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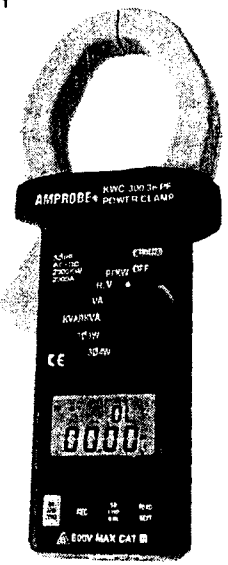
OPERATING INSTRUCTIONS
for
AMPROBE

3ϕ POWER CLAMP



Model KWC-2000

AMPROBE.
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Features

- **PF(cosϕ) for 3ϕ4W, 3ϕ3W, 1ϕ2W.**
- **KVAR and KVA for 3ϕ4W, 3ϕ3W, 1ϕ2W**
- **AC+DC true power, and True RMS AC Voltage and Current**
- **AC+DC 2000A, AC 600V, DC 800V**
- **AC+DC 1200KW(1ϕ), AC+DC 2000KW (3ϕ)**
- **Dual Display V+Hz, A+V, W+PF, KVA+KVAR**
- **Memory of 4 records.**
- **AC/DC Auto Detection.**
- **Auto range.**

Limited Warranty

Congratulations! You are now the owner of an AMPROBE® instrument. It has been quality crafted according to the highest standards of quality and workmanship. This instrument has been inspected for proper operation of all its functions and tested by qualified factory technicians according to the long-established standards of AMPROBE®.

Your AMPROBE® instrument has a limited warranty against defective materials and/or workmanship for one year from the date of purchase provided that the seal is unbroken or, in the opinion of the factory, the instrument has not been tampered with or taken apart.

Should your instrument fail due to defective materials, and/or workmanship during the one year warranty period, return it along with a copy of your dated bill of sale which must identify instrument by model number and manufacturing number.

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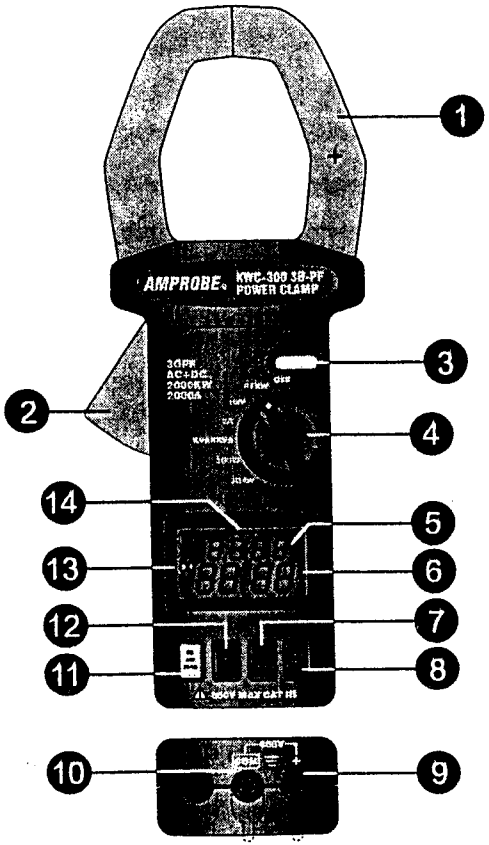
Front Panel



Panel Description

1. Transformer Jaw
This is used to pick up current signal. To measure AC+DC current or AC+DC power, conductor must be enclosed by the jaw.

2. Transformer Trigger
This is used to open the jaw.

3. Data Hold Button
Once this button is pressed, reading will be held in the LCD. Press again to release it.

4. Function Selection and On/Off Switch
This is used to select the function users desired, such as KW, V, A, Phase, KVA, or 3ϕ.

5. LCD
This is a 4 digits Liquid Crystal Display with maximum indication of 9999. Function symbols, units, sign, decimal points, low battery symbols, and zero symbol are included.

6. Units Symbols
Once a function is selected, corresponding unit (KW, V, A, Phase, KVA, or 3ϕ) will be displayed in LCD.

7. 3ϕ KVA/KVAR Select Button
If users want to read the value of KVA and KVAR for 3ϕ3W, or 3ϕ4W, users can press this button. Press it again to return to displays of W + PF.

8. Read/Next Button
When the rotary switch is set at 3ϕ3W, or 3ϕ4W function, this button is used as a **NEXT** button.

a) In the 3ϕ3W system mode, Pressing the **NEXT** button to store the measured values $W_{RS(L1L2)}$/$KVAR_{RS(L1L2)}$ and $W_{TS(L3L2)}$/$KVAR_{TS(L3L2)}$. After two set of data are measured and stored, the microprocessor inside the power clamp will process these data, display the result in LCD and show the symbol of RST to represent $W_{3\phi3W}$. To start another $W_{3\phi3W}$ measurement, press the **NEXT** button again.

Panel Description - cont.

b) In the 3ϕ4W system mode, Pressing the **NEXT** button to store the measured values $W_{R(L1)}/PF_{R(L1)}$ $W_{S(L2)}/PF_{S(L2)}$ and $W_{T(L3)}/PF_{T(L3)}$. After three set of data are measured and stored, the microprocessor inside the power clamp will process these data, display the result in **LCD** and show the symbol of **RST** to represent $W_{3ϕ4W}$. To start another $W_{3ϕ4W}$ measurement, press the **NEXT** button again.

If the rotary switch is not set at the 3ϕ3W or 3ϕ4W functions, the button is used as a **READ** button. If users ever store data in the memory by pressing **REC** button, pressing the **READ** button will retrieve the data from the memory. First the data number will be shown in **LCD**, then the data stored. Once **READ** function is enabled, symbol of **REC** and **NO.** will be shown in **LCD** to indicate the power clamp is in **READ** mode. The reading shown in **LCD** is not current reading but data stored in memory. To exit **READ** function, turn the rotary switch to change function.

9.V Input Terminal
This terminal is used as input for voltage measurements.

10.COM Terminal
This terminal is used as common reference input.

11. DC A/W ZERO button
When users find the reading of A or W is not zero, press this button once will zero the A or W reading (Users do not need to press and hold the button). When the power clamp is doing the zero action, a symbol of **ZERO** will be shown in **LCD.**

12. REC button
The clamp meter can store 4 data in memory. Once the button is pressed, the data number will be shown in **LCD.** A **REC** symbol will be shown in **LCD** if any data is stored. If the memory is full, **FULL** will be show in **LCD.** To clear memory, users need to turn the power off and on again.

13. Low Battery Symbol
When this symbol appears, it means the battery voltage drops below the minimum required voltage. Refer to Section V for battery replacement.

14. REC and NO. symbols
If users observe **REC** is shown, that means data is stored in memory. If users observe both **REC** and **NO.** are shown, that means readings shown in **LCD** are data stored in memory not current data measured.

AC+DC 1ϕ2W Power Measurement (KW PF)

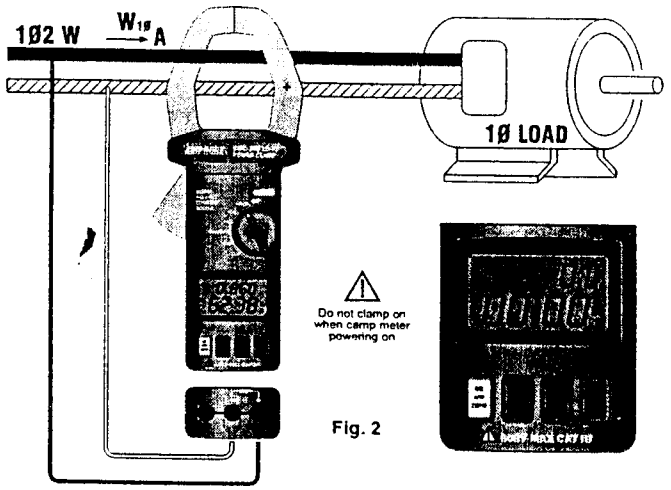


Fig. 2

Operating Instructions

1. Turn the power on without jaws clamping on to any wire.
2. Set the rotary switch at PFKW (refer to figure 2).
3. <u>**Always press the DCA/DCW ZERO button once to zero the watt and current readings.**</u>
4. Insert the test leads into the input jack.
5. Connect the COM (black) test probe to the neutral line.
6. Connect the V (red) test probe to the power line.
7. Clamp on to the line where V (red) test probe is connected.
8. The power clamp will automatically select proper range.
9. Read the Watt and PF values displayed in LCD.
10. Positive PF(+) means inductance load, while negative PF(-) means capacitance load.

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

AC+DC Voltage Measurement (V+Hz)

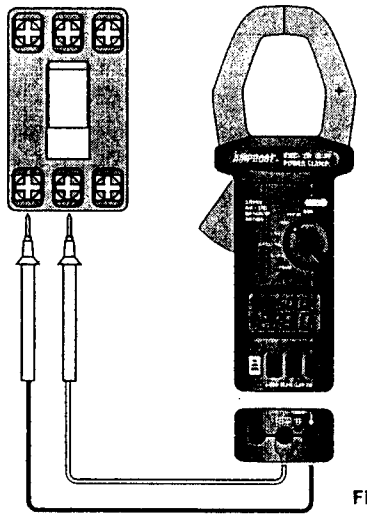


Fig. 3

WARNING: Maximum input for DC V is 1000, and for AC V is 750. Do not attempt to take any voltage measurement that exceeds the limits. Exceeding the limits could cause electrical shock and damage to the clamp meter.

1. Set the rotary switch at HzV (refer to figure 3).
2. Insert the test leads into the input jacks.
3. Connect the test probes to the circuit to be measured.
4. The power clamp will automatically select proper range.
5. Read the voltage and Frequency values displayed on the LCD.

NOTE: The sensitivity for voltage frequency measurement is 1V, and the frequency range is 10 - 1000Hz. If the frequency is < 10 Hz, LCD will show 0 Hz. If the frequency is > 1000 Hz, LCD will show OL. If voltage is DC, there will be NO frequency indication.

AC+DC Voltage & Current Measurement (V+A)

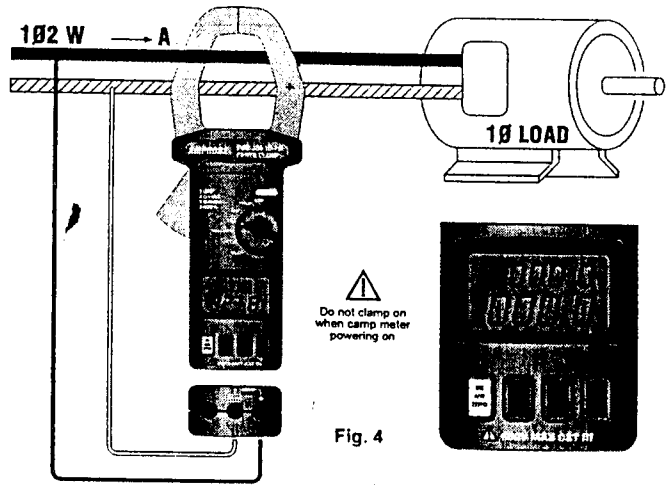


Fig. 4

Operating Instructions

1. Set the rotary switch at VA (refer to figure 4).
2. Push the DC A/W ZERO once to zero the reading.
3. Press the trigger to open the jaw and fully enclose the conductor to be measured. No air gap is allowed between the two half jaws.
4. Connect Voltage leads across load.
5. The power clamp will automatically select proper range.
6. Read the current and voltage values displayed in LCD.

3ϕ3W AC+DC Power Measurement (W+PF, KVA+KVAR)

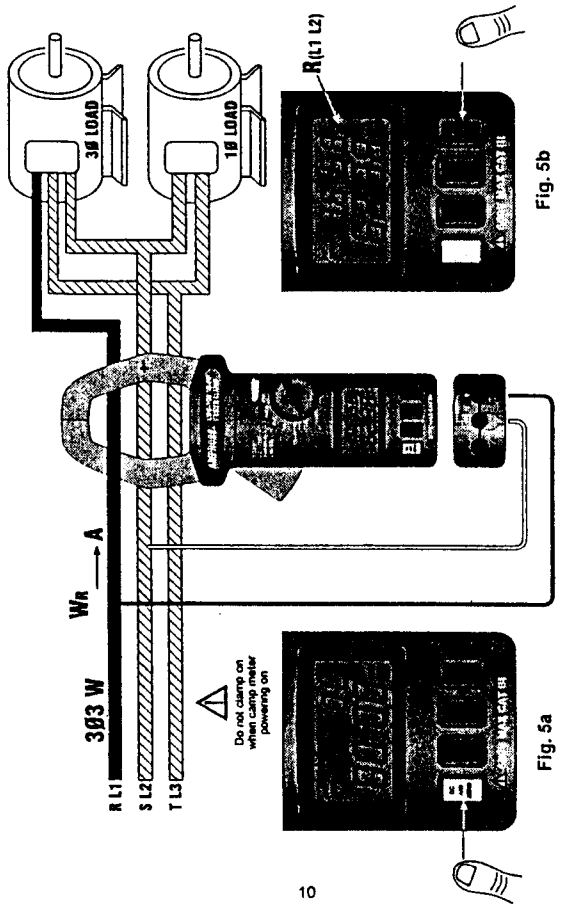


Fig. 5b

Fig. 5

Fig. 5a

3ϕ3W AC+DC Power Measurement (W+PF, KVA+KVAR)

Two measurements are required ($W_{RS(L1L2)}$ /$KVAR_{RS(L1L2)}$and $W_{TS(L3L2)}$/$KVAR_{TS(L3L2)}$)

First, measure $W_{RS(L1L2)}$ and $KVAR_{RS(L1L2)}$ (refer to figure 5).

1A. Turn the power on without clamping on to any wire.
2A. Set the rotary switch at 33W, and R symbol blinks to instruct users to take measurement of $W_{RS(L2L1)}$ and $KVAR_{RS(L2L1)}$. $W_{RS(L2L1)}$ is displayed in the lower row of LCD while $KVAR_{RS(L2L1)}$ is displayed in the upper row of LCD.
3A. <u>Always press the DCA/DCW ZERO button once to zero the watt and current readings (Figure 5a).</u>
4A. Insert the test leads into the input jack.
5A. Select one phase (eg. S or L2) as COM and connect the test probe of the COM (black) terminal to that phase (eg. S or L2).
6A. Connect the test probe of V (red) terminal to the second phase (eg. R or L1).
7A. Clamp on to the second phase as in step 6A. (eg. R or L1).
8A. The power clamp will automatically select proper range.
9A. Wait until the reading is stable, press the NEXT button (Figure 5b), and R symbol will disappear. At this moment, $W_{RS(L2L2)}$ and $KVAR_{RS(L2L1)}$ is stored in the memory, and T symbol appears and blinks to instruct users to take measurement of W_{TS} (W_{L3L2}) and $KVAR_{TS}$ ($KVAR_{L3L2}$).

Second, measure $W_{TS(L3L2)}$ and $KVAR_{TS(L3L2)}$ (refer to figure 6).

1B. Disconnect the red test probe from the phase where jaws is clamped on in previous measurement.
2B. Connect the test probe to the third phase (eg. T or L3).
3B. Open the jaws, and remove clamp from second phase (7A). Close Jaws.
4B. <u>Always press the DCA/DCW ZERO button once to zero the watt and current readings.</u>
5B. Camp on to the third phase where test probe is connected to (eg. T or L3)
6B. The power clamp will automatically select proper range.
7B. Wait until the reading is stable, press the NEXT button, and T symbol will disappear. At this moment, $W_{TS(L3L2)}$ and $KVAR_{TS(L3L2)}$ are stored in the memory.

3ϕ3W AC+DC Power Measurement (W+PF, KVA+KVAR)

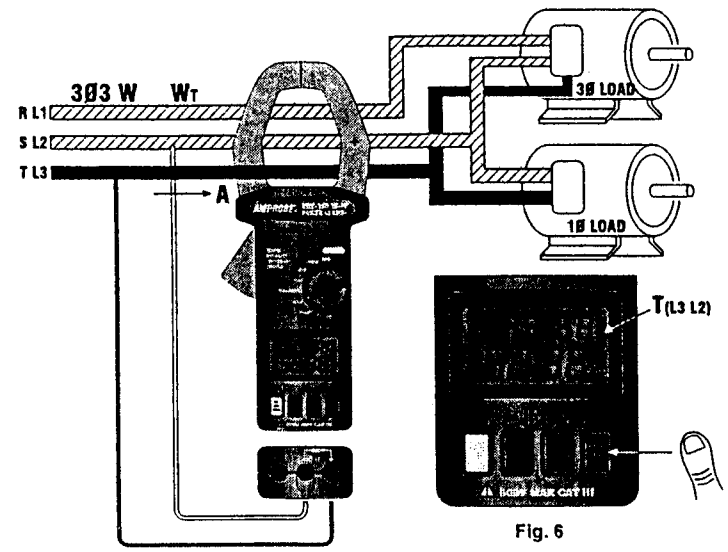


Fig. 6

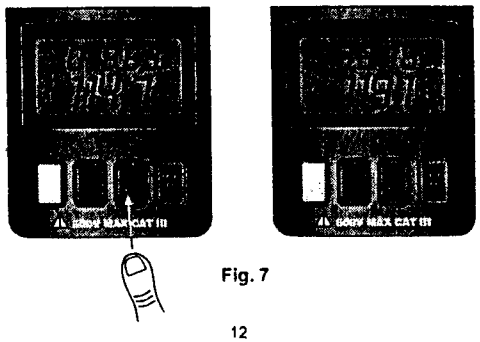


Fig. 7

3ϕ3W AC+DC Power Measurement (W+PF, KVA+KVAR)

Once the NEXT button is pressed after measurements of $W_{RS(L2L1)}$ / $KVAR_{RS(L2L1)}$ and $W_{TS(L3L2)}$ / $KVAR_{TS(L3L2)}$, the power clamp will process those two set of data and show the result on the LCD. RST symbol will be shown to indicate the watt of 3ϕ3W power. Power is displayed in the lower row of LCD while PF is show in the upper row of LCD (refer to figure 7).

To display KVA and KVAR, press the 3/KVA/KVAR button. KVA will be displayed in the lower row of LCD while KVAR is displayed in the upper row of LCD.

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

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

$$KVA_{3\phi 3W} = \sqrt{KW^2_{3\phi 3W} + KVAR^2_{3\phi 3W}}$$

$$PF_{3\phi 3W} = \frac{KW_{3\phi 3W}}{KVA_{3\phi 3W}}$$

NOTE: Once a phase is selected as COM, users can not change this selection in the subsequent measurement. For example, if S (or L2) phase is selected, S (or L2) phase is always connected to the COM during measurement of W_{RS} (or W_{L1L2}) and W_{TS} (or W_{L3L2}) in 3ϕ3W unbalanced power.

NOTE: The "+" sign printed on jaw must face the power source, and make sure all the connections and clamping are correct for correct measurement.

NOTE: In the 3ϕ3W unbalanced power measurement, one of W_{RS} or W_{TS} could be negative. So users must make sure all the connections and clamping are correct to obtain correct power and power factor.

3ϕ4W AC+DC Power Measurement (W+PF, KVA+KVAR)

Three measurements are required ($W_{R(L1)}/PF_{R(L1)}$, $W_{S(L2)}/PF_{S(L2)}$, and $W_{T(L3)}/PF_{T(L3)}$)

First, measure $W_{R(L1)}/PF_{R(L1)}$ (refer to figure 8).

1. Turn the power on without clamping on to any wire.
2. Set the rotary switch at 3ϕ4W.
3. **Always press the DCA/DCW ZERO button once to zero the watt and current readings.**
4. Insert the test leads into the input jack.
5. Connect the neutral line to the COM (black) terminal.
6. Connect the test probe of the V (red) terminal to the first phase (eg. R or L1).
7. Clamp on to the same phase (eg. R or L1).
8. The power clamp meter will automatically select proper range.
9. Wait until the reading is stable, press the NEXT button, and R symbol will disappear.

At this moment, $W_{R(L1)}/PF_{R(L1)}$ are stored in memory, and S symbol appears and blinks to instruct user to take next measurement of $W_{S(L2)}/PF_{S(L2)}$.

Second, measure $W_{S(L2)}/PF_{S(L2)}$ (refer to figure 9)

1. Disconnect the test probe from the phase where jaws is clamp on.
2. Connect the test probe of the V (red) terminal to the second phase (eg. S or L2).
3. Open the jaws and remove clamp meter from phase (7). Close Jaw.
4. **Always press the DCA/DCW ZERO button once to zero the watt and current readings.**
5. Camp on to phase where test probe is connected to (eg. S or L2 phase)
6. The power clamp will automatically select proper range.
7. Wait until the reading is stable, press the NEXT button, and S symbol will disappear.

At this moment, $W_{S(L2)}/PF_{S(L2)}$ are stored in the memory,

3ϕ4W AC+DC Power Measurement (W+PF, KVA+KVAR)

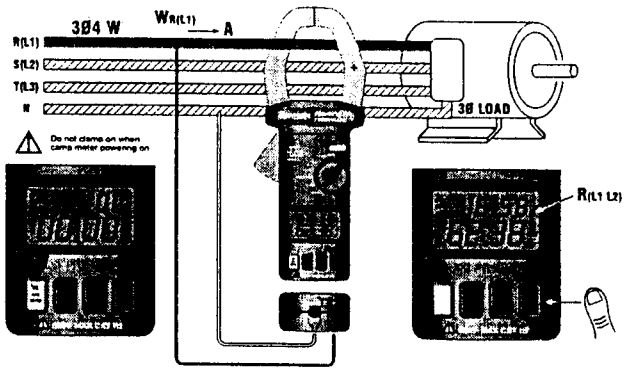


Fig. 8

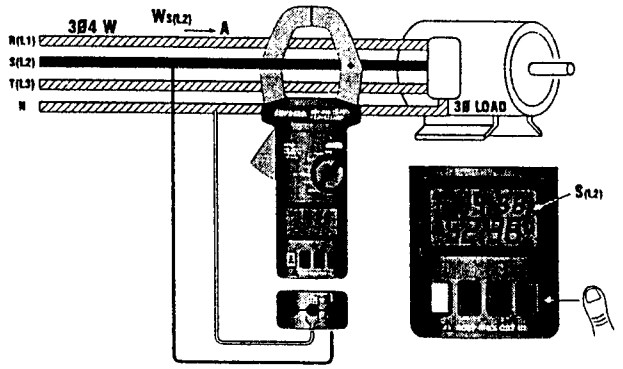


Fig. 9

3ϕ4W AC+DC Power Measurement (W+PF, KVA+KVAR)

Third, measure $W_{T(L3)}/PF_{T(L3)}$ (refer to figure 10).

1. Disconnect the test probe from the phase where jaws is clamp on.
2. Connect the test probe of the V (red) terminal to the third phase (eg. T or L3 phase).
3. Open the jaws and remove clamp from phase. Close Jaw.
4. **Always press the DCA/DCW ZERO button once to zero the watt and current readings.**
5. Camp on to the phase where test probe is connected to (eg. T or L3).
6. The power clamp will automatically select proper range.
7. Wait until the reading is stable, press the NEXT button, and T symbol will disappear.

At this moment, $W_{T(L3)}/PF_{T(L3)}$ are stored in the memory,

Once the NEXT button is pressed after measurements of $W_{R(L1)}/PF_{R(L1)}$, $W_{S(L2)}/PF_{S(L2)}$ and $W_{T(L3)}/PF_{T(L3)}$, the power clamp will process these three set of data, and show the result on the LCD. RST symbol will be shown to indicate the total wattage of 3ϕ4W power (refer to figure 11). Power is displayed in the lower row of LCD while PF is show in the upper row of LCD.

To display KVA and KVAR, press the 3/KVA/KVAR button. KVA will be displayed in the lower row of LCD while KVAR is displayed in the upper row of LCD.

$$W_{3\phi4W} = W_{R\,(L1)} + W_{S\,(L2)} + W_{T\,(L3)}$$

$$KVAR_{3\phi4W} = KVAR_{R\,(L1)} + KVAR_{S\,(L2)} + KVAR_{T\,(L3)}$$

$$KVA_{3\phi4W} = \sqrt{KW^2_{3\phi4W} + KVAR^2_{3\phi4W}}$$

$$PF_{3\phi4W} = \frac{KW_{3\phi4W}}{KVA_{3\phi4W}}$$

NOTE: The "+" sign printed on jaw must face the power source, and make sure all the connections and clamping are correct for correct measurement.

NOTE: In the 3ϕ4W power measurement, all three W_R or W_S and W_T must be positive. If users find one negative power, check the connection of test leads and clamping of jaw. Make sure all the connections and clamping are correct to obtain correct power.

3ϕ4W AC+DC Power Measurement (W+PF, KVA+KVAR)

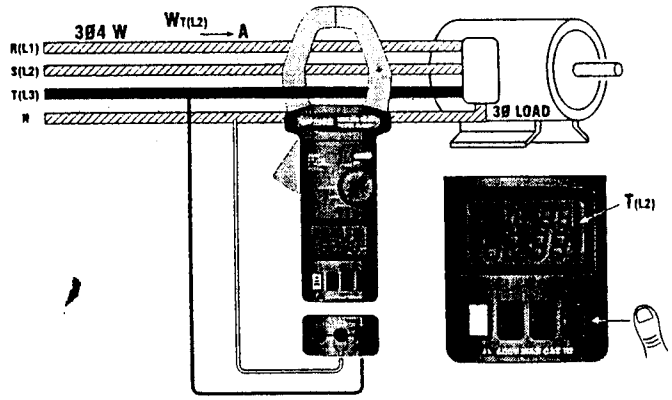


Fig. 10

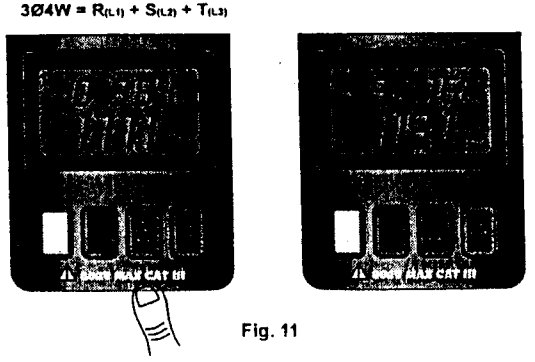


Fig. 11

1φ3W Power Measurement

1φ3W power measurement is similar to 3φ3W unbalanced power measurement except the nomenclature is different.

Two measurements are required ($W_{RS\,(L1G)}$ and $W_{TS(L2G)}$).

First, measure $W_{RS(L1G)}$ (refer to figure 12).

1. Turn the power on without clamping on to any wire.
2. Set the rotary switch at 3φ3W.
3. <u>Always press the DCA/DCW ZERO button once to zero the watt and current readings.</u>
4. Insert the test leads into the input jack.
5. Connect the test probe of the COM (black) terminal to ground.
6. Connect the test probe of V (red) terminal to the second phase (eg. L1).
7. Clamp on to the same phase as in step 6. (eg. L1).
8. The power clamp will automatically select proper range.
9. Wait until the reading is stable, press the NEXT button, and R symbol will disappear.

At this moment, $W_{RS(L1G)}$ is stored in the memory, and T symbol appears and blinks to instruct users to take measurement of $W_{TS(L2G)}$.

Second, measure W_{TS} (or W_{L2G}) (refer to figure 13).

1. Disconnect the test probe from the phase where jaws is clamping on in the previous measurement.
2. Connect the test probe to the L2 line.
3. Open the jaw and remove clamp meter from phase.
4. <u>Always press the DCA/DCW ZERO button once to zero the watt and current readings.</u>
5. Clamp on to the L2 line where the red test probe is now connected.
6. The power clamp will automatically select proper range.
7. Wait until the reading is stable, press the NEXT button, and $W_{T(L2G)}$ symbol will disappear. At this moment, $W_{TS(L2G)}$ is stored in the memory.

Once the NEXT button is pressed after measurements of $W_{RS(L1G)}$ and $W_{TS(L2G)}$, the power clamp will add the two values together and show the result on the LCD. RST symbol will be shown to indicate the total wattage of 1φ3W power in the lower LCD (refer to figure 14) while PF is displayed in the upper LCD.

1φ3W Power Measurement

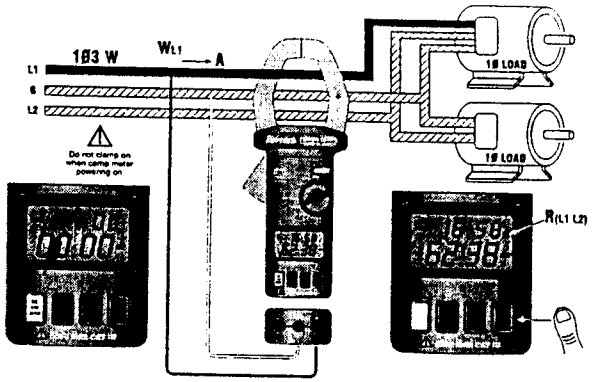


Fig. 12

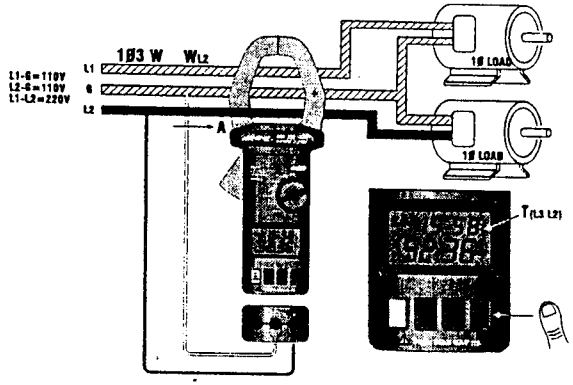


Fig. 13

1ϕ3W Power Measurement

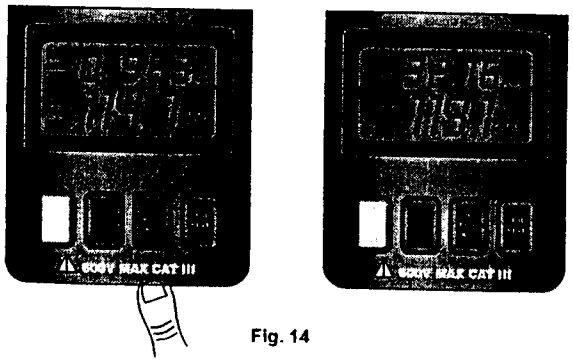


Fig. 14

AC+DC 1ϕ2W Apparent/Reactive Power Measurement (KVA+KVAR)

Before any measurement, zero the current (A) reading. Then set the rotary switch at KVARKVA. The rest of the procedures are the same as AC+DC 1ϕ2W Power(KW) and Power Factor (PF) measurement. Refer to figure 2 for test leads connection and clamping of jaw.

KVAR is a calculated value in this function, and its accuracy greatly depends on the accuracy of V, A, and KW. To obtain a more accurate KVAR value when PF is greater than 0.91 (ϕ < 25°), users can set the switch at 3ϕ3W and measure the KVAR for sine wave.

WARNING: Before taking measurement, users must make sure the current (A) reading is zero by setting the rotary switch at A position. If the current reading is not zero, users might get an incorrect KVA and KVAR values.

Improving Power Factor of 3ϕ4W Power System

1. Measure $KVAR_{R(L1)}$, $KVAR_{S(L2)}$, and $KVAR_{T(L3)}$ values of each phase.
2. Based upon the measured values, user can purchase required capacitors at rate voltage and frequency to improve power factor.
3. If actual value of capacitance is needed, user can obtained the value by the follow ing equation.

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

It is recommended that the KVAR value of the capacitor should be a little less than th value measured.

Improving Power Factor of 3ϕ3W Power System

1. Measure $KVAR_{3\phi}$ value of a balanced system.
2. Based upon the measured value, user can purchase required 3ϕ capacitors at rate voltage and frequency to improve power factor.
3. If actual value of capacitance is needed, user can obtained the value by the followin equation.

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

It is recommended that the KVAR value of the capacitor should be a little less than th value measured.

Improving Power Factor of 1ϕ2W Power System

1. Measure KVAR value of a 1ϕ2W power system.
2. Based upon the measured value, user can purchase required capacitor at rated vol age and frequency to improve power factor.
3. If actual value of capacitance is needed, user can obtained the value by the followin equation.

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

It is recommended that the KVAR value of the capacitor should be a little less than th value measured.

Recording Data in Memory

The power clamp can store 4 readings in memory. To store any reading displayed in LCD, press the REC button. If the power clamp has stored 4 readings already, the LCD will display FULL. The data is lost if power is turned off.

The REC symbol will be displayed in LCD if any data is stored.

NOTE: If user sees REC (only) in LCD, that means their is some data stored in memory.

Reading Data in Memory

To retrieve data in memory, press the READ button (Be sure rotary switch is not set at 3ϕ3W or 3ϕ4W function). Once the read button is pressed, the record number will be first displayed, then data is displayed. Once in the READ function, the REC. NO. will be displayed in LCD.

To exit the READ function, turn the rotary switch to change function.

NOTE: If user observe both **REC and NO.** symbols in LCD, user should know that the readings shown in LCD are not current data. They are data stored in memory.

Sign Convention of PF and KVAR

	PF	KVAR
Inductance Load	+	- (Lag)
Capacitance Load	-	+ (Lead)

Specifications

All specifications rated for 23°C ± 5°C Temperature

AC+DC True Power (PF 0.2 - 1.0, 3ϕ3W, 3ϕ4W, 1ϕ2W, and 1ϕ3W)

Range	Resolution	Accuracy (of rdg)	Range
0 - 99.99KW	0.01KW	±2.0%±0.05KW	AC 600V, DC 800V ACA/DCA 2000A
100 - 999.9KW	0.1KW	±2.0%±0.5KW	AC 600V, DC 800V ACA/DCA 2000A
1000-1200KW	1KW	±2.0%±5KW	AC 600V DC 800V ACA/DCA 2000A

KW Autoranging Map (PF 0.2 - 1.0, 3ϕ3W , 3ϕ4W, 1ϕ2W, and 1ϕ3W)

	0V - 200V	200V - 600VAC 200V - 800VDC
100 - 999.9KW	0.00 - 40.00KW	0.00 - 99.99KW 100.0 - 160.0KW
200A - 2000A	0.0 - 400.0KW	0.0 - 999.9KW 1000 - 1600KW

POWER FACTOR (PF)

$$PF = \frac{KW}{KVA}$$

AC+DC Voltage (True RMS, Crest Factor < 4, Autorange, Overload Protection 800VAC for all range)

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

Specifications

AC+DC Current (True RMS, Crest Factor < 4)

		Accuracy (of reading)	Accuracy (of reading)	Overload Protection
Range	Resolution	DC, 50 / 60 Hz	40 - 400Hz	
0 - 200A	0.1A	±1.5%±5dgts	±2.0%±5dgts	AC 3000A
200 - 500A	0.1A	±2.0%±5dgts	±2.5%±5dgts	AC 3000A
500 - 2000A	1A	±2.0%±5dgts	±2.5%±5dgts	AC 3000A

AC+DC KVAR (Reactive Power, 3ϕ3W Sine Wave)

Range	Resolution	Accuracy (of rdg)	Range
0 - 99.99KW	0.01KW	±2.0%±0.05KW	AC 600V, DC 800V ACA/DCA 2000A
100 - 999.9KW	0.1KW	±2.0%±0.5KW	AC 600V, DC 800V ACA/DCA 2000A
1000-1200KW	1KW	±2.0%±5KW	AC 600V DC 800V ACA/DCA 2000A

AC+DC KVAR (Reactive Power, 3ϕ4W, 1ϕ2W, and 1ϕ3W)

$$(KVAR) = \sqrt{(KVA)^2 - (KW)^2}$$

KVAR is a calculated value, and its accuracy greatly depends on the accuracy of the V, A, and KW measurements, especially when PF is very close to 1. To get a more accurate value when PF is greater than 0.91(ϕ < 25°), users set the rotary switch at 3ϕ3W, and measrue the KVAR.

AC+DC KVA (Apparent Power)

$$KVA = \frac{V*A}{1000}$$

Frequency (If < 10Hz, Hz = 0)

Range	Accuracy	Sensitivity
50/60 Hz	±2dgts	V: > 1V, A: > 5A
10 - 1000 Hz	1.5% ± 2 dgts	V: > 1V, A: > 5A

Specifications

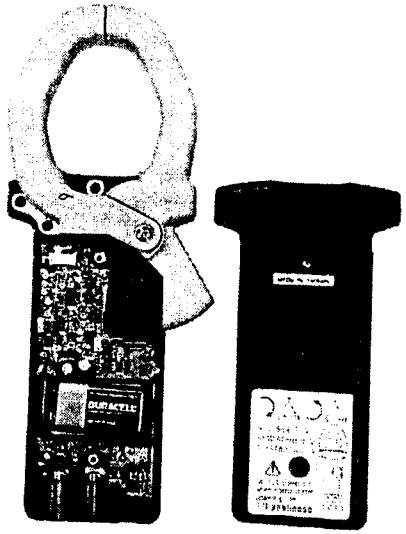
Indoor Use	
Conductor Size:	Cable 2.1" (55mm approx.)
	Bus Bar 2.5" (65mm) D x .98" (24mm) W
Battery Type:	9V
Display:	2 X 4 Digits Dual Display LCD
Range Selection:	Auto
Overload Indication:	OL
Low battery Indication:	▯X▯
Power Consumption:	25 mA (approx.)
Sampling Time:	0.5 sec. (V and A)
	1.6 sec. (W)
Operating Temperature:	39°F to 122°F (4°C to 50°C)
Operating Humidity:	less than 85% relative
Altitude:	up to 2000M
Storage Temperature:	-4°F to 140°F (-20°C to 60°C)
Storage Humidity:	less than 75% relative
Dimension:	271mm (L) x 112mm (W) x 46mm (H)
	10.7" (L) x 4.4" (W) x 1.8" (H)
Weight:	22.8 oz (647 g) batteries included
Accessories:	Carrying bag x 1 (CAT. No. CC-KWC)
	Users manual x 1 (CAT No. 932753)
	9V battery x 1 (Installed) (CAT No. MN1604)
	Test leads (CAT No. DTL-2000)

Maintenance & Cleaning

Servicing not covered in this manual should only be performed by qualified personnel Repairs should only be performed by qualified personnel.

Periodically wipe the case with a damp cloth and detergent; do not use abrasive or sol vents.

Battery Replacement



When the low battery symbol is displayed on the LCD, replace the old battery with new battery.

1. Turn the power off and remove the test leads from the power clamp.
2. Remove the screws of the bottom case.
3. Lift and remove the bottom case.
4. Remove the old battery.
5. Insert new 9V battery.
6. Replace the bottom case and secure the screws.

WARNING: Do not touch or adjust any parts inside the power clamp when the bottom case is open.

Notes