INSTALLATION INSTRUCTIONS

EMX-IP True RMS Energy Meter With Traditional 0.333V or Rogo CTs BACnetIP/Modbus TCP

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DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Failure to follow these instructions may cause serious injury or death

- Do not use this product for life safety applications.
- Do not install this product in hazardous or classified locations.
- Only qualified trade installers should install, program, maintain and test system incorporated therein. Installer is responsible for compliance of all applicable codes.
- Read, understand, and follow instructions thoroughly.
- The Standard CTs associated with this product must be mounted inside a suitable fire and electrical enclosure. For safe electrical work practices, see NFPA 70E in the USA or applicable local standards and codes.
- Replace all doors, covers, and protective devices before powering the equipment.
- Product may use multiple voltage/power sources. Disconnect ALL sources before servicing.
- Use a properly rated voltage sensing device to confirm that power is off. DO NOT depend on this product for voltage indication.
- The installer is responsible for conformance to all applicable codes.
- For use with Listed Energy Monitoring Current Transformers.
- Use Copper Conductors Only
- Per IEC 61010-1 section 8.2.2 "impact test", this product tested with energy of 2J (reduced from 5J) code: IK07

WARNING

Failure to follow these instructions may cause injury, death or equipment damage.

- If product is used in a manner not specified by the manufacturer, the protection provided by the product may be impaired. No responsibility is assumed by the manufacturer for any consequences arising out of the use of this material.

LIMITATION OF LIABILITY

Senva's liability, whether in contract, in tort, under any warranty, in negligence or otherwise shall not exceed the amount of the purchase price paid by the purchaser for the product. Under no circumstances shall Senva be liable for special or consequential damages.

FEATURES

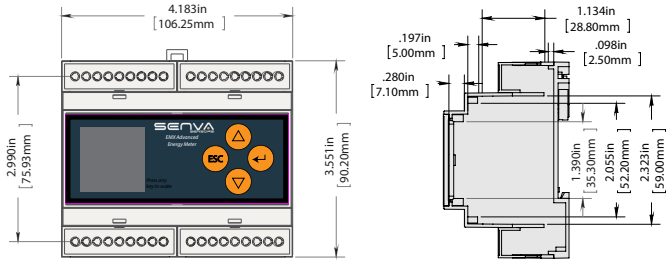
The Senva EMX-IP True RMS Energy Meter is a 3 channel True RMS energy meter featuring a color OLED display as well as an easy-connect, intuitive web interface for simple commissioning and monitoring. The EMX-IP meets ANSI C12.20 Class 0.2 Standards. The EMX-IP supports both BACnet IP and Modbus TCP protocols and also includes 2 pulse inputs for external utility metering.

The EMX-IP supports metering CTs with either a 0.333V voltage output or di/dt signal (Rogo). The EMX-IP is a class 2 low voltage device for mounting flexibility. See *Specifications* section for recommended conductor gauge and terminal tightening torque.

MOUNTING

The Senva EMX-IP Advanced Energy Meter is suitable for installation on T35 DIN rail. Simply place unit approximately centered over the mounted DIN rail and press upward until the bottom clicks into place. Using a flat-nose screwdriver, pull top tab and apply pressure downward until unit is flush and release the tab. See Dimensions section for details.

DIMENSIONS

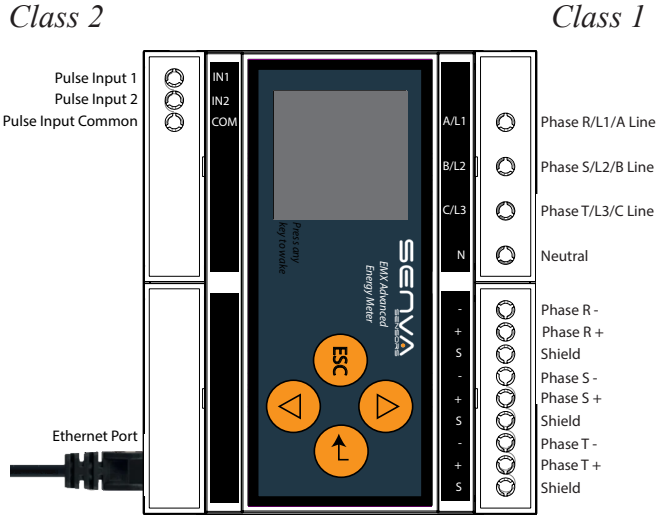


WIRING

EMX-IP Wiring

Using Traditional metering CTs please wire according to the following diagram.

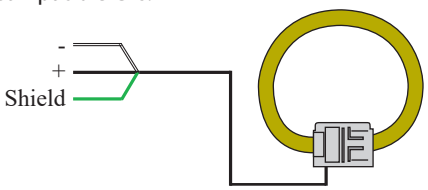
Wiring for connections labeled "Class 2" shall be permanently separated from those labeled "Class 1" by a minimum of 6 mm by means of clamping, routing, or equivalent means.



WIRING (CONT.)

Typical Metering CT Wiring

A compatible metering CT has either a 0.333V voltage output or di/dt signal. All channels must use the same type of CT. The wiring shown below corresponds to a Senva Metering CT and may not represent the coloring for all compatible CTs.



WARNING: To reduce the risk of electric shock, always open or disconnect circuit from power distribution system (or service) or building before installing or servicing current transformers.

Current transformers are not suitable for Class 2 wiring methods and not intended for connection to Class 2 equipment.

Field installed current transformers can be installed in panel boards or switch gear enclosures and shall be installed according to the following:
1. Always open or disconnect circuit from power-distribution system (or service) of building before installing or servicing current transformers.
2. The current transformers may not be installed in equipment where they exceed 75 percent of the wiring space of any cross-sectional area within the equipment.
3. Restrict installation of current transformer in an area where it would block ventilation openings.
4. Restrict installation of current transformer in an area of breaker arc venting.
5. Secure current transformer and route conductors so that they do not directly contact livsoue terminals or bus.

Voltage Wiring

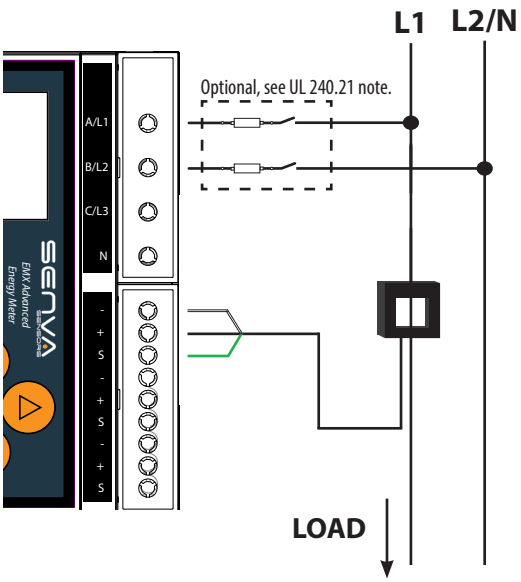
NFPA 70 (NEC) 240.21 code permits qualified installers to forgo use of a disconnect device (fuses or circuit breakers) when connecting the voltage reference of the CT, as long as the tap does not exceed 10 feet and complies with additional guidelines regarding ampacity rating, enclosure spacing and point of connection. It is the responsibility of the installer to ensure the system meets the requirements of the NEC 240.21 code.

If the installation does not conform with the NEC 240.21 code or the voltage reference must be extended beyond 10 feet, proper use of over current protection is required (i.e., fusing or circuit breakers.)

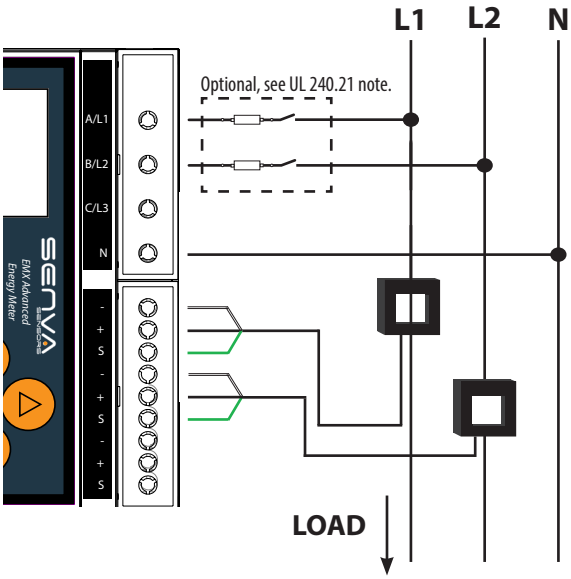
In the U.S. and Canada, disconnecting fuse holders or circuit breakers can be used. Place this device in close proximity to the CT and within easy reach of the operator, and mark it as the disconnecting method. The disconnect shall meet the relevant requirements of IEC 60947-1 and IEC 60947-3 and shall be suitable for the application. Provide over-current protection and disconnecting method for supply conductors with approved current limiting devices suitable for protecting the wiring.

WIRING DIAGRAMS

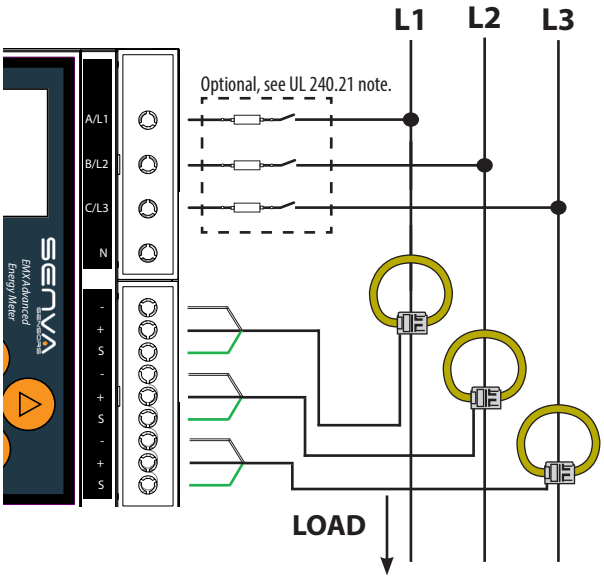
1Ø 2-WIRE 120 to 600VAC



Split Phase 120 to 600VAC

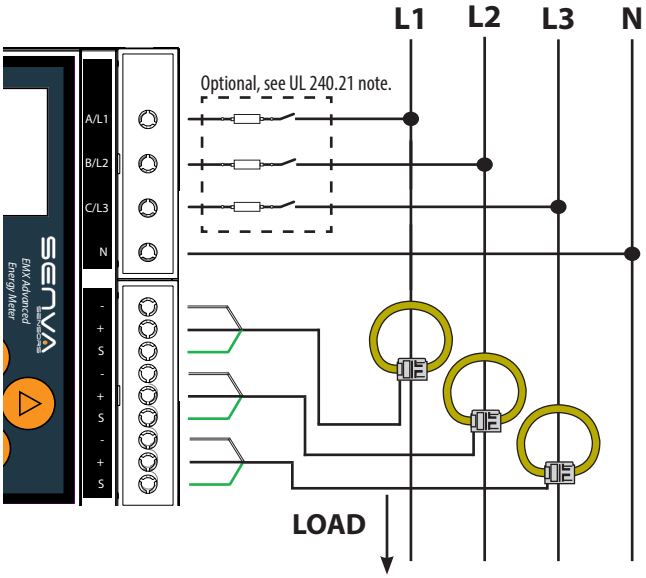


3Ø 3-WIRE 120 to 600VAC



WIRING DIAGRAMS (CONT.)

3Ø 4-WIRE 120 to 600VAC



OPERATION

Once power is applied to the unit, the OLED screen will display the summary screen for a single load meter. To review more system measurements, the up and down arrows will cycle between the summary page, power readings, amperage readings, and voltage readings.

Wiring Config:
To set up the meter for the correct circuit, press the enter button to enter the Metering Menu. The connection type 3-phase ABCN or ABC and 1-phase ABN or AB must be selected via menu, this must correspond to the wiring method used. Press enter to confirm the circuit selection.

Current element selection:
The second required item in the metering menu is the current element selection. The options are CT and Rogowski Coil. Please select the option that matches the installed current element and press enter to confirm.

THE EMX-IP ONLY ACCEPTS 0.333V AND ROGOWSKI DI/DT CURRENT TRANSFORMERS.

Current scale:
The third required item in the metering menu is the current scale. The units for this field are Amps per 0.333 volt. If a 0.333 volt CT is used this is should be set to the primary side current of the CT. Rogowski Coils are typically rated as XX mV/1000A, this value must be converted before being programmed in. The conversion is Current scale = (1000A / XX mV) * 333mV. For example a Rogowski coil rated as 120mv/kA would use a current scale of (1000 / 120) * 333 = 2775.

OPERATION (CONT.)

Communications Setup
The EMX-IP is designed to easily connect to an existing communication network. Device defaults having a dynamic IP but can be configured for a static IP via the webUI. To see the IP addresses, press the enter button and scroll down to access the *Communication Menu*. Here you can see the following:

1. IPv4 IP Address
2. IPv6 Local IP Address
3. IPv6 Global IP Address

Alarm Menu
If any alarm is present, a red exclamation mark will appear in the top right corner of the OLED. At any time during normal operation, user may scroll to the alarm menu to view active or previous alarm conditions. See Troubleshooting section for diagnostics.

TROUBLESHOOTING

Problem	Corrective Action
Negative power	Verify CT orientation toward load.
Phase loss	Check all phase voltages and current.
Low power factor (PF)	Sensor is reading PF<0.5. If not low PF, ensure voltage legs match with CTs.
Freq out of range	Frequency is below the minimum 45Hz or above the maximum 65Hz.
Voltage out of Range	Ensure system voltage does not exceed 600VAC.
Current out of range	Replace with a larger amperage rated CT.
Neutral current out of range	Ensure desired voltages are being monitored.
Frequency deviation	Verify the settings for the nominal frequency and the threshold in the alarm menu.
Voltage phase loss	No dected voltage on one of more phases.
Real time clock error	RTC is unresponsive or may need the battery replaced.

If code is not shown in table above, please contact Senva technical support@senvainc.com or (866) 660-8864

BACnet/Modbus Quick Reference

The following section outlines some commonly utilized Modbus registers and BACnet objects for quick reference. For a complete list and description of each, please see the associated protocol guides: *EMX-IP BACnet Protocol Guide* or *EMX-IP Modbus Protocol Guide*.

Description	BACnet Object	Modbus Register	Unit
L-N Average RMS Voltage	AI1	1	Vrms
L-L Average RMS Voltage	AI2	2	Vrms
Average RMS Current	AI3	3	Arms
Total Real Power	AI5	5	W
Total Reactive Power	AI6	6	VAR
Total Apparent Power	AI7	7	VA
Total Real Energy	AI8	45-48	kWh
R/S/T Phase RMS Voltage	AI11/12/13	8/9/10	$Vrms_{LN}$
RS/ST/TR Line RMS Voltage	AI14/15/16	11/12/13	$Vrms_{LL}$
R/S/T Phase RMS Current	AI17/18/19	14/15/16	Arms
R/S/T Phase Power Factor	AI20/21/22	17/18/19	PF
R/S/T Phase Real Power	AI24/25/26	21/22/23	W
R/S/T Phase Real Energy	AI33/34/35	49-52/53-56/57-60	kWh
Pulse Input 1	AI47	41-42	#
Pulse Input 2	AI48	43-44	#

Supported Modbus Functions:

0x03 Read Holding Registers
0x04 Read Input Register
0x06 Write Single Register
0x10 Write multiple Registers

SPECIFICATION

Power Supply Input	
Line/High Voltage Model	90-600VLL (+20%), 50/60Hz, 1-3 phase
Power Consumption	4W Typical
Frequency Range	50/60 Hz
Ethernet	
Connection	RJ45
Protocol	BACnetIP, Modbus TCP
Ethernet Speeds Supported	10M/100M Base-T
Wiring Requirements	
Conductor Gauge	12-24 AWG; Power terminals: 12-18 AWG
Terminal Torque Rating	0.37 ft-lb (0.50 N•m)
Pulse Inputs	
Input Rating	7 ± 0.5 VDC, short circuit current is <5mA max
Pulse Active	<10 kOhms
Pulse Undefined	10-30 kOhms
Pulse Idle	>30 kOhms
Pulse Length	Accepts Pulses >10ms
Service Types	
Configurations	1Ph, 2Ph, 3Ph Wye (4-Wire), 3Ph Delta (3-Wire)
Voltages	90VL-N through 600VL-L
Frequency	45-65 Hz
Measurement	CAT III
Performance	
Meter Accuracy	0.2% (ANSI C12.20 Class 0.2 standards), True RMS
Harmonic Resolution	≥4kHz, 34th Harmonic (50/60 Hz)
State	Meets WA State Clean Building Bill
System Accuracy[1]	1% for V, A, kW, kVAR, kVA
Operating Environment	
Operating Temperature	-4 to 158ºF (-20 to 70ºC)
Storage Temperature	-4 to 185ºF (-20 to 70ºC)
Humidity	0-95% non-condensing
Environmental Rating	IP20
EMX Meter Enclosure	
Material	Polycarbonate/ABS
Dimensions	3.55"h x 4.18"w x 2.26"d
Compliance	
Agency	UL Listed, cUL Listed, File E489498
Standards	RoHS, IEEE 802.3

[1] System accuracy of 1% is with Senva's CTs and Rogowski Coils.

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