

ISO-TECH IPM3005
Flexible AC Power Quality Tester
Instruction Manual



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I. **Safety Information**

For safe operation of this instrument, read these instructions completely before you use it and comply with them fully. Failure to observe these warnings can result in severe **injury** or **death**.

The following symbols may appear on the instrument or in this Instruction Manual:



Caution: Risk of danger - Refer to Instruction Manual



Caution: Risk of electric shock



Equipment protected throughout by Double Insulation or Reinforced Insulation



Do not apply around or remove from Hazardous Live conductors.



Complies with applicable EU directives.

- If this instrument is used in a manner not specified by the manufacturer, the protection afforded by the instrument may be impaired.
- If possible, do not work alone, so assistance can be given if required.
- Examine the instrument and test leads before use. Do not use the instrument or test-leads if they are damaged.
- Do not use the instrument if it is not operating correctly, or if it is wet.
- Use extreme caution and wear Personal Protective Equipment when taking measurements where Hazardous Live parts could be accessible.
- Use caution when measuring or working near voltages above 30 V ac rms, or 60 V dc. These voltages may cause a shock.
- Do not allow fingers to protrude beyond Tactile Barriers when fitting to or removing probes or clips from a Hazardous Live conductor, as this may cause a shock.

TEST EQUIPMENT RISK ASSESSMENT

Users of this equipment and/or their employers are reminded that Health and Safety Legislation requires them to carry out a valid risk assessments of all electrical work, so as to identify potential sources of electrical danger and risk of electrical injury such as from inadvertent short circuits. Where the assessments show that the risk is significant then the use of fused test leads constructed in accordance with HSE guidance note GS38 "Electrical Test Equipment for use by Electricians" should be used.

EN 61010-2-032 :2002, CAT III 600V, Pollution Degree 2

Measurement Category I is for measurements performed on circuits not directly connected to mains. Examples include: Measurements on battery powered equipment and specially protected (internal) mains-derived circuits.

Measurement Category II is for measurements on circuits directly connected to the low voltage installation. Examples include: Household appliances, portable tools and similar equipment.

Measurement Category III is for measurements performed in the building installation. Examples include measurements on distribution boards, junction boxes, socket-outlets and wiring and cables in the fixed installation.

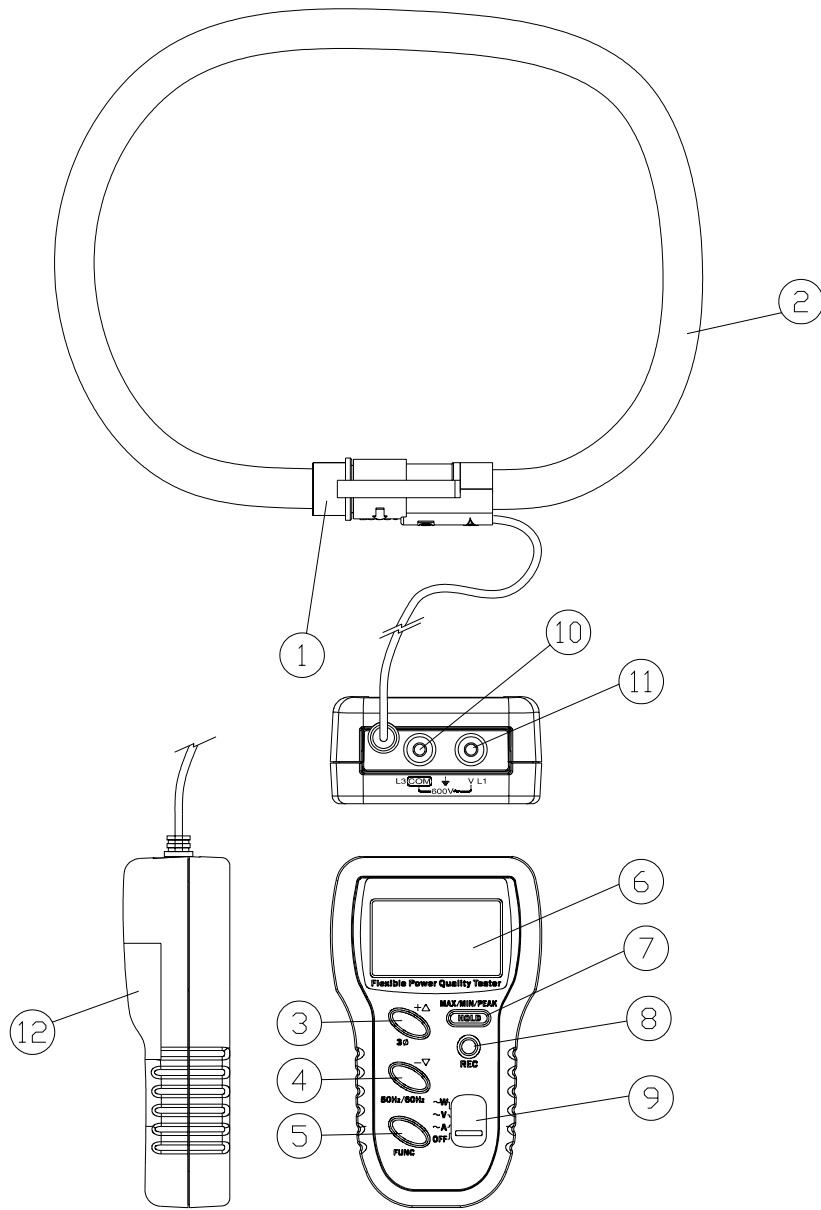
Measurement Category IV is for measurements performed at the source of the low-voltage installation. Examples include measurements on primary overcurrent protection devices and electricity meters.

I. FEATURES

I. FEATURES

- a. Non-interrupted AC current harmonic analysis.
- b. 1 to 99th order of harmonics at 2.0% basic accuracy.
- c. Total harmonic distortion (%THD-F) and crest factor (CF).
- d. True RMS measurement of V with 0.5% basic accuracy.
- e. True RMS measurement of A with 1% of scale accuracy
- f. Fast peak function (39 μ s for 50 Hz, 33 μ s for 60Hz).
- g. Programmable CT ratio from 1 to 250.
- h. Max, Min and data hold functions.
- i. Auto power off function in 15 minutes.
- j. Active (W, KW, HP), reactive (VAR, KVAR) and apparent (VA, KVA) power.
- k. Power factor (PF), phase angle (Φ), and energy (WH, KWH).
- l. Measurement of balanced 3 Φ power.
- m. Measurement of balanced 3 Φ sequence.
- n. Active power in H.P.

II. PANEL DESCRIPTION



{tc \ 1 "II. Panel Description"}1. Coupling Assembly

2. Flexible Sensor Loop

Squeeze the side clips to open the coupler and place the Flexible Sensor around the conductor. Engage the ends and press them together until the side clips lock into place.

3. ▲ 3Φ Button

Increment order of harmonics or CT ratio. When the slide switch is set to the W position, press this button to select measurement of balanced 3Φ power or single-phase power.

4. ▼ 50/60 Hz button

Press this button to select nominal mains frequency (50 or 60Hz).

Decrement the order of harmonics or CT ratio.

Hold this button when turning on the instrument changes the mode to allow measurement of phase sequence instead of phase angle in a balanced 3Φ power system.

5. FUNC Button

When measuring A or V, press this button to select harmonics, THD-F or CF functions. When measuring W with PF, press this button to select VA, VAR, phase angle, HP, or energy (KWH) functions.

6. LCD

This is a 4+4 digit Liquid Crystal Display which also shows function, units, sign, decimal points, low battery, max, min, peak and harmonic symbols.

7. MAX/MIN/HOLD/PEAK

When measuring A, or V, press this button to select MAXIMUM, MINIMUM, HOLD, or PEAK. function.

8. REC

Press this button to start data logging. Press it again to stop. Hold the button when turning the power on to clear the data memory.

9. Function Slide Switch

This is used to turn the power on and select measurement of current, voltage or power.

10. COM Terminal

This terminal is used as an input common for a voltage to be measured.

11. V Input Terminal

This terminal is used as an input for voltage and power measurements.

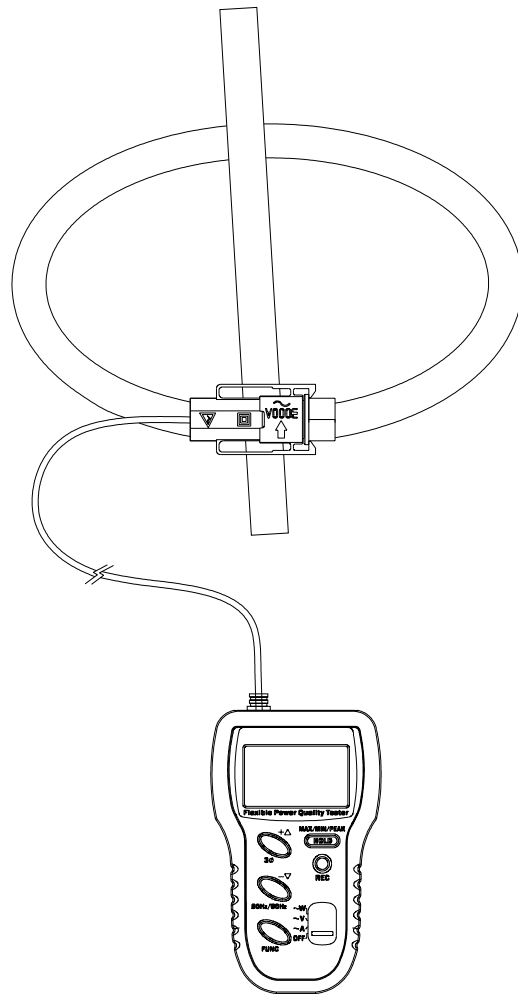
12. Battery Cover.

III. OPERATING INSTRUCTIONS

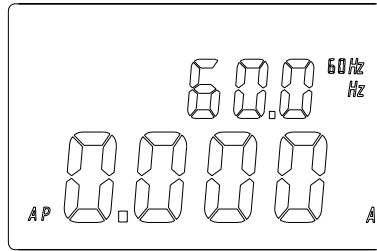
III.1. Measurement of AC Current

NOTES:

1. The instrument will automatically display the measured frequency. Hold the ▼ button when turning on the power to fix the measurement frequency at 50 or 60 Hz.
2. If the peak value of the input AC current is greater than the maximum value of the range, OL will appear on the display.
3. Whenever the sliding switch is set at a new position, the CT ratio will be displayed first. If the CT ratio is not 1, a symbol of "⊖" will be shown in the LCD display for the measurement of A. The reading of current shown in LCD is equal to the true RMS value measured by the instrument multiplied by the CT ratio ($A_{LCD} = A_{RMS} \times CT$).

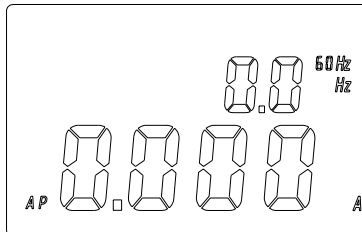


III.1.1. True RMS value of AC Current

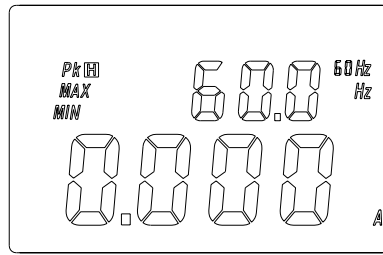


- Set the slide switch to the A position, then press the 50/60 Hz button to select the correct frequency.
- Fit the flexible probe around the conductor. Ensure the probe coupling is more than 25mm away from the conductor.
- Read the measured value from the LCD display. The measured frequency will be displayed in the upper LCD digits.

NOTE: If the true RMS value is less than 30A, the frequency of the signal will be displayed as 0 as shown in the following figure.



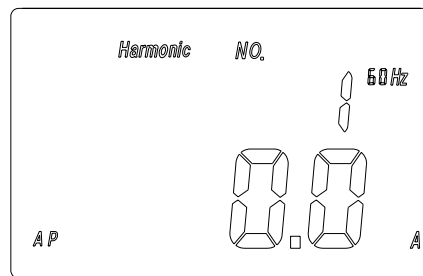
III.1.2. HOLD, MAX, MIN and PEAK of AC Current.



- Set the slide switch to the A position, then press the 50/60 Hz button to select the correct frequency.
- Fit the flexible probe around the conductor. Ensure the probe coupling is more than 25mm away from the conductor.
- Read the measured value from the LCD display. Press the HOLD button repeatedly and the symbols of "HOLD", "MAX", "MIN" or "PEAK" will appear on the LCD with the corresponding measured value.
- Press and hold the "HOLD" button for more than 2 seconds to return to normal operation and display the current measurement.

NOTE: The PEAK function displays the maximum value of the input waveform. The sampling time for the PEAK function is 39 μ s (50Hz) or 33 μ s (60Hz). The HOLD, MAX, or MIN function displays the true RMS value.

III.1.3. Harmonics of AC Current in Magnitude

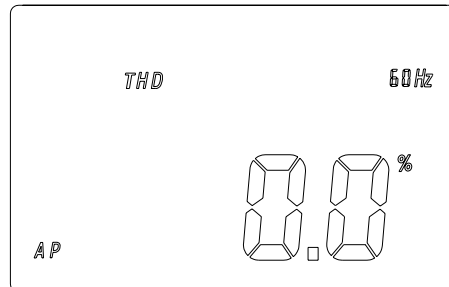


- Set the slide switch to the A position, then press the 50/60 Hz button to select the correct frequency.
- Fit the flexible probe around the conductor. Ensure the probe coupling is more than 25mm away from the conductor.
- Press the FUNC button once. The symbols of "Harmonic" and "NO." will

appear on the LCD. The n-th order (1 to 99) will appear in the upper row of digits.

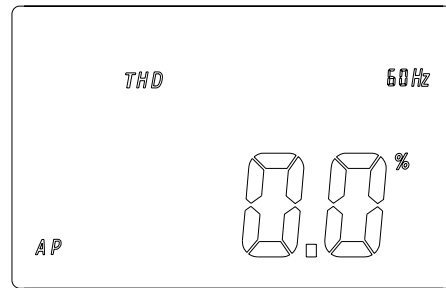
- d. Press the ▲ or ▼ button to increment or decrement the order of harmonics as shown by the upper row of digits. The number will roll over when the maximum (99) or minimum (1) is reached.
- e. The measured value of current for the selected harmonic will appear on the lower row of digits.

III.1.4. Harmonics of AC Current in Percentage (%)



- a. Set the slide switch to the A position, then press the 50/60 Hz button to select the correct frequency.
- b. Fit the flexible probe around the conductor. Ensure the probe coupling is more than 25mm away from the conductor.
- c. Press the FUNC button twice. The symbols of "Harmonic" and "NO." will appear on the LCD. The n-th order (1 to 99) will appear in the upper row of digits.
- d. Press the ▲ or ▼ button to increment or decrement the order of harmonics as shown by the upper row of digits. The number will roll over when the maximum (99) or minimum (1) is reached.
- e. The measured percentage value of current for the selected harmonic with respect to the fundamental will appear on the lower row of digits.

III.1.5. Total Harmonic Distortion (% THD-F)



- Set the slide switch to the A position, then press the 50/60 Hz button to select the correct frequency.
- Fit the flexible probe around the conductor. Ensure the probe coupling is more than 25mm away from the conductor.
- Press the FUNC button three times. The symbols of “THD” and “%” will appear on the LCD.
- The total harmonic distortion in percentage with respect to the fundamental frequency (50 or 60 Hz) will be measured and appear on the lower row of digits.

The Total Harmonic Distortion is derived as follows:

$$\%THD-F = (\sqrt{I_2^2 + I_3^2 + \dots + I_{49}^2 + I_{50}^2} / I_1) * 100$$

Where,

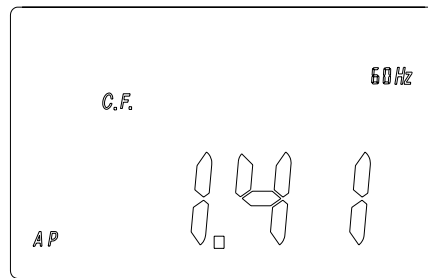
I1: magnitude at the 50 or 60 Hz

I2: magnitude at the second harmonic

...

I50: magnitude at the 50-th harmonic.

III.1.6. Crest Factor (C.F.)



- a. Set the slide switch to the A position, then press the 50/60 Hz button to select the correct frequency.
- b. Fit the flexible probe around the conductor. Ensure the probe coupling is more than 25mm away from the conductor.
- c. Press the FUNC button four times. The symbol C.F. will appear on the LCD. The crest factor will be measured and displayed on the lower row of digits.

The crest factor (CF) is defined as follows:

$$\text{C.F.} = (\text{peak value}) / (\text{RMS value})$$


III.2 Measurement of AC Voltage

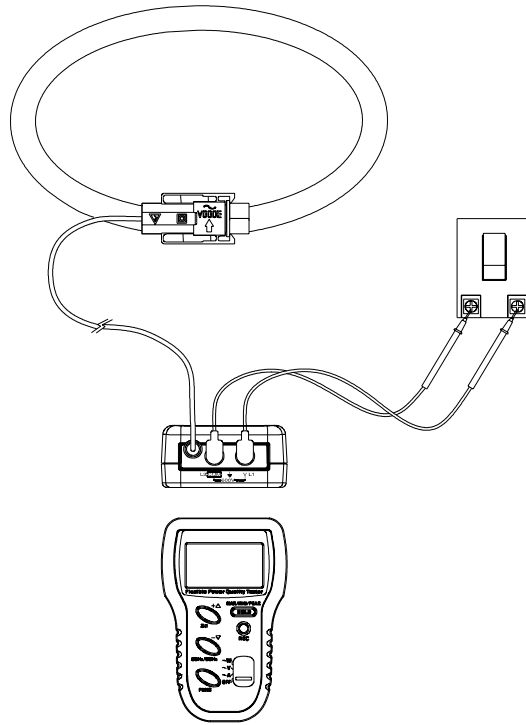
{tc \ 2 "B. DC/AC Voltage Measurements"}



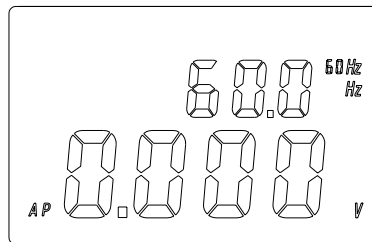
CAUTION: The maximum AC input Voltage is 600V. Do not attempt to take voltage measurements which exceed this limit. Measurements of voltages greater than 600 V AC may cause electrical shock and damage to the clamp meter.

NOTES:

1. The instrument will automatically display the measured frequency. Hold the ▼ button when turning on the power to fix the measurement frequency at 50 or 60 Hz.
2. If the peak value of the input AC voltage is greater than the maximum value of the range, OL will appear on the display.
3. Whenever the slide switch is set at a new position, the CT ratio will be displayed first. If the CT ratio is not 1, a symbol of  will be shown in the LCD display.

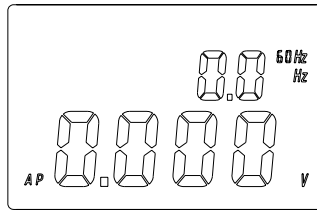


III.2.1. True RMS value of AC Voltage

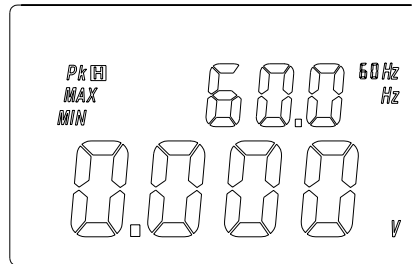


- a. Set the slide switch to the V position then press the 50/60 Hz button to select the correct frequency.
- b. Insert the test leads into the input sockets on the instrument. Connect the test probes of the test leads in PARALLEL with the circuit to be measured.
- c. Read the measured RMS Voltage value from the LCD display.

NOTE: If the true RMS Voltage value is less than 10V, the frequency of the signal will be displayed as 0, as shown in the following figure.



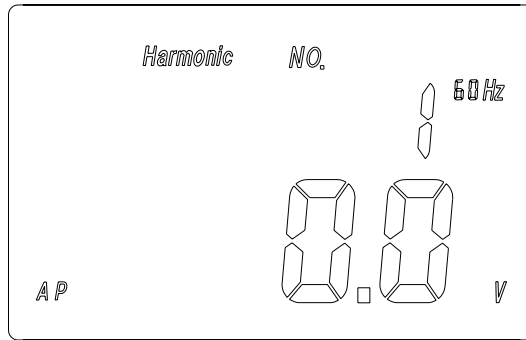
III.2.2. HOLD, MAX, MIN and PEAK value of AC Voltage



- Set the slide switch to the V position then press the 50/60 Hz button to select the correct frequency.
- Insert the test leads into the input sockets on the instrument. Connect the test probes of the test leads in PARALLEL with the circuit to be measured.
- Read the measured value from the LCD display. Press the HOLD button repeatedly and the symbols of "HOLD", "MAX", "MIN" or "PEAK" will appear on the LCD with the corresponding measured value.
- Press and hold the "HOLD" button for more than 2 seconds to return to normal operation and display the current measurement.

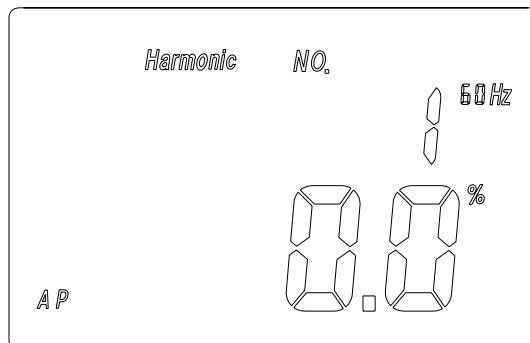
NOTE: The PEAK function displays the maximum value of the input waveform. The sampling time for the PEAK function is 39 μ s (50Hz) or 33 μ s (60Hz). The HOLD, MAX, or MIN function displays the true RMS value.

III.2.3. Harmonics of AC Voltage in Magnitude (V)



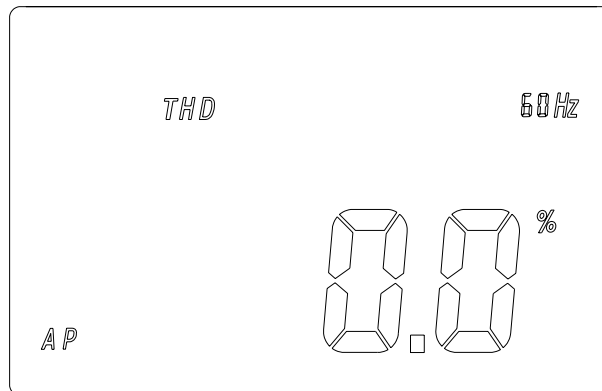
- Set the slide switch to the V position then press the 50/60 Hz button to select the correct frequency.
- Insert the test leads into the input sockets on the instrument. Connect the test probes of the test leads in PARALLEL with the circuit to be measured.
- Press the FUNC button once. The symbols of "Harmonic" and "NO." will appear on the LCD. The n-th order (1 to 99) will appear in the upper row of digits.
- Press the ▲ or ▼ button to increment or decrement the order of harmonics as shown by the upper row of digits. The number will roll over when the maximum (99) or minimum (1) is reached.
- The measured value of Voltage for the selected harmonic will appear on the lower row of digits.

III.2.4. Harmonics of AC Voltage in Percentage (%)



- Set the slide switch to the V position then press the 50/60 Hz button to select the correct frequency.
- Insert the test leads into the input sockets on the instrument. Connect the test probes of the test leads in PARALLEL with the circuit to be measured.
- Press the FUNC button twice. The symbols of "Harmonic" and "NO." will appear on the LCD. The n-th order (1 to 99) will appear in the upper row of digits.
- Press the ▲ or ▼ button to increment or decrement the order of harmonics as shown by the upper row of digits. The number will roll over when the maximum (99) or minimum (1) is reached.
- The measured percentage value of Voltage for the selected harmonic with respect to the fundamental will appear on the lower row of digits.

III.2.5. Total Harmonic Distortion (% THD-F)



- Set the slide switch to the V position then press the 50/60 Hz button to select the correct frequency.
- Insert the test leads into the input sockets on the instrument. Connect the test probes of the test leads in PARALLEL with the circuit to be measured.
- Press the FUNC button three times. The symbols of "THD" and "%" will appear on the LCD.
- The total harmonic distortion in percentage with respect to the fundamental frequency (50 or 60 Hz) will be measured and appear on the lower row of digits.

The Total Harmonic Distortion is derived as follows:

$$\%THD-F = (\sqrt{V_2^2 + V_3^2 + \dots + V_{49}^2 + V_{50}^2}) / V_1 * 100$$

Where,

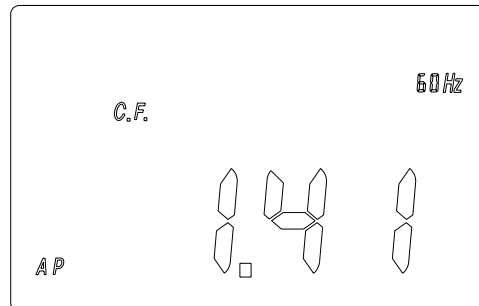
V1: magnitude at the 50 or 60 Hz

V2: magnitude at the second harmonics

...

V50: magnitude at the 50-th harmonics.

III.2.6. Crest Factor (C.F.)



- Set the slide switch to the V position then press the 50/60 Hz button to select the correct frequency.
- Insert the test leads into the input sockets on the instrument. Connect the test probes of the test leads in PARALLEL with the circuit to be measured.
- Press the FUNC button four times. The symbol C.F. will appear on the LCD. The crest factor will be measured and displayed on the lower row of digits.

The crest factor (CF) is defined as follows:


$$C.F. = (\text{peak value}) / (\text{RMS value})$$

III.3 Measurement of Single Phase AC Power Quality

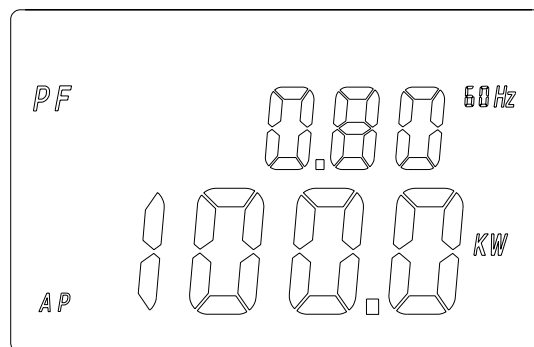
{tc \ 2 "B. DC/AC Voltage Measurements"}

WARNING: The maximum AC input Voltage is 600V. Do not attempt to take voltage measurements which exceed this limit. Measurements of voltages greater than 600 V AC may cause electrical shock and damage to the clamp meter.

NOTES:

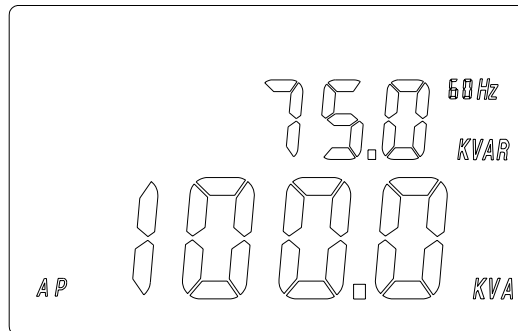
1. The instrument will automatically display the measured frequency. Hold the ▼ button when turning on the power to fix the measurement frequency at 50 or 60 Hz.
2. If the peak value of the input AC voltage is greater than the maximum value of the range, OL will appear on the display.
3. Whenever the slide switch is set at a new position, the CT ratio will be displayed first. If the CT ratio is not 1, a symbol of “” will be shown in the LCD display.
4. The reading of current shown on the LCD is equal to the W, VA, and VAR values measured by the instrument multiplied by CT ratio ($W_{LCD} = W \times CT$, $VA_{LCD} = VA \times CT$, $VAR_{LCD} = VAR \times CT$ and $WH_{LCD} = WH \times CT$).

III.3.1 Single Phase AC Watt (W) and Power Factor (PF)



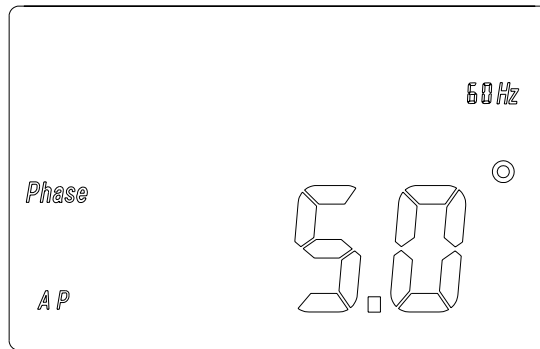
- Insert the test leads into the input sockets on the instrument. Connect the test probes of the test leads in PARALLEL with the circuit to be measured.
- Fit the flexible probe around one of the conductors to the load. The current should flow in the direction as indicated by the arrow on the clamp coupling. Ensure the probe coupling is more than 25mm away from the conductor.
- Set the slide switch to the W position.
- The measured values of W or KW will appear on the lower digits of the LCD. The unit of watts is automatically scaled. The measured value of Power factor (PF) will appear on the upper digits of the LCD.

III.3.2. Apparent Power (VA, KVA) and Reactive Power (VAR, KVAR)



- Insert the test leads into the input sockets on the instrument. Connect the test probes of the test leads in PARALLEL with the circuit to be measured.
- Fit the flexible probe around one of the conductors to the load. The current should flow in the direction as indicated by the arrow on the clamp coupling. Ensure the probe coupling is more than 25mm away from the conductor.
- Set the slide switch to the W position.
- The measured values of W or KW and PF will appear on the LCD.
- Press the FUNC button once to display VA or KVA and VAR or KVAR. The units are automatically scaled.

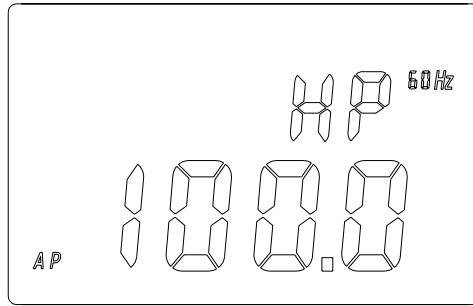
III.3.3. Phase Angle (Φ)



- a. Insert the test leads into the input sockets on the instrument. Connect the test probes of the test leads in PARALLEL with the circuit to be measured.
- b. Fit the flexible probe around one of the conductors to the load. The current should flow in the direction as indicated by the arrow on the clamp coupling. Ensure the probe coupling is more than 25mm away from the conductor.
- c. Set the slide switch to the W position.
- d. The measured values of W or KW and PF will appear on the LCD. The units are automatically scaled.
- e. Press the FUNC button twice to display phase angle (Φ) from -180° to $+180^\circ$.

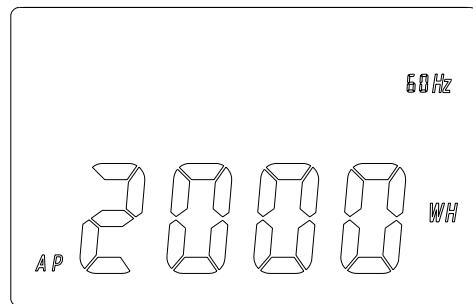
NOTE: To display phase angle (Φ) from 0 to 360, hold the ▲ button when turning the instrument power on. If the instrument is turned on in this way, it will display phase angle from 0 to 360° when the phase angle function is selected.

III.3.4. Horse Power (H.P.)



- Insert the test leads into the input sockets on the instrument. Connect the test probes of the test leads in PARALLEL with the circuit to be measured.
- Fit the flexible probe around one of the conductors to the load. The current should flow in the direction as indicated by the arrow on the clamp coupling. Ensure the probe coupling is more than 25mm away from the conductor.
- Set the slide switch to the W position.
- The measured values of W or KW and PF will appear on the LCD. The units are automatically scaled.
- Press the FUNC button three times to display power in the units of HP (Horse Power).

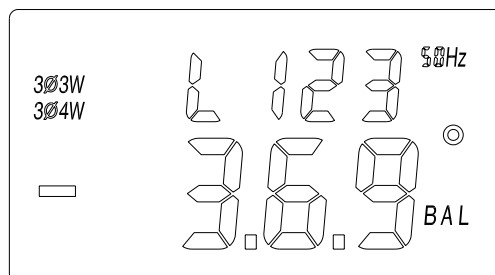
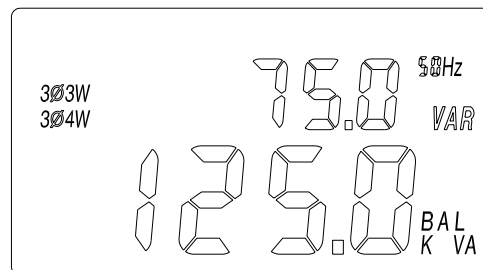
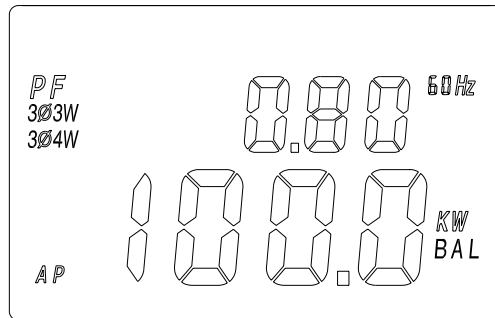
III.3.5. Energy Consumption (WH or KWH)

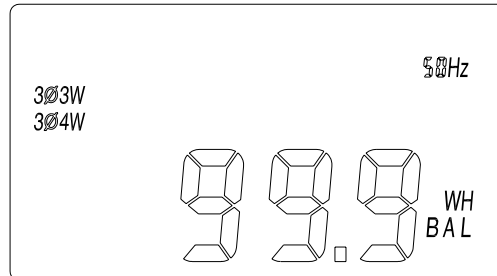
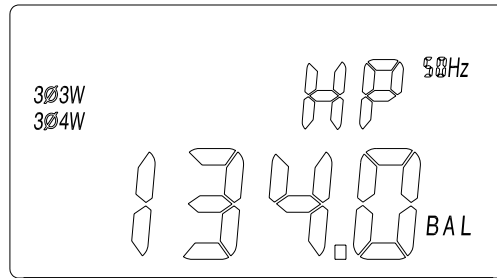


- Insert the test leads into the input sockets on the instrument. Connect the test probes of the test leads in PARALLEL with the circuit to be measured.
- Fit the flexible probe around one of the conductors to the load. The current should flow in the direction as indicated by the arrow on the clamp coupling.

- Ensure the probe coupling is more than 25mm away from the conductor.
- Set the slide switch to the W position.
 - The measured values of W or KW and PF will appear on the LCD. The units are automatically scaled.
 - Press the FUNC button four times. A character of H is displayed behind the W reading to indicate energy (Watt-Hours WH or KiloWatt-Hours KWH).

III.4 Measurement of the Balanced 3 Phase AC Power Quality (3005)



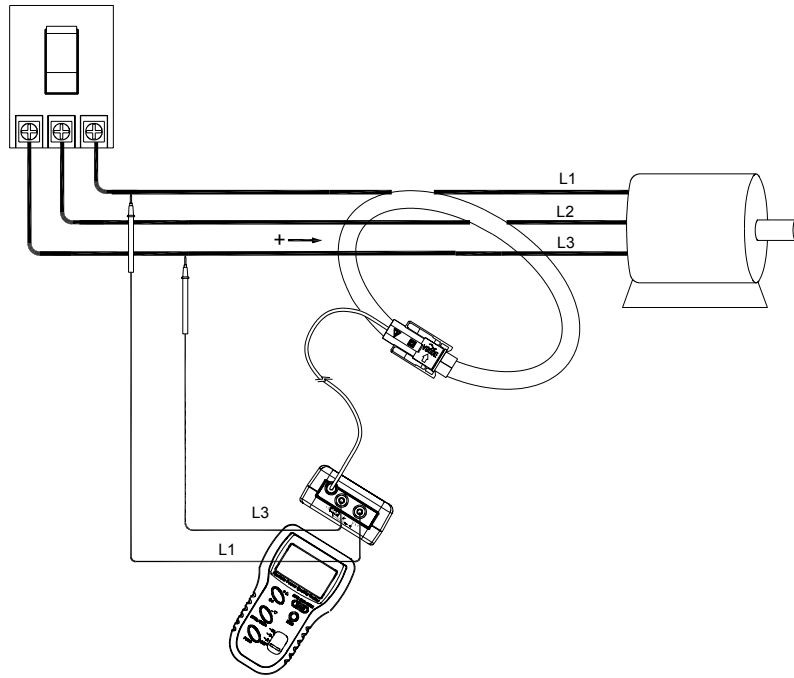


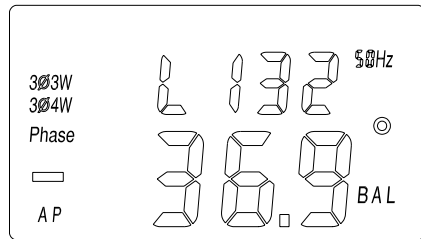
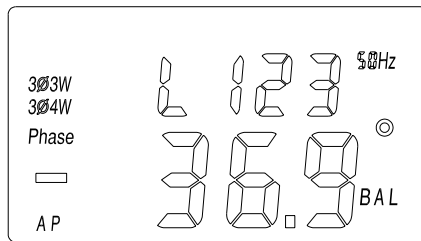
- a. Connect the black test lead to the L3 Phase and connect the red test lead to L1 Phase.
- b. Fit the flexible probe around the L2 Phase conductor to the load. The current should flow in the direction as indicated by the arrow on the clamp coupling. Ensure the probe coupling is more than 25mm away from the conductor.
- c. Set the slide switch at the W position.
- d. Press the ▲ 3Φ button to select balanced 3Φ mode. The symbols of “3Φ3W, 3Φ4W, and BAL” will appear on the LCD.
- e. The value of W or KW and PF will appear on the LCD. The unit of watts is automatically scaled.
- f. Press the FUNC button and the apparent power (VA) and reactive power (VAR) will appear on the LCD.
- g. To measure and display the phase angle and phase sequence, press the FUNC button again.
- h. Press the FUNC button again and the true power in Horse Power (HP) will appear on the LCD.
- i. To measure and display the energy consumption in Watt-Hours (WH), press the FUNC button again. The current energy consumption in Watt-Hours WH or KiloWatt-Hours (KWH) will appear on the LCD.

NOTE: Measurements of VA, VAR, Phase Angle, phase sequence, HP, and energy (WH) for balanced 3 Φ power system may be obtained. The operations are the same as the measurements for the single-phase power system (See III.3.2 above).

NOTE: The reading of current shown on the LCD is equal to the W, VA, and VAR values measured by the instrument multiplied by CT ratio ($W_{LCD} = W \times CT$, $VA_{LCD} = VA \times CT$, $VAR_{LCD} = VAR \times CT$, $WH_{LCD} = WH \times CT$)

III.5 Measurement of the Balanced 3 Phase Sequence





- Set the sliding switch to the W position
- Connect the black test lead to the L3 Phase and connect the red test lead to L1 Phase.
- Fit the flexible probe around the L2 Phase conductor to the load. The current should flow in the direction as indicated by the arrow on the clamp coupling. Ensure the probe coupling is more than 25mm away from the conductor
- Press the ▲ 3Φ button to select balanced 3Φ mode. A symbol of 3Φ will appear on the LCD.
- Press the FUNC button to select phase angle function. The upper row of digits of the LCD will show L123 to indicate a clockwise rotation sequence, or L132 to indicate counter-clockwise rotation sequence.

NOTE: To indicate phase sequence correctly, the supply voltage must be greater than 5V and the current must be greater than 5A, otherwise the instrument will show OL and L1— on the LCD.

IV. SETTING THE NOMINAL SUPPLY FREQUENCY

When the instrument power is first turned on, the frequency of the signal will be measured and displayed automatically. To set the frequency manually to 50 or

60 Hz if required, press and hold the ▼ button whilst turning the instrument power on.

V. DATA LOGGING

Press the REC button to start data logging. The instrument will log all data displayed on the LCD at the specified interval. For example:
(Hz, A), (Order of Harmonics, A), (Hz, V), (PF, W), or (VAR, VA).
The memory size is 8000 records.

VI. CLEAR DATA MEMORY

To clear the data logger memory, press and hold the REC button whilst turning the power on.


VII. SET THE DATA LOGGING INTERVAL

When the memory is cleared, the LCD will display the symbols of REC and the data logging interval in seconds. Press the ▲ or ▼ buttons to increase or decrease the data logging interval in seconds. To return to normal measurement, press the REC button again.

VIII. USB INTERFACE PROTOCOL

Baud Rate: 9600
Data Bits: 8
Stop Bit: 1
Parity: None
Format: ASCII

IX. SET THE CT RATIO

To set the CT ratio, hold the FUNC button and then turn the power on. The symbol “” will appear on the LCD. The default value of CT is 1. To change the CT ratio, press the ▲ or ▼ button to increment or decrement the value by 1. Hold the ▲ or ▼ button to rapidly increment or decrement the value.

To exit the CT ratio setting mode, press the FUNC button.

X. DISABLE AUTO-POWER-OFF{TC \L 2 "H. TO RECOVER FROM AUTO-POWER-OFF"}

The instrument has an auto-power-off function. The tester will turn the power off after power is turned on for 15 minutes. To disable the auto power off function, press and hold the FUNC button for more than 2 seconds. A beep will be heard to indicate that the auto power off function is disabled.

Alternatively, press and hold the "**HOLD**" button whilst turning the power on.

XI. SPECIFICATIONS {TC \L 1 "IV.SPECIFICATIONS"}(23°C±5°C)

Conditions: AC Watts (50 or 60 Hz, PF 0.5 to 1. CT = 1, Voltage > AC 5V, Current > AC 5A for A range, and continuous waveform. Conductor is located at the center of flexible loop. Position sensitivity is 2% of range. External field effect of < 40A/m and 200mm from the coupling is 1% of range. Temperature coefficient is 0.02% of reading / °C)

Range (0 to 3000A)	Resolution	Accuracy of Readings ¹	
		> 20 V and > 30A	< 20V or < 30A
10.0 – 999.9 W	0.1W	±1% of range	±2% of range
1.000 – 9.999 KW	0.001 KW	±1% of range	±2% of range
10.00 – 99.99 KW	0.01 KW	±1% of range	±2% of range
100.0 – 999.9 KW	0.1 KW	±1% of range	±2% of range
1000 – 9999 KW	1 KW	±1% of range	±2% of range

¹For CT ≠1, the accuracy in percentage is the same (±1%). But the additional wattage should be multiplied by the CT ratio.

For example, ±0.2W becomes ±0.2W * CT ratio

AC Apparent Power (VA, from 0.000VA to 9999 KVA)

Range (0 to 3000A)	Resolution	Accuracy of Readings ¹	
		> 20 V and > 30A	< 20V or < 30A
10.0 – 999.9 VA	0.1VA	±1% of range	±2% of range
1.000 – 9.999 KVA	0.001 KVA	±1% of range	±2% of range
10.00 – 99.99 KVA	0.01 KVA	±1% of range	±2% of range
100.0 – 999.9 KVA	0.1 KVA	±1% of range	±2% of range
1000 – 9999 KVA	1 KVA	±1% of range	±2% of range

¹For CT ≠1, the accuracy in percentage is the same (±1%). But the additional wattage should be multiplied by the CT ratio.

For example, ±0.2VA becomes ±0.2VA * CT ratio

AC Reactive Power (VAR, from 0.000 VAR to 9999 KVAR)

Range (0 to 3000A)	Resolution	Accuracy of Readings ¹	
		> 20 V and > 30A	< 20V or < 30A
10.0 – 999.9 VAR	0.1VAR	±1% of range	±2% of range
1.000 – 9.999 KVAR	0.001 KVAR	±1% of range	±2% of range
10.00 – 99.99 KVAR	0.01 KVAR	±1% of range	±2% of range
100.0 – 999.9 KVAR	0.1 KVAR	±1% of range	±2% of range
1000 – 9999 KVAR	1 KVAR	±1% of range	±2% of range

¹For CT ≠1, the accuracy in percentage is the same (±2%). But the additional wattage should be multiplied by the CT ratio.

For example, ±0.2VAR becomes ± 0.2VAR * CT ratio

Range of CT (Current Transformer) Ratio: 1 to 3000

H.P. (Horse Power)

$$1 \text{ H.P.} = 746 \text{ W}$$

AC Active Energy (WH, or KWH, from 0 WH to 999,999 KWH)

$$\text{WH} = \text{W} * \text{Time (in hours)}$$

Power Factor (PF)

Range	Resolution	Accuracy	
		> 20V and > 30A	< 20V or < 30A
0.000 – 1.000	0.001	± 0.04	±0.1

AC Current (50 or 60 Hz, Auto Range, True RMS, Crest Factor < 4, CT=1, Conductor is located at the center of flexible loop. Position sensitivity is 2% of range. External field effect of < 40A/m and 200mm from the coupling is 1% of range. Temperature coefficient is 0.02% of reading / °C)

Range	Resolution	Accuracy of Readings ⁴
0 – 300.0A	0.1A	±1% of range
300.0 – 999.9A	0.1A	±1% of range
1000 – 3000 A	1 A	±1% of range

⁴For CT ≠1, the accuracy in percentage is the same (±0.5%). But the additional digits should be multiplied by the CT ratio.

For example, ±5 digits becomes ±5 digits * CT ratio

AC Voltage (50 or 60 Hz, Auto Range, True RMS, Crest Factor < 4, Input Impedance 10 MΩ, Overload Protection AC 800V)

Range	Resolution	Accuracy of Readings
4.0 V – 600.0 V	0.1 V	±0.5% ± 5dgt

Harmonics of AC Voltage in Percentage (1 to 50th order, minimum voltage at the 50 or 60 Hz > AC 80V. If the voltage is 0 at 50 or 60 Hz, all the percentage (%) is set to 0.)

Range	Resolution	Accuracy
1 – 20 th	0.1%	±2%
21 – 50 th	0.1%	4% of reading ±2.0%

Harmonics of AC Voltage in Magnitude (1 to 50th order, minimum voltage at the 50 or 60 Hz > AC 80V)

Range	Resolution	Accuracy
1 – 20 th	0.1%	±2% ± 0.5V
21 – 50 th	0.1%	4% of reading ±0.5V

Harmonics of AC Current in Percentage (1 to 50th order, minimum current at the 50 or 60 Hz > 30 A. If the current is 0 at 50 or 60 Hz, all the percentage (%) display is 0.)

Range	Resolution	Accuracy
1 – 20 th	0.1%	±2%
21 – 50 th	0.1%	±6%

Harmonics of AC Current in Magnitude (1 to 50th order, minimum current at the 50 or 60 Hz, True RMS < 300A)

Range (0 – 300A)	Resolution	Accuracy
1 – 20 th	0.1A	±2% of range ±0.4A
21 – 50 th	0.1A	±4% of range ±0.4A

Harmonics of AC Current in Magnitude (1 to 50th order, minimum current at the 50 or 60 Hz, 3000A > True RMS > 300A)

Range	Resolution	Accuracy
1 – 20 th	1A	±2% of range ±40A
21 – 50 th	1A	±4% of range ±40A

Phase Angle (Φ , V > 20V, A > 30A)

Range	Resolution	Accuracy
-180° to 180°	0.1°	± 2°
0° to 360°	0.1°	± 2°

Total Harmonic Distortion (THD-F with respect to the 50 or 60 Hz, min. value at the 50 or 60 Hz > 80V and > 20 A, 1 to 50th Harmonics. If the voltage or current is 0 at 50 or 60 Hz, all the percentage (%) display is 0)

Range	Resolution	Accuracy
0.0 – 20%	0.1%	± 2%
20 – 100%	01%	± 6% of reading ± 1%
100 – 999.9 %	0.1%	± 10% of reading ± 1%

Peak Value of AC Voltage (RMS value > 10V)

Range	Sampling Time	Accuracy of Reading
50 Hz	39 μ s	± 5% ± 30 digits
60 Hz	33 μ s	± 5% ± 30 digits

Peak Value of AC Current (RMS value > 30A)

Range	Sampling Time	Accuracy of Reading
50 Hz	39 μ s	± 5% of range ± 30 digits
60 Hz	33 μ s	± 5% of range ± 30 digits


Crest Factor (C.F.) of ACV (RMS value > 10V) or ACA (RMS value > 30A)

Range	Resolution	Accuracy of Readings
1.00 – 99.99	0.01	± 5% ± 30 digits

Frequency (RMS value > 10V) or ACA (RMS value > 30A)

Range	Resolution	Accuracy
45 – 65	0.1	± 0.2Hz

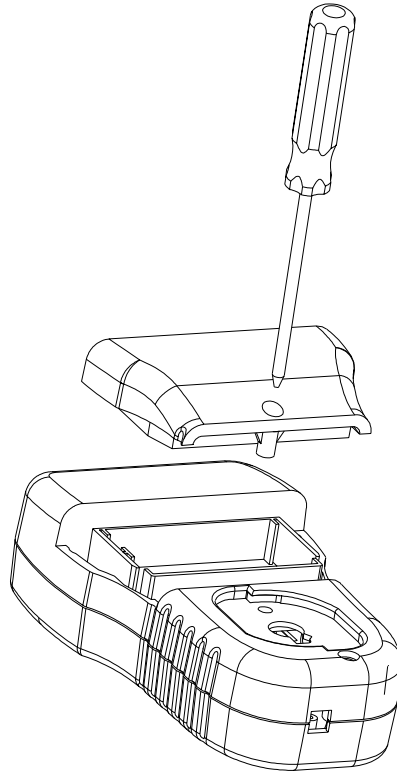
Indoor Use Only

Probe Length:	24 in / 610 mm
Minimum Bending Diameter:	35mm
Connector Diameter:	23mm
Cable Diameter:	14mm
Cable Length from Probe to Box:	1.7m approximately.
USB Data Cable Length:	1.7m approximately.
Data Logging Memory Capacity:	8000 records.
Instrument Dimensions:	130mm(L) x 80mm(W)x 43mm(H) 5.1"(L) x 3.1"(W) x 1.7"(H)
Battery Type:	Qty 2 x 1.5V SUM-3
Display:	4+4 digits LCD
Range Selection:	Automatic
Overload Indication:	OL
Power Consumption:	10mA(approx.)
Low battery Indication:	
Auto-Power-Off:	15 minutes after power-on
LCD Update Time:	2 times/sec.
No. Of Samples per Period	512 (voltage or current) 256 (power)
Operating Temperature:	-10°C to 85°C
Operating Humidity:	15% to 85% RH
Altitude:	up to 2000 Meters
Storage Temperature:	-20°C to 85°C
Storage Humidity:	15% to 85% RH
Weight:	430g (battery included)
Supplied Accessories:	Test leads Instruction Manual x 1 Batteries, 1.5V Qty. x 2 USB Data Lead

XII. BATTERY REPLACEMENT (TC 1 "V.BATTERY REPLACEMENT")



WARNING: Disconnect all test leads and remove the instrument from around the circuit before removing the battery cover. Do not connect the instrument to a circuit whilst the battery cover is removed.



When the battery voltage low is shown in LCD:

- A. Turn the power off and remove the test leads from the instrument.
- B. Disconnect the flexible loop from any conductor.
- C. Remove the screw from the battery compartment cover.
- D. Lift and remove the battery compartment cover.
- E. Remove the old batteries
- F. Insert two new 1.5V SUM-3 batteries.
- G. Replace the battery compartment and secure the screw.

H. Dispose of the removed batteries in accordance with local regulations.

XIII. CLEANING, MAINTENANCE & CALIBRATION {TC \L 1 "VI.MAINTENANCE & CLEANING"}
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To clean the instrument, wipe the case with a damp cloth and detergent; do not use abrasives or solvents.

Remove the batteries if the instrument is to be stored for a long period.

Maintenance not covered in this Instruction Manual should only be performed by qualified personnel. To maintain accuracy, this instrument should be calibrated at least yearly, or if it is suspected of being inaccurate.

Repairs should only be performed by qualified personnel. For maintenance, repair and calibration, contact your local distributor or RS Components; the address is given at the end of these instructions.

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Fax: 01536 405678
<http://rswww.com>

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