



Digital Energy
Multilin



EPM 2200

**MULTI-FUNCTION
POWER METER**

Instruction Manual

Software Revision: 1.01

Manual P/N: 1601-9111-A2

Manual Order Code: GEK-113575A

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EPM 2200 Multi-function Power Metering System

Chapter 2: Overview and Specifications

2.1 Hardware Overview

The EPM2200 monitor is a 0.5% class electrical panel meter. Using bright and large .56" LED displays, it is designed to be used in electrical panels and switchgear. The meter has a unique anti-dither algorithm to improve reading stability. The EPM2200 meter uses high-speed DSP technology with high-resolution A/D conversion to provide stable and reliable measurements.

The EPM2200 meter is a meter and transducer in one compact unit. Featuring an optional RS485 port, it can be programmed using the faceplate of the meter or through software. ANSI or DIN mounting may be used..

EPM2200 meter features that are detailed in this manual are as follows:

- 0.5% Class Accuracy
- Multifunction Measurement including Voltage, Current, Power, Frequency, Energy, etc.
- Percentage of Load Bar for Analog Meter Perception
- Easy to Use Faceplate Programming
- RS485 Modbus Communication

2.1.1 Voltage and Current Inputs

Universal Voltage Inputs

Voltage Inputs allow measurement to 416 Volts Line-to-Neutral and 721 Volts Line-to-Line. This insures proper meter safety when wiring directly to high voltage systems. One unit will perform to specification on 69 Volt, 120 Volt, 230 Volt, 277 Volt, 277 Volt and 347 Volt power systems.

Current Inputs

The EPM2200 meter's Current Inputs use a unique dual input method:

Method 1: CT Pass Through.

The CT passes directly 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 for utility users when sharing relay class CTs. No Burden is added to the secondary CT circuit.

Method 2: Current “Gills”.

This unit additionally provides ultra-rugged Termination Pass Through Bars that allow CT leads to be terminated on the meter. This, too, eliminates any possible point of failure at the meter. This is a preferred technique for insuring that relay class CT integrity is not compromised (the CT will not open in a fault condition).

2.1.2 Order Codes

The order codes for the EPM 2200 are indicated below.



Mfr Part Number PL2200-C1-S

Table 2-1: EPM 2200 Order Codes

PL2200	-	*	-	*
Option	A1		Volts and Amps Meter	
	B1		Volts, Amps, Power & Frequency	
	C1		Volts, Amps, Power, Frequency & Energy Counters	
Communications	X		None	
	S		RS485 + Pulse	

For example, to order an EPM 2200 to measure Volts, Amps, Power & Frequency, with RS485 + Pulse communications, use PL2200-B-S.

2.1.3 Measured Values

The following table lists the measured values available in real time, average, maximum, and minimum.

Table 2-2: EPM 2200 Measured Values

Measured Values	Real Time	Average	Maximum	Minimum
Voltage L-N	X		X	X
Voltage L-L	X		X	X
Current per phase	X	X	X	X
Current Neutral	X			
Watts	X	X	X	X
VARs	X	X	X	X
VA	X	X	X	X
Power Factor (PF)	X	X	X	X
Positive watt-hours	X			

Table 2-2: EPM 2200 Measured Values

Measured Values	Real Time	Average	Maximum	Minimum
Negative watt-hours	X			
Net watt-hours	X			
Positive VAR-hours	X			
Negative VAR-hours	X			
Net VAR-hours	X			
VA-hours	X			
Frequency	X		X	X
Voltage angles	X			
Current angles	X			
% of load bar	X			

2.1.4 Utility Peak Demand

The EPM 2200 provides user-configured Block (fixed) window, or Rolling window demand. This feature allows you to set up a customized demand profile. Block window demand is demand used over a user-configured demand period (usually 5, 15, or 30 minutes). Rolling window demand is a fixed window demand that moves for a user-specified subinterval period. For example, a 15-minute demand using 3 subintervals and providing a new demand reading every 5 minutes, based on the last 15 minutes.

Utility demand features can be used to calculate kW, kVAR, kVA and PF readings. All other parameters offer maximum and minimum capability over the user-selectable averaging period. Voltage provides an instantaneous maximum and minimum reading which displays the highest surge and lowest sag seen by the meter.

2.2 Specifications

POWER SUPPLY

Range:..... Universal, (90 to 265) VAC @50/60Hz
 Power consumption:..... 5 VA

VOLTAGE INPUTS (MEASUREMENT CATEGORY III)

Range:..... Universal, Auto-ranging up to 416 V AC L-N, 721 V AC L-L
 Supported hookups:..... 3-element Wye, 2.5-element Wye, 2-element Delta,
 4-wire Delta
 Input impedance:..... 1 MOhm/phase
 Burden:..... 0.0144 VA/phase at 120 Volts
 Pickup voltage:..... 10 V AC
 Connection:..... Screw terminal
 Maximum input wire gauge:..... AWG #12 / 2.5 mm²
 Fault withstand:..... Meets IEEE C37.90.1
 Reading:..... Programmable full-scale to any PT ratio

CURRENT INPUTS

Class 10:..... 5 A nominal, 10 A maximum
 Burden:..... 0.005 VA per phase maximum at 11 A
 Pickup current:..... 0.1% of nominal
 Connections:..... O or U lug;
 Pass-through wire, 0.177" / 4.5 mm maximum diameter
 Quick connect, 0.25" male tab
 Fault Withstand (at 23°C):..... 100 A / 10 seconds, 300 A / 3 seconds, 500 A / 1 second
 Reading:..... Programmable full-scale to any CT ratio

MEASUREMENT METHODS

Voltage and current:..... True RMS
 Power:..... Sampling at 400+ samples/cycle on all channels
 measured; readings simultaneously
 A/D conversion:..... 6 simultaneous 24-bit analog-to-digital converters

UPDATE RATE

All parameters:..... Up to 1 second

ACCURACY

For 23⁰ C, 3 Phase balanced Wye or Delta load.

Parameter	Accuracy	Accuracy Input Range
Voltage L-N [V]	0.2% of reading ²	(69 to 480)V
Voltage L-L [V]	0.4% of reading	(120 to 600)V
Current Phase [A]	0.2% of reading ¹	(0.15 to 5)A
Current Neutral (calculated) [A]	2% of Full Scale ¹	(0.15 to 5)A @ (45 to 65)Hz
Active Power Total [W]	0.5% of reading ^{1,2}	(0.15 to 5)A @ (69 to 480)V @ +/- (0.5 to 1) lag/lead PF
Active Energy Total [Wh]	0.5% of reading ^{1,2}	(0.15 to 5)A @ (69 to 480)V @ +/- (0.5 to 1) lag/lead PF
Reactive Power Total [VAR]	1.0% of reading ^{1,2}	(0.15 to 5)A @ (69 to 480)V @ +/- (0 to 0.8) lag/lead PF
Reactive Energy Total [VARh]	1.0% of reading ^{1,2}	(0.15 to 5)A @ (69 to 480)V @ +/- (0 to 0.8) lag/lead PF
Apparent Power Total [VA]	1.0% of reading ^{1,2}	(0.15 to 5)A @ (69 to 480)V @ +/- (0.5 to 1) lag/lead PF
Apparent Energy Total [VAh]	1.0% of reading ^{1,2}	(0.15 to 5)A @ (69 to 480)V @ +/- (0.5 to 1) lag/lead PF
Power Factor	1.0% of reading ^{1,2}	(0.15 to 5)A @ (69 to 480)V @ +/- (0.5 to 1) lag/lead PF
Frequency	+/- 0.01Hz	(45 to 65)Hz
Load Bar	+/- 1 segment	(0.005 to 6)A

¹ For 2.5 element programmed units, degrade accuracy by an additional 0.5% of reading.

² For unbalanced voltage inputs where at least one crosses the 150V auto-scale threshold (for example, 120V/120V/208V system), degrade accuracy by additional 0.4%.

EPM 2200 accuracy meets the IEC62053-22 Accuracy Standards for 0.5% Class Meters. This standard is shown in the table below.

Value of Current	Power Factor	Percentage Error Limits for Meters of Class 0.5 S
$0.01 I_n \leq I < 0.05 I_n$	1	±1.0
$0.05 I_n \leq I \leq I_{max}$	1	±0.5
$0.02 I_n \leq I < 0.1 I_n$	0.5 inductive 0.8 capacitive	±1.0 ±1.0
$0.1 I_n \leq I \leq I_{max}$	0.5 inductive 0.8 capacitive	±0.6 ±0.6
When specially requested by the user, from: $0.1 I_n \leq I \leq I_{max}$	0.25 inductive 0.8 capacitive	±1.0 ±1.0



NOTE

In the table above:

I_n = Nominal (5A)

I_{max} = Full Scale

ISOLATION

All Inputs and Outputs are galvanically isolated to 2500 V AC

ENVIRONMENTAL

Storage:.....-20 to 70°C

Operating:.....-10 to 60°C

Humidity:.....up to 95% RH, non-condensing

Faceplate rating:NEMA 12 (water resistant), mounting gasket included

COMMUNICATIONS FORMAT

Types:.....RS485P - RS485 port through back plate plus KYZ Pulse

KYZ/RS485 PORT SPECIFICATIONS

RS485 Transceiver; meets or exceeds EIA/TIA-485 Standard:

Type:Two-wire, half duplex

Min. Input Impedance:96kΩ

Max. Output Current:±60mA

Wh PULSE

KYZ output contacts (and infrared LED light pulses through face plate):

Pulse Width:40ms

Full Scale Frequency:6Hz

Contact type:Solid State – SPDT (NO – C – NC)

Relay type:Solid state

Peak switching voltage:DC ±350V

Continuous load current:120mA

Peak load current:350mA for 10ms

On resistance, max.:35Ω

Leakage current:1μA@350V

Isolation:AC 3750V

Reset State:(NC - C) Closed; (NO - C) Open

Infrared LED:

Peak Spectral Wavelength:940nm

Reset State:Off

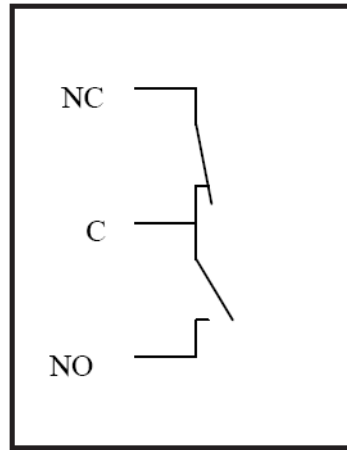


FIGURE 2-1: Internal Schematic (De-energized State)

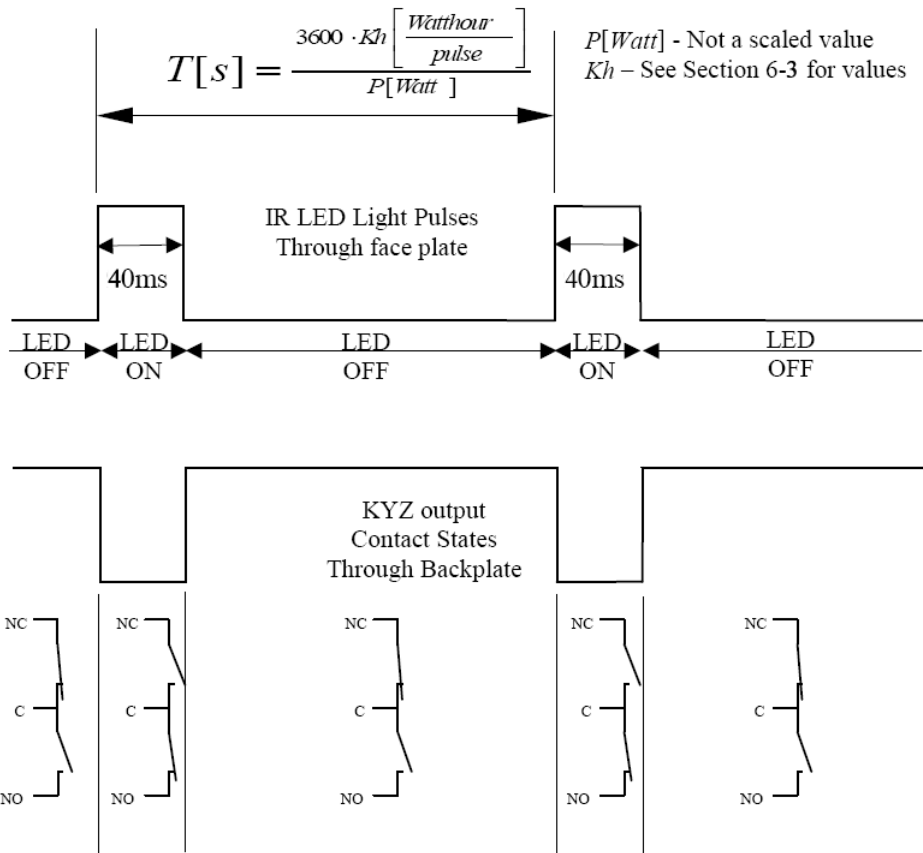


FIGURE 2-2: Output Timing

COMMUNICATIONS PORTS

Protocols:Modbus RTU, Modbus ASCII
 Baud rate:9600 to 57600 bps
 Port address:001 to 247
 Data format:8 bits, no parity

MECHANICAL PARAMETERS

Dimensions:4.25" × 4.82" × 4.85" (L × W × H)
 105.4 mm × 123.2 mm × 123.2 mm (L × W × H)
 Mounting:mounts in 92 mm square DIN or ANSI C39.1, 4-inch round cut-out
 Weight:2 pounds / 0.907 kg

COMPLIANCE

Test	Reference Standard
IEC62053-22 (0.5% Accuracy)	
ANSI C12.20 (0.5% Accuracy)	
Surge Withstand	ANSI (IEEE) C37.90
Burst	ANSI C62.41
Electrostatic Discharge	IEC1000-4-2
RF Immunity	EC1000-4-3
Fast Transient	IEC1000-4-4
Surge Immunity	IEC1000-4-5

APPROVALS

	Applicable Council Directive	According to:
North America	UL Recognized	UL61010-1 C22.2. No 61010-1 (PICQ7)
ISO	Manufactured under a registered quality program	ISO9001