

UNI-T®

UT231 Operating Manual

Digital Power Clamp
Meter

P/N: 41451518



UNI-T®

**Model UT231
OPERATING MANUAL**

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Overview

This Operating Manual covers information on safety and cautions. Please read the relevant information carefully and observe all the **Warnings** and **Notes** strictly.

Warning

To avoid electric shock or personal injury, read the “Safety Information” and “Rules for Safe Operation” carefully before using the Meter.

Model UT231 is a digital power clamp meter (hereafter referred to as “the Meter”) is a handheld intelligent power meter which has both the features of digital current meter and also power measurement meter.

The Meter can measure Voltage, Current, Active Power, Apparent Power, Reactive Power, Power Factor, Phase Angle, Frequency, Active Energy, Temperature and etc.

Unpacking Inspection

Open the package case and take out the Meter. Check the following items carefully to see any missing or damaged part:

Item	Description	Qty
1	English Operating Manual	1 piece
2	Test Lead	1 pair
3	Alligator Clip	1 pair
4	Point Contact Temperature Probe	1 piece
5	USB Interface Cable	1 piece
6	Software	1 piece
7	Tool Box	1 piece
8	1.5V Battery (LR6)	4 pieces

In the event you find any missing or damage, please contact your dealer immediately.

Safety Information

This Meter complies with the standards IEC61010: in pollution degree 2, overvoltage category (CAT. III 600V, CAT IV 300V) and double insulation.

CAT. III: Distribution level, fixed installation, with smaller transient overvoltages than CAT. IV.

CAT IV: Primary supply level, overhead lines, cable systems.

Use the Meter only as specified in this operating manual, otherwise the protection provided by the Meter may be impaired.

In this manual, a **Warning** identifies conditions and actions that pose hazards to the user, or may damage the Meter or the equipment under test.

A **Note** identifies the information that user should pay attention to.


International electrical symbols used on the Meter and in this Operating Manual are explained on page 6.

Rules For Safe Operation

Warning

To avoid possible electric shock or personal injury, and to avoid possible damage to the Meter or to the equipment under test, adhere to the following rules:

- **Before using the Meter inspect the case. Do not use the Meter if it is damaged or the case (or part of the case) is removed. Look for cracks or missing plastic. Pay attention to the insulation around the connectors.**
- **Inspect the test leads for damaged insulation or exposed metal. Replace damaged test leads with identical model number or electrical specifications before using the Meter.**
- **Do not apply more than the rated voltage, as marked on the Meter.**

- When measurement has been completed, disconnect the connection between the test leads and the circuit under test, remove the testing leads away from the input terminals of the Meter and turn the Meter power off.
- Do not carry out the measurement when the Meter's back case and / or battery door is opened to avoid electric shock.
- When the Meter working at an effective voltage over 30V in AC, special care should be taken.
- Use the proper terminals and function for your measurements.
- Do not use or store the Meter in an environment of high temperature, humidity, explosive, inflammable and strong magnetic field. The performance of the Meter may deteriorate after dampened.
- Do not use the Meter if the surface of it is wet or the user's hands are wet.
- When using the test leads, keep your fingers behind the finger guards.
- Replace the battery as soon as the battery indicator  appears. With a low battery, the Meter might produce false readings that can lead to electric shock and personal injury.
- When opening the battery door, must make sure the Meter is power off.
- When servicing the Meter, use only the same model number or identical electrical specifications replacement parts.
- The internal circuit of the Meter shall not be altered at will to avoid damage of the Meter and any accident.
- Soft cloth and mild detergent should be used to clean the surface of the Meter when servicing. No abrasive and solvent should be used to prevent the surface of the Meter from corrosion, damage and accident.
- Turn the Meter off when it is not in use and take out the battery when not using for a long time.
- Constantly check the battery as it may leak when it has been using for some time, replace the battery as soon as leaking appears. A leaking battery will damage the Meter.

International Electrical Symbols

~	AC (Alternating Current)
⏏	Grounding
⊞	Double Insulated
⚠	Warning. Refer to the Operating Manual
🔋	Deficiency of Built-In Battery
⚡	Danger of High Voltage
CE	Conforms to Standards of European Union

The Meter Structure

A. The Meter Face View (see figure 1)

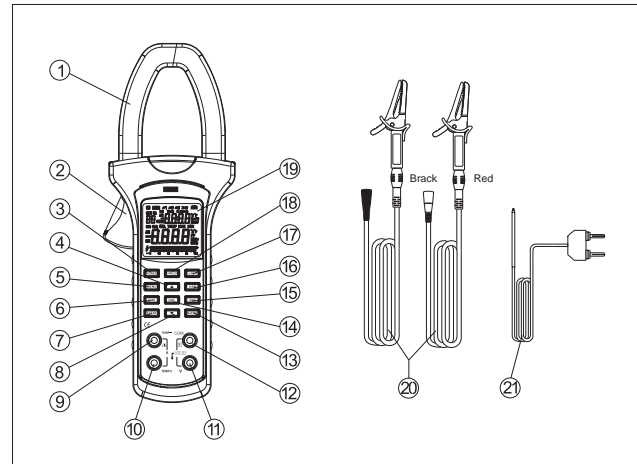


Figure 1

Model UT231: OPERATING MANUAL

①	Transformer Jaw: designed to pick up the AC and DC current flowing through the conductor. It could transfer current to voltage. The tested conductor must vertically go through the Jaw center.
②	Hand Guards: to protect user's hand from touching the dangerous area.
③	Power button
④	Max/ Δ button
⑤	MENU button
⑥	LOAD button (recall data)
⑦	CLEAR button (clear the stored reading)
⑧	MIN/ ∇ button

⑨	Temperature negative Input Terminal
⑩	Temperature positive Input Terminal
⑪	V: Voltage Input Terminal
⑫	COM Input Terminal
⑬	MAX/MIN button
⑭	CAL: calibration button
⑮	SAVE button (data store button)
⑯	USB button
⑰	LIGHT button (auto display backlight button)
⑱	HOLD button
⑲	LCD Display
⑳	Testing Leads (Red and Black)
㉑	Temperature Probe

B.The Meter Back and Bottom Structure (see figure 2)

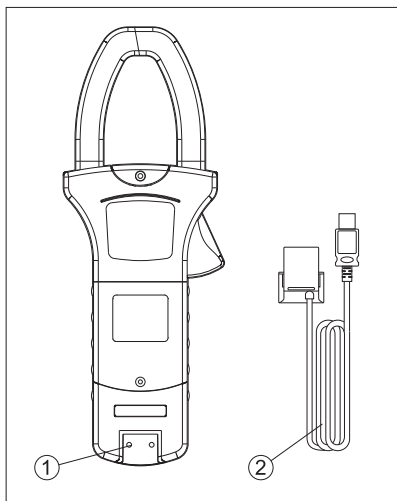



Figure 2

①	Infrared Interface
②	USB Communication Interface Cable

Functional Buttons

Below table indicated for information about the functional button operations.

Button	Operation Performed
POWER	Press and hold POWER for 1 second to turn the Meter on. Press POWER again to turn the Meter off.
HOLD	<ul style="list-style-type: none"> ● Press HOLD to enter the Hold mode in any mode, H appears and the Meter beeps. ● Press HOLD again to exit the Hold mode to return to measurement mode, the Meter beeps and H disappears.
LIGHT	<ul style="list-style-type: none"> ● Press LIGHT to turn the display backlight on. ● The display backlight will be off automatically after 30 seconds.
MENU	Press MENU to display the following functions in sequence:

Button	Operation Performed
MENU	<ul style="list-style-type: none"> ● AC Voltage (main display) + Frequency (secondary display) ● AC Current (main display) + AC Voltage (secondary display) ● Active power (main display) + Phase angle (secondary display) ● Apparent power (main display) + Reactive power (secondary display) ● Power factor (main display) + Phase angle (secondary display) ● Active Energy (main display) + Time (secondary display) ● Temperature °C (main display) + Temperature °F (secondary display)
	<ul style="list-style-type: none"> ● Press LOAD once, MR icon shown, the Meter displays the next stored reading, the left secondary display showing the index increase one.
USB	<ul style="list-style-type: none"> ● Press USB once to turn the USB

Button	Operation Performed
USB	<p>interface on, USB appears and the Meter beeps.</p> <ul style="list-style-type: none"> ● Press USB again to turn the USB interface off, USB disappears and the Meter beeps. ● It is invalid at active energy mode.
LOAD	<ul style="list-style-type: none"> ● Press once to enter LOAD mode, MR appears and the Meter beeps. ● Press again to exit LOAD mode, MR disappears and the Meter beeps. ● Press and hold LOAD for 1 second to display the stored data quickly.
CAL	Calibrating data. It is not recommended to calibrate the meter without authorization.
SAVE	<ul style="list-style-type: none"> ● Press once to store single reading, MEM appears and the Meter beeps. ● Press and hold for over 1 second to continuous store reading, MEM blinks and the Meter beeps. The index number

Button	Operation Performed
SAVE	shown on the left secondary display keep on increasing. Press SAVE again to exit. The maximum number of data store is 99, when it achieves 99, the Meter shows FUL. Press CLEAR to clear the stored reading in order to store next reading.
CLEAR	<ul style="list-style-type: none"> ● At active energy range, press to reset time the zero, then restart the timing. ● At all other ranges, press to clear stored readings.
▽	<ul style="list-style-type: none"> ● Press once at LOAD mode, MR icon shown, the Meter displays the previous stored reading, the left secondary display showing the index decrease one.
MAX/MIN	<ul style="list-style-type: none"> ● Starts recording of maximum and minimum vales. Press to step through maximum (high), minimum (low) and the current AC voltage True RMS value

Button	Operation Performed
MAX/MIN	at any mode except at the following ranges: <ul style="list-style-type: none"> ➤ Power factor (main display) + Phase angle (secondary display) ➤ Active Energy (main display) + Time (secondary display) ➤ Temperature °C (main display) + Temperature °F (secondary display)

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Display Symbols (see figure 3)

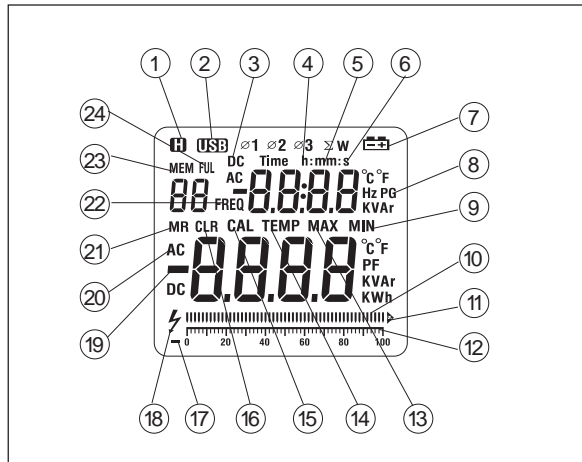







Figure 3


Number	Symbol	Meaning
①		Data hold is active
②	USB	Data Output is in progress
③	DC	Indicator for DC measurement
④	h	Unit for hour
⑤	mm	Unit for minute
⑥	s	Unit for second
⑦		The battery is low. ⚠ Warning: To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator appears.
⑧	Hz, PG, KVAR	Symbol of Unit. Hz: Hertz. The unit of frequency. PG: The unit of phase angle KVAR: The unit of reactive power Minimum reading

Number	Symbol	Meaning
⑨	MIN	Minimum reading
⑩		Analogue Bar Graph
⑪		Overloading
⑫		Ruler
⑬	MAX	Maximum reading
⑭	TEMP	Temperature symbol
⑮	CAL	Calibration symbol
⑯	CLR	Indicator for clear the stored reading
⑰	-	Ruler negative symbol
⑱		High voltage symbol
⑲		Indicates negative reading
⑳	AC	Indicator for AC voltage or current
㉑	MR	Indicator for recall the stored reading
㉒	FREQ	Frequency symbol

Number	Symbol	Meaning
㉓	MEM	Indicator for data store
㉔	FUL	Indicator for data stored is full

Measurement Operation

Preparation

- Press and hold **POWER** for one second to turn the Meter on. The default range is the last measurement range when you turned off the Meter.
- Replace the battery as soon as the battery indicator “” appears on the display.

A. AC Voltage (main display) + Frequency (secondary display) Measurement (see figure 4)

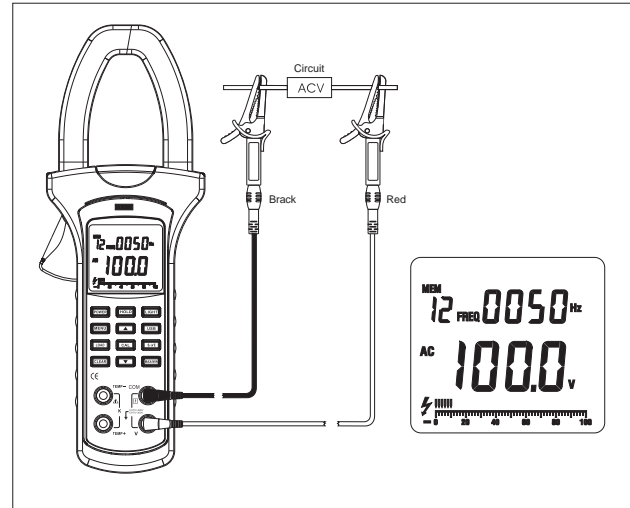



Figure 4

The AC Voltage ranges are:
15V, 100V, 300V and 600V

The frequency range is:
20Hz~500Hz



Warning

- When the voltage input is higher than 30V, the display shows  to warn you to take extra care of safety.
- When the input voltage is higher than 600V (r.m.s.), the display shows **OL**.

To measure AC voltage + frequency, connect the Meter as follows:

1. Insert the red test lead into the **V** terminal and black test lead to the **COM** input terminal.
2. Press the **MENU** to select Voltage (main display) + Frequency (secondary display) range and connect the two test leads to the object being measured.
3. The double display shows the AC voltage True RMS value and the frequency value.

4. Press **MAX/MIN** once, the LCD displays MAX, it starts recording the maximum AC voltage True RMS value.
5. Press **MAX/MIN** again, the LCD displays MIN, it starts recording the minimum AC voltage True RMS value.
6. Press **MAX/MIN** again to show the present AC voltage True RMS value.
7. The display shows **OL** when the input voltage is higher than 600V (r.m.s).

Note

- When the measurement has been completed, disconnect the connection between the testing leads and the circuit under test and remove testing leads from the input terminals.

B. AC Current (main display) + AC Voltage (secondary display) Measurement (see figure 5)

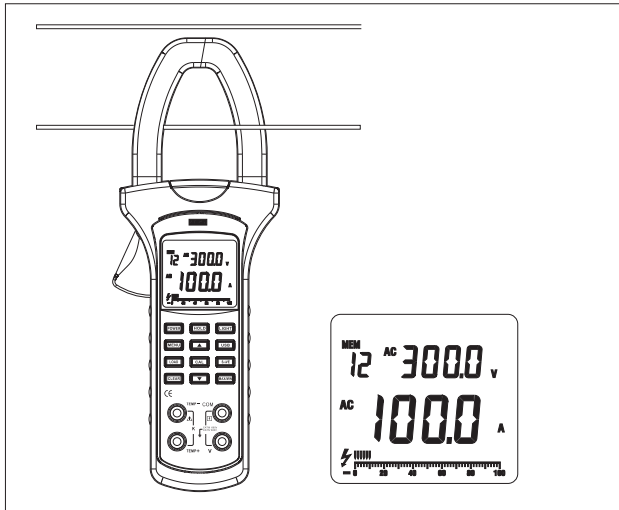


Figure 5

The AC current ranges are:
40A, 100A, 400A and 1000A

The AC Voltage ranges are:
15V, 100V, 300V and 600V

To measure AC current + AC voltage, connect the Meter as follows:

1. Press the **MENU** to select AC Current (main display) + AC Voltage (secondary display) range.
2. Press the lever to open the transformer jaw.
3. Center the tested conductor within the transformer jaw, then release the Meter slowly until the transformer jaw is completely closed, Make sure the conductor to be tested is placed at the center of the transformer jaw, otherwise it will cause deviation. The Meter can only measure one conductor at a time, to measure more than one conductor at a time will cause deviation.
4. The double display shows the AC current True RMS value and AC voltage True RMS value.
5. Press **MAX/MIN** once, the LCD displays MAX, it

- starts recording the maximum AC current True RMS value.
- Press **MAX/MIN** again, the LCD displays MIN, it starts recording the minimum AC current True RMS value.
 - Press **MAX/MIN** again to show the present AC current True RMS value.
 - The display shows **OL** when the current of the tested conductor is higher than 1000A rms.

Note

- When the measurement has been completed, disconnect the connection between the conductor under test and the jaw, and remove the conductor away from the transformer jaw of the Meter.

C. Active Power (main display) + Phase Angle (secondary display) Measurement (see figure 6)

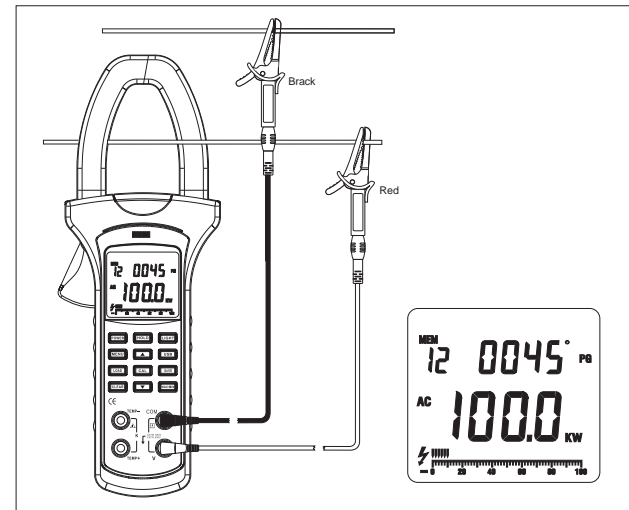


Figure 6

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The active power ranges are:
40A, 100A, 400A and 1000A

The phase angle ranges are:
0° ~360°



Warning

To avoid damages to the Meter or harms to you, do you measure higher than AC voltage 600 v.r.s. and AC current 1000A v.r.s.

To measure active power + phase angle, connect the Meter as follows:

1. Press the **MENU** to select Active power (main display) + Phase angle (secondary display) range.
2. Press the lever to open the transformer jaw, and clamp them to the power source or the tested conductor.
3. Insert the red test lead to **V** input terminal and black test lead to **COM** input terminal and connect them to the live wire and neutral wire of the tested circuit.
4. The double display shows the active power kW value and the PG value of the measured object.
5. The maximum active power kW measuring range is 600kW, **OL** will be displayed when it is over than that.
6. Press **MAX/MIN** once, the LCD displays MAX, it starts recording the maximum active power value.
7. Press **MAX/MIN** again, the LCD displays MIN, it starts recording the minimum active power value.
8. Press **MAX/MIN** again to show the present active power value.

Note

- When testing has been completed, disconnect the connection between the testing leads and the circuit under test and remove testing leads from the input terminals.

D. Apparent Power (main display) + Reactive Power (secondary display) Measurement (see figure 7)

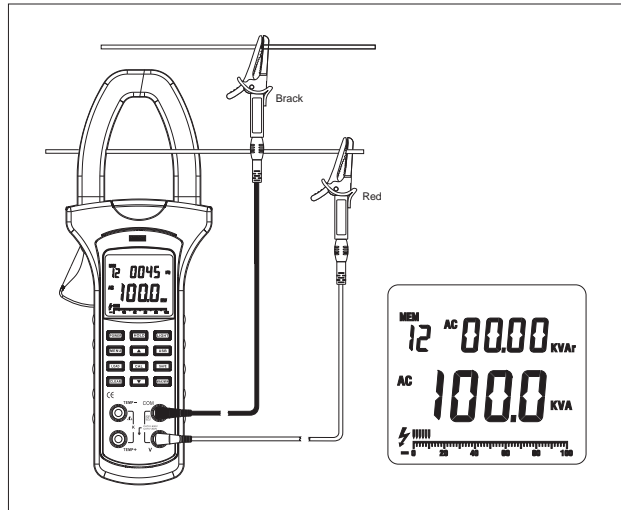


Figure 7

⚠ Warning

To avoid damages to the Meter or harms to you, do you measure higher than AC voltage 600V rms and AC current 1000A rms.

To test for Apparent power (main display) + Reactive power (secondary display), connect the Meter as follows:

1. Press the **MENU** to select Apparent power (main display) + Reactive power (secondary display) range.
2. Press the lever to open the transformer jaw, and clamp them to the power source or the tested conductor.
3. Insert the red test lead to **V** input terminal and black test lead to **COM** input terminal and connect them to the live wire and neutral wire of the tested circuit.
4. The double display shows the apparent power kVA value and the reactive power KVAR value of the measured object.
5. The maximum apparent value kVA and the reactive power KVAR measuring range is 600kVar. **OL** will be displayed when it is over than that.
6. Press **MAX/MIN** once, the LCD displays MAX, it

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starts recording the maximum apparent power value.

- 7 . Press **MAX/MIN** again, the LCD displays MIN, it starts recording the minimum apparent power value.
- 8 . Press **MAX/MIN** again to show the present apparent power value.

Note

- When testing has been completed, disconnect the connection between the testing leads and the circuit under test and remove testing leads from the input terminals.

E. Power Factor (main display) + Phase Angle (secondary display) Measurement (see figure 8)

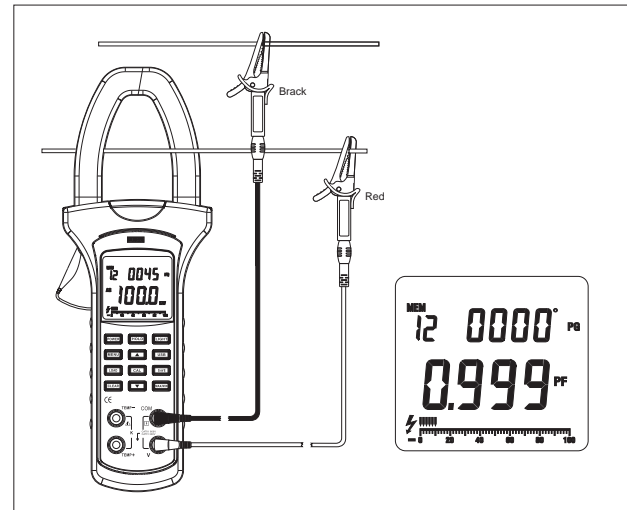


Figure 8

Warning

To avoid damages to the Meter or harms to you, do you measure higher than AC voltage 600V rms and AC current 1000A rms.

To test for Apparent power (main display) + Reactive power (secondary display), connect the Meter as follows:

1. Press the **MENU** to select Power factor (main display) + Phase angle (secondary display) range.
2. Press the lever to open the transformer jaw, and clamp them to the power source or the tested conductor.
3. Insert the red test lead to **V** input terminal and black test lead to **COM** input terminal and connect them to the live wire and neutral wire of the tested circuit.
4. The double display shows the power factor value and the phase angle value of the measured object.
5. When the power factor value is negative, it means the loading is capacitive.
6. When the power factor value is positive, it means the loading is inductive.
7. **MAX** and **MIN** are not valid when measuring power

factor.

Note

- When testing has been completed, disconnect the connection between the testing leads and the circuit under test and remove testing leads from the input terminals.

F. Active Energy (main display) + Time (secondary display) Measurement (see figure 9)

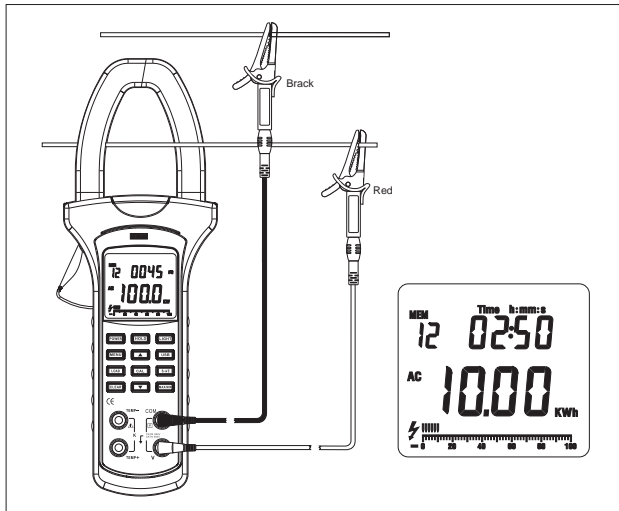


Figure 9

⚠ Warning

To avoid damages to the Meter or harms to you, do you measure higher than AC voltage 600V rms and AC current 1000A rms.

To test for Active Energy (main display) + Time (secondary display), connect the Meter as follows:

1. Press the **MENU** to select Power factor (main display) + Phase angle (secondary display) range.
2. Press the lever to open the transformer jaw, and clamp them to the power source or the tested conductor.
3. Insert the red test lead to **V** input terminal and black test lead to **COM** input terminal and connect them to the live wire and neutral wire of the tested circuit.
4. The double display shows the active energy value and the measuring time value of the measured object.
 - The measuring reading gets increasing along with the time increases. Press **HOLD** to read a particular time kWh value. Then the reading and

time are locked, but still continuous accumulate measuring time.

- After read the data, press **HOLD** again to continuous measurement. kWh value continuous accumulate and the measuring time jumps to the present measuring time.
 - When the measuring time is over 24 hours or the Meter is switched to other measuring ranges, active energy measuring will stop.
 - The maximum reading of active energy is 9999kWh. **OL** will be displayed when the reading is over than that.
5. **MAX** and **MIN** are not valid when measuring active energy.
 6. Press **CLEAR** to reset the time.

Note

- When testing has been completed, disconnect the connection between the testing leads and the circuit under test and remove testing leads from the input terminals.

G. Temperature °C (main display) and Temperature °F (secondary display) Measurement (see figure 10)

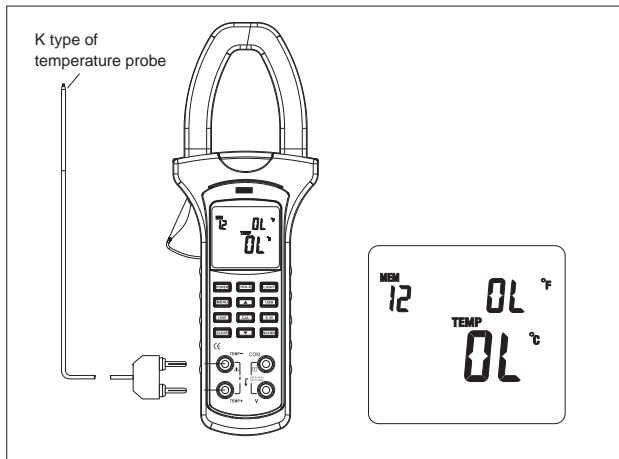


Figure 10

To test for temperature °C (main display) and Temperature °F (secondary display), connect the Meter as follows:

1. Press the **MENU** to select Power factor (main display) + Phase angle (secondary display) range.
2. Insert the temperature probe positive to the **TEMP+** input terminal and negative to the **TEMP -** input terminal and connect it to the measured object.
3. The double display shows the present degree celsius value on the main display and the fahrenheit value on the secondary display.

Note


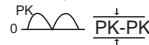
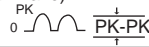


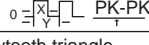
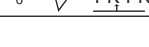
- When testing has been completed, disconnect the connection between the temperature probe and the circuit under test and remove temperature probe from the input terminals.

True RMS Measurement and Average Value Measurement

The True RMS measurement method can measure accurately the effective value of non-sine wave input signal.

Average value measurement method can measure the mean value of one sine wave input signal, and then displays it as RMS value

When the input waveform has distortion, measuring tolerance will be included. The total tolerance depends on the total distortion. Below table 1 shows the waveform coefficient and the relationship and the requested changing factor of sine wave, square wave, pulse rectangle wave, sawtooth triangle wave, RMS value and average value.

Input Wave	PK-PK	0-PK	RMS	AVG
Sine 	2.828	1.414	1.000	0.900
sine commute (whole wave) 	1.414	1.414	1.000	0.900
sine commute (half wave) 	2.828	2.828	1.414	0.900
square wave 	1.800	0.900	0.900	0.900
commuted square wave 	1.800	1.800	1.272	0.900
pulse rectangle D=X/Y 	0.9/D	0.9/ D	0.9D/2	0.9/D
sawtooth triangle 	3.600	1.800	1.038	0.900

Three Phases Four Wires and Three Phases Three Wires Measurement Method

The Model UT231 digital power clamp meter can measure single phase power and power factor. The power of three phases four wires system can use single phase power measurement method to measure, see figure 7.

If it is a balance load, the total watts is three times of single phase. If it is not a balance load, test each phase power separately, then sum up the three phases power value to obtain the total watt. The apparent power, reactive power, active energy and active power measurement methods are the same.

Power factor value can be obtained directly from each phase power factor testing. Three phases total power factor is equal to three phases total active power value divided by three phases total apparent power value.



Under three phases three wires balance load situation,

its total watt can be directly by measuring its voltage of the line and current of the line. Connect the loaded two phases to the V and COM input terminal of the power meter, clamp the transformer jaw to the third phase, its total watt is equal to the reading obtained times 1.732.

Three phases total watt also can be obtained by using the specified clamp type three phases digital power meter.

Specifications


A. General Specifications

- Maximum Voltage between any Terminals and grounding: Refer to different range input protection voltage.
- Display: Multi LCD displays, Maximum display 9999.
- Ranges: Auto
- Overloading: Display **OL**.
- Battery Deficiency: Display .
- Data Holding: Display .
- Data Logging: Maximum 99, Single or Continuous records
- Data Recall
- Maximum and Minimum value display: Voltage, Current, Active Power and Apparent Power ranges
- Display Backlight: White colour
- Computer connection: USB
- Calibration Feature
- Sleep Mode: To preserve battery life, the Meter automatically turns off if you do not turn press any button for around 15 minutes., except at active

energy range.

- Analogue Bar Graph
- Sampling: 3 times per second.
- Max. Jaw Size: 55mm diameter.
- Power: 4 x 1.5V battery (LR6)
- Dimensions: 303mm x 112mm x 39mm
- Weight: Approximate 601g

B. Environmental Requirements

- Altitude: Operating: 2000m
Storage: 10000m
- Temperature and humidity:
 - Operating:
 - 0°C~30°C (≤ 85%R.H)
 - 30°C~40°C (≤ 75%R.H)
 - 40°C~50°C (≤ 45%R.H)
 - Storage:
 - 10°C~+60°C (≤ 85%R.H)
- Safety/ Compliances: IEC 61010 CAT.III 600V, CAT.IV 300V overvoltage and double insulation standard, pollution degree 2.
- Certification: 

Accurate Specifications

Accuracy: $\pm(a\% \text{ reading} + b \text{ digits})$, guarantee for 1 year.

Operating temperature: $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$

Operating humidity: 45~75%R.H

A. AC Voltage (True RMS)

Range	Resolution	Accuracy	Allowable Maximum overload protection voltage	Input Impedance
15V	0.1V	$\pm(1.2\%+5)$	600 RMS	10M Ω
100V				
300V				

B. Frequency

Range	Precision	Accuracy
20Hz~500Hz	1Hz	$\pm(0.5\%+5)$

C. AC Current (True RMS)

Range	Resolution	Accuracy	Allowable Maximum overload protection current
40A	0.1A	$\pm(2\%+5)$	1000A RMS
100A			
400A			
1000A	1A		

D. Active Power ($W=V \times A \times \text{COS } \Phi$)

Voltage / Current		Voltage Range			
		15V	100V	300V	600V
Current Range	40A	0.60kW	4.00kW	12.00kW	24.00kW
	100A	1.50kW	10.00kW	30.00kW	60.00kW
	400A	6.00kW	40.00kW	120.0kW	240.0kW
	1000A	15.00kW	100.0kW	300.0kW	600.0kW
Precision		$\pm(3\%+5)$			
Defend Rate		$<100\text{kW}:0.01\text{kW}$		$\geq 100\text{kW}: 0.1\text{kW}$	

Remarks:

- Allowable maximum overload protection voltage: 600V RMS
- Allowable maximum overload protection current: 1000A RMS

E. Apparent Power (VA = V x A)

Voltage / Current		Voltage Range			
		15V	100V	300V	600V
Current Range	40A	0.60kVA	4.00kVA	12.00kVA	24.00kVA
	100A	1.50kVA	10.00kVA	30.00kVA	60.00kVA
	400A	6.00kVA	40.00kVA	120.0kVA	240.0kVA
	1000A	15.00kVA	100.0kVA	300.0kVA	600.0kVA
Accuracy		±(3%+5)			
Resolution		<1000kVA:0.01kVA		≥100kVA: 0.1kVA	

Remarks:

- Allowable maximum overload protection voltage: 600V RMS
- Allowable maximum overload protection current: 1000A RMS

F. Reactive Power (Var = V x A x SIN Φ)

Voltage / Current		Voltage Range			
		15V	100V	300V	600V
Current Range	40A	0.60kVar	4.00kVar	12.00kVar	24.00kVar
	100A	1.50kVar	10.00kVar	30.00kVar	60.00kVar
	400A	6.00kVar	40.00kVar	120.0kVar	240.0kVar
	1000A	15.00kVar	100.0kVar	300.0kVar	600.0kVar
Accuracy		±(4%+5)			
Resolution		<1000kVar: 0.01kVar		≥100kVar: 0.1kVar	

Remarks:

- Allowable maximum overload protection voltage: 600V RMS
- Allowable maximum overload protection current: 1000A RMS

G. Power Factor (PF = W / VA)

Range	Accuracy	Resolution	Measuring Condition
0.3~1 (capacitive or inductive)	± 0.022	0.001	The minimum measuring current 10A The minimum measuring voltage 45V
0.3~1 (capacitive or inductive)	For reference only		Measuring current less than 10A OR Measuring voltage less than 45V

Remarks:

- Allowable maximum overload protection voltage: 600V RMS
- Allowable maximum overload protection current: 1000A RMS

H. Phase Angle (PG=acos (PF))

Range	Accuracy	Resolution	Measuring Condition
0° ~360°	$\pm 1^\circ$	1°	The minimum measuring current 10A The minimum measuring voltage 45V
0° ~360°	For reference only		Measuring current less than 10A OR Measuring voltage less than 45V

I. Active Energy (kWh)

Range	Accuracy	Resolution
1~9999kWh	$\pm(3\%+2)$	0.001kWh

Remarks:

- Allowable maximum overload protection voltage: 600V RMS
- Allowable maximum overload protection current: 1000A RMS

K. Temperature (TEMP)

Range	Accuracy	Resolution
-50°C~0°C	$\pm(1\%+10)$	1°C
0°C~1300°C	$\pm(1\%+5)$	1°C
-58°F~32°F	$\pm(1\%+18)$	
32°F~2372°F	$\pm(1\%+11)$	

MAINTENANCE

This section provides basic maintenance information including battery replacement instruction.



Warning

Do not attempt to repair or service your Meter unless you are qualified to do so and have the relevant calibration, performance test, and service information.

To avoid electrical shock or damage to the Meter, do not get water inside the case.

A. General Service

- Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents.
 - To clean the terminals with cotton bar with detergent, as dirt or moisture in the terminals can affect readings.
 - Turn the Meter power off when it is not in use.
 - Take out the battery when it is not using for a long time.
- Do not use or store the Meter in a place of humidity, high temperature, explosive, inflammable and strong magnetic field.

B. Replacing the Battery (see figure 11)

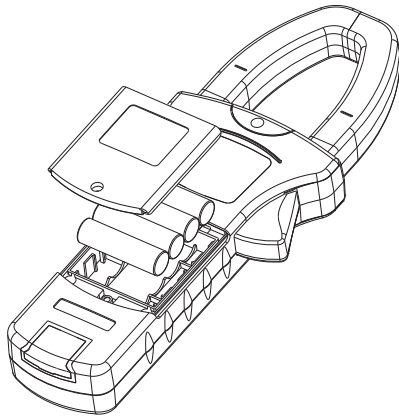



Figure 11

⚠ Warning

To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator “” appears. Make sure the transformer jaw and the tests leads are disconnected from the circuit being tested before opening the case bottom.

To replace the battery:.

1. Press **POWER** to turn the Meter off and remove all the connections from the input terminals
2. Turn the Meter's front case down.
3. Remove the screw from the battery door, and separate the battery door from the case bottom.
4. Take out the old battery and replace with 4 x 1.5V battery (LR6).
5. Rejoin the case bottom and the battery compartment, and reinstall the screw.

END

This operating manual is subject to change without notice.