

# Power MultiMeter PMM-1 Version 2.12

## Multi-function Measuring Instrument



- **Simultaneous measurement and display of all three-phase system parameters**
- **Accurate phase angle measurement at low current levels**
- **Versatile, menu-driven instrument with a built-in timer and data-logging**
- **High-speed measurement mode**

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### DESCRIPTION

The Power MultiMeter (PMM-1) version 2.12 is a next-generation multifunction instrument for measuring ac or dc voltage, ac primary and secondary current, power, reactive power, power factor, phase angle and frequency of a single or three-phase electrical system.

In the single-phase mode, the PMM-1 is easily configured to measure the amplitude and phase angle between any two voltages and current inputs. These measured quantities are then displayed in an enlarged font size for easier reading on a graphic display. In three-phase mode, all measured quantities are displayed simultaneously on a large, easy-to-read graphic display.

The unique firmware in the PMM-1, combined with a built-in, microprocessor-based timer, is specifically designed to ease testing and commissioning of protective relay systems, including induction unit pickup and timing tests.

The internal timer responds to a variety of start and stop gates, including the application of ac or dc voltage, and opening or closing of dry contacts.

The PMM-1 is a menu-driven instrument equipped with data-retention and data-logging capabilities. It can be used to automatically store measured data at user defined intervals from one minute to 60 minutes. The date and time can also be set, which can be used to start and stop data logging. Up to 286 three-phase data sets can be stored in non-volatile memory. Twenty-four

hours (1 day) of data logging can be achieved at 5-minute intervals or 72 hours (3 days) using 15-minute intervals. This feature provides the ability to conduct load and voltage surveys.

Accurate phase angle measurement at very low current levels, which can be displayed either as lagging or leading angles, is another feature of the PMM-1. The user can choose for phase angle readings to be displayed as 0-360 degrees (leading or lagging) or  $\pm 180$  degrees lagging.

Motor starting currents, voltages, and power can be captured for analysis. In addition, if a circuit is known to trip under given conditions, its high-speed capture capability can be used to record the quantities prior to the event causing the trip condition. The high-speed capture mode allows 15, 30, or 60 second measurement periods to be selected. This results in 300, 600, or 1200 sets of readings in the single-phase mode and 100, 200, or 400 sets of readings in the three-phase mode.

Any current or voltage transformer ratio up to a ratio of 9999:1 or 9999:5 can be input into the equipment. The displayed value on the PMM-1 is the Primary Line value of the circuit under test. The values measured will be displayed as Primary values eliminating the need for making conversions.

### APPLICATIONS

The PMM-1 is an ideal instrument for use in general electrical systems maintenance, electrical machine repairs, protective relay

testing or in monitoring power at the electrical service entrance.

The PMM-1 is designed to perform fast, accurate checking and testing of protective relay and meter installations during their commissioning and in routine maintenance.

For meter installations, unit measures phase-to-phase voltage and single-phase current amplitudes and phase angles.

Combined with a voltage or current source, the PMM-1 also becomes an excellent tool for testing and calibrating virtually any type of protective relay.

The portable PMM-1 allows current measurements to be made without disconnecting the current wires through the use of clamp type current transformers. Measured quantities can be printed to an external printer or downloaded to a PC for further analysis.

Max Hold feature records highest value amplitude recorded during the measurement period.

### FEATURES AND BENEFITS

- Battery and line operated, with an automatic, built-in charger.
- Rugged, ergonomic and lightweight plastic enclosure.
- Three independent voltage and current channels with a built-in timer.
- Ability to input any current transformer ratio up to a ratio of 9999:1 or 9999:5.
- Simultaneously measures and displays voltage, current, phase angle, power, reactive power, power factor and frequency of single or three-phase systems.
- Measures neutral current when measuring three-phase currents.
- Wide current and voltage operating ranges.
- High-speed measurement mode with up to 1200 sets of readings in single-phase mode and up to 400 sets of readings in three-phase mode.
- When in timer mode, the phase angle between the voltage and current is measured and displayed eliminating the need to change to the single-phase mode to obtain phase angle readings.
- Accurate phase angle measurement at low current levels.
- Phase angle measurements can be displayed as lagging or leading angles.
- Data storage for saving measured values.
- Autoranging to reduce test time.
- Measurement of primary currents, using optional clamp-on CTs.

- Programmable timed data transmission for data-logging purposes.
- RS-232C data and parallel printer output ports.
- Motor starting currents, voltages, and power can be captured for analysis.
- Large, easy-to-read, high-resolution LCD display with an available backlight and contrast control.
- Measures all harmonic content simultaneously of any selected voltage or current, up to the 49th harmonic.
- Measures phase-to-phase voltage and single-phase currents for checking revenue meter installations.
- Max Hold feature records highest amplitudes during period of time.

### SPECIFICATION

#### Input

**Line:** 90 - 253 Vac, 50/60 Hz, 30 VA

#### Battery

Rechargeable battery with internal automatic charger. Safety features include internal battery overcharging and charge exhaustion protection.

**Operation Time:** 10 hours continuous on full charge

#### Voltage

0 - 650 Volts (AC/DC), 0.01% resolution of range

**Accuracy:**  $\pm 0.05\%$  of reading, 50/60 Hz

From 3 - 650 ac Volts (21° - 25° C).

$\pm 0.1\%$  of reading, from 3 - 650 ac Volts (0° - 50° C).

$\pm 0.1\%$  of reading  $\pm 25\text{mV}$ , from 3-650 V dc.

**Input Impedance:** 1M  $\Omega$

**Maximum Input:** 1000 Volts (ac) Between inputs or from inputs to chassis.

**Measured:** RMS or AVG

**Crest Factor:** 3

#### Current

**Direct Input:** 0 - 100 Amperes (ac), 0.01% resolution of range

**Accuracy:**  $\pm 0.05\%$  of reading, 50/60 Hz

From 0.10 - 10A (21° - 25° C)  $\pm 0.1\%$  of reading  $> 10$  amperes

**Minimum Current Measurement:** 2 mA

**Burden at 5A:** 0.1VA

**Crest Factor:** 3

#### Phase Angle

0 - 360.00° or  $\pm 0$  - 180.00°, 0.01° resolution

**Accuracy 50/60 Hz:**  $\pm 0.08^\circ$  input levels above 30 V and 1.0 amp<sup>(1)</sup>,  $\pm 0.5^\circ$

input levels above 3 Volts and 0.02 amps,  $\pm 2^\circ$  input levels down to 0.002 amps.

**Power**

± 0 - 100kW, 0.1% Resolution

Accuracy ± 0.1% reading (0.1A to 10A) 50/60Hz  
± 0.15% reading (10A to 100A) 50/60Hz

**Reactive Power**

± 0 - 100kVAR, 0.1% Resolution

Accuracy ± 0.1% reading (0.1A to 10A) 50/60Hz  
± 0.15% reading (10A to 100A) 50/60Hz

**Frequency component only of a voltage or current**

10 - 1000 Hz, 0.01 Hz resolution.

Accuracy: ±0.03 Hz.

**Harmonics**

Measures all harmonics content simultaneously of any selected voltage or current, up to the 49th harmonic.

Accuracy: ±5% of reading

**Time**

0.000 to 999.999 seconds

0.000 to 9999.9 cycles

**Seconds Mode**

±LSD or ±0.005% of reading, whichever is greater when initiated by a dry contact, a DC potential above 5 volts or an AC potential above 115 VAC\*.

**Cycles Mode**

±0.5 cycle when initiated by a dry contact, a DC potential above 5 volts or an AC potential above 115 VAC.\*

\*AC voltage accuracy is worse at lower voltages and is ±8 ms in worst cases (5 V rms applied just following wave-shape peak).

**Start/Stop Inputs**

5-300 Volts (AC or DC) start or stop inputs. AC or DC applied/removed, or dry contact closure or opening.

**Voltage Applied**

Timer starts or stops when an AC or DC potential (5 to 300 V) is applied.

**Voltage Removed**

Timer starts or stops when an AC or DC potential (5 to 300 V) is removed.

**Input Resistance**

1000MΩ min.

**Response Time**

Regular measurement mode 2 readings per second.

**High speed measurement mode**

20 readings per second for a period of 15, 30 or 60 sec.

**Data input/output**

**RS-232 Serial Data Port:** The RS232 port is provided for control of PMM-1 and transferring data from the instrument to a personal computer. PMM-1 software is included.

**Printer Port:** Parallel printer port is provided to allow the printing of data on an external printer. (Printer is not included with instrument.)

**Dimensions**

13.5 H x 9 W x 9 D in.

344 W x 242 H 242 D mm

**Weight**

13.4lbs (6.0 kg)

**Operating Temperature**

-15° to 55° C (5° to 131° F)

**Storage Temperature**

-30° to 75° C (-22° to 167° F)

**Safety, EMC, Emissions and Immunity**

IEC61010-1, Overvoltage Category II, EN61326-1

**Shock, Vibration and Temperature**

**Shock:** MIL-PRF-28800D (30g/11ms half-sine)

**Vibration:** MIL-PRF-28800D (5 to 500 Hz sinnsodial)

**Temperature:** MIL-STD-810

<sup>(1)</sup> Using current as reference

**OPTIONAL ACCESSORIES**

- Fused potential leads for measuring high voltage
- Miniature clamp-on CT's assists in current check of wired distribution panels
- Clamp-on CT allows current measurement of primary cable or busbar circuits

The Power MultiMeter optional accessories are used to measure ac voltage, ac primary and secondary current of a single or three-phase electrical systems.

The Power MultiMeter accessories shown on the following page allows the technician to easily connect a power measuring instrument to any electrical system for measurement.

**Standard Potential Leads**

Cat. No. 835312



The standard potential leads are for general use when measuring a standard voltage system.

Set of 4 leads,  
6 ft. 6 in. (2 m)

**20 Amp States Current Plug**

Cat. No. 835313



The measurement of secondary current from a distribution test switch can be obtained by using the 20 amp states current plug. Set of 3 states current plugs, 3 ft. 6 in. (1m)

**Fused Potential Leads**

Cat. No. 830213



The fused potential leads provides the technician protection when measuring a higher system voltage (600 vac/2 amp fuse).

Set of 4 fused leads,  
6 ft. 6 in. (2m)

**CLAMP-ON CURRENT TRANSFORMERS**

 Miniature Clamp-On CT  
 Cat. No. 50611


The miniature clamp-on CT makes it easy to check current path in a wired distribution panel without worry of interrupting a current circuit in service.

**Ratio:** 200:1

**Accuracy Class:**  $\pm 1\%$ 
**Cable Size:**

0.59 in. (14.98 mm)

**Dimensions:**

3.8 H x 1.69 W x 0.9 D in. 96.5 H x 43 W x 23 D mm

**Weight:** 0.25 lbs (0.11 Kg)

**Clamp-On CT**

The measurement of primary current (100 amps or more) can be measured by using the optional clamp-on CT's. The clamp-on CT's allows the technician to measure current from primary cable or busbar circuits.

Clamp-On CT 1000

Cat. No. 830312

Cat. No. 835318


**Ratio:**

1000:1 (Cat. No. 830312)

1000:5 (Cat. No. 835318)

**Accuracy Class:**  $\pm 1\%$ 
**Cable Opening:** 1.7 in. (43.18 mm)(US) 2.0 in. (51 mm) (NS)

**Busbar Opening:**

1.7 in. x 0.47 in. (43.18 mm x 11.94 mm) (US)

**Dimensions:**

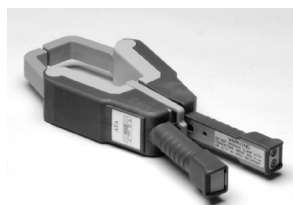
8.0 H x 2.5 W x 1.6 D in. (203 H x 63.5 W x 40.6 D mm)

**Weight:** 1.2 lbs (0.55 Kg)

**Clamp-On CT 3000**

Cat. No. 835319

Cat. No. 835320


**Ratio:**

3000:1 (Cat. No. 835319)

3000:5 (Cat. No. 835320)

**Accuracy Class:**  $\pm 1\%$ 
**Cable Opening:**

2.76 in. (70 mm)

**Busbar Opening:**

5.0 in. x 1.3 in. or

4.0 in x 1.8 in.

(127 mm x 33 mm or

102 mm x 45.7 mm)

**Dimensions:** 5.7 H x 13.2 W x

2.0 D in. (144.8 H x 335.3 W x 51 D mm)

**Weight:** 3.7 lbs (1.7 Kg)

**Soft Carrying Case**

Cat. No. 50775



Padded Canvas/polyester case

**Dimensions:**

11.0 H x 10.0 W x 10.0 D in. (281.0 H x 255 W x 255 D mm)

**Weight:** 0.8 lb (0.37 Kg)

**ORDERING INFORMATION**

Item (Qty)	Cat. No.
PowerMultiMeter	PMM-1
<b>Included Accessories</b>	
Accessory pouch	
External mount portable case	17355
Fuses 1.0 A 250 V, 5 x 20 mm [2]	MC7797
Line cord, three wire, 120 V	6828
Instruction manual	17357
<b>Optional Accessories</b>	
Standard potential leads [set of 4, 2m]	835312
Fused potential leads [set of 4, 2m]	830213
20-Amp current leads, states plugs [set of 3, 1m]	835313
20-Amp current leads, clips [set of 3, 1m]	835314
100-Amp current leads [set of 3, 1m]	835315
1000:1 clamp-on current transformer	830312
1000:5 clamp-on current transformer	835318
3000:1 clamp-on current transformer	835319
3000:5 clamp-on current transformer	835320
200:1 miniature clamp-on current transformer	50611
Soft carrying case	50775