Panasonic
ideas for life

CE
Conforming to Low Voltage
and EMC Directives

One Meter Works
for Both Energy Saving and Power Surveillance

Panasonic   Eco-POWER METER

P

0 20   40   60   80   100 120%
1   10.000   kW
0 20   40   60   80   100 120%
2   10.000
0 20   40   60   80   100 120%
3   10.000
Σ   30.000

MODE   SET   SHIFT/▼   ITEM/▲

KW9M

③ Year Warranty

Multi function type developed by adding a power surveillance function to a simple power meter

KW9M Eco-POWER METER is a new type of power meter, which can promote energy saving by making power consumption visualization as with existing Eco-POWER METER models. This single meter KW9M also monitors power with high accuracy and functionality.

KW9M

KW Series
Energy Saving

Electric Power Surveillance
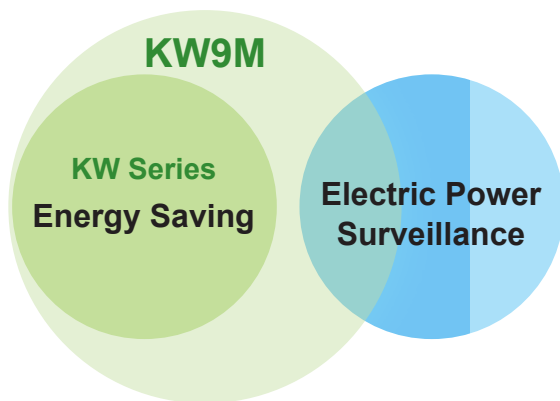
Energy Saving

Fields
- Factory
- Store
- Office
- Infrastructure (Freeway, railway station · facility, etc)
- Theme park

Applications
- Visualizing power consumption by department or equipment
- Monitoring for any waste of electric power

Electric Power Surveillance

Fields
- Factory
- Store
- Office
- Power equipment
- Infrastructure (Freeway, railway station · facility, etc)
- Public facilities

Applications
- Monitoring power receiving and regenerative electric power
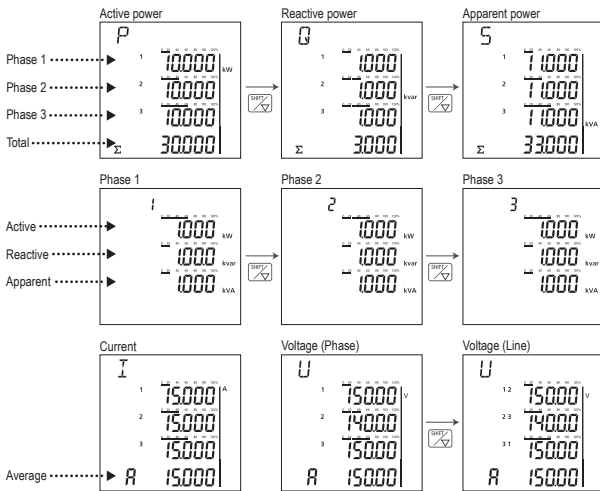- Improving power factor

Features

Feature 1

- **Large-screen LCD with backlight clearly displays values in four lines**
- **High accuracy! Instantaneous active power: 1%, Class 1 (IEC62053-21)**
  Display updating time: 0.1 sec

96 mm
3.78 in

Large key switches for easy operations

96 mm
3.78 in
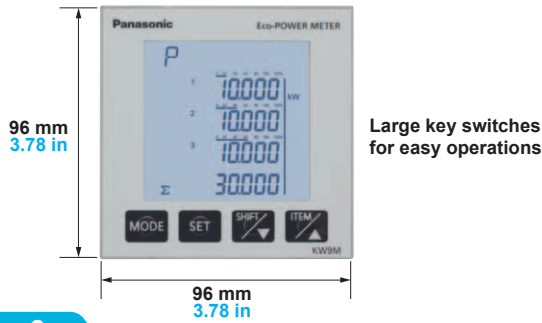
Feature 2

- **The total and individual power values of each phase are displayed on one screen, enabling you to check the phase balance at a glance. The data is useful for power quality checks and power factor improvements.**
 (Line voltage, Phase voltage, Current, Power factor, Active/Apparent/Reactive power)

Active power
Phase 1
Phase 2
Phase 3
Total

Reactive power

Apparent power

Phase 1 — Active, Reactive, Apparent
Phase 2
Phase 3

Current — Average
Voltage (Phase)
Voltage (Line)

Feature 3

- **Panel-mount type capable of multi-circuit measurement**
- **Capable of simultaneously measuring up to three circuits in a single phase two-wire system of same power supply**
- **Capable of displaying voltages, currents, electric power (active, reactive, apparent), and power factor**

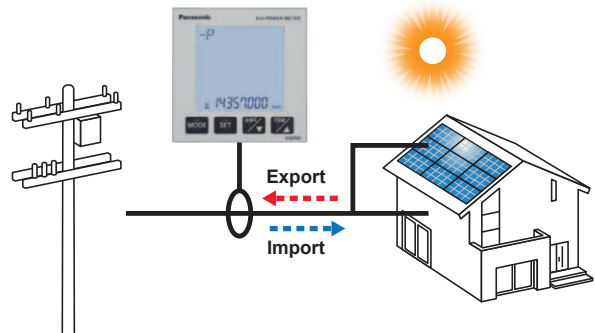Power supply 1 2
CT1 — Load 1
CT2 — Load 2
CT3 — Load 3
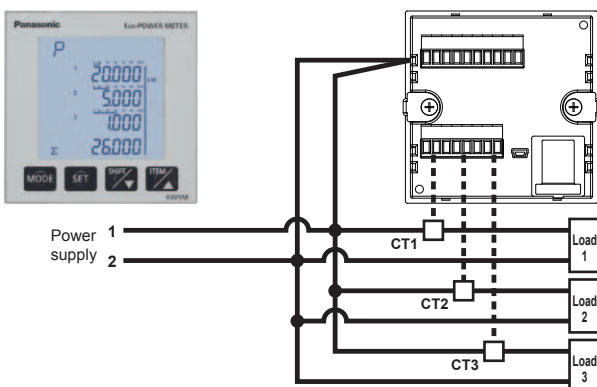
Feature 4

- **Capable of displaying small currents of 1 mA or above This allows for the monitoring of standby power consumption, which helps energy saving.**

1 mA or above displayable*
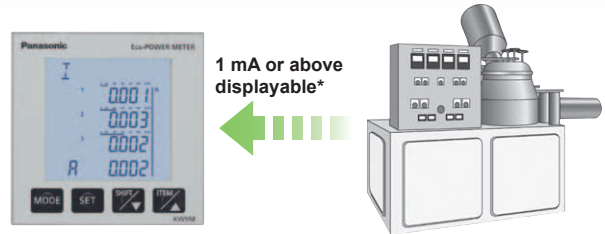
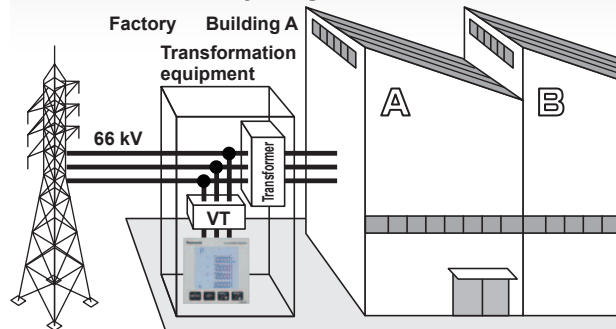* Capable of measuring 0.1 % or higher the rating of the secondary side of CT.

Feature 5

- **Regenerative power can also be measured by one KW9M Eco-POWER METER. Bidirectional integrated electric power of each circuit can be measured.**
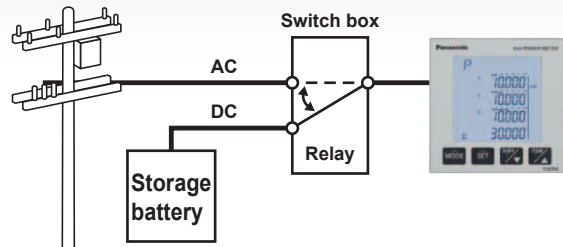

Export
Import

Feature 6

- **A maximum of 66 kV high voltage power supply can also be measured by using VT.**

Factory   Building A
Transformation equipment
66 kV
Transformer
VT
A   B

Feature 7

- **Compatible with AC/DC operating power supply**

Switch box
AC
DC
Relay
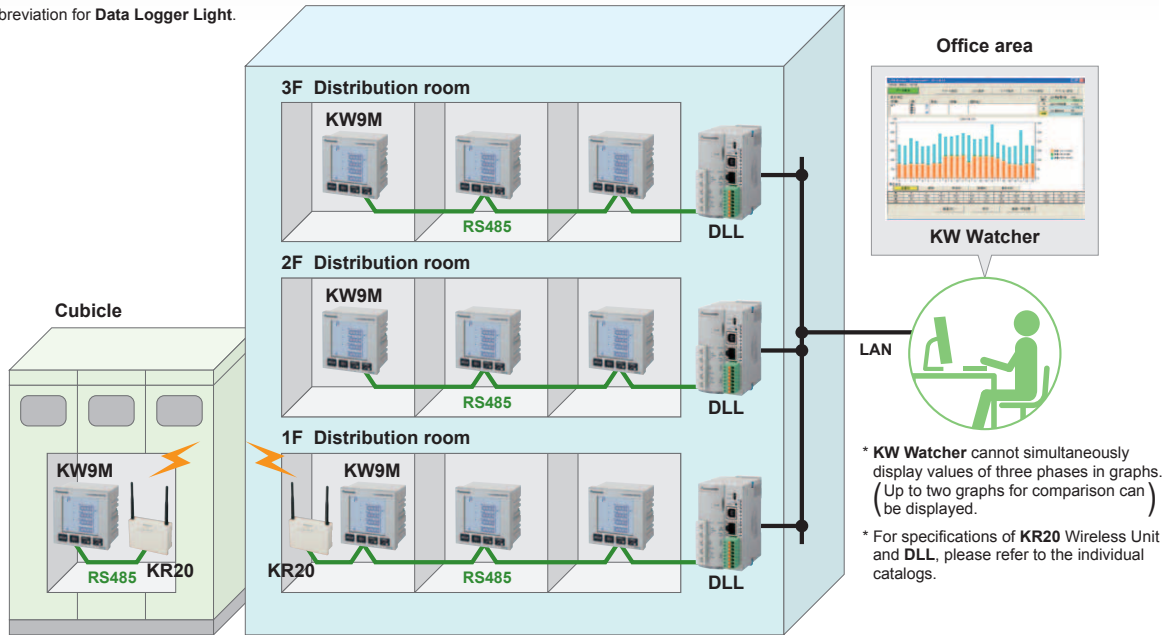Storage battery

Feature 8

- Capable of measuring power (primary side) of inverter-controlled equipment, which is susceptible to harmonic effects.
- Ideal for measuring inverter power for large equipment, lighting, etc.

Compressor   Molding machine   Lighting
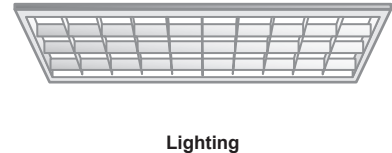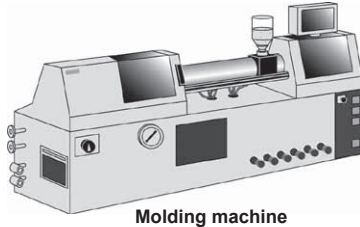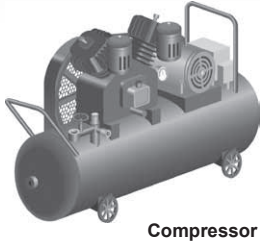
Feature 9

- Data can be made visualization by connecting the meter to DLL* and logging the data.
- The RS485 port is isolated for safe use. Up to 99 KW9M units can be connected.

*DLL is the abbreviation for **Data Logger Light**.

Office area

3F Distribution room
KW9M
RS485
DLL

KW Watcher

2F Distribution room
KW9M
RS485
DLL

LAN

Cubicle

1F Distribution room
KW9M
KW9M
RS485
KR20
KR20   RS485   DLL

* **KW Watcher** cannot simultaneously display values of three phases in graphs. (Up to two graphs for comparison can be displayed.)

* For specifications of **KR20** Wireless Unit and **DLL**, please refer to the individual catalogs.
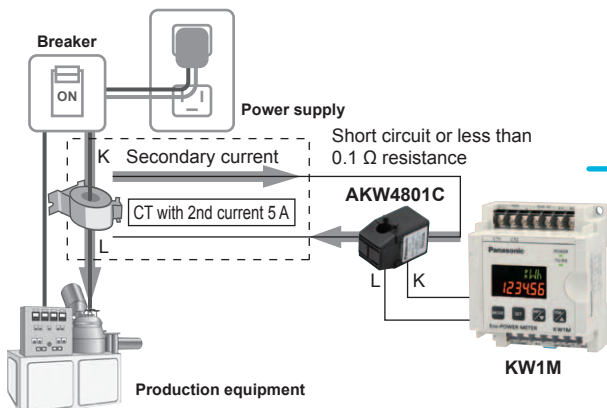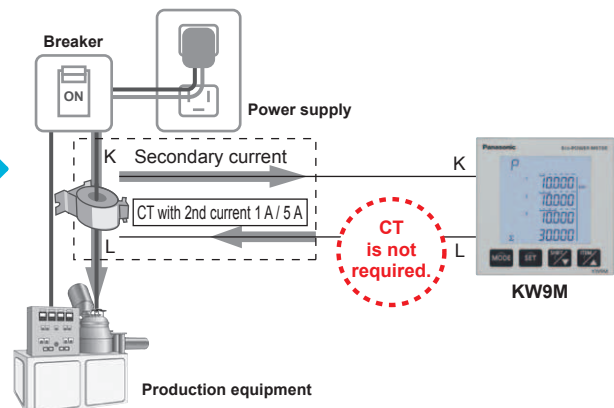
Feature 10

You can measure power with a direct connection to an already-installed large-capacity general-purpose CT (secondary side 1 A / 5 A type).

* The dedicated CT for Eco-POWER METER cannot be used. Use a CT with a secondary side current of 1 A / 5 A.

Measuring power using another Eco-POWER METER series

Breaker
ON
Power supply
K
Secondary current
CT with 2nd current 5 A
L
Short circuit or less than 0.1 Ω resistance
AKW4801C
L
K
KW1M
Production equipment

Measuring power using large-capacity general-purpose CT

Breaker
ON
Power supply
K
Secondary current
CT with 2nd current 1 A / 5 A
L
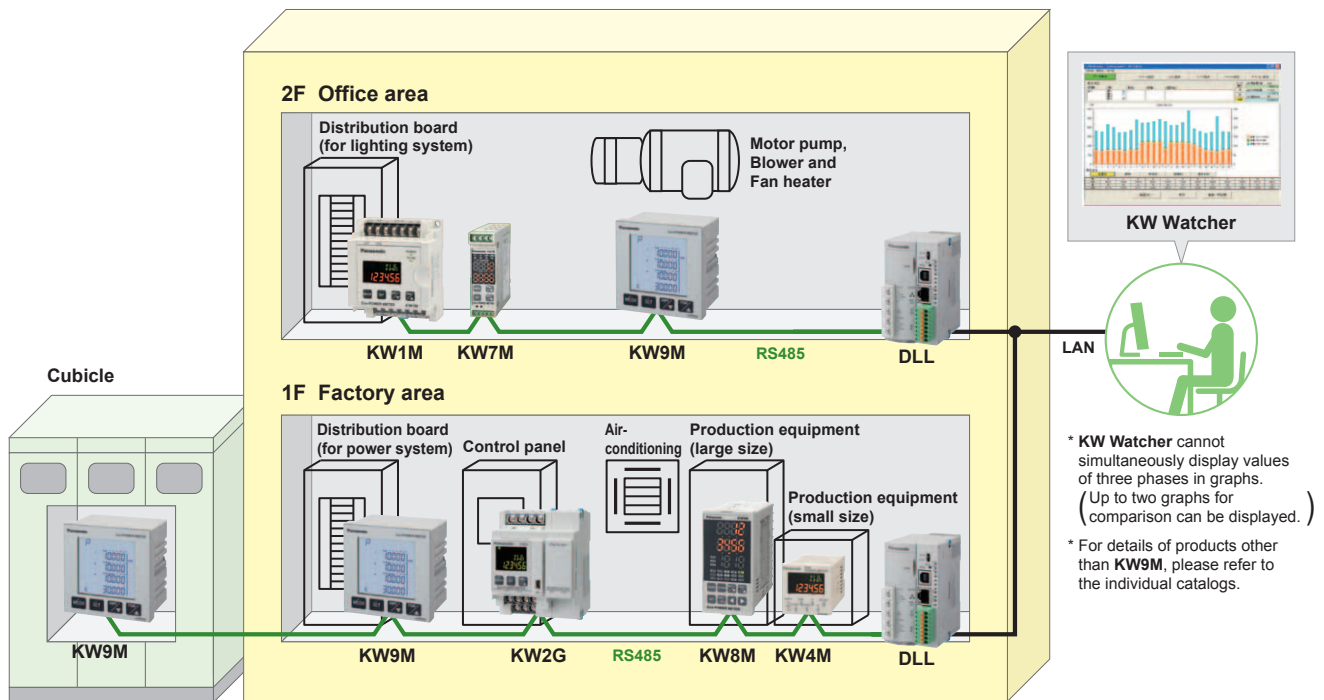**CT is not required.**
K
L
KW9M
Production equipment

The measuring accuracy of the Eco-POWER METER does not take the CT error into account. Other Eco-POWER METER series need to use two CTs for measurement. **KW9M** is ready for direct input from only one CT, allowing higher accuracy measurements than with other Eco-POWER METER series.

Example of a comprehensive solution for the entire factory

2F Office area

Distribution board
(for lighting system)

Motor pump,
Blower and
Fan heater

KW1M   KW7M   KW9M   RS485   DLL

1F Factory area

Distribution board   Control panel   Air-   Production equipment
(for power system)   conditioning   (large size)

Production equipment
(small size)

KW9M   KW2G   RS485   KW8M   KW4M   DLL

Cubicle

KW9M

KW Watcher

LAN

* **KW Watcher** cannot simultaneously display values of three phases in graphs. (Up to two graphs for comparison can be displayed.)

* For details of products other than **KW9M**, please refer to the individual catalogs.

Free visualization software for supporting energy management

Power consumption analysis enhances equipment operation efficiency.

Panasonic
KW Watcher
Ver. 2.10

This product is licensed to:
sunx
sunx
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KW Watcher can be downloaded, free of charge, from our website.
*You can also check the required operating environments.

Free software to create graphs
from data collected by DLL
for energy management

■ **Cumulative bar charts by equipment and pie charts**
■ **Comparison graphs by time and equipment**
■ **Numeric display function**
■ **Auto graph updating function**

* **KW Watcher** cannot simultaneously display values of three phases in graphs.
(Up to two graphs for comparison can be displayed.)
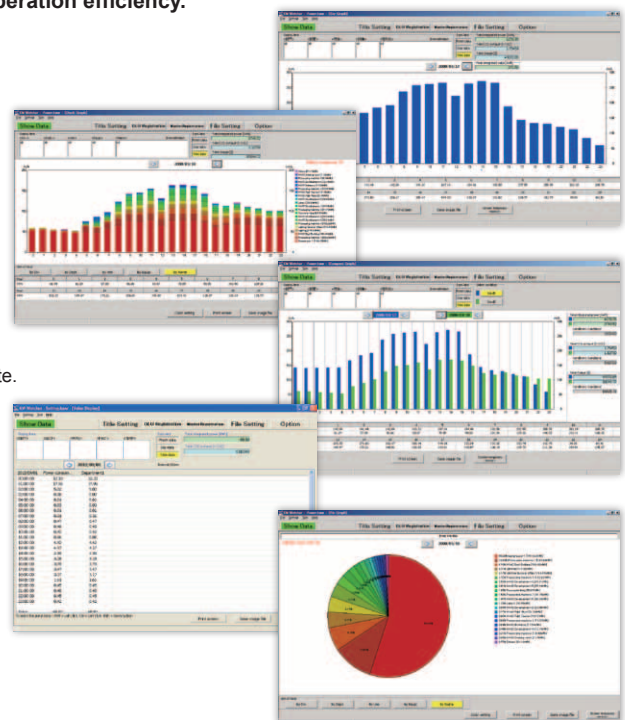
Specifications

■ORDER GUIDE

Product name	Phase/Wire system	Input measurement voltage	Input measurement current	Model No.
KW9M Eco-POWER METER Standard type	Single-phase two-wire (1P2W) Single-phase three-wire (1P3W) Three-phase three-wire (3P3W) Three-phase four-wire (3P4W) (common)	0 to 500 V AC	1 to 4,000 A	**AKW91110**

*The dedicated current transformer (CT) can not be used. Please use a general-purpose CT with a secondary side 1 A / 5 A.

■MEASUREMENT ITEMS

Item		Unit	Display data range
Integral power (import)	Active	kWh	0.000 to 9999999.9
	Reactive	kvarh	
	Apparent	kVAh	
Integral power (export)	Active	kWh	0.000 to 9999999.9
	Reactive	kvarh	
Instantaneous power	Active	kW	−99999 to 0.000 to 99999
	Reactive	kvar	
	Apparent	kVA	0.000 to 99999
Current		A	0.000 to 8000.0 (Note)
Voltage		V	0.00 to 99999 (Note)
Power factor			−1.000 to 0.000 to 1.000 (Fixed 3 places of decimal)
Frequency		Hz	0.00 to 99.99 (Fixed 2 places of decimal) (Note)
Convertion value			0.000 to 9999999.9
Temperature		degree C	−100.0 to 0.0 to 100.0 (Fixed 1 place of decimal) (Note)

Note: "Display data range" is the range to be able to indicate with the main unit display, it is not a range that can be measured.

■MAIN UNIT SPECIFICATIONS

Supply voltage range	AC	85 to 264 V
	DC	100 to 300 V
Rated frequency	50/60 Hz	
Nominal power consumption	5 VA approx. (240 V AC at 25 °C 77 °F)	
	3 W approx. (240 V DC at 25 °C 77 °F)	
Inrush current	30 A or less (240 V AC/DC at 25 °C 77 °F)	
Allowable momentary power-off time	10 ms	
Ambient temperature	Accuracy guarantee: −10 to +55 °C 14 to 131 °F	
	Operation: −25 to +55 °C −14 to 131 °F	
	Storage: −25 to +70 °C −14 to 158 °F	
Ambient humidity	30 to 85 % RH (at 20 °C 68 °F) non-condensing	
Breakdown voltage (initial)	Between the isolated circuits: 2,000 V/1 min	a) enclosure - all terminals b) between insulated circuits • power supply terminals – other terminals • RS485 terminals – other terminals • measured current input terminals – other terminals
Insulation resistance (initial)	Between the isolated circuits: 100 MΩ or more	
Vibration resistance	10 to 150 Hz (7.5 minutes/cycle) single amplitude: 0.075 mm 0.0030 in (1 h on 3 axes)	
	10 to 55 Hz (1 minute/cycle) single amplitude: 0.375 mm 0.015 in (1 h on 3 axes)	
Shock resistance	Min. 294 m/s^2 (5 times on 3 axes)	
Display method	LCD with backlight	
Display updating time	100 ms	
Power failure memory method	Internal memory (overwrite 10^{10} or more) Saved data: setting value and integral measurement value	
Degree of protection	Front: IP51, Back: IP20	
Sea level altitude	Under 2,000 m 6,562 ft	
Dimensions W/H/D	96 × 96 × 56 mm 3.78 × 3.78 × 2.20 in (without terminal block) 96 × 96 × 68 mm 3.78 × 3.78 × 2.68 in (with terminal block)	
Weight	450 g approx.	
Terminal connection	Cable conductor cross section	Single wire 1 pc.	0.13 to 4 mm^2 (AWG26 to 12)
		Stranded cable 1 pc.	0.2 to 4 mm^2 (AWG24 to 12)
		Single wire/ stranded cable 2 pcs.	0.5 to 2.1 mm^2 (AWG20 to 14)
	Connection method	Screw M2.5	
	Tightening torque	0.4 to 0.5 N•m	

■MEASUREMENT SPECIFICATIONS

Measured data	AC sine		
Phase/Wire system	Single-phase two-wire (1P2W) (max. 3-circuit), Single-phase three-wire (1P3W), Three-phase three-wire (3P3W) and Three-phase four-wire (3P4W) (Common)		
Applicable power system	100 V system, 200 V system and 400 V system		
Measured frequency	50/60 Hz		
Measured speed	Sampling rate	1.024 MHz (1.0 µs approx.)	
	Date update	100 ms	
Voltage	Input voltage	1P2W	L-L	0 to 500 V AC
		1P3W	L-L	0 to 500 V AC
			L-N	0 to 250 V AC
		3P3W	L-L	0 to 500 V AC
		3P4W	L-N	0 to 500 V AC
			L-L	0 to 289 V AC
	Impedance	2 MΩ or more (L-N; V1/V2/V3-Vn)	
	Resolution	0.01 V	
	Power consumption	0.2 VA approx. (L-N; V1/V2/V3-Vn)	
	Accuracy (Note)	0.5 % *1.0 % for 3-1 voltage of 1P3W, 3P3W and line voltage of 3P4W.	
	VT ratio	1.00 to 600.00 (set with setting mode) *Voltage transformer (VT) is required when you measure a load with voltage over rated voltage. (Rated secondary voltage of VT is 110 V.) *When it input direct, VT ratio is set to 1.00.	
Current	Input current (with CT)	Primary current	4,000 A or less
		Secondary current	1 A or 5 A (set with setting mode)
	Max. current	10 A (200 % of the rating)	
	Overload capacity	1,000 % of the rating for 3s	
	Resolution	0.001 A	
	Power consumption	0.2 VA approx.	
	Accuracy (Note 1)	0.5% *1.0 % for 2 (N) - phase of 1P3W and 2 (S) - phase of 3P3W.	
Power	Accuracy (Note 1)	1.0 %	
		Active power Class 1 (IEC 62053-21) (Note 2)	
		Reactive power Class 2 (IEC 62053-23) (Note 2)	
Temper-ature	Accuracy	±5.0 °C ±41 °F (after ambient temperature correction with setting mode) Passing 2 hours or more after energized	

Notes: 1) Without error of current transformers (CT) and voltage transformers (VT) It measures from 0.1 % of CT secondary current.
2) IEC62053 is the international standard for Electricity metering equipment.

■COMMUNICATION SPECIFICATIONS

<RS485>

Interface	Conforming to RS485
Communication method	Half-duplex
Synchronous system	Synchronous communication method
Isolation status	Isolated with the internal circuits
Protocol	MEWTOCOL, MODBUS (RTU), DL/T645-2007 (Note 1) (select with setting mode)
Number of connected unit	99 (max.) (Note 2)
Transmission distance	1,200 m 3,937 ft (Note 3)
Transmission speed	38,400, 19,200, 9,600, 4,800, 2,400, 1,200 bps (select with setting mode)
Transmission format	Data length	8bit (fixed)
	Parity	Not available / odd number / even number (select with setting mode)
	Stop bit	1bit, 2bit (select with setting mode)

Notes: 1) MEWTOCOL is the protocol for PLC from Panasonic. DL/T645 is the China power-meter standard. Only DL/T645-2007 is supported.
2) For RS485 converter on the computer side, we recommend SI-35 and SI-35USB (from LINE EYE Co., Ltd.). When using SI-35, SI-35USB or PLC from our company (which can be connected up to 99 units), up to 99 can be connected. In case using this system with the other devices, up to 31 can be connected.
3) Please check with the actual devices when some commercial devices with RS485 interface are connected. The number of connected devices, transmission distance, and transmission speed may be different according to using transmission line.

<USB>

Electric specification	Conform to USB2.0 standard
Connector shape	USB series Mini B
Insulation method	Insulated to internal circuit
Transmission speed	12 Mbps (Full-Speed)
Transmission function	Computer link (MEWTOCOL)

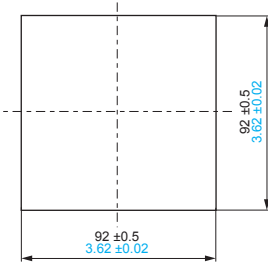* Install the dedicated USB driver before using USB port.

Dimensions

■EXTERNAL DIMENSIONS

(Unit: mm in)

□96
□3.78

(68)
(2.68)

14
0.55

56
2.20

Panasonic Eco-POWER METER

MODE SET SHIFT/ ITEM/
KW9M

LCD
MODE key
SET key
SHIFT / Decrease key
ITEM / Increase key

Mounting clip

Terminal block A

Terminal block B
Mounting screw: M4×10

Terminal block

□91 ±0.4
□3.58 ±0.02
(70.4)
(2.77)
(25.6)
(1.01)

(70.4)
(2.77)
(25.6)
(1.01)

Panel cut-out

92 ±0.5
3.62 ±0.02

92 ±0.5
3.62 ±0.02
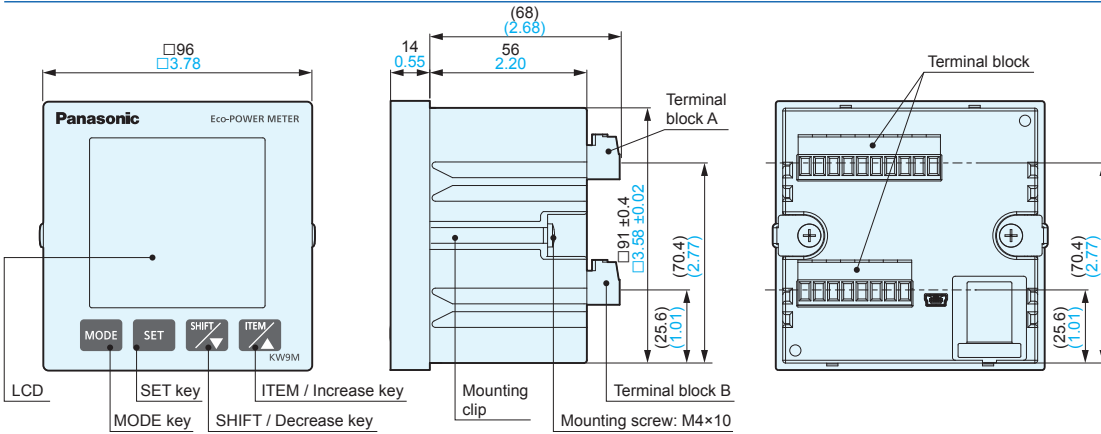
Keep enough space for several mountings.
Recommended space: 130 mm 5.12 in the left, right, top and bottom from center of the unit

Panel mounting

1) Remove the mounting clips from the unit.
2) Insert the unit from the front of the panel.
3) Attach the mounting clips at the both side of the case and secure in place with the screws.
 • Applicable panel thickness: 1 to 5 mm 0.04 to 0.20 in
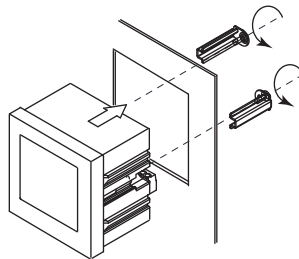
■TERMINAL ARRANGEMENT AND WIRING DIAGRAMS

Terminal wiring

1) Be sure to wire correctly according to the terminal arrangement and wiring diagrams.
2) Please connect a fuse or a breaker to power supply part for safety reasons, to protect the device and ease of maintenance.
 This has no built-in power switch, circuit breaker or fuse for measured voltage input parts. Therefore it is necessary to install them in the circuit near this unit.
3) Do not turn on the power supply or input until all wiring is completed.

Rear view

Terminal block A 10P

Terminal block B 8P

USB port
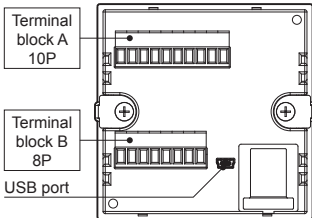
Common for terminal block A, B

Screw size: M2.5
Tightening torque: 0.4 to 0.5 N•m
Applicable wire: (Crimp-type terminal is recommended.)
 • Single wire 0.13 to 4 mm² (AWG26 to 12)
 • Stranded wire 0.2 to 4 mm² (AWG24 to 12)

 • for 2 pcs.
Single wire / Stranded wire 2 pcs.
0.5 to 2.1 mm² (AWG20 to 14)

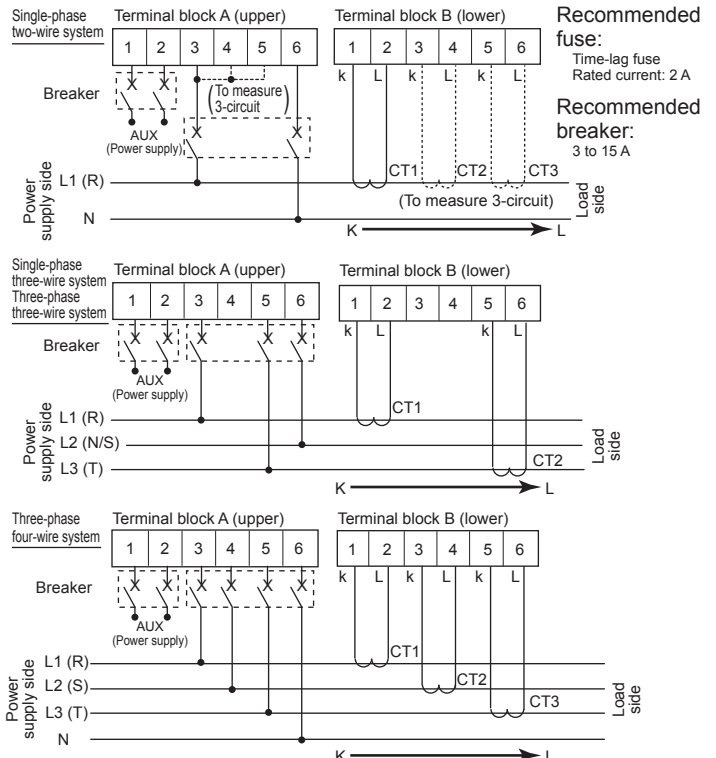Stripping length: 7 to 8 mm 0.28 to 0.31 in

Terminal arrangement

Terminal block A (upper) 10P

Terminal number	1	2	3	4	5	6	7	8	9	10
Functions	L+	N-	V1	V2	V3	Vn	NC	SG	A+	B-
	AUX (Power supply)		Measured voltage input				Vacant		RS485	

Terminal block B (lower) 8P

Terminal number	1	2	3	4	5	6	7	8
Functions	CT1 K	CT1 L	CT2 K	CT2 L	CT3 K	CT3 L	NC	NC
	Measured current input						Vacant	

Wiring diagrams

Single-phase two-wire system

Terminal block A (upper)
| 1 | 2 | 3 | 4 | 5 | 6 |

Breaker
AUX (Power supply)
(To measure 3-circuit)

Terminal block B (lower)
| 1 | 2 | 3 | 4 | 5 | 6 |
k L k L k L

CT1 CT2 CT3
(To measure 3-circuit)

Power supply side
L1 (R)
N

Load side
K → L

Recommended fuse:
Time-lag fuse
Rated current: 2 A

Recommended breaker:
3 to 15 A

Single-phase three-wire system
Three-phase three-wire system

Terminal block A (upper)
| 1 | 2 | 3 | 4 | 5 | 6 |

Breaker
AUX (Power supply)

Terminal block B (lower)
| 1 | 2 | 3 | 4 | 5 | 6 |
k L k L

CT1 CT2

Power supply side
L1 (R)
L2 (N/S)
L3 (T)

Load side
K → L

Three-phase four-wire system

Terminal block A (upper)
| 1 | 2 | 3 | 4 | 5 | 6 |

Breaker
AUX (Power supply)

Terminal block B (lower)
| 1 | 2 | 3 | 4 | 5 | 6 |
k L k L k L

CT1 CT2 CT3

Power supply side
L1 (R)
L2 (S)
L3 (T)
N

Load side
K → L

CE MARKING

■ Acquisition of CE marking
When using in the application conforming to EN61010-1/IEC61010-1, make sure to satisfy the following conditions. For using under the measurement category III, install varistors between the lines of power supply and the measured voltage input.

[Environmental conditions]
• Overvoltage category II, Pollution degree 2
• Indoor use
• An ambient temperature of -25 to +55°C -13 to +131°F
• An ambient non-condensing humidity of 30 to 85%RH (at 20°C 68°F)
• Altitude of 2,000 m 6,562 ft or less

[Mount the product in a place with]
• A minimum of dust, and an absence of corrosive gases
• No flammable, explosive gasses
• Few mechanical vibrations or shocks
• No exposure to direct sunlight
• No large capacity electromagnetic switches or cables through which large current is flowing

■ Applicable standard

Safety standard	EN61010-1		
EMC	EMI EN61326-1	Radiation interference field strength	CISPR11 class A
		Noise terminal voltage	CISPR11 class A
	EMS EN61326-1	Static discharge immunity	EN61000-4-2
		RF electromagnetic field immunity	EN61000-4-3
		EFT/B immunity	EN61000-4-4
		Surge immunity	EN61000-4-5
		Conductivity noise immunity	EN61000-4-6
		Power frequency magnetic field immunity	EN61000-4-8
		Voltage dip / Instantaneous stop / Voltage fluctuation immunity	EN61000-4-11

Energy Consumption Visualization Components

Data collection and storage	Monitoring by LAN (Ethernet)	For cases where wired connection is difficult	For measuring multiple circuits
DLL (Data Logger Light)	**KS1 Signal Converter**	**KR20 Wireless Unit**	**KW2G** SERIES

Data collection and storage — DLL (Data Logger Light)
• Collecting and storing power, pulse and analog data of Eco-POWER METER
• Provided with a USB port and an SD/SDHC memory card slot
• Equipped with an AC/DC power supply
• Provided with a RS232C/RS485 communication port [MEWTOCOL / MODBUS (RTU)]

Monitoring by LAN (Ethernet) — KS1 Signal Converter
• Converting RS232C/RS485 power data for communications by LAN

For cases where wired connection is difficult — KR20 Wireless Unit
• Wireless communications of RS232C/RS485 power data
• 2.4 GHz band wireless communications
• Compliant with wireless standards of Europe and Japan

*For details, please refer to the our website or user's manual.

For measuring multiple circuits — KW2G SERIES
• Up to 7 expansion units can be added.
• Up to 16 circuits measurement (Single-phase two-wire system)
• Setting from a PC is possible through a USB connection.
• Compatible with DIN rails for installation.
• The lineup includes a type compatible with SD memory cards.
• The expansion unit (power measurement and pulse) enables each expansion unit to produce pulse outputs.
• Connectable to various sensors using expansion units (analog/pulse input type)

SOFTWARE TOOL

**For easy "visualization" of data collected in DLL***

KW Watcher

*DLL is the abbreviation for **Data Logger Light**.

Measurement monitoring software │ Management

■ Collected files stored according to unit of time on the Data logger, are downloaded as required to a PC and graphs and numerical data can be displayed for simple electric power, water amount, temperature, primary unit and air flow amount measurement values.
■ Measurement is in 15 min, 30 min, and 60 min units.

KW Watcher can be downloaded*, free of charge, from our website.
*Customer registration is required before you download

Power | CO2 | Charge | Pulse
Analog | Primary unit | Time set OK

RS485
LAN
KW9M
DLL
PC
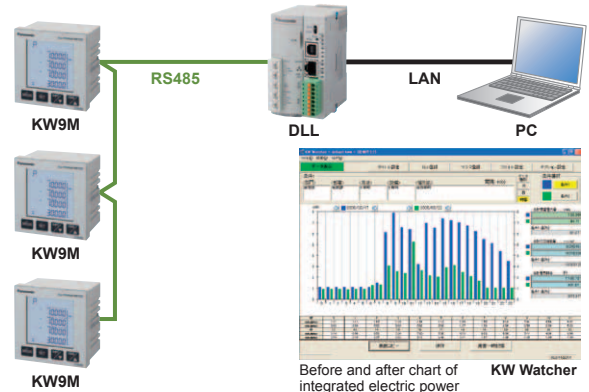
Before and after chart of integrated electric power
KW Watcher

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