Power & Energy Logger
PEL 100 Series

Models PEL 102 & PEL 103

All You Need For Power & Energy Logging

Economical
Compact
Simple To Use

- Simple to use, single-, dual- (split-phase) and three-phase (Y, Δ) power and energy loggers
- Designed to work in 1000V CAT III and 600V CAT IV environments and fits in many distribution panels
- Power measurements: VA, W and var
- Energy measurements: VAh, Wh (source, load) and varh (4 quadrants)
- DataView® software for data storage, real-time display, analysis and report generation with supplied pre-defined or custom templates
- Minimal programming required
- Ethernet compatible
- *Bluetooth* Class 1 wireless communication up to 300 feet away
- Satisfies the requirements of NEC 220.87

IP 54 Rated

SAFETY 1000V CAT III RATING

SAFETY 600V CAT IV RATING

ETHERNET

Our products are backed by over 100 years of experience in test and measurement equipment, and encompass the latest international standards for quality and safety.

techniCAL
eXpanding possibilities

AEMC® INSTRUMENTS
CHAUVIN ARNOUX GROUP

PEL 100 Series: MODELS PEL 102 & 103

Model PEL 102

Model PEL 103

The PEL 100 series is a low cost, simple to use, single-, dual- (split-phase) and three-phase (Y, Δ) power/energy data logger. There are two models available; Model PEL 102 (no display) and Model PEL 103 (with a backlit digital display).

This product is ideal for electricians, engineers and contractors doing work in the area of building and system monitoring and upgrades, as well as residential and overall energy audits. All vital energy data is easily measured, recorded, and analyzed. Reports can be generated with confidence with minimal configuration time and effort (Standard and Customizable Reports supplied).

The PEL 100 series has many up-to-date features demanded by the present market conditions for energy and power consumption information needs.

The instrument's design enables it to be installed inside a load center panel (including the current sensors) and still allow the door to close on most panels. The PEL 100 series offers all the essential functions for logging power/energy data from most electrical power networks in use today across the world (17 network set-ups provided). The PEL 100 series energy loggers measure and record three voltage inputs and current inputs, Watts, VARS, VA and Energy (kWh and kVA). Power Factor (PF), Displacement Power Factor (DPF), Crest Factor, Frequency and THD are calculated and recorded, as well. Individual harmonic % information from 1 to the 50th harmonic are recorded at the operator's choice. All variables are recorded and stored at a one second interval and on user selectable demand intervals from 1 to 60 minutes. Energy costs can be calculated and displayed quickly and easily by simply inputting the unit cost for a kilowatt hour into the software. Data is stored on a removable SD card. Data can be retrieved using a USB cable, *Bluetooth* and/or the Ethernet (local or internet) connection or by transporting the SD card back to a PC. The comprehensive DataView® software (included) provides the ability to view data from several hundred PEL 100 series instruments on a local network or over the internet, allowing the user to evaluate energy usage in a department or facility basis, a remote site, or even in a city, anywhere in the world. DataView® allows measurements to be viewed in real-time on a PC and stored data to be downloaded for analysis and report generation.

Configuration of the PEL 100 series instruments is accomplished through DataView® software either locally or remotely. Most of the configured parameters are pre-set in the instrument, keeping the user interface very simple and straightforward. Current probes are automatically detected and scaled to a pre-defined or user specified configuration when connected to the instrument. User selections include network type, demand interval, recording length, voltage and current ratios (where necessary), recording duration (defined either by time and/or date) and communication method. Password protection can be configured for *Bluetooth* and network communication to guard against unauthorized access and protection of data integrity.

The DataView® software provides the ability to view power, harmonic (for AC measurements) and RMS, as well as DC data in real-time and download recorded sessions for more extensive analysis and report generation. One second trend data, demand interval trend graphs and tabular listings can be displayed and printed. Energy costs can be calculated from the downloaded session. Source and load graphs can be plotted. Individual phase and the sum of all phases can be evaluated. Once data is downloaded and displayed, the user has access to a variety of tools to analyze individual data points or sections of the recorded data without the frustration of having to deal with layers of button pushing to get to the information they need.

This simple to use yet comprehensive power and energy logger will be an invaluable asset to your power and energy monitoring and analysis needs.

FEATURES, NETWORKS & APPLICATIONS

FEATURES

- Simple to use, single-, dual- (split-phase) and three-phase (Y, Δ) power & energy loggers
- Provides all the necessary functions for Power/Energy data logging for 50Hz, 60Hz, 400Hz and DC distribution systems
- Current measurements from 100mA up to 10,000A using flexible current sensors
- Power measurements: VA, W and var
- Energy measurements VAh, Wh (source/load indication) and varh (including quadrant indication)
- Record cost of energy usage
- Power Factor (PF), Cos (φ), Tan (Φ) and DPF
- Crest Factor
- Total Harmonic Distortion (THD) for voltages and currents
- Harmonics up to the 50th order for 50/60Hz voltages and currents and 7th order for 400Hz
- Frequency measurements
- Simultaneous RMS measurements of each phase @ 128 samples/cycle and DC
- Bright blue three line LCD on the Model PEL 103 (3 phases shown simultaneously)
- Storage of measured and calculated values on a SD-Card or SDHC-Card
- Automatic recognition of the connected current sensors/probes
- Configuration of current and voltage ratios to external PT and CT ratios
- 17 types of hook-ups for supported electrical distribution systems
- USB, LAN, and *Bluetooth* communication
- Includes DataView® software for data storage, real-time display, analysis and report generation with pre-defined or custom templates

Application photograph to the left:

The PEL series energy loggers can safely and easily be mounted to a wall, load center panel or inside the equipment cabinet, facilitating the connection of the voltage and current hook-ups.

DISTRIBUTION SYSTEMS SUPPORTED

- Single-Phase 2-Wire
- Single-Phase 3-Wire (Split-phase from a center tap transformer)

Three-Phase 3-Wire Power Networks

- Three-phase 3-wire Δ (with two current sensors)
- Three-phase 3-wire Δ (with three current sensors)
- Three-phase 3-wire Open Δ (with two current sensors)
- Three-phase 3-wire Open Δ (with three current sensors)
- Three-phase 3-wire Y (with two current sensors)
- Three-phase 3-wire Y (with three current sensors)
- Three-phase 3-wire Δ Balanced (with one current sensor)

Three-phase 4-Wire Y Power Networks

- Three-phase 4-wire Y (with three current sensors)
- Three-phase 4-wire Y Balanced
- Three-phase 4-wire Y 2½ Element
- Three-phase 4-wire Δ
- Three-phase 4-wire Open Δ

DC Power Networks

- DC 2-wire
- DC 3-wire
- DC 4-wire

APPLICATIONS

- Measure efficiency, find areas for potential savings
- Track sub-billing occupants for energy costs
- Assign energy costs to departments or operations within a department
- Track peak demand periods and find opportunities for surcharge reductions
- Determine present capacity and circumvent unnecessary electrical expansion costs
- Verify the reliability and operation of electrical machinery
- Improve response time to solve power related problems
- Track energy availability and reliability of supply
- Reduce field service time at sub-stations
- Baseline studies for system upgrades in high-rise and office buildings

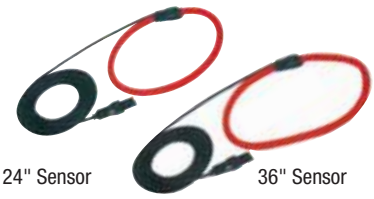
SPECIFICATIONS

GENERAL			
Sampling Frequency	128 samples per cycle; 50/60Hz (16 samples/cycle 400Hz)		
Data Storage Rate	1 per second		
Demand Period Storage Rate	User selectable (1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30 and 60 minutes)		
Recorded Parameters (Single- and Poly-Phase)	V, I, W, VA, var, PF, Tan, Wh, Vah, varh, THD (V and I), Individual harmonics (from 1 through 50 per phase); Crest Factor (CF), Cos f / DPF,		
Event Log	Tracks and records status changes and error messages along with recorded data		
Front Panel Indicator LEDs	*Bluetooth* active, recording in progress, phase connection reversal, overload, battery charging and SD Card status		
Storage Capacity	2GB SD card (included) is used for storage. SD cards (up to 2GB); SDHC cards (4 to 32GB) formatted FAT32 are supported		
INPUTS			
Voltage	3 voltage input channels via 4mm safety banana jacks		
Current	3 current input channels via custom 4 pin jacks that accept AEMC® probes and sensors shown on page 5		
ELECTRICAL			
VOLTAGE MEASUREMENT	**RANGE**	**RESOLUTION**	*** ACCURACY (% of Reading)**
50/60Hz	42.5 to 69Hz	–	±0.1Hz
Single-Phase RMS Voltages	100 to 1000rms	0.1V	±0.2% Rdg ± 0.2V
Phase-to-Phase RMS Voltages	100 to 2000Vrms	0.1 to 1V	±0.2% Rdg ± 0.4V
400Hz	340 to 460Hz	–	–
Single-Phase RMS Voltages	100 to 600Vrms	0.1V	±1% Rdg ± 1V
Phase-to-Phase RMS Voltages	200 to 1200Vrms	0.1 to 1V	±1% Rdg ± 1V
DC	100 to 1000V	0.1V	±1% Rdg ± 3V (typical)
PT Ratios	Programmable from 50V to 65,0000V (primary and secondary)	0.01V to 0.1V	–
CURRENT MEASUREMENT			
Current Probe: MiniFlex® Sensor MA193 ***	100mA to 100Arms	1 to 100mA	±1% ± 50mA
	20 to 400Arms	10 to 100mA	±1% ± 0.2A
For further specifications and other compatible current probes, see chart on page 5	100 to 2000Arms	0.1 to 1A	±1% ± 1A
	500 to 10,000Arms	0.1 to 1A	±1%
CT Ratios	Programmable from 1:1 to 25,000:1 (probe dependent)		
POWER MEASUREMENTS			
Active Power (P)*	-2 to 2GW	0.001W	±0.5% Rdg ± 0.005% Pnom
Reactive Power (Q)*	-2 to 2Gvar	0.001var	±1% Rdg ± 0.01% Qnom
Apparent Power (S)*	0 to 2GVA	0.001VA	±0.5% Rdg ± 0.005% Snom
Power Factor	-1 to +1	0.001	± 0.05
Tangent ϕ (active/reactive power ratio)	-3.2 to +3.2	0.001	± 0.02
ENERGY MEASUREMENTS			
Active Energy (EP)	0 to 4 x 10^{18}	1Wh	±0.5% Rdg
Reactive Energy (EQ)	0 to 4 x 10^{18}	1varh	±2% Rdg
Apparent Energy (ES)	0 to 4 x 10^{18}	1Vah	±0.5% Rdg
HARMONICS			
THD	± 655%		
Individual Harmonics	1 to 50 displayed in percentage; 1 to 7 at 400Hz		
External Supply	110V/250V (10%) @ 50/60Hz; 400Hz		
Back-Up Power Source / Charge Time	Rechargeable 8.4V NiMH battery pack / Approximately 5 hours		
Battery Life	Provides up to 30 minute ride through upon power loss		
MECHANICAL			
Communication Ports	USB 2.0, Ethernet (RJ45), Wireless *Bluetooth* Class 1 **		
Dimension/Weight	10.08 x 4.92 x 1.46" (256 x 125 x 37mm) / <1kg		
Case / Index of Protection	Double insulated, rubber over-molded, polycarbonate UL94 V1 rated / IP54 non operating		
Mounting	Embedded magnets on back side, keyhole slot on back side		
Security	Kensington anti-theft system		
DISPLAY			
Display Type for Model PEL 103	2.63 x 2.16" (67 x 55mm), four line, monochrome, backlit LCD with adjustable brightness and contrast		
ENVIRONMENTAL			
Operating Temperature / Relative Humidity	32° to 122°F (0° to 50°C) / up to 85%		
Storage Temperature	-4° to 122°F (-20° to 50°C) with batteries; -4° to 158°F (-20° to 70°C without batteries)		
SAFETY			
Safety Rating / CE Rating	Complies with IEC 61010-1:Ed3, and IEC 61010-2-030:Ed1 for 1000V CAT III / 600V CAT IV, Pollution Degree 2 / CE Marked		

* Maximum value is current probe dependent.
** Computers with Class II *Bluetooth* will restrict range to 40ft. Computers without *Bluetooth* will require a Class I or Class II *Bluetooth* radio adapter.
*** Maximum current reduced by a factor of 2 for 400Hz fundamental frequency.

PROBES & SENSORS

A complete family of current measurement probes to meet most AC or DC measurement applications up to 10,000Arms.

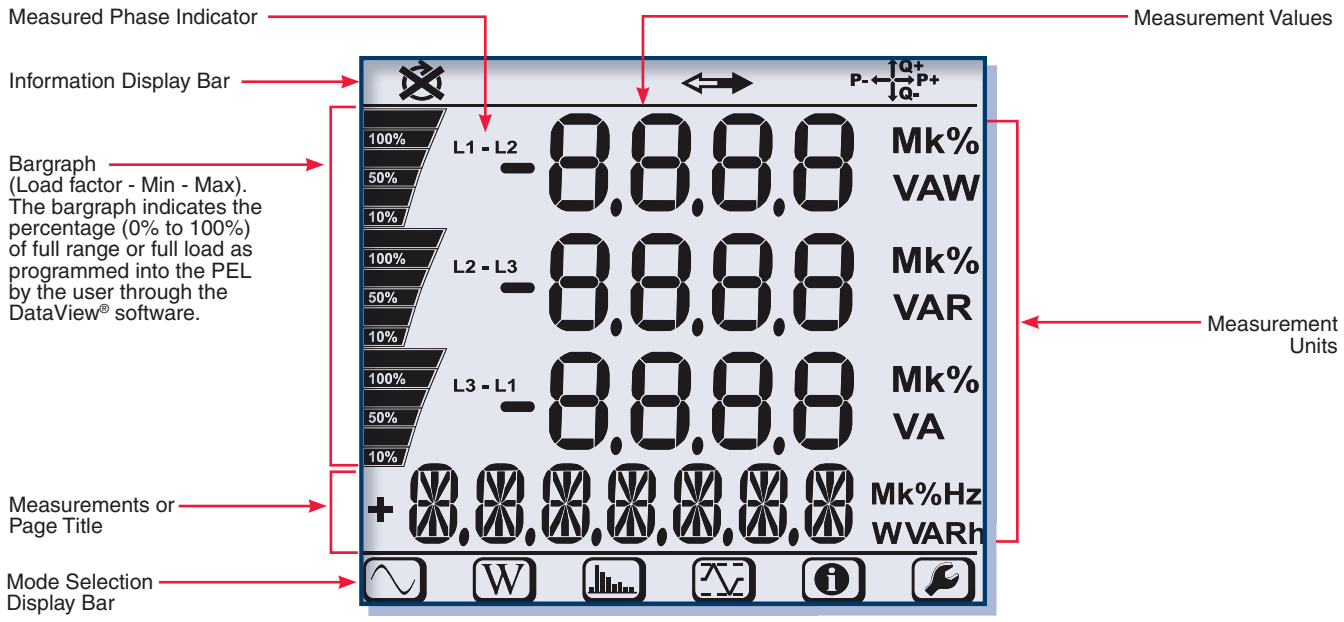
Sensor Type		Nominal Current	RMS or DC Current	Accuracy	Typical Error on φ at 50/60Hz	Maximum Error on φ at 50/60Hz	Typical Error on φ at 400Hz	Max Conductor Size
MiniFlex® MA193 * *(Included with instrument)*  10" Sensor		100AAC	100mA to 120A	±1% ± 50mA	0°	±0.5°	-0.5°	2.75" (70mm)
		400AAC	20 to 500A	±1% ± 0.2A	0°	±0.5°	-0.5°	
		2000AAC	100 to 2400A	±1% ± 1A	0°	±0.5°	-0.5°	
		10,000AAC	500 to 12,000A	±1%	0°	±0.8°	-0.5°	
MR193 		1000AAC/DC	50 to 100A	±1.5% ± 1A	-0.90°	±2.5°	-4.5° @ 100A	1.6" (41mm)
			100 to 800A	±2.5%	-0.80°	±2°		
			800 to 1000A	±4%	-0.65°			
SR193 		1000AAC	50 to 100A	±0.5%	+0.25°	±1°	+0.1° @ 1000A	2.05" (52mm)
			100 to 1200A	±0.3%	+0.2°	±0.7°		
AmpFlex® 193 *  24" Sensor 36" Sensor		100AAC	5 to 120A	±1% ± 50mA	0°	±0.5°	-0.5°	7.64" (190mm)
		400AAC	20 to 500A	±1% ± 0.2A	0°	±0.5°	-0.5°	
		2000AAC	100 to 2400A	±1% ± 1A	0°	±0.5°	-0.5°	11.46" (290mm)
		10,000AAC	500 to 12,000A	±1%	0°	±0.5°	-0.5°	
MN93 		200AAC	5 to 40A	±2.5% ± 1A	+2°	±5°	-1.5° @ 40A	0.78" (20mm)
			40 to 100A	±2% ± 1A	+1.2°	±3°	-0.8° @ 100A	
			100 to 240A	±1% + 1A	+0.8°	±2.5°	-1° @ 200A	
MN193 	**100A**	100AAC	5 to 120A	±1%	+0.75°	±2.5°	-0.5° @ 100A	0.78" (20mm)
	5A	5AAC	250mA to 6A	±1%	+1.7°	±5°	-0.5° @ 5A	
SL261 ** 	**10A**	100AAC/DC	5 to 40A	±4% ± 50mA	–	±1°	–	0.46" (11.8mm)
			40 to 100A	±15%	–	±1°	–	
	100A	10AAC/DC	50mA to 10A	±3% ± 50mA	–	±1.5°	–	

* Maximum current reduced by a factor of 2 for 400Hz fundamental frequency.

** AC/DC Current Probe BNC Adapter for Model SL261 only
Catalog #2140.40 

MODEL PEL 103 LCD DISPLAY

Key Features of the PEL 103 Display



Top and Bottom Display Bars Indicate the Following

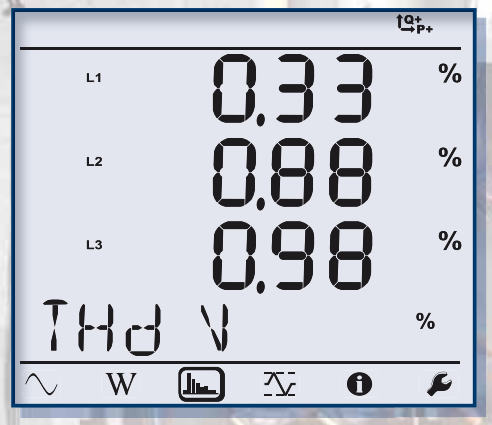
ICON	DESCRIPTION
	Phase Sequence reversal indicator or missing phase (displayed in 3-Phase distribution systems)
	Data available for recording (non-display indicates possible internal problem)
	Power Quadrant Indication
	Measurement Mode (Real Time values)
	Power and Energy Mode
	Harmonics Mode
	Min/Max Mode
	Information Mode
	Not used

The backlit display on the Model PEL 103 can be read in dark areas showing the real-time measurements.

FUNCTIONAL DISPLAYS

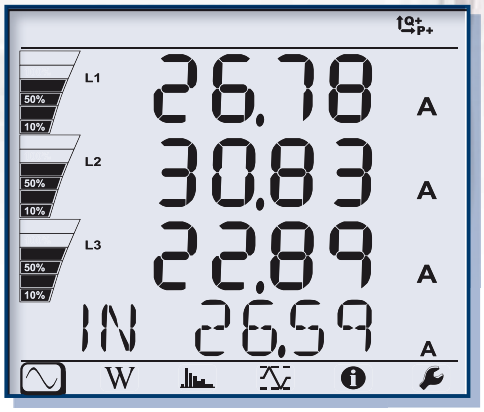
The PEL 103 display provides real-time information for all the measured and calculated values that are recorded. The left/right navigation button scrolls through the display modes while the up/down navigation button scrolls through the available real-time measurements for the selected display mode.

Harmonic Mode



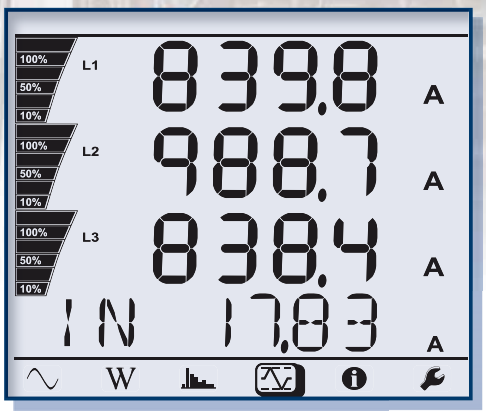
Total Harmonic Distortion (THD) can be displayed by phase or phase to phase. Neutral current THD can also be displayed.

Measurement Mode



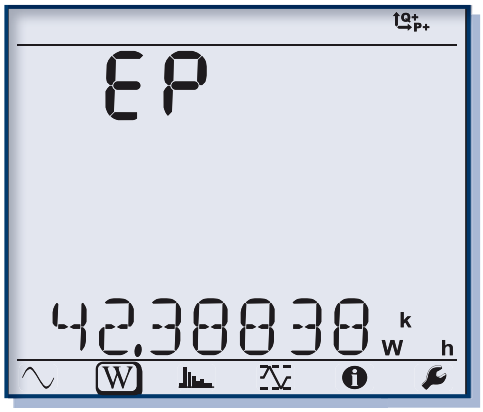
Real-time updates are displayed for voltage, current, power, frequency, power factor and tangent.

Min/Max Mode



Min/Max values for voltage, current (including neutral current), power and harmonics.

Energy Mode



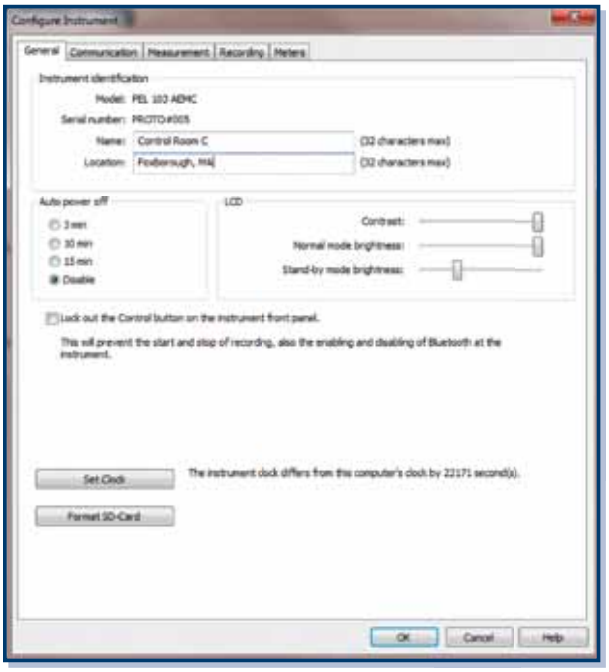
Real and apparent energy can be displayed along with an indicator identifying whether the energy is used by the load or supplied back to the source. Reactive energy can also be displayed with source/load, capacitive or inductive properties indicated.

Information Mode

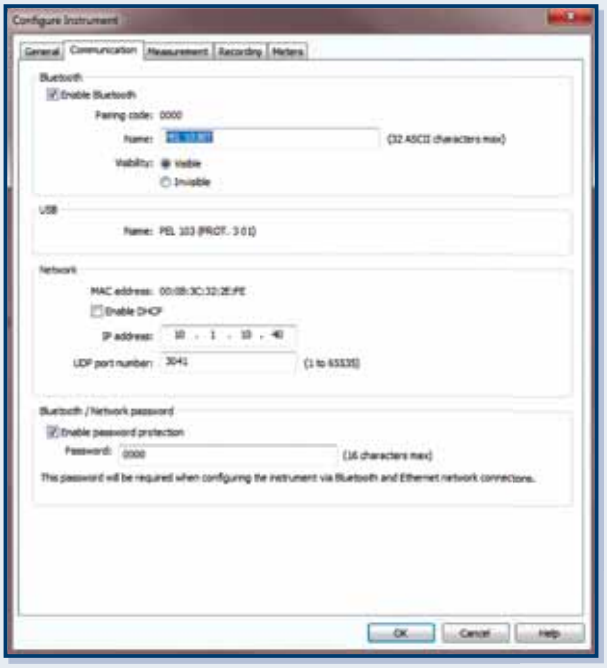
In this display the network hook-up, PT and CT primary and secondary values can be displayed as well as the IP address (if connected to the Ethernet), Software and Firmware version and serial number.

DataView® CONTROL PANEL

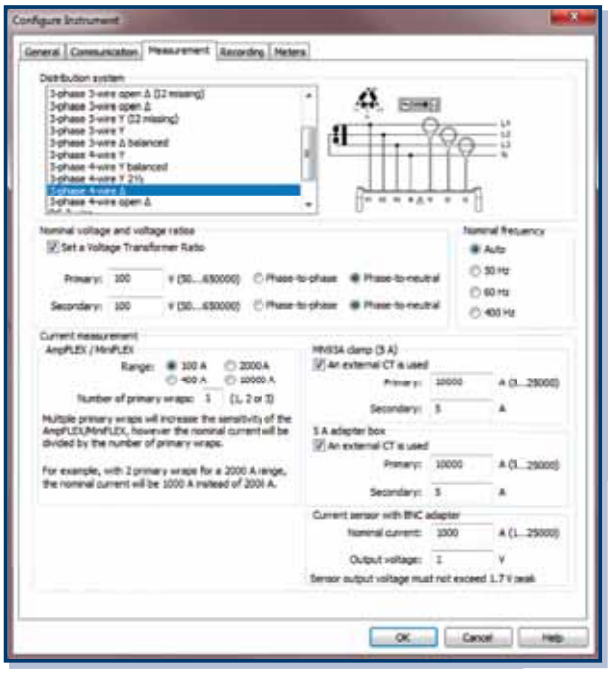
DataView® software provides a convenient way to configure and control power and energy tests from a computer. Through the use of clear and easy-to-use tabbed dialog boxes, all PEL 100 Series functions can be configured and tests can be initiated. Results can be displayed in real-time and stored on a PC. Reports may be printed along with the operator's comments and analysis.



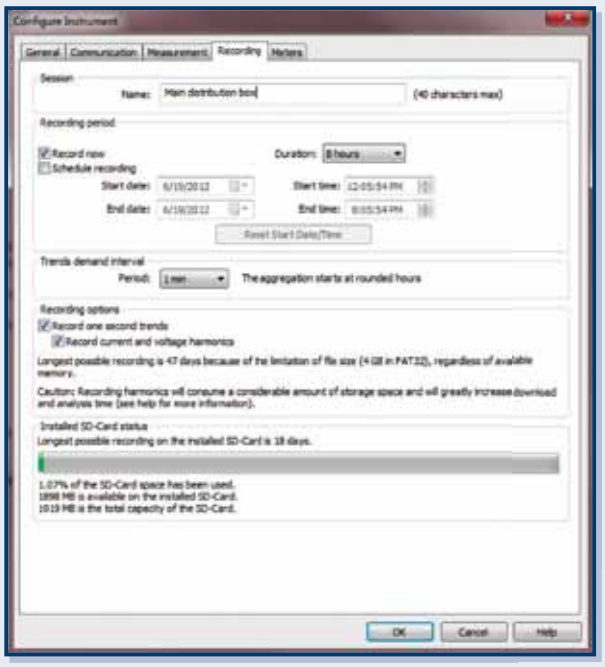
Basic information regarding Auto Power Off, instrument name and location, display brightness and contrast (Model PEL 103), setting of the real-time clock and SD card formatting is easily accomplished from the General tab.



The Communication tab provides information about the various communication mediums supported by the instrument with clear and easy setup of all functions from one dialog box.

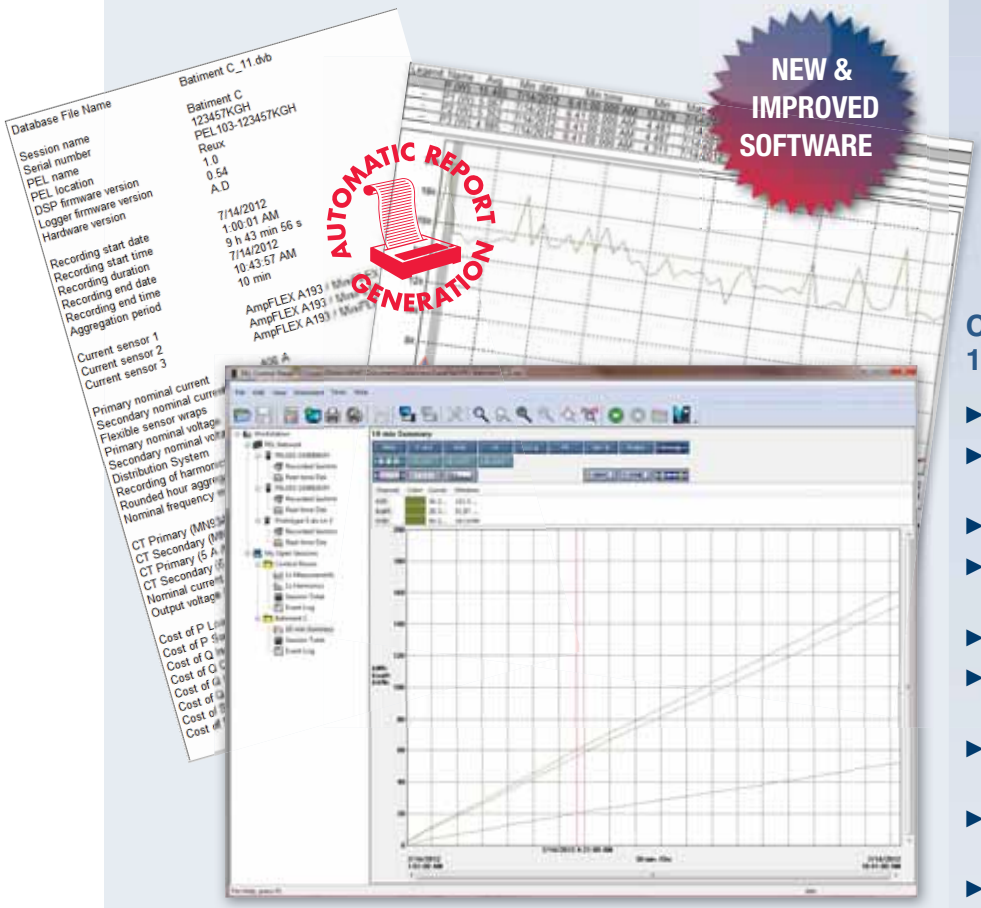


The Measurement tab specifies the electrical distribution system, voltage ratios, nominal frequency and current probe options and ratios.



In the Recording tab, configure the instrument to measure (and record) over a user selectable recording period from a few hours to a month or longer. Select demand intervals from one to sixty minutes and view available memory for data storage.

DataView® DATA ANALYSIS & REPORTING



Reports can be displayed on a PC and printed. Each report includes all test results in a tabular and graphic format, as well as operator and test site information. Comments typed by the operator will also be included.

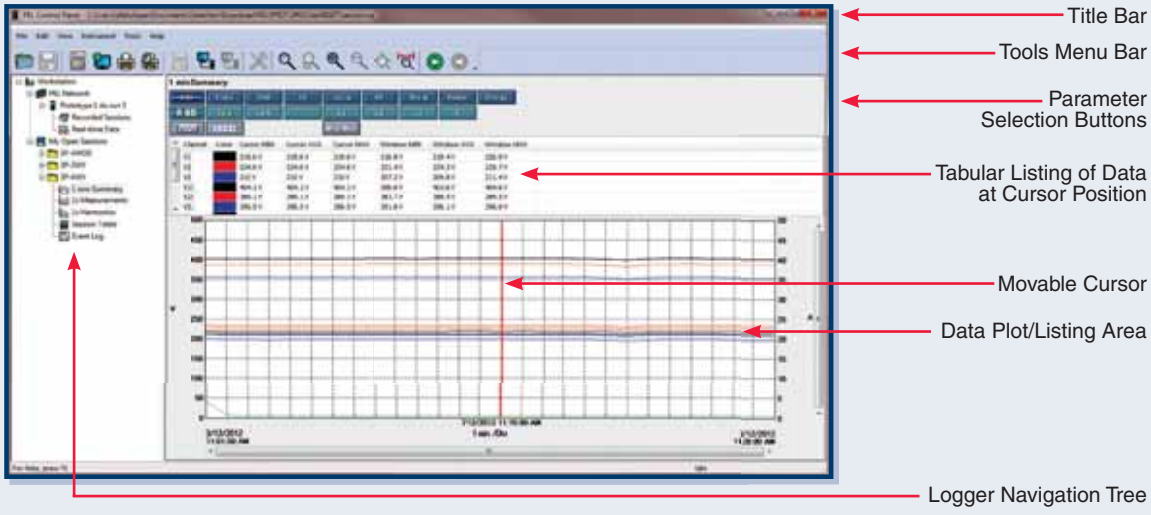
DataView® is included with Models PEL 102 and PEL 103 on a USB stick.

Configure all functions of the PEL 100 Series Loggers with DataView®

- Display real-time data on a PC
- Configure all PEL 100 Series functions and parameters from your PC
- Poll multiple energy loggers from your PC
- Customize views, templates and reports to meet specific needs
- Export data to spreadsheets
- Zoom in and out and pan through sections of the graph to analyze the data
- Display trend graphs, harmonic spectrums, text summaries and event logs
- Print reports using predefined or user designed custom templates
- Selectively review values, phases or total network recordings
- Keep track of accumulated energy and cost over time
- Create user-specific cover sheets for reports that identify specific data that includes operator, tests site and narrative associated with the data

In the PEL control panel you will find all the necessary tools and selection buttons to review recorded data as trend plots or tabular lists. Also logger selection, when multiple loggers are detected, is accomplished in the control panel.

Typical Control Panel Trend View



CASE FEATURES

PANEL FEATURES

Four safety banana jack voltage measurement terminals

Three current input terminals on the top of the instrument with automatic recognition of the current sensors

Rigid molded casing over-molded with thermo-adhesive rubber

Digital LCD displaying measured, calculated and parameterizing quantities (PEL 103 only)

Two (PEL 102) or four (PEL 103) function buttons

LED status indicators

Mounting magnets (molded into the rubber casing)

Keyhole mounting bracket

Mounting magnets (molded into the rubber casing)

Anti-theft Kensington Security Slot (on side, not shown)

Standard (IEC C7 terminal – non polarized) power connector for 110/250 VAC power source

SD memory card USB Port Ethernet RJ 45 Port

(Terminal cover caps not shown)

MOUNTING

Models PEL 102 and PEL103 can be mounted on a door or other object using the Multifix mounting attachment, included.

Models PEL 102 and PEL103 are equipped with four powerful magnets for mounting the instrument on a metallic surface.

Compact side view of Models PEL 102 and PEL103

Models PEL 102 and PEL103 easily mount in a panel with the cover in place.

MODEL PACKAGING

Assurance Guaranteed

The PEL 102 and PEL 103 power and energy loggers come complete with all the required components and accessories to conduct your power and energy recording, data analysis and report generation. No worrying or second guessing if you purchased everything to get the job done. It all comes neatly packaged in a convenient canvas carrying bag with multiple pockets to store all the components with easy access when needed.

INCLUDED WITH EACH MODEL

(1) Small Classic Tool Bag
Cat. #2133.72

OR

(1) of the following:
Power Energy Logger Model PEL 102
Power Energy Logger Model PEL 103
Cat. #2137.51 / 2137.52

(1) Multifix Universal
Mounting System
Cat. #5000.44

(4) Black Test Leads and Alligator Clips
Cat. #2137.76

(12) Color-coded ID Markers
for Test Leads
Cat. #2140.45

(3) MiniFlex® Model MA193-10-BK
Cat. #2140.48

(1) Power Cord
Cat. #5000.14

(1) 5ft USB Cable
Cat. #2140.46

(1) USB Stick with DataView®
and User Manual

(1) USB-SD-Card
Reader for PC
Cat. #5000.45

ORDERING INFORMATION

Model PEL 102 is a cost effective energy monitoring solution that can be mounted in unattended areas allowing real-time and recorded data to be reviewed remotely via Ethernet or Bluetooth communication.

www.pel100.com

DESCRIPTION	CATALOG NO.

Models PEL 102 and PEL 103 include: Small Classic Tool Bag, Three MiniFlex® MA193-10-BK Sensors, 5 ft USB Cable, Four Black Test Leads and Alligator Clips, Power Cord, 12 Color-coded ID Markers, Multifix Mounting System, Safety Card for the PEL, Sensor Compliance Sheet, 2 GB SD-Card with USB-SD-Card Reader, Quick Start User Guide and USB Stick with DataView® and User Manual.

Power & Energy Logger Model PEL 102 (no LCD) . . . . . **Cat. #2137.51**

Power & Energy Logger Model PEL 103 (includes LCD). . . . . **Cat. #2137.52**

Accessories and Replacement Parts (Optional)

AC/DC Current Probe Model MR193-BK (1000AAC/1400ADC) . . . . . **Cat. #2140.28**

AC Current Probe Model MN93-BK (200A) . . . . . **Cat. #2140.32**

AC Current Probe Model SR193-BK (1200A). . . . . **Cat. #2140.33**

AmpFlex® Sensor 24" Model 193-24-BK (6500A). . . . . **Cat. #2140.34**

AmpFlex® Sensor 36" Model 193-36-BK (6500A). . . . . **Cat. #2140.35**

AC Current Probe Model MN193-BK (5A/100A). . . . . **Cat. #2140.36**

MiniFlex® Current Sensor 10" Model MA193-10-BK. . . . . **Cat. #2140.48**

AC/DC Current Probe Model SL261 (10A-100mV/A, 100A-10mV/A, BNC). . . . . **Cat. #1201.51**

Replacement - Small classic tool bag . . . . . **Cat. #2133.72**

Replacement - Battery (custom factory replacement NiMH AAA 8.4V) . . . . . **Cat. #2137.75**

Replacement - Set of 4 black test leads, 10 ft (3m), 4 black alligator clips and 12 color-coded ID markers . . . . . **Cat. #2137.76**

Replacement - Set of 12 color-coded input ID markers . . . . . **Cat. #2140.45**

Replacement - USB cable A/B, 5 ft (1.5m) . . . . . **Cat. #2140.46**

Replacement - Power cord, 5 ft (1.5m) 115 V. . . . . **Cat. #5000.14**

Replacement - Multifix (universal mounting system) . . . . . **Cat. #5000.44**

Replacement - USB SD-card reader for PC . . . . . **Cat. #5000.45**

USB cable, A/B 10 ft (3m) . . . . . **Cat. #2136.80**

BNC adapter for SL261 current probe. . . . . **Cat. #2140.40**

Anti-thief Kensington Laptop Security Cable (available in most office supply stores) . . . . . N/A

Call the AEMC® Instruments Technical Assistance Hotline for immediate consultation with an applications engineer: **(866) 327-8731**