



Manual

Elma BM789 True RMS multimeter

English

EAN: 5706445410439



English

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.

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.

The meter meets IEC/EN/CSA_C22.2_No./UL standards of 61010-1 Ed. 3.0, 61010-2-030 Ed. 1.0, 61010-2-033 Ed. 1.0 to Measurement Categories CAT III 1000V and CAT IV 600V ac & dc.

The accompanied test probe assembly meets IEC/EN/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 as well as on 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.

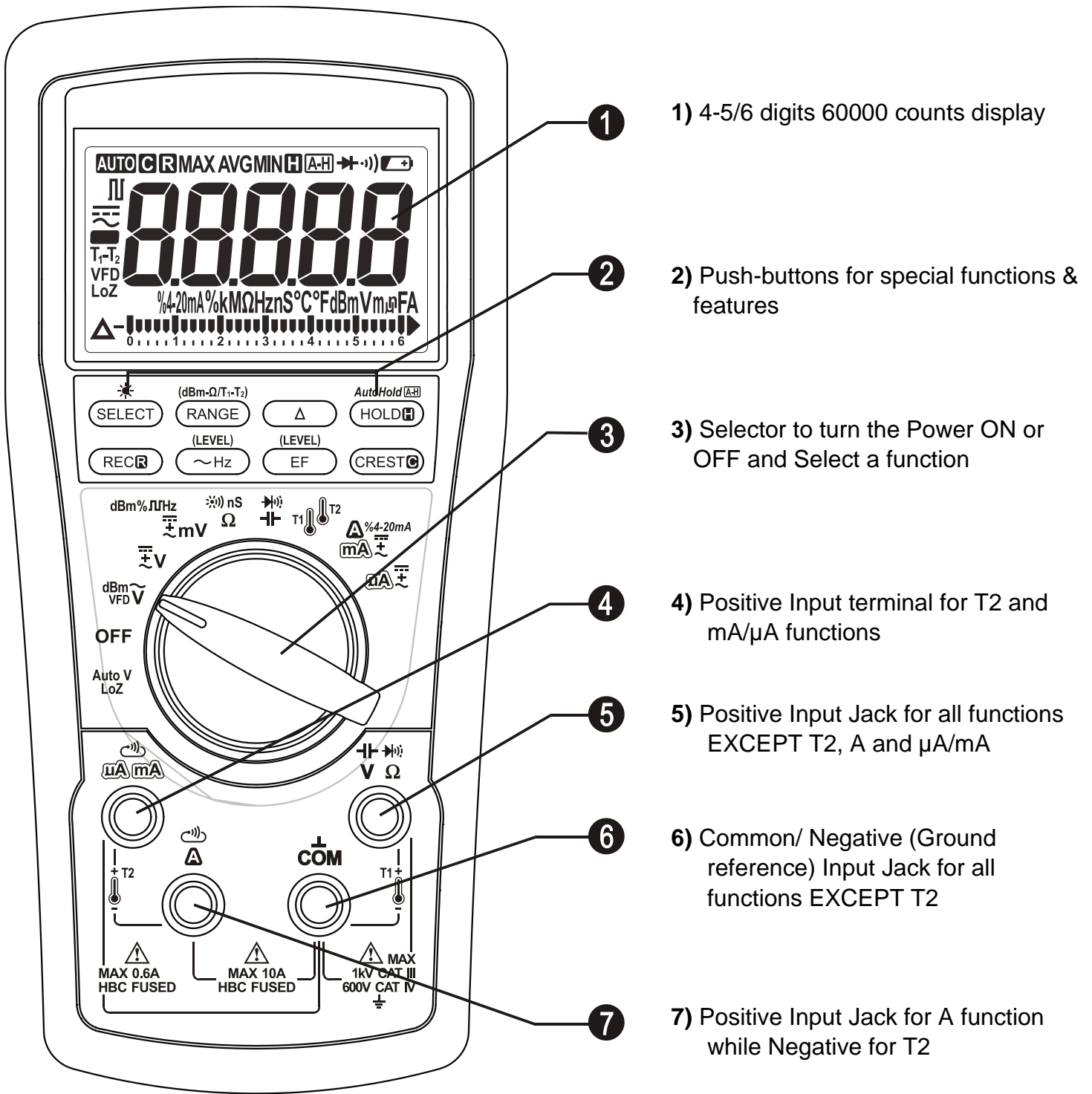
Measurement Category III is applicable to test and measuring circuits connected to the distribution part of the building's low-voltage MAINS installation. Examples are measurements on distribution boards (including secondary meters), circuit-breakers, cables, busbars, junction boxes, switches, socket-outlets, 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.

EUROPEAN DIRECTIVES

The instruments conform to EUROPEAN 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.

PRODUCT DESCRIPTION



Analog bar-graph

The analog bar graph provides a visual indication of measurement like a traditional analog meter needle. It is excellent in detecting faulty contacts, identifying potentiometer clicks, and indicating signal spikes during adjustments.

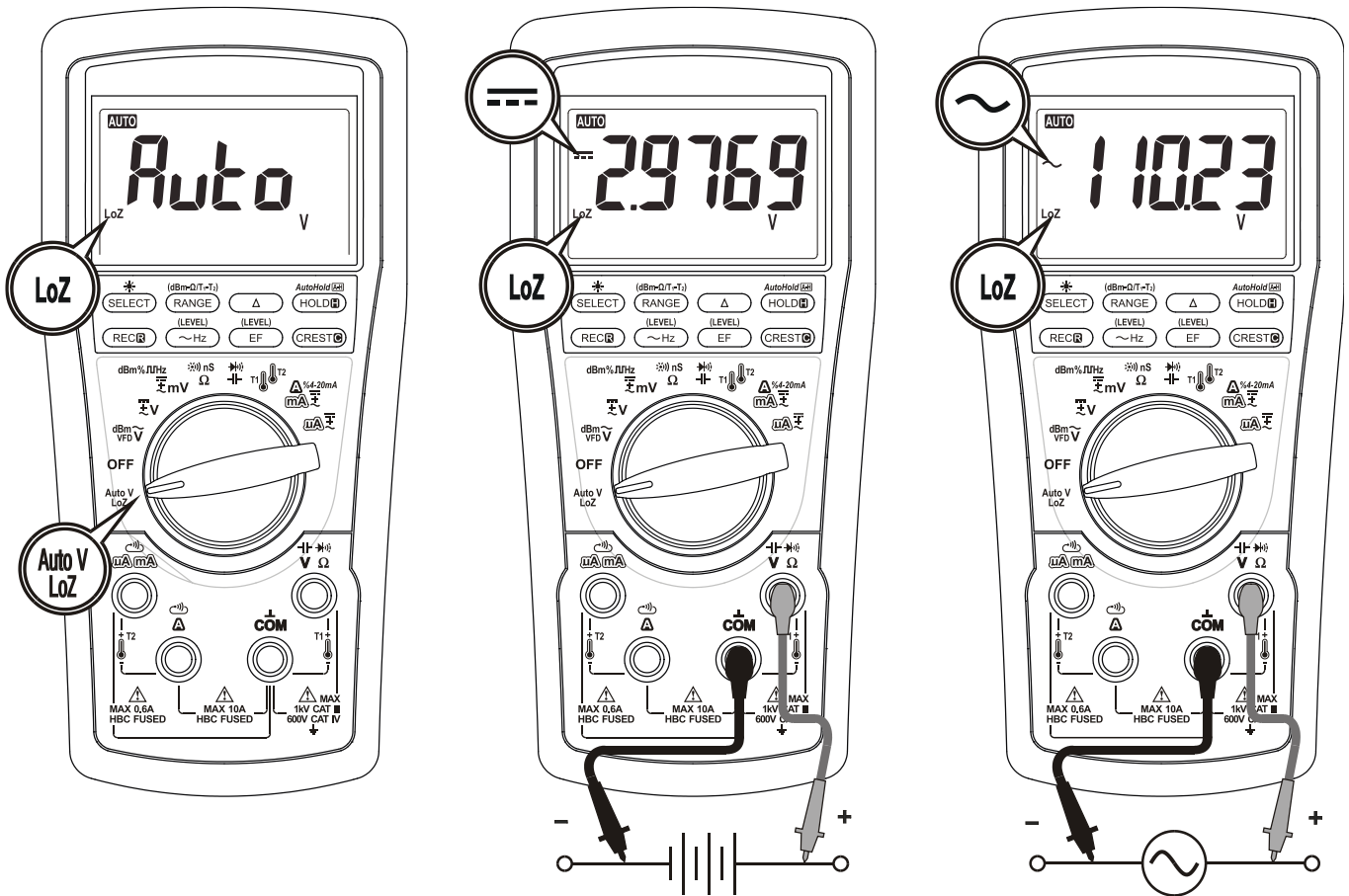
OPERATION

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

AutoV (LoZ)

Inputs are made via the test lead terminals **V-COM**. AutoV automatically selects measurement function of DCV or ACV based on their input levels via the test leads. The input also provides a low ramp-up impedance (LoZ) to drain ghost voltages.

- ⊙ With no input, the meter displays “Auto” when it is ready.
- ⊙ When a signal above the voltage threshold of 1V DC or AC up to the rated 1000V is present, the meter displays the voltage value in appropriate DC or AC, whichever larger in peak magnitude.
- ⊙ Push-button features of only **HOLD**, **AutoHold**, **EF** and **Backlight** are available in **AutoV** mode.



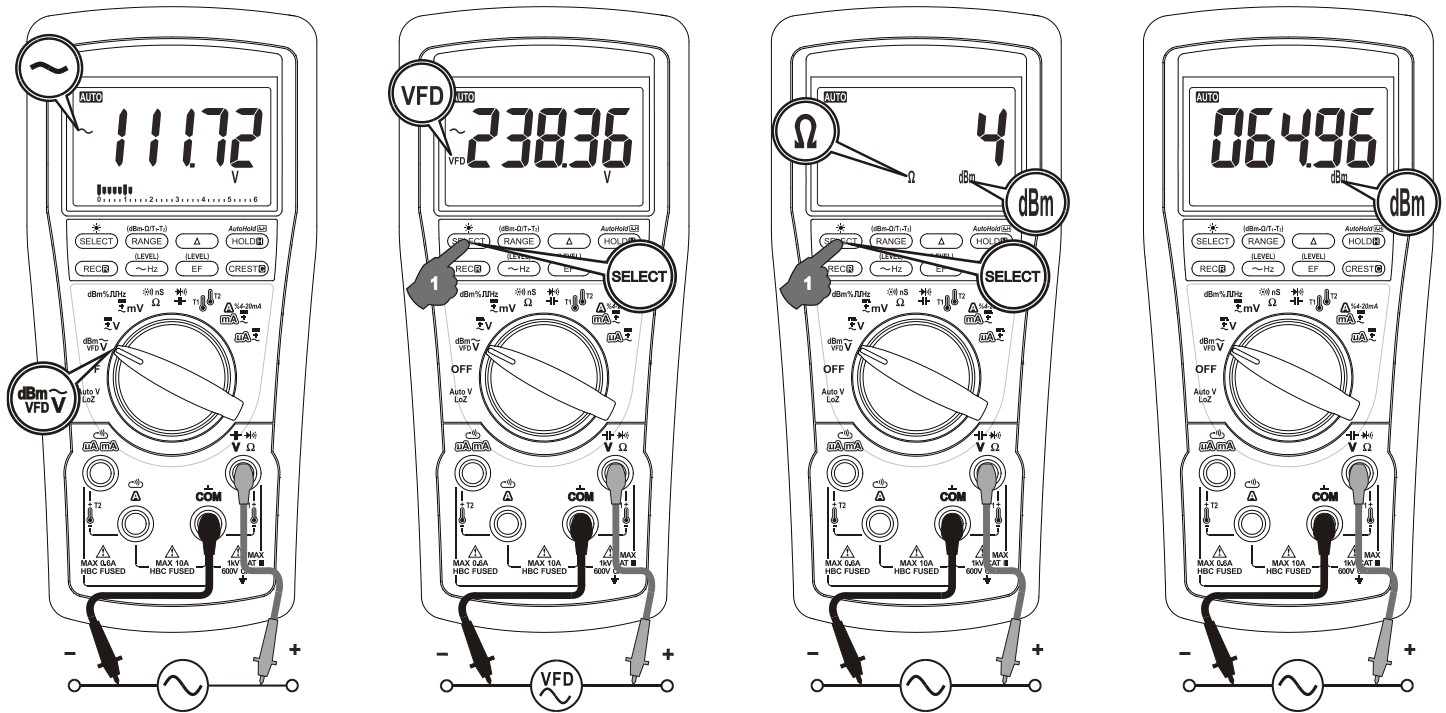
Note:

1) Ghost-voltage Buster: Ghost-voltages are unwanted stray signals coupled from adjacent hard signals, which confuse common multimeter voltage measurements. The AutoV mode provides low (ramp-up) input impedance (approx. 2.1kΩ at low voltage) to drain ghost voltages leaving mainly hard signal values on meter readings. It is an invaluable feature for precise indication of hard signals, such as distinguishing between hot and open wires (to ground) in electrical installation applications.

2) AutoV Mode input impedance increases abruptly from initial 2.1kΩ to a few hundred kΩ's on high voltage hard signals. “LoZ” displays on the LCD to remind the users of being in such a low impedance mode. Peak initial load current, while probing 1000VAC for example, can be up to 673mA (1000V x 1.414 / 2.1kΩ), decreasing abruptly to approx. 2.1mA (1000V x 1.414 / 670kΩ) within a fraction of a second. Do not use AutoV mode on circuits that could be damaged by such low input impedance. Instead, use rotary selector \tilde{V} or \bar{V} high input impedance voltage modes to minimize the test loadings for such circuits.

ACV; VFD-ACV; dBm

Inputs are made via the test lead terminals **V-COM**. Press the **SELECT** button momentarily to select the subject functions in sequence. Last selection will be saved as power up default for repeat measurement convenience.



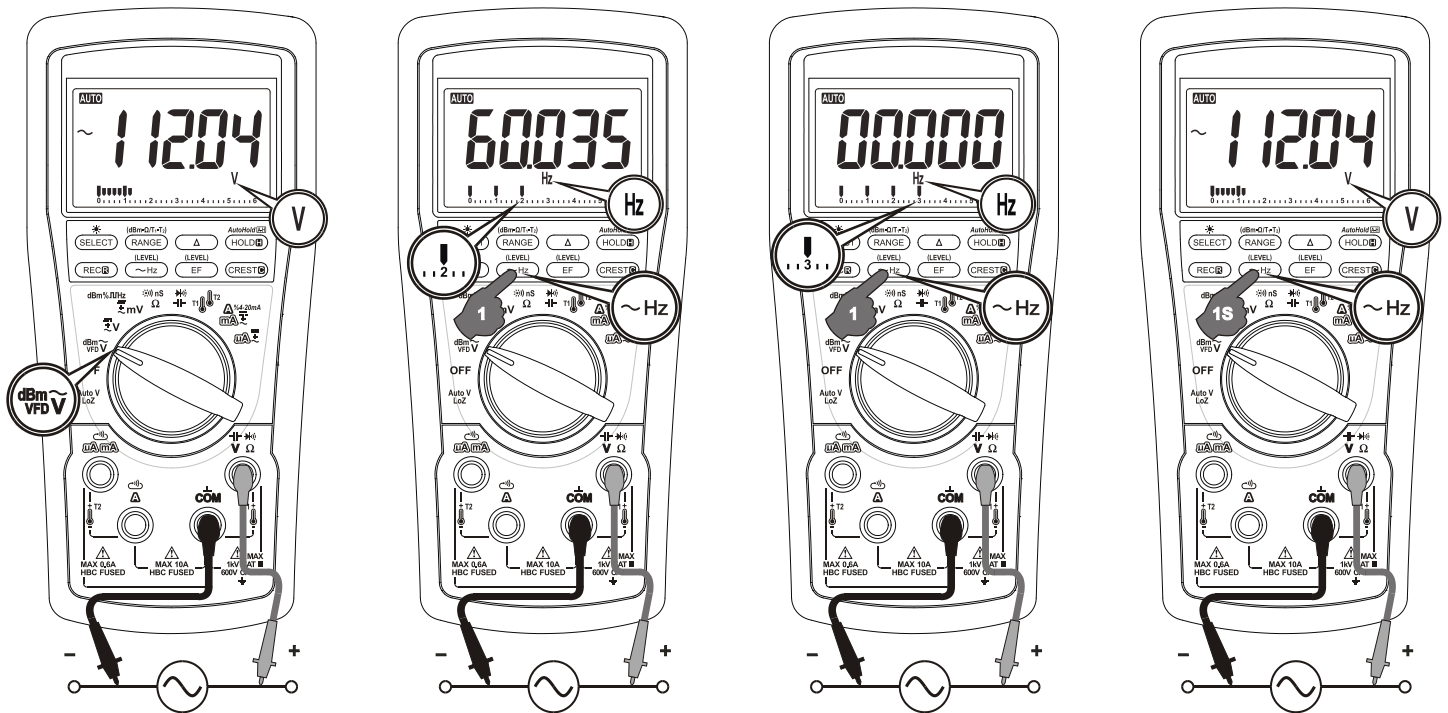
Note: In **dBm** function, power up default reference impedance will be displayed for 1 second before displaying the dBm readings. Press **dBm-Ω (RANGE)** button momentarily to select different reference impedance of 4, 8, 16, 32, 50, 75, 93, 110, 125, 135, 150, 200, 250, 300, 500, 600, 800, 900, 1000, up to 1200Ω. Last selection will be saved as power up default for repeat measurement convenience.

~Hz Line Frequency

Press the ~Hz button momentarily to switch to Line Frequency function. It is only available to the functions as in the table below. Input sensitivity varies automatically with the function range selected while the ~Hz function is being activated. Level 0 is the highest sensitivity while LEVEL 3 is the lowest. Press momentarily the ~Hz (LEVEL) button can manually select the available Trigger Levels (see table below) in sequence.

Press the ~Hz button for one-second-or-more to leave Line Frequency function.

TRIGGER	ACV/dBm/DCV/AC+DCV	VFD-ACV	μ A	mA	A
LEVEL 0	6V		600 μ A	60mA	6A
LEVEL 1	60V		6000 μ A	600mA	10A
LEVEL 2	600V	600V			
LEVEL 3	1000V	1000V			

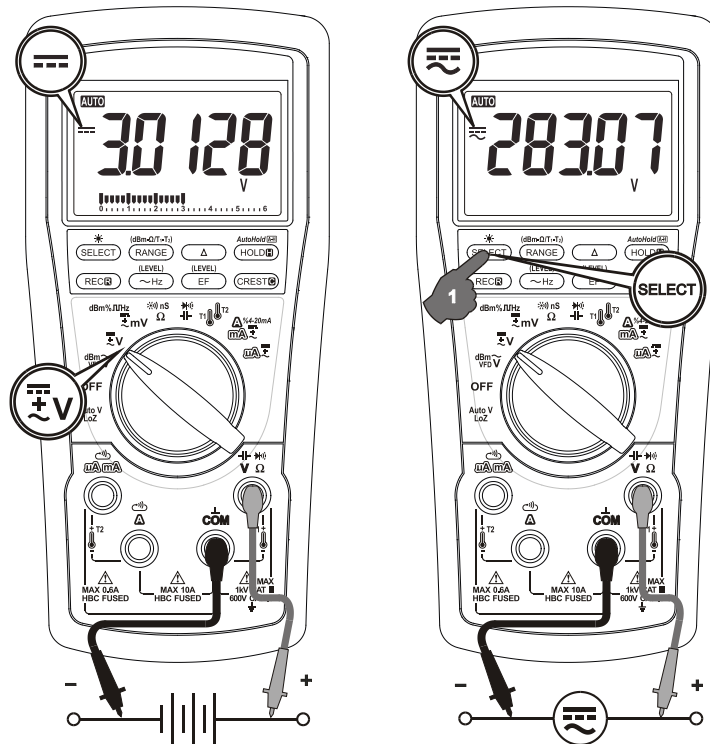


Note: It is recommended to direct measure the signals (voltage or current) in auto-ranging mode before activating the ~Hz function right in that range to get the most appropriate trigger level automatically. If the ~Hz reading is unstable, select lower sensitivity to avoid possible electrical noises. If the reading shows zero, select higher sensitivity to measure.

DCV; DC+ACV

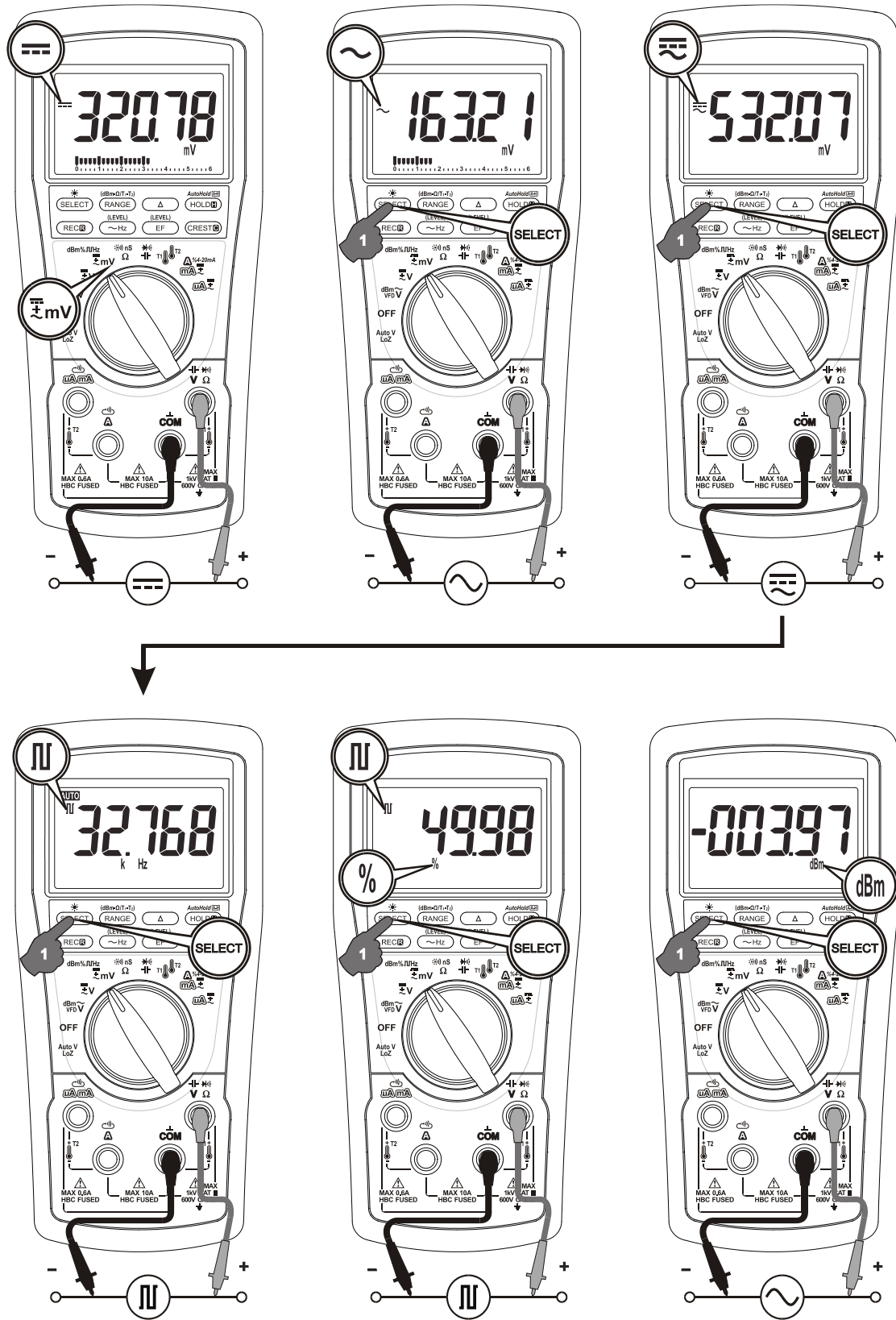
Inputs are made via the test lead terminals **V-COM**. Press the **SELECT** button momentarily to select the subject functions in sequence.

Last selection will be saved as power up default for repeat measurement convenience.



DCmV; ACmV; DC+ACmV; Logic-level Hz; Logic-level Duty %; dBm

Inputs are made via the test lead terminals **V-COM**. Press the **SELECT** button momentarily to select the subject functions in sequence. Last selection will be saved as power up default for repeat measurement convenience.

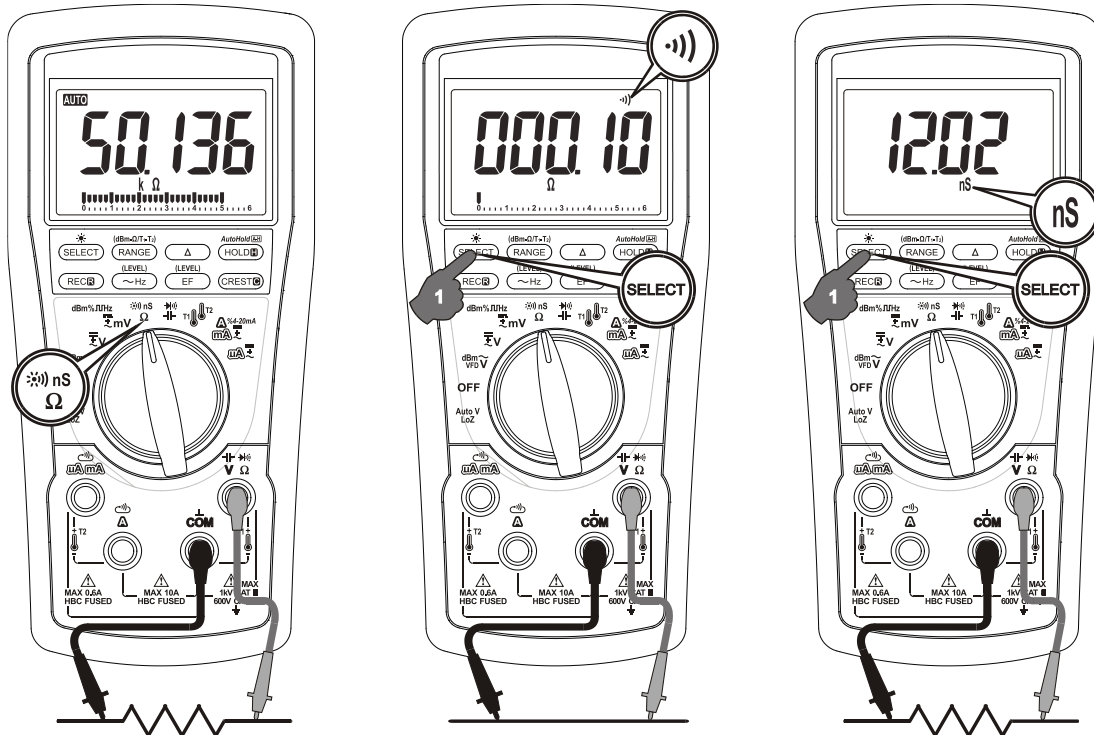


Note: In dBm function, power up default reference impedance will be displayed for 1 second before displaying the dBm readings. Press **dBm-Ω (RANGE)** button momentary to select different reference impedance of 4, 8, 16, 32, 50, 75, 93, 110, 125, 135, 150, 200, 250, 300, 500, 600, 800, 900, 1000, up to 1200Ω. Last selection will be saved as power up default for repeat measurement convenience.

Ω Resistance; 📢) BeepLit™ Continuity; nS Conductance

Inputs are made via the test lead terminals **V-COM**. Press the **SELECT** button momentarily to select the subject functions in sequence.

Last selection will be saved as power up default for repeat measurement convenience.



📢) BeepLit™ Continuity

This function is having improved convenience for checking wiring connections and operation of switches. Resistance threshold is being used. A continuous beep tone together with display backlight flashing indicate a complete wire. Such audible and visible indications improve continuity readabilities in noisy working environments.

nS Conductance

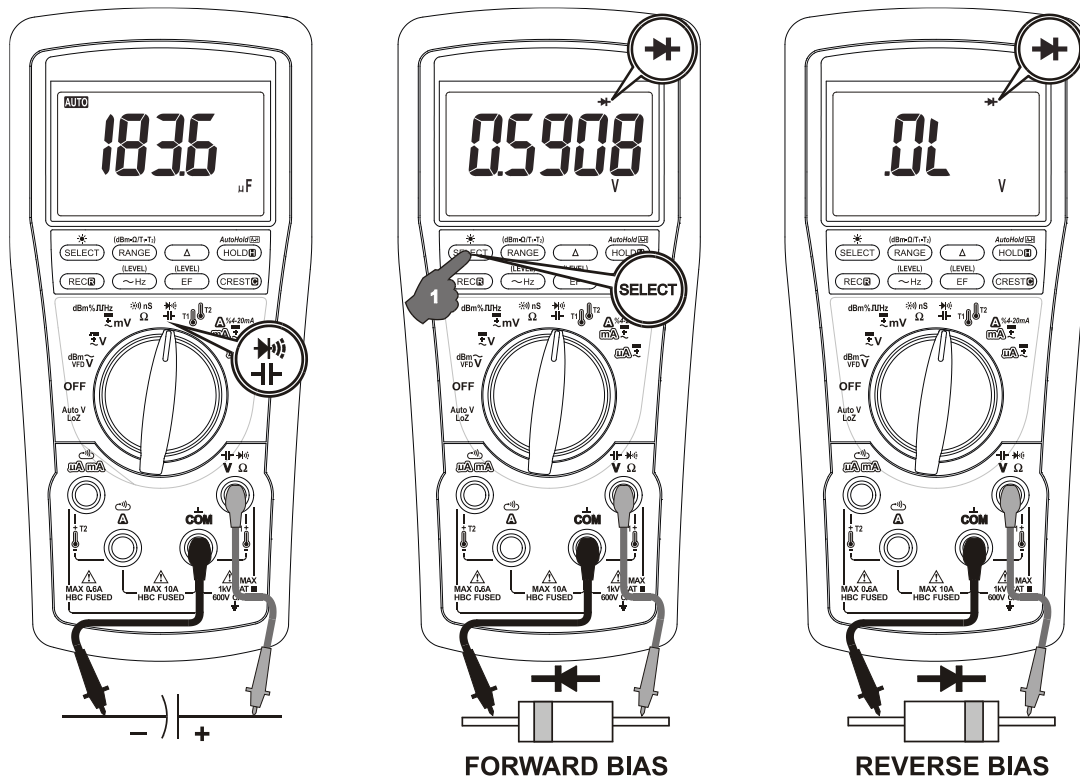
nS Conductance is the inverse of Resistance. That is, $S=1/\Omega$ or $nS=1/G\Omega$. It virtually extends the Resistance measurements to the order of Giga-Ohms for leakage measurements.

Note: Using **Resistance**, **BeepLit™ Continuity** or **nS Conductance** 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.

⚡ Capacitance; 🔊 BeepLit™ Diode

Inputs are made via the test lead terminals **V-COM**. Press the **SELECT** button momentarily to select the subject functions in sequence.

Last selection will be saved as power up default for repeat measurement convenience.



🔊 BeepLit™ Diode

● **Reading indication:** Forward voltage drop (forward biased) for a good silicon diode is between 0.400V to 0.900V. A higher reading indicates a leaky diode (defective). A zero reading indicates a shorted diode (defective). An over-range display indicates an open diode (defective). Reverse the test leads connections (reverse biased) across the diode. The digital display shows over-range if the diode is good. Any other readings indicate the diode is resistive or shorted (defective).

● **Beep-Alert & BeepLit™ indication:** When the display reading drops across 0.850V, the meter alerts a short beep to signal a reasonable forward voltage drop of common diodes. However, if the reading further drops below 0.100V, the meter gives a continuous beep tone together with flashing display backlight to indicate a shorted diode or a complete wire. It is similar to that of BeepLit™ Continuity function but BeepLit™ Diode, instead, is based on voltage threshold to indicate a complete wire.

Note:

1) Discharge capacitor(s) before making capacitance measurements. Large value capacitors should be discharged through an appropriate resistance load.

2) Using BeepLit™ 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.

Temperature T1 & T2

T1 inputs are made via the input terminals **V-COM**. Press **SELECT** button momentarily can toggle between °C (Celsius) and °F (Fahrenheit) readings when enabled.

Last selection will be saved as power up default for repeat measurement convenience.

Additional T2 inputs are made via the input terminals **uA mA A**.

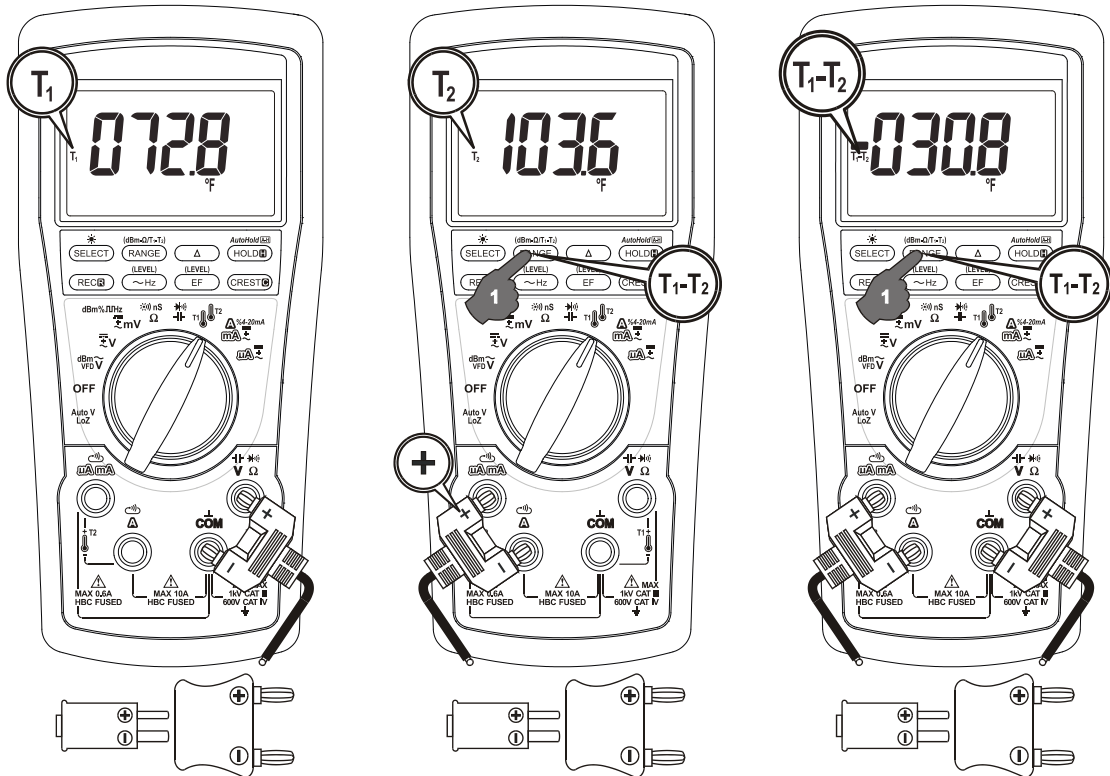
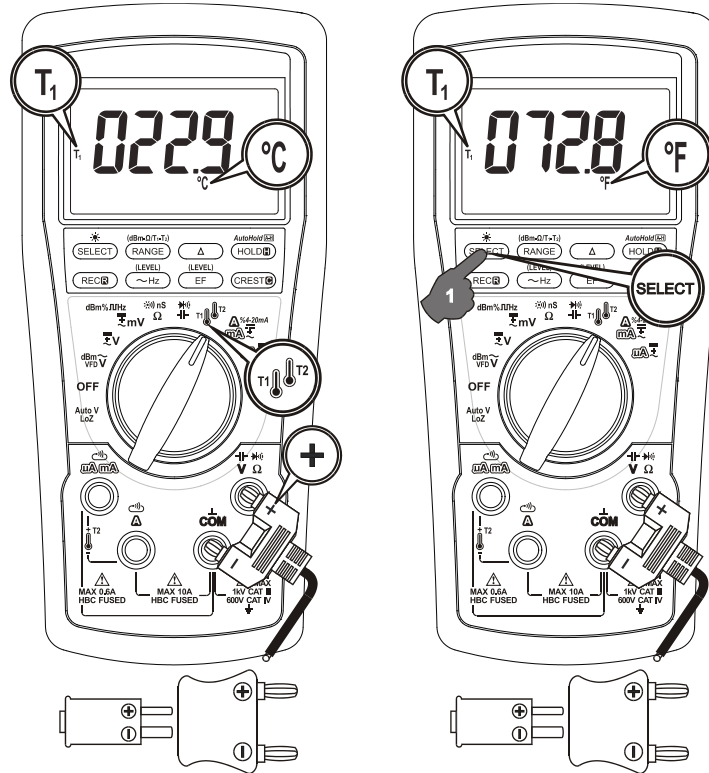
Press **RANGE** (T1-T2) button momentarily to select T1, T2 and T1-T2 in sequence.

Enabling °F and/or °C readings

- 1) **Enabling both °F and °C readings:** Press-and-hold **EF** button to power on the meter.
The meter displays "C-F" to acknowledge both °F and °C readings are enabled.
- 2) **Enabling °C readings only:** Repeat step #1 when needed.
Turn on the meter to temperature function.
Select readings in °C and then turn the meter off.
Press-and-hold **CREST** button to power on the meter again.
The meter displays "C" to acknowledge °C readings only is enabled.
- 3) **Enabling °F readings only:** Repeat step #1 when needed.
Turn on the meter to temperature function.
Select readings in °F and then turn the meter off.
Press-and-hold **CREST** button to power on the meter again.
The meter displays "F" to acknowledge °F readings only is enabled.

Note:

- 1) *Temperature accuracies assume meter interior has the same temperature (isothermal stage) of the ambient for a correct junction voltage compensation.
Allow the meter and the type-K probe set to reach isothermal stage for a significant change of ambient temperature. It can take up to an hour for changes > 5°C.*
- 2) Beware +/- polarities of the banana-plug when using the type-K temperature bead-probe.
- 3) Banana-pins to type-K socket adapter can be used to adapt other type-K probes with standard miniature plugs. However, the adapter becomes part of the measurement isothermal block when in use and should be included in the overall isothermal considerations to minimize erratic readings.

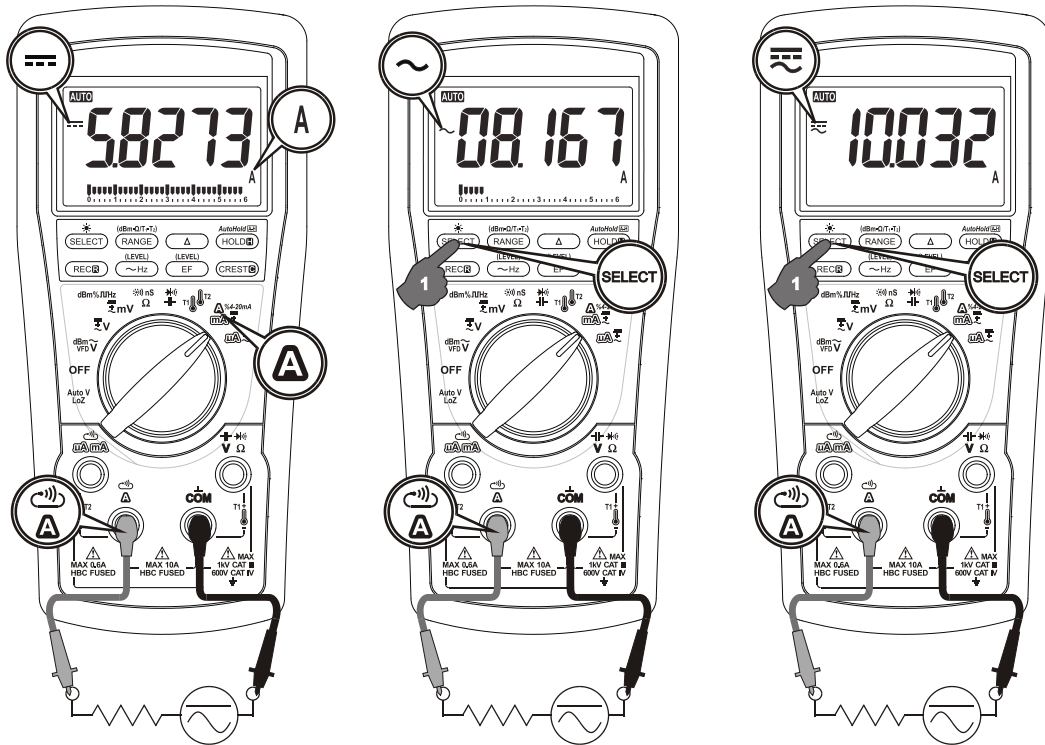


A Current

Inputs are made via the input terminals **A-COM**.

Press the **SELECT** button momentarily to select **DC, AC, DC+AC** in sequence.

Last selection will be saved as power up default for repeat measurement convenience of all current functions.

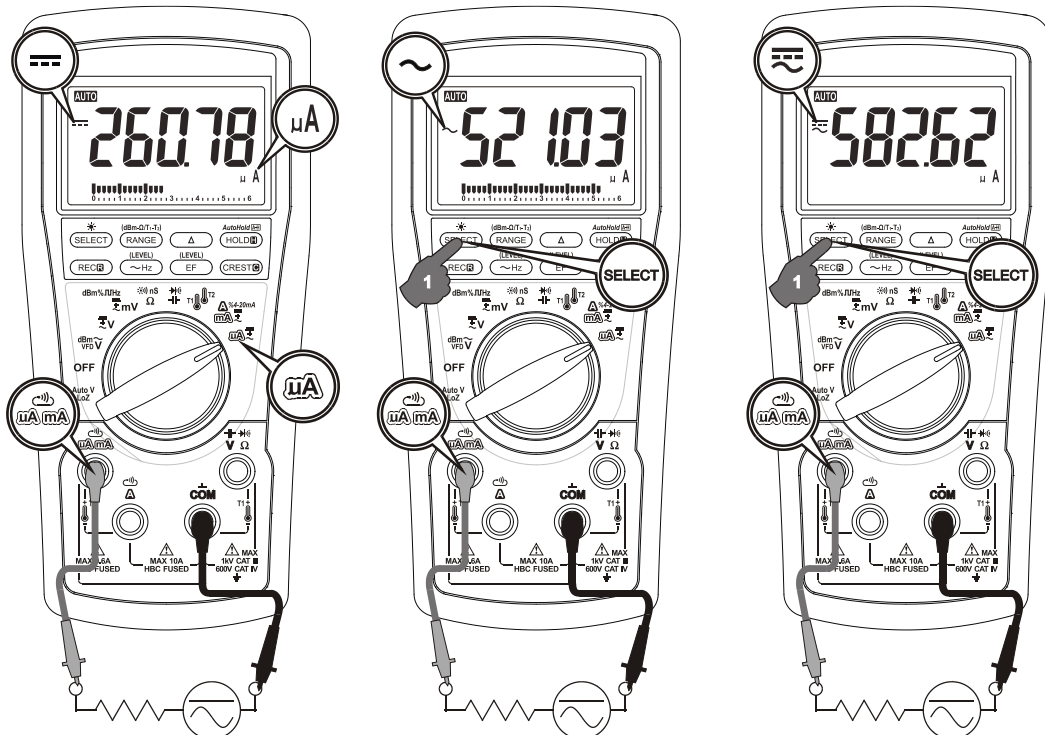


µA Current

Inputs are made via the input terminals **µA mA-COM**.

Press the **SELECT** button momentarily to select **DC, AC, DC+AC** in sequence.

Last selection will be saved as power up default for repeat measurement convenience of all current functions.

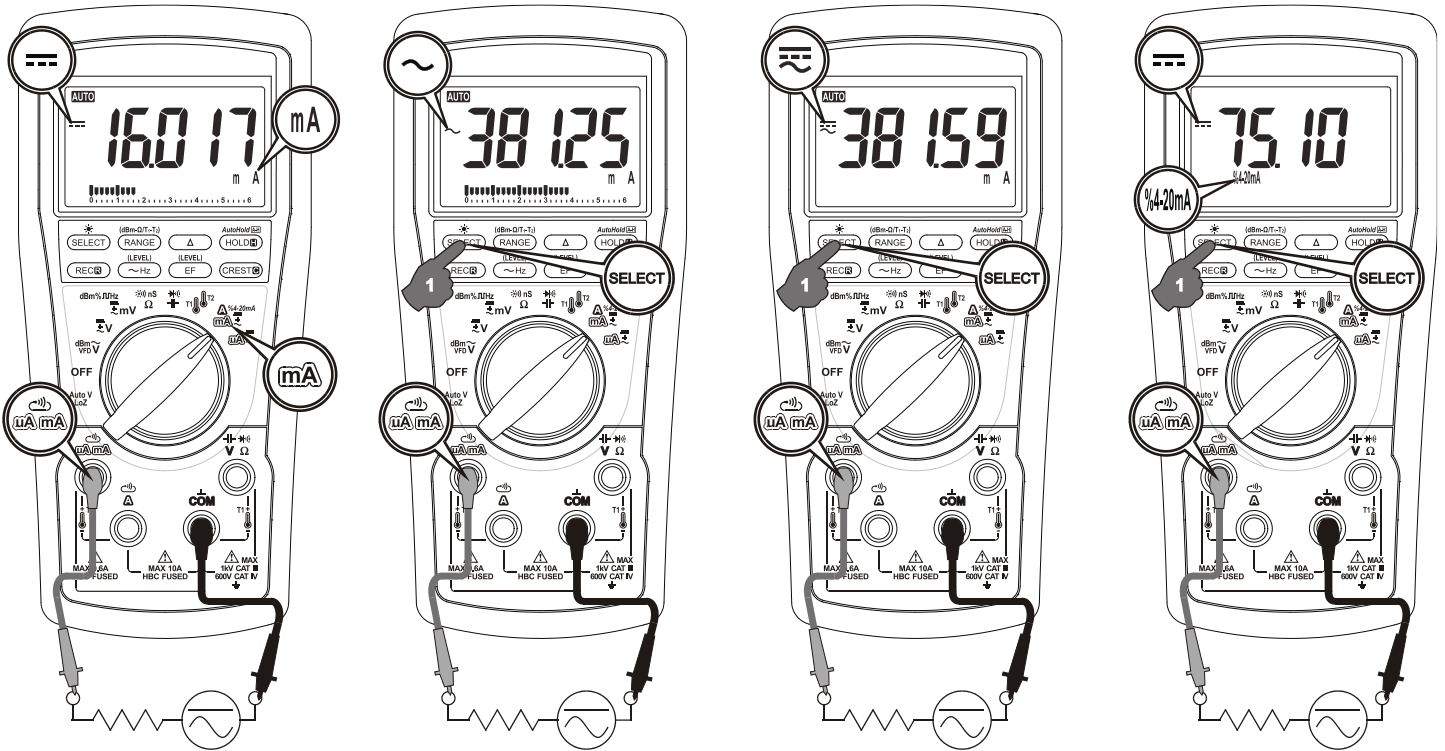


mA Current

Inputs are made via the input terminals **uA mA-COM**.

Press the **SELECT** button momentarily to select **DC**, **AC**, **DC+AC** and **%4-20mA** in sequence.

Last selection will be saved as power up default for repeat measurement convenience of all current functions.



EF-Detection of Electric Field

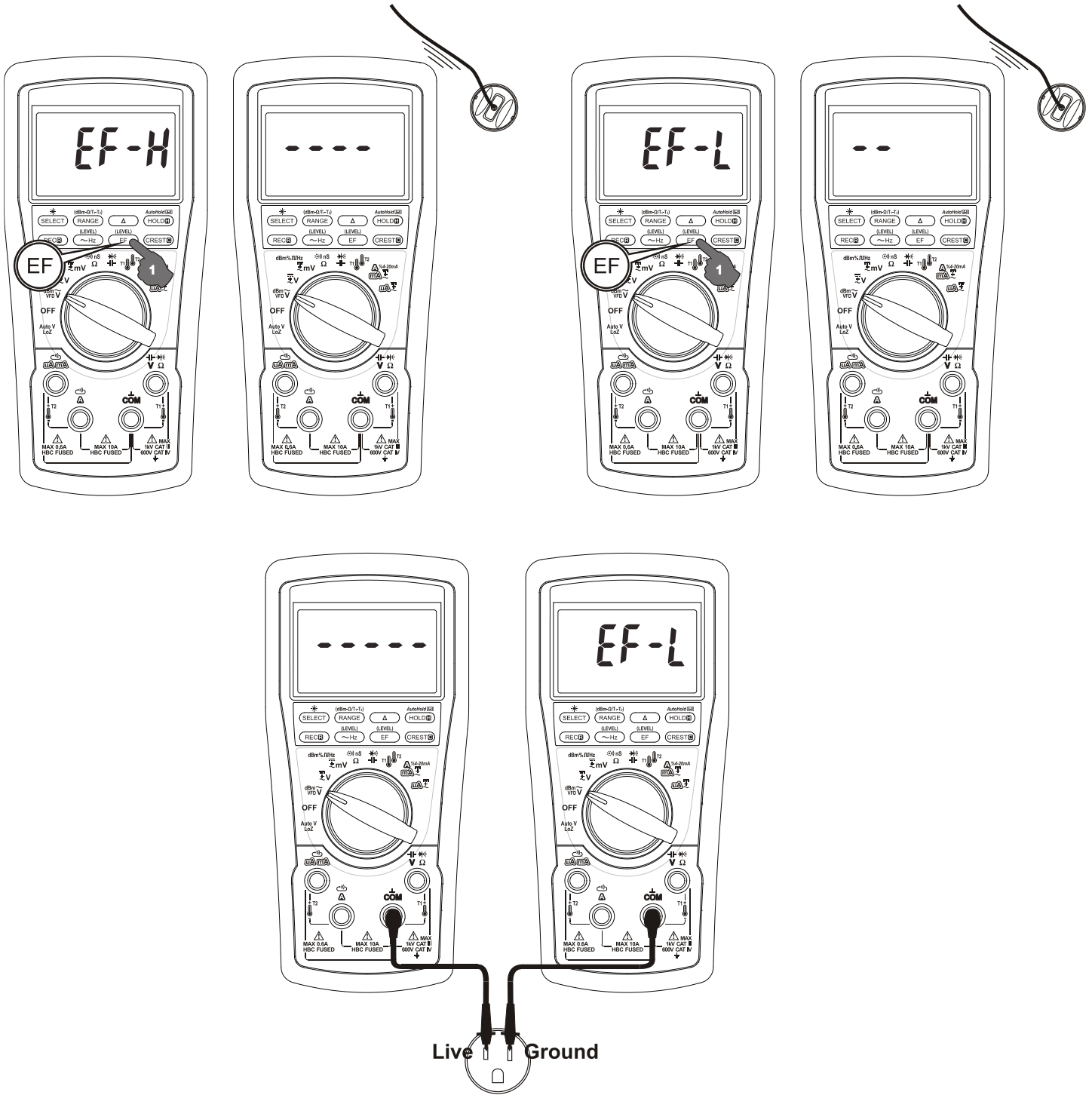
Press **EF** button momentarily to enter **EF-Detection** function. Defaults at high sensitivity **EF-H**.

The meter displays “**EF-H**” when it is ready. If it is too sensitive for your applications, press **EF** button momentarily to select lower sensitivity “**EF-L**”. The detected Electric Field strength is indicated as a series of bar-graph segments on the display plus variable beep tones.

Press **EF** button for one-second-or-more to exit **EF-Detection** function.

© **Non-Contact EF-Detection (NCV):** An antenna is located along the top-right corner which detects the electric field surrounding energized conductors. It is ideal for tracing live wiring connections, locating wiring breakages and to distinguish between live and earth connections.

© **Probe-Contact EF-Detection (Single-pole):** For more precise indication of live wires, such as distinguishing between Live and Ground connections, use one single test-probe to test via terminal **COM** for direct metal contact probing to achieve the most distinctive indications.



LCD Backlight

Press the **SELECT** button for one-second-or-more to toggle the LCD backlight.

The LCD backlight goes off automatically after idling for approximately **16** minutes to extend battery life.

Manual or Auto-ranging

For most auto-ranging functions (LCD "AUTO" turns on by default), press the **RANGE** button momentarily to override and select manual-ranging. The meter will remain in the range it was in, the LCD "AUTO" turns off. Press the button momentarily again to select the next range. Press **RANGE** button for one-second-or-more to resume auto-ranging.

Note: Manual-ranging feature is not available to the **Auto-V, dBm, Capacitance & Hz functions**.

HOLD

HOLD feature freezes the display for later view. LCD "H" turns on. Press the **HOLD** button momentarily to toggle the **HOLD** feature.

AutoHold Real-Read™ A-H

AutoHold feature displays the last latched stable-reading for later view when the test leads are removed from the test points after a significant-measurement session. Real-Read™ is to show real-time readings during the significant-measurement session to avoid "blind" measurements.

Press the **AutoHold** A-H button for one-second-or-more to toggle the **AutoHold** feature on. LCD "A-H" turns on.

Availability: Resistance, Continuity, LoZ AutoV, VFD Volts, Voltage and Current functions.

- ⊙ Significant-measurements (readings) are >5% of range in Voltage and Current functions, or non-OL in Resistance function.
- ⊙ Stable-reading is a significant-measurement reading having ≤ 30 counts in difference with its two immediate preceding measurement readings.
- ⊙ Significant-measurement readings are being displayed in real time (Real-Read™); "- - - -" is being displayed while awaiting significant-measurements.
- ⊙ The **AutoHold** gives a short-beep with a flashing A-H when a stable-reading is successfully latched ready for later display. If any of the further significant-measurement readings differs from the latched reading by >30 counts, the latched-reading will be reset waiting to re-latch a new stable-reading.
- ⊙ After a significant-measurement session, **AutoHold** gives a short-beep and displays the latched-reading. The reading flashes to emphasize it is on hold to avoid confusions.
- ⊙ The **AutoHold** gives 3 short-beeps and "- - - -" flashes to indicate a null capture after a significant-measurement. It represents no stable-reading is being latched or that has been reset after further encountering unstable signal changes to avoid displaying misleading readings.

Note: Make sure both test probes are making good contacts simultaneously when using the **AutoHold** feature. Single probe contact may lead to latching floating-signal readings.

Removing both probes from the test points simultaneously largely avoids the mis-latching of an unwanted floating-signal.

MAX/MIN/AVG Record mode

Press REC R button momentarily to activate **MAX/MIN/AVG** recording mode. LCD "R MAX AVG MIN" turn on. The meter beeps when new **MAX** (maximum) or **MIN** (minimum) reading is updated. Press the button momentarily to read the **MAX, MIN, AVG** and **MAXAVGMIN** (active measurement) readings in sequence.

Press REC R button for one-second-or-more to exit this mode.

Auto-Power-Off is disabled automatically in this mode.

Relative Δ mode

Relative Δ mode allows the user to offset the meter consecutive measurements with the displaying reading as the reference value. LCD " Δ " turns on.

Press the Δ button momentarily to toggle Relative Δ mode.

CREST mode

Press **CREST** button momentarily to activate **CREST** mode (Instantaneous PEAK-HOLD) to capture current or voltage peak values in duration as short as 0.25ms. LCD **C** & **MAX** turn on.

The meter beeps when new **C MAX** (maximum) or **C MIN** (minimum) reading is updated.

Press the button momentarily to toggle the **C MAX** and **C MIN** readings.

Press the button for one-second-or-more to exit this mode.

Auto-Power-Off is disabled automatically in this mode. Availability: Voltage and Current functions.

Beep-Jack™ Input Warning

The meter beeps as well as displays “**InEr**” to warn the user against possible damage to the meter due to improper connections to the μ A, mA, or A input jacks when another function, especially a voltage function, is selected.

Auto-Power-Off (APO)

The Auto-Power-off (APO) mode turns the meter off automatically to extend battery life after approximately 30 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

Power-on Options

⊙ Disabling APO

Press-and-hold the **SELECT** button while powering on the meter can disable **APO**-feature temporarily during the power-on session.

The LCD will display “**dSAPO**” to confirm selection before the **SELECT** button is released.

⊙ Disabling beep tone

Press-and-hold the **RANGE** button while powering on the meter can toggle the beep tone OFF or ON in sequence. The meter confirms selection by displaying “**dSbEP**” for beeper OFF (disabled) or “**EnbEP**” for beeper ON (enabled), before the **RANGE** button is released.

Last selection will be saved as power up default.

When disabled, most operation beep tones are turned off except those for BeepLit™ Continuity and BeepLit™ Diode functions.

⊙ Shortening APO idling time for inspection

Press-and-hold the **△ (Relative)** button while powering on the meter can shorten the **APO** idling time to approximately 8 seconds temporarily during the power-on session.

It is designed mainly for production inspection.

⊙ Disabling/Enabling °C or °F function availability

See Temperature measurement operation description for details.

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 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.

Refer to the LIMITED WARRANTY section for obtaining calibration, repairing or warranty 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.

Cleaning and Storage

Periodically wipe the meter and the test probe assembly with a damp cloth and mild detergent.

Do not use abrasives or solvents. Allow to dry completely before operating.

If the meter is not to be used for periods of longer than 60 days, remove the batteries and store them separately.

Battery use and replacement

The meter uses standard 1.5V AAA Size (IEC R03) battery X 3

1. Loosen the 2 captive screws on the battery compartment of the bottom housing
2. Lift the battery compartment cartridge.
3. Replace with new batteries.
4. Replace the battery compartment cartridge. Re-fasten the screws.

Fuse use and replacement

The Meter uses:

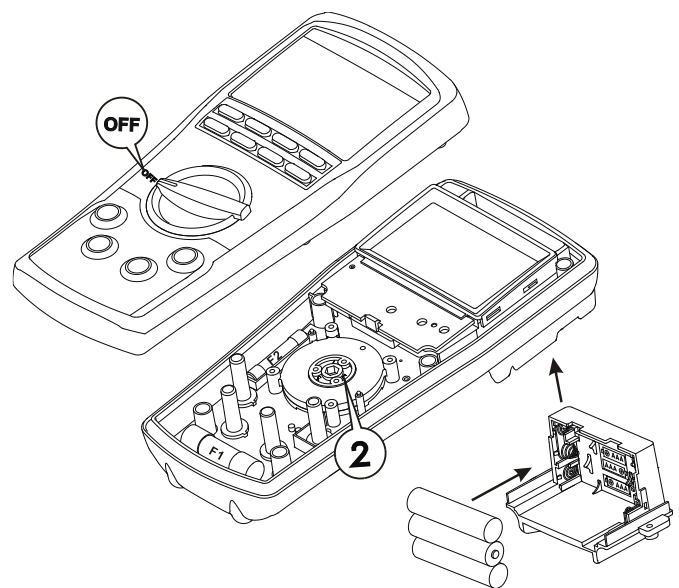
Fuse (F1) for **A** input:

Bussmann DMM-11AR; 11A/1000Vac & Vdc, IR 20kA, F fuse; Dimension: 10 x 38 mm

Fuse (F2) for **μA/mA** input:

SIBA 7017240; 0.4A/1000Vac & Vdc, IR 30kA, F fuse; Dimension: 6 x 32 mm

1. Turn the rotary knob to off position.
2. Loosen 6 captive screws (2 are under the tilt stand) from the bottom housing.
3. Lift the battery compartment cartridge.
4. Further loosen 2 captive screws under the battery compartment cartridge.
5. Lift the upper housing and replace with new fuse(s).
6. Replace the upper housing, and make sure the rotary knob is pointing at the OFF position when doing so.
7. Re-fasten the 2 captive screws under the battery compartment cartridge.
8. Replace the battery compartment cartridge.
9. Re-fasten the 6 captive screws on the bottom housing.



GENERAL SPECIFICATION

- **Display:** 4-5/6 digits 60,000 counts.
- **Polarity:** Automatic
- **Update rate:**
4-5/6 digits: max 5 per second nominal
31 Segment Bar-graph: 50 per second max
- **Operating Temperature:** -20°C to 55°C continuous operating
(except on a function, see Electrical Specifications below for more details)
- **Relative humidity:** Maximum relative humidity 80% for temperature up to 31°C decreasing linearly to 50% relative humidity at 55°C
- **Pollution degree:** 2
- **Storage Temperature:** -20°C to 60°C, < 80% r.h. (with battery removed)
- **Altitude:** Operating below 2000m
- **Temperature Coefficient:** nominal 0.10 x (specified accuracy)/ °C @ (-20°C ~ 18°C or 28°C ~ 55°C), or otherwise specified
- **Sensing:** AC and AC+DC True RMS
- **Safety:** Double insulation per IEC/UL/EN 61010-1 ed. 3.0, IEC/UL/EN 61010-2-030 Ed. 1.0, IEC/UL/EN 61010-2-033 ed. 1.0, IEC/UL/EN 61010-031 Ed. 2.0 and the corresponding CAN/CSA-C22.2 regulations to Measurement Categories III 1000V AC & DC and Category IV 600V AC & DC
- **Overload protections:**
µa & ma: 0.4A/1000V DC/AC, IR 30kA or better, F fuse
A: 11A/1000V DC/AC, IR 20kA or better, F fuse
V: 1100V DC/AC RMS
mV, Ω & Others: 1000 V DC/AC RMS
- **Transient protection:** 8kV (1.2/50µs surge)
- **E.M.C.:** Meets EN61326-1:2013
- **Power supply:** 1.5V AAA Alkaline battery x 3
- **Power consumption:** 10mA typical for AC & AC+DC Voltage/Current functions; 8mA typical for other functions
- **Low Battery:** Below approx. 3.7v
- **Apo Timing:** idle for 30 minutes
- **Apo consumption:** 15µA typical.
- **Dimension:** L 193 mm X W 89 mm X H 51mm
- **Weight:** 420 g
- **Accessories:** Test lead pair, User's manual, Bkp60 banana plug K-type thermocouple x 1
- **Optional accessories:** BKB32 banana plug to type-k socket plug adaptor, BMH-02 magnetic hanger strap
- **Special features:** Autohold; VFD; BeepLit™ Continuity; Record MAX, MIN, & AVG readings; Crest (instantaneous Peak hold) MAX & MIN readings; Relative Zero mode; Data Hold; Backlighted LCD display; Beepjack™ audible & visible input warning; %4-20mA loop current readings; T1-T2 differential temperature readings; dBm readings

ELECTRICAL SPECIFICATIONS

Accuracy is \pm (% reading digits + number of digits) or otherwise specified, at $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ & less than 75% relative humidity.

Maximum Crest Factor <1.6:1 at full scale & < 3.2:1 at half scale, and with frequency components fall within the specified frequency bandwidth for non-sinusoidal waveforms.

DC VOLTAGE

RANGE	ACCURACY
600.00mV, 6.0000V, 60.000V	0.03% + 2d
600.00V	0.05% + 5d
1000.0V	0.15% + 5d

Input impedance: $10\text{M}\Omega$, 75pF nominal (280pF nominal for 600mv range)

AC VOLTAGE

RANGE	ACCURACY ¹⁾
50 Hz ~ 60 Hz	
600.00mV ²⁾ , 6.0000V, 60.000V, 600.00V, 1000.0V	0.5% + 30d
40Hz ~ 1kHz	
600.00mV ²⁾ , 6.0000V, 60.000V, 600.00V, 1000.0V	0.9% + 30d
1 kHz ~ 7 kHz	
600.00mV ²⁾ , 6.0000V, 60.000V, 600.00V	1.8% + 40d
1000.0V	Unspec'd
7 kHz ~ 20 kHz	
600.00mV ²⁾ , 6.0000V, 60.000V, 600.00V ⁴⁾	2.0%+60d
1000.0V	Unspec'd
20kHz ~ 100 kHz	
600.00mV ^{2) 5)} , 6.0000V ⁵⁾ , 60.000V ⁵⁾	4.0%+60d
600.00V, 1000.0V	Unspec'd

¹⁾ Accuracy specified from 10% to 100% of range

²⁾ Signal peak absolute values, including DC Bias, less than $1000\text{mV}_{\text{peak}}$

⁴⁾ Bandwidth specified to 10kHz only for 600V range

⁵⁾ Accuracy specified from 30% to 100% of range

Input impedance: $10\text{M}\Omega$, 75pF nominal (140pF nominal for 600mV range)

Residual reading less than 50 digits with test leads shorted

AC+DC VOLTAGE

RANGE	ACCURACY ¹⁾
50Hz ~ 60 Hz	
600.00mV ²⁾ , 6.0000V, 60.000V, 600.00V, 1000.0V	0.7% + 40d
0Hz, 40Hz ~ 1kHz	
600.00mV ²⁾ , 6.0000V, 60.000V, 600.00V, 1000.0V	1.2% + 40d
1kHz ~ 7kHz	
600.00mV ²⁾ , 6.0000V, 60.000V, 600.00V	2.0% + 50d
1000.0V	Unspec'd
7kHz ~ 20kHz	
600.00mV ²⁾ , 6.0000V, 60.000V, 600.00V ⁴⁾	2.5%+70d
1000.0V	Unspec'd

¹⁾ Accuracy specified from 10% to 100% of range

²⁾ Signal peak absolute values, including DC bias, less than $1000\text{mV}_{\text{peak}}$

⁴⁾ Bandwidth specified to 10kHz only for 600V range

Input impedance: $10\text{M}\Omega$, 75pF nominal (140pF nominal for 600mV range)

Residual reading less than 50 digits with test leads shorted.

VFD AC VOLTAGE

RANGE	ACCURACY ¹⁾
10Hz ~ 200Hz	
600.00V, 1000.0V	4% + 50d
200Hz ~ 440Hz	
600.00V, 1000.0V	10% + 50d ²⁾

¹⁾ Signal fundamental frequency > 440Hz is unspecified

²⁾ Accuracy linearly decreases from 2% + 50d @ 200Hz to 10% + 50d @ 440Hz

LoZ AUTO-DCV

RANGE	ACCURACY
6.0000V, 60.000V, 600.00V, 1000.0V	0.5%+30d

LoZ Auto-DCV Threshold: > +1.0VDC or < -1.0VDC nominal

LoZ Auto-DCV Input Impedance:

Initially approx. 2.1k Ω , 140pF nominal; Impedance increases abruptly within a fraction of a second as display voltage is above 50V (typical). Ended up impedances vs display voltages typically are:

12k Ω	@ 100V	300k Ω	@ 600V
90k Ω	@ 300V	670k Ω	@ 1000V

LoZ Auto-ACV

RANGE	ACCURACY ¹⁾
50Hz ~ 60Hz	
6.0000V, 60.000V, 600.00V, 1000.0V	1.0%+40d

¹⁾Accuracy specified from 10% to 100% of range

LoZ Auto-ACV Threshold: > 1.0VAC (50/60Hz) nominal

LoZ Auto-ACV Input Impedance:

Initially approx. 2.1k Ω , 140pF nominal; Impedance increases abruptly within a fraction of a second as display voltage is above 50V (typical). Ended up impedances vs display voltages typically are:

12k Ω	@ 100V	300k Ω	@ 600V
90k Ω	@ 300V	670k Ω	@ 1000V

dBm

Range and accuracy are subject to ACmV, ACV and reference impedance selected.

Typical 600 Ω reference impedance ranges:

In ACmV: -42.22 dBm to -2.22 dBm

In ACV: -17.78 dBm to 62.22 dBm

Input Impedance: 10M Ω , 140pF nominal

Selectable reference impedance of:

4, 8, 16, 32, 50, 75, 93, 110, 125, 135, 150, 200, 250, 300, 500, 600, 800, 900, 1000 and 1200 Ω

Ohms

RANGE	ACCURACY 1)
600.00Ω	0.085%+10d
6.0000kΩ, 60.000kΩ	0.085%+4d
600.00kΩ	0.15%+4d
6.0000MΩ ²⁾	1.5%+5d
60.000MΩ ^{3) 4)}	2.0%+5d
99.99nS ^{3) 5)}	1.0%+10d

Open Circuit Voltage: < 1.3VDC (< 1.5VDC for 600Ω range)

¹⁾ Temperature Coefficient: 0.20 x (specified accuracy)/ °C @ (-20°C ~ 18°C or 28°C ~ 55°C)

²⁾ Constant Test Current: 0.1μA Typical ³⁾ Constant Test Current: 0.01μA Typical

⁴⁾ Specified accuracy adds 0.5% @ >50MΩ ⁵⁾ Specified accuracy adds 30d @ <10nS

BeepLit™ Continuity Tester

Audible threshold: between 100Ω and 420Ω

Response time < 100μs

Audible Indication: Beep Sound

Visible Response: LCD Backlight

BeepLit™ Diode Tester

RANGE	ACCURACY	TEST CURRENT (TYPICAL)	OPEN CIRCUIT VOLTAGE
3.0000V	1%+20d	0.35mA	< 3.1 VDC

Short-Beep-Alert Threshold: Drop across 0.850V

BeepLit™ continuous ON Threshold: < 0.100V

Audible Indication: Beep sound

Visible Indication: LCD Backlight

Capacitance

RANGE	ACCURACY ^{1) 2)}
10.00nF	1.0% + 10d
100.0nF~1000nF	1.0% + 2d
10.00μF~1.000mF	1.8% + 4d
10.00mF	2.0% + 4d

¹⁾Accuracies with film capacitor or better

²⁾Temperature Coefficient: 0.20 x (specified accuracy)/ °C @ (-20°C ~ 18°C or 28°C ~ 55°C)

DC Current

RANGE	ACCURACY	BURDEN VOLTAGE
600.00μA ^{1) 2)}	0.075%+20d	0.2mV/μA
6000.0μA	0.075%+20d	0.2mV/μA
60.000mA ²⁾	0.075%+20d	2.0mV/mA
600.00mA	0.15%+20d	2.0mV/mA
6.0000A	0.3%+20d	30mV/A
10.000A ³⁾	0.3%+30d	30mV/A

¹⁾ Specified with Open-circuit-voltage (OCV) of Current-loop-under-test at >100μV.

²⁾ The meter shows a few negative residues counts when the input is short-circuited, with OCV at zero volt. It is the nature of the internal protection circuitry design and will not affect measurement readings at nominal OCVs greater than 100μV in significant measurements.

³⁾ 10A continuous up to ambient 40°C only, and is <3 min on per >15 min off @ 40°C ~ 55°C; >10A to 20A for <30 seconds on per >15 min off

AC Current

RANGE	ACCURACY ¹⁾	BURDEN VOLTAGE
40Hz ~ 3kHz		
600.00µA, 6000.0µA	0.9%+20d	0.2mV/µA
60.000mA, 600.00mA		2.0mV/mA
6.0000A, 10.000A ²⁾	1.0%+30d	30mV/A

¹⁾ Accuracy unspecified @ <10% of range

²⁾ 10A continuous up to ambient 40°C only, and is <3 min on per >15 min off @ 40°C ~ 55°C; >10A to 20A for <30 seconds on per >15 min off

AC+DC Current

RANGE	ACCURACY ¹⁾	BURDEN VOLTAGE
0Hz, 40Hz ~ 3kHz		
600.00µA, 6000.0µA	1.0%+30d	0.2mV/µA
60.000mA, 600.00mA	1.2%+40d	2.0mV/mA
6.0000A, 10.000A ²⁾		30mV/A

¹⁾ Accuracy unspecified @ <10% of range

²⁾ 10A continuous up to ambient 40°C only, and is <3 min on per >15 min off @ 40°C ~ 55°C; >10A to 20A for <30 seconds on per >15 min off

DC Loop Current %4~20mA

4mA = 0% (zero)

20mA = 100% (span)

Resolution: 0.01%

Accuracy: ± 25d

Temperature

RANGE	ACCURACY ^{1) 2)}
-200.0°C to 1090°C	1.0%+1.0°C
-328.0°F to 1994°F	1.0%+1.8°F

¹⁾ Accuracies assume meter interior has the same temperature (isothermal stage) of the ambient for a correct junction voltage compensation. Allow the meter and the type-K probe set to reach isothermal stage for a significant change of ambient temperature. It can take up to an hour for changes > 5°C.

²⁾ Type-K thermocouple range & accuracy not included

Hz Logic Level Frequency

RANGE	ACCURACY ^{1) 2)}
5.000Hz ~ 1.0000MHz	0.002%+4d

¹⁾ Sensitivity: >3.0Vp square wave

²⁾ Specified with Pulse Width > 0.5µs

%Duty Cycle

5V LOGIC FREQUENCY	RANGE SPECIFIED	ACCURACY
5Hz ~ 1kHz	0.10% ~ 99.99%	3d/kHz+2d
1kHz ~ 10kHz	1.00% ~ 99.00%	
10kHz ~ 500kHz	20.00% ~ 80.00%	

Sensitivity: >3.0Vp square wave

~ Hz Line Level Frequency

FUNCTION RANGE	SENSITIVITY (SINE RMS)	RANGE
6V	0.4V	10Hz ~ 50kHz
60V	4V	10Hz ~ 50kHz
600V	40V	10Hz ~ 30kHz
1000V	400V	10Hz ~ 5kHz
VFD 600V	40V	10Hz ~ 400Hz
VFD 1000V	400V	10Hz ~ 400Hz
600 μ A	40 μ A	10Hz ~ 5kHz
6000 μ A	400 μ A	10Hz ~ 5kHz
60mA	4mA	10Hz ~ 5kHz
600mA	40mA	10Hz ~ 5kHz
6A	0.6A	10Hz ~ 3kHz
10A	6A	10Hz ~ 3kHz

Accuracy: 0.05%+5d

Non-Contact EF-Detection (NCV)

Bar-Graph Indication	EF-H (Hi Sensitivity)	EF-L (Lo Sensitivity)
	Typical Voltage (Tolerance)	
-	25V (18V ~ 45V)	60V (50V ~ 140V)
--	50V (30V ~ 80V)	120V (100V ~ 260V)
---	80V (70V ~ 160V)	230V (180V ~ 400V)
----	120V (110V ~ 250V)	400V (330V ~ 490V)
-----	350V (>270V)	600V (>500V)

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

Detection Frequency: 50/60Hz

Detection Antenna: Top-left end of the meter

Probe-Contact EF-Detection (Single-pole): For more precise indication of live wires, such as distinguishing between live and ground connections, use one single test probe to test via terminal **COM** for direct metal contact probing to achieve the most distinctive indications.

RECORD mode (MAX MIN AVG)

Function Mode Where Available	Added Uncertainty ¹⁾ to Specified Accuracy	Min. Volts/Amps Signal Duration	REC Nominal Update Rate per Second
DC	$\pm 30d$	300ms	10
AC	$\pm 300d$ ($\pm 80d$ ²⁾)	460ms	5 (10)
VFD	$\pm 180d$	800ms	5
DC+AC	$\pm 300d$ ²⁾	2s	1
nS	--	--	1
Cx	--	--	Subject to Cx Values
Hz, T1-T2	--	--	2
Ω , T1, T2, Others	--	--	5

¹⁾ Specified at Range Locked (Manual-ranging)

²⁾ Specified at AC Inputs >15% of Range

CREST mode (Instantaneous Peak Hold)

Accuracy: Specified accuracy ± 100 digits for changes > 0.35ms in duration

Availability: Voltage and Current functions

Resolution: 6000 counts

AutoHold Real-Read™

Accuracy: Specified accuracy ± 50 digits

Availability: Resistance, Continuity, LoZ AutoV, VFD Volts, Voltage and Current function

LIMITED WARRANTY

Elma Instruments 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. **Elma Instruments** warranty does not apply to accessories, fuses, fusible resistors, spark gaps, varistors, batteries or any product which, in **Elma Instruments** opinion, has been misused, altered, neglected, or damaged by accident or abnormal conditions of operation or handling.

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

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