GE Grid Solutions

Multilin EPM 9650 & 9450

High Performance Power Quality Metering

Ideal for industrial, commercial, and utility applications, the performance enhanced EPM 9650 & 9450 Power Quality Meters provide a comprehensive set of features required for the highest levels of Power Quality analysis and communications.

The Multilin™ EPM 9650 & 9450 meters provide the total picture of power usage and power quality for metered points within a distribution network, allowing users to make power related decisions quickly and effectively.

Key Benefits

• High-performance power quality and revenue class metering for critical power applications
• ANSI C-12 and IEC 687 specifications for accuracy with auto calibration using temperature compensation
• Software and hardware triggers record waveform events, allowing the meter to be used for fault analysis, system apparatus monitoring and many other applications
• Real time phasor analyzer monitors phase angles between the voltages and currents
• Able to record THD to the 255th order peak and real-time harmonic magnitudes analysis to the 128th order for every channel for accurate power quality analysis
• Simplified system integration with communication option for 10/100 BaseT Ethernet with Modbus/TCP
• Expandable analog and digital output modules, simplifying the polling, logging, and transfer of data to master station devices

Applications

• Revenue class metering and load aggregation for energy management
• Transformer loss compensation
• High-performance power quality monitoring of critical loads

Monitoring & Metering

• Current, voltage, real and reactive power, energy use, cost of power, power factor and frequency
• Laboratory grade 0.04% Watt-Hour accuracy
• Flicker and waveform recording
• Real-time PQ monitoring and harmonic magnitude analysis to 255th order

Control

• Programmable setpoints for alarms and 90 millisecond relay activation for high speed updates and control
• Expandable external outputs
• 8 built-in, high-speed, digital inputs
• Multiple analog, digital and relay outputs

Communications

• On-board Ethernet and Modbus/TCP capability
• High-speed RS485 and RS232 Com Ports
• Multiple protocols including Modbus and DNP3.0 level 2
• Built-in modem with dial-out capability
• Web Server & Gateway
Standard Features

Perfect for industrial, commercial and utility applications, the performance enhanced EPM 9000 Series of meters, includes all the attributes required for the highest level of PQ analysis and communications. From today’s utility giants to Fortune 100 companies to local electrical municipals, an effective energy management and power-monitoring program is critical for success. The EPM 9650 & 9450 are advanced monitoring products, providing the total picture of power usage and power quality for any metered point within a power distribution network allowing users to make power related decisions quickly and effectively.

Robust Communication

Four Isolated High-speed Communication Ports: EPM 9000 Series of meters offers four built-in communication ports. Each port can communicate independently using supported protocols. Standard protocols include Modbus RTU/ASCII and DNP 3.0. Logs and waveform events are available in Modbus format. Port 3 and Port 4 can be used as a Modbus slave for external output modules.

8 Built-in Digital High Speed Status Inputs: These inputs automatically sense whether the circuit is externally wetted. If externally wetted, the input will accept up to 400VDC. If internally wetted, the unit supplies the needed voltage for the desired control application.

High Speed-Transducer Outputs for Control Purposes: EPM 9000 Series of meters offers 50 millisecond updates for all instantaneous readings. The unit can be a high-speed control transducer for power generation, transmission line synchronization and other control schemes.

Precision Power Quality Measurement

16-bit Waveform and Fault Recorder: EPM 9000 Series of meters captures up to 512 samples per cycle for an event. Voltage and current are recorded with pre-and-post-event analysis. Hardware and software triggers are available to activate a waveform reading, which can be used for power quality surveys, fault analysis, breaker timing, motor start-up, etc.

Measure and Record Harmonics Magnitude to the 255th Order: Measure harmonics magnitude up to the 255th order for each voltage and current channel. Real-time harmonics magnitude are resolved to the 128th order. Percent THD and K-factor are also calculated. Harmonic magnitude analysis allows users to conduct power quality analysis at the high end of the harmonic spectrum.

Sub-Cycle Transient Recorder: The unit records sub-cycle transients on voltage and current readings. It monitors switching noise from capacitors, static transfer switches, SCRs and many other “power quality harmful” devices. Transients are often the cause of intermittent and expensive downtime, and may cause damage to electrical equipment.

Phasor Analysis: The monitor reads a phase angle analysis between the voltage and current channels, allowing for efficiency and system-integrity analysis.

Inter-harmonics Analysis: The EPM 9000 Series of meters provides users with the ability to view inter-harmonics, the discrete frequencies that lie between the harmonics of the power frequency voltage and current. Frequencies can now be observed which are not an integer multiple of the fundamental.
Revenue Metering

Accuracy in Billing Measurements:
Dual 16 Bit A/D converters provide supreme sampling accuracy and resolution. The unit far exceeds ANSI C-12 and IEC 687 accuracy standards offering 0.04% watt-hour accuracy.

To ensure optimum accuracy the unit auto-adjusts to dual internal references accurate to 1 part per million. In addition, the EPM 9000 uses an auto-calibration technique that recalibrates the unit on the fly when the temperature changes more than 5 degrees Celsius for improved accuracy over the full temperature range.

Max/Min Integration and Recording: The unit offers time stamped max and min values for every measured reading. kW readings are integrated using:
- Block (fixed) window
- Thermal window
- Rolling (sliding) window
- Predictive window

Time of use (TOU) Capability: EPM 9000 offers comprehensive time of use capability. Standard features include:
- Bi-directional consumption and demand quantities
- 20-year calendar - 4 seasons/yr, 2 holidays/yr
- 4 TOU schedules/seasons
- Prior month, prior season storage
- Present month, present season storage

Transformer Loss and Line Loss Compensation: The unit compensates for transformer and line losses. Power reading compensation is conducted for both iron and copper losses.

Load Aggregation/Universal Metering: Using the status inputs, EPM 9000 has the ability to count pulses and aggregate different loads providing a total picture of the load and its component parts. This can be used to accumulate and aggregate other utilities such as water and gas data.

EnerVista Viewpoint Monitoring harmonic spectrum graph to quantify power quality
Multiple Programmable Memory Logs
The EPM 9000 Series meters utilize two separate logs of historical information. History can be used for trending and conducting preventive maintenance. Conduct preventative maintenance on critical equipment as well as power analysis.

Primary Historical Tending Log File - Log 1
Log any measured parameter from either the main unit or any of the option modules. Either 8, 16, 32 or 64 values can be logged per programmable interval.

Secondary Historical Tending Log File - Log 2
This log can be set up as an additional historical interval log or as an exclusive energy log. Either 8, 16, 32 or 64 values can be logged per interval.

Out Of Limit Log
The units offer an independent out of limit log. This allows a user to download out of limit information to obtain a sequence of events for any occurrence. Utilizing the 1 millisecond clock resolution, the logs can be combined with different metered points through a distribution system to provide an accurate system-wide depiction of a power disturbance.

Event-Triggered Waveform Recording Log
EPM 9000 records waveforms with a resolution of up to 512 samples per cycle. The amount of waveform recording is based on the amount of memory installed.

The unit records the waveform when a value goes out of limit and when the value returns to normal. All information is time stamp to the nearest 1 millisecond. The 8 on-board high-speed inputs can be tied to the waveform recording. Record when the breaker tripped as compared to when the relay activated. This is very useful for fault and breaker integrity analysis.

The unit can be programmed to take more than one recording every time an event occurs. Thousands of cycles can be recorded per event.

Optional Features

Flicker (EPM 9650 only)
EN50160 Flicker and Compliance Monitoring: Flicker consists of low frequency (less than 24 Hz) to intermittent line disturbances on the power line. Flicker can affect equipment. The EPM 9650 complies with the Flicker requirements of EN50160 that includes harmonics.

Modem
Dial-Out on Alarm: With the built-in optional modem, the meter provides dial-out capabilities that can detect an alarm occurrence and dials out to provide notification.

Dial-Out for other Events
The meter can dial-out for the following circumstances:

- Limit status change
- High-speed input change
- Waveform record capture
- CBEMA power quality event
- Control output change
- Filling of meter memory
- Cycling of control power
- Password failure on a call coming into the modem
- Meter communication failure

Dial-In Server Capabilities
The dial-in server will record all notifications and accept downloads from the meter.

Ethernet Capability
The EPM 9000 Series of meters has an optional Ethernet that supports Modbus/TCP.

Output Modules
GE Multilin offers multiple analog and digital output modules that mount externally to the EPM 9650 or 9450 meter. The unit supports up to 8 output modules using internal power. An additional power supply extends output capability. The unit can poll different output devices, log data, and send data to a master station via Modbus or DNP 3.0 protocol.

The EPM 9000 Series of meters provides advanced logic and control on programmable limit settings.

EnerVista Viewpoint Monitoring - Access real-time system values and track energy consumption
EnerVista™ Software

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 setpoints, read metered values, monitor status and evaluate power quality. Powerful troubleshooting features make it easy to retrieve and view voltage & current wave shapes and harmonic analysis. This vital information can help provide early warning of problems and prevent equipment damage or nuisance breaker tripping.

Viewpoint Monitoring

Viewpoint monitoring is a simple-to-use, full-featured monitoring and data recording software package for small systems. Viewpoint Monitoring provides a complete HMI package that instantly puts critical real-time device data on your PC through pre-configured graphical screens with the following functionality:

- Plug-&-Play Device Monitoring
- System Single-Line Monitoring & Control
- Annunciator Alarm Screens
- Trending Reports
- Automatic Event Retrieval
- Automatic Waveform Retrieval

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

EnerVista Viewpoint Monitoring - Monitor the status of digital inputs and review the magnitude of system highs and lows.
Typical Wiring

4 Wire Wye: 3 Element Direct Voltage

3 Wire: 3 Element Direct Delta
**Technical Specifications**

### DEMAND MONITORING

**Measured values:**
- Phase A/B/C/N current (A)
- 3 phase real power (kW)
- 3 phase reactive power (kvar)
- 3 phase apparent power (kVA)

**Measurement type:**
- Thermal exponential
  - 1 – 9999 sec, steps of 1 sec
  - Block interval/rolling demand time in interval (programmable)
  - 1 – 9999 sec, steps of 1 sec

### POWER SUPPLY

**CONTROL POWER**
- Input options: 90–276 Volts AC/DC
- 18–60 Volts DC
- Frequency: 20–400Hz
- Burden: 20 VA max

### METERING VALUES

<table>
<thead>
<tr>
<th>MEASUREMENTS</th>
<th>200 Megs*</th>
<th>1 Sec</th>
<th>Display Resolution</th>
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<tbody>
<tr>
<td>Voltage (L-N)</td>
<td>0.10%</td>
<td>0.05%</td>
<td>5 Digit</td>
</tr>
<tr>
<td>Voltage (L-L)</td>
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<td>0.05%</td>
<td>5 Digit</td>
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<tr>
<td>Current</td>
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<td>KW @ .5 PF</td>
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<tr>
<td>VAR</td>
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<td>0.08%</td>
<td>5 Digit</td>
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</table>

**Note:** Readings are in percent of reading where applicable (more accurate standard), not in percent of full scale (less accurate standard).

**Accuracy:**
- harmonics: ANSI C12.20 Class 0.2 and IEC687
  - Measures harmonic magnitudes to the 255th order for each voltage and current channel
  - Real-time harmonics resolved to the 128th

**ENVIRONMENTAL**
- Humidity: Up to 95% non-condensing
- Temperature: -40°C to +80°C ambient

**CONSTRUCTION**
- Constructed in a metal case. All hardware is stainless steel.

**PACKAGING**
- Shipping box: 16" x13" x11"
- Weight: Approx. 12 lbs (5.4 kgs)

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**INPUTS**

**INPUT VOLTAGE RANGE**
- 150V phase to neutral, 300V phase to phase*
- 300V phase to neutral, 600V phase to phase

**INPUT CURRENT RANGE**
- 5 amp inputs 24 continuous programmable to any CT range
- Fault current recording to 60 amps peak secondary based on 5 amp full scale

**SENSING METHOD**
- Up to 512 samples per cycle (programmable)
- 16 Bit AD resolution – dual converters
- True RMS

**UPDATE TIME**
- 200milliseconds — high speed instant readings
- 1 second — Revenue accurate

### COMMUNICATIONS

**Format:**
- Programmable parity and stop bits

**Ports:**
- 4 Communication ports
- 2 slave ports
- RS-232 or RS-485 selectable
- Protocol: Modbus®
- Modbus ASCII/RTU and DNP 3.0

**Media:**
- All ports use 2-wire RS-485
- Read/write setpoints
- Read actual values
- Isolated: All Com Ports are additionally isolated from each other

**EQUIPMENT FOR TRANSMISSION**
- Connects to RS-485 network
- Connects to power system
- Displays data from a single meter

**DIGITAL DRY CONTACT RELAY OUTPUTS**
- 4 Relay Outputs, 5 amps, 125, AC/DC, Form C

**ORDERING SPECIFICs:**
- MULTIPLE MODULES CAN BE USED

**DISPLAY**

**Touch Screen LCD Display**
- Touch screen graphical display
- Displays data from up to 8 meters
- 4.7" x 3.5" aperture (12.1cm x 9.1cm)

**LED Display**
- 3-line multi-function LEDs
- RS-485 master
- Displays data from a single meter

**TYPE TESTS**

**AS PER UL® & CE®**
- Emissions: EN55011
- Immunity: EN55082
- Accuracy:
  - ANSI C12.20 Class 0.2 and IEC687
  - Displays data from a single meter

**TYPE TESTS AS PER UL® & CE®**
- Emissions: EN55011
- ISO: Manufactured to an ISO9001 registered program
- UL & cUL: Recognized under e200431
- CE: Conforms to EN 55011/ EN 50082
- Industry Canada: Approval #44-1069

**BUILT-IN DIGITAL INPUTS**
- 8 Digital Status Inputs Wet/Dry Auto-Detect Up to 300 Volts DC

**DIAGNOSTIC & MONITORING:**
- Touch Screen LCD Display
- 3-line multi-function LEDs
- RS-485 master
- Displays data from a single meter

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**OUTPUT MODULES**

**ANALOG TRANSDUCER SIGNAL OUTPUT**
- 4 Analog Outputs, 0–1mA, self-powered, scalable, bi-directional
- 8 Analog Outputs, 0–1mA, self-powered, scalable, bi-directional

**DIGITAL SOLID STATE PULSE OUTPUTS**
- 4 Solid State Pulse, Outputs, Form A or C or KY2 Pulses

**LED DISPLAY**
- Touch screen graphical display
- Displays data from up to 8 meters
- 4.7" x 3.5" aperture (12.1cm x 9.1cm)

**EQUIPMENT FOR TRANSMISSION**
- Connects to RS-485 network
- Connects to power system
- Displays data from a single meter
### Ordering

#### Meters

**EPM 9450 - High performance power quality metering with logging**

<table>
<thead>
<tr>
<th>PL9450</th>
<th>Frequency</th>
<th>System Voltage</th>
<th>Control Power</th>
<th>Features Options</th>
<th>Communications</th>
<th>Current Inputs</th>
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</table>

- **Frequency**: 60 Hz, 50 Hz, 400 Hz
- **System Voltage**: 210/208 volts connection, 277/480 volts connection
- **Control Power**: 90-276 volts AC/DC power supply, 18-60 volts DC power supply
- **Features Options**: Basic unit with 512 K memory, 8 digital inputs, 8 cycle of waveform (up to 512 samples/cycle), 100 days data log.
- **Communications**: 4 communication ports, User-selectable RS 485 Modbus and DNP - no modem or Ethernet connection
- **Current Inputs**: 5 Amps, 1 Amps

**EPM 9650 - High performance power quality metering with advanced logging**

<table>
<thead>
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<th>PL9650</th>
<th>Frequency</th>
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</table>

- **Frequency**: 60 Hz, 50 Hz
- **System Voltage**: 120/208 volts connection, 277/480 volts connection
- **Control Power**: 90-276 volts AC/DC power supply, 18-60 volts DC power supply
- **Features Options**: Advance unit includes basic unit, 2 Meg memory, up to 96 days of data logging, up to 64 cycles of waveform recording, Flicker includes advance unit plus Flicker with 4 Meg memory, 602 days of data logging
- **Communications**: 4 Communication ports, User-selectable RS 485 Modbus and DNP - no modem or Ethernet connection
- **Current Inputs**: 5 Amps, 1 Amps

#### Accessories

**PL9000**

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</table>

**PL9000**

- **Analog Output Modules**: 4 Channel 0-1 mA Analog Outputs, 8 Channel 0-20 mA Analog Outputs, 8 Channel 0-1 mA Analog Outputs
- **Analog Input Modules**: 8 Channel 0-1 mA Analog inputs, 8 Channel 0-20 mA Analog Inputs, 8 Channel 0-5V DC Analog Inputs
- **Digital Output Modules**: 4 Channel Control Relay Outputs, 4 Channel 4-20 mA Analog Outputs
- **Digital Input Modules**: 8 Channel Digital Status Inputs
- **Auxiliary Mounting Bracket**: (One set per module group)
- **Auxiliary Power Supply**: (For more than 4 modules)
- **9000 Series Meter Display Module**: Three line LED Display
- **Touch-Screen LCD Display**: Touch-Screen LCD Display with 6-ft cable
- **9000 Series Meter Software**: Communicator Software, Single User License

**PLSOF**

- **9000 Series Meter Software**: Communicator Software, Single User License
- **9000 Series Meter Software**: Communicator Software, Three User License

GE reserves the right to make changes to specifications of products described at any time without notice and without obligation to notify any person of such changes.

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