

EM1000/EM1200/EM1220 Power and Energy Meter
Quick Start Guide
C60000243-09



Safety Precautions

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

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- 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 energy 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.
- When removing or installing panels, do not allow them to extend into the energized bus.
- The successful operation of this equipment depends upon proper handling, installation, and operation. Neglecting fundamental installation requirements may lead to personal injury as well as damage to electrical equipment or other property.
- NEVER bypass external fusing.
- NEVER short the secondary of a PT.
- NEVER open circuit a CT; use the shorting block to short circuit the leads of the CT before removing the connection from the energy meter.
- Before performing Dielectric (Hi-Pot) or Megger testing on any equipment in which the energy meter is installed, disconnect all input and output wires to the energy meter. High voltage testing may damage electronic components contained in the energy meter.
- The energy meter should be installed in a suitable electrical enclosure.

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

Additional Resources

To download user manuals and other documentation, visit www.se.com/in. Type the device model (For e.g., EM1220) in the search field.

Introduction
Models and Parameters

The power and energy meter ships in three different configurations.

Parameter		EM1000	EM1200	EM1220
RMS	VLL - V12 V23 V31 VLN - V1 V2 V3			•
	A A1 A2 A3			•
	F			•
	PF PF1 PF2 PF3	•	•	•
	W W1 W2 W3 / VA VA1 VA2 VA3 / VAR VAR1 VAR2 VAR3	•	•	•
INTG & OLD	KWh / KVAh / KVARh	•	•	•
	Run.h	•	•	•
	On.h	•	•	•
	INTR	•	•	•
POP		•		
RS-485 communication			•	•
Class 0.5 Accuracy		□	□	□
Class 1.0 Accuracy		□	□	□

NOTE: • Standard □ Option specified while ordering

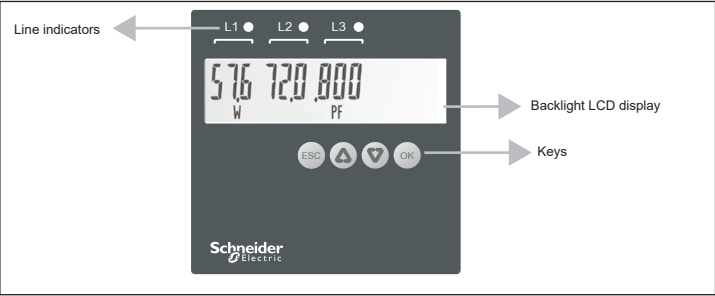
The power/energy parameters are user-programmable. Only one power related parameter will be available at a time in the meter.

Box Contents

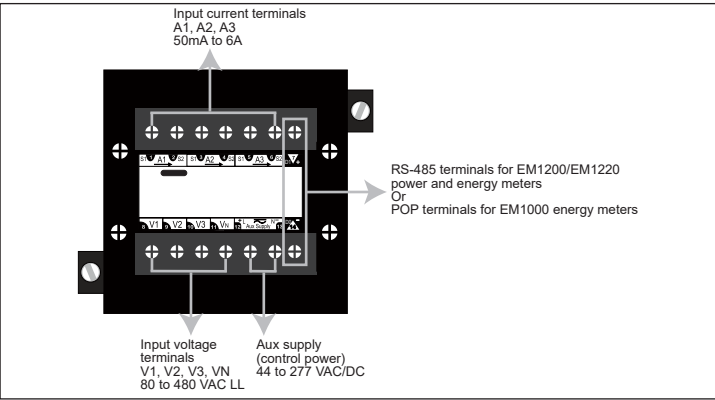
- One (1) EM1000/EM1200/EM1220 power and energy meter.
- One (1) quick start guide (QSG).
- One (1) test and calibration certificate for the power and energy meter.

Power and Energy Meter Physical Description

Front Panel



Rear Panel



Installation

Connecting Cable Recommendations

	Current rating	Wire size	Temperature Rating	Insulation rating
Voltage circuit	> 0.1 A	0.82 - 3.31 mm ² (18 - 12 AWG)	> 75 °C (167 °F)	> 600 VAC
Current circuit	> 7.5 A	2.08 - 3.31 mm ² (14 - 12 AWG)		
Auxiliary supply (control power)	> 0.1 A	0.82 - 3.31 mm ² (18 - 12 AWG)		
RS-485	—	0.33 - 3.31 mm ² (22 - 12 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.

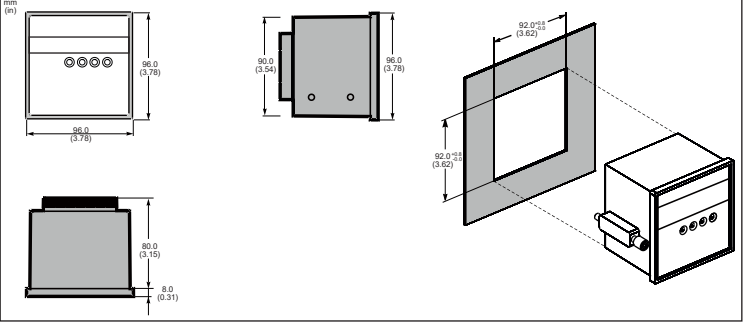
Tools and Equipment Requirements

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 □ 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

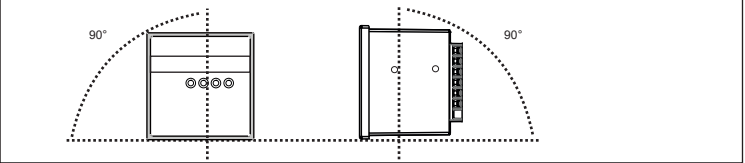
NOTE: Installation should include a disconnecting device, like a switch or circuit breaker, with clear ON/OFF markings, to turn-off the auxiliary supply (control power). The disconnecting device should be within the reach of the equipment and the operator.

Dimensions and Mounting

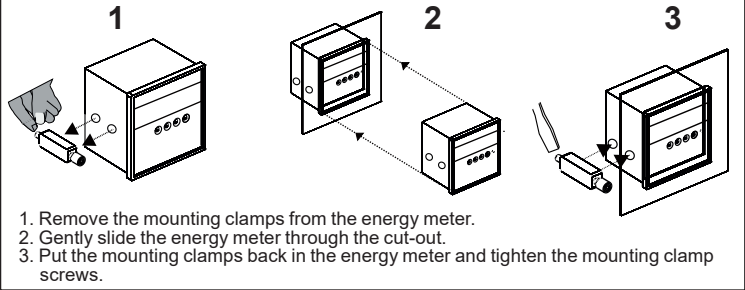
Dimensions



Mounting angle



Mounting



Wiring

Supported System Types

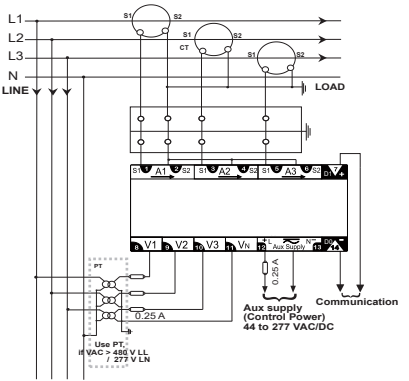
System type	Meter configuration
Star/Wye	StAr
Delta, open delta	dLTA
2-phase	2 ph
Single-phase	1 ph

Wiring Diagram Symbols

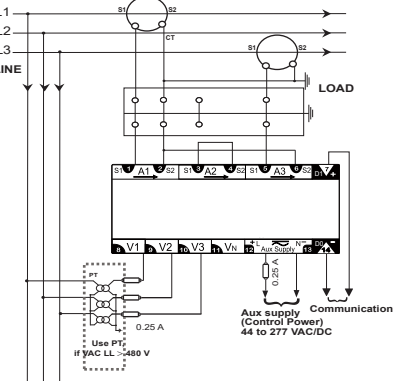
Symbol	Description
	Fuse (Slow blow)
	Current transformer (CT)
	Potential transformer (PT)

Wiring Diagrams

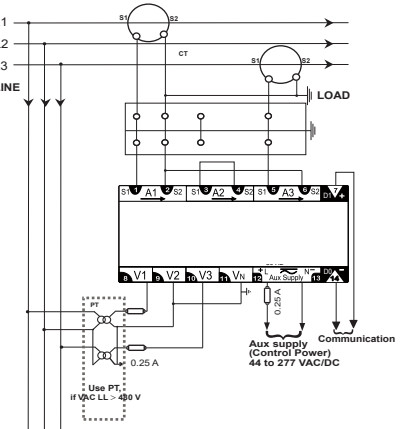
3-phase 4-wire star/wye connection

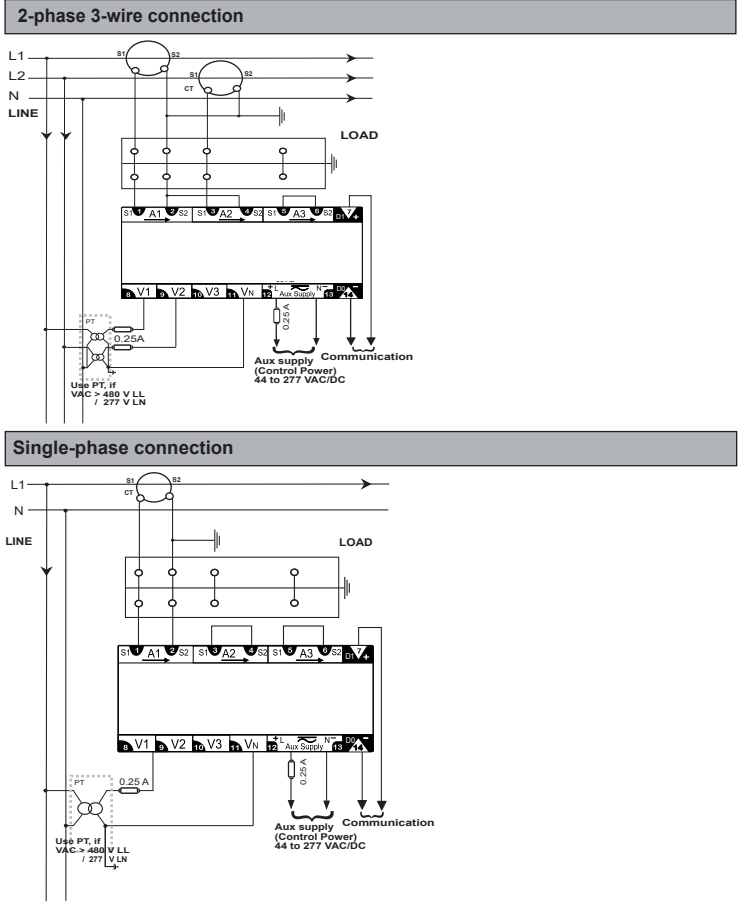


3-phase 3-wire delta connection



3-phase 3-wire open delta connection





Keys and Operation

Keys Description

The EM1000/EM1200/EM1220 power and energy meter has four keys. The keys and their descriptions are explained in the following table :

Keys and Description

	OK key: To navigate forward to the sub-parameter pages.
	ESC key: To navigate back to the main parameter pages.
	Up Key: Used to scroll up through the display pages of same level, within the same function. In Set mode, used to increase the value by one.
	Down Key: Used to scroll down through the display pages of same level, within the same function. In Set mode, used to decrease the value by one.

NOTE: The following symbols are used to represent the different keys operations.
▶/← - OK operation.

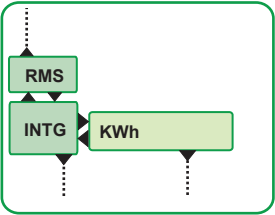
◀/▶ - ESC operation.

▲/▼ - Up/Down operation.

▼/▲ - Down/Up operation.

Keys Operation

The following example explains how to navigate from the **RMS** page to the **KWh** display page and back to the **RMS** page.



1. Press ▼ from **RMS**. The display shows **INTG** page.
2. Press ▶ from **INTG**. The display shows **KWh**.
3. Press ▶ to return to **INTG** page.
4. Press ▲ to return to **RMS** page.

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

PROG Menu – Setup

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

- You must set up the power and energy 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 provided by 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.

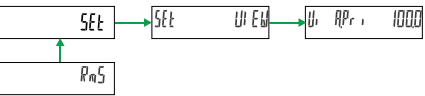
CAUTION

HAZARD OF UNINTENDED OPERATION

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

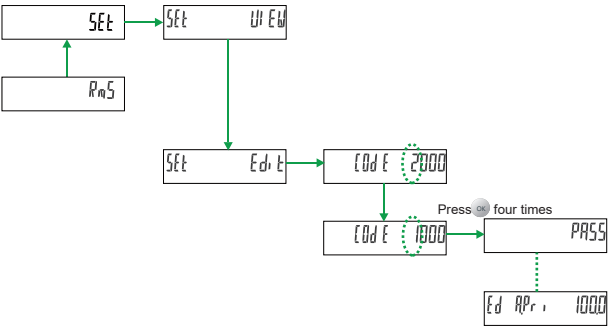
Failure to follow this instruction can result in injury or equipment damage.

Enter Setup Menu in View Mode



1. Press ▲ from **RMS**. The display shows **SET**.
2. Press ▶. The display shows **SET VIEW**.
3. Press ▶. The display shows **VI A.PRI 100.0**. Use ▲ and ▼ to view the setup parameters and their default values.

Enter Setup Menu in Edit Mode



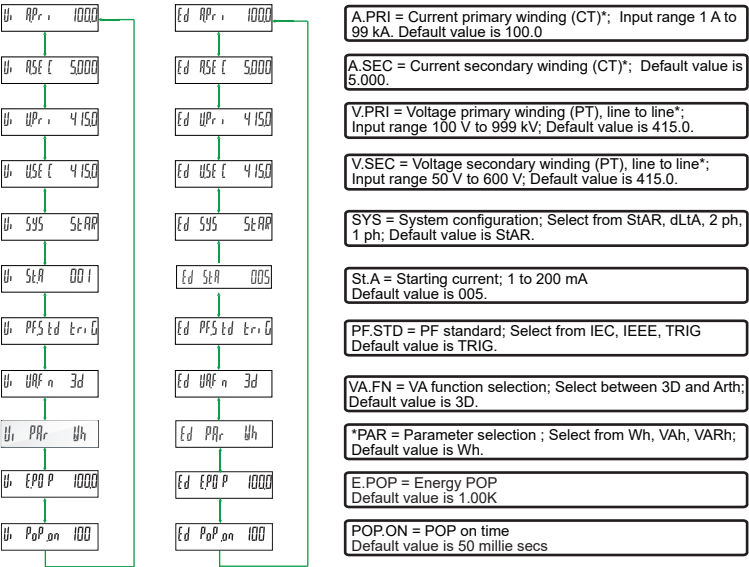
NOTE:
◊ - Means blinking.
2 - Means 2 is blinking.

1. Press ▲ from **RMS**. The display shows **SET**.
2. Press ▶. The display shows **SET VIEW**.
3. Press ▼. The display shows **SET EDIT**. You are required to enter **CODE** to enter into setup in Edit mode.
4. Press ▶. The display shows **CODE 2000** with blinking **2**. The factory set CODE is 1000.
5. Press ▼. The display shows **CODE 1000** with blinking **1**.
6. Press ▶ four times. The display flashes **PASS** and then **Ed A.PRI 100.0**.

This indicates that you have successfully entered the setup menu in edit mode.

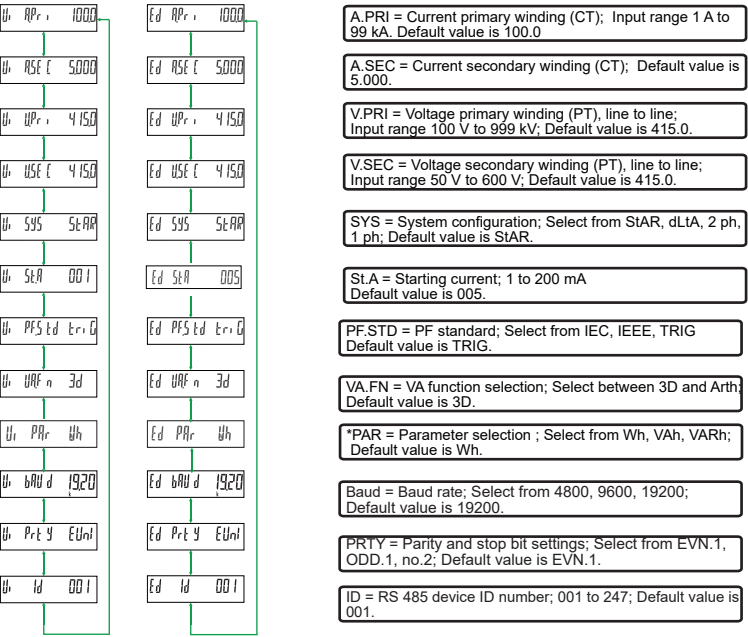
NOTE: If you enter a wrong **CODE**, the display flashes **FAIL** and then shows **SET EDIT**. Repeat the steps and make sure that you enter the correct **CODE**.

Setup Parameters in View and Edit Modes (EM1000)



NOTE:
• *Parameters such as Wh, VAh, and VARh are User selectable.
• If a parameter is changed in setup, the integrator will get reset. The following integrators will be reset:
- VA h/ Wh/ VAR h
- Run.h
- On.h
- No. of INTR

Setup Parameters in View and Edit Modes (EM1200/EM1220)

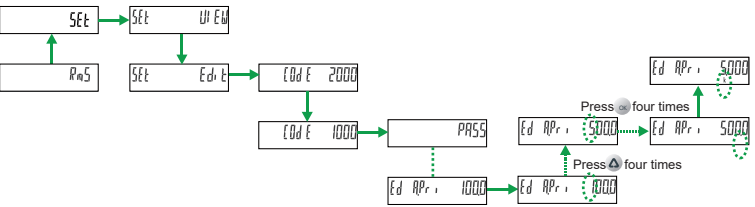


NOTE:
• *Parameters such as Wh, VAh, and VARh are User selectable.
• If a parameter is changed in setup, the integrator will get reset. The following integrators will be reset:
- VA h/ Wh/ VAR h
- Run.h
- On.h
- No. of INTR

Edit Set Parameters

This section explains how to edit the setup parameter **A.PRI** from **100.0** to **5000** in the EM1000/EM1200/EM1220 power and energy meter. For better understanding, the editing is explained in two parts: Edit and Accept Setup, Save New Value to the Setup.

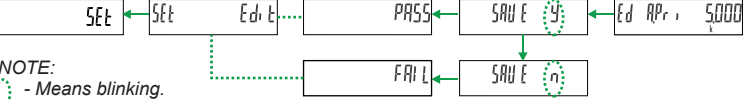
Edit and Accept Setup



NOTE:
◊ - Means blinking.
2 - Means 2 is blinking.

1. After you have successfully entered the setup in Edit mode (See "Enter Setup Menu in Edit Mode" for more information), press ▶. The display shows **ED A.PRI 100.0** with blinking **1**.
2. Press ▲ four times. The display shows **ED A.PRI 500.0** with blinking **5**.
3. Press ▶ four times. The display shows **ED A.PRI 500.0** with blinking ".".
4. Press ▲ once. The display shows **ED A.PRI 5.000** with blinking "." and **k** indicator. The value **5000** is represented as **5.00** with **k** indicator. See "Indicators" on page 3 for more information.
5. Press ▶. The new value is accepted.

Save New Value to the Setup

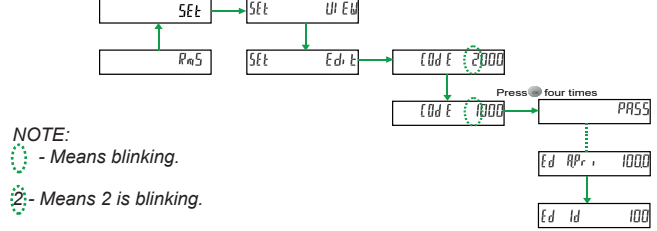


NOTE:
◊ - Means blinking.
y - Means y is blinking.

1. After you edit and accept the parameter as previously described, press ▶. The display shows **SAVE y** with blinking **y**.
2. Press ▶. The display flashes **PASS** and shows **SET EDIT**.
3. Press ▶. The display shows **SET**.

NOTE:
1.If you do not want to save the new value, press ▼ to change **SAVE y** to **SAVE n** in step 1. Press ▶. The display flashes **FAIL** and shows **SET EDIT**. Proceed to step 3.
2.If you want to go back to the **ED A.PRI 5.000** page from **SAVE y** in step 1, then press ▶.

Edit ID

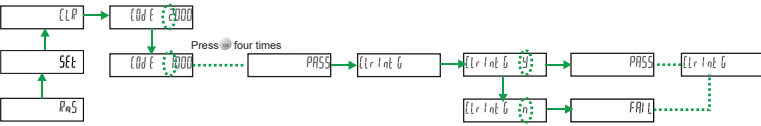


NOTE:
◊ - Means blinking.
2 - Means 2 is blinking.

1. Press ▲ from **RMS**. The display shows **SET**.
2. Press ▶. The display shows **SET VIEW**.
3. Press ▼. The display shows **SET EDIT**.
4. Press ▶.
5. You are required to enter CODE to enter into setup in Edit mode.
6. Press ▶. The display shows **CODE 2000** with blinking **2**. The factory set CODE is **1000**.
7. Press ▼. The display shows **CODE 1000** with blinking **1**.
8. Press ▶ four times. The display flashes **PASS** and then **Ed A.PRI 100.0**.
9. Press ▲. The display shows **ED ID 001**.
10. To edit the values, press ▶ and set the values as required.
11. Press ▶, the display shows **SAVE y** with blinking **y**.
12. Press ▶. The display flashes **PASS** and shows **SET EDIT**.

CLR INTG

The EM1000/EM1200/EM1220 power and energy meters are equipped with an energy integrator INTG where the energy parameters are accumulated.



NOTE:
- Means blinking.
- Means y is blinking.

- 1. Press CLR from RMS page. The display shows SET.
- 2. Press DEL. The display shows CLR.
- You are required to enter CODE to clear the INTG values.
- 2. Press 2. The display shows 2000 with blinking 2. The factory set CODE is 1000.
- 3. Press 1. The display shows 1000 with blinking 1.
- 4. Press OK four times to accept the new CODE value. The display flashes PASS and then shows CLR INTG.
- 5. Press CLR. The display shows CLR INTG y with blinking y.
- 6. Press CLR to clear the INTG values. The display flashes PASS and then shows CLR INTG.
- 7. Press ESC. The display shows CLR.
- 8. Press DEL twice. The display shows RMS.

NOTE: If you do not want to clear the INTG, press 1 to change the value from CLR INTG y to CLR INTG n in step 5. Press OK. The display flashes FAIL and then shows CLR INTG. Proceed to step 7.

Energy Integrator INTG, OLD, Overflow

Energy Integrator INTG

Your EM1000/EM1200/EM1220 power and energy meter is equipped with an energy integrator function which provides several parameters for Energy Management: VAh, Wh, VARh, RUN.h, ON.h, INTR. All the values stored in INTG are direct readings and have high resolution.

- A few of these need explanation:
- **RUN.h:** Indicates the period the load is ON and has run. This counter gets accumulated as long as the load is ON.
 - **ON.h:** The period for which the input voltage is ON.
 - **INTR:** The number of input voltage interruptions or input voltage outages.

Integrator Overflow

- The energy values stored in INTG are based on V.Pri x A.Pri; they are independent of secondary values of V and A.
- The energy value readings will overflow based on V.Pri x A.Pri of the primary settings in setup.
- The energy parameter is user selectable (Wh, VARh or VAh) through setup. By default it is Wh.

Integrator Overflow

V.PRI x A.PRI x 1.732	Max Reading (Wh/VAh/VARh)	Minimum time to overflow at full scale (in months)
< 1000 k	9999999.0 k	13.88
< 1000 M	9999999.0 M	13.88
< 1000 G	9999999.000 G	13.88

OLD Data Register

- 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. When the integrator is cleared next time, the OLD values will be overwritten.

kVA Measurement

EM1000/EM1200/EM1220 power and energy meter has two different kVA measurements **3D** and **arithmetic**. These are available in the setup parameter **VA.FN** and can be edited upon entering the **SET**.

- **3D measurement (factory-set):** Advanced method which provides most accurate and predictable measurement under unbalanced as well as distorted waveform conditions.
- **Arithmetic measurement:** Used when the energy meter needs to match the readings of the older or simpler meters.

kVA measurement selection

kVA function	Formula	Other names	Which one?
3D	$kVA_{3D} = \sqrt{\bar{A}^2 \bar{W}^2 + \bar{A}^2 \bar{VAR}^2 + \bar{A}^2 \bar{D}^2}$ where D = Distortion power per IEEE 100	U, Apparent vector kVA	Best all around
Arth	$kVA_{Arth} = kVA_1 + kVA_2 + kVA_3$	Arithmetic scalar kVA	Good under low unbalance, to match simple meters without 3D capability

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 meter displays parameter name and value for four seconds.
- Auto-scroll is possible only within the page groups. i.e., the parameters within the page groups like RMS or INTG or DIAG will be auto-scrolled sequentially.
- The following table explains the auto-scroll operation in RMS parameter pages in EM1000/EM1200/EM1220 power and energy meter.

Auto-scroll

Step	Perform	Output
1	Press CLR from RMS.	The display shows W PF or A VLL PF(For EM1220)
2	Press and hold DEL or 1 for three seconds.	The display flashes AUTO and scrolls through the RMS parameter 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). The value 1000 is displayed as 1.00 K and 10,000 is displayed as 10.0 K.
	Mega: When lit, indicates that the reading is in Mega (10^6). The value 1000 k is displayed as 1.00 M and 10,000 K is displayed as 10.0 M.
	Giga: When both K and M are lit, indicates that the reading is in Giga (10^9). The value 1000 M is displayed as 1.00 G and 10,000 M is displayed as 10.0 G.
	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.

Energy Readings

Energy Reading, 3-Phase	Range	As shown in the Display
Active(Wh) / Apparent(VAh) / Reactive(VARh)	00001.0000 to 9999999.00 K	000 0 10 000 to 999 999 900 k
	10000.0000 to 9999999.00 M	100 000 000 to 999 999 900 M
	10000.0000 to 9999999.00 G	100 000 000 to 999 999 900 Hk

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:

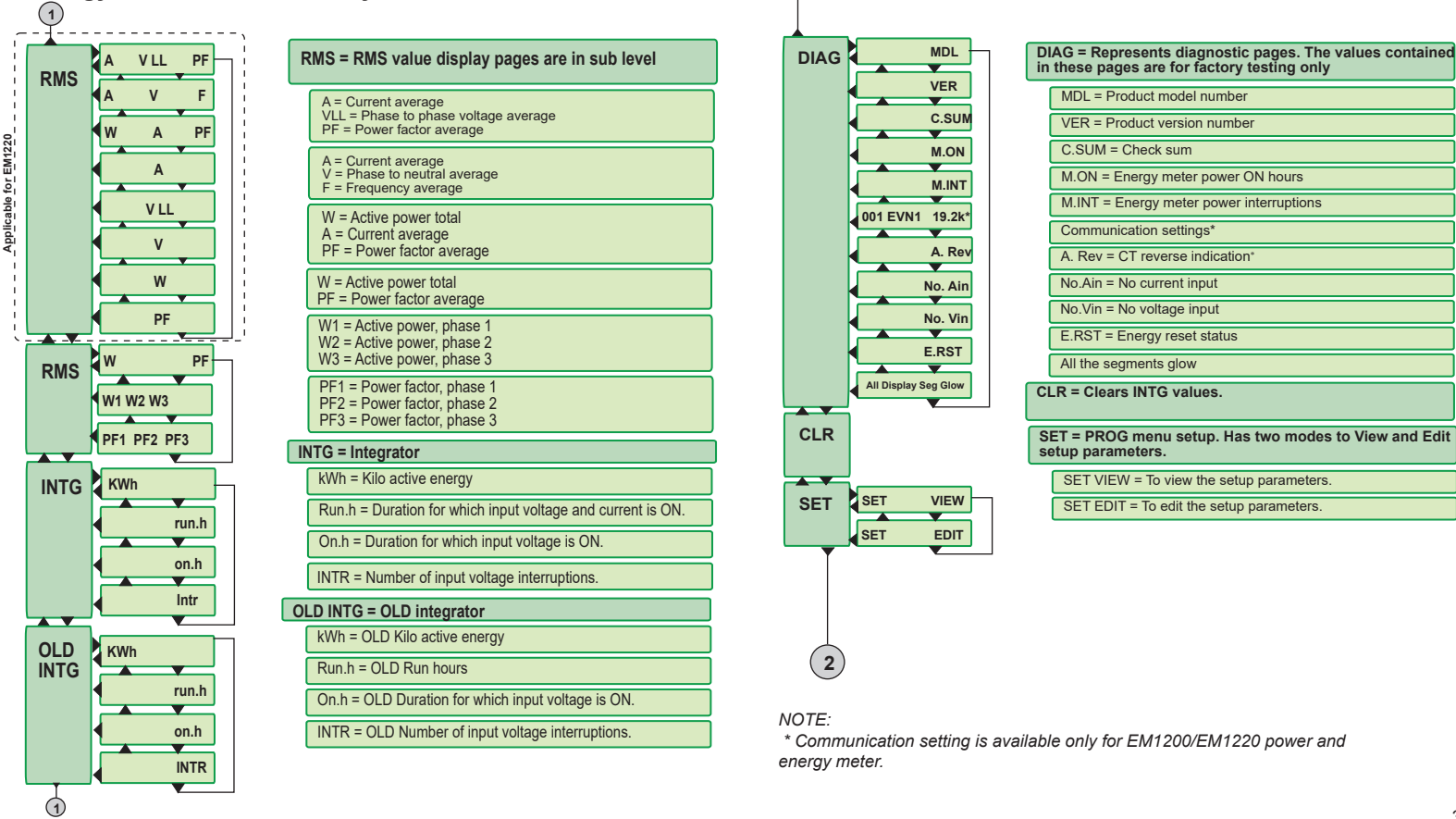
Go to the desired page you want to set as default display page. Press DEL and 1 together until the display shows LOCK and the display page is locked.

To unlock default display page:

Once the default display page is active, press DEL and 1 together until the display shows UN LOCK and the default display page is unlocked.

NOTE:
Entry to SET EDIT and CLR is possible only when the default display page is unlocked.

EM1000/EM1200/EM1220 Series Power and Energy Meter Menu Hierarchy



NOTE:
* Communication setting is available only for EM1200/EM1220 power and energy meter.

Technical Specifications

Description		Specification		
Sensing/measurement		True RMS, two quadrant power and energy, one second update time.		
Measurement Accuracy (3 Phase)		Applicable for	Accuracy % of Full Scale	
	Voltage LN and LL per phase and average	EM1220	CL 1.0	CL 0.5 ¹
	Amp per phase ² and average		±1.0%	±0.5%
	Frequency		±1.0%	±0.5%
	Active power (kW) & Active energy (kWh)	EM1220 EM1200 EM1000	±0.2%	±0.2%
	Apparent power (kVA)& Apparent energy (kVAh)		±1.0%	±0.5%
	Reactive power (kVAR) & Reactive energy (kVARh)		±1.0%	±0.5%
	Power Factor		±2.0%	±1.0%
			±0.05 (5 count)	
Auxiliary supply (control power)		AC: 44 to 277 V LN ~ 50/60Hz ±5% DC: 44 to 277 V		
Input voltage		Three voltage inputs (V1, V2, V3) 110 or 415 VLL nominal (operating range 80 to 480 VLL) ~ 50/60Hz ± 5%		
Input current (energy measurement)		50 mA to 6 A (5 mA starting current) ~ 50/60Hz ±5%		
Burden		Voltage and current input < 0.2 VA per phase Auxiliary supply (control power): • AC burden: < 4 VA at 277 V LN • DC burden: < 2 W at 277 V DC		
Overload		10 A max continuous		
Display and resolution		Backlight LCD display; Resolution: RMS Three digits (phase wise, average values); Energy Nine digits.		
Safety		CAT III - Measurement Pollution degree 2 ☐ - Double Insulation at user-accessible area		
Communication (EM1200/EM1220)		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		≤ 2000 m		
Weight		400 gms approx, unpacked 500 gms approx, shipping		
IP degree of protection		Front display: IP 51 Meter body: IP 40 (excluding terminals)		
EM1000/EM1200/EM1220 conform to		Emission : CISPR11 class A; ESD: IEC 61000-4-2 ³ ; Fast Transient: IEC 61000-4-4 ³ ; Surge withstand: IEC 61000-4-5 ³ ; Impulse voltage: IEC 60060-1;		

¹ For 1-Ph and 2-Ph system configuration, accuracy is applicable with additional error of ± 0.5%

² In delta system configuration, the accuracy for ampere per phase would be ± 1.0%

³ As per IEC 61326-1

Notices

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. Electrical equipment should be installed, operated, serviced and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material. A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

Schneider Electric and EasyLogic are trademark or registered trademark of Schneider Electric in France, the USA and other countries.

- This product must be installed, connected and used in compliance with prevailing standards and/or installation regulations.
- If this product is used in a manner not specified by the manufacturer, the protection provided by the product may be impaired.
- The safety of any system incorporating this product is the responsibility of the assembler/installer of the system.
- As standards, specifications and designs change from time to time, always ask for confirmation of the information given in this publication.

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