# Multilin™
# EPM 7000
## POWER QUALITY METER

## Power Quality and Energy Cost Management

## KEY BENEFITS

- Four Quadrant Energy and Power Measurement, complying with ANSI C12.20 (0.2% Accuracy)
- Analyze power quality over long periods of time to improve network reliability through high resolution event and disturbance recording
- Ideal for monitoring industrial power centers, data centers and hospitals due to high accuracy disturbance recording (up to 512 samples/cycle)
- Retrieve archived data, capture past events and analyze disturbances through high resolution data recording (up to 4MB of data logging)
- Flexible communication options provide easy to access meter values, simplified configuration and seamless integration into new or existing automation systems

## APPLICATIONS

- Four quadrant energy and power monitoring of distribution feeders, transformers, reactors and generators
- Power monitoring of LV and MV industrial power control centers and motor control centers
- Energy monitoring of commercial and distribution utilities

## FEATURES

### Metering
- Meets ANSI C 12.20 and IEC 687 (0.2% Accuracy)
- Ia Ib Ic In
- Va Vb Vc Vab Vbc Vca
- Hz W VAR VA
- Wh VARh VAh
- Demand: W VAR VA
- Power Factor
- Voltage and Current Angles
- Load Bar

### Power Quality
- Harmonics to the 40th order
- Total Harmonic Distortion
- Disturbance Recording and Waveform Capture
- Sag and Swell

### Data Logging
- Up to 4 MB Memory
- Disturbance Recording
- Power Quality Studies
- Load Studies

### Communications
- Standard RS485 Modbus (DNP 3.0 and Modbus RTU or ASCII)
- Optional Ethernet 100BaseT
- IrDA Port
- Intuitive faceplate programming

### Software
- Embedded Web Server
- GE Communicator
- EnerVista™ Integrator
- EnerVista™ Launchpad

imagination at work

## Overview

The EPM 7000 meter provides revenue class (0.2%) three phase power metering with optional Ethernet, relay, status, and analog output communication modules. This flexible meter can be used for a wide range of high accuracy applications including disturbance recording and power quality studies.

EPM 7000 can easily be mounted in a panel for generator monitoring, substation automation, power quality studies, data recording and more. The meter can also provide data to RTUs, PLCs and other control devices.

The EPM 7000 is a highly accurate meter providing 0.1% accuracy for Voltage and Current. The unit's real-time clock provides time stamping of all logs as they are created. Up to 4 MB of data can be logged for analysis of historical trends, limit alarms, I/O changes power quality recording and sequence of events.

## Metering

The following electrical parameters are measured and remotely accessed from the EPM 7000.

### Universal Voltage and Current Inputs

This meter allows voltage input measurements 20 Volts to 576 Volts Line to Neutral and up to 721 Volts Line to Line. This ensures proper meter safety when wiring directly to high voltage systems. The unit will perform to specification on 69 Volt, 120 Volt, 230 Volt, 277 Volt and 347 Volt power systems.

### Unique Current Input Connections

EPM 7000 meter uses two current input wiring methods.

- Method One - CT pass through.
  Directly pass the CT through the meter without any physical termination on the meter. This insures that the meter cannot be a point of failure on the CT circuit. This is preferable to utility users when sharing relay class CTs. No Burden is added to the secondary CT circuit.

- Method Two - Current "Gills."
  The meter additionally provides ultra-rugged termination pass through bars allowing the CT leads to be terminated on the meter. This also eliminates any possible point of failure at the meter. This method is also a preferred technique for ensuring relay class CT integrity does not get compromised. No terminal blocks are required and this stud based design ensures that CTs will not open under a fault condition.
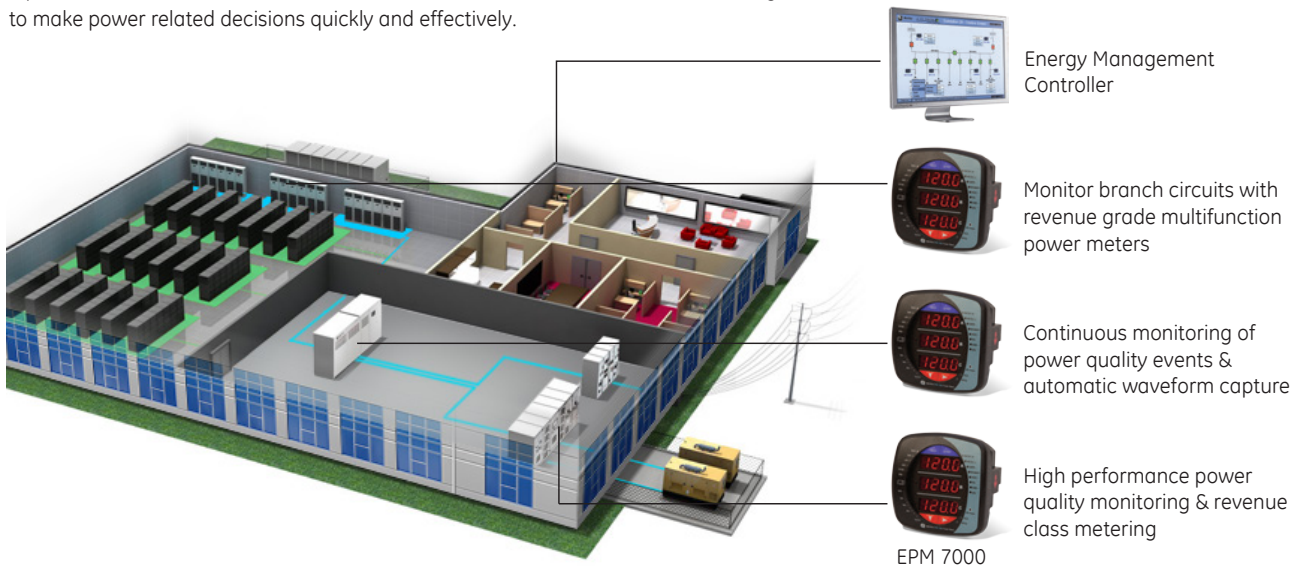
Through an optional high speed Modbus communications interface, the meter can also provide data to RTUs, PLCs and other control devices at Baud rates ranging from 9600 baud to 57.6 kbaud.

### Solid Construction with Mounting Versatility

The EPM 7000 has a rugged design for harsh environment. This is especially important in power generation, utility substation, and critical user applications. The structural and electrical design of this meter was developed based on the recommendations and approvals of many of our utility customers.

## Multifunction Metering & Power Quality Monitoring

The EPM 7000 can provide a total picture usage and power quality as different points within a power distribution network on critical infrastructure such as data centers, allowing users to make power related decisions quickly and effectively.



Energy Management Controller

Monitor branch circuits with revenue grade multifunction power meters

Continuous monitoring of power quality events & automatic waveform capture

High performance power quality monitoring & revenue class metering

EPM 7000

EPM 7000 can easily be mounted in a panel for generator monitoring, substation automation and more. The unique dual design combines ANSI and DIN mounting structure and allows easy installation for both new metering applications and retrofit of existing analog meters.
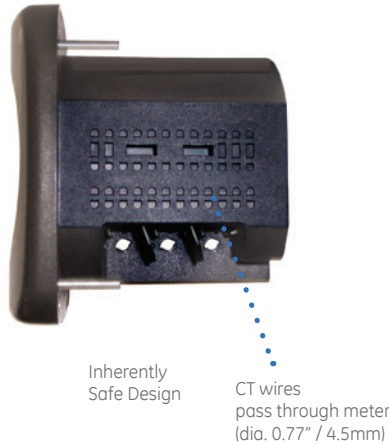
The unit mounts directly in an ANSI C39.1 (4" Round form) or an IEC 92 mm DIN square form.
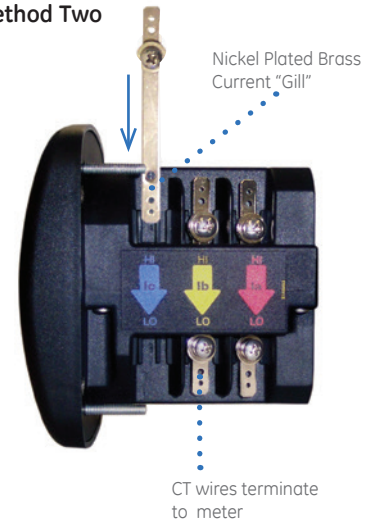
### Future Upgrade Packs

The EPM 7000 is equipped with a virtual firmware based switch that allows feature upgrades through communications even after installation. This allows you to optimize your metering investment. Begin with a standard meter and upgrade it with more functionality as new features are needed, such as data-logging, waveform capture or more memory.

## Current Input Connections

**Method One**

**Method Two**

Nickel Plated Brass Current "Gill"

Inherently Safe Design

CT wires pass through meter (dia. 0.77" / 4.5mm)

CT wires terminate to meter

## Software Options

| Software Option | Measured Values | Real-Time | Avg | Max | Min |
|---|---|:---:|:---:|:---:|:---:|
| A | Voltage L-N | • | | • | • |
| | Voltage L-L | • | | • | • |
| | Current Per Phase | • | • | • | • |
| | Current Neutral | • | | | |
| | % of Load Bar | • | | | |
| | Voltage Angles | • | | | |
| | Current Angles | • | | | |
| | Watts | • | • | • | • |
| | VAR | • | • | • | • |
| | VA | • | • | • | • |
| | PF | • | • | • | • |
| | Frequency | • | | • | • |
| | +Watt-hr | • | | | |
| | -Watt-hr | • | | | |
| | Watt-hr Net | • | | | |
| | +VAR-hr | • | | | |
| | -VAR-hr | • | | | |
| | VAR-hr Net | • | | | |
| | VA-hr | • | | | |
| B  The above plus data-logging | 2 MB Data-Logging | • | | | |
| C  The above plus Harmonic Analysis | Harmonic Analysis | • | | | |
| D  The above plus Limit and Control | Limit and Control Functions | • | | | |
| E  The above plus Waveform Capture | Waveform Capture at 64 samples/cycle | • | | | |
| | 3 MB total Data-Logging | • | | | |
| F  The above plus Waveform Capture and Additional Memory | Waveform Capture at 512 samples/cycle | • | | | |
| | 4 MB total Data-Logging | • | | | |

## Waveform Options

| Software Option | Samples per cycle | Pre Event Cycles | Post Event Cycles | Max Waveform per Event | Number of Stored Events |
|---|---|---|---|---|---|
| E | 16 | 32 | 96 | 256 | 85 |
| | 32 | 16 | 48 | 128 | 85 |
| | 64 | 8 | 24 | 64 | 85 |
| F | 128 | 4 | 12 | 32 | 170 |
| | 256 | 2 | 6 | 16 | 170 |
| | 512 | 1 | 3 | 8 | 170 |

## Power Quality

The EPM7000 can record voltage sag, swell, and current fault events. It records up to 512 samples per cycle, when events occur the meter will record pre and post event activity at a programmable sampling rate. Up to 4MB of storage is available allowing for a maximum of 170 events to be stored. Waveform data is stored in a circular buffer, this means that the meter is always recording.

## Data Logging

The EPM 7000 meter offers the capability of having 2MB of date-logging to be used for historical trends, limit alarms, I/0 changes power quality recording and sequence of events. The unit has a real-time clock that allows for time stamping of all the data in the instrument when log events are created.

### Historical Logs:

- 3 Assignable Historical Logs
- Independently Program Trending
- Up to 64 Parameters per Log

### System Events Log:

- Demand Resets
- Password Requests
- System Startup
- Energy Resets
- Log Resets & Reads
- Programmable Settings Changes

### I/O Change Log:

- Times Stamped Log of any Relay Output
- Time Stamped Log of Input Status Changes
- 2048 possible events

### Limit/Alarm Log

- Provides Magnitude and Duration of an Event
- Time Stamp and Alarm Value provided
- 2048 possible events

### Limits Alarms and Control Capability (Option D and higher)

- Any measured parameter
- Up to 16 limits can be selected
- Voltage Imbalance
- Current Imbalance
- Based on percentage full scale settings

## Communications

### Front Mounted IrDA

All EPM 7000 meters come equipped with Front Mounted IrDA Communications port. This eliminates the need for a communications cable when the technician has an IrDA-equipped PC or a PDA with COPILOT EXT software. The meter can be set-up and programmed through the IrDA connection.

### Rear Mounted Serial Port with KYZ Pulse

The RS485 serial interface supports Modbus, and DNP 3.0 at baud rates ranging from 9600 to 57.6K. Also supported are KYZ pulse outputs that are mapped to absolute energy
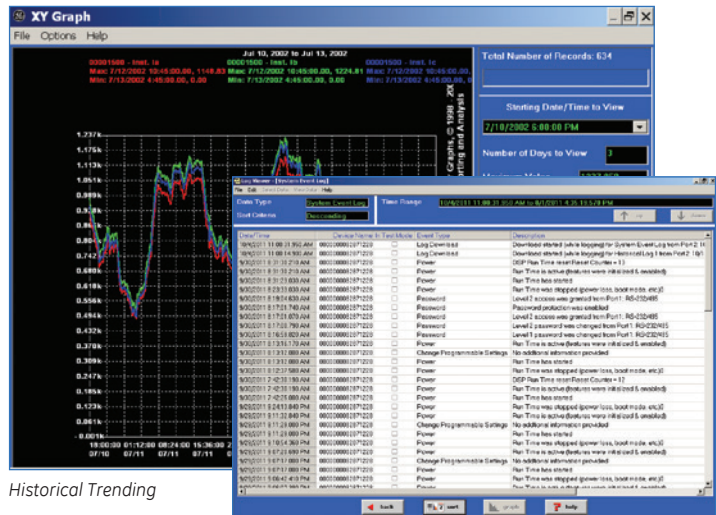
### Expandable I/O and Communications Capabilities

EPM 7000 meters have two expansion slots used to accept new I/O cards. These slots can be equipped at the factory or in the field. The meter auto-detects installed I/O cards. Up to two cards of any type may be used per meter.
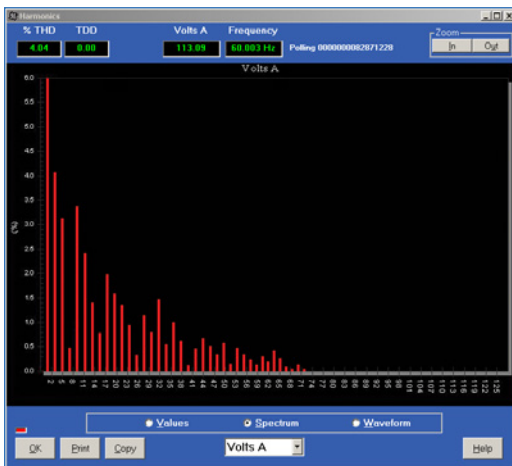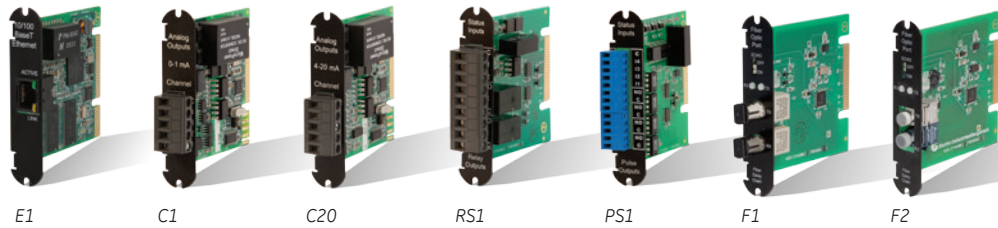


*Harmonic Spectrum*



*Historical Trending*

# Expandable I/0 Cards



E1     C1     C20     RS1     PS1     F1     F2

### E1:

- 100BaseT Ethernet Card
- This card provides 100BaseT Ethernet functionality. Up to 12 simultaneous Modbus TCP/IP connections are supported

### C1:

- Four Channel Bi-directional 0-1mA Outputs
- Assignable to any parameter
- 0.1% of Full Scale
- 0 to 10KΩ
- Range ±1.20mA

### C20:

- Four Channel 4-20mA Outputs
- Assignable to any parameter
- 0.1% of full scale
- 0 – 500Ω, no accuracy losses
- Loop Powered up to 24VDC

### RS1:

- Two Output Relays/ Two Status Inputs
- 250VAC/30VDC – 5A Relays, Form C

- Trigger on user set alarms
- Set delays and reset delays
- Status Inputs – Wet/Dry Auto Detect (Up to 150VDC)
- Requires Software Option D or higher for limit based alarms and control

### PS1:

- Four Pulse Outputs / Four Status Inputs
- Programmable to any energy parameter and pulse value
- Normally Open Contacts, Form A
- 120mA continuous load current
- Status Inputs – Wet/Dry Auto Detect (Up to 150VDC)
- Can function for manual relay control and limit based control
- Requires Software options D or higher for limit based alarms and control

### F1:

- Fiber Optic Interface with ST terminations
- Daisy Chain switchable built-in logic mimics RS485 half duplex bus

- ST terminated
- Modbus and DNP 3.0 Protocols available

### F2:

- Fiber Optic Interface with Versatile terminations
- Daisy Chain switchable built-in logic mimics RS485 half duplex bus.
- Versatile terminated
- Modbus and DNP 3.0 Protocols available

### Embedded Web

The EPM 7000 with Ethernet card gives the meter a Web server that is viewable by almost all browsers. The web pages allow you to see the following information:

- Voltage and Current Reading
- Power and Energy Readings
- Power Quantity Information
- General Meter Information

Digital Metering



*Simultneous Data Connection through Ethernet and Web Server*

*GE Communicator Software – Phasor Demo Mode*
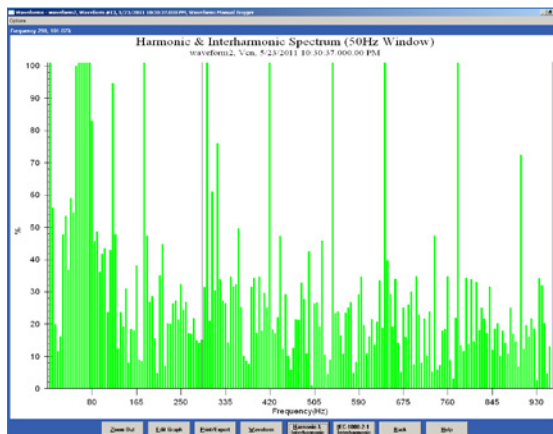


*GE Communicator Software – Harmonic and Interharmonic Spectrum*

# Software

### GE Communicator Software

This software connects remote meters via Serial, Ethernet or Modem. It allows users to view real time metered data, configure and analyze collected information from remote EI power monitors. It works with the EPM 2200, EPM 6000, EPM 7000, EPM 9450, EPM 9650 and EPM 9800 meters.

GE Communicator displays real time data from supported meters. The data is presented in a simple and powerful graphical format so that laymen access data easily. The software offers many screens, including:

- Voltage, Current, Power & Energy
- Time of Usage & Accumulations
- Power Quality
- Harmonics to the 255th Order
- Actual Real time Waveform Scopes
- Alarms & Limits
- Max. & Min. for Each Parameter
- I/O Device Information

### EnerVista™ Launchpad

EnerVista™ Launchpad is a powerful software package that provides users a platform to access all of the setup and support tools needed for configuring and maintaining GE Multilin Products.
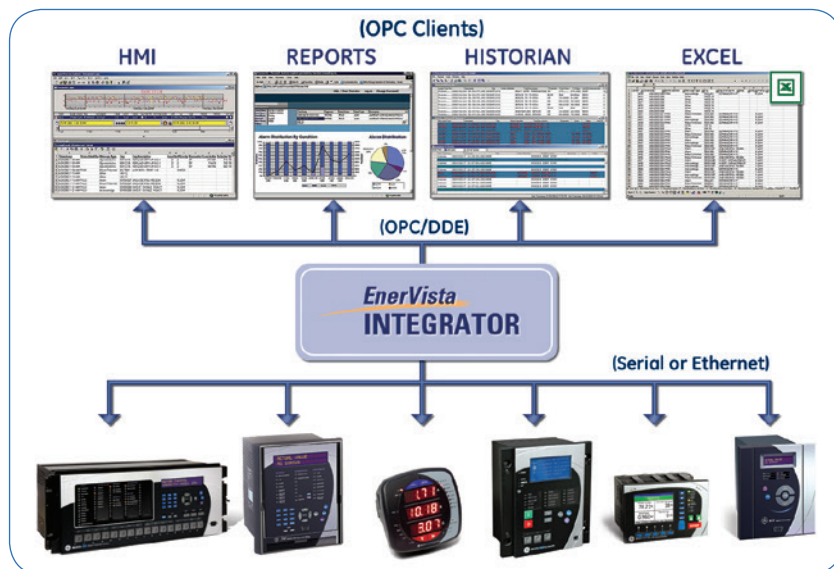
Launchpad allows configuration of devices in real-time by communicating using RS232, RS485, Ethernet, or modem connections. Using Launchpad as the single interface to the setup and analysis software makes it simple to enter set points, read metered values, monitor status and evaluate power quality.

Included in Launchpad is a document archiving and management system that ensures critical documentation is up-to-date and available when needed by automatically checking for and downloading new versions of manuals, applications notes, specifications, and service bulletins.

### EnerVista™ Integrator

EnerVista™ Integrator is a toolkit that allows seamless integration of GE Multilin devices into new or existing automation systems by sending GE device data to HMI, DCS, and SCADA systems. Included in EnerVista™ Integrator is:

- OPC/DDE Server
- GE Multilin Drivers
- Automatic Event Retrieval
- Automatic Waveform Retrieval

Digital Metering

# Dimensions and Mounting



# User Interface



- Reading Type Designator
- Large .56" LEDs
- Screen Selectors
- IRDA Port
- Vh Pulse
- % Load Bar
- Auto Scale Indicator

- Tx Rx Indicator LEDs
- RS 485 Communication
- Removable Cards
- Current "Gills"
- Universal Voltage Inputs

Digital Metering
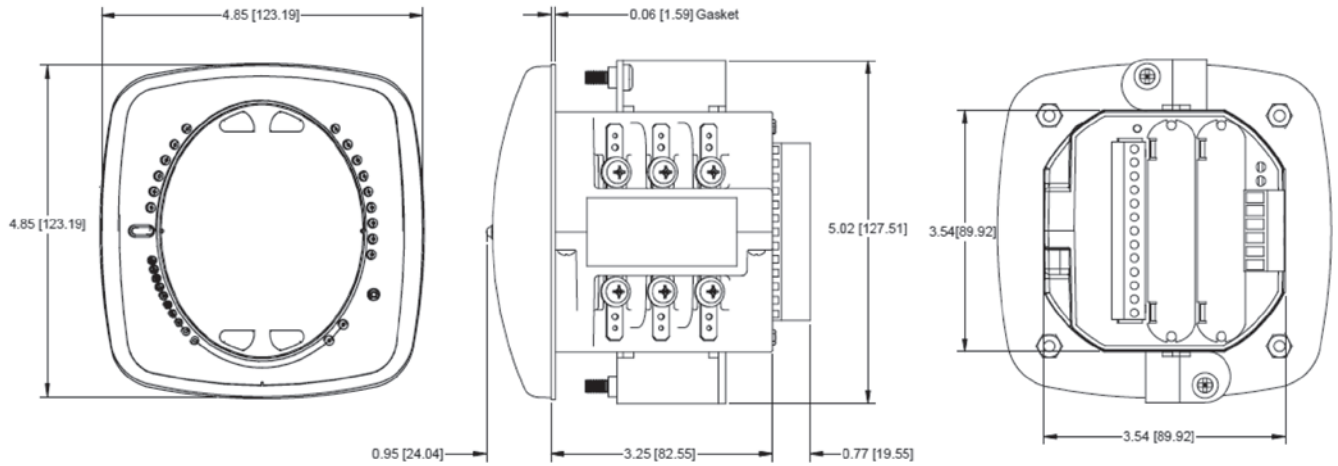
# Technical Specifications

### VOLTAGE INPUTS
- 20-576 Volts Line to Neutral
- 0-721 Volts Line to Line
- Universal Voltage Input
- Input Withstand Capability – Meets IEEE C37.90.1 (Surge Withstand Capability)
- Programmable Voltage range to any PT ratio
- Supports: 3 Element WYE, 2.5 Element WYE, 2 Element Delta, 4 Wire Delta Systems
- Burden: 0.014W at 120 Volts
- Input Wire Gauge Max (AWG 12 / 2.5 mm²)

### CURRENT INPUTS
- Class 10: (0.005 to 11)A, 5 Amp Nominal
- Class 2: (0.001 to 2)A, 1A Nominal Secondary
- Fault Current Withstand:
  - 100 Amps for 10 Seconds
  - 300 Amps for 3 Seconds
  - 500 Amps for 1 Second
- Continuous current withstand:
  - 20A for Screw Terminated or Pass Through Current Connections
- Programmable Current to Any CT Ratio
- Burden 0.005VA Per Phase
- Max at 11 Amps
- Pickup Current:
  0.1% of Nominal
  Class 10: 5mA
  Class 2: 1mA
- Pass Through Wire Gauge Dimension: 0.177" / 4.5mm

### ISOLATION
- All Inputs and Outputs are Galvanically Isolated to 2500 Volts AC

### SENSING METHOD
- True RMS
- Sampling at 400+ Samples per Cycle on all channels measured readings simultaneously
- Waveform up to 512 Samples/cycle
- Harminocs resolution to 40th order

### UPDATE RATE
- Watts, VAR and VA-100msec
- All other parameters 1sec

### POWER SUPPLY
- HI Option: 90 to 265VAC 100 to 370VDC
- LDC Option: 18-60VDC Suitable for 24 and 48VDC Systems

### STANDARD COMMUNICATIONS
- 2 Com Ports (Back and Faceplate)
- RS485 Communications Port
- Through Backplate
- Protocol Modbus RTU or ASCII
- Com Port Baud Rate: 9600 to 57.6K
- Com Port Addresses: 001-247
- 8 Bit, No Parity
- IrDA
  - Through Faceplate
- Modbus RTU, ASCII or DNP 3.0 Protocols

### METERING ACCURACY

| Measured Parameters | Accuracy% of Reading | Display Range |
|---|---|---|
| Voltage L-N | 0.1% | 0-9999 V or kV |
| Voltage L-L | 0.2% | 0-9999 Scalable V or kV |
| Current | 0.1% | 0-9999 Amps or kAmps |
| +/- Watts Mwatts | 0.2% | 0-9999 Watts, kWatts, |
| +/- Wh | 0.2% | 5-8 Digits Programmable |
| +/-VARs MVARs | 0.2% | 0-9999 VARs, kVARs, |
| +/-VARh | 0.2% | 5-8 Digits Programmable |
| VA | 0.2% | 0-9999 VA, kVA, MVA |
| VAh | 0.2% | 5 –8 Digits Programmable |
| PF | 0.2% | +/- 0.5 – 1.0 |
| Frequency | +/- 0.03 Hz | 45 –65 Hz |
| %THD | +/- 2.0% | 1 to 99.99% |
| % Load Bar | +/- 1 Segment | (0.005 to 6) A |

### KYZ PULSE
- Type Form C Contact
- On Resistance: 35Ω Max
- Peak Voltage: 350VDC
- Continuous Load Current: 120mA
- Peak Load Current: 350mA (10ms)
- Off State Leakage Current @ 350VDC: 1µA

### DIMENSIONS & SHIPPING
- Weight: 2lbs
- Basic Unit: H4.85x W4.82 xL4.25 inches
- Mounts in 92mm Square DIN or ANSI c39.1 Round Cut-outs
- Shipping Container Dimensions: 6" cube

### ENVIRONMENTAL
| | |
|---|---|
| Storage: | -20° C to +70° C |
| Operating: | -20° C to +70° C |
| Humidity: | to 95% RH Non-Condensing |
| Faceplate Rating: | NEMA12 (Water Resistant) Mounting Gasket Included |

### COMPLIANCE
- IEC 687 (0.2% Accuracy)
- ANSI C 12.20 (0.2% Accuracy)
- ANSI (IEEE) C37.90.1 Surge Withstand
- ANSI C62.41 (Burst)
- IEC1000-4-2: ESD
- IEC1000-4-3: Radiated Immunity
- IEC1000-4-4: Fast Transient
- IEC1000-4-5: Surge Immunity

### APPROVALS
| | |
|---|---|
| ISO: | Manufactured to an ISO9001 registered program |
| UL: | Listed under E250818 |
| CE: | Conforms to European CE standards |

# Ordering

PL7000   *   *   *   *   *   *

**Description**

Standard unit with display, all current/voltage/power/frequency/energy counters measurement, % load bar, RS 485 and IRDA communication ports and one front test pulse output.

| | | | | | | | Description |
|---|---|---|---|---|---|---|---|
| Frequency | 5 | | | | | | 50 Hz AC frequency system |
| | 6 | | | | | | 60 Hz AC frequency system |
| Current Inputs | | 5A | | | | | 5 Amps |
| | | 1A | | | | | 1 Amp |
| Software | | | A | | | | Multimeter Function Only |
| | | | B | | | | Data Logging Memory, 2 MB of Memory |
| | | | C | | | | Power Quality Harmonics, 2 MB of Memory |
| | | | D | | | | Limits and Control, 2 MB of Memory |
| | | | E | | | | 64 Samples/Cycle Waveform Recording, 3 MB of Memory |
| | | | F | | | | 512 Samples/Cycle Waveform Recording, 4 MB of Memory |
| Power Supply | | | | HI | | | 90-265VAC/100-370VDC |
| | | | | LDC | | | 18-60VDC |
| I/O Modules | | | | | X | X | None |
| | | | | | E1 | E1 | 100BaseT Ethernet* |
| | | | | | C1 | C1 | Four Channel Bi-directional 0-1mA Outputs |
| | | | | | C20 | C20 | Four Channel 4-20mA Outputs |
| | | | | | RS1 | RS1 | Two Relay status Outputs / Two Status Inputs |
| | | | | | PS1 | PS1 | Four Pulse Outputs / Four Status Inputs |
| | | | | | F1 | F1 | Fiber Optic Interface with ST terminations |
| | | | | | F2 | F2 | Fiber Optic Interface with Versatile Terminations |

\* Only one E1 module may be used in the EPM7000

EPM 7000 is available without a display as the EPM 7000T. Please see the online store for ordering information.

## Visit GEMultilin.com/EPM7000 to:

- View Guideform Specifications
- Download the instruction manual
- Review applications notes and support documents
- Buy a EPM 7000 online