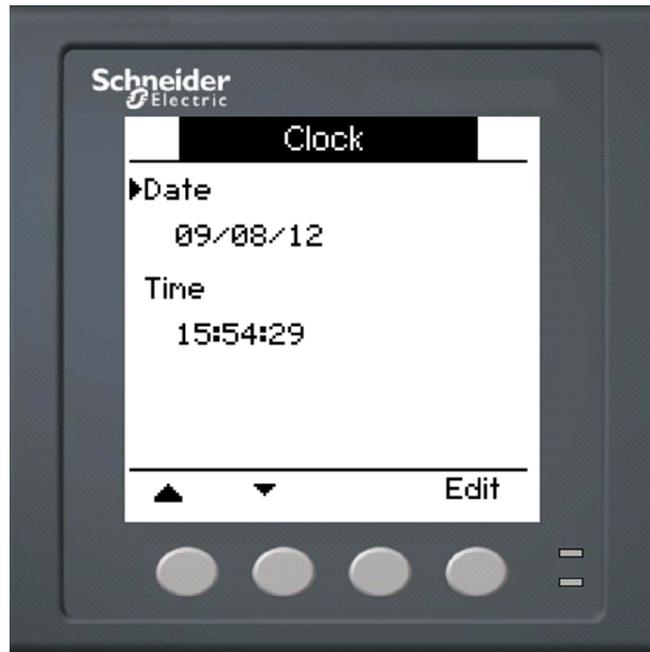
1. Press ► to navigate to **[Maint]** in the menu list.
2. Press **[Maint]**.
3. Press **[Setup]**.
4. Enter your setup password.
NOTE: The default password is 0000. See Smart demand controller password setup, page 30 for information on changing passwords.
5. Press **[OK]**.
6. Press ► to navigate to **[Clock]** in the menu list.
7. Press **[Clock]**. The clock setup screen appears.

Use the directions in the following sections to set up smart demand controller clock values.

Setting up the Clock

The smart demand controller stores all date and time stamps in GMT.

To set up the Clock:



1. Press ▼ or ▲ to move the cursor ► to point to the parameter you want to modify.
2. Press **[Edit]** to update the **Date**.
3. Press + to increase the active digit for the first character of the date.
4. Press ◀ to enter the selected character and move to the character to the left.

Parameter	Values	Description
Date	DD/MM/YY	Set the current date using the format displayed on screen, where DD = day, MM = month and YY = year.

5. Continue until all values are selected, then press **[OK]** to set the **Date**.

6. Press ▼ to select **Time**, then press **[Edit]**.
7. Press + to increase the active digit for the first character of the time.
8. Press ◀ to enter the selected character and move to the character to the left.

Parameter	Values	Description
Time	HH:MM:SS (24 hour format)	Use the 24-hour format to set the current time in UTC (GMT).

9. Continue until all values are selected, then press **[OK]** to set the **Time**.

NOTE: If existing associations will be lost by making the new selection, a confirmation screen appears.

 - Press **[Yes]** to accept the changes and return to the previous screen.
 - Press **[No]** to keep the existing configuration and return to the previous screen.
10. Press ▲ to return to the previous screen.

Smart demand controller auto reset

Auto reset feature enables the user to reset or clear the INTEG (accumulated values) and Max demand to zero on a pre-programmed date and month. The existing values are stored in the OLD register and the new values are accumulated in the INTEG.

To begin smart demand controller auto reset:

1. Press ► to navigate to **[Maint]** in the menu list.
2. Press **[Maint]**.
3. Press **[Setup]**.
4. Enter your setup password.

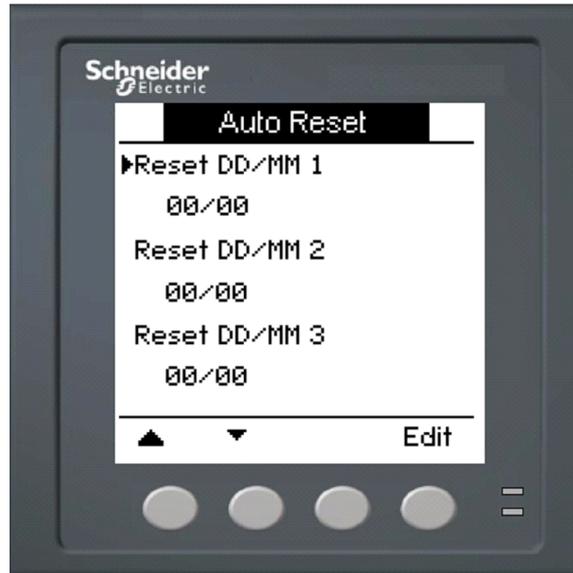
NOTE: The default password is 0000. See *Smart demand controller password setup*, page 30 for information on changing passwords.
5. Press **[OK]**.
6. Press ► to navigate to **[A. Rst]** in the menu list.
7. Press **[A. Rst]**. The Auto Reset screen appears.

Use the directions in the following sections to reset the smart demand controller auto reset values.

Setting up the Auto Reset

The smart demand controller resets.

To set up the Auto Reset:



1. Press ▼ or ▲ to move the cursor ► to point to the parameter you want to modify.
2. Press [Edit] to update the **Reset DD/MM 1**.
3. Press + to increase the active digit for the first character of the date.
4. Press ◀ to enter the selected character and move to the character to the left.

Parameter	Values	Description
Reset DD/MM 1	DD/MM	Set the date using the format displayed on screen, where DD = day and MM = month.

5. Continue until all values are selected, then press [OK] to set the **Reset DD/MM 1**.

NOTE: Repeat the above steps from step 1 to step 5 to auto reset the other date and month values.

6. Press ▲ to return to the previous screen.

NOTE: The date and month order should be set as per the month ascending order. For example, the order must be set as 12/Jan, 12/Feb; do not set as 12/Feb, 12/Jan.

NOTE: The meter allows Auto Reset of all INTEG parameters along with Max Demand, Relay Counters, Accumulated Energy, Quadrant Reactive Energy (VARh), and Rate Counters values at the specified date and month.

Time Of Use (TOU)

TOU Demand Upper & Lower settings can be set through front panel keys. TOU schedule configuration can be done only through ION Setup.

The time of use (TOU) is a structure where the energy consumption (kVAh, kWh, kVARh) at different time intervals (user-programmable) can be stored in separate registers. TOU is very useful where the power tariff changes with time of consumption.

TOU helps the power utility company to optimize the consumption, throughout the day and night. Due to higher rates at peak hours and lower rates at off peak hours the consumers will try to reschedule their processes to off peak hours to reduce the power costs. This in turn helps the utility to reduce the overload at peak hours and the wastage of power during the off peak hours.

NOTE: Use ION Setup to configure the software. You can download the software from www.se.com.

Smart demand controller TOU

To begin smart demand controller Time of Use (TOU):

1. Press ► to navigate to **[Maint]** in the menu list.
2. Press **[Maint]**.
3. Press **[Setup]**.
4. Enter your setup password.

NOTE: The default password is 0000. See Smart demand controller password setup, page 30 for information on changing passwords.

5. Press **[OK]**.
6. Press ► to navigate to **[TOU]** in the menu list.
7. Press **[TOU]**. The TOU DM Setup screen appears.

Use the directions in the following sections to reset the smart demand controller TOU values.

TOU setting and configuration

Yearly Settings

Year (12 months)	January to December (1 to 12)											
No of Seasons (6)	Season1/Season2/Season3/Season4/Season5/Season6 (start date)											
Weekday / weekend	Weekday schedule & Tariff configuration				Weekday schedule & Tariff configuration				Weekday schedule & Tariff configuration			
	Time	Sub Integ	DM UL	DM LL	Time	Sub Integ	DM UL	DM LL	Time	Sub Integ	DM UL	DM LL
Slot1 start time												
Slot2 start time												
Slot3 start time												
Slot4 start time												
Slot5 start time												
Slot6 start time												
Slot7 start time												
Slot8 start time												

Season Settings

Number of Seasons	1 to 6	INT16U		
Season1 start date and time	Date and Time	Date Time Format		
Season2 start date and time	Date and Time	Date Time Format		
Season3 start date and time	Date and Time	Date Time Format		

Season Settings (Continued)

Season4 start date and time	Date and Time	Date Time Format		
Season5 start date and time	Date and Time	Date Time Format		
Season6 start date and time	Date and Time	Date Time Format		

Weekend Settings

Weekend Settings	Day	Remarks				
Weekend1 in Season1	1 to 7	Can configure any day as weekend				
Weekend2 in Season1	1 to 7	Can configure any day as weekend				
Weekend3 in Season1	1 to 7	Can configure any day as weekend				
Weekend1 in Season1	1 to 7	Can configure any day as weekend				
Weekend2 in Season1	1 to 7	Can configure any day as weekend				
Weekend3 in Season1	1 to 7	Can configure any day as weekend				
Weekend1 in Season1	1 to 7	Can configure any day as weekend				
Weekend2 in Season1	1 to 7	Can configure any day as weekend				
Weekend3 in Season1	1 to 7	Can configure any day as weekend				
Weekend1 in Season1	1 to 7	Can configure any day as weekend				
Weekend2 in Season1	1 to 7	Can configure any day as weekend				
Weekend3 in Season1	1 to 7	Can configure any day as weekend				
Weekend1 in Season1	1 to 7	Can configure any day as weekend				
Weekend2 in Season1	1 to 7	Can configure any day as weekend				
Weekend3 in Season1	1 to 7	Can configure any day as weekend				
Weekend1 in Season1	1 to 7	Can configure any day as weekend				
Weekend2 in Season1	1 to 7	Can configure any day as weekend				
Weekend3 in Season1	1 to 7	Can configure any day as weekend				

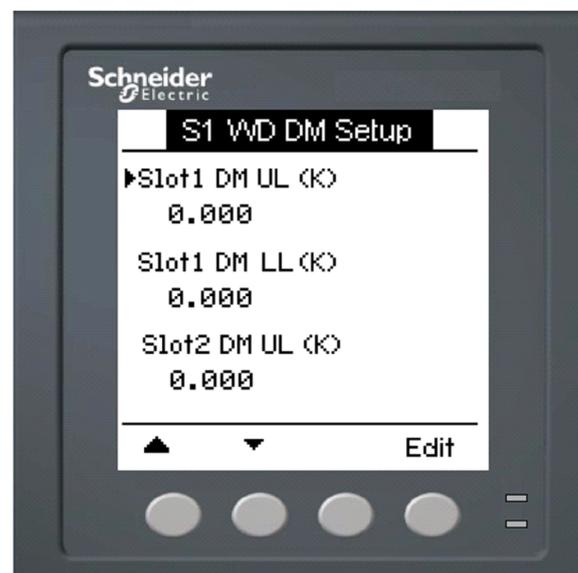
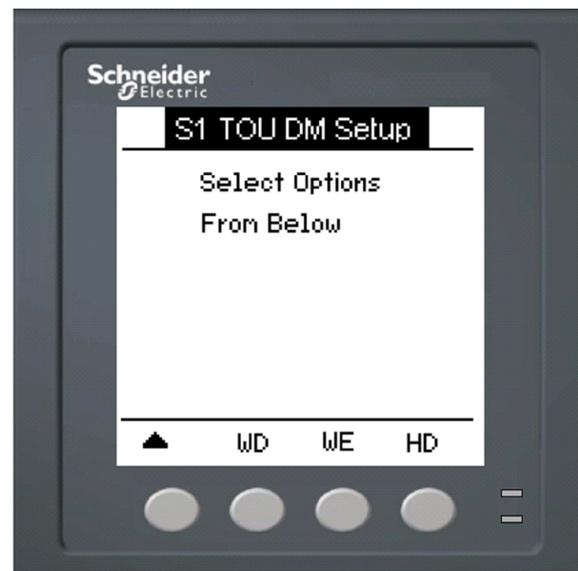
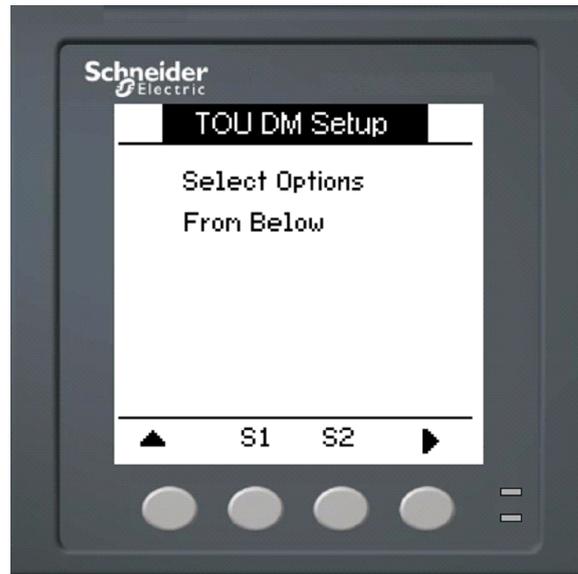
Holiday Configuration

Public Holiday configuration	
Holiday 1 to 16	Month and Day

Setting up the TOU

The smart demand controller Time of Use (TOU).

To set up the TOU:



1. Press **[S1]** to select the **S1 TOU DM Setup**.
2. Press **[WD]** to set the Weekday slot.
3. Press **▼** or **▲** to select weekday slot, then press **[Edit]**.
4. Press **+** to increase the active digit through the numerals 0-9.
5. Press **◀** to enter the selected character and move to the character to the left.

Parameter	Values (Default)	Description
Slot1 DM UL (K)	0.011 to 1.198	Set the required weekday values.

6. Continue until all the values are selected, then press **[OK]** to set the slot.
NOTE: Repeat the above steps from step 3 to step 6 to set the other WD values.
7. Press **▲** to return to the previous screen.
NOTE: If existing associations will be lost by making the new selection, a confirmation screen appears.
 - Press **[Yes]** to accept the changes and return to the previous screen.
 - Press **[No]** to keep the existing configuration and return to the previous screen.
8. Press **[WE]** to set the Weekend slot.
9. Press **▼** to select weekend slot, then press **[Edit]**.
10. Press **+** to increase the active digit through the numerals 0-9.
11. Press **◀** to enter the selected character and move to the character to the left.

Parameter	Values (Default)	Description
Slot1 DM UL (K)	0.011 to 1.198	Set the required weekend values.

12. Continue until all values are selected, then press **[OK]** to set the slot.
NOTE: Repeat the above steps from step 9 to step 12 to set the other values of WE.
13. Press **▲** to return to the previous screen.
NOTE: If existing associations will be lost by making the new selection, a confirmation screen appears.
 - Press **[Yes]** to accept the changes and return to the previous screen.
 - Press **[No]** to keep the existing configuration and return to the previous screen.
14. Press **[HD]** to set the Holiday slot.
15. Press **▼** to select holiday slot, then press **[Edit]**.
16. Press **+** to increase the active digit through the numerals 0-9.
17. Press **◀** to enter the selected character and move to the character to the left.

Parameter	Values (Default)	Description
Slot1 DM UL (K)	0.011 to 1.198	Set the required holiday values.

18. Continue until all values are selected, then press **[OK]** to set the slot.
NOTE: Repeat the above steps from step 15 to step 18 to set the other values of HD.

19. Press ▲ to return to the previous screen.

NOTE: If existing associations will be lost by making the new selection, a confirmation screen appears.

- Press **[Yes]** to accept the changes and return to the previous screen.
- Press **[No]** to keep the existing configuration and return to the previous screen.

SnapShot

The meter supports recording of instantaneous values through snap shot using HMI. This page enables capturing values of Voltage Average, Current Average, Power Total, and Energy Delivered. The time of recording is defined by the time set for the snap shot feature. This can be set using HMI or communication. Snapshot feature is aligned with the RTC of the meter.

NOTE: In certain conditions where the time is skipped due to RTC behaviour, the recording of that respective day will be skipped and successive days records will be available.

Smart demand controller SnapShot

To begin smart demand controller SnapShot:

1. Press ► to navigate to **[Maint]** in the menu list.
2. Press **[Maint]**.
3. Press **[Setup]**.
4. Enter your setup password.

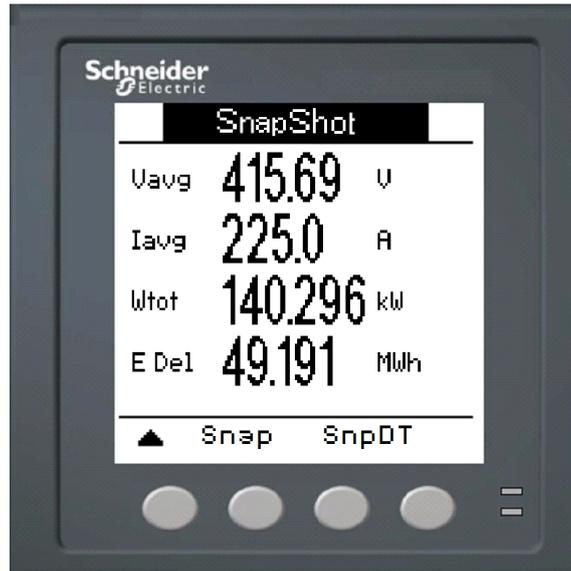
NOTE: The default password is 0000. See Smart demand controller password setup, page 30 for information on changing passwords.
5. Press **[OK]**.
6. Press ► to navigate to **[Snap]** in the menu list.
7. Press **[Snap]**. The SnapShot Setup screen appears.

Use the directions in the following sections to reset the smart demand controller snapshot time.

Viewing SnapShot page

The smart demand controller SnapShot.

To view SnapShot page:



1. Press ► to navigate to **[Snap]**.
2. Press **[Snap]** to view parameter values. Snap page displays below parameters:
 - Voltage Average
 - Current Average
 - Power Total
 - Energy Delivered
3. Press **[SnpDT]** to view SnapShot date and time.

Setting up the SnapShot

The smart demand controller SnapShot.

To set up the SnapShot:



1. Press **[Edit]** to select the **SnapShot** time.

2. Press **+** to increase the active digit through the numerals 0-9.
3. Press **◀** to enter the selected character and move to the character to the left.

Parameter	Values	Description
SnapShot Time	HH:MM	Set the time format displayed on screen, where HH= hours and MM = minutes.

4. Continue until all values are selected, then press **[OK]** to set the time.
 - Press **[Yes]** to accept the changes and return to the previous screen.
 - Press **[No]** to keep the existing configuration and return to the previous screen.

Rate Counter

Rate counters enable tracking of CO2 emissions based on the Energy Delivered / Received. A predefined calculation can determine the CO2 Emission and Energy Cost for each customer. This feature enables two Rate Settings.

Smart demand controller Rate

To begin smart demand controller Rate:

1. Press **▶** to navigate to **[Maint]** in the menu list.
2. Press **[Maint]**.
3. Press **[Setup]**.
4. Enter your setup password.

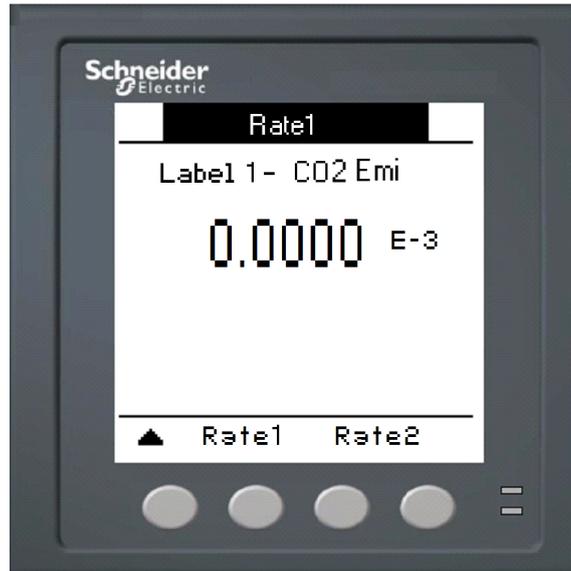
NOTE: The default password is 0000. See Smart demand controller password setup, page 30 for information on changing passwords.
5. Press **[OK]**.
6. Press **▶** to navigate to **[Rate]** in the menu list.
7. Press **[Rate]**. The Rate Setup screen appears.

Use the directions in the following sections to reset the smart demand controller Rate parameters.

Viewing rate page

The smart demand controller Rate.

To view rate page:

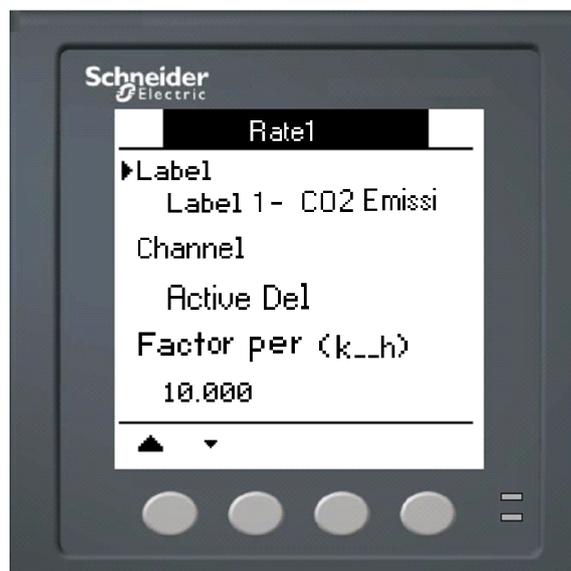


1. Press ► to navigate to **[Rate]**.
2. Press **[Rate1]** to view Rate1 parameter values.
3. Press **[Rate2]** to view Rate2 parameter values.

Setting up the Rate

The smart demand controller Rate.

To set up the Rate:



1. Press **[Edit]** to select **Rate1**. Or press ▼ to select **Rate 2** and press **[Edit]**.
2. Press ▼ to select **Channel** and press **[Edit]**.

3. Press - or + to scroll through the Channel parameters.

Parameter	Values	Description
Parameter	None, Active Del, Active Rec, Active Del + Rec, Reactive Del, Reactive Rec, Reactive Del + Rec, Apparent Del, Apparent Rec, Apparent Del + Rec	Select the parameter as required.

4. Press **[OK]** to set the required parameter.
5. Press **▲** to return to the previous screen.
6. Press **▼** to select **Factor per (k_h)** and press **[Edit]**.
7. Press **+** to increase the active digit through the numerals 0-9.
8. Press **◀** to enter the selected character and move to the character to the left.

Parameter	Values	Description
Factor per (k_h)	0.000 to 9999.999	Set the parameter value as required.

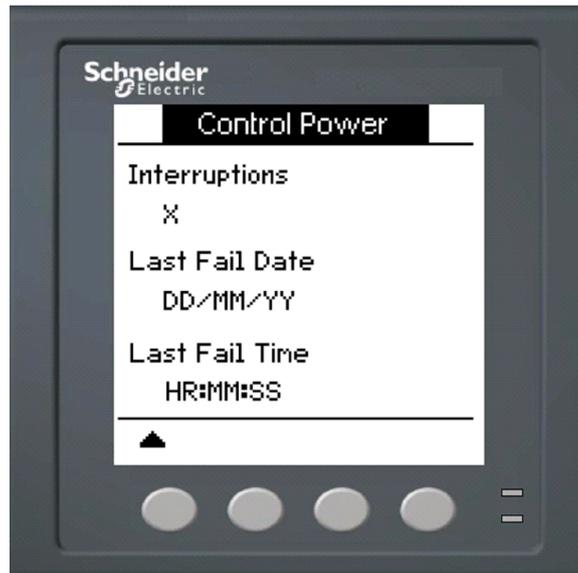
9. Continue until all values are selected, then press **[OK]** to set the **Factor per (k_h)** value.
10. Press **▲** to return to the previous screen.
- Press **[Yes]** to accept the changes and return to the previous screen.
 - Press **[No]** to keep the existing configuration and return to the previous screen.

NOTE: Label can be configured only through ION Setup.

Smart Demand Controller Diagnostics

Diagnostics

To check the smart demand controller diagnostics.



1. Press ► to navigate to **[Maint]** in the menu list.
2. Press **[Maint]**.
3. Press **[Diag]**, the Diagnostics screen appears.
4. Press ▲ to return to the previous screen.

NOTE: Interruptions display the number of supply outages. This indicates the number of auxiliary supply interruptions. The fail date and time display the last time an interruption occurred.

Smart demand controller reset

To begin smart demand controller reset setup:

1. Press ► to navigate to **[Maint]** in the menu list.
2. Press **[Maint]**.
3. Press **[Reset]**.
4. Enter your setup password. The default password is 0000.
5. The resets screen appears.

Meter values can be re-initialized using the reset function. Use the directions in the following sections to set up smart demand controller reset values.

Resets

Resets include smart demand controller re-initialization, as well as resets of all values for the following items:

- Energy - Clears all values for Energy, Quadrant VARh, and Rate Counters
- Max Demand - Clears all values for Max Demand and Relay Counters
- Max Min - Clears all values for Max Min
- TOU - Clears all values for TOU
- DM Profile - Clears all values for DM Profile
- DM Sync - Clears all values for Demand

Reset

To re-initialize the smart demand controller:



1. Press **[Select]** to select **Energy**.
2. A confirmation screen appears.
 - Press **[Yes]** to reset the energy.
 - Press **[No]** to return to the previous screen.
3. Press **▼** to select **Max Demand**, then press **[Select]**.
4. A confirmation screen appears.
 - Press **[Yes]** to reset the maximum demand.
 - Press **[No]** to return to the previous screen.
5. Press **▼** to select **Max Min**, then press **[Select]**.
6. A confirmation screen appears.
 - Press **[Yes]** to reset the maximum minimum.
 - Press **[No]** to return to the previous screen.
7. Press **▼** to select **TOU**, then press **[Select]**.
8. A confirmation screen appears.
 - Press **[Yes]** to reset the TOU.
 - Press **[No]** to return to the previous screen.
9. Press **▼** to select **DM Profile**, then press **[Select]**.
10. A confirmation screen appears.
 - Press **[Yes]** to reset the DM profile.
 - Press **[No]** to return to the previous screen.
11. Press **▼** to select **DM Sync**, then press **[Select]**.
12. A confirmation screen appears.
 - Press **[Yes]** to reset the DM sync.
 - Press **[No]** to return to the previous screen.

Metering

Smart Demand Controller characteristics

The smart demand controller offers comprehensive power and energy monitoring at the feeders and individual loads. The smart demand controller replaces over 20 individual transducers and meters for comprehensive load management in 3-phase commercial and industrial applications.

Smart Demand Controller characteristics

Instantaneous rms Values	
Current	Per phase, neutral or ground, average of 3 phases
Voltage	Average of 3 phases, L-L and L-N
Frequency	System Frequency
Active power	Total and per phase (signed)
Reactive power	Total and per phase (signed)
Apparent power	Total and per phase
True Power Factor	Total and per phase 0.000 to 1 (signed, four quadrant)
Energy Values (FWD, REV, F+R, F-R) and Previous (Old) Energy Readings	
Active Energy	
Reactive Energy	
Apparent Energy	
PF Average	
Amp Hour	
VLL Average	
VLN Average	
Frequency Average	
Timers	
Run Hours	Load ON hours
On Hours	Voltage ON hours
Interruptions	Voltage interruptions
Demand Values	
Active, reactive, apparent	Present, Last, Predictive Demand values
Current	Present, Last, Predictive Demand values
Spare Load	
Time Remaining	
Maximum Demand Values	
Maximum demand active power	Total
Maximum demand apparent power	Total
Maximum demand reactive power	Total
Maximum demand current	Average
Maximum demand occurrence date and time	For all the maximum demand parameters
Demand Control	
Trip Status	Indicates the trip status (Shed, Restore, DM > UL, PdDM > UL)
Demand Profile	

Smart Demand Controller characteristics (Continued)

Demand Profiles	9 levels of demand profiles on selected parameters (W / VA / Amps)
Power-Quality Values	
Total harmonic distortion (THD)	Current THD Voltage VLN THD (if SYS configuration is Star / 2ph / 1ph) Voltage VLL THD (if SYS configuration is Delta)
Individual Harmonic (Up to 31st level)	Ia Harmonics Ib Harmonics Ic Harmonics Van Harmonics Vbn Harmonics Vcn Harmonics

Smart Demand Controller characteristics

Reset (Password protected)	
Energy values	
Maximum demand current and power values	
Minimum and maximum values	
TOU page values	
Demand Profile values	
Demand Sync (for clearing demand values)	
Minimum and Maximum Values (4 levels) with time stamp	
Voltage line to line avg	
Voltage Line to neutral	
Current avg	
Frequency	
Active power total	
Reactive power total	
Apparent power	
Power factor	
Power total	
Other Parameters	
Unbalance	Displays Voltage LL and LN and Current
% Load	Phase wise and Average
Phasor angle	Phase angles between voltage and current Phase angle between voltage and line voltages
Clock	Real time clock (RTC)
Local or Remote Setup	
Distribution system Type	STAR, DELTA, 2-Phase and Single Phase
Current transformers rating	Primary 5 to 32767 A Secondary 5 A, 1 A
Voltage transformers rating	Primary 100 to 999000 VLL max Secondary 50 to 480 VLL
Demand calculation interval (period)	1 to 30 minutes

Smart Demand Controller characteristics (Continued)

Diagnostics
Control Power interruptions
Control Power Last Fail Date and Time

MODBUS RS-485

Modbus RS-485 specifications

Functions	
RS-485 link	2-wire
Communication protocol	MODBUS RTU
Settings	
Communication address	1 to 247
Baud rate (communication speed)	4800, 9600, 19200, 38400 baud
Parity	none, even, odd

Digital inputs

Digital Inputs status

Digital input status	2 digital inputs, Display Status is indicated ON or OFF
----------------------	---

Relay outputs

The meter provides 3 output relays with change-over contacts for demand control. While the relays are in use, you may find the meter:

- Wired to a local annunciator panel
- Extended to remote annunciators, or
- Used for automatic tripping via control contactors wired to a circuit breaker

Relay counters and description

Relay Counter	Status	Counter Increment	Description
Restore	Off -> ON On -> Off	No Yes	Indicates that loads may now be restored. Additional load allowed, is shown by SprLD (+ve).
DM > UL	Off -> ON On -> Off	Yes No	When the actual (present) load crosses the set Upper Limit.
PdDM > UL	Off -> ON On -> Off	Yes No	Indicates that demand is predicted to exceed Upper Limit (UL) within programmed Prediction Interval (PdIN). Load Shedding by the amount shown by SprLD (-ve) is necessary to keep demand within the programmed Upper Limit (UL). Alternatively, transfer excess load to an in-house generator. The Prediction Interval (PdIN) provides valuable advance notice for this operation.
Shed	NA	NA	Indicates that load shedding is required. This indications occurs only on HMI.

You can also use ION Setup for configuring Relay Counters on your meter. For additional information refer to ION Setup Configuration Guide available on www.se.com.

Demand readings

The smart demand controller provides a variety of demand readings. Below table lists the available demand readings and their reportable ranges.

Demand readings

Demand readings
Demand Current, Average (VA, W,VAR, Amps)
Present
Last
Predicted
Peak
Spare Load
Time Remaining

Demand calculation methods

Demand power is the energy accumulated during a specified period divided by the length of that period. How the smart demand controller performs this calculation depends on the method you select. To be compatible with electric utility billing practices, the smart demand controller provides Block Interval Demand power calculations.

The default demand calculation is set to a User & RTC Block with a 15 minute interval.

Block interval demand

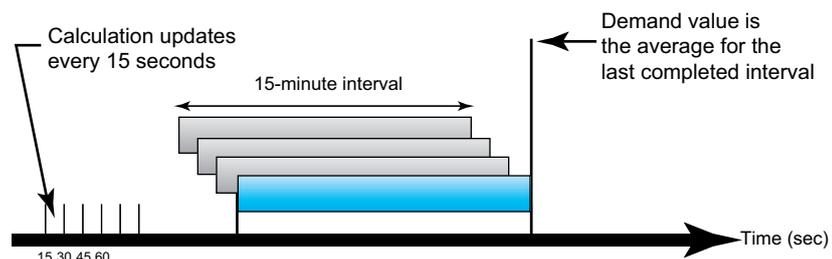
In the block interval demand method, you select a “block” of time that the smart demand controller uses for the demand calculation. You choose how the smart demand controller handles that block of time (interval). Two different modes are possible:

- **Auto (Sliding) Block.** Select an interval from 1 to 30 minutes (in 1-minute increments). The value is updated every 15 seconds irrespective of demand period programmed. The smart demand controller displays the demand value for the last completed interval.
- **User & RTC (Fixed) Block.** Select an interval from 1 to 30 minutes (in 1-minute increments). The smart demand controller calculates and updates the demand at the end of each interval.

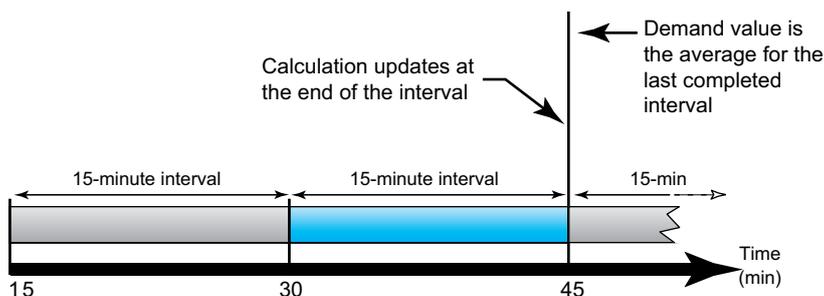
Below figure illustrates the two ways to calculate demand controller using the block method. For illustration purposes, the interval is set to 15 minutes.

Block interval demand examples

Sliding Block



Fixed Block



Predicted demand

The smart demand controller calculates predicted demand for the end of the present interval for kW / kVA / Amp demand. This prediction takes into account the energy consumption thus far within the present (partial) interval and the present rate of consumption. The prediction is updated every second.

Max Demand

In non-volatile memory, the smart demand controller maintains a running maximum of power and current demand values, called "Max Demand". The Max is the highest / average for each of these readings: Wdm, VARdm, VAdm & Idm, since the last reset. The smart demand controller stores the date and time when the max demand occurred, as well as the max demand during the last incremental energy interval.

You can view the old max demand values from the smart demand controller display, and old max demand occurrence date and time with respect to W, VAR, VA and I. To view the old demand values, select O.Md.

To reset Max Demand values from the demand controller display, navigate through Maint > Reset > Password > Max Demand.

To reset all demand values from the demand controller display, navigate through Maint > Reset > Password > Demand sync.

You should reset max demand after changes to basic smart demand controller setup, such as CT ratio or power system configuration.

Demand profiles

The demand profile provides the cumulative frequency histogram of demand values. The profile generates nine levels above and below the programmed level 0, at the spacing programmed by the step size in the setup menu.

At every demand interval (choices 1 to 30 minutes), the highest demand value in the interval is compared with the 19 Levels. A count of levels, where the demand value has exceeded, is maintained against each level. Thus, the total count of demands compared is also maintained.

Demand profile

Level	Demand kVA / kW / Amps	Cumulative Counts
L9	1750	0
L8	1700	0
:	:	:
L3	1450	0
L2	1400	3

Demand profile (Continued)

L1	1350	16
L0	1300	35
L-1	1250	39
L-2	1200	73
L-3	1150	127
:	:	:
L-8	900	1352
L-9	850	1379
	Total	1440

Power cycle modes

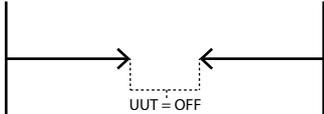
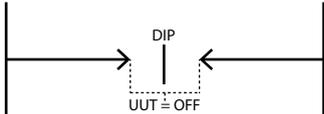
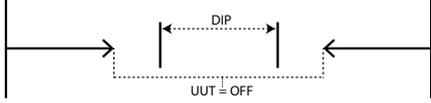
The smart demand controller has different power cycle modes.

- Auto Mode: In Auto mode, demand values are updated and remain constant for any number of subsequent demand periods.
- User/RTC mode: In User and RTC mode, demand values are updated appropriately and fall back to zero at the end of the particular demand period. For next demand period cycle, the demand accumulations start afresh.

NOTE: The demand values update when the load is fluctuating.

Control power interruptions

The control power interruptions during and between Demand Interval Period (DIP) under Auto, User and RTC modes are described below with illustrations:

Use case description	Expected behaviour
<ul style="list-style-type: none"> • Inject measurement signals. • Switch OFF the meter before the period completion. • Switch ON with in the period completion. 	<ul style="list-style-type: none"> • Present demand and predicted demand continues from previous values. • Last demand continues to be the same at the instance of meter restart.
<ul style="list-style-type: none"> • Inject measurement signals. • Switch OFF the meter in the current DIP. • Switch ON the meter in the next DIP. 	<ul style="list-style-type: none"> • Present demand and predicted values start from afresh in the new cycle. • Last demand continues to be the same at the instance of meter restart.
<ul style="list-style-type: none"> • Inject measurement signals. • Switch off the meter before the DIP completion. • Skip a Demand Interval period. • Switch on the meter in the next demand interval period. 	<ul style="list-style-type: none"> • Present demand, Last Dmd and predicted demand are all set to Zero.

- User mode behaviour is similar to RTC mode, but during every power interruption, the Dm values start afresh irrespective of between and outside the DIP.
- In Auto mode, Dm values drop off to, or will reach zero.
- The Dm values update appropriately when the load is fluctuating.

Timer offset

Timer offset is caused when user does a Demand sync operation during the running DIP.

In order to sync the TR with the RTC, user has to:

1. Make changes in **Dm** setup page.
2. Select **Dm** control.
3. Save the settings.
4. Go back to the original **Dm** settings.

Integrator

An Integrator is a register in which all the integrated (energy and time) parameters like VAh, Wh, VARh, Ah, PF(avg), Vavg., Favg. Run Hours, maximum demand (PF) etc are accumulated or stored.

Energy readings

The smart demand controller calculates and stores accumulated energy values for real, reactive, and energy.

You can view accumulated energy from the display. The resolution of the energy value automatically changes from kVAh to GVAh.

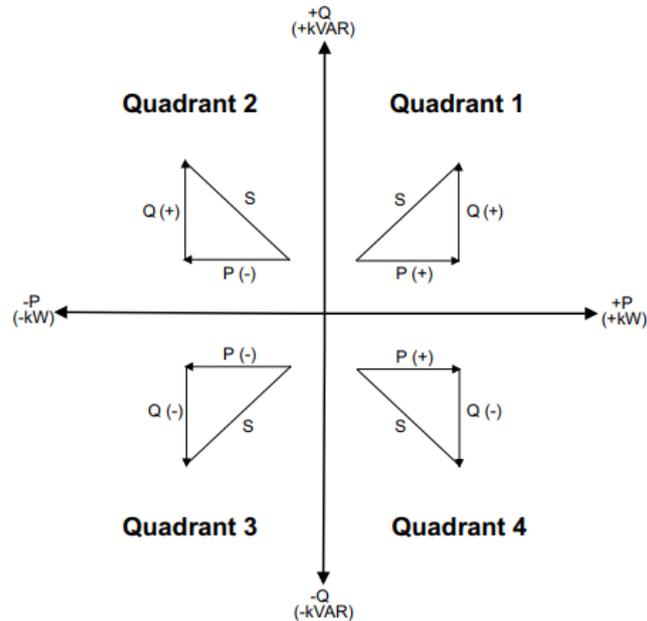
Energy values can be reported over communication as 32-bit float and 64-bit signed integers. The units for 32-bit float integers are kWh, kVARh, or kVAh and for 64-bit signed integers are Wh, VARh, or VAh.

The smart demand controller distinguishes the direction of power flow (kW). It integrates energy parameters kVAh, kWh, kVARh, Ah, PFavg, VLLavg, VLNavg, Favg during the forward and reverse flow of energy, where Energy parameters readings accurately reflects the billing.

Import-Export energy parameters are available.

Quadrant based VARh

The meter provides a 4-quadrant based accurate reactive energy metering. These are available using Modbus communication.



Preset energy values

The smart demand controller provides preset energy feature. This feature helps in inputting previous energy values in case of a meter replacement or panel change. Preset energy value cannot be set more than over flow energy value, that is 99999GWh. The preset energy values include:

- Delivered / Import / Forward
- Received / Export / Reverse
- Forward + Reverse
- Forward - Reverse

Timers

RUN hours: Indicates the period the load has been ON and has run. This counter accumulates as long as the load is ON.

On hours: The period for which the smart demand controller (supply) is ON.

INTR: Number of supply outages, means the number of load outages. The meter displays forward and reverse interruption counts based on the direction of current flow.

Previous (Old) readings

The smart demand controller has previous (old) data register, where the last cleared energy and timer values are stored. The energy and timer values in the integrator are transferred to the previous (old) register when the reset energy is cleared (manually/due to overflow).

Thus, the previous (old) energy values are not lost even after the integrator is cleared and can be viewed with the previous (old) parameter. Remember that the previous (old) values will be overwritten, when the INTG is cleared next time.

Harmonics

THD

Total Harmonic Distortion (THD) is a quick measure of the total distortion present in a waveform and is the ratio of harmonic content to the fundamental. It provides a general indication of the “quality” of a waveform. THD is calculated for both voltage and current.

The smart demand controller uses the following equation to calculate THD:

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

where,

$$\text{HC (Harmonic Content)} = \sqrt{H_2^2 + H_3^2 + H_4^2 + \dots}$$

H1 = Fundamental Content

Individual harmonic

The smart demand controller gives the power quality measurement parameters. The power quality parameters measured are individual harmonic distortion% for V1 V2 V3 / V12 V23 V31, I1, I2, and I3 waveforms.

Harmonics: Percentage of each harmonic divided by fundamental harmonics

$$V_h = \frac{V_h}{V_1} \times 100\%$$

where,

Vh = Harmonic Voltage

V1 = Fundamental Voltage

The device measures harmonic distortion from 2nd to 31st level.

Time Of Use (TOU)

TOU Demand Upper & Lower settings can be set through front panel keys. TOU schedule configuration can be done only through ION Setup. See Time Of Use (TOU), page 41 for more information on TOU and TOU setting and configuration.

Maintenance and troubleshooting

Password recovery

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

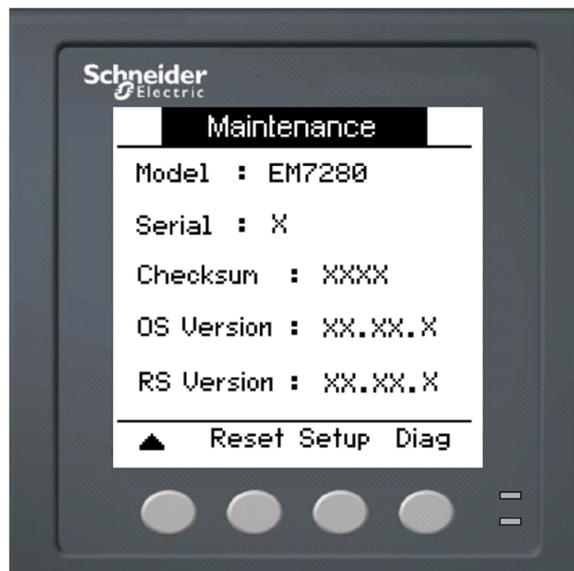
Make sure you include your meter's model, serial number and firmware version in your email or have it readily available if calling Technical Support.

Smart Demand Controller memory

The smart demand controller uses its non-volatile memory to retain all data and metering configuration values. Under the operating temperature range specified for the smart demand controller, this non-volatile memory has an expected life of at least 45 years.

NOTE: Life expectancy is a function of operating conditions and does not constitute any expressed or implied warranty.

Identifying the firmware version, model, and serial number



1. Press ► to navigate to **[Maint]** in the menu list.
2. Press **[Maint]** to view the model, firmware (OS) version, serial number, and other smart demand controller information.
3. Press ▲ to return to the maintenance screen.

Firmware upgrade

The smart demand controller supports the downloading of new firmware and language files over the communications link. This requires the free DLF3000 software, which is available at www.se.com. The DLF3000 offers an extensive Help file with information on operating the software. The most recent firmware and language files are also available on the website.

Troubleshooting

The information in Heartbeat/communication LED, page 64 describes potential problems and their possible causes. It also describes checks you can perform or possible solutions for each. After referring to this table, if you cannot resolve the problem, contact your local Schneider Electric sales representative for assistance.

 **DANGER**

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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

Heartbeat/communication LED

The heartbeat/communication LED helps to troubleshoot the smart demand controller.

The heartbeat/communication LED works as follows:

- **Normal operation** — the LED flashes at a steady rate during normal operation.
- **Communications** — the LED flash rate changes as the communications port transmits and receives data. If the LED flash rate does not change when data is sent from the host computer, the smart demand controller is not receiving requests from the host computer.
- **Hardware** — if the heartbeat LED remains lit and does not flash On and Off, there is a hardware problem. First check for the display at top left side corner icon for flash On and Off, perform a hard reset of the smart demand controller (turn Off power to the smart demand controller, then restore power to the smart demand controller). If the heartbeat LED remains lit, contact your local sales representative.
- **Control power and display** — if the heartbeat LED flashes, but the display is blank, the display may not be functioning properly or may have timed out (see *Smart demand controller clock setup*, page 39). If the control power is available to the meter, and still the display is blank and the LED is not lit, then contact your local sales representative.

Troubleshooting

Potential Problem	Possible Cause	Possible Solution
The maintenance (wrench) icon is illuminated on the smart demand controller display.	When the maintenance (wrench) icon is illuminated, it indicates an event has occurred which may require attention.	Go to [Maint] > [Diag]. Event messages display to indicate the reason the icon is illuminated. Note these event messages and call the Technical Support or contact your local sales representative for assistance.
The display is blank after applying control power to the smart demand controller.	The smart demand controller may not be receiving the necessary power. The display may have timed out.	Verify that the smart demand controller line and terminals are receiving the necessary power.

Troubleshooting (Continued)

		<p>Verify that the heartbeat LED is blinking.</p> <p>Press a button to see if the display timed out.</p>
The data being displayed is inaccurate or not what you expect.	Incorrect setup values.	Check that the correct values have been entered for smart demand controller setup parameters (CT and VT ratings, Nominal Frequency, and so on). See <i>Setting up the smart demand controller</i> , page 19 for setup instructions.
	Incorrect voltage inputs.	Check smart demand controller voltage input terminals L (8, 9, 10, 11) to verify that adequate voltage is present.
	Smart demand controller is wired improperly.	Check that all CTs and VTs are connected correctly (proper polarity is observed) and that they are energized. Check shorting terminals. See the recommended torque in the <i>Wire Sizes and Torque</i> , page 19 section.
Cannot communicate with smart demand controller from a remote personal computer.	Smart demand controller address is incorrect.	Check to see that the smart demand controller is correctly addressed. See <i>Setting up the Communications</i> , page 36 for instructions.
	Smart demand controller baud rate is incorrect.	Verify that the baud rate of the smart demand controller matches the baud rate of all other devices on its communications link. See <i>Setting up the Communications</i> , page 36 for instructions.
	Communications lines are improperly connected.	Verify the smart demand controller communications connections. Refer to the <i>Communications capabilities</i> , page 70 section for instructions.
	Communications lines are improperly terminated.	Check to see that a multipoint communications terminator is properly installed. See the <i>Communications capabilities</i> , page 70 section for instructions.
Digital Inputs not reading.	Digital input lines are improperly connected.	Verify the smart demand controller digital input connections. Refer to the <i>Smart demand controller configurations</i> , page 19 section for instructions.
	Voltage levels at the Digital input connector side is not in the range.	Check the voltage for the digital input, as mentioned in the specification.
Whetting output voltage low.	Whetting output lines are improperly connected.	Check the load conditions to ensure it is in the specified limits as mentioned in the specification.
Power demand controlling fail.	Control output relays are improperly terminated.	Verify the control output relay connections. Refer to the <i>Smart demand controller configurations</i> , page 19 section in the installation manual for instructions.
	Incorrect setup values.	Check the settings for the limits of demand in the setup page.

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

Getting technical support

Please refer to the Technical Support Contacts provided in the smart demand controller shipping carton for a list of support phone numbers by country, or go to www.se.com select your country > Support, then navigate to support for contact information by country.

Register list

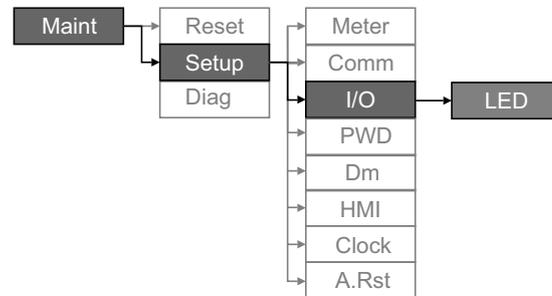
To download the latest version of the EM72xx Register List.xlsx, go to www.se.com. For information on using the register list to configure the smart demand controller with the command interface, see [Command interface](#), page 72.

CAL LED

Setting up the CAL LED

The LED setup screen allows you to configure the CAL LED for energy pulsing application.

CAL LED settings menu tree



1. Press ► to navigate to **[Maint]** in the menu list.
2. Press **[Maint]**.
3. Press **[Setup]**.
4. Enter the setup password (default is “0000”), then press **[OK]**.
5. Press ► to navigate to **[I/O]** in the menu list. Then press **[I/O]**.
6. Press **[LED]**, then press **[Edit]**.
7. Press - or + to modify the parameter as required, then press **[OK]**.

LED setup parameter

Parameter	Values	Description	
Mode	Off	Off disables the LED.	
	Energy	Energy sets the LED for energy pulsing.	
	Parameter	Values	Description
	Mode	Off, Energy	Off disables the LED. Energy sets the LED for energy pulsing.
	Pulse Wt. (p/k_h)	1 to 9999999	When configured for energy pulsing, this setting defines how many pulses are sent to the LED for every 1 kWh, 1 kVARh or 1 kVAh accumulated energy.
	Channel	Active Del Active Rec Active Del + Rec Reactive Del Reactive Rec Reactive Del + Rec Apparent Del Apparent Rec Apparent Del + Rec	Select which accumulated energy channel to monitor and use for energy pulsing.

8. Press **▲** to exit. Press **Yes** to save your changes.

Configuring the CAL LED for energy pulsing using ION Setup

You can use the ION Setup to configure your meter's LED for energy pulsing.

1. Start ION Setup.
2. Connect to your meter
3. Navigate to **I/O configuration > Energy Pulsing**.
4. Select the LED to configure and click **Edit**. The setup screen is displayed.
5. Enter a descriptive name for the LED **Label**.
6. Configure the other setup parameters as required.

7. Click **Send** to save your changes.

Energy pulsing LED setup parameters available through ION Setup

Parameter	Values	Description
Mode	Off, Energy	Off disables the LED. Energy sets the LED for energy pulsing.
Pulse Wt. (p/k_h)	1 to 9999999	When configured for energy pulsing, this defines how many pulses are sent to the LED for every 1 kWh, 1 kVARh or 1kVAh of accumulated energy.
Channel	Active Energy Delivered	Select which accumulated energy channel to monitor and use for energy pulsing.
	Active Energy Received	
	Active Energy Del+Rec	
	Reactive Energy Delivered	
	Reactive Energy Received	
	Reactive Energy Del+Rec	
	Apparent Energy Delivered	
	Apparent Energy Received	
	Apparent Energy Del+Rec	

Communication wiring

Communications capabilities

RS-485 Communications Distances

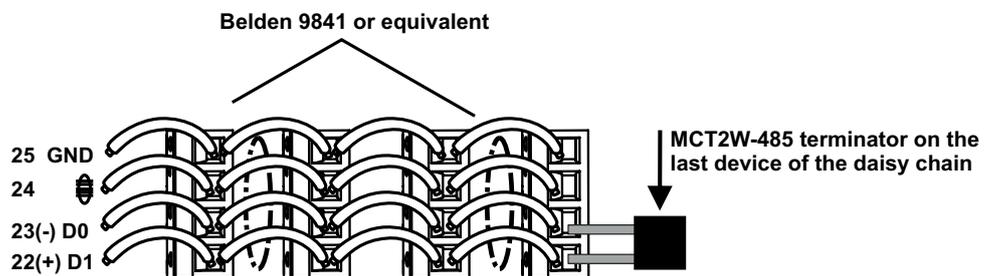
Baud Rate	Maximum Communication Distances	
	1 to 32 Devices	
	Feet	Meters
4800	9000	2744
9600	8000	2438
19200	6000	1829
38400	2500	762

NOTE: Distances listed should be used as a guide only and cannot be guaranteed for non-EasyLogic devices. Refer to the master device's documentation for any additional distance limitations.

Daisy-chaining devices to the Smart Demand Controller

The RS-485 slave port allows the smart demand controller to be connected in a daisy chain with up to 31, 2-wire devices. In this document, communications link refers to a chain of devices that are connected by a communications cable.

Daisy-chaining 2-wire devices



Smart Demand Controller EM7XXX or other EasyLogic 2-wire compatible devices

- If the smart demand controller is the last device on the daisy chain, terminate it with the terminator provided.
- See *RS-485 Communications Distances*, page 70 for the maximum daisy-chain communications distances for 2-wire devices.

The terminal's voltage and current ratings are compliant with the requirements of the EIA RS-485 communications standard.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Shield conductors may be energized if not properly connected.
- Shield wire should be installed per the device's installation instructions and grounded at one end only.

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

Power Factor register format

Power Factor register format

Each Power Factor (PF) value occupies one floating point register. The smart demand controller display and ION software interpret the register format in all reporting or data entry fields according to the Power (active, reactive, and apparent) Coordinate System Chart. The Power (active, reactive, and apparent) Coordinate System Chart uses the power factor register value to provide information on leading or lagging power factor and current, as well as energy delivered or received.

- Power Factor (PF): The ratio of Active (W) power to Apparent (kVA) power (i.e. kW/kVA).
- True PF: Includes harmonic content.
- Leading PF: Active and Reactive power flowing in opposite directions.
- Lagging PF: Active and Reactive power flowing in the same directions.

The Power (active, reactive, and apparent) Coordinate System chart quadrants are based on Active and Reactive power from the point of view of a utility. Whether or not a connected facility or substation is consuming or providing energy, it is assumed that the utility considers it the load.

Power Factor (PF) standards

Quadrant	IEC	IEEE
Quadrant 1	+	-
Quadrant 2	-	+
Quadrant 3	-	-
Quadrant 4	+	+

To determine power factor:

1. Get the register value.
2. Use the register value to determine in which quadrant the system is operating.
 - NOTE:** The Quadrant determines lead/lag for power factor and current.
3. Use the register value to determine the flow of Active power:
 - a. a positive value indicates Energy Delivered.
 - b. a negative value indicates Energy Received.
4. Use the register value to determine power factor:
 - a. if the register value is within -1 to +1, the register value is the power factor value.
 - b. if the register value is not within -1 to +1, the power factor value is derived differently for Energy Delivered/Forward and Energy Received/Reverse systems.

For example:

- Register value = 0.999: Apparent power is in Quadrant 1, current (I) is lagging, and energy is delivered by the utility to the customer with a lagging power factor of 0.999.
- Register value = -0.986: Apparent power is in Quadrant 3, current (I) is leading, and energy is received by the utility from the customer with a lagging power factor of 0.986.

Command interface

Command interface

The command interface allows you to configure the smart demand controller by sending specific commands using Modbus protocol. Reference the online Modbus register list for meter commands, results, and data types. For information on accessing the register list, see [Register list](#), page 66.

Command Interface

		Protected Command Interface	Unprotected Command Interface
	Command Block	Register #	Register #
A	Command	5000	5250
B	Semaphore	5001	5251 (Ignored)
C	Parameters	5002 - 5124	5252 - 5374
	Meter Results	Register #	Register #
D	Status	5125	5375
E	Result	5126	5376
F	Data	5127 - 5249	5377 - 5499

- **A.** In the **Command** register, enter a meter command.
- **B.** In the **Semaphore** register, when using the protected command interface, enter the semaphore you are given (see [Using the protected command interface](#), page 72). The semaphore register is not used with the unprotected command interface (see [Using the unprotected command interface](#), page 73).
- **C.** In the **Parameters** register, enter all parameters for a meter command.
- **D.** The **Status** register displays 0 when the smart demand controller receives a command. Once the command is completed, the status register displays the same value as the command register.
- **E.** The **Result** register indicates if the command was successful, and if not, what error may have occurred.
- **F.** The **Data** register displays the executed parameters of a successful command and the invalid parameters based on data type of an unsuccessful command.

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

Using the protected command interface

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

To get a semaphore, read the semaphore Modbus register (see the [Command interface](#), page 72 section of the online [Register list](#), page 66). The smart demand controller will return a 0 or a nonzero number.

- If 0 is returned, someone else owns the semaphore. You must wait for the semaphore to be available before sending a command.
- If a nonzero number is returned, you now own the semaphore. The semaphore is provided once until it is released or has been inactive for approximately 4 minutes. Once you have the semaphore, subsequent reads of the semaphore register will return 0 until you release the semaphore or it times out.

To send a meter command using the protected command interface:

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

Protected Command Block Example

Command Block	Register #
Command	2039
Semaphore	5
Parameters	1

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

Protected Meter Response Example

Meter Response	Register #
Status	2039
Result	0
Data	1

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

Using the unprotected command interface

The unprotected command interface allows you to issue a broadcast command to multiple meters at once. The unprotected command interface ignores the semaphore register.

Although some applications require the unprotected command interface, it is recommended that you use the protected command interface whenever possible.

To send a meter command using the unprotected command interface:

1. Build the packet to be written to the command block.
2. Write the packet as a Modbus block write (enter the command number, any number as the semaphore, and the parameters at the same time).

Unprotected Command Block Example

Command Block	Register #
Command	2039
Semaphore	—
Parameters	1

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

Unprotected Meter Response Example

Meter Response	Register #
Status	2039
Result	0
Data	1

Specification

Specification

Models and features

General	EM7230	EM7280	EM7290
Current accuracy (50 mA to 6 A)	± 1.0%	± 0.5%	± 0.5%
Voltage accuracy (110 or 415/480 V AC LL nominal)	± 1.0%	± 0.5%	± 0.5%
Energy and Power accuracy	± 1.0%	± 0.5%	± 0.2%
Instantaneous rms values			
Current (Average, Phases and neutral (calc))	✓	✓	✓
Voltage (Average, Ph-Ph, Ph-N)	✓	✓	✓
Frequency	✓	✓	✓
Unbalance (voltage and current)	✓	✓	✓
Percentage Load (I%)	✓	✓	✓
Phase angle	✓	✓	✓
Power values (total and phase-wise)			
Real	✓	✓	✓
Reactive	✓	✓	✓
Apparent	✓	✓	✓
Power Factor (Average)	✓	✓	✓
Energy Values			
Signed real and reactive energy and apparent energy	✓	✓	✓
Previous Energy Values			
Signed real and reactive energy and apparent energy	✓	✓	✓
Timers			
Run hrs, On hrs, Interruptions	✓	✓	✓
Previous Timers			
Run hrs, On hrs, Interruptions	✓	✓	✓
Demand Values			
Current, signed active, signed reactive, and apparent power (present, last, predictive, and max.) max. date and time	✓	✓	✓
Demand Period	✓	✓	✓
Demand Method	✓	✓	✓
DM Ctrl Parameter	✓	✓	✓
Pr.dm Interval	✓	✓	✓
Essential Load	✓	✓	✓
Dm Profile L0	✓	✓	✓
Dm Profile Step	✓	✓	✓
Demand UL	✓	✓	✓
Demand LL	✓	✓	✓
DM control	✓	✓	✓
Trip Status			

Models and features (Continued)

Shed, restore, dm > UL, pd dm > UL	✓	✓	✓
Demand Profile			
19 levels (kVA or kW or l)	✓	✓	✓
Power Quality Measurements			
Total Harmonic Distortion (current, voltage)	✓	✓	✓
Individual Harmonic (up to 31st level)	✓	✓	✓
Time of Use			
TOU	✓	✓	✓
Data Recording			
Min/Max (four levels)	✓	✓	✓
Demand	✓	✓	✓
Display and I/O			
Backlight LCD display	✓	✓	✓
Digital I/P	✓	✓	✓
Clock			
Real Time Clock (RTC)	✓	✓	✓
Communication			
RS-485 port	✓	✓	✓
Modbus protocol	✓	✓	✓
Snapshot			
Date	✓	✓	✓
Time	✓	✓	✓
Rate Counter			
Rate 1, Rate 2	✓	✓	✓

Technical specifications

Description	Specifications			
Sensing/Measurement	True RMS, one second update time, four quadrant power and energy			
Accuracy class	Parameter	EM7230	EM7280	EM7290
	Active Energy	Class 1.0 as per IEC 62052-11 and IEC 62053-21	Class 0.5S as per, IEC 62052-11 and IEC 62053-22 ¹ , Class 0.5 as per, IEC 61557-12 ²	Class 0.2 as per IEC 62052-11 and IEC 62053-22 ¹³
	Reactive Energy	Class 2.0 as per IEC 62052-11 and IEC 62053-23	Class 2.0 as per IEC 62052-11, IEC 62053-23 and IEC 61557-12 ²	Class 2.0 as per IEC 62052-11 and IEC 62053-23
	Active Power	± 1.0%	Class 0.5 ⁴	± 0.2%
	Reactive Power	± 2.0%	Class 1.0 ⁴	± 2.0%
	Apparent Power	± 1.0%	Class 0.5 ⁴	± 0.2%
	Current and Voltage	± 1.0%	Class 0.5 ⁴	± 0.5%
	Frequency	± 0.1%	Class 0.05 ⁴	± 0.1%
Auxiliary supply (control power)	AC: 90-277 V L-N ±10%			

- For 1A nominal CT, accuracy is applicable with an additional error of ± 1 % from 50 mA to 150 mA and ± 3 % from 10 mA to 50 mA.
- Power and Energy parameter accuracy at 240 V LN / 415 V LL system nominal.
- Class 0.2 S accuracy is applicable in 3P4W configuration with 5A CT nominal at 50 Hz, tested in accordance with the test methods and error limits given as per IEC 62052-11 and IEC 62053-22.
- This class parameter is defined as per the IEC 61557-12 standard.

Technical specifications (Continued)

	DC: 120-300 V ± 20%
Burden	Voltage and current input < 0.2 VA per phase Auxiliary supply (control power): Max 10 VA at 240 V AC; Max 4.5 W at 300 V DC
Display	Monochrome Graphics LCD Display: every 1 second Demand update: every 15 seconds Harmonic (%) update: every 5 seconds
Resolution	128x128 pixels
Input Voltage	Voltage inputs (V1, V2, V3, VN) 110/480 V AC LL nominal (range: 63.5-277 V AC LN; 110-480 V AC LL) Measurement Voltage range : 90 V to 480 V LL max 277 V LN
Input current	Current inputs (I1, I2, I3); 5 A Nominal current: 50 mA to 6 A (Starting current: 5 mA) 1 A Nominal current: 10 mA to 1.2 A (Starting current: 5 mA)
Frequency	50 /60 Hz ± 5%
Overload	10 A max continuous, 50 A @ 10 sec/hr, 500 A @ 1 sec/hr
Environmental	Operating temp: -10 °C to 60 °C (14 °F to 140 °F) (Operating Display functions to -5 °C (23 °F) with reduced performance) Storage temp: -25 °C to 70 °C (-3 °F to 158 °F) Humidity 5% to 95% non-condensing
Safety	Measurement category: CAT III Pollution Degree 2 <input checked="" type="checkbox"/> Double insulation at user-accessible area
Communication	RS-485 serial channel connection Industry standard Modbus RTU protocol Baud rate support: Minimum: 4800; Maximum: 38400; Default: 19200
IP Degree of Protection	Front display: IP 51 Meter body: IP 30 (except connectors)
Product Weight	380 g (approx.)
Dimensions W x H x D [protrusion from cabinet]	96 x 96 x 71.7 mm (depth of meter from housing mounting flange) [12.6 mm]
Standards and Certifications	<p>Certifications:</p>   <p>as per IEC/UL 61010-1 Edition-3</p>  <p>Standards:</p> <p>Emission: CISPR11 Class A; Fast Transient: IEC 61000-4-4** Surge withstand: IEC 61000-4-5** ESD: IEC 61000-4-2** Radiated Susceptibility: IEC 61000-4-3** Conducted susceptibility: IEC 61000-4-6**</p>

Technical specifications (Continued)

	Voltage dips and interruptions: IEC 61000-4-11**
Status Digital Inputs	Voltage Ratings: ON 18.5 to 36 V DC; OFF 0 to 4 V DC Input Resistance: 110 kΩ Maximum Frequency: 2 Hz, 50% duty cycle Response Time: 10 ms
Whetting Output	Nominal Voltage: 24 V DC Allowable Load: 8 mA
Control Output Relays	CAT II, 240 V AC/3 A; 24 V DC/2 A
Altitude	2000 m
Not suitable for wet locations	
Indoor use only	
NOTE: **As per IEC 61326-1.	

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