

USER'S MANUAL

MW3518

2000A TRMS AC+DC Clamp Meter

Dedicated for
photovoltaic
installations.



1) SAFETY

This manual contains information and warnings that must be followed for operating the meter safely and maintaining the meter in a safe operating condition. If the meter is used in a manner not specified by the manufacturer, the protection provided by the meter may be impaired.

Observe proper safety precautions when working with voltages above 30 Vrms, 42.4 Vpeak, or 60 VDC. These voltage levels pose a potential shock hazard to the user. Do not expose this product to rain or moisture. The meter is intended only for indoor use.

Keep your hands/fingers behind the hand/finger barriers (of the meter and the test probe assembly, where applicable) that indicate the limits of safe access of the hand-held parts during measurements. Inspect lead wires, connectors, and probes for damaged insulation or exposed metal periodically. If any defects are found, replace them immediately. Only use the test probe assembly provided with the meter or a UL Listed test probe assembly to the same meter ratings or better.











This Clamp-on meter is designed to apply around or remove from uninsulated hazardous live conductors. But still, individual protective equipment must be used if hazardous live parts in the installation where measurement is to be carried out could be accessible.

Optional offer premium test probe assembly using silicone lead wire insulation, at agent's discretion, is equipped with white inner insulation layers as wear indicators. Replace them immediately if any of the white layers has become visible. Disconnect the test leads from the test points before changing functions.

All meter models meet IEC/EN/BSEN/CSA_C22.2_No./UL standards of 61010-1 Ed. 3.1 and 61010-2-032 Ed. 4.0 to Measurement Categories CAT IV 1000V ac & dc. The model MW3518 additionally meets CAT III 1500V dc for Photovoltaic Power Generation applications.

The accompanying test probe assembly meets IEC/EN/BSEN/CSA_C22.2_No./UL standards of 61010-031 Ed. 2.0 to the same meter ratings or better. The 61010-031 requires exposed conductive test probe tips to be $\leq 4\text{mm}$ for CAT III & CAT IV ratings. Refer to the category markings on your probe assemblies and the add-on accessories (like detachable Caps or Alligator Clips), if any, for applicable rating changes.

INTERNATIONAL SYMBOLS

	Marking of Electrical and Electronic Equipment (EEE). Do not dispose of this product as unsorted municipal waste. Contact a qualified recycler.
	Refer to the explanation in this Manual
	Possibility of electric shock
	Earth (Ground)
	Meter protected throughout by Double Insulation or Reinforced insulation.
	Fuse
	Direct Current (DC)
	Alternating Current (AC)
	Three-phase Alternating Current
	Application around and removal from hazardous live conductors is permitted.

BRIEF INFORMATION ON MEASUREMENT CATEGORIES

Measurement Category IV is applicable to test and measuring circuits connected at the source of the building's low-voltage MAINS installation. Examples are measurements on devices installed before the main fuse or circuit breaker in the building installation.

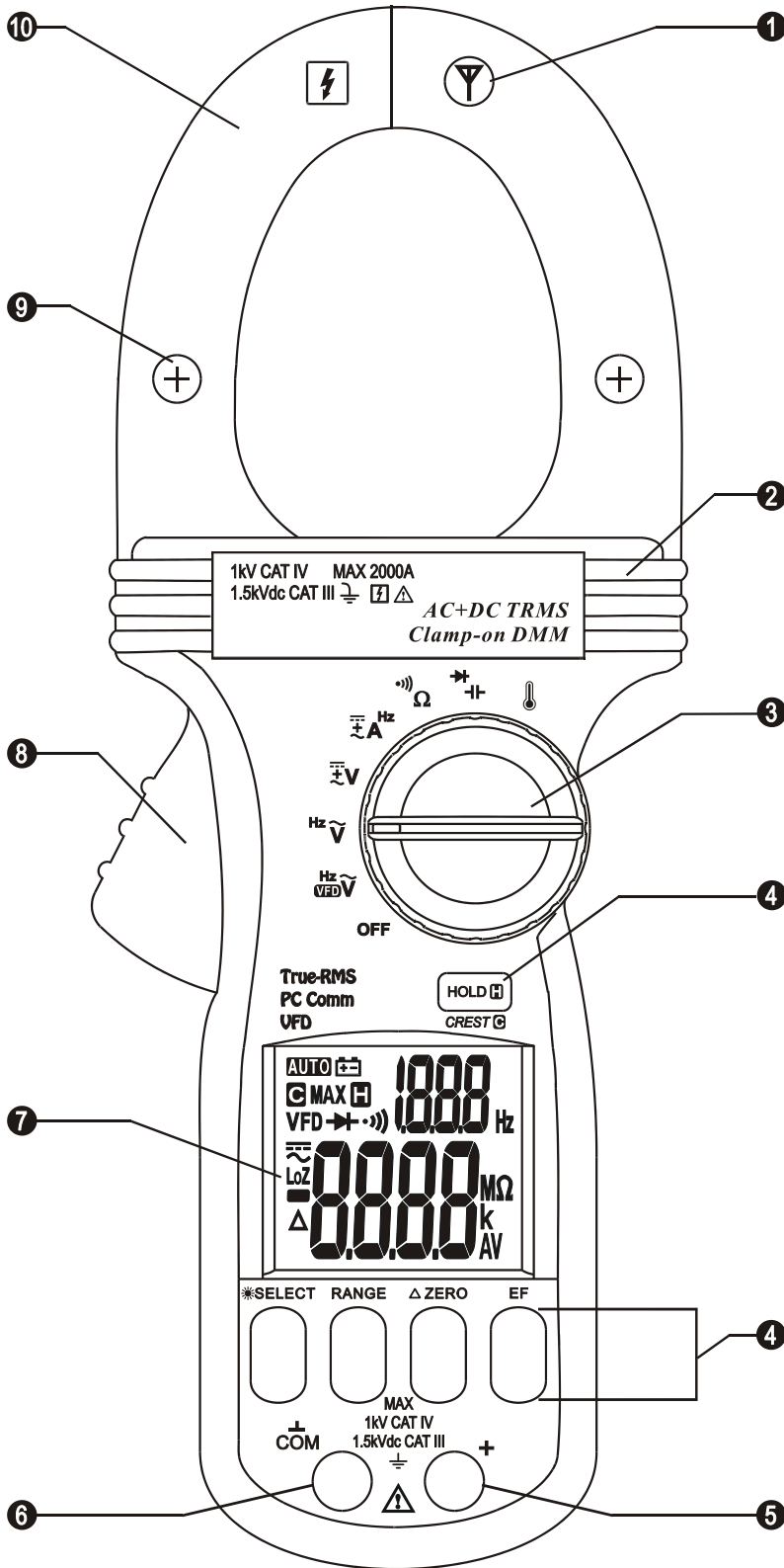
Measurement Category III is applicable to test and measuring circuits connected to the distribution part of the building's low-voltage MAINS installation. Examples are measurements on distribution boards (including secondary meters), circuit-breakers, cables, bus-bars, junction boxes, switches, socket-outlets, stationary motors in the fixed installation, and equipment for industrial use.

Measurement Category II is applicable to test and measuring circuits connected directly to utilization points (socket outlets and similar points) of the low-voltage MAINS installation. Examples are measurements on MAINS CIRCUITS of household appliances, portable tools and similar equipment.

2) EUROPEAN DIRECTIVES AND UK STATUTORY REQUIREMENTS

The instruments conform to EUROPEAN (CE) Low-Voltage Directive 2014/35/EU, Electromagnetic Compatibility Directive 2014/30/EU, and RoHS 2 Directive 2011/65/EU plus amendment Directive (EU) 2015/863. The instruments also conform to the UK (UKCA) Electrical Equipment (Safety) Regulations 2016, Electromagnetic Compatibility Regulations 2016, and The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012.

3) PRODUCT DESCRIPTION



1) Antenna for Non-Contact EF-Detection

2) Hand/Finger Barrier to indicate the limits of safe access of the meter during a measurement

3) Rotary-switch Selector to turn the power ON/OFF and Select a function

4) Push-buttons for special functions & features.

5) Input Jack for all functions EXCEPT non-invasive DCA & ACA current functions

6) Common (Ground reference) Input Jack for all functions EXCEPT non-invasive DCA & ACA current functions

7) 3-5/6 digits 6000 counts & 3-1/2 digits 2000 counts dual numeric LCD display

8) Jaw trigger for opening the clamp jaw

9) Jaw center (& DCA polarity) Indicator, at where best DCA & ACA accuracy is specified

10) Hall-effect Clamp Jaw for AC & DC current magnetic field pick up

4) OPERATION

Note: Before and after hazardous voltage measurements, test the voltage function on a known source such as line voltage to determine proper meter functioning.

VFD-ACV^{Hz} & ACV^{Hz} functions

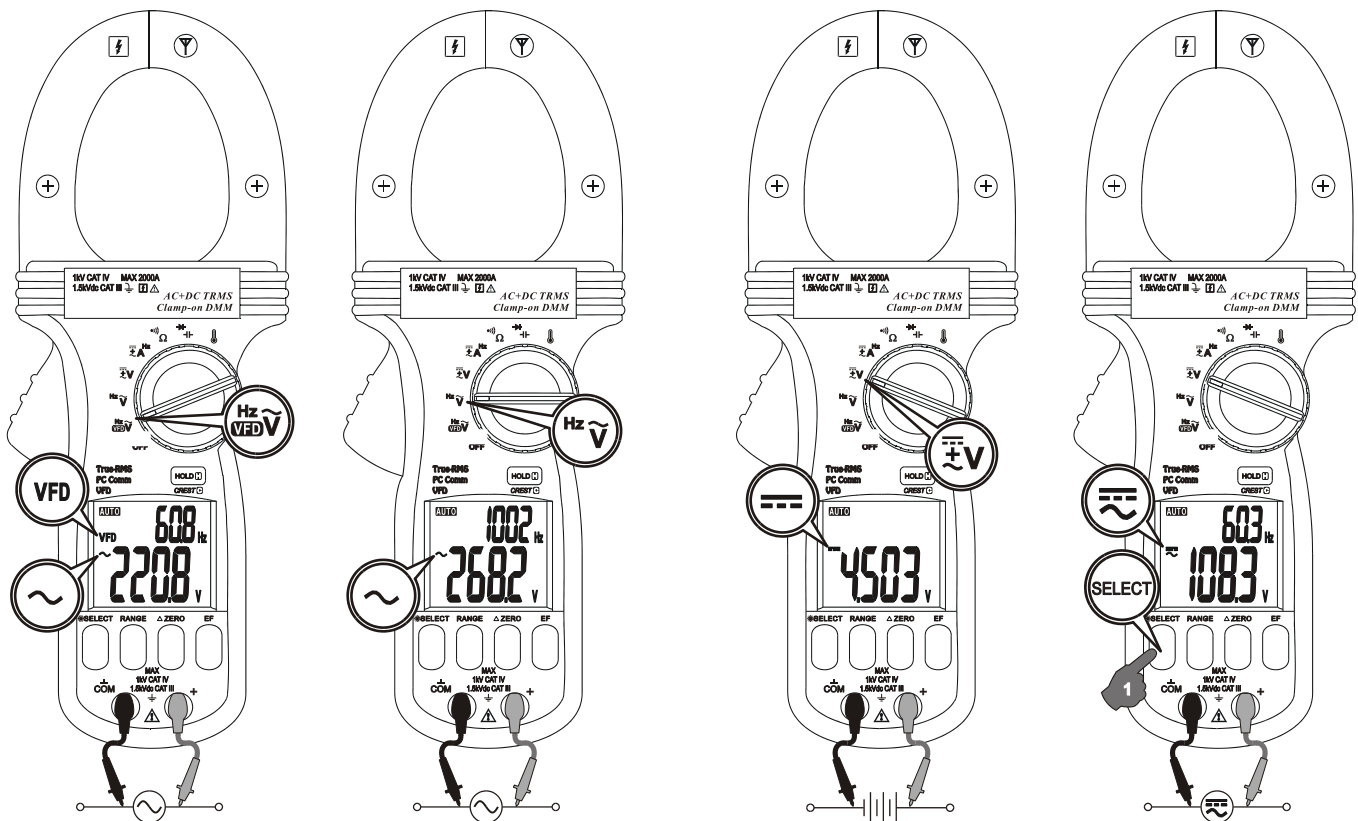
Inputs are made through the test lead terminals.

VFD-ACV^{Hz} function is to deal with VFD (Variable Frequency Device) signals. It, however, further pre-selects the most appropriate voltage ranges and thus the Hz trigger levels to best cope with most VFD-Voltage and VFD-Frequency applications.

Note: The Hz trigger level is determined by the **AC/DC+AC Voltage or Current** function range being in use. Press **RANGE** button to select different function ranges and thus trigger levels manually.

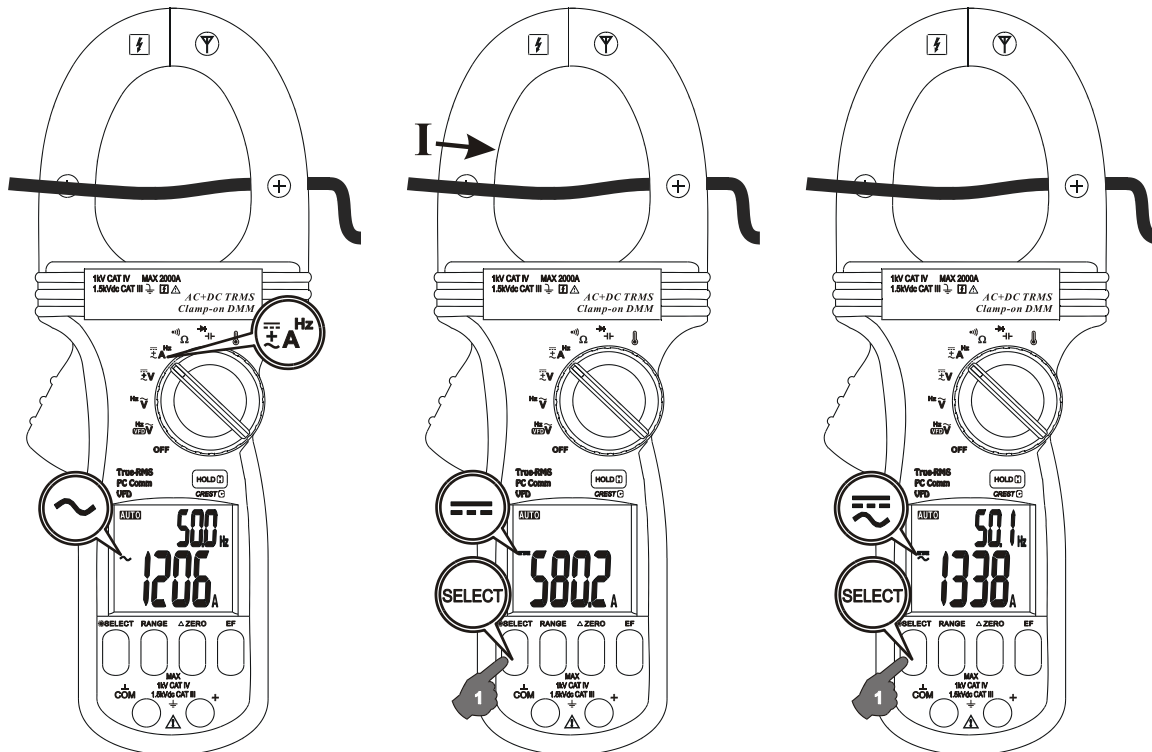
DCV & DC+ACV^{Hz}

Inputs are made through the test lead terminals. Defaults at **DCV** Function. Press **SELECT** button momentarily and release to select **DC+ACV^{Hz}**.



ACA Hz, DCA & DC+ACA Hz

Input is made through the clamp jaws for non-invasive current measurements. Defaults at **ACA Hz** Function. Press **SELECT** button momentarily and release to select the subject functions in sequence.



Note: (Application and removal of the Clamp-on meter)

For non-invasive current measurements, press the jaw trigger and clamp the jaws around conductor(s) of only one single pole of a circuit for load current measurement. Make sure the jaws are completely closed, or else it will introduce measurement errors. Enclosing conductor(s) of more than one pole of a circuit may result in differential current (like identifying leakage current) measurement. Locate the conductor(s) at the Jaws center as much as possible to get the best measuring accuracy. For removal, press the jaw trigger and remove the jaws from the conductor(s).

Adjacent current-carrying devices such as transformers, motors, and conductor wires will affect measurement accuracy. Keep the jaws away from them as much as possible to minimize influence.

Note:

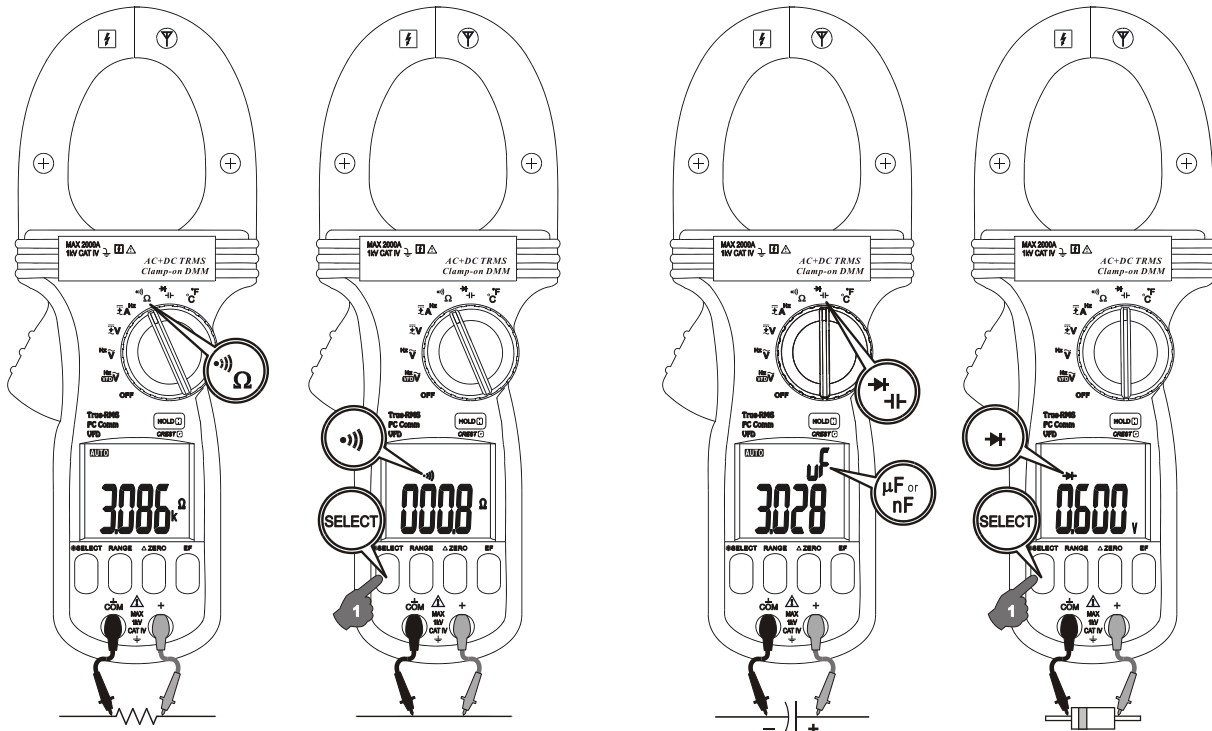
Do not use the meter to measure currents above the rated frequency (400Hz). Circulating currents may cause the magnetic circuits of the Jaws to reach a hazardous temperature.

Ω Resistance & \rightarrow) Continuity functions

Inputs are made through the test lead terminals. Defaults at Ω Resistance. Press **SELECT** button momentarily and release to select \rightarrow) Continuity

\leftarrow) Capacitance & \rightarrow) Diode functions

Inputs are made through the test lead terminals. Defaults at \leftarrow) Capacitance. Press **SELECT** button momentarily and release to select \rightarrow) Diode.



Note:

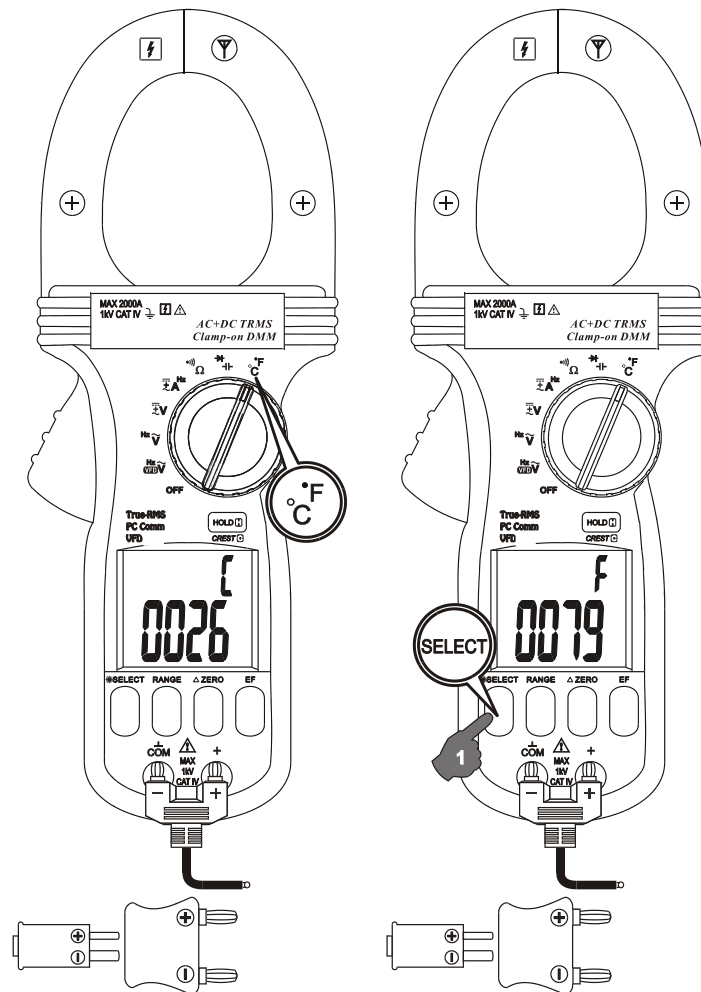
When using Diode test function, normal forward voltage drop (forward-biased) for a good silicon diode is between 0.400V to 0.900V. A reading higher than that indicates a leaky diode (defective). A zero reading indicates a shorted diode (defective). An OL indicates an open diode (defective). Reverse the test leads connections (reverse biased) across the diode. The digital display shows OL if the diode is good. Any other readings indicate the diode is resistive or shorted (defective).

Note:

1. Using Resistance, Continuity, Diode, or Capacitance function in a live circuit will produce false results and may damage the meter. In many cases, the suspected component(s) must be disconnected from the circuit to obtain an accurate measurement reading.
2. When using Capacitance function, discharge capacitor(s) before making any measurements. Large value capacitors should be discharged through an appropriate resistance load.

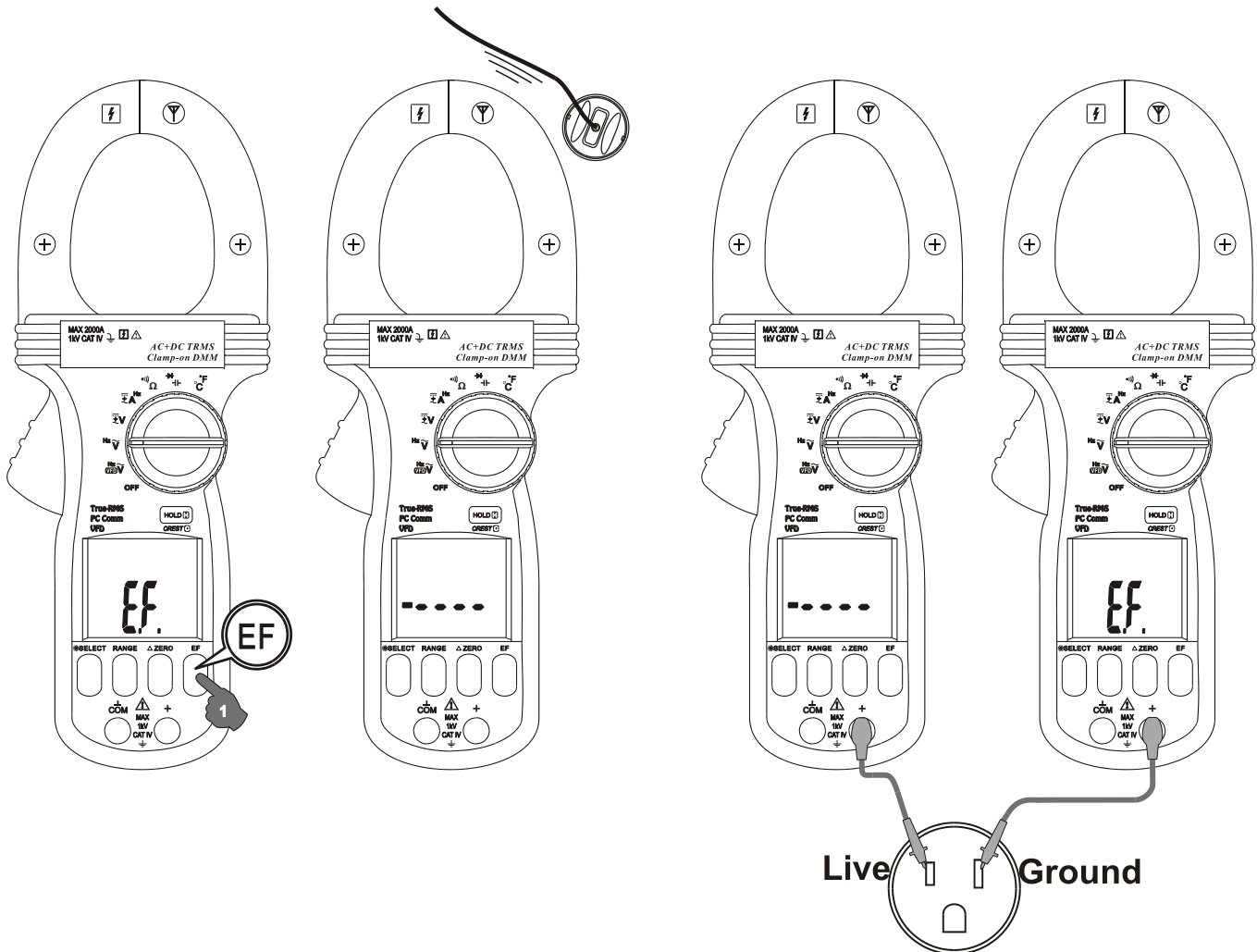
Temperature function

Defaults at °C (Celsius) readings. Press **SELECT** button momentarily and release to select °F (Fahrenheit) readings. Inputs are made through the test lead terminals. Be sure to insert the banana plug type-K temperature bead probe with correct **+** **-** polarities. You can also use a plug adapter ST306 (Optional purchase) with banana pins to a type-K socket to adapt other type-K standard mini-plug temperature probes.



Electric Field EF-Detection

In Voltage or Current function, press the EF button momentarily and release to toggle to EF-Detection feature. The meter displays “E.F.” when it is ready. Signal strength is indicated as a series of bar-graph segments on the display together with variable beep tones.



- **Non-Contact EF-Detection:** An antenna is located along the top-right end of the clamp jaw, which detects the electric field surrounds energized conductors. It is ideal for tracing live wiring connections, locating wiring breakage, and distinguishing between live or earth connections.

- **Probe-Contact EF-Detection:** For a more precise indication of live wires, such as distinguishing between live and ground connections, use the Red (+) test probe for direct contact measurements.

Hold

The hold feature freezes the display for later views. Press the **HOLD** button momentarily and release to toggle the hold feature.

5ms CREST-MAX capture mode

Press **CREST** (HOLD) button for one second or more and release to activate CREST-MAX capture (Instantaneous Peak-Hold) mode to capture signal peaks of voltage or current in duration as short as 5ms. The LCD “**C**” & “**MAX**” turn on. Press again the button momentarily and release can toggle the combination use of the HOLD feature. Press the button for 1 second or more and release to exit CREST-MAX capture mode. Auto-ranging and Auto-Power-Off are disabled automatically in this mode.

Backlight LCD display

Press the **SELECT** button for 1 second or more to toggle the LCD backlight. The backlight will also be turned off automatically after 32 seconds to extend battery life.

Relative-Zero (Δ) mode

Relative-Zero allows the user to offset the meter consecutive measurements with the main display displaying reading as the reference value. Press the **REL** button momentarily and release to toggle Relative-Zero mode.

Manual or Auto-ranging

Press the **RANGE** button momentarily and release to select manual-ranging, and the meter will remain in the range it was in, the LCD **AUTO** turns off. Press the button again to step through the ranges. Press and hold the button for 1 second or more and release to resume auto-ranging.

Note: Manual-ranging feature is not available in **Hz** and **Hz** function ranges.

Set Beeper Off

Press the **RANGE** button while turning the meter on to temporarily disable the Beeper feature. Turn the rotary switch OFF and then back on to resume.

Auto-Power-Off (APO)

The Auto-Power-Off (APO) mode turns the meter off automatically to extend battery life after approximately 34 minutes of no rotary switch or push-button operations. To wake up the meter from APO, press the **SELECT** button momentarily and release or turn the rotary switch OFF and then back on. Always turn the rotary switch to the OFF position when the meter is not in use.

Disabling Auto-Power-Off

Press and hold the **SELECT** button while turning the meter on to temporarily disable

the Auto-Power-Off (APO) feature. Turn the rotary switch OFF and then back on to resume.

5) MAINTENANCE

Note:

To avoid electrical shock, disconnect the meter from any circuit, remove the test leads from the input jacks and turn OFF the meter before opening the case. Do not operate with an open case.

Trouble Shooting

If the instrument fails to operate, check batteries and test leads, etc., and replace as necessary. Double-check operating procedure as described in this user's manual.

If the instrument voltage-resistance input terminal has been subjected to high voltage transient (caused by lightning or switching surge to the system under test) by accident or abnormal conditions of operation, the protective impedance components in series might be blown off (become high impedance) like fuses to protect the user and the instrument. Most measuring functions through this terminal will then be open-circuited. Such components should then be replaced by qualified technicians. Refer to the LIMITED WARRANTY section for obtaining a warranty or repairing service.


Accuracy and Calibration

Accuracy is specified for a period of one year after calibration. Periodic calibration at intervals of one year is recommended to maintain meter accuracy. Refer to the LIMITED WARRANTY section for obtaining calibration, repairing, or warranty service.

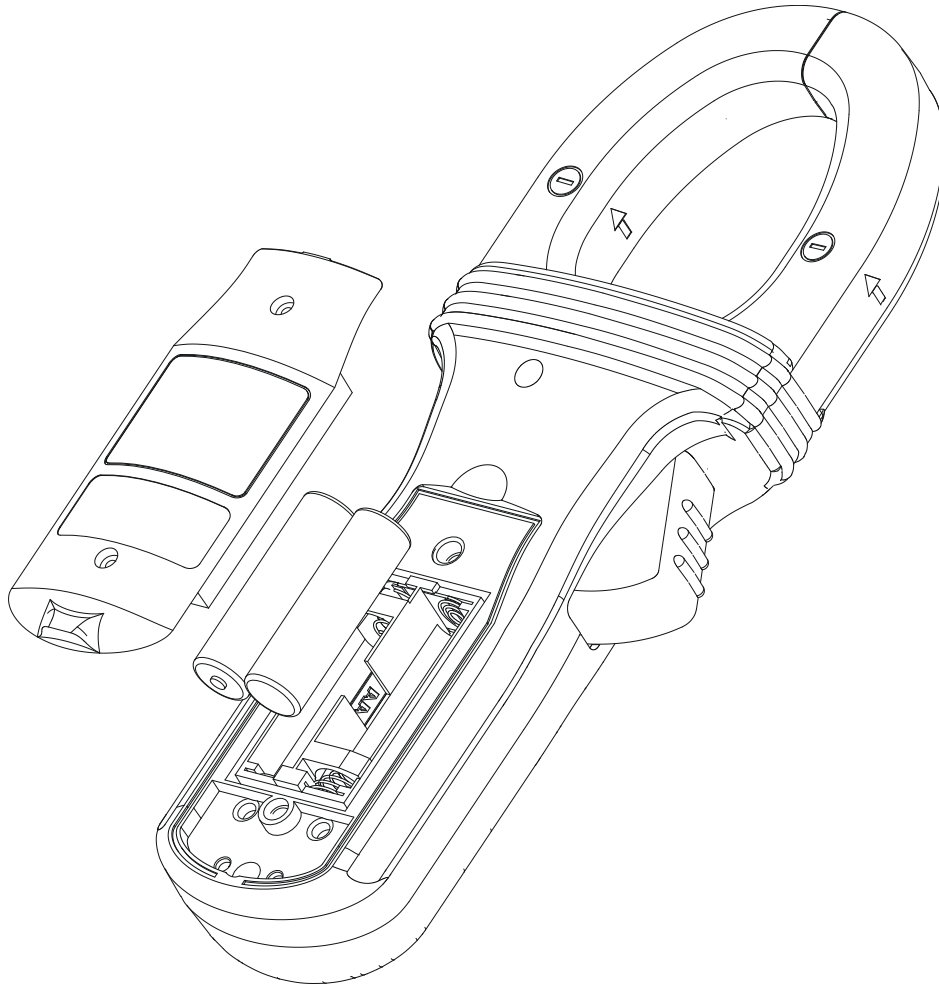
Cleaning and Storage

Periodically wipe the case with a damp cloth and mild detergent; do not use abrasives or solvents. If the meter is not to be used for periods of longer than 60 days, remove the batteries and store them separately.

Battery replacement

When the low battery icon  turns on, the meter accuracy and performance cannot be guaranteed. The meter shuts off accordingly. Replace with new batteries to ensure accuracy. The meter uses standard 1.5V AA Size (IEC LR6) battery X 2

Loosen the 2 captive screws from the battery cover case. Lift the battery cover case. Replace the batteries. Replace the battery cover case. Re-fasten the screws.



GENERAL SPECIFICATIONS

Display: 3-5/6 digits 6000 counts & 3-1/2 digits 1,999 counts for Hz

Polarity: Automatic

Update Rate: 5 per second nominal;

Operating Temperature: 0°C to 40°C

Relative Humidity: Maximum relative humidity 80% for temperature up to 31°C decreasing linearly to 50% relative humidity at 40°C

Pollution degree: 2

Storage Temperature: -20°C to 60°C, < 80% R.H. (with battery removed)

Altitude: Operating below 2000m

Temperature Coefficient: nominal 0.15 x (specified accuracy)/°C @(0°C -- 18°C or 28°C -- 40°C), or otherwise specified

Sensing: True RMS

Safety: The device meets IEC/EN/BSEN/CSA_C22.2_No./UL standards of 61010-1 Ed.

3.1 & 61010-2-032 Ed. 4.0 to Measurement Categories CAT IV 1000V ac & dc. and CAT III 1500Vdc

Transient Protection: 12kV (1.2/50 μ s surge)

Overload Protections:

Clamp-on jaws: 2000A DC/AC rms continuous

Voltage via terminals: 1650Vdc / 1100Vac rms

Other functions via terminals: 1500Vdc / 1000Vac rms

E.M.C.: Meets EN61326-1:2013

In an RF field of 3V/m:


Capacitance function is not specified.

Other function ranges: Total Accuracy = Specified Accuracy + 200 digits

Performance above 3V/m is not specified.

Power Supply: 1.5V AA Size (IEC LR6) battery X 2

Power Consumption: Typical 14mA for Current functions and 5.2mA for others

Low Battery:  Appears at approx. <2.4V where the meter accuracy cannot be guaranteed. The meter shuts off accordingly.

APO Timing: Idle for 34 minutes

APO Consumption: 10 μ A typical

Dimension: L264mm X W97mm X H43mm

Weight: 608 gm

Jaw opening & Conductor diameter: 55mm max

Accessories: Test leads (pair), user's manual, banana plug K-type thermocouple x 1 Soft carrying pouch

Special Features: VFD-V & VFD-Hz; Backlighted LCD 5ms CREST-MAX Capture mode (Peak Hold); Auto-ranging Relative-Zero mode; Display Hold; EF-Detection (NCV);

Electrical Specifications

Accuracy is \pm (% reading digits + number of digits) or otherwise specified, at 23°C \pm 5°C.

True RMS models ACV, DC+ACV, ACA & DC+ACA accuracies are specified from 5 % to 100 % of range or otherwise specified. Maximum Crest Factor < 1.4 : 1 at full scale & < 2.8 : 1 at half scale, and with frequency components fall within the specified frequency bandwidth for non-sinusoidal waveforms.

DC Voltage

RANGE	Accuracy
6.000V, 60.00V, 600.0V & 1000V	0.5%+5d
>1000V ~ 1500V	0.5%+5d

Input Impedance: 10M Ω , 50 pF nominal

AC Voltage

RANGE	Accuracy
50Hz ~ 400Hz	
6.000V, 60.00V, 600.0V & 1000V	1.2% + 5d

Input Impedance: 10M Ω , 50 pF nominal

AC+DC Voltage

RANGE	Accuracy
DC, 50Hz ~ 400Hz	
6.000V, 60.00V, 600.0V & 1000V	1.4% + 7d

Input Impedance: 10M Ω , 50 pF nominal

VFD_ACV (with Low Pass Filter)

RANGE	Accuracy ¹⁾
10Hz ~ 20Hz	
6.000V, 60.00V, 600.0V & 1000V	4%+80d
20Hz ~ 200Hz	
6.000V, 60.00V, 600.0V & 1000V	2%+60d
200Hz - 400Hz ²⁾	
6.000V, 60.00V, 600.0V & 1000V	7%+80d

¹⁾Not specified for fundamental frequency > 400Hz

²⁾Accuracy linearly decreases from 2% + 60d @ 200Hz to 7% + 80d @ 400Hz

CREST-MAX Capture Mode

Accuracy: Specified accuracy plus 250 digits for changes > 5ms in duration

Ohm

RANGE	Accuracy
600.0 Ω , 6.000K Ω , 60.00K Ω	0.5%+5d
600.0K Ω	0.8%+5d
6.000M Ω	1.2%+5d
40.00M Ω	2.3%+5d

Open Circuit Voltage: 0.45VDC typical

Audible Continuity Tester

Audible Threshold: Between 10 Ω and 200 Ω
Response time: 32ms approx.

Capacitance

RANGE	Accuracy ¹⁾
60.00nF, 600.0nF, 6.000 μ F	2.0%+5d
60.00 μ F, 600.0 μ F	3.5%+5d ²⁾
2000 μ F	4.0%+5d ²⁾

¹⁾Accuracies with film capacitor or better

²⁾Temperature Coefficient: 0.25 x (specified accuracy)/ $^{\circ}$ C @ (0 $^{\circ}$ C -- 18 $^{\circ}$ C or 28 $^{\circ}$ C -- 40 $^{\circ}$ C)

Diode Tester

RANGE	Accuracy
1.000V	1.0% + 3d

Test Current: 0.56mA typically

Open Circuit Voltage: < 1.8VDC typically

DCA Current (Clamp on)

RANGE	Accuracy ^{1) 2)}
200.0A	2.0%+5d
0~500A	2.0%+5d
500~2000A	3.0%+5d

¹⁾Induced error from adjacent current-carrying conductor: <0.1A/A

²⁾Specified with Relative Zero Δ mode applied to offset the non-zero residual readings, if any

Temperature

RANGE	Accuracy
-50 $^{\circ}$ C ~ 1000 $^{\circ}$ C	0.3% +4d
-58 $^{\circ}$ F ~ 1832 $^{\circ}$ F	0.3% + 6d

K-type thermocouple range & accuracy not included.

ACA Current (Clamp on)

RANGE	Accuracy ¹⁾
50Hz ~ 60Hz	
200.0A	2.0%+5d
0~500A	2.5%+5d
500~2000A	3.0%+5d
40Hz ~ 50Hz & 60Hz ~ 400Hz	
200.0A	2.5%+5d
0~500A	3.0%+5d
500~1000A	3.5%+5d
1000~2000A	unspecified

True RMS Crest Factor:

< 1.4: 1 at full scale & < 2.8: 1 at half scale

¹⁾Induced error from adjacent current-carrying conductor: < 0.1A/A

DC+ACA Current (Clamp on)

RANGE	Accuracy ^{1) 2)}
DC, 50Hz ~ 60Hz	
200.0A, 2000A	3.0%+8d
40Hz ~ 50Hz & 60Hz ~ 400Hz	
200.0A	3.5%+8d
0~1000A	3.5%+8d
1000~2000A	unspecified

True RMS Crest Factor:

< 1.4: 1 at full scale & < 2.8 : 1 at half scale

¹⁾Induced error from adjacent current-carrying conductor: < 0.1A/A

²⁾Specified with Relative Zero Δ mode applied to offset the non-zero residual readings if any

Hz Line Level Frequency

Function	Sensitivity (Sine RMS)	Range
6V	2V ²⁾	40Hz ~ 1999Hz
60V	20V ²⁾	40Hz ~ 1999Hz
600V	100V ²⁾	40Hz ~ 1999Hz
1000V	600V ³⁾	40Hz ~ 1999Hz
200A	10A ²⁾	20Hz ~ 400Hz
2000A	100A ²⁾	20Hz ~ 400Hz
VFD 6V ¹⁾	0.6V~2.4V ²⁾	10Hz ~ 400Hz
VFD 60V ¹⁾	6~24V ²⁾	10Hz ~ 400Hz
VFD 600V ¹⁾	60V~240V ²⁾	10Hz ~ 400Hz

Accuracy: 0.1%+4d

¹⁾VFD sensitivity linearly decreases from 10% F.S. @ 200Hz to 40% F.S. @ 400Hz

²⁾DC-bias, if any, not more than 50% of Sine RMS

³⁾DC-bias, if any, not more than 100V

Non-Contact EF-Detection

Typical Voltage	Bar-Graph Indication
89V (tolerance: 12V ~ 165V)	-
177V (tolerance: 81V ~ 272V)	---
589V (tolerance: 178V ~ 1000V)	-----

Indication: Bar-graph segments & audible beep tones proportional to the field strength

Detection Frequency: 50/60Hz

Detection Antenna: Top side of the stationary jaw

Probe-Contact EF-Detection: For more precise indications of live wires, such as distinguishing between live and ground connections, use the Red (+) test probe for direct contact measurement.

LIMITED WARRANTY

SEFRAM warrants to the original product purchaser that each product it manufactures will be free from defects in material and workmanship under normal use and service within a period of one year from the date of purchase. SEFRAM's warranty does not apply to accessories, fuses, fusible resistors, spark gaps, batteries, or any product which, in SEFRAM's opinion, has been misused, altered, neglected, or damaged by an accident or abnormal condition of operation or handling.

To obtain warranty service, contact your nearest SEFRAM authorized agent or send the product, with proof of purchase and description of the difficulty, postage and insurance prepaid, to SEFRAM INSTRUMENTS. SEFRAM assumes no risk for damage in transit. SEFRAM will, at its option, repair or replace the defective product free of charge. However, if SEFRAM determines that the failure was caused by misused, altered, neglected, or damaged by an accident or abnormal condition of operation or handling, you will be billed for the repair.

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The logo for Sefram, featuring the word "Sefram" in white lowercase letters on a red rectangular background.

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