

Quick Start Guide

CTD7302



English
03/2017



Read and follow all the safety precautions and instructions before installing and working with this equipment.



- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. In the USA, see NFPA 70E.
- Only qualified electrical workers should install this equipment. Such work should be performed only after reading this entire set of instructions.
- If the equipment is not used in the manner specified by the manufacturer, the protection provided by the equipment may be impaired.
- NEVER work alone.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Turn off all power supplying the power meter and the equipment in which it is installed before working on it.
- Always use a properly rated voltage sensing device to confirm that all power is off.
- Before closing all covers and doors, 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.
- The successful operation of this equipment depends upon proper handling, installation, and operation. Neglecting fundamental installation requirements may lead to personal injury as well as damage to electrical equipment or other property.
- NEVER bypass external fusing.
- NEVER short the secondary of a PT.
- NEVER open circuit a CT; use the shorting block to short circuit the leads of the CT before removing the connection from the power meter.
- Before performing Dielectric (Hi-Pot) or Megger testing on any equipment in which the power meter is installed, disconnect all input and output wires to the power meter. High voltage testing may damage electronic components contained in the power meter.
- The power meter should be installed in a suitable electrical enclosure.
- RS-485 is safe to access up to 277 L-N / 480 L-L V only. If the voltage is above 277 L-N / 480 L-L V , then switch OFF the input voltage before handling the RS-485 terminal.

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

To download user manuals and other documentation, visit www.schneider-electric.co.in. Type the device model EM6400 in the search field.

The power meter ships in five different configurations.

EM6400 series power meter models and parameters

Parameter		EM 6459	EM 6433	EM 6434	EM 6436	EM 6400
RMS	V V1 V2 V3 V12 V23 V31	●			●	●
	A A1 A2 A3	●	●		●	●
	An Neutral Current	C				C
	F	●			●	●
	%Load	●				●
	%A Unbal %V UnbaU	●				●
	PF PF1 PF2 PF3	●		●	●	●
	%AFS Analog load bar	●	●	●	●	●
	RPM	●				●
	A° Phase Angle A°1 A°2 A°3	●				●
	W W1 W2 W3		⊙	●	⊙	●
	VA VA1 VA2 VA3		⊙	●	⊙	●
VAR VAR1 VAR2 VAR3			●		●	
DM	Demand VA/ W/ A					DM □
	Rising demand					
	Time remaining					
	MD Maximum demand					
	Hr MD occurred					
INTG Fwd	Wh		⊙	●	⊙	●
	VAh		⊙	●	⊙	●
	VARh			●		●
	-VARh			●		●
	Run hours		●	●	●	●
	ON hours	●	●	●	●	●
	INTR	●	●	●	●	●

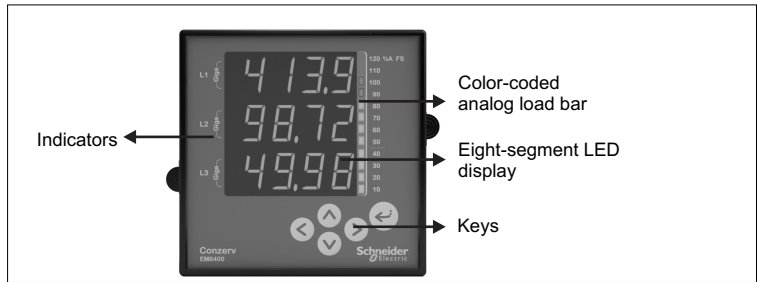
Parameter	EM 6459	EM 6433	EM 6434	EM 6436	EM 6400
INTG Rev	R.Wh				IE ☐
	R.VAh				
	R.VARh				
	-R.VARh				
	Run hours				
OLD Fwd	Wh	☒	☒	☒	☒
	VAh	☒	☒	☒	☒
	VARh		☒		☒
	-VARh		☒		☒
	Run hours		☒	☒	☒
OLD Rev	R.Wh				IE ☐
	R.VAh				
	R.VARh				
	-R.VARh				
	Run hours				

C = Only through communication

⊙ = User selectable VAh/Wh through setup mode (EM6436, EM6433)

- One (1) EM6400 series power meter
- One (1) quick start guide (QSG)
- One (1) test and calibration certificate for the power meter

Front Panel



Warning: avoid of this label in terminal block

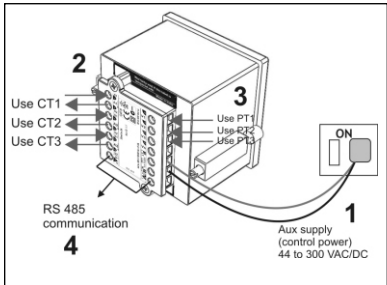
Input current terminals
A1, A2, A3

Input voltage terminals
V1, V2, V3, VN

Auxiliary supply
(control power) terminals

RS-485 communication
terminals

It is much easier to set up the power meter before you mount the power meter into the panel. This section explains you, how to set up the power meter before mounting.



1. Connect the auxiliary supply (control power) 44 to 300 VAC/DC to the terminals 12 and 13. Press and hold  for two seconds, while powering up the power meter. The display directly enters into PROG menu setup and displays **EDIT A.PRI 100.0**.

Refer to “Edit set parameters” for programming.

- **Program the following readings for accurate readings:**
- **A.PRI, A.SEC:** Set these values to match your CT primary and secondary values. For example, if your CT ratio is 200:5, set A.PRI = 200.0 and A.SEC = 5.000.
 - **V.PRI, V.SEC:** Set these values to your input voltage VLL of circuit, if your input voltage is < 600 VACLL. For example, if the input voltage is 300 VACLL, set V.PRI = 300.0 and V.SEC = 300.0.
- Use potential transformer (PT/VT), if the input voltage > 600 VACLL. Set the V.pri and V.sec values to match the primary and secondary of the PT(VT) respectively. For example, if PT(VT) ratio is 11 kV: 110, set V.pri = 11.00 k and V.sec = 110.0.
- Select one of the following systems according to your wiring configuration.
- SYS = Star for 4-phase 3-wire system
 - SYS = Delta for 3-phase 3-wire system
 - SYS = 2-phase for 2-phase 3-wire system
 - SYS = Single-phase for single-phase 2-wire system
2. Connect the current transformers (CTs).

+ve	-ve
7	14

Mechanical and Electrical Installation

	Insulation rating	Temperature rating	Current rating	Wire size
Voltage circuit	> 600 VAC	> 75 °C (167 °F)	> 0.1 A	1.5 - 2.5 mm ² (16 - 14 AWG)
Current circuit			> 7.5 A	1.5 - 2.5 mm ² (16 - 14 AWG)

NOTICE

DAMAGE TO THE DEVICE

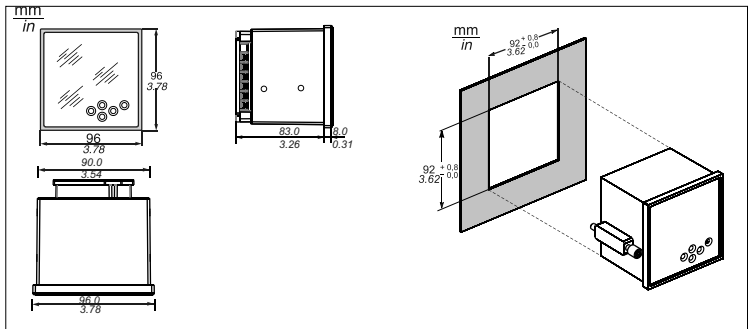
- Use only the specified tool for tightening and loosening the screw
- Do not over-torque the screw above the specified range

Failure to follow these instructions can result in equipment damage.

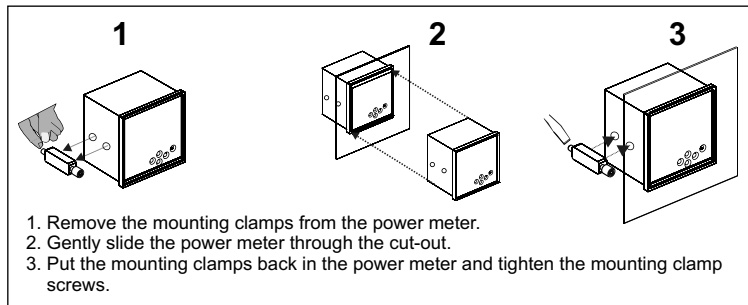
Driver	Torque driver preferred; may use hand screwdriver.
Tip	Phillips tip preferred, but you can also use flat. Do not use Pozidriv tip.
Screw head Diameter	3.5 mm (0.14 in.)
Shaft diameter	< 5 mm (0.2 in.). Diameter $\geq$ 5 mm (0.2 in.) will get stuck in the cover.
Torque	Tightening Torque: 0.25 to 1 N.m (2.21 to 8.85 lb-in) If the torque is more than 1 N.m (8.85 lb-in), then it may damage the screw or the screw head. Loosening Torque: 1.2 N.m

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

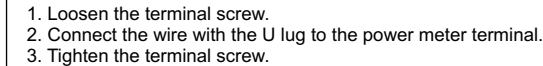
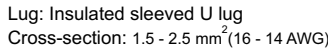
Power meter dimensions



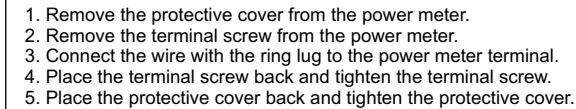
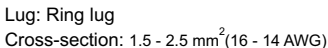
The diagram illustrates two 90-degree rotations of a square. On the left, a square is shown with a dashed line indicating a 90-degree clockwise rotation. The square contains diagonal hatching and four small circles. On the right, a square is shown with a dashed line indicating a 90-degree counter-clockwise rotation. The square contains a central circle and a vertical line of four small squares.



Terminal Connections using U Lugs



Terminal Connections using Ring Lugs



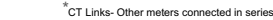
Supported System Types

Wiring Diagram Symbols

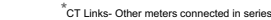
Wiring Diagrams

Wiring Diagrams

3-phase 4-wire star/bye connection



3-phase 3-wire delta connection



3-phase 3-wire open delta connection



2-phase 3-wire connection



Single-phase connection



Keys Description

Keys Operation

The following example explains how the different keys in the power meter operates.

The example explains, how to navigate from the **RMS** page to **VLN A F** page and back to **RMS** page, in EM6400 power meter.

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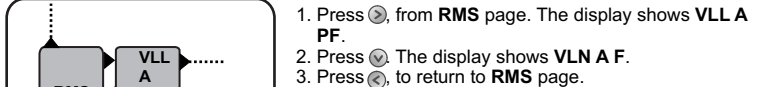
NOTE: The following symbols are used to explain the different operations of the keys.

- for right key operation.

◀ for left key operation.

▲ for up key operation.

▼ for down key operation.



1. Press , from **RMS** page. The display shows **VLL A PF**.
2. Press . The display shows **VLN A F**.
3. Press , to return to **RMS** page.

NOTE: Use to go forward to sub-parameter pages. Use to go back to main parameter pages. Use and  to scroll up and down through the display pages.

The PROG menu setup gives the complete list of user-programmable parameters.

- You must set up the power meter to match the application settings before use. Otherwise, readings will be wrong.
- All the setup parameters can be re-programmed, using SET. However, the following settings critically determine the scaling of the measured readings: SYS (star or delta), Vpri, Vsec, Apri, Asec.
- The scaling may be used to minimize the errors in reading due to Instrument Transformer errors. However, wrong settings will introduce errors in readings on other running systems.

You can enter PROG menu setup in

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

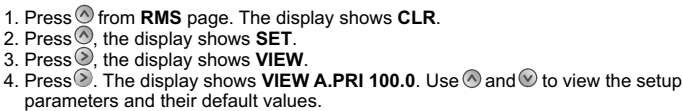
⚠ CAUTION

HAZARD OF UNINTENDED OPERATION

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

Failure to follow this instruction can result in injury or equipment damage.

Enter Setup Menu in View (Read-only) Mode



⋮ - Means blinking

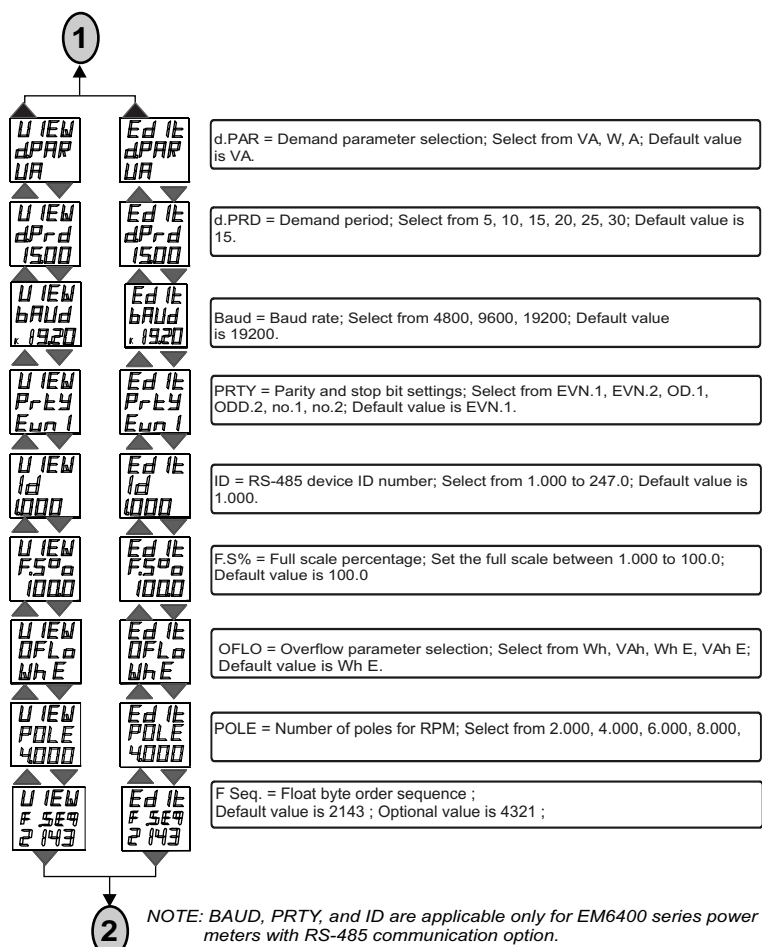
⋮1⋮ - Means blinking 1

1. Press  from **RMS** page. The display shows **CLR**.
2. Press . The display shows **CLR**.
3. Press . The display shows **VIEW**.
4. Press . The display shows **EDIT**.
CODE entry is required to edit the parameters.
5. Press  for two seconds. The display shows **CODE 2000** with blinking **2**.
The factory set CODE is 1000.
6. Press . The display shows **CODE 1000** with blinking **1**.
7. Press  once or  four times to accept the new CODE value.
The display flashes **PASS** and shows **EDIT A.PRI 100.0**. This indicates that you have successfully entered the setup menu in edit mode.

NOTE: If you enter a wrong **CODE**, the display flashes **FAIL** and shows **EDIT**. Repeat the steps and make sure that you enter the correct **CODE**.

Figure 1: Example of a 1000-bit address. The diagram shows a vertical stack of 1000-bit addresses, numbered 1 to 1000. Each address is represented by a box containing a 1000-bit address (e.g., 1000, 1000, 1000, 1000, 1000, 1000, 1000, 1000, 1000, 1000). To the right of each address box is a description of the address bits. The descriptions are:

- A.PRI = Current primary winding (CT); Input range 1 A to 99 kA. Default value is 100.0
- A.SEC = Current secondary winding (CT); Default value is 5.000
- V.PRI = Voltage primary winding (PT), line to line; Input range 100 V to 999 kV; Default value is 415.0
- V.SEC = Voltage secondary winding (PT), line to line; Input range 80 V to 600 V; Default value is 415.0
- SYS = System configuration; Select from StAR, dLTA, 2 ph, 1 ph; Default value is StAR
- LABL = Phase labeling; Select from 123, RYB, RST, PQR, ABC; Default value is 123
- VA.Fn = VA function selection; Select between 3D, ARTH; Default value is 3D
- d.SEL = Demand selection; Select from AUTO, User; Default value is AUTO



This section explains how you can edit the setup parameter A.PRI from 100.0 to 5000 in the EM6400 series power meter.

For better understanding, the editing is explained in two parts: Edit and accept setup, save new value to the setup.

Figure 1 illustrates the sequence of screen displays for the password change process. The sequence is as follows:

- SEEK VIEW
- CLP Ed 16
- CODE 2000
- RMS
- CODE 1000
- PASS
- Ed 16 APP 1000
- Ed 16 APP (1000)

Additional screens shown at the top are APP 5000 and APP 5000.

Arrows indicate the flow between screens. A dashed line with a circle containing '4' and the text 'Press four times' points from the 'PASS' screen to the 'Ed 16 APP 1000' screen.

Legend:

- Means blinking
- Means blinking 1

-
- Figure 1 illustrates the sequence of events for the 'SAVE' button in the 'Ed 10' application. The sequence consists of four screenshots showing the button being highlighted by a dashed line, followed by a solid line. The application window has a title bar 'Ed 10' and a menu bar with 'FILE', 'EDIT', and 'HELP'. The main area contains a text editor with the text 'APP' and 'SOUT'.

- NOTE: If you do not want to save the new value, press  to change **SAVE y** to SAVE n. Press . The display flashes FAIL and shows EDIT. Then proceed to step 3.

Diagram illustrating the sequence of screen displays for the 'SETUP' screen:

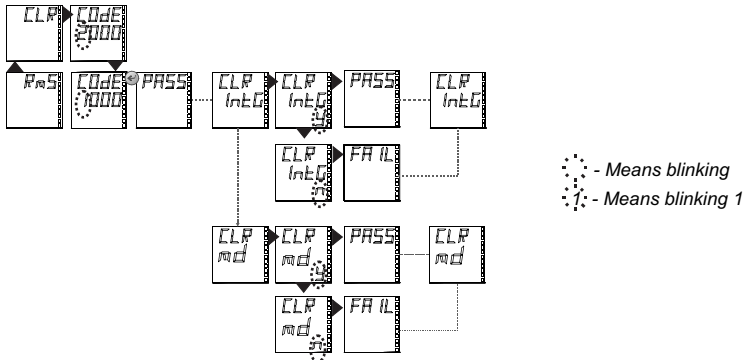
- SETUP VIEW
- CLAR Ed 12
- CODE 1000
- Rm5
- CODE PASS 1000
- Ed 12 APR 1000
- Ed 12 12 1000

Legend:

- ... - Means blinking
- 1 - Means blinking 1

- NOTE:** If you enter a wrong code, the display flashes **FAIL**, then displays **EDIT**. Repeat the procedure and make sure that you enter correct code.

- INTG clear - clears both INTG and MD
- MD clear - clears only MD (where MD is maximum demand)



1. From **RMS**, Press . The display shows **CLR**.
CODE entry is required to clear the **INTG** values.
2. Press or two seconds. The display shows **CODE 2000** with blinking **2**.
The factory set **CODE** is **1000**.
3. Press . The display shows **CODE 1000** with blinking **1**.
4. Press once or four times to accept the new value.
After the successful **CODE** entry, the display shows **CLR INTG**.
5. To clear **INTG**, press . The display shows **CLR INTG y** with blinking **y**.
6. Press or to clear **INTG**. The display flashes **PASS** and then **CLR INTG**.
7. Press . The display shows **CLR**.
8. Press to return to **RMS** page.

NOTE: If you do not want to clear the integrators, press ∇ to change the value from **CLR INTG y** to **CLR INTG n** in step 5. Then press $\leftarrow$ or $\rightarrow$. The display flashes **FAIL** and then shows **CLR INTG**. Proceed to step 7.

1. From **RMS**, Press . The display shows **CLR**.
CODE entry is required to clear the **MD** values.
2. Press or two seconds. The display shows **CODE 2000** with blinking **2**.
The factory set **CODE** is **1000**.
3. Press . The display shows **CODE 1000** with blinking **1**.
4. Press once or four times to accept the new value.
After the successful **CODE** entry, the display shows **CLR INTG**.
5. Press . The display shows **CLR MD**.
- 6 To clear **MD**, press . The display shows **CLR MD y** with blinking **y**.
7. Press or to clear **MD**. The display flashes **PASS** and then **CLR MD**.
8. Press . The display shows **CLR**.
9. Press to return to **RMS** page.

NOTE: If you do not want to clear the integrators, press to change the value from **CLR MD y** to **CLR MD n** in step 6. Then press or . The display flashes **FAIL** and then shows **CLR MD**. Proceed to step 8.

Your EM6400 series power meter is equipped with an energy integrator function which provides several parameters for Energy Management: VAh, Wh, VARh (Ind), -VARh (Cap), RUN.h (run hours), ON.h (on hours), INTR (Interruptions / outages). All the values stored in INTG are direct readings and have high resolution.

- **RUN.h:** Indicates the period the load is ON and has run. This counter accumulates as long as the load is ON.
- **ON.h:** Indicates the period for which the the power meter's auxiliary supply is ON, regardless of the Voltage and Current inputs.
- **INTR:** Number of supply outages, means the number of auxiliary supply interruptions. If power meter auxiliary supply is from a UPS then the INTR (number of interruptions) will be zero (as long as the UPS stays ON), even if the voltage signals die out from time to time.

- The energy values stored in INTG are based on $V.Pri \times A.Pri$; they are independent of secondary values of V and A.
- The energy value readings will overflow based on $V.Pri \times A.Pri$ of the primary settings in setup, when 9999 run hours is reached.
- The energy parameter for overflow is user selectable (Wh, VAh, Wh E or VAh E) through setup. By default it is Wh E.

- Wh (Integrator reset based on either Wh or Run hours whichever reach max value)
 - VAh (Integrator reset based on either VAh or Run hours whichever reach max value);
INTG clears when 9999 Run hours (almost 13.88 months)
 - VAh E (Integrator reset based on only VAh overflow)
 - Wh E (Integrator reset based on only Wh overflow)
- For power systems ranging from 1 VA to 1000 MVA, the integrator will overflow at 9999 run hours. The duration required for the integrator to overflow will be 13.88 months if the power meter is constantly running at full scale.
 - However, in case of power systems greater than 1000 MVA, the integrator will overflow at a value less than 9999 run hours. The duration required for the integrator to overflow will be less than a year if the meter is constantly running at full scale.

Power Ratio (1.732 x V.PRI x A.PRI)	Max Reading (Wh E/VAh E)	Max time (in months) to overflow at full scale
1 VA to 1000 VA	9999 K	13.88
1 kVA to 1000 kVA	9999 M	13.88
1 MVA to 1000 MVA	9999 G	13.88
>1000 MVA		< 1 year

- When the integrator is cleared (manually or due to overflow), the energy values stored in the integrator will be transferred to the OLD register.
- Thus the old energy values are not lost even after the integrator is cleared and can be viewed with the OLD parameter.

NOTE: For energy studies clear the Integrator at the end of each observation. This transfers all the stored energy values to the OLD register, where they are held while the Integrator begins accumulating data for the next observation. Remember that the next time the Integrator is cleared, the OLD values will be overwritten.

Features

Auto-scroll

- Auto-scroll allows you to view a group of display pages sequentially every five seconds without manual key operation.
- During auto-scroll, the power meter displays parameter name for one second and value for four seconds.
- The power meter has three different types of auto-scroll as explained below.

Auto-scroll within the Page Group

1. Go to a particular page in the desired page group.
2. Press  continuously for three seconds and release. The display flashes **AUTO** and starts auto-scroll within the page group.

Auto-scroll Down the Entire Column of Pages

1. Go to the desired page.
2. Press  continuously for three seconds and release. The display flashes **AUTO** and starts auto-scroll down the column of pages.

TURBO Auto-scroll

Press  continuously for three seconds and release. The display flashes **AUTO** and starts auto-scroll down the TURBO pages.

NOTE:

Press any key to revert to manual scrolling.
Auto scrolling is not possible in setup parameters.

Indicators

	Kilo: When lit, indicates that the reading is in Kilo (10 ³). 10,000 is displayed as 10.00 K and 1.0 K is displayed as 1000.
	Mega: When lit, indicates that the reading is in Mega (10 ⁶). 10,000 K is displayed as 10.00 M and 1.0 M is displayed as 1000 K.
	Giga: When both K and M are lit, indicates that the reading is in Giga (10 ⁹). 10,000 M is displayed as 10.00 G and 1.0 G is displayed as 1000 M.
	Negative: When lit, indicates that the reading is in negative as per IEEE 100 and industry standard. When power factor(PF) is lead (capacitive load): Both PF and VAR will be negative When current is reversed, W will be negative.

Default Display Page

The default display page feature enables you to select any display page as user-set display page. You can scroll to other pages, when the default display page is active. The default display page will be displayed two minutes after you stop the manual key operation.

To LOCK default display page:

Go to the desired page you want to set as default display page.
Press  and  together. The display shows **LOCK** and the display page is locked.

To unlock default display page:

Once the default display page is active, press  and  together.
The display shows ULOC and the default display page is unlocked.

NOTE:

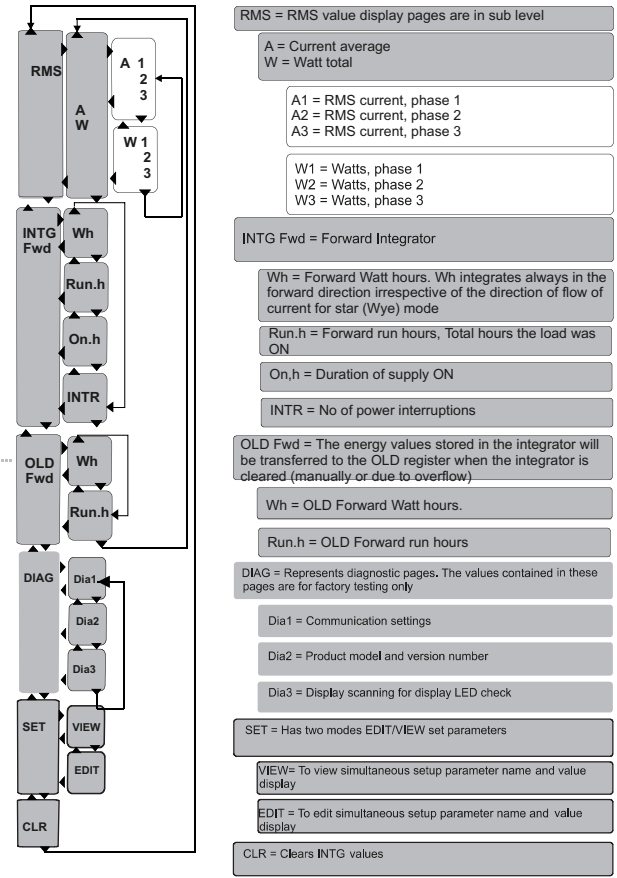
Entry to PROG menu setup is possible only when the default display page is unlocked.

Default display page through communication:

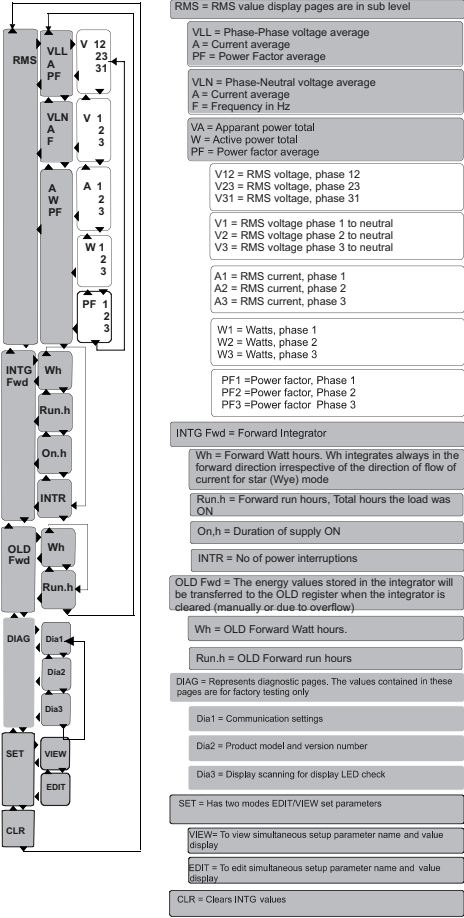
- ! You can lock and unlock the default display page through communication (ION Setup).
- ! If an operator locks the default display page through communication, any user can unlock it from the front panel.
- ! If a supervisor locks the default display page through communication, an operator cannot unlock it. Only a supervisor can unlock it through communication.

Menu Hierarchies

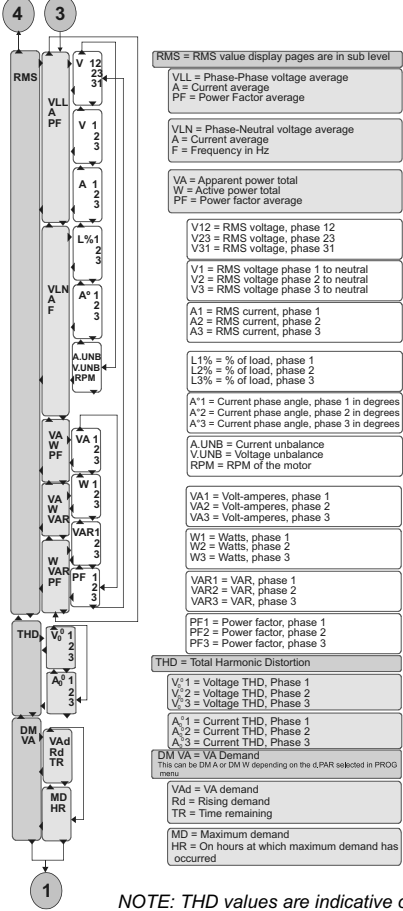
EM6433: Menu Hierarchy



EM6436: Menu Hierarchy

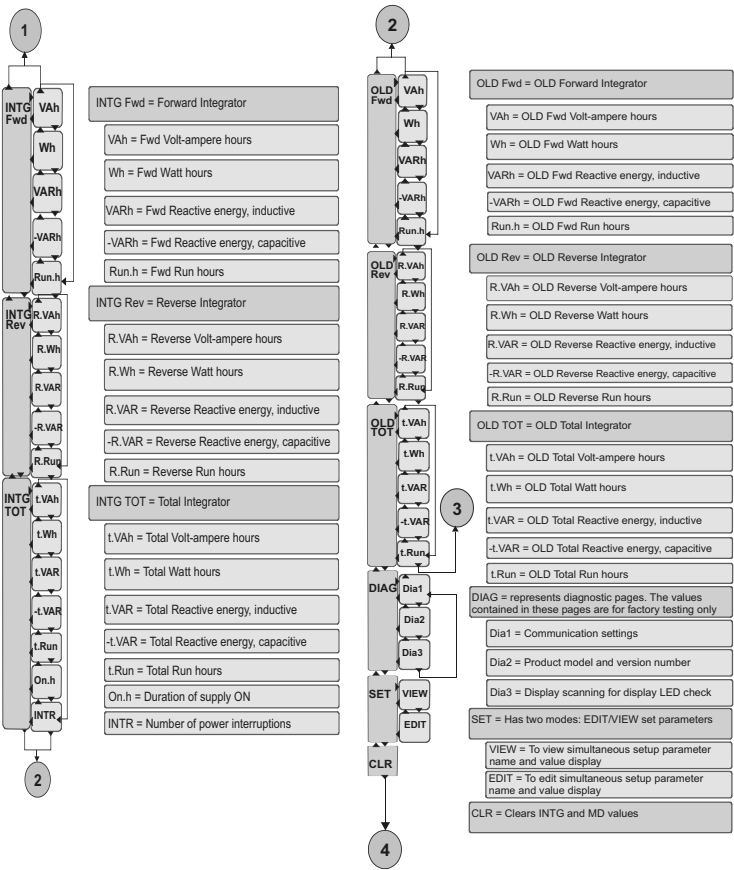


EM6400: Menu Hierarchy



NOTE: THD values are indicative only

EM6400: Menu Hierarchy (Continued)



Technical Specifications

Description	Specification
Sensing/measurement	True RMS, one second update time, four quadrant power and energy
Accuracy	Class 1.0 as per IEC 62052-11 and IEC 62053-21; Class 0.5S (optional) as per IEC 62052-11, IEC 62053-22 Class 0.2*(optional)
Auxiliary supply (control power)**	44 to 300 VAC/DC, CAT III 50/60 Hz
Input voltage	Four voltage inputs (V1, V2, V3, VN) IEC: 80 to 480 V-LL (50 to 277 V-LN) CAT III 80 to 600 V-LL (50 to 350 V-LN) CAT II UL: 80 to 600 V-LL
Input current*** (energy measurement)	Current inputs(A1, A2, A3); 5 A Class 1.0/0.5S: 5 mA (starting) to 6 A 5 A Class 0.5S/0.2: 5 mA (starting) to 6 A 1 A Class 0.5S/0.2: 1 mA (starting) to 1.2 A
Frequency	45 to 65 Hz
Burden	Voltage and current input < 0.2 VA per phase Auxiliary supply (control power) < 3 VA at 240 V, 5 VA Max < 2 W at 300 V DC
Overload	5 A meter: 10 A max continuous, 50 A for 5 sec/hr, 120 A for 1 sec/hr 1 A meter: 2 A max continuous, 10 A for 5 sec/hr, 24 A for 1 sec/hr
Display and resolution	Alphanumeric LED display; RMS: Four digits; INTG: Eight digits
Standards	CAT III - Measurement category III, Pollution degree 2  - Double insulation at user-accessible area
Communication (optional)	RS-485 serial channel connection industry standard Modbus RTU protocol
Environmental	Operating temperature: -10 °C to 60 °C (14 °F to 140 °F) Storage temperature: -25 °C to 70 °C (-13 °F to 158 °F) Humidity 5 % to 95 % non-condensing Altitude: ≤ 2000m
Weight	400 gms approx, unpacked 500 gms approx, shipping
IP degree of protection	Front display: IP 51 Meter body: IP 40 Excluding terminals

NOTE: Universal CT range is applicable for Class 1 & Class 0.5 meters where CT secondary of 1 A or 5 A is field-programmable. For Class 0.5S & Class 0.2 meters, CT secondary rating (1 A or 5 A) should be specified while ordering.

* Class 0.2 is applicable when the voltage (line-neutral) is above 120 V.

** Auxiliary voltage should not exceed 300 V AC/DC
*** Additional error of 0.05% of full scale, for dual energy meter input current below 100mA for 5A and below 20mA for 1A.

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Toll Free Help desk Number:
1800 425 4272, 1800 103 0011
www.schneider-electric.co.in

Electrical equipment should be installed,
operated, serviced, and maintained
only by qualified personnel.
No responsibility is assumed by
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