User Manual
ENGLISH

AEMC® INSTRUMENTS
CHAUVIN ARNOUX GROUP

Power Clamp-On Meter
Model 404

CLAMP-ON METERS

Measure Up
WITH AEMC® INSTRUMENTS

Statement of Compliance

Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments certifies that this instrument has been calibrated using standards and instruments traceable to international standards.

We guarantee that at the time of shipping your instrument has met the instrument's published specifications.

An NIST traceable certificate may be requested at the time of purchase, or obtained by returning the instrument to our repair and calibration facility, for a nominal charge.

The recommended calibration interval for this instrument is 12 months and begins on the date of receipt by the customer. For recalibration, please use our calibration services.

Serial #:

Catalog #: 2139.22

Model #: 404

Please ill in the appropriate date as indicated:

Date Received:

Date Calibration Due:

AEMC® INSTRUMENTS
CHAUVIN ARNOUX GROUP

TABLE OF CONTENTS

1. INTRODUCTION

Thank you for purchasing an AEMC® Instruments **Model 404 Clamp-On Meter**.

For best results from your instrument and for your safety, read the enclosed operating instructions carefully and comply with the precautions for use. Only qualified and trained operators should use this product.

1.1 INTERNATIONAL ELECTRICAL SYMBOLS

	Signifies that the instrument is protected by double or reinforced insulation.
	**CAUTION - Risk of Danger!** Indicates a **WARNING**. Whenever this symbol is present, the operator must refer to the user manual before operation.
	Indicates a risk of electric shock. The voltage at the parts marked with this symbol may be dangerous.
	Application or withdrawal authorized on conductors carrying dangerous voltages. Type A current sensor as per IEC 61010-2-032.
	Battery
	Indicates Important information to acknowledge
	This product complies with the Low Voltage & Electromagnetic Compatibility European directives (73/23/CEE & 89/336/CEE).
	In the European Union, this product is subject to a separate collection system for recycling electrical and electronic components in accordance with directive WEEE 2012/19/EU.
	AC - Alternating Current
	AC and DC - Alternating and Direct Current or Voltage
	Ground/Earth

1.2 DEFINITION OF MEASUREMENT CATEGORIES (CAT)

CAT IV: Corresponds to measurements performed at primary electrical supply (< 1000 V).
Example: primary overcurrent protection devices, ripple control units, and meters.

CAT III: Corresponds to measurements performed in the building installation at the distribution level.
Example: hardwired equipment in fixed installation and circuit breakers.

CAT II: Corresponds to measurements performed on circuits directly connected to the electrical distribution system.
Example: measurements on household appliances and portable tools.

1.3 PRECAUTIONS FOR USE

This device complies with safety standards IEC/EN 61010-1 or BS EN 61010-1 and IEC/EN 61010-2-032 or BS EN 61010-2-032 for voltages of 1000 V in CAT IV and 1500 V in CAT III. These safety instructions are intended to ensure the safety of persons and proper operation of the device.

- The operator and/or the responsible authority must carefully read and clearly understand the various precautions to be taken in use.
- If this instrument is used other than as specified, the protection it provides may be compromised, thereby endangering you.
- Do not use the instrument in an explosive atmosphere or in the presence of flammable gases or fumes.
- Do not use the instrument on networks of which the voltage or category exceeds those mentioned.
- Do not exceed the rated maximum voltages and currents between terminals or with respect to earth.
- Do not use the instrument if it appears to be damaged, incomplete, or not properly closed.
- Before each use, check the condition of the insulation on the leads, housing, and accessories. Any element of which the insulation is deteriorated (even partially) must be set aside for repair or scrapped.
- Do not use leads and accessories rated lower for voltages and measurement categories (CAT) than those of the instrument. To avoid safety hazards and ensure that the instrument operates at full capacity, use only leads and accessories rated for voltages and measurement categories (CAT) at least equal to those of the instrument.
- Observe the environmental conditions of use.
- Do not modify the instrument and only use factory replacement parts. Repairs and adjustments must be done by approved qualified personnel.
- Replace the batteries as soon as the  symbol appears on the display of the unit. Disconnect all leads before opening the battery compartment cover.
- Use personal protective equipment when conditions require.
- Keep your hands away from the unused terminals of the instrument.
- When handling the test probes, alligator clips, and clamp ammeters, keep your fingers behind the physical guard.
- As a safety measure, and to avoid repeated overloads on the inputs of the device, configuration operations should only be performed when the device is disconnected from all dangerous voltages.

1.4 RECEIVING YOUR SHIPMENT

Upon receiving your shipment, make sure that the contents are consistent with the packing list. Notify your distributor of any missing items. If the equipment appears to be damaged, file a claim immediately with the carrier and notify your distributor at once, giving a detailed description of any damage. Save the damaged packing container to substantiate your claim.

1.5 ORDERING INFORMATION

Clamp-On Meter Model 404 ..... **Cat. #2139.22**

Includes set of two color-coded silicone insulated test leads, test probes and alligator clips, K-thermocouple with 4 mm integrated adapter, soft carrying case, four 1.5 V AA batteries, and user manual.

1.5.1 Accessories

Multi-purpose Canvas Pouch..... **Cat. #2119.48**

Set of two 5 ft (1.5 m) Needle Tip Color-coded (Red/Black) Leads w/ 4 mm Right-angle Plug (600 V CAT IV w/shield on Needle Tip, 1000 V CAT II w/o shield)..... **Cat. #2154.74**

1.5.2 Replacement Parts

K-thermocouple with 4 mm Integrated Adapter ..... **Cat. #2139.71**

Soft Carrying Case..... **Cat. #2139.72**

Set of two Color-coded Silicone Test Leads (Red/Black) 5 ft..... **Cat. #2152.15**

Probe - Black Test Probe (Rated 1000 V CAT IV, 15 A, UL V2)..... **Cat. #5000.97**

Probe - Red Test Probe (Rated 1000 V CAT IV, 15 A, UL V2) ..... **Cat. #5000.98**

Set of two Color-coded Silicone Test Leads (Red/Black) 5 ft with 4 mm straight/right angle banana plugs (Rated 1000 V, CAT IV, UL V2)..... **Cat. #5000.94**

Safety Alligator Clip (Black) ..... **Cat. #5000.99**

Safety Alligator Clip (Red)..... **Cat. #5100.00**

2. PRODUCT FEATURES

The Clamp-On Meter Model 404 is a 6000-count professional electrical measuring instrument that combines the following functions:

- Current measurement
- Measurement of Inrush current / overcurrent (True InRush®)
- Voltage measurement
- Frequency measurement
- Continuity test with buzzer
- Resistance measurement
- Diode test
- Temperature measurement
- Adapter function (for use with external transducers/measurement devices)

2.1 FRONT & BACK OF INSTRUMENT

Figure 1

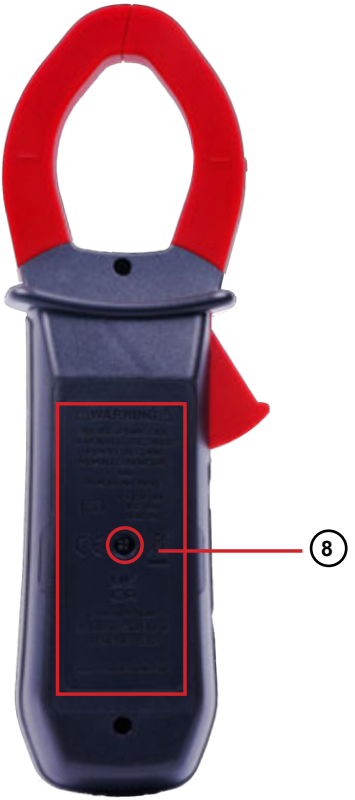


Figure 2

Item	Designation	See §
1	Jaws with centering marks (see connection principles)	4.5 to 4.13
2	Physical Guard	-
3	Rotary Function Switch	2.2
4	Function Buttons	2.3
5	Backlit Display	2.4
6	Input Terminals	2.5
7	Trigger	-
8	Battery Compartment & Compartment Screw For instructions on installing the batteries, see § 4.1.	2.1

2.2 ROTARY SWITCH

The rotary switch has six positions.

To access the V≂, A≂, °C °F T°, Ω, and Adp≂ functions, set the switch to the desired function.

The functions are described in the table below.

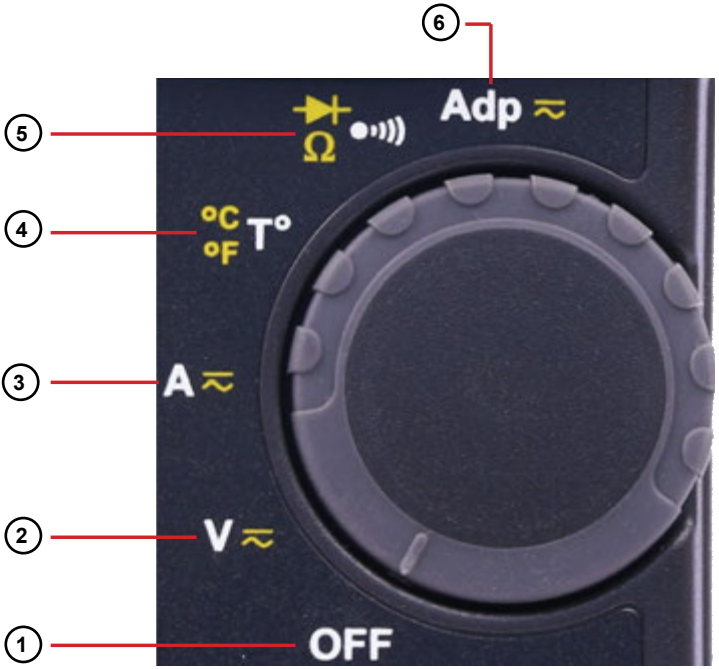


Figure 3

Item	Function	See §
1	OFF mode - Turns the clamp-on Meter off	4.3
2	AC, DC voltage measurement (V)	4.5
3	AC, DC current measurement (A)	4.9
4	Temperature measurement (°C/°F)	4.12
5	Continuity test Resistance measurement Ω Diode test	4.6 4.7 4.8
6	Adapter function measurement	4.13

2.3 FUNCTION BUTTONS

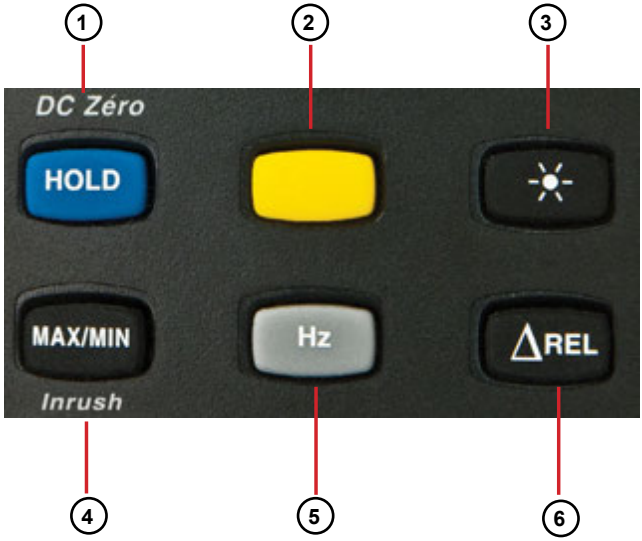


Figure 4

Item	Function	See §
1	Holds the last value on the display Zero correction ADC Lead resistance compensation in the continuity and ohmmeter functions	3.1 4.9.2 4.6.1
2	Selects the type of measurement and configuration functions (AC, DC)	3.2
3	Enables/disables display backlighting	3.3
4	Enables/disables the **MAX/MIN** mode Enables/disables the True InRush® mode	3.4
5	Performs frequency measurements (Hz)	3.5
6	Adapter function **ΔREL** – Displays differential and relative values	3.6

2.4 DISPLAY

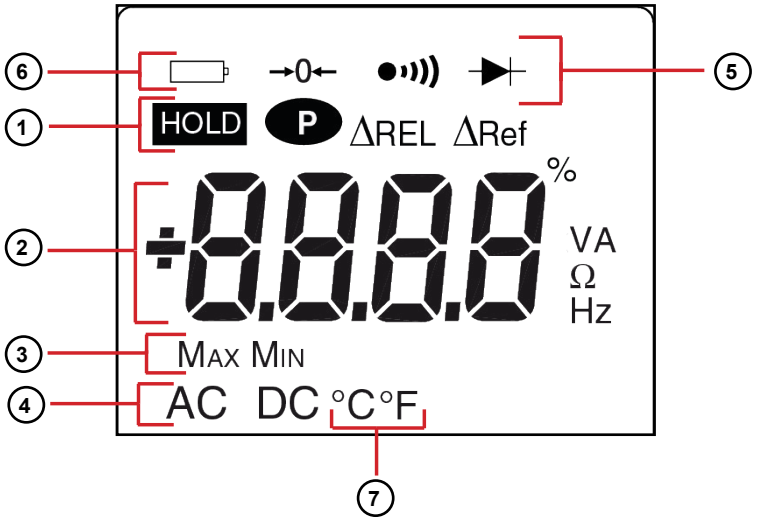


Figure 5

Item	Function	See §
1	Mode selection display	3
2	Active measurement value and unit display	4.5 to 4.13
3	Display of the **MAX/MIN** modes	3.4
4	Type of measurement (AC or DC)	3.2
5	Resistance measurement selection display	2.2
6	Low battery indication	6.3
7	Temperature unit display	4.4.4

2.4.1 Display Symbols

Symbol	Description
AC	Alternating current or voltage
DC	Direct current or voltage
ΔREL	Relative value, with respect to a reference
ΔRef	Reference value
HOLD	Storage of the values and display HOLD
Max	Maximum DC or RMS value
Min	Minimum DC or RMS value
V	Volt

Symbol	Description
Hz	Hertz
A	Ampere
°C/°F	Temperature unit (Celsius or Fahrenheit)
%	Percentage
Ω	Ohm
m	Milli- prefix
k	Kilo- prefix
→0←	Lead resistance compensation
	Continuity test
	Diode test
P	Auto Power Off disabled
	Low battery indicator

2.4.2 Measurement Capacity Exceeded (OL)

The **OL** (Over Load) symbol is displayed when the display capacity is exceeded.

2.5 TERMINALS

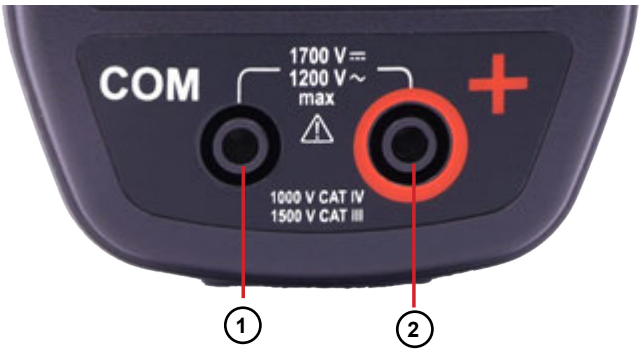


Figure 6

The terminals are used as follows:

Item	Function
1	**COM** (black) Input Terminal Jack
2	**+ Positive** (red) Input Terminal Jack

3. FUNCTION BUTTONS

The buttons respond differently to short, long, and sustained presses.

The MAX/MIN, Hz, and ΔREL buttons provide additional functions and provide the detection and acquisition of parameters complementary to the basic measurements.

- Each of these buttons can be used independently of the others or in conjunction with each other. This makes navigation simple and intuitive when reviewing measurement results.
- It is possible, for example, to either look up IN TURN sequence the MAX, MIN, etc. values of the RMS voltage alone and then display relative values in parallel.

In this section, the  icon represents the possible positions of the switch for the button's functionality.

3.1 HOLD BUTTON

This button is used to:

- Store and look up the last values acquired specific to each function (V, A, Ω, T°, Adp) according to the specific modes previously activated (MAX/MIN, Hz, ΔREL). The present display is then maintained while the detection and acquisition of new values continues.
- Perform automatic lead resistance compensation (see § 4.6.1).
- Perform automatic zero correction in ADC (see § 4.9.2).

Successive presses on HOLD		Function
		**First Press:** Holds the display of the last value displayed **Second Press:** Returns to normal display mode (each new measurement value is displayed)
long (> 2 sec)	ADC	Performs automatic zero correction (see § 4.9.2) **NOTE:** This mode operates if the MAX/MIN or HOLD modes (short press) are first deactivated
long (> 2 sec)		Performs automatic lead resistance compensation (See § 4.6.1)

See § 3.4.2 and § 3.5.2 for the HOLD button functionality in combination with the MAX/MIN and Hz buttons.

3.2 BUTTON (SECOND FUNCTION)

This button is used to select the type of measurement (AC, DC) and the second functions marked in yellow next to the relevant positions of the switch.

It can also be used to modify the default values in the configuration mode (see § 4.4).

NOTE: This button is invalid in the **MAX/MIN**, **HOLD** and **ΔREL** modes.

Successive presses on		Function
	V≂ A≂ Adp≂	Selects AC or DC. Depending on your choice, the screen displays AC or DC
	Ω •)))	Cycles through the continuity •))) , Ω, and diode test ⊣▶ modes and returns to the continuity test •)))
	°C °F T°	Selects °C or °F as the temperature unit

3.3 BACKLIGHT DISPLAY BUTTON

Successive presses on		Function
	V≂ A≂ °C °F T° Ω •))) Adp≂	Enables/disables the backlighting of the display

NOTE: The **backlighting** is automatically disabled at the end of two (2) minutes.

3.4 MAX/MIN BUTTON

This button activates the detection of the MAX and MIN values of the measurements made. MAX and MIN are the extreme mean values in DC and the extreme RMS values in AC.

3.4.1 Normal Mode

NOTE: In this mode, the **Auto Power Off** function of the device is automatically disabled. The P symbol is displayed on the screen.

Successive presses on MAX/MIN		Functions
short	V≂ A≂ °C °F T° Adp≂	**First press:** Activates detection of MAX/MIN values **Second press:** Displays the MAX or MIN value successively **Third press:** Returns to the display of the present measurement without exiting from the mode (the values already detected are not erased) **NOTE:** The **MAX** and **MIN** symbols are both displayed, but only the symbol of the measurement selected blinks. **Example:** If MIN has been selected, MIN blinks and MAX stays lit.
long (> 2 sec)	V≂ A≂ °C °F T° Ω •)) Adp≂	Exits the MAX/MIN mode. The values previously recorded are then erased. **NOTE:** If the **HOLD** function is activated, it is not possible to exit from the **MAX/MIN** mode. The **HOLD** function must first be disabled first.

NOTE: The **ΔREL** function can be used with the functions of the MAX/MIN mode.

3.4.2 The MAX/MIN Mode + Activation of the HOLD Mode

Successive presses on MAX/MIN		Function
short	V≈ A≈ °C °F T° Ω Adp ≈	Displays the MAX/MIN values detected before the HOLD button was pressed. When the HOLD button is pressed, the last value is held on the display.

NOTE: The **HOLD** function does not interrupt the acquisition of new MAX/MIN values.

3.4.3 Access to the True InRush® Mode (MAX/MIN set to A≈)

This button allows measurement of the True InRush® current (starting current, or overcurrent in steady-state operation) for AC or DC current.

Successive presses on MAX/MIN		Function
long (> 2 sec)	A≈	**First press:** Enters the True InRush® mode **Inrh** is displayed for 3 sec (the backlighting blinks) The triggering threshold is displayed for 5 sec (the backlighting is steady) - - - - is displayed and the **A** symbol flashes (backlighting turns off) After detection and acquisition, the Inrush current measurement is displayed, after the calculations stage - - - - (backlighting turns off) **NOTE:** The **A** symbol flashes to indicate **surveillance** of the signal. **Second press:** Exits the True InRush® mode (returns to simple current measurement).
short (< 2 sec) **NOTE:** A short press is functional only if a True InRush® value has been detected.	A≈	Displays the PEAK+ value of the current Displays the PEAK- value of the current Displays the RMS True InRush® current **NOTE:** The **A**, **AC** and **PEAK** values flash during this sequence.

3.5 Hz BUTTON

This button is used to display the frequency measurements of a signal.

NOTE: This button is not functional in the DC mode.

3.5.1 Normal Mode

Successive presses on Hz		Function
		Displays: 1. The frequency of the signal measured 2. The present voltage (V) or current (A) measurement

3.5.2 The Hz Function + Activation of the HOLD Mode

Successive presses on Hz		Function
		1. Holds the last frequency reading 2. Successively displays the last held frequency, then the voltage or the current **NOTE:** Pressing the HOLD button a second time returns to real-time measurement updates.

3.6 ΔREL BUTTON

This button is used to display and store the reference value or to display the differential and relative value, in the unit of magnitude measured or in %.

Successive presses on ΔREL		Function
short		- Enters the ΔREL mode, to store, then displays the reference value. The ΔRef symbol is displayed. - Displays the differential value: (current value – reference (Δ)) The ΔREL symbol is displayed - Displays the relative value in %: $\frac{\text{current value – reference (Δ)}}{\text{reference (Δ)}}$ The ΔRef and % symbols are displayed. - Displays the reference. The ΔRef symbol is displayed. - Displays the current value. The ΔRef symbol blinks.
long (> 2 sec)		Exits from ΔREL mode

NOTE: The Relative mode **ΔREL** function can also be used with the functions of the MAX/MIN mode.

4. OPERATION

4.1 INSTALLING THE BATTERIES

Insert the batteries supplied with the device as follows:

1. Using a screwdriver, unscrew the battery compartment cover (1) from the back of the housing.
2. Insert the (4) 1.5 V AA batteries supplied (2), observing polarities.
3. Close the battery compartment cover and screw it onto the housing.

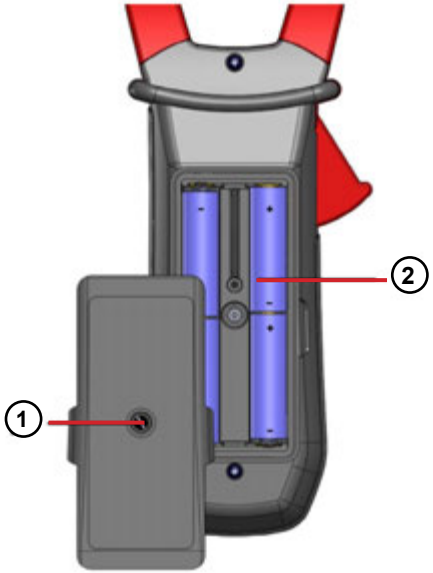


Figure 7

4.2 TURNING THE CLAMP-ON METER ON

- With the rotary switch set in the **OFF** position, turn the switch to the desired function. The display lights (all symbols) for a few seconds (see § 2.2), then the screen of the function chosen is displayed.
- The clamp-on meter is now ready to make measurements.

4.3 TURNING THE CLAMP-ON METER OFF

The clamp-on meter can be turned off in two ways:

- Manually - Turn the switch to the **OFF** position.
- Automatically - After 10 minutes with no activity, the instrument will turn **OFF**. Thirty (30) seconds before the device is switched off, an audible signal sounds intermittently. To re-activate the device, press any button or turn the rotary switch.

4.4 CONFIGURATION

As a safety measure and to avoid repeated overloads on the inputs of the device, configuration operations should only be performed when the device is disconnected from all dangerous voltages.

4.4.1 Configuring the Maximum Resistance for Continuity

To configure the maximum resistance allowed for a continuity:

1. With the switch in the **OFF** position, hold the button down while turning the switch to until the **full screen** display ends and a beep is emitted. The display will then indicate the **less than** threshold value at which the buzzer is activated and the symbol is displayed. The value stored by default is 40 Ω. The possible values range between (1 and 999) Ω.

2. To change the threshold, press the button. The right-hand digit flashes; each press on the button will adjust the threshold in increments of one digit. To shift to the next digit, apply a long press (> 2 sec) to the button.

When the desired value is displayed, turn the switch to another setting. The detection threshold chosen is stored and a double beep is emitted.

4.4.2 Auto Power OFF

The **Auto Power OFF** feature is enabled by default. To disable it, perform the following:

1. In the OFF position, hold the HOLD button down while turning the switch to V≈ until the **full screen** display ends and a beep is emitted. The P symbol is displayed.

2. When the HOLD button is released, the device is in the voltmeter function in the normal mode.

3. To return to **Auto Power OFF**, turn the clamp-on meter **OFF** and then turn back **ON**.

4.4.3 Configuring Current Threshold for True InRush® Measurement

To configure the triggering current threshold of the True InRush® measurement:

1. In the **OFF** position, hold the MAX/MIN button down while turning the switch to A≈ until the **full screen** display ends and a beep is emitted. The display will indicate the percentage overshoot to apply to the measured current to determine the measurement triggering threshold.
   The value stored by default is 10 %, representing 110 % of the established current measured. The possible values are (5, 10, 20, 50, 70, 100, 150, and 200) %.
2. To change the threshold, press the button. The value will flash; each press on the button displays the next value. To record the chosen threshold, apply a long press (> 2 sec) on the button. A confirmation beep is emitted.

When the desired value is displayed, turn the switch to another setting.
The chosen threshold is stored and a double beep is emitted.

NOTE: The starting (inrush) current measurement triggering threshold is fixed at 1 % of the least sensitive range.
This value is 1 % of 99.99 A or 1 A.

4.4.4 Changing the Default Temperature Unit

To change the measurement unit, °C or °F:

1. In the **OFF** position, hold the button down while turning the switch to °C °F T° until the **full screen** display ends and a beep is emitted. The display will indicate the currently assigned unit (°C or °F). The default unit is °C.
2. Pressing the button toggles between °C and °F.

When the desired unit is displayed, turn the switch to another setting. The unit chosen is stored and a double beep is emitted.

NOTE: Pressing the button during an active temperature measurement will toggle between °C and °F.

4.4.5 Configuring the Adapter Function Scale Factor

To configure the Adapter function scale factor:

1. From the **OFF** position, hold the  button down while turning the switch to  until the **full screen** display ends and a beep is emitted signaling the instrument is in configuration mode. The display unit indicates the stored scale factor value. The default stored value is 10. The possible values, in order, are (1, 10 k, 100 k, 100 m, 10 m, 1 m, 100, 10) see § 4.13.
2. To change the value of the scale factor, press the  button. The currently active scale factor is displayed. Each press of the  button displays the next value in the list shown above.

Once the scale factor displayed has been chosen, turn the switch to another position. The chosen value is stored and a double beep is emitted.

4.4.6 Default Configuration

To reset the clamp-on meter to its default parameters (factory configuration):

1. In the OFF position, hold the  button down while turning the switch to  until the **full screen** display ends and a beep is emitted. The **rSt** symbol is displayed.
2. After 2 seconds, the clamp-on meter emits a double beep, then all of the digital symbols of the screen are displayed until the  button is released. The default parameters are then restored:
   - Continuity detection threshold = 40 Ω
   - True InRush® triggering threshold = 10 %
   - Temperature measurement unit = °C
   - Adapter function scale factor = 10

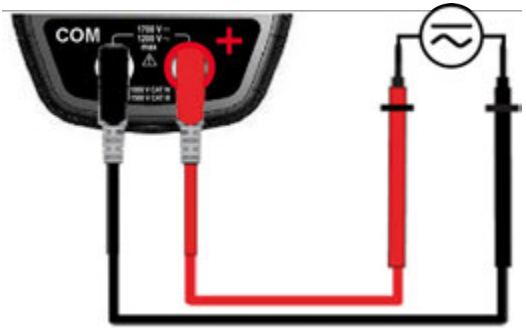
4.5 VOLTAGE MEASUREMENT (V)

To measure voltage, proceed as follows:

1. Set the switch to V≂ .
2. Connect the black lead to the **COM** terminal and the red lead to the **+** terminal.
3. Connect the test probes or the alligator clips to the circuit to be measured. The device selects AC or DC automatically according to which measured value is larger. The AC or DC symbol displays blinking in auto detect mode.

To select AC or DC manually, press the button to toggle between them.

The symbol corresponding to the choice will then display.

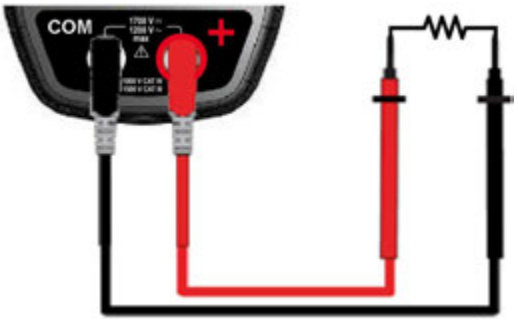


The measured value is displayed on the screen.

4.6 CONTINUITY TEST

WARNING: Before performing the test, make sure the circuit is **OFF** and all capacitors have been discharged.

1. Set the switch to Ω; the symbol is displayed.
2. Connect the black lead to the **COM** terminal and the red lead to the **+** terminal.
3. Connect the test probes or the alligator clips to the circuit or component to be measured.



An audible signal is emitted if there is continuity (resistance value is below the maximum threshold, see § 4.4.1) and the measured value is displayed on the screen.

4.6.1 Lead Resistance Compensation

WARNING: Before the compensation is executed, the **MAX/MIN** and **HOLD** modes must be deactivated.

To perform automatic compensation of the test lead resistance, proceed as follows:

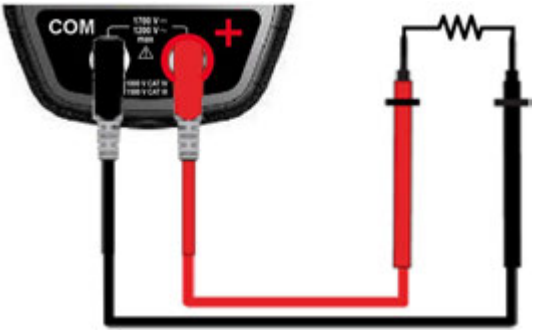
1. Short-circuit the leads connected to the meter.
2. Hold the HOLD button down until the display unit indicates the lowest value. The device measures the resistance of the leads.
3. Release the HOLD button. The correction and the → 0 ← symbol are displayed. The value displayed is stored.

NOTE: The correction value is stored only if it is ≤ 2 Ω. Above 2 Ω, the value displayed blinks and is not stored.

4.7 RESISTANCE MEASUREMENT Ω

WARNING: Before making a resistance measurement, make sure that the circuit is **OFF** and all capacitors have been discharged.

1. Set the switch to Ω and press the button. The **Ω** symbol is displayed.
2. Connect the black lead to the **COM** terminal and the red lead to the **+** terminal.
3. Connect the test probes or the alligator clips to the circuit or component to be measured.



The measured value is displayed on the screen.

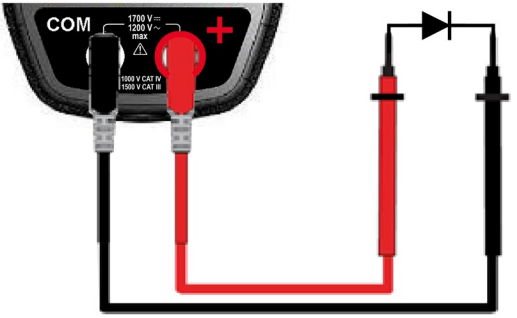
NOTE: To measure low resistance values, first perform lead resistance compensation (see § 4.6.1).

4.8 DIODE TEST

WARNING: Before performing the diode test, make sure that the circuit is off and all capacitors have been discharged.

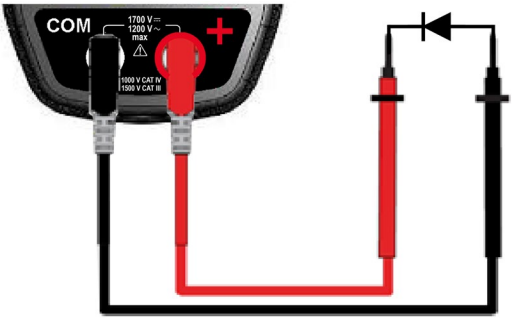
1. Set the switch to  and press the  button twice.

   The → symbol is displayed.
2. Connect the black lead to the **COM** terminal and the red lead to the **+** terminal.
3. Connect the test probes or the alligator clips to the circuit or component to be tested.



The measured value is displayed on the screen.

4. Reverse the leads on the diode and repeat the test.



The measured value is displayed on the screen

4.9 CURRENT MEASUREMENT (A)

The jaws are opened by pressing the trigger on the body of the meter. The arrow on the jaws of the clamp-on meter (see the diagram below) should point in the presumed direction of current flow, from the generator to the load. Make sure that the jaws have closed correctly after clamping around the conductor.

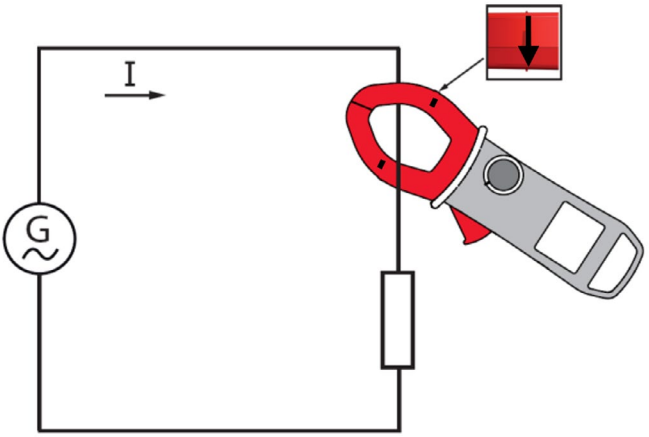
NOTE: The measurement results are optimal when the conductor is centered in the jaws (aligned with the centering marks).

The device selects AC or DC automatically according to which measured value is larger. The AC or DC symbol displays blinking in auto detect mode.

4.9.1 AC Measurement

For an AC current measurement, proceed as follows:

1. Set the switch to A≂ and select **AC** by pressing the button. The AC symbol is displayed.
2. Clamp the jaws around the conductor to be measured. The device selects **AC** or **DC** automatically.



The measured value is displayed on the screen

4.9.2 DC Measurement

Set the switch to A≈ and select **DC** if the display does not indicate **0**; the DC zero must first be corrected.

Step 1: Correction of DC Zero

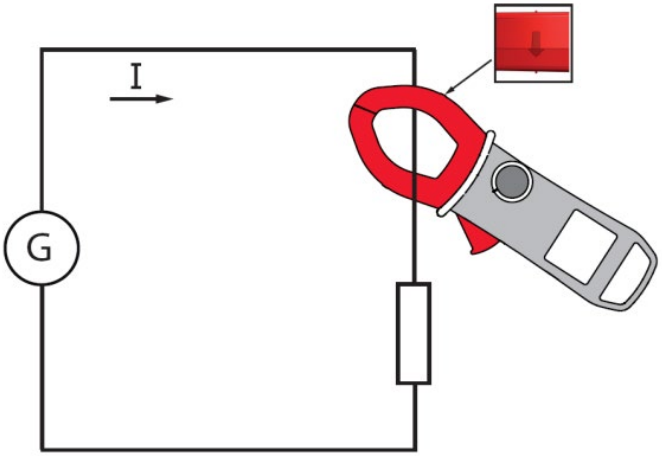
NOTE: The clamp must not be closed on the conductor during the DC zero correction. Hold the clamp in the same position during the whole procedure so that the correction value will be exact.

Press the HOLD button until the device emits a double beep and displays a value near **0**. The correction value is stored until the clamp is powered down.

NOTE: The correction is affected only if the value displayed is < ±20 A, otherwise the value displayed blinks and is not stored. The clamp must be recalibrated (see § 6.4).

Step 2: Make a Measurement

1. The switch is set to A≈. Select **DC** by pressing the button until the desired choice is reached.
2. Clamp the jaws around the conductor to be measured.



The measured value is displayed on the screen.

4.10 STARTING CURRENT OR OVERCURRENT (TRUE INRUSH®) MEASUREMENT

To measure a starting current or overcurrent, proceed as follows:

1. Set the switch to A≈, correct the DC zero (see § 4.9.2), then clamp the jaws around the conductor to be measured.
2. Perform a long press on the MAX/MIN button. The **InRh** symbol is displayed, along with the triggering threshold. The clamp then awaits detection of the True InRush® current. - - - - is displayed and the **A** symbol flashes.
3. After detection and acquisition for 100 ms, the RMS value of the True InRush® current is displayed. Pressing the MAX/MIN button will display the **PEAK+/PEAK-** values subsequently.
4. A long press on the MAX/MIN button or a change of function on the rotary switch will exit the True InRush® mode.

NOTE: The triggering threshold in A is 20 A if the initial current is zero (starting of installation), it is that set in the configuration (see § 4.4) for an established current (overload in an installation).

4.11 FREQUENCY MEASUREMENT (Hz)

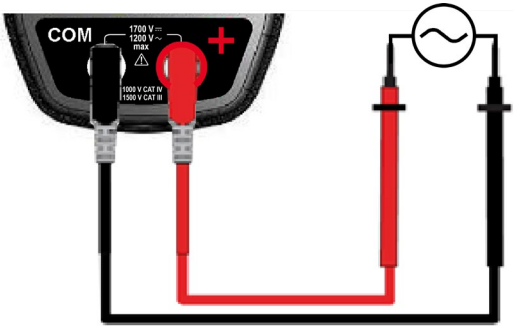
The frequency measurement is available in **V** and **A** for AC measurements. The measurement is based on a count oof the passages of the signal through zero (positive-going edges).

4.11.1 Frequency Measurement (V)

To measure the frequency in voltage, proceed as follows:

1. Set the switch to V≈ and press the Hz button. The **Hz** symbol is displayed.
2. Select **AC** by pressing the button until desired choice is reached.
3. Connect the black lead to the **COM** terminal and the red lead to the **+** terminal.

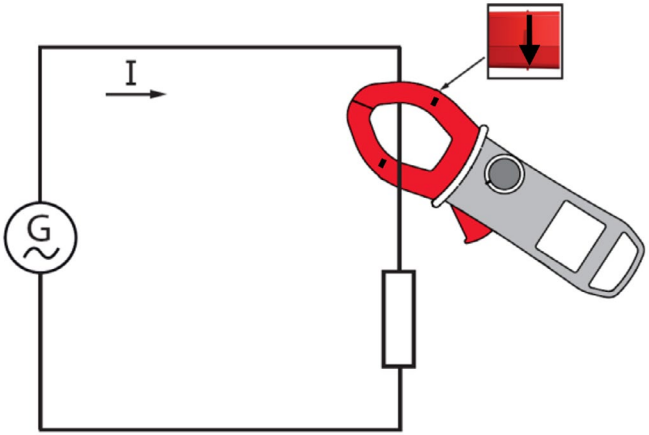
4. Connect the test probes or the alligator clips to the circuit to be measured.



The measured value is displayed on the screen.

4.11.2 Frequency Measurement (A)

1. Set the switch to A≂ and press the Hz button. The **Hz** symbol is displayed.
2. Select AC by pressing the button until desired choice is reached.
3. Clamp the jaws around the conductor to be measured.



The measured value is displayed on the screen.

4.12 TEMPERATURE MEASUREMENT

4.12.1 Measurement without External Sensor

1. Set the switch °C °F T°.

The temperature (blinking) displayed is the internal temperature of the device. It will be equal to the ambient temperature after a sufficiently long thermal stabilization time (at least one hour).

4.12.2 Measurement with External Sensor

The device measures the temperature using a K-thermocouple.

1. Connect the K-thermocouple to the **COM** and **+** input terminals of the device observing the red and black banana plug polarity.
2. Set the switch °C °F T°.
3. Place the K-thermocouple on the element or environment to be measured. It must not be at a dangerous voltage.

The temperature will be displayed on the screen.

To change the unit to either °F or °C, press the button.

Figure 8

NOTE 1: If the external sensor is defective, the temperature displayed blinks.

NOTE 2: If there are large variations of the initial temperature environment of the meter and the measurement environment, the measurement must be preceded by a stabilization time.

4.13 ADAPTER FUNCTION MEASUREMENT

This function makes it possible to connect any adapter or sensor that converts a measured electrical or physical quantity into a voltage (either DC or AC).
A direct, immediate reading is obtained without applying a conversion factor.
The measurement is made as a voltage measurement.

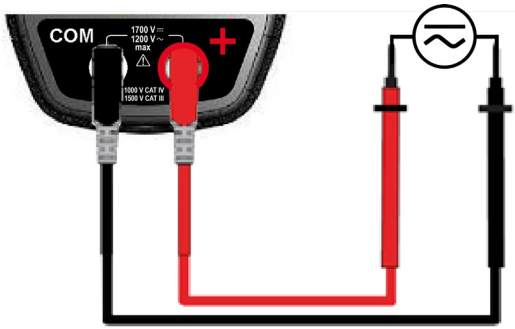
The measurement mode, AC or DC (the default), must be chosen manually using the button.

The scale factor for the adapter or sensor must be chosen in advance in the instrument's set-up (§ 4.4.5). The table below indicates the various adapter/ sensor sensitivities that allow a direct reading once the scale factor has been chosen.

Adapter/Sensor Sensitivity	Scale Factor to be Programmed
10 mV/kX (0.01 mV/X)	10 k
100 mV/kX (0.1 mV/X)	100 k
1 mV/X	1
10 mV/X	10
100 mV/X	100
1000 mV/X (1mV/mX)	1 m
10 mV/mX	10 m
100 mV/mX	100 m

NOTE: The value represented as (X) is valid for any quantity: humidity (% RH), illumination (lux), speed (m/s), flow (GPM) etc.

1. Connect the black lead to the **COM** terminal and the red lead to the **+** terminal.
2. Set the switch to Adp ≈.



3. Select the AC or DC mode.
4. Connect the adapter according to its directions for use.

The measured value is displayed on the screen.

5. SPECIFICATIONS

5.1 REFERENCE CONDITIONS

Quantities of Influence	Reference Conditions
Temperature	(23 ± 2) °C
Relative humidity	(45 to 75) %
Supply voltage	(6.0 ± 0.5) V
Frequency range of the applied signal	(45 to 65) Hz
Sine wave	Pure
Peak factor of the applied alternating signal	√2
Position of the conductor in the clamp	Centered
Adjacent conductors	none
Alternating magnetic field	none
Electric field	none

5.2 SPECIFICATIONS UNDER THE REFERENCE CONDITIONS

Accuracy is expressed in ± (x % of the reading (R) + y counts (ct)).

5.2.1 DC Voltage Measurement

Measurement Range	(0.00 to 99.99) V	(100.0 to 999.9) V	(1000 to 1700) V(1)
Specified Measurement Range	(0 to 1600) V		
Accuracy	(0.00 to 9.99) V ± (1 % R + 10 cts) (10.00 to 99.99) V ± (1 % R + 3 cts)	± (1 % R + 4 cts)	
Resolution	0.01 V	0.1 V	1 V
Input Impedance	10 MΩ		

*(1) The display indicates **+OL** above + 3400 V and **-OL** below - 3400 V, in **REL** mode. Above 1700 V, a repetitive beep indicates that the voltage being measured is greater than the safety voltage for which the device is guaranteed.*

5.2.2 AC Voltage Measurement

Measurement Range	(0.15 to 99.99) V	(100.0 to 999.9) V	(1000 to 1200) V_{RMS} 1700 V peak[1]
Specified Measurement Range[2]	(0 to 1100) V_{AC} / 1600 V peak		
Accuracy	(0.15 to 9.99) V ± (1 % R + 10 cts) (10.00 to 99.99) V ± (1 % R + 3 cts)	± (1 % R + 4 cts)	
Resolution	0.01 V	0.1 V	1 V
Input Impedance	10 MΩ		

*(1) The display indicates **OL** above 1700 V. Above 1200 V_{RMS}, a repetitive beep indicates that the voltage being measured is greater than the safety voltage for which the device is guaranteed Bandwidth in AC = 3 kHz.*

(2) Any value between zero and the min threshold of the measurement range (0.15 V) is forced to - - - - on the display.

5.2.3 DC Current Measurement

Measurement Range[2]	(0.00 to 99.99) A	(100.0 to 999.9) A	(1000 to 1500) A[1]
Specified Measurement Range	(0 to 100) % of the measurement range		
Accuracy[2] **(zero corrected)**	± (1 % R + 10 cts)	± (1 % R + 3 cts)	± (1.5 % R + 3 cts)
Resolution	0.01 A	0.1 A	1 A

*(1) The display indicates **+OL** above 3000 A and **-OL** below -3000 A in REL mode. The **-** and **+** signs are displayed (polarity).*

*(2) The residual current at zero depends on the remanence, it can be corrected by the **DC zero** function of the **HOLD** button.*

5.2.4 AC Current Measurement

Measurement Range[2]	(0.25 to 99.99) A	(100.0 to 999.9) A	1000 A (1500 A peak)[1]
Specified Measurement Range	(0 to 100) % of the measurement range		
Accuracy	± (1 % R + 10 cts)	± (1 % R + 3 cts)	
Resolution	0.01 A	0.1 A	1 A

*(1) The display indicates **OL** above 1500 A in PEAK mode. The **-** and **+** signs are not displayed. Bandwidth in AC = 2 kHz.*

(2) In AC, any value between zero and the min. threshold of the measurement range (0.25 A) is forced to show - - - - on the display.

5.2.5 True InRush® Measurement

Measurement Range	10 A to 1000 A_{AC}	10 A to 1500 A_{DC}
Specified Measurement Range	(0 to 100) % of the measurement range	
Accuracy	± (5 % R + 5 cts)	
Resolution	1 A	

Specific Specifications in PEAK mode in True InRush®
(from 10 Hz to 1 kHz in AC):

- Accuracy: add ± (1.5 % R + 0.5 A) to the values in the table above.
- PEAK capture time: 1 ms min. to 1.5 ms max.

5.2.6 Continuity Measurement

Measurement Range	(0.0 to 999.9) Ω
Open-circuit Voltage	≤ 3.6 V
Measurement Current	550 µA
Accuracy	± (1 % R + 5 cts)
Buzzer Triggering Threshold	Adjustable from (1 to 999) Ω (40 Ω is the default)

5.2.7 Resistance Measurement

Measurement Range[(1)]	(0.0 to 99.9) Ω	(100.0 to 999.9) Ω	(1000 to 9999) Ω	(10.00 to 99.99) kΩ
Specified Measurement Range	(1 to 100) % of the measurement range		(0 to 100) % of the measurement range	
Accuracy	± (1 % R + 10 cts)	± (1 % R + 5 cts)		
Resolution	0.1 Ω		1 Ω	10 Ω
Open-circuit Voltage	≤ 3.6 V			
Measurement Current	550 µA		100 µA	10 µA

*(1) Above the maximum display value, the display unit indicates **OL**.*
*The **-** and **+** signs are not displayed.*

Specific Specifications in MAX/MIN mode:

- Accuracy: add 1 % R to the values of the table above.
- Capture of the extreme: approximately 100 ms.

5.2.8 Diode Test

Measurement Range	(0.000 to 3.199) V_{DC}
Specified Measurement Range	(1 to 100) % of the measurement range
Accuracy	± (1 % R + 10 cts)
Resolution	0.001 V
Measurement Current	0.55 mA
Indication: junction reversed or open-circuit	**OL** is displayed when the measured voltage > 3.199 V

NOTE: The **-** sign is disabled for the diode test function.

5.2.9 Frequency Measurements

5.2.9.1 Voltage

Measurement Range(1)	(5.0 to 999.9) Hz	(1000 to 9999) Hz	(10.00 to 19.99) kHz
Specified Measurement Range	(1 to 100) % of the measurement range	(0 to 100) % of the measurement range	
Accuracy	± (0.4 % R + 1 ct)		
Resolution	0.1 Hz	1 Hz	10 Hz

5.2.9.2 Current

Measurement Range(1)	(5.0 to 999.9) Hz
Specified Measurement Range	(1 to 100) % of the measurement range
Accuracy	± (0.4 % R + 1 ct)
Resolution	0.1 Hz

*(1) In **MAX/MIN** mode, the operating range is limited to 1 kHz. If the level of the signal is too low (U < 3 V or I < 3 A) or if the frequency is less than 5 Hz, the device cannot determine the frequency and displays* `----`.

Specifications in MAX/MIN mode (from 10 Hz to 1 kHz) for voltage and current.

- Accuracy: add 1 % R to the values of the table above.
- Capture time of the extreme: approximately 100 ms.

5.2.10 Temperature Measurement

Function	External Temperature	
Type of Sensor	K-thermocouple	
Measurement Range	(-60.0 to +999.9) °C (-76.0 to +1831.8) °F	(+1000 to +1200) °C (+1832 to +2192) °F
Specified Measurement Range	(1 to 100) % of the measurement range	(0 to 100) % of the measurement range
Accuracy[1]	1 % R ± 3 °C 1 % R ± 5.4 °F	1 % R ± 3 °C 1 % R ± 5.4 °F
Resolution	0.1 °C 0.1 °F	1 °C 1 °F

(1) The stated external temperature measurement accuracy does not take the accuracy of the K-thermocouple into account.

NOTE: Use of the thermal time constant (0.7 min/°C): If there is a sudden variation of the temperature of the clamp, by 10 °C for example, the clamp will be at 99 % (cnst = 5) of the final temperature after 0.7 min/°C x 5 - 35 min (the time constant of the external sensor must be added to this value).

Specific Specifications in MAX/MIN mode (10 Hz to 1 kHz):

- Accuracy: add 1 % R to the values of the table above.
- Capture time of the extreme: approximately 100 ms.

5.2.11 Adapter Function Measurement

5.2.11.1 In DC mode

Measurement Range[1]	(0.0 to 999.9) mV	(1.00 to 9.99) V
Specified Measurement Range[2]	(0 to 100) % of the measurement range	
Accuracy	1 % R + 3 cts	
Resolution	0.1 mV	10 mV
Input Impedance	10 MΩ	

5.2.11.2 In AC mode

Measurement Range[1]	(5.0 to 999.9) mV	(1.00 to 9.99) V
Specified Measurement Range[2]	(1 to 100) % of the measurement range	(0 to 100) % of the measurement range
Accuracy	(5.0 to 99.9) mV ± (1 % R + 10 cts) (100.0 to 999.9) mV ± (1 % R + 3 cts)	1 % R + 3 cts
Resolution	0.1 mV	10 mV
Input Impedance	10 MΩ	

(1) The basic display is 10,000 counts. The position of the decimal count and the display of multiples (m and k) depend on the programming of the scale factor.
-In DC, the display indicates **+OL** *above +9999 counts and* **-OL** *below -9999 counts.*
The **-** *and* **+** *signs are displayed (polarity).*
-In AC, the display indicates **OL** *above 9999 counts.*

(2) The max. bandwidth is 1 kHz.

Specific specifications in MAX/MIN mode (from 10 Hz to 1 kHz):

- Accuracy: add 1 % R to the values of the table above.
- Capture of the extreme: approximately 100 ms.

5.3 ENVIRONMENTAL CONDITIONS

Conditions	Operating	Storage
Temperature	(-4 to +131) °F (-20 to +55) °C	(-40 to +158) °F (-40 to +70) °C
Relative Humidity (RH)	≤ 90 % up to 131 °F (55 °C)	≤ 90 % up to 158 °F (70 °C)

5.4 MECHANICAL SPECIFICATIONS

Housing	Rigid polycarbonate shell with over-molded elastomer covering; UL94 V1
Jaws	Polycarbonate Opening: 1.9 in (48 mm) Clamping diameter: 1.9 in (48 mm)
Screen	LCD display unit Blue backlighting Dimensions: (1.6 x 1.9 in) (41 x 48 mm)
Dimension	(10.7 x 3.6 x 1.6) in (272 x 92 x 41) mm
Weight	1.32 lbs (600 g) with the batteries

5.5 POWER SUPPLY

Batteries	Four 1.5 V AA LR6
Battery life	> 350 h (without backlighting)
Auto Power Off	After 10 min with no switch and/or button activity

5.6 COMPLIANCE WITH INTERNATIONAL STANDARDS

Electric Safety	Compliant with standards IEC/EN 61010-1 or BS EN 61010-1, IEC/EN 61010-2-032 or BS EN 61010-2-032: 1000 V CAT IV and 1500 V CAT III
Electromagnetic Compatibility	Compliant with standard EN-61326-1 or BS EN 61326-1 Classification: residential environment
Mechanical strength	Free fall: 2 m (in accordance with standard IEC-68-2-32)
Level of Protection	Housing: IP54 (per standard IEC-60529) / Jaws: IP40

5.7 ENVIRONMENTAL VARIATIONS

Condition of Influence	Range of Influence	Measurement Influenced	Influence	
			Typical	MAX
Temperature	(-4 to +131) °F (-20 to +55) °C	V_{AC} V_{DC} A* Ω →|← T°C Adp	- 0.1 % R / 10 °C 1 % R / 10 °C* - (0.2 % R +1 °C) / 10 °C 0.1 % R / 10 °C + 3 cts	0.1 % R / 10 °C 0.5 % R / 10 °C + 2 cts 1.5 % R / 10 °C + 2 cts* 0.1 % R / 10 °C + 2 cts (0.3 % R + 2° C) / 10 °C 0.3 % R / 10 °C + 5 cts
Humidity	(10 to 90) % RH	V A Ω →|←	≤ 1 ct - 0.2 % R	0.1 % R + 1 ct 0.1 % R + 2 cts 0.3 % R + 2 cts
Frequency	10 Hz to 1 kHz (1 to 3) kHz (10 to 400) Hz 400 Hz to 2 kHz	V A	1 % R + 1 ct 8 % R + 1 ct 1 % R + 1 ct 4 % R + 1 ct	1 % R + 1 ct 9 % R + 1 ct 1 % R + 1 ct 5 % R + 1 ct
Position of the conductor in the jaws (f≤400 Hz)	Any position on the internal perimeter of the jaws	A	1.5 % R	3 % R + 1 ct
Adjacent conductor carrying a current of A_{DC} or RMS	Conductor touching the external perimeter of the jaws	A	42 dB	35 dB
Conductor enclosed by the clamp	(0 to 500) A_{DC} or RMS	V	< 1 ct	1 ct
Application of a voltage on the clamp	(0 to 1600) V_{DC} or RMS	A	< 1 ct	3 % R + 1 ct
Peak factor	1.4 to 3.5 limited to 1500 A peak 1400 V peak	A (AC) V (AC)	1 % R 1 % R	3 % R + 1 ct

***Note on Temperature:** Influence specified until 1000 A_{DC}

6. MAINTENANCE

6.1 WARNING

- Remove the test leads on any input before opening the case.
- Do not operate the clamp-on meter without a battery case cover.
- To avoid electrical shock, do not attempt to perform any servicing unless you are qualified to do so.
- To avoid electrical shock and/or damage to the instrument, do not get water or other foreign agents into the probe.

6.2 CLEANING

- Disconnect everything connected to the device and set the switch to OFF.
- Use a soft cloth moistened with soapy water.
- Rinse with a damp cloth and dry quickly using a dry cloth or forced air.
- Dry completely before putting back into use.

6.3 REPLACEMENT OF THE BATTERIES

The  symbol indicates that the batteries are low. When this symbol appears on the display unit, the batteries must be replaced. The measurements and specifications are no longer guaranteed.

To replace the batteries, proceed as follows:

1. Disconnect the measurement leads from the input terminals.
2. Set the switch to OFF.
3. Using a screwdriver, unscrew the battery compartment cover from the back of the housing (see § 4.1).
4. Remove the used batteries and replace them with four 1.5 V AA batteries, observing the polarities.
5. Close the battery compartment cover and screw it onto the housing.

6.4 REPAIR AND CALIBRATION

To ensure that your instrument meets factory specifications, we recommend that it be sent back to our factory Service Center at one-year intervals for recalibration or as required by other standards or internal procedures.

For instrument repair and calibration:

(Or contact your authorized distributor.)

Contact us for the costs for repair, standard calibration, and calibration traceable to N.I.S.T.

NOTE: You must obtain a CSA# before returning any instrument.

6.5 TECHNICAL ASSISTANCE

If you are experiencing any technical problems or require any assistance with the proper operation or application of your instrument, please call, e-mail or fax our technical support team.

6.6 LIMITED WARRANTY

The instrument is warrantied to the owner for a period of three years from the date of original purchase against defects in manufacture. This limited warranty is given by AEMC® Instruments, not by the distributor from whom it was purchased. This warranty is void if the unit has been tampered with, abused, or if the defect is related to service not performed by AEMC® Instruments.

Please print the online Warranty Coverage Information for your records.

What AEMC® Instruments will do:

If a malfunction occurs within the warranty period, you may return the instrument to us for repair, provided we have your warranty registration information on file or a proof of purchase. AEMC® Instruments will repair or replace the faulty material at our discretion.

Caution: To protect yourself against in-transit loss, we recommend that you insure your returned material.

NOTE: You must obtain a CSA# before returning any instrument.

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