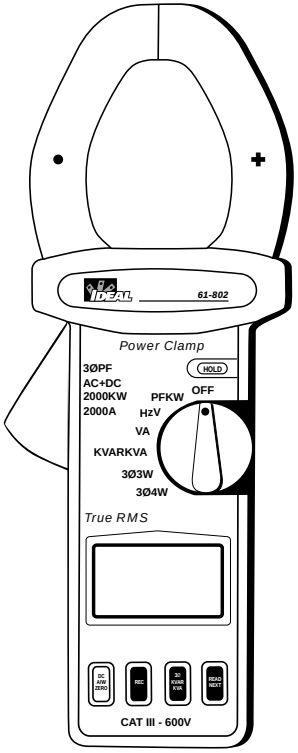
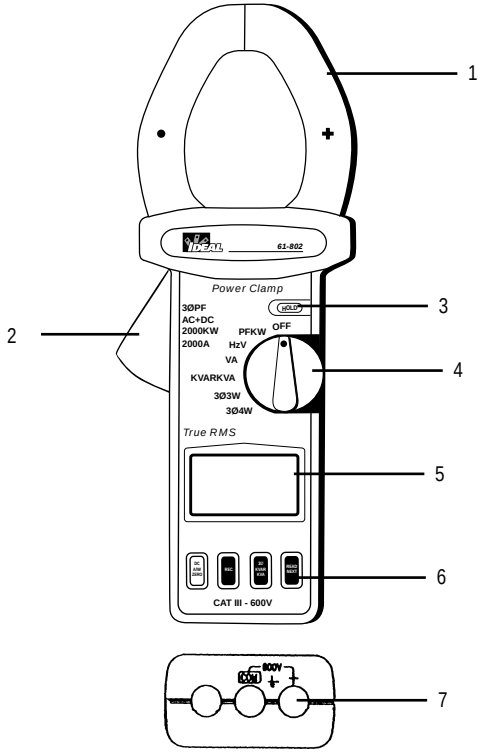
#61-802

800 Series
Power Clamp Meter





1. **Transformer Jaw**
2. **Transformer Trigger**
3. **Data Hold Button**
4. **Rotary Function Switch**
5. **LCD Display**
6. **Function Buttons**
7. **Input Terminals**

WARNING!

1. DO NOT UNDER ANY CIRCUMSTANCES EXCEED THESE RATINGS:
   - Voltage is not to exceed 800 Volts.
   - Wattage, Resistance and Continuity functions are not to be performed on circuits capable of delivering greater than 600 Volts.
   - Current measurements are not to be performed on circuits capable of delivering greater than 500 Volts
2. To avoid electrical shock hazards and/or damage to the meter:
   - Do not exceed the voltage ratings for the meter. Use caution when measuring voltage.
   - Do not use during electrical storms. AC power sources with inductive loads or electrical storms may result in high voltage. High energy transients can damage meter and present a dangerous shock hazard.
   - Turn off power to the circuit or device being measured before taking resistance and capacitance measurements. Fully discharge all capacitors before measuring.
3. Ensure meter is in proper working order before using. Visually inspect meter for damage. Performing a continuity check can verify proper operation. If the meter reading goes from overload to zero, this typically means the meter is in proper working order.
4. Visually inspect leads for damage before using. Replace if insulation is damaged or leads appear suspect.
5. Never ground yourself when taking electrical measurements. Do not touch exposed metal pipes, outlets, fixtures etc. Keep your body isolated from ground by using dry clothing, rubber shoes, mats, or any other approved insulating material. Keep your fingers behind the finger guards on the probes. Work with others.
6. Before beginning all unknown measurements, set meter to highest possible range.
7. Before breaking a circuit for testing, turn off the power to the circuit. When disconnecting from a circuit, disconnect the hot lead first, then the common lead.
8. Disconnect the meter from the circuit before turning off any indicator, including motors, transformers, and solenoids.

Data Hold Button

- The data hold button is used to capture and hold a reading on the LCD display.
- Press the button again to release the reading.

LCD Display

- 3-3/4 digit display with maximum indication of 3999.
- Function symbols, units, analog bargraph, low battery symbol, min/max symbols, relative symbol, and zero symbol are included.

Function Buttons

DC A/W ZERO Button

- The DC A/W Zero button is used to zero out the DCA residual value.
- Press this button until the LCD displays a zero value and the zero symbol.
- This button does not force the meter into manual range mode.
- Press and hold the DC A/W Zero button for 2 seconds to disable this function.

REC Button

- The meter can store 4 data points in memory.
- Pressing the REC button will store the current value into memory.
- The data point number (1-4) will be shown on the upper display, and the stored data will be shown on the main display for approximately 3 seconds.
- After all four data points have been stored, the meter will display FULL on the secondary display when the REC button is pressed.
- When data is stored in memory, the REC symbol is shown on the LCD display.
- This data can be viewed by pressing the READ NEXT button.
- This data is stored until the meter is turned off.

3Φ KVAR KVA Button

- The 3Φ KVAR KVA button toggles between the KVAR/KVA measurements and the PF/kW measurements in the 3Φ3W or 3Φ4W functions.
- Toggling between these measurements can only be done after the power clamp has calculated the power factor and kW measurement.

Read Next Button

In 3Φ3W Function

- Pressing the read next button stores the measured values for $kW_{RS(L1L2)}$/$kVA_{RS(L1L2)}$ and moves to the next measurement.
- Pressing read next after the $kW_{TS(L2L3)}$/$kVAR_{TS(L2L3)}$ stores the values and calculates the kW and PF values for the 3Φ3W system.
- After these values have been calculated, press the 3Φ KVAR KVA button to display the KVAR and KVA values for the system.
- To start another calculation, press the read next button again to return and take a measurement for the $kW_{RS(L1L2)}$/$kVARS_{(L1L2)}$ values.

In 3Φ4W Function

- Pressing the read next button stores the measured values for $W_{R(L1)}$/$PF_{R(L1)}$ and moves to the next measurement.
- Pressing read next after the $W_{S(L2)}$/$PF_{S(L2)}$ stores the values and moves on to the next measurement.
- Pressing read next after the $W_{T(L3)}$/$PF_{T(L3)}$ stores the values and calculates the kW and PF values for the 3Φ4W system.
- After these values have been calculated, press the 3Φ KVAR KVA button to display the KVAR and KVA values for the system.
- To start another calculation, press the read next button again to return and take a measurement for the $W_{R(L1)}$/$PF_{R(L1)}$ values.

In any other function

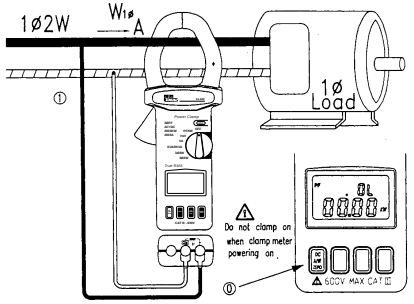
- Pressing the read next button in any other function displays the measurement values stored with the REC button.
- The REC NO. symbol will be shown on the LCD display and the record number will flash on the secondary display to notify the user of what values are being displayed.
- Pressing this button after the meter displays last stored data point returns to the first stored data point.
- To exit the read next mode, turn the function switch to any other function. This will exit without losing the stored data.

Kilowatt/Power Factor Measurements

Kilowatt Range (AC+DC True Power)	Resolution	Accuracy	Voltage/Current Range
0-99.99kW	0.01kW	±(2.0% +0.05)	600VAC, 800VDC
100-999.9kW	0.1kW		2000A AC/DC
1000-1600kW	1kW	±(2.0% +5)	

Power Factor 0.2-1.0 for 1Φ2W, 1Φ3W, 3Φ3W, and 3Φ4W

Autoranging Table	0-200VAC 0-200VDC	200-600VAC 200-800VDC
0-200A	0.00-40.00kW	0.00-99.99kW 100.0-160.0kW
200-2000A	0.0-400.0kW	0.0-999.9kW 1000-1600kW



To measure Kilowatts and Power Factor in a single phase 2-wire system

- Set rotary switch to PF/kW without jaws clamping onto any wire
- If the watt reading is not zero, press the DC A/W ZERO button once to zero out the watt reading.
- Insert the black test lead into the COM terminal and the red test lead into the + terminal.
- Connect the black test probe to the neutral conductor and the red test probe to the hot conductor.
- Using the trigger to open the jaws, fully enclose the hot conductor within the clamp.
- Release the trigger and be sure that the jaws have closed completely.
- The power clamp selects the appropriate range based on the Autoranging table.
- Power Factor (PF) is a calculated value based on the formula

$$PF = \frac{kW}{kVA}$$

- The kW value is shown on the main display and the PF value is shown on the upper display.
- Positive PF (+) indicates an inductive load, while negative PF (-) indicates a capacitive load.

Note: The "+" sign on the jaw must face the power source for correct measurement.

To measure Kilowatts and Power Factor in a single phase 3-wire system

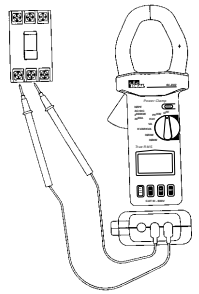
See section on 1Φ3W AC+DC Power Measurements

AC+DC Voltage/Frequency Measurements

Voltage Range	Resolution	Accuracy (50/60Hz)	Accuracy (40-400Hz)	Input Impedance
0-200V	0.1V	±(1.5% +5)	±(2.0% +5)	10M
200-500V				
500-600VAC	1V			
500-800VDC				

Overload Protection: 800V
TRMS Measurements
Accuracies specified at Crest Factor <3.5

Frequency Range	Accuracy	Sensitivity
50/60Hz	±(0.5% + 2)	>5V
10-400Hz		



To Measure Voltage and Frequency

- Set the rotary switch to V/Hz
- Insert the black test lead into the COM terminal and the red test lead into the + terminal.
- Connect the test probes in parallel with the load or circuit.
- The power clamps automatically selects the proper range.

- The voltage value is shown on the main display and the frequency value is shown on the upper display.

Note: If the frequency is <10Hz, the display will show 0Hz. If the frequency is >1000Hz, the display will show OL.

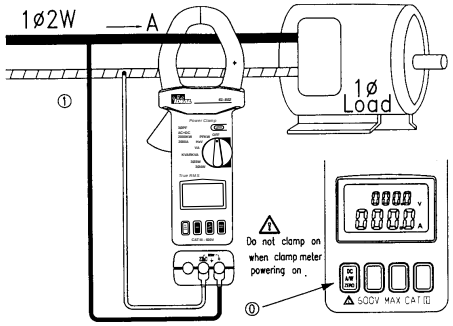
AC+DC Current and Voltage Measurement

AC+DC Current Range	Resolution	Accuracy (50/60Hz)	Accuracy (40-400Khz)
0-200A	0.1A	±(1.5% +5)	±(2.0% +5)
200-500A		±(2.0% +5)	±(2.5% +5)
500-2000A	1A		

Overload Protection: 3000A
TRMS Measurements
Accuracies specified at Crest Factor <3.5

Voltage Range	Resolution	Accuracy (50/60Hz)	Accuracy (40-400Hz)	Input Impedance
0-200V	0.1V	±(1.5% +5)	±(2.0% +5)	10M
200-500V				
500-600VAC				
500-800VDC	1V			

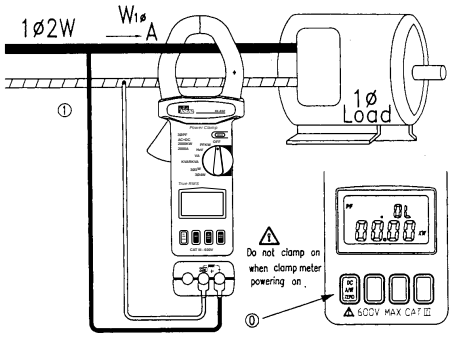
Overload Protection: 800V
TRMS Measurements
Accuracies specified at Crest Factor <3.5



To Measure AC+DC Current and Voltage in a single phase 2-wire system

- Set rotary switch to A/V
- Press the DC A/W ZERO button to zero the reading
- Using the trigger to open the jaws, fully enclose the conductor within the clamp.
- Release the trigger and be sure that the jaws have closed completely.
- Insert the black test lead into the COM terminal and the red test lead into the + terminal.
- Connect the test probes in parallel with the load or circuit.
- The power clamp automatically selects the proper range.
- The current value is shown on the main display and the voltage value is shown on the upper display.

AC + DC Apparent Power/Reactive Power Measurement (kVA/kVAR)



Note: Before taking a kVA/kVAR measurement, the DC A/W ZERO button must be used to zero the current reading. If the current reading is not zero, the kVA and kVAR values might be incorrect.

To Measure AC+DC Apparent and Reactive Power (kVA/kVAR) in a single phase 2-wire system

- Set the rotary switch to A/V.
- Press the DC A/W ZERO button to zero the reading.
- Set the rotary switch to kVA/kVAR.
- Insert the black test lead into the COM terminal and the red test lead into the + terminal.
- Connect the black test probe to the neutral conductor and the red test probe to the hot conductor.
- Using the trigger to open the jaws, fully enclose the hot conductor within the clamp.
- Release the trigger and be sure that the jaws have closed completely.
- Apparent Power (kVA) is a calculated value based on the formula

$$kVA = \frac{VA}{1000}$$

- Reactive Power (kVAR) is a calculated value based on the formula

$$kVAR = \sqrt{(kVA)^2 - (kW)^2}$$

- To obtain a more accurate kVAR value when the power factor (PF) is greater than 0.91, use the 3Φ3W function.
- The kVA value is shown on the main display and the kVAR value is shown on the upper display.
- Positive kVAR (+) indicates a capacitive load, while negative kVAR (-) indicates an inductive load.

Note: The "+" sign on the jaw must face the power source for correct measurement.

To measure AC+DC Apparent and Reactive Power (kVA/kVAR) in a single phase 3-wire system

See section on 1Φ3W AC+DC Power Measurements

3Φ3W AC+DC Power Measurements

Kilowatt Range (AC+DC True Power)	Resolution Range	Accuracy	Voltage/Current
0-99.99kW	0.01kW	±(2.0% +0.05)	600VAC, 800VDC
100-999.9kW	0.1kW		2000A AC/DC
1000-1200kW	1kW	±(2.0% +5)	

Power Factor 0.2-1.0 for 1Φ2W, 1Φ3W, 3Φ3W, and 3Φ4W

KVAR Range (AC+DC Reactive Power)	Resolution	Accuracy	Voltage/Current Range
0-99.99kW	0.01kW	±(2.0% +0.05)	600VAC, 800VDC
100-999.9kW	0.1kW		2000A AC/DC
1000-1200kW	1kW	±(2.0% +5)	

In a three phase 3-wire system, the 61-802 power clamp measures the true power (kW), power factor (PF), apparent power (kVA), and reactive power (kVAR) of the system. These values are calculated based on the formulas

$$kW_{3\phi 3W} = kW_{RS(L1L2)} + kW_{TS(L3L2)}$$

$$PF_{3\phi 3W} = \frac{kW\ 3\Phi 3W}{kVA\ 3\Phi 3W}$$

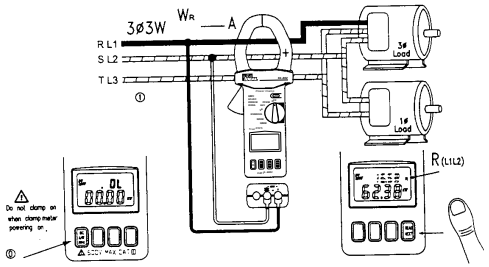
$$kVA_{3\phi 3W} = \sqrt{kW^2_{3\phi 3W} - kVAR^2_{3\phi 3W}}$$

$$kVAR_{3\phi 3W} = kVA_{RS(L1L2)} + kVA_{RTS(L1L2)}$$

To Measure AC+DC Power Measurements in a three phase 3-wire system

- Set rotary switch to 3Φ3W without jaws clamping onto any wire.
- The LCD display will show a flashing R to indicate that the meter is ready for the first measurement.
- If the watt reading is not zero, press the DC A/W ZERO button once to zero out the watt reading.
- Insert the black test lead into the COM terminal and the red test lead into the + terminal.

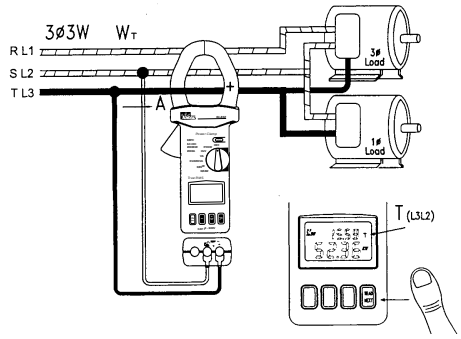
L1L2 Measurement



- Select one phase to be the common phase. (eg. S or L2)
- Connect the black test probe to the common phase (S or L2) and the red test probe to another phase (eg. R or L1).
- Using the trigger to open the jaws, fully enclose the phase (R or L1) within the clamp.
- Release the trigger and be sure that the jaws have closed completely.
- Wait until the reading is stable, and press the READ NEXT button to capture the reading, storing the data in memory.
- The LCD display will show a flashing T to indicate that the meter is ready for the next measurement.
- Remove the clamp and test probes from the phases tested in the first measurement.

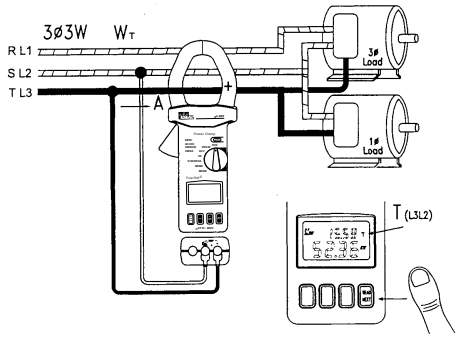
Note: Once a phase is selected as common, this selection cannot be changed. For example, if S or L2 phase is selected, S is always connected to COM during measurement of $W_{RS(L1L2)}$ in 3Φ3W unbalanced power.

L3L2 Measurement



- Connect the black test probe to the common phase (S or L2) and the red test probe to the third phase (eg. T or L3)
- Using the trigger to open the jaws, fully enclose the phase (T or L3) within the clamp.
- Release the trigger and be sure that the jaws have closed completely.
- Wait until the reading is stable, and press the READ NEXT button to capture the reading, storing the data in memory.

Calculations



- The power clamp processes the two sets of data and calculates the true power (kW) of the system, which is shown on the main display, and the power factor (PF), which is shown on the upper display. RST is shown on the LCD display to indicate that this is a measurement of the total system.
- Pressing the 3ϕ KVAR KVA button toggles to display the apparent power (kVA) of the system, which is shown on the main display, and the reactive power (kVAR), which is shown on the upper display.
- Pressing the READ NEXT button clears the stored data from memory and readies the power clamp for another three phase 3-wire calculation.

Note: The "+" sign on the jaw must face the power source for correct measurement.

Note: In the 3ϕ3W unbalanced power measurement, one of W_{RS} or W_{TS} could be negative. Make sure all the connections and clamping are correct to obtain correct power and power factor measurements.

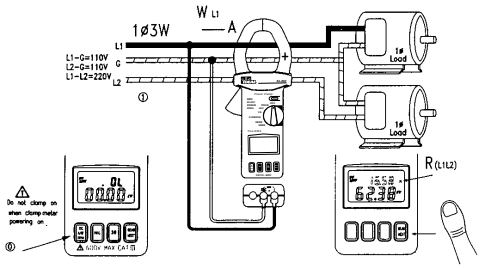
1ϕ3W AC+DC Power Measurements

The measurements for a single phase 3-wire system are similar to a three phase 3-wire unbalanced measurements, except the nomenclature is different.

To Measure AC+DC Power Measurements in a single phase 3-wire system

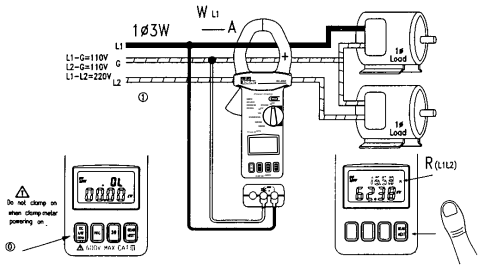
- Set rotary switch to 3ϕ3W without jaws clamping onto any wire.
- The LCD display will show a flashing R to indicate that the meter is ready for the first measurement.
- If the watt reading is not zero, press the DC A/W ZERO button once to zero out the watt reading.
- Insert the black test lead into the COM terminal and the red test lead into the + terminal.

L1G Measurement

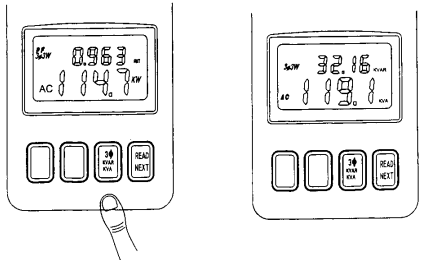


- Connect the black test probe to ground and the red test probe to the first phase (R or L1).
- Using the trigger to open the jaws, fully enclose the phase (R or L1) within the clamp.
- Release the trigger and be sure that the jaws have closed completely.
- Wait until the reading is stable, and press the READ NEXT button to capture the reading, storing the data in memory.
- The LCD display will show a flashing T to indicate that the meter is ready for the next measurement.
- Remove the clamp and test probes from the phases tested in the first measurement.

L2G Measurement



- Connect the black test probe to ground and the red test probe to the second phase (T or L2).
- Using the trigger to open the jaws, fully enclose the phase (T or L2) within the clamp.
- Release the trigger and be sure that the jaws have closed completely.
- Wait until the reading is stable, and press the READ NEXT button to capture the reading, storing the data in memory.



- The power clamp processes the two sets of data and calculates the true power (kW) of the system, which is shown on the main display, and the power factor (PF), which is shown on the upper display. RST is shown on the LCD display to indicate that this is a measurement of the total system.
- Pressing the 3Φ KVAR KVA button toggles to display the apparent power (kVA) of the system, which is shown on the main display, and the reactive power (kVAR), which is shown on the upper display.
- Pressing the READ NEXT button clears the stored data from memory and readies the power clamp for another single phase 3-wire calculation.

3Φ4W AC+DC Power Measurements

Kilowatt Range (AC+DC True Power)	Resolution	Accuracy	Voltage/Current Range
0-99.99kW	0.01kW	±(2.0% +0.05)	600VAC, 800VDC
100-999.9kW	0.1kW		2000A AC/DC
1000-1200kW	1kW	±(2.0% +5)	

Power Factor 0.2-1.0 for 1Φ2W, 1Φ3W, 3Φ3W, and 3Φ4W

In a three phase 4-wire system, the 61-802 power clamp measures the true power (kW), power factor (PF), apparent power (kVA), and reactive power (kVAR) of the system. These values are calculated based on the formulas

$$kW_{3\Phi4W} = \quad kW_{3\Phi4W} = kW_{R(L1)} + kW_{S(L2)} + kW_{T(L3)}$$

$$PF_{3\Phi4W} = \frac{kW\ 3\Phi4W}{kVA\ 3\Phi4W}$$

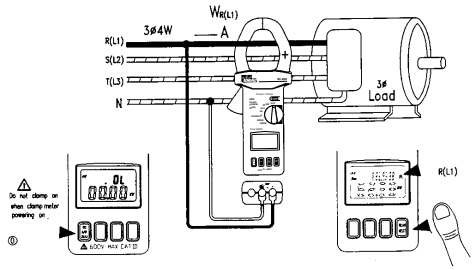
$$kVA_{3\Phi4W} = \sqrt{kW^2_{3\Phi4W} + kVAR^2_{3\Phi4W}}$$

$$kVAR_{3\Phi4W} = \quad kVAR_{R(L1)} + kVAR_{S(L2)} + kVAR_{(TL3)}$$

To Measure AC+DC Power Measurements in a three phase 4-wire system

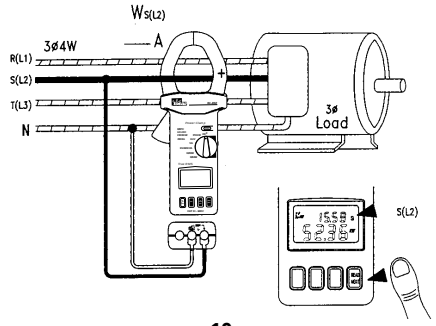
- Set rotary switch to 3Φ4W without jaws clamping onto any wire.
- The LCD display will show a flashing R to indicate that the meter is ready for the first measurement.
- If the watt reading is not zero, press the DC A/W ZERO button once to zero out the watt reading.
- Insert the black test lead into the COM terminal and the red test lead into the + terminal.

L1 Measurement



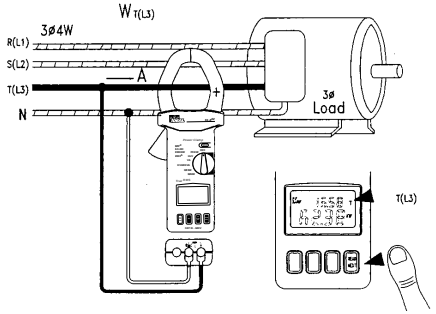
- Connect the black test probe to neutral and the red test probe to the first phase (R or L1).
- Using the trigger to open the jaws, fully enclose the phase (R or L1) within the clamp.
- Release the trigger and be sure that the jaws have closed completely.
- Wait until the reading is stable, and press the READ NEXT button to capture the reading, storing the data in memory.
- The LCD display will show a flashing S to indicate that the meter is ready for the next measurement.
- Remove the clamp and test probe from the first phase.

L2 Measurement



- Connect the black test probe to neutral and the red test probe to the second phase (S or L2)
- Using the trigger to open the jaws, fully enclose the second phase (S or L2) within the clamp.
- Release the trigger and be sure that the jaws have closed completely.
- Wait until the reading is stable, and press the READ NEXT button to capture the reading, storing the data in memory.
- The LCD display will show a flashing T to indicate that the meter is ready for the next measurement.
- Remove the clamp and test probe from the second phase.

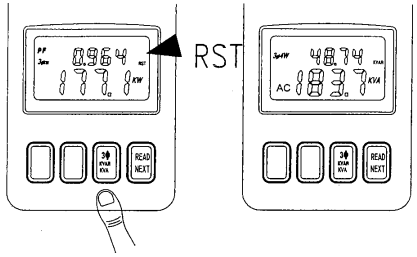
L3 Measurement



- Connect the black test probe to neutral and the red test probe to the third phase (T or L3)
- Using the trigger to open the jaws, fully enclose the third phase (T or L3) within the clamp.
- Release the trigger and be sure that the jaws have closed completely.
- Wait until the reading is stable, and press the READ NEXT button to capture the reading, storing the data in memory.

Power Calculations

$3\phi 4W = R_{(L1)} + S_{(L2)} + T_{(L3)}$



- The power clamp processes the three sets of data and calculates the true power (kW) of the system, which is shown on the main display, and the power factor (PF), which is shown on the upper display. RST is shown on the LCD display to indicate that this is a measurement of the total system.
- Pressing the 3ϕ KVAR KVA button toggles to display the apparent power (kVA) of the system, which is shown on the main display, and the reactive power (kVAR), which is shown on the upper display.
- Pressing the READ NEXT button clears the stored data from memory and readies the power clamp for another three phase 3-wire calculation.

Note: The "+" sign on the jaw must face the power source for correct measurement.

Note: In the 3ϕ4W power measurement, all three W_R or W_T or W_S must be positive. If one of the three phases has a negative power, check the connections and clamping and re-measure the phase to obtain correct power and power factor measurements.

Power Factor Corrections

A positive power factor indicates that an inductive load has brought the power system out of phase. Based on the kVAR values of the system, capacitors are available to improve the power factor. By measuring the frequency, phase voltage and kVAR of the system, you can calculate the capacitive load required for this correction. Single phase capacitors can be used in a 1ϕ2W or 3ϕ4W systems. Three phase capacitors are available for 3ϕ3W and 3ϕ4W systems.

Determining the Required Capacitor Value

- Measure the $kVAR_{3\phi 3W}$ value of the power system.
- The capacitor value required can be calculated based on the following equation:

$$\text{Capacitance (Farad)} = \frac{kVAR * 1000}{2\pi f V^2}$$

f = frequency rating of the system
V = phase voltage

- It is recommended that the KVAR value of the capacitor be a little less that the measured value.

General Specifications

Indoor Use

Conductor Size:	Cable ϕ55mm (approx.)
	Bus Bar 65mm (D) x 24mm (W)
Battery Type:	9V
Display:	2 x 4 Digits Dual Display LCD
Range Selection:	Auto
Overload Indication:	OL
Power Consumption:	25mA (approx.)
Low Battery Indication:	
Sampling Time:	0.5 sec. (V and A)
	1.6 sec. (W)
Operating Temperature:	4°C to 50°C
Operating Humidity:	Less than 85% relative
Altitude:	Up to 2000M
Storage Temperature:	-20°C to 60°C
Storage Humidity:	Less than 75% relative

General Specifications (Continued)

Indoor Use

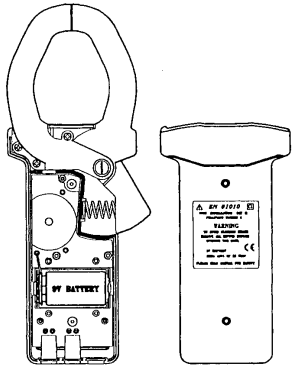
Dimension: (H)	271mm (L) x 112mm (W) x 46mm
	10.7" (L) x 4.4" (W) x 1.8" (H)
Weight:	647 g/22.8 oz. (batteries included)
Accessories:	Carrying bag x 1
	Users manual x 1
	9V battery x 1 (installed)

Maintenance

> ⚠ **Warning**
> To avoid electrical shock, remove test leads before opening the cover. Repairs or servicing not covered in this manual should only be performed by qualified personnel.

Battery Replacement

> ⚠ **Warning**
> Do not touch or adjust any components inside the clamp when the back case is removed.



- Turn the power off and remove the test leads from the clamp meter.
- Remove the screws from the back case.
- Lift and remove the back case.
- Remove the old battery and insert a new 9V battery.
- Replace the back case, and secure the case screws.

Lifetime Limited Warranty

This meter is warranted to the original purchaser against defects in material or workmanship for the lifetime of the meter. During this warranty period, IDEAL INDUSTRIES, INC. will, at its option, replace or repair the defective unit, subject to verification of the defect or malfunction.

This warranty does not apply to defects resulting from abuse, neglect, accident, unauthorized repair, alteration, or unreasonable use of the instrument.

Any implied warranties arising out of the sale of an IDEAL product, including but not limited to implied warranties of merchantability and fitness for a particular purpose, are limited to the above. The manufacturer shall not be liable for loss of use of the instrument or other incidental or consequential damages, expenses, or economic loss, or for any claim or claims for such damage, expenses or economic loss.

State laws vary, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and may also have other rights which vary from state to state.
the data for future analysis.

IDEAL INDUSTRIES, INC.
Sycamore, IL 60178, U.S.A.
800-304-3578 Customer Assistance
www.testersandmeters.com
ND 2396-1 Made in Taiwan