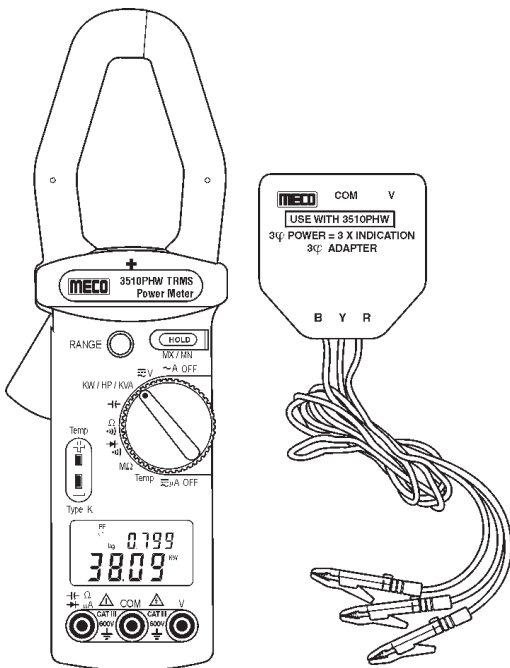




HVAC TRMS CLAMP METER

MODEL : 3510PHW



INSTRUCTION MANUAL

2. TECHNICAL SPECIFICATIONS

2.1 Environment Conditions :

1. Installation category III
2. Pollution degree 2
3. Altitude up to 2000 meters
4. Indoor use only
5. Relatively humidity 80% max.
6. Operation ambient 0 ~ 50 °C

2.2 Maintenance :

1. Repairs or servicing is not covered in this manual, should only be performed by qualified personnel.
2. Periodically wipe the case with a dry cloth. Do not use abrasives or solvents on this instrument.

2.3 Features :

2.3-1 HVAC and Electrical :

1. To check current drawn by motors and compressors.
2. To use MAX/MIN/Recording in the temperature mode to assess the efficiency.
3. To test run / start capacitors.
4. To measure low voltage control signals.
5. To measure flame protection diode current (<200µA) in a heater control.
6. To analyze temperature and power data with the aid of the time stamp.
7. To measure high resistance.
8. To capture max. load current.
9. To determine peak power demand periods.
10. To monitor motors and other loads for excess heat.

1. SAFETY INFORMATION

- Read the following safety information carefully before attempting to operate or service the meter.
- To avoid damages to the instrument do not exceed the maximum limits of the input values shown in the technical specification tables.
- Do not use the meter or test leads if they look damaged.
- Use extreme caution when working around bare conductors or bus bars. Accidental contact with the conductor could result in electric shock.
- Use the meter only as specified in this manual; otherwise, the protection provided by the meter may be impaired.
- Read the operating instructions before use and follow all safety information.
- Caution when working with voltages above 60VDC or 30VAC RMS. Such voltages cause a shock hazard.
- Before taking resistance measurements or testing acoustic continuity, disconnect circuit from main power supply and all loads from circuit.

Safety symbols

- Caution refer to this manual before using the meter.
- Dangerous voltages.
- Meter is protected throughout by double insulation or reinforced insulation. When servicing, use only specified replacement parts.
- Complies with EN-61010-1, IEC 1010-2-32

2.3-2 Functions :

1. True RMS, ACV, ACA, KW, KVA.
2. 9999 counts dual display LCD with unit sign.
3. Dual KW + hp, KW +P.F, KW+KVAR, KVA + 0, A + V (5 types)
4. Temp. °C/°F
5. Dual display A + Hz, V + Hz.
6. Data hold mode/MAX-MIN mode
7. Auto Power Off and to disable Auto Power off function.

2-4 General Specifications :

- Maximum voltage between any terminal and earth ground : 600V rms.
- Numerical dual display : Dual display 4 digit LCD maximum reading 9999. (10,000 Count Reading)
- Battery life : approx. 32hr
- Low battery indication : The " " is displayed when the battery voltage drops below the operating voltage.
- Auto power off time : approx. 30 minutes. (To disable Auto Power Off, please refer to 4-9)
- Sampling rate : 2.5 times / sec (Digital display) 1 times / 6 sec (on KW,KVA)
- Jaw opening diameter : Cables Φ 43mm
- Operating temperature and humidity : 0°C to 50°C (32°F to 122°F) R.H. < 80% non-condensing.
- Temperature coefficient : 0.1 x (specified accuracy) / °C (< 18°C or > 28°C, < 64°F or > 82°F)
- Storage temperature and humidity : - 10°C to 60°C (14°F to 140°F) R.H. < 70% non-condensing.

Dimensions : 247 x 76 x 39 mm (approx.)
 Weight : 465gms including battery (approx.)
 Accessories : Three phase adapter x 1, Carrying Case x 1, Test leads x 1, Battery (installed) x 1, Pair of alligator clip x 1, Instruction manual x 1

2-5 Measurement Specifications :

Accuracy : ± (% of reading + number of digits) at 18°C to 28°C (64°F to 82°F) with relative humidity to 80%.

AC Current : (50 to 400Hz) Trms

| Range | Resolution | Accuracy | Sensitivity | Overload Protection |
|--------|------------|------------------------|-------------|---------------------|
| 99.99A | 0.01A | ±2% ±20dgts (50,60Hz) | 0.10A | 1000A |
| 999.9A | 0.1A | ±4% ±20dgts (40-400Hz) | 1.0A | |

µA Trms : (AC+DC) (Burden Voltage : 5mV/µA) (50 to 400Hz)

| Range | Resolution | Accuracy | Sensitivity | Overload Protection |
|---------|------------|-------------|-------------|---------------------|
| 99.99µA | 0.01µA | ±1% ±20dgts | 0.20µA | 600V |
| 999.9µA | 0.1µA | | 2.0µA | |

AC Voltage : (50 to 400Hz) Trms

| Range | Resolution | Accuracy | Sensitivity | Overload Protection |
|---------|------------|---|-------------|---------------------|
| 999.9mV | 0.1mV | ±1% ±20dgts (50,60Hz) ±2% ±20dgts (40-100Hz) | 2.0mV | 600V |
| 9.999V | 0.001V | ±1% ±20dgts (50,60Hz) ±2% ±20dgts (40-400Hz) | 0.020V | |
| 99.99V | 0.01V | | 0.20V | |
| 600.0V | 0.1V | | 2V | |

Input Impedance : 3MΩ

DC Voltage :

| Range | Resolution | Accuracy | Sensitivity | Overload Protection |
|---------|------------|-------------|-------------|---------------------|
| 999.9mV | 0.1mV | ±1% ±20dgts | 2.0mV | 600V |
| 9.999V | 0.001V | | 0.020V | |
| 99.99V | 0.01V | | 0.20V | |
| 600.0V | 0.1V | | 2V | |

Input Impedance : 3MΩ

Resistance (Continuity <40Ω on the 999.9Ω range) :

| Range | Resolution | Accuracy | Overload Protection |
|---------|------------|-------------|---------------------|
| 999.9Ω | 0.1Ω | ±1% ±10dgts | 600V |
| 9.999KΩ | 0.001KΩ | | |
| 99.99KΩ | 0.01KΩ | | |
| 999.9Ω | 0.1KΩ | | |

MΩ :

| Range | Resolution | Accuracy | Overload Protection |
|---------|------------|-------------|---------------------|
| 9.999MΩ | 0.001MΩ | ±5% ±10dgts | 600V |
| 99.99MΩ | 0.01MΩ | | |

Capacitance :

| Range | Resolution | Accuracy | Overload Protection |
|----------|------------|--------------|---------------------|
| 10.000µF | 0.001µF | ±1.5% ±5dgts | 600V |
| 100.00µF | 0.01µF | | |
| 1000.0µF | 0.1µF | | |
| 7000µF | 1µF | | |

Diode (Continuity<40mV) :

| Range | Resolution | Accuracy | Overload Protection |
|--------|------------|------------|---------------------|
| 2.000V | 0.001V | ±2% ±1dgts | 600V |

Temperature (K-Type thermocouple) :

| Range | Resolution | Accuracy | Overload Protection |
|-----------------|------------|----------|---------------------|
| -50°C to 900°C | 0.1°C | ±1% ±1°C | 30VAC or 60VDC |
| -58°F to 1000°F | 0.1°F | ±1% ±2°F | |

TRUE Power : (PF>0.5 or θ <60°) (1hp = 0.7457kW)

| Range | Resolution | Accuracy | Overload Protection |
|-----------------|------------|----------------------|---------------------|
| 60.00kW (<100A) | 0.01kW | ±5% +20 (50,60Hz) | 600VAC/ |
| 600.0kW (>100A) | 0.1kW | | 1000AAC |

Horse Power : (PF>0.5 or θ <60°) (1hp = 0.7457kW)

| Range | Resolution | Accuracy | Overload Protection |
|-----------------|------------|----------------------|---------------------|
| 80.00HP (<100A) | 0.01HP | ±5% +20 (50,60Hz) | 600VAC/ |
| 800.0HP (>100A) | 0.1HP | | 1000AAC |

Apparent Power :

| Range | Resolution | Accuracy | Overload Protection |
|------------------|------------|---------------|---------------------|
| 60.00KVA (<100A) | 0.01KVA | ±2.5% ±20dgts | 600VAC/1000AAC |
| 600.0KVA (>100A) | 0.1KVA | | |

PF & Phase Angle (50Hz, 60Hz) :

| Range | Resolution | Accuracy | Sensitivity |
|------------------|------------|----------|-------------------|
| -60° / 0° / +60° | 0.1° | ±3.0° | ACV>100V, ACA>10A |
| -0.5 / 1 / +0.5 | | | |

Frequency :

| Range | Resolution | Accuracy | Sensitivity |
|-----------|------------|-----------------|------------------|
| 40Hz/1KHz | 0.1Hz | ±0.5%rdg ±2dgts | ACV>1.2V, ACA>6A |

3. PARTS & CONTROLS

3.1 Description of Parts & Controls

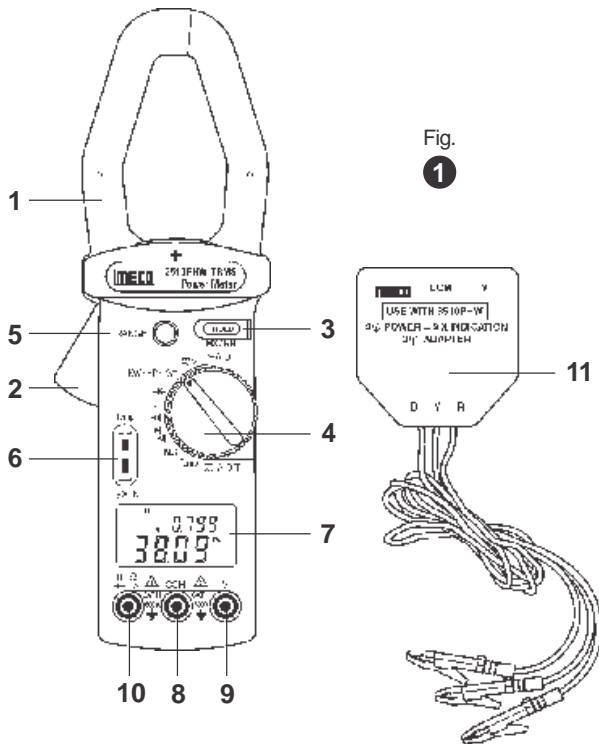


Fig.

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1. Transformer jaws (+mark to face source):

To pick up the AC current flowing through the conductor.

2. Jaw opening trigger

3. Data Hold (MX/MN) button :

- a. Data Hold Mode :
Press it once to hold the measured value and store the value in memory. Press again to release hold function. (except capacitance function)
- b. Maximum and Minimum with Elapsed Time mode
 1. Select desired ACA, ACV, DCV, °C/°F or mA function and perform the measurement, until the measured value shows stable reading on the LCD.
 2. Press “ MX/MN ” button for 2 seconds to enter recording with Elapsed Time mode, LCD will show “ ® ” mark to lock the measurement range and “ MX/MN ” mark to indicate the current measured value with current elapsed time. The Auto Power Off function will be automatically cancelled.
 3. Press “ MX/MN ” button one time, LCD will show “ MX ” mark to indicate the recorded Maximum value and maximum value occurred Elapsed Time.
 4. Press “ MX/MN ” button one time, LCD will show “ MN ” mark to indicate the recorded Minimum value and minimum value occurred Elapsed Time.
 5. Press “ MX/MN ” button one time, LCD will show “ MX/MN ” mark to indicate the current value and current Elapsed Time.
 6. Step 3, 4, 5 can be cycled.
 7. Press “ MX/MN ” button for 2 seconds to exit this mode.

Note : The Elapsed Time initial setting is “ minute : second ”, when current Elapsed Time is over 60 minutes, the Elapsed Time will be auto setting to “ hour : minute ”. The maximum Elapsed Time length is 100 hours.

4. Function selector :

For selection of desired function.

5. Range button :

A. In ACA, ACV, DCV, mA, Capacitance and Resistance function.

1. Press it once to enter the manual range select mode, LCD will show ® mark.
2. Press again to select the desired range.
3. Press it 2 seconds to exit the manual range and enter to the autorange mode, LCD ® mark will be disappeared.

B. In KW/HP/KVA function

a. Press RANGE button to select viewing the KW/hp, KW/PF, KW/KVAR, KVA/u or V/A dual display.

B1. Press HOLD button keep the measured valued in memory.

B2. Press RANGE button to select viewing the KW/hp, KW/PF, KW/KVAR, KVA/u or V/A dual display.

B3. Press HOLD button to exit this mode.

C. In TEMP function

1. Press RANGE button to select desired °C or °F temperature units.

6. Temperature input jack :

Only type K thermocouple input is accepted.

7. LCD Display :

4 digital LCD with indications for measurement values, unit symbols, decimal point, polarity, over range and low battery; etc.

8. COM Jack :

Connect black test lead for voltage, Power, Capacitance, Resistance, Diode, Countinuity and Micro ampere measurement.

9. “ V ” Jack :

Connect red test lead for Voltage and Power measurement as a positive terminal.

10. “ V ” Jack :

Connect red test lead for Capacitance, Resistance, Diode, Countinuity and Micro ampere measurement as a positive terminal.

11. 3 Phase Adapter :

Insert plug in type 3 phase adapter in terminals “ COM ” and “ V ” for 3 phase 3 wire power measurement.

4. OPERATING INSTRUCTION

4.1 AC + DC Voltage Measurement

WARNING

Maximum input is 600V. Do not attempt to take any voltage measurement that exceeds these limits. Exceeding these limits could cause electrical shock and damage to the clamp meter.

1. Set the rotary switch to the “ V ” position.
2. Insert the test leads in to the input jack. (Black to COM and Red to V)
3. Connect the test leads in PARALLEL to the measured circuit.
4. The meter will automatically switch to ACV or DCV display.
5. The meter will automatically select the appropriate range.
6. Read the voltage and frequency values displayed on the LCD.

NOTE

The sensitivity for voltage frequency measurement is 1.2V and the frequency range is 40 - 1KHz. If the frequency is less than 40Hz the LCD may show Hz.

4.2 AC Current Measurement

1. Set the rotary switch to the " A " position.
2. Press the trigger to open the jaw and fully enclose the conductor to be measured. No gap is allowed between the two half jaws.
3. The clamp will automatically select the appropriate range.
4. Read the current and frequency values displayed on the LCD.

NOTE

The sensitivity for Current frequency measurement is 6A and the frequency range is 40 ~ 400Hz. If the frequency is less than 40Hz the LCD may show Hz.

4.3 AC Power KW, KVA, PF (Power Factor) and u(Phase Angle) Measurement

1. Set the rotary switch to the " KW/KVA " position (refer to figure 2).
2. Insert the test leads in to the input jack. (Black to COM and Red to V)
3. Connect the Black lead COM to the neutral line.
4. Connect the Red lead V to the power line and clamp the same conductor where V (red) terminal is connected.
5. The power clamp will automatically select the appropriate range.
6. Read the watt and hp values displayed on the LCD.
7. Press range button to display required parameters.

$$PF = \frac{KW}{KVA} = \cos u \text{ (} u = \text{Phase Angle)}$$

$$KVA \text{ (Apparent Power)} : KVA = (V \cdot A) / 1000$$

$$KVAR \text{ (Reactive Power)} : KVAR = \sqrt{(KV \cdot A)^2 - (KW)^2} = KVA \cdot \sin u$$

$$HP \text{ (Horse Power)} = 746W$$

8. For 3 Phase 3 Wire balanced load system, insert 3f plug in adapter in terminals " COM " and " V ". Connect three crocodile clips to appropriate phase (R, Y and B). Clamp " R " Phase conductor. 3F power = 3 x Meter indication (Refer fig 3).
9. For measurement in other systems please refer figures 4, 5 and 6.

NOTE

1. The " + " sign printed on panel must face the power source for correct measurement.
2. If the device under test is switching mode power, the meter KW, PF and u reading may be incorrect.

1f 2W System

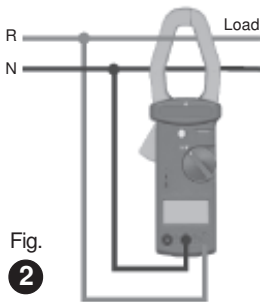


Fig. 2

KW, HP, PF, f, KVAR, KVA

3f 3W Balanced System

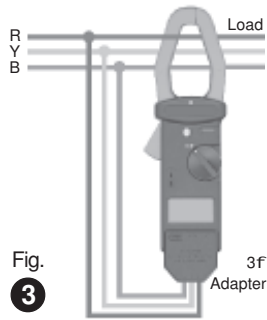


Fig. 3

3f Values = 3 x Displayed Value for KW, HP, KVAR & KVA

3f 4W Balanced System

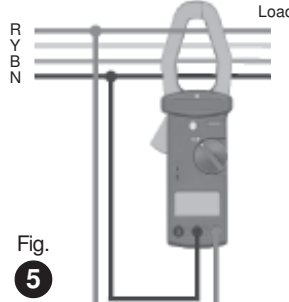


Fig. 5

3f Values = 3 x Displayed Value for KW, HP, KVAR & KVA

3f 4W Unbalanced System

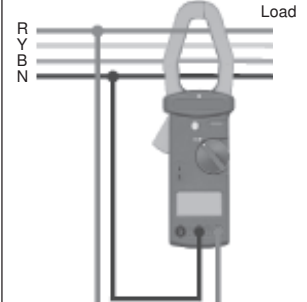


Fig. 6

Measured Value = KW1, HP1, KVAR1 & KVA1

3f 3W Unbalanced System

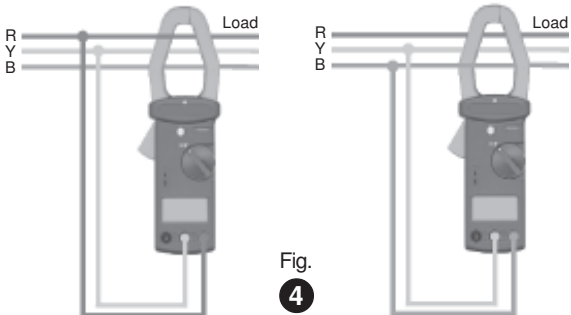


Fig. 4

Measured Value = KW1, HP1 & KVAR1

Measured Value = KW2, HP2 & KVAR2

$$3f \text{ Values} = (KW1+KW2) \text{ or } (HP1+HP2) \text{ or } (KVAR1+KVAR2)$$

$$3f \text{ PF} = \cos[\tan^{-1} \sqrt{3(KW1-KW2)} / (KW1+KW2)]$$

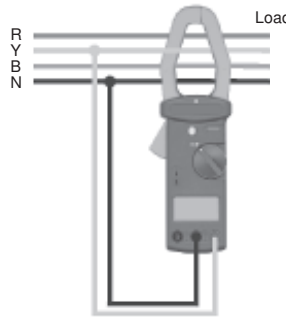


Fig. 6

Measured Value = KW2, HP2, KVAR2 & KVA2

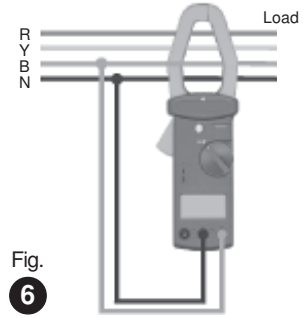


Fig. 6

Measured Value = KW3, HP3, KVAR3 & KVA3

$$3f \text{ Values} = (KW1+KW2+KW3) \text{ or } (HP1+HP2+HP3) \text{ or } (KVAR1+KVAR2+KVAR3)$$

$$\text{or } (KVA1+KVA2+KVA3) \quad 3f \text{ PF} = KW_T / \sqrt{KW_T^2 + KVAR_T^2} \text{ or } KW_T / KVA_T$$

4.4 Resistance & Continuity Measurement

WARNING

Before taking any in circuit resistance measurement, remove Power from the circuit being tested and discharge all capacitors.

1. Before taking resistance measurement, make sure the circuit is not live and discharge any capacitors present in the circuit.
2. Set the rotary switch to the “ Ω , \rightarrow ” or “ $M\Omega$ ” range.
3. Insert the test leads into the input jack. (Black to COM and Red to Ω).
4. Connect the test leads to the circuit being measured and read the displayed value.
5. When the reading is below 40 Ω , it will be indicated by a continuous beeping.

4.5 Capacitance Measurement

1. Fully discharge the capacitor being tested, will speed test response time.
2. Insert the test leads into the input jack. (Black to COM and Red to $-C$).
3. Set the rotary switch to the “ $-C$ ” position.
4. Connect the red test leads to the positive side and black test lead to the negative side of the capacitor being tested.
5. Read capacitance value on LCD.

4.6 Diode & Continuity Measurement

1. Set the rotary switch to the “ \rightarrow ” range.
2. Insert the test leads into the input jack. (Black to COM and Red to \rightarrow).
3. Connect the red test lead to the anode side and black test lead to the cathode side of the Diode being tested.
4. When the reading is below 40mV, it will be indicated by a continuous beeping.

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4.7 Temperature Measurement

1. Set the rotary switch to the “Temp” position.
2. Press RANGE button to select desired $^{\circ}C$ or $^{\circ}F$ temperature units.
3. Insert the Type K thermocouple to the Temp jack.
4. Use temperature probe to touch the object being measured and read the displayed value.

4.8 AC + DC Micro-Ampere Measurement

1. Set the rotary switch to the “ μA ” position.
2. Insert the test leads into the input jack. (Black to COM and Red to μA).
3. Connect the test in series with the circuit being measured and read the displayed value.

4.9 To disable Auto Power Off function

The meter will automatically enter sleep mode if no button is pressed and no function is changed for 30 minutes to save power consumption.

1. Set the rotary switch to the “OFF” position.
2. Press and hold “HOLD” key then set the rotary switch to “ $\sim A$ ” Position, the auto power off function will be disabled.

The auto power off mark “ \odot ” will disappear.

Auto power off mode is enabled each time you turn on the meter and is automatically disabled in the “MX / MN” mode.

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4. BATTERY REPLACEMENT

WARNING

To prevent electrical hazard or shock, turn off clamp meter and disconnect test leads before removing back cover.

1. As battery power is not sufficient, LCD will display “ \square ”. Replacement with one new battery type 9V is required.
2. Set range switch to OFF position.
3. Use a screwdriver to unscrew the screw secured on back cover. Take out the batteries and replace with one new battery Type 9V.
4. Place back cover and secure with the screw.

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CERTIFICATE OF CALIBRATION

We hereby certify that this product has been calibrated and found to be in accordance with the applicable SPECIFICATIONS and MECO STANDARDS. Accuracies of the standard equipment used in this calibration are traceable to the National Standards.

MECO METERS PVT. LTD.

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Web : www.mecoinst.com

SR. NO : _____

CHECKED BY : _____

DATE : _____

MODEL NO : _____

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