K P M 1 0 0 0

Applies to the wide range of power measurements, from very low power to high power!!

Effective Jan.7.2013

ErP Directive Lot 6 Requirements
Second phase implementation
Household electrical appliances
and office electronic and electrical
equipment
Requires the standby
power is reduced
to **0.5 W**
or less!

NEW

Digital Power Meter
KPM 1000

Exclusively for single phase
IEC62301 First Edition compliant, ErP Directive (Lot 6 and other) standby power measurements
17 measurement items, including voltage, current, frequency, active power, phase angle, and power factor
Basic accuracy ± (0.1% reading + 0.1% range)
Current range: 5 mA to 20 A
RS232C standard interface
GPIB/USB (factory option)

CALRIGHT INSTRUMENTS

The Right Source For Your Test & Measurement Needs

8715 Mesa Point Terrace San Diego, CA 92154
Toll Free: 1.866.363.6634 Tel: 1.619.429.4545 Fax: 1.619.374.7012
Email: sales@calright.com http://www.calright.com

High-precision resolution

Voltage, current, and power basic accuracy
± (0.1 % of reading + 0.1 % of range)

Voltage range	150V/300V/Auto range
Current range	5mA/10mA/20mA/50mA/100mA/200mA/500mA/1A/2A/5A/10A/20A/Auto range
Power range *	750mW/1.5W/3W/6W/7.5W/15W/15W/30W60W/75W/150W/300W/600W/750W/1.5kW3kW/6kW *Automatically determined based on voltage/current range combination.

Single-phase two-wire (measurement category: CAT II)

The measurement category is classi ed into several categories, such as CAT I, CAT II, CAT III, CAT IV, etc. The KPM1000 is capable of applying to the category CAT II measurement.

[Measurement categories]
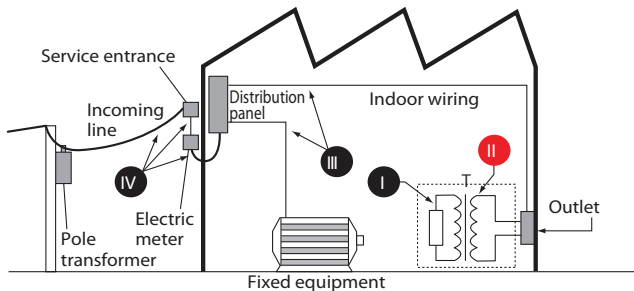
[Maximum transient voltage]

Line-to-Neutral Voltage V r.m.s	Maximum Transient Voltage V peak		
	Measurement Category II*	Measurement Category III*	Measurement Category IV*
50	500	800	1500
100	800	1500	2500
150	1500	2500	4000
300	2500	4000	6000
600	4000	6000	8000
1000	6000	8000	12000

*Measurement categories II, III, and IV apply only to measurements with the main power supply up to an AC effective value of 1000 V.

Crest factor 6

Obtaining crest factor 6 realizes to perform high-precision measurements of waveforms having a small effective value but large peak value.

$$\text{Crest factor} = \frac{\text{Peak value}}{\text{Effective value}}$$

☐ Allowable crestfactor of voltage mesurement is 3.
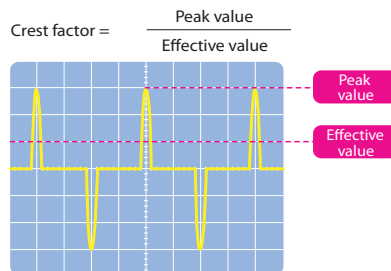
With the KPM1000:

$$\text{Crest factor} = \frac{(\text{measurement range} \times 6)}{\text{Measured value (effective value)}}$$

▶ Voltage (measurement range × 3)/measured value or 900 Vpk, whichever is less
▶ Current (measurement range × 6)/measured value or 120 Apk, whichever is less

Four-item display

Displays four measurement items simultaneously. Save the trouble from switching the measurement item.
High viewability of seven-segment display provides excellent visibility even from distant positions.

17 diverse measurement items

☐ Voltage
☐ Current
☐ Active power
☐ Apparent power
☐ Reactive power
☐ Power factor
☐ Phase angle
☐ Frequency
☐ Integrated current
☐ Integrated power
☐ Integrated power in positive direction
☐ Integrated power in negative direction
☐ Integrated elapsed time
☐ Voltage crest factor
☐ Current crest factor
☐ Voltage peak
☐ Current peak

Separate positive and negative measurements of cumulative power

The unit is suitable for measuring power consumption and regeneration of solar power conditioners and other system interconnection inverters.
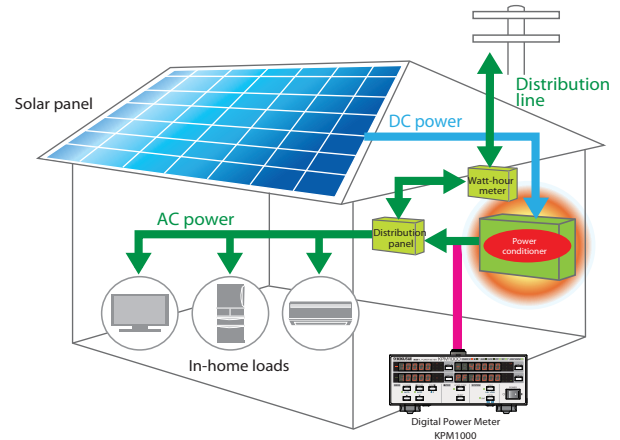
【Example of display】

▼Integrated elapsed time display

▼Integrated power (total) display [net power]

▼Integrated power (positive direction) display [purchased power]

▼Integrated power (negative direction) display [sold power]

Simple operation

The KPM1000 can be operated intuitively without reliance on a manual.

RS232C standard interface

*GPIB, USB (factory option)

☐ Rear panel

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Email: sales@calright.com http://www.calright.com

APPLICATION

Power measurement and application examples

● Measurement with direct input (Less than 20A of DUT)

Digital Power Meter
KPM1000

Option
＊One TL42 set attached to the main unit.

Test lead TL40

Various connector adapters
TL40/41/42/43/44/45

AC power supply

DUT
Microwave ranges, microwave ovens, etc.

● Measurement using CT (current transformer) and PT (potential transformer)
(Exceeds 20A of DUT)

Digital Power Meter
KPM1000

PT (potential transformer)

Option
＊One TL42 set attached to main unit.

Test lead TL40

DUT (20A or greater), high voltage equipment, etc.

Various connector adapters
TL40/41/42/43/44/45

AC power supply

CT (current transformer)
Clamp-type current sensor, etc.

Options

Test lead 【TL40】
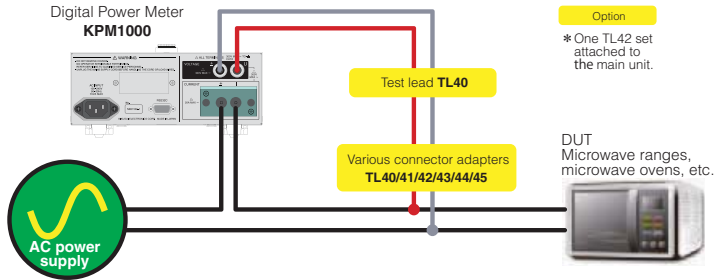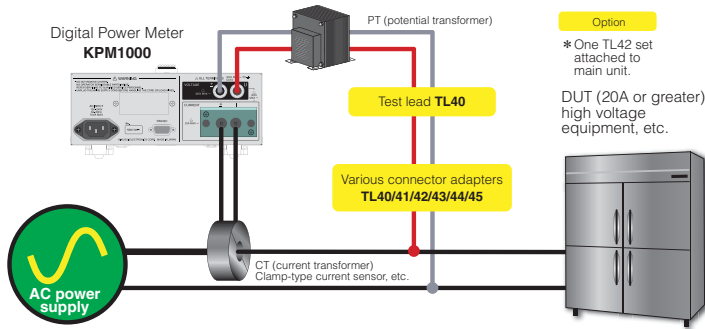Red/black One each
1000V/ CAT II max 32A   Length: 1m

Safety plug (clamped connection type) 【TL43】
Red/black One each
600V/ CAT II max 10A

Safety plug (threaded connection type) 【TL41】
Red/black One each
1000V/ CAT II max 32A

Alligator clip 【TL44】
Red/black One each
1000V/ CAT II max 32A

Safety plug (soldered connection type) 【TL42】
Red/black One each
1000V/ CAT II max 32A

Fork terminal adapter 【TL45】
Red/black One each
1000V/ CAT II max 20A

Utilization of Assist Tool

A handy application software Assist Tool can be downloaded from the WEB. It makes the operation possible from a PC as you would from the main unit panel. And as a data logger, it can easily acquire the long term periods of data, too.

● Collective display of measurement parameters

17 measurement items can be displayed in a single window.

Free download from our Web site

● Measurement data logging feature

Using the Assist Tool, you can import waveform data to the PC in the CSV format with a simple connection and a single press of a button.
When an application such as Excel is used, graphs can easily be created.

Output in CSV format   Graphing
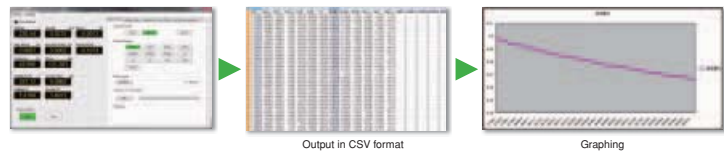
● Acquisition of voltage and current waveform data

You can easily import voltage and current waveforms to a PC. It is difficult to imagine what type of waveform they actually have even when the peak values, crest factors, and power factor values are viewed. Also, it is difficult to use and take measurements with an instrument such as an oscilloscope with linear measurements of surroundings. With this function, voltage and current waveform data can easily be imported to a PC in the CSV format. When an application such as Excel is used, graphs can easily be created.

Output in CSV format   Graphing
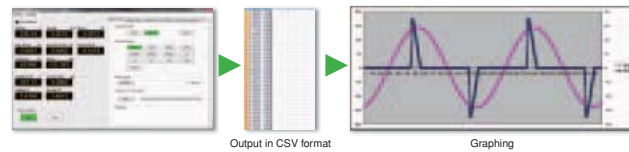
● Measurement of integrated power

Output in CSV format   Graphing
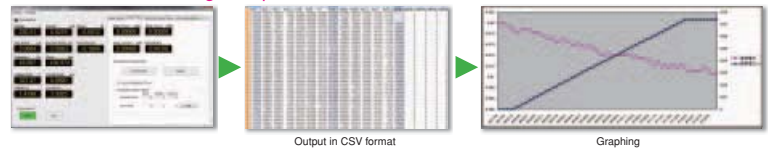
● Measurement of standby power

● Other, advanced settings

● Communication settings

Power measurement and application examples

Measurement of standby power

● Measurements complying with IEC62301 First Edition standards can be performed. It is possible to measure the "standby and off mode power" of the household and office electrical and electronic equipment products required by the standard such as ErP Directive Lot 6.

Digital Power Meter
KPM1000

IEC62301 First Edition
measurement application
software

Available in
the near future

AC power supply
PCR-M Series

DUT
Household appliances, OA
equipment, etc.

AC outlet adapter
OT01-KPM

【What is the ErP Directive?】

The ErP Directive ※ is a directive that requires ecodesigns (environmentally conscious designs) for energy-related products (ErP). An energy-related product is defined as "a product that does not directly consume energy but affects energy con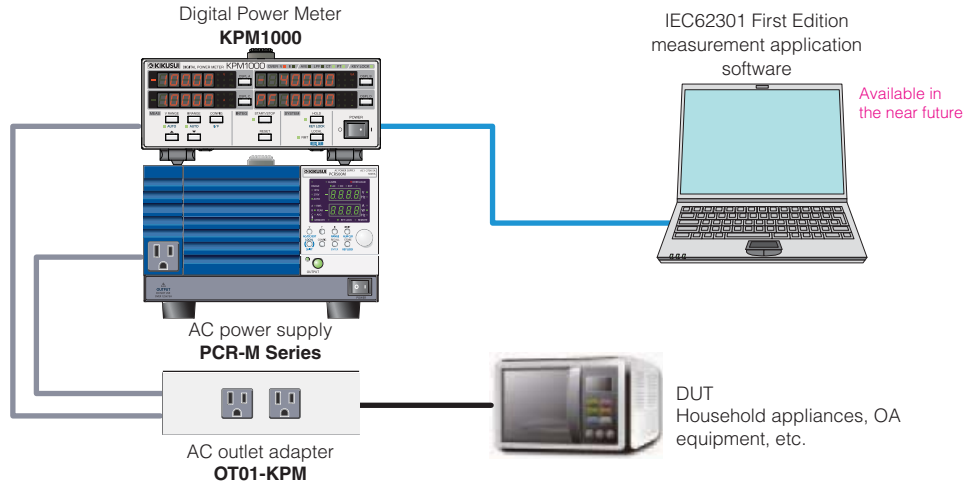sumption in the stage of usage." Therefore, the ErP Directive requires ecodesigns not only for electronic and electrical equipment and other products that directly consume energy but for products that indirectly affect energy consumption and reduction (such as windows and equipment that utilizes water). Specifically targeted products and requirements are determined by implementation measures (IMs) for each product field (lot). Environmentally compliant designs and limiting values for energy usage and energy efficiency are established particularly for the purpose of improving energy efficiency.

※ DIRECTIVE 2009/125/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products

Values prescribed by ErP Directive Lot 6	Power consumption of household electrical appliances and office electronic and electrical equipment in standby mode and off mode (Commission Regulation (EC) No 1275/2008)		
		Phase 1	Phase 2
	Date of commencement for mandatory implementation of measure	7-Jan-10	7-Jan-13
	Off mode power consumption	1 W or less	0.5 W or less
	Standby mode power consumption	1 W or less (2 W or less when information or status is displayed)	0.5 W or less (1 W or less when information or status is displayed)

Related options
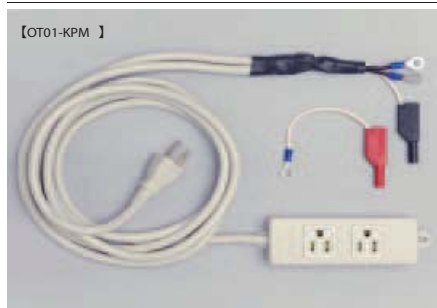
【OT01-KPM 】

AC outlet cable
【OT01-KPM 】
125V/15A

AC multi-outlet cable
【OT02-KPM 】coming soon
250V/15A
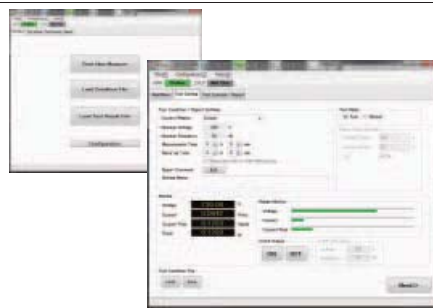
IEC62301 First Edition measurement application software
【SD010-KPM 】 coming soon
This is special application software for performing standard tests easily.

Specifications

Unless specified otherwise, the specification are for the following settings and conditions.
- The warm-up time is 30 minutes.
- After the KPM1000 has been warmed up, it must be calibrated correctly in a 23°C ± 5°C environment.

Input

Measurement line	Single-phase two-wire (measurement category CAT Ⅱ)*1
Voltage input terminal	Safety terminal
Current input terminal	M6 terminal block
Measurement rated voltage	300 Vrms
Measurement rated current	20 Arms
Maximum allowable input voltage	900 Vpk or 360 Vrms
Maximum allowable input current	120 Apk or 24 Arms
Maximum isolation voltage	300 V
Input impedance	Voltage input	6 MΩ ± 10 %
(50/60 Hz)	Current input	2 mΩ or less
Line filter (LPF)	Cutoff frequency	500 Hz (ON/OFF possible)

*1 Applies to measurements on circuits directly connected to a low-voltage installation. This category applies to measurements on circuits of equipment on the primary side of a transformer. Such pieces of equipment have a power cord connected to a power outlet. Examples are household appliances and portable tools.

Display items

Measurement items	Voltage, current, active power, apparent power, reactive power, power factor, phase angle, frequency, integrated current, integrated power, positive direction integrated power, negative direction integrated power, integrated time, voltage crest factor, current crest factor, voltage peak, current peak
Display update interval	100 ms / 200 ms / 500 ms / 1 s / 2 s/ 5 s / 10 s
Number of display items	Four-item simultaneous display

Voltage measurement function

Measure-ment range	Resolution	150 V	0.01 V
		300 V	0.01 V
Allowable crest factor			3
Accuracy *1 *2	Effective input range	Full range	1% to 120% of range
	45 Hz ≦ f ≦ 66Hz LPF:ON/OFF		± (0.1 % of reading + 0.1 % of range)
	66 Hz< f ≦ 400Hz LPF:OFF		± (0.1 % of reading + 0.2 % of range)
	400 Hz< f ≦ 1kHz LPF:OFF		± (0.1 % of reading + 0.2 % of range)
	1kHz< f ≦ 5kHz LPF:OFF		± (3 % of range)
One-year accuracy (accuracy up to 12 months after calibration)			1.5 times the reading errors for the accuracy at 6 months
Auto range	UP conditions		When the value exceeds 120 % of the range or when a peak over-range occurs
	DOWN condition		When the value is less than 30 % of the range, the value is less than or equal to 90 % of the next lower range, and a peak overrange is not occurring

*1 Under the following conditions: within the effective input range, within six months after the last calibration, at a temperature of 23 °C ± 5 °C, sine wave, power factor of 1, and common mode voltage of 0 V.
If the waveform is asymmetrical (waveforms such as half-wave rectified waveforms and full-wave rectified waveforms), errors will occur.
*2 The peak voltage accuracy is defined for a sine wave whose frequency is between 45 Hz and 66 Hz. Accuracy: ± (0.1 % of reading + 3.1 % of range)

Current measurement function

Measurement range	Resolution	5 mA	0.0001 mA
		10 mA	0.001 mA
		20 mA	
		50 mA	
		100 mA	0.01 mA
		200 mA	
		500 mA	
		1 A	0.1 mA
		2 A	
		5 A	
		10 A	1 mA
		20 A	
Allowable crest factor			6
Accuracy *1 *2 *3	Effective input range	Full range	1% to 120% of range
	45 Hz ≦ f ≦ 66Hz LPF:ON/OFF		± (0.1 % of reading + 0.1 % of range)
	66 Hz< f ≦ 400Hz LPF:OFF		± (0.1 % of reading + 0.2 % of range)
	400 Hz< f ≦ 1kHz LPF:OFF		± (0.1 % of reading + 0.2 % of range)
	1kHz< f ≦ 5kHz LPF:OFF		± (3 % of range)
Residual noise	Input short circuit LPF:ON/OFF		0.5 % of range
One-year accuracy (accuracy up to 12 months after calibration)			1.5 times the reading errors for the accuracy at 6 months
Auto range	UP condition		When the value exceeds 120 % of the range or when a peak over-range occurs
	DOWN condition		When the value is less than 30 % of the range, the value is less than or equal to 90 % of the next lower range, and a peak overrange is not occurring

*1 Under the following conditions: within the effective input range, within six months after the last calibration, at a temperature of 23 °C ± 5 °C, sine wave, power factor of 1, and common mode voltage of 0 V.
If the waveform is asymmetrical (waveforms such as half-wave rectified waveforms and full-wave rectified waveforms), errors will occur.
*2 When you are using the 5 mA range and the input is less than 10 % of the range, add (0.1 % of range).
*3 The peak current accuracy is defined for a sine wave whose frequency is between 45 Hz and 66 Hz. Accuracy: ± (0.1 % of reading + 3.1 % of range)

Power measurement function

Measurement range (combination of voltage range and current range)	Resolution	750 mW	0.01 mW
		1.5 W	0.1 mW
		3 W	
		6 W	
		7.5 W	
		15 W	1 mW
		30 W	
		60 W	
		75 W	
		150 W	0.01 W
		300 W	
		600 W	
		750 W	
		1.5 kW	0.1 W
		3 kW	
		6 kW	
Accuracy *1 *2	Effective input range	Full range	1% to 144 % of range
	45 Hz ≦ f ≦ 66Hz LPF:ON/OFF		± (0.1 % of reading + 0.1 % of range)
	66 Hz< f ≦ 400Hz LPF:OFF		± (0.1 % of reading + 0.2 % of range)
	400 Hz< f ≦ 1kHz LPF:OFF		± (0.1 % of reading + 0.3 % of range)
	1kHz< f ≦ 3kHz LPF:OFF		± (3 % of range)
Effect of power factor	Power factor 0	45Hz to 66Hz	±0.4% of VA
	0 < Power factor < 1		Add (tan θ × 0.4)% of reading
One-year accuracy (accuracy up to 12 months after calibration)			1.5 times the reading errors for the accuracy at 6 months

*1 Under the following conditions: within the effective input range, within six months after the last calibration, at a temperature of 23 °C ± 5 °C, sine wave, power factor of 1, and common mode voltage of 0 V.
If the waveform is asymmetrical (waveforms such as half-wave rectified waveforms and full-wave rectified waveforms), errors will occur.
*2 When you are using the 5 mA range and the input is less than 10 % of the range, add (0.1 % of range).

Frequency measurement function

Frequency measurement function	
Measurement range	10 Hz to 10 kHz
Measurement target	Voltage/current
Measurement input level	30% to 120% of measurement range
Frequency filter	ON (cutoff frequency 500 Hz)/OFF
Accuracy ±	(0.06 % of reading)

Math features

Math features	
Apparent power*1 *2	$VA = V \cdot A$
Reactive power*1 *2	$var = \sqrt{(VA)^2 - W^2}$
Power factor*1 *2	$PF = W / VA$
Phase angle*1 *2	$deg = \cos^{-1}(W / VA)$
Crest factor*1 *2	Peak value/effective value
Moving average (averaging)	OFF/ 2/ 4/ 8/ 16/ 32/ 64
Selectable range for the PT ratio	1 to 2000 in steps of 1
Selectable range for the CT ratio	1 to 2000 in steps of 1
Accuracy of leading phase and lagging phase detection	The voltage and current input is 50 % to 120 % of the measurement range. 45 Hz ≤ f ≤ 1 kHz LPF: Off	±10 °

*1 This is determined through a digital computation using the voltage, current, and active power. For distorted signal input, the value obtained on the KPM1000 may differ from that obtained on other instruments that use a different method.
*2 The measurement accuracy is determined by an expression whose components are the measurement accuracies of the voltage, current, and active power.

Integration feature

Integration feature		
Integration	Accuracy	±(accuracy of the power or current + 0.1 % of reading)
Timer*1	Selectable range	0 hours 00 minutes to 9999 hours 59 minutes
	Accuracy	±0.02 %

*1 You can use the timer setting to automatically stop integration.

Other functions

Other functions	
Synchronization source	Voltage/current/OFF (all display update intervals)
Display hold	Holds measured value. Possible to switch display items (measurement items).

Communication function

Communication function
RS232C (standard), GPIB/USB (select either, factory option)

General specifications

General specifications		
AC input	Nominal input rating	100 V to 240 V, 50 Hz to 60 Hz
	Voltage range	90 V to 250 V
	Maximum power consumption	70 VA
Withstand voltage	Between the voltage and current input terminals and the chassis and interface	1980 Vac for 5 minutes
	Between the voltage and current input terminals and the AC input	
	Between the voltage input terminals and the current input terminals	
	Between the AC input and the chassis	1500 Vac for 1 minute
Insulation resistance	Between the voltage and current input terminals and the chassis and interface	100 MΩ or greater at 500 Vdc
	Between the voltage and current input terminals and the AC input	
	Between the voltage input terminals and the current input terminals	
	Between the AC input and the chassis	
Environmental conditions	Operating environment	Indoor use, overvoltage category II
	Operating temperature	0 ℃ to +40 ℃
	Operating humidity	20 %rh to 80 %rh (There shall be no condensation.)
	Storage temperature	-20 ℃ to +70 ℃
	Storage humidity	90%rh or less (There shall be no condensation.)
	Altitude	2000 m or less
Earth continuity		0.1 Ω or less at 25 Aac
Safety*1		Complies with the requirements of the following directive and standard Low Voltage Directive 2006/95/EC*2 EN61010-1, class I, pollution degree 2
Electromagnetic compatibility (EMC) *1*2*3		Complies with the requirements of the following directive and standard EMC Directive 2004/108/EC EN 61326-1 Compliance condition: The maximum length of all cabling and wiring connected to the KPM1000 must be less than 3 m.
Dimensions		See the outline drawing
Weight		Approx. 2.5 kg (5.51 lb.)
Accessories	Power cord (three-pronged)	1
	Safety plugs (solder-connection type)	1 set (red and black)
	CD-ROM*4	1
	Quick start	English: 1, Japanese: 1
	Safety information	1 (contains English, Chinese, and Japanese)
	Packing list	1 (contains both English and Japanese)

*1 Does not apply to specially ordered or modified KPM1000s.
*2 Limited to products that have the CE mark on their panels.
*3 The measured values may be affected by noise.
Use shielded cables for the communication cables. The act of connecting measuring cables may cause radio interference, in which case users may be required to correct the interference.
*4 Contains the User's Manual, the Communication Interface Manual, and the KI-VISA library.

Dimensions

Units: mm
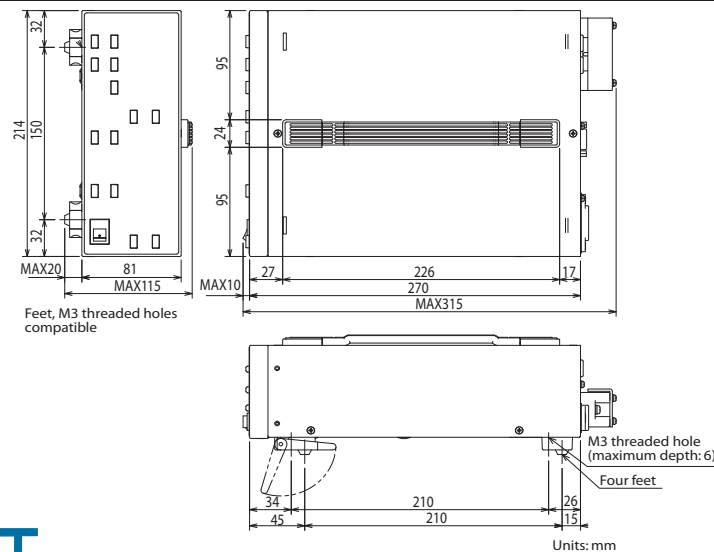
Main unit

Model	Part	Remarks
KPM1000	Digital Power Meter	IEC62301 First Edition compliant

Option

Test lead
【TL40】
Red/black One each
1000V/ CAT II max 32A   Length: 1m

Safety plug (threaded connection type)
【TL41】
Red/black One each
1000V/ CAT II max 32A

Safety plug (clamped connection type)
【TL43】
Red/black One each
600V/ CAT II max 10A

Alligator clip
【TL44】
Red/black One each
1000V/ CAT II max 32A

Fork terminal adapter
【TL45】
Red/black One each
1000V/ CAT II max 20A

Safety plug (soldered connection type)
【TL42】
Red/black One each
1000V/ CAT II max 32A

AC outlet cable
【OT01-KPM】
125V/15A

AC Multi-outlet cable
【OT02-KPM 】
250V/15A

● Other

Model	Part	Remarks
KRA2	Rack mount adapter (EIA)	Inch size, 2U width
KRA100	Rack mount adapter (JIS)	Millimeter size, 2U width
	GPIB interface ※	Factory option
	USB interface ※	
SD010-KPM	For IEC62301 measurement Application software	IEC62301 First Edition compliant

※ This is a factory option. Either one shall be attached to the main unit.