HT INSTRUMENTS HT3010 Trms Clamp Meter User Manual

Contents

HT INSTRUMENTS HT3010 Trms Clamp Meter

Product Information

Specifications

- Model: HT3010
- Release Version: 2.10
- Language: Italian (IT Version 2.00)

Product Usage Instructions

Precautions and Safety Measures

Preliminary Instructions

Before use, ensure to read and understand all safety precautions mentioned in the manual.

During Use

When using the product, follow the specified guidelines for safe operation.

After Use

After using the product, make sure to properly store it and perform any recommended post-usage maintenance.

General Description

The HT3010 is a measuring instrument capable of calculating both Average Value and True RMS (Root Mean Square) Value.

Mean Value and True RMS

The device can measure both Mean Value and True RMS, providing accurate readings for different types of electrical signals.

Preparation for Use

Initial Checks

Prior to usage, perform the initial checks as outlined in the manual to ensure the device is functioning correctly.

Power Supply

Connect the device to a suitable power source as described in the manual.

Storage

When not in use, store the device in a safe and dry place to prevent damage.

Nomenclature

The product features various buttons with specific functions as described below:

Instrument Description

Includes details about alignment notches and other physical characteristics of the device.

Function Button Description

- **H Button:** Function of the H button.
- **Mode Button:** Function of the Mode button.
- **Range Button:** Function of the Range button.
- **Max Min Button:** Function of the Max Min button.
- **Disable Auto Power Off:** How to disable the auto power off function.

Operational Instructions

Learn how to measure DC Voltage using the device by following the instructions provided in the manual.

PRECAUTIONS AND SAFETY MEASURES

The instrument has been designed in compliance with directive IEC/EN61010-1 relevant to electronic measuring instruments. For your safety and in order to prevent damaging the instrument, please carefully follow the procedures described in this manual and read all notes preceded by the symbol with the utmost attention.
Before and after carrying out the measurements, carefully observe the following instructions:

- Do not carry out any voltage or current measurement in humid environments.
- Do not carry out any measurements in case gas, explosive materials or flammables are present, or in dusty environments.
- Avoid any contact with the circuit being measured if no measurements are being carried out.
- Avoid any contact with exposed metal parts, with unused measuring probes, circuits, etc.
- Do not carry out any measurement in case you find anomalies in the instrument such as deformation, breaks, substance leaks, absence of display on the screen, etc.
- Pay special attention when measuring voltages higher than 20V, since a risk of electrical shock exists.

In this manual, and on the instrument, the following symbols are used:

-  Warning: observe the instructions given in this manual; improper use could damage the instrument or its components.
-  High voltage danger: electrical shock hazard.
-  Double-insulated meter.
-  AC voltage or current
-  DC voltage
-  Connection to earth
-  This symbol indicates that the clamp can operate on live conductors

PRELIMINARY INSTRUCTIONS

- This instrument has been designed for use in environments of pollution degree 2.
- It can be used for CURRENT and VOLTAGE measurements on installations with measurement category CAT III 600V. For a definition of measurement categories, see § 1.4
- We recommend following the normal safety rules devised to protect the user against dangerous currents and the instrument against incorrect use.
- Only the leads supplied with the instrument guarantee compliance with the safety standards. They must be in

good conditions and replaced with identical models, when necessary.
- Do not test circuits exceeding the specified current and voltage limits.
- Check that the battery is correctly inserted
- Before connecting the test leads to the circuit to be tested, make sure that the switch is correctly set.
- Make sure that the LCD display and the switch indicate the same function.

DURING USE

- Please carefully read the following recommendations and instructions:
- **CAUTION** Failure to comply with the Caution notes may damage the instrument and/or its components or be a source of danger for the operator.
- Before activating the switch, remove the conductor from the clamp jaw or disconnect the test leads from the circuit under test.
- When the instrument is connected to the circuit under test, do not touch any unused terminal.
- Avoid measuring resistance if external voltages are present. Even if the instrument is protected, excessive voltage could cause a malfunction of the clamp.
- When measuring current with the clamp jaws, first remove the test leads from the instruments input jacks.
- During current measurement, any other current near the clamp may affect measurement precision.
- When measuring current, always put the conductor as near as possible to the middle of the clamp jaw, to obtain the most accurate reading.
- While measuring, if the value or the sign of the quantity being measured remain unchanged, check if the HOLD function is enabled.

AFTER USE

- When measurement is complete, switch OFF the instrument.
- If you expect not to use the instrument for a long period, remove the battery.

DEFINITION OF MEASUREMENT (OVERVOLTAGE) CATEGORY

- Standard “IEC/EN61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements” defines what measurement category is. § 6.7.4: Measured circuits, reads: (OMISSIS)
- Circuits are divided into the following measurement categories:
- **Measurement category IV** is for measurements performed at the source of the low-voltage installation.
    - Examples are electricity meters and measurements on primary overcurrent protection devices and ripple control units.
- **Measurement category III** is for measurements performed on installations inside buildings.
    - Examples are measurements on distribution boards, circuit breakers, wiring, including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation, and equipment for industrial use and some other equipment, for example, stationary motors with permanent connection to fixed installation.
- **Measurement category II** is for measurements performed on circuits directly connected to the low-voltage installation.
    - Examples are measurements on household appliances and similar equipment.

- **Measurement category I** is for measurements performed on circuits not directly connected to MAINS.
    - Examples are measurements on circuits not derived from MAINS, and specially protected (internal) MAINS-derived circuits. In the latter case, transient stresses are variable; for that reason, the standard requires that the transient withstand capability of the equipment is made known to the user.

GENERAL DESCRIPTION

The instrument carries out the following measurements:

- DC and TRMS AC Voltage up to 600V
- TRMS AC Current up to 400A
- Resistance and continuity test with buzzer
- Frequency with leads and jaws
- Diode test
- Detection of the presence of AC voltage without contact with the in-built sensor.
- Each of these functions may be selected through a rotary switch. The instrument also has function keys (see § 4.2) and backlight feature. The instrument is also equipped with an Auto Power OFF function (which cannot be disabled) which automatically switches off the instrument approx. 15 minutes after the last operation was carried out.

MEASURING AVERAGE VALUES AND TRMS VALUES

- Measuring instruments of alternating quantities are divided into two big families:
- AVERAGE-VALUE meters: instruments measuring the value of the sole wave at fundamental frequency (50 or 60 Hz).
- TRMS (True Root Mean Square) VALUE meters: instruments measuring the TRMS value of the quantity being tested.
- With a perfectly sinusoidal wave, the two families of instruments provide identical results. With distorted waves, instead, the readings shall differ. Average-value meters provide the RMS value of the sole fundamental wave; TRSM meters, instead, provide the
- RMS value of the whole wave, including harmonics (within the instruments bandwidth). Therefore, by measuring the same quantity with instruments from both families, the values obtained are identical only if the wave is perfectly sinusoidal. In case it is distorted, TRMS meters shall provide higher values than the values read by average-value meters.

DEFINITION OF TRUE ROOT MEAN SQUARE VALUE AND CREST FACTOR

- The root mean square value of current is defined as follows: “In a time equal to a period, an alternating current with a root mean square value of 1A intensity, circulating on a resistor, dissipates the same energy that, during the same time, would be dissipated by a direct current with an intensity of 1A”. This definition results in the numeric expression:
- G=$\sqrt{\frac{1}{T}\int_{t_0}^{t_0+T} g^2(t)dt}$ The root mean square value is indicated with the acronym RMS.

- The Crest Factor is defined as the relationship between the Peak Value of a signal and its

$$(G)=\frac{G_p}{G_{RMS}}$$

- RMS value: CF $\sqrt{2}$ This value changes with the signal waveform, for a purely 2 sinusoidal wave it is =1.41. In case of distortion, the Crest Factor takes higher values as wave distortion increases.

PREPARATION FOR USE

INITIAL CHECKS

- Before shipping, the instrument has been checked from an electric as well as mechanical point of view. All possible precautions have been taken so that the instrument is delivered undamaged. However, we recommend generally checking the instrument in order to detect possible damage suffered during transport. In case anomalies are found, immediately contact the forwarding agent. We also recommend checking that the packaging contains all components indicated in § 7.3.1. In case of discrepancy, please contact the Dealer. In case the instrument should be returned, please follow the instructions given in § 8.

INSTRUMENT POWER SUPPLY

- The instrument is supplied with 3×1.5V batteries type AAA LR03 included in the package. The “  “ symbol appears when the battery is nearly flat. Replace the battery by following the instructions given in § 6.2.

STORAGE

- In order to guarantee precise measurement, after a long storage time under extreme environmental conditions, wait for the instrument to come back to normal condition (see § 7.2.1).

NOMENCLATURE

- **INSTRUMENT DESCRIPTION**

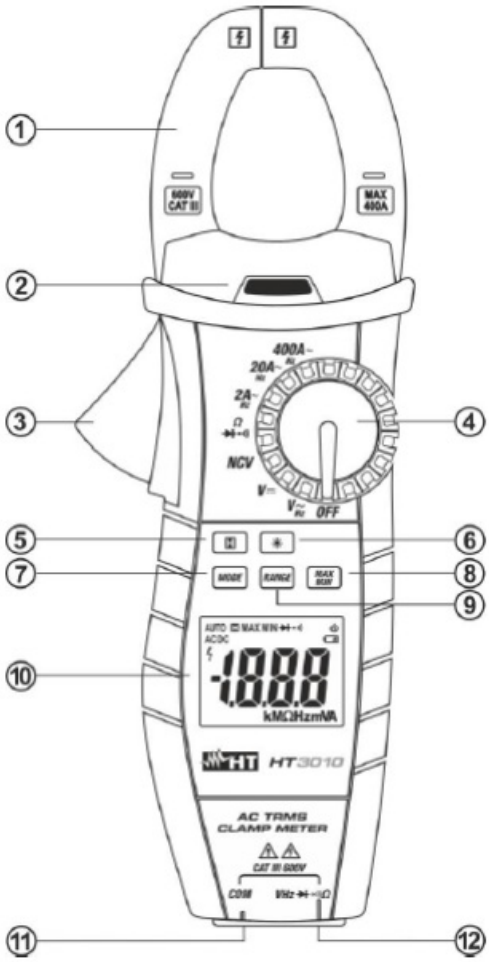


Fig. 1: Instrument description

- **CAPTION:**

1. Inductive clamp jaw
2. AC Voltage detector
3. Jaw trigger
4. Rotary selector switch
5. key
6. key
7. MODE key
8. MAX MIN key
9. RANGE key
10. LCD display
11. Input terminal COM
12. Input terminal VΩHz

- **Alignment marks**
- Put the conductor within the jaws on intersection of the indicated marks as much as possible (see Fig. 2) to meet the meter accuracy specifications

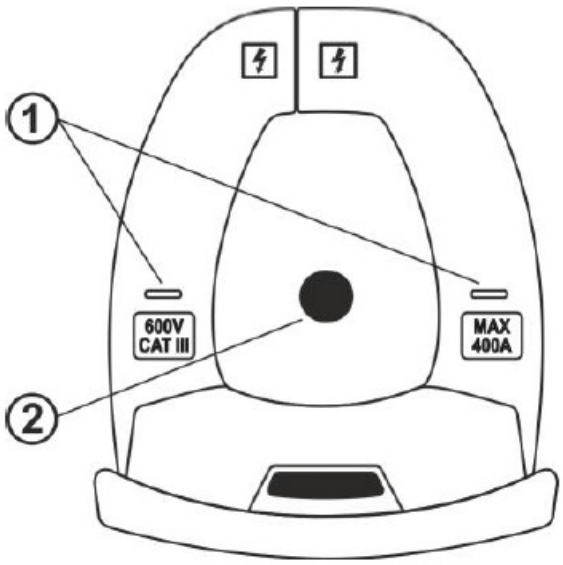


Fig. 2: Alignment marks

- **CAPTION**

1. Alignment marks
2. Conductor

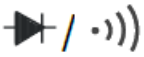
- **DESCRIPTION OF FUNCTION KEYS**
- [redacted] key

  Pressing the [redacted] key activates the function Data HOLD, i.e. the value of the measured quantity is frozen. The message “H” appears on the display. This operating mode is disabled when the “HOLD” key is pressed again or the switch is operated.
- **key**

  Press the key to enable/disable the backlight feature. This function is active for each position of the switch and for the sake of battery saving after 1 minute the light is automatically switched off
- **MODE key**

  The MODE key allows to selection a double function in some positions of the switch. In particular, it is active in the 2A~Hz, 20A~Hz 400A~Hz, V~Hz positions to pass through frequency (Hz) for AC or voltage measurements, in VΩHz in order to select resistance measurement, continuity test with buzzer, and diode test
- **RANGE key**
- By pressing RANGE key, the manual mode is activated and the “AUTO” symbol disappears from the display. Press RANGE cyclically to change the measuring range and fix the decimal point on the display. To restore the autorange keep the RANGE key pressed for at least 1s or rotate the switch to another position. This feature is not active in NCV
- 2A~Hz, 20A~Hz 400A~Hz, V~Hz and / positions.

MAX MIN key

- Pressing the MAX MIN key activates the detection of maximum and minimum values of the quantity being tested. The values are constantly updated and are displayed cyclically every time the same key is pressed again. The display shows the symbol associated with the selected function: “MAX” for maximum value and “MIN” for minimum value. Pressing the MAXMIN key the “AUTO” function is disabled. The function is not active for measurements of NCV, Hz, and  / or positions. Long pressing the MAX MIN key (or upon switching on the instrument again) allows quitting the function.

Disabling the Auto Power Off function

- To preserve internal batteries, the instrument switches off automatically approximately 15 minutes after it was last used. To disable the Auto Power Off function, proceed as follows:
- Switch off the instrument (OFF)
- By pressing and holding the MODE key and switching on the instrument. The symbol “  ” disappears from the display
- Switch off and then on again the instrument to enable the function again.

OPERATING INSTRUCTIONS

- **DC VOLTAGE MEASUREMENT**
- **CAUTION** The maximum input DC Voltage is 600Vrms. Do not measure voltages exceeding the limits given in this manual. Exceeding these limits could result in electrical shocks to the user and damage to the instrument.

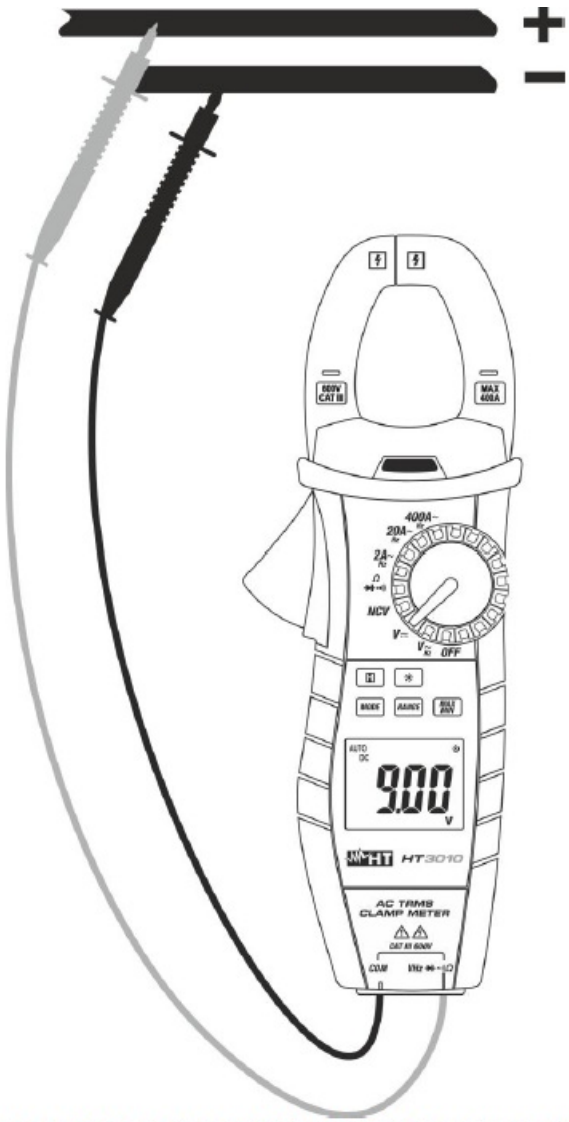


Fig. 3: Use of the instrument for DC Voltage measurement

1. Select the position V
2. Insert the red cable into input terminal VΩHz and the black cable into input terminal COM
3. Position the test leads in the desired points of the circuit to be measured (see Fig. 3). The display shows the value of voltage.
4. If the symbol “O.L” is displayed, this indicates overload status
5. When symbol “-” appears on the instrument’s display, it means that voltage has the opposite direction with respect to the connection in Fig. 3
6. For use the HOLD, RANGE and MAX MIN functions, please refer to § 4.2.

- **NON-CONTACT AC VOLTAGE DETECTION (NCV)**
- **CAUTION** The maximum input AC voltage is 600V. Do not measure voltages exceeding the limits given in this manual. Exceeding these limits could result in electrical shocks to the user and damage to the instrument.

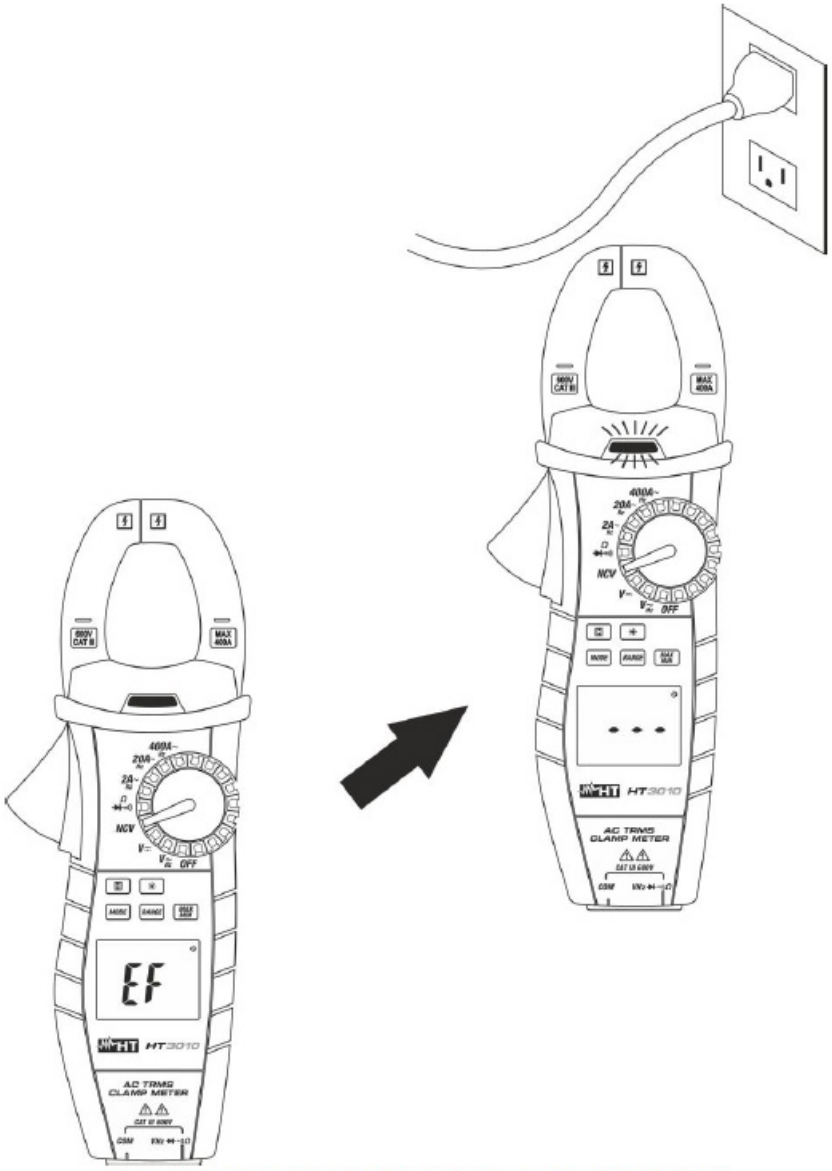


Fig. 4: Non-contact AC Voltage detection (NCV)

1. Select the position NCV. The “EF” indication is displayed
2. Move the instrument to the AC source (see Fig. 4)
3. Note the intermittent flashing frequency of the AC voltage detector (see Fig. 1 – part 2) and the sound emitted by the instrument which gradually increases in intensity close to the AC source
4. The “- – – -“ indication, the maximum flashing frequency and the sound in the closest point to the AC source is shown by the instrument

AC VOLTAGE AND FREQUENCY MEASUREMENT

- **CAUTION** The maximum input AC Voltage is 600Vrms. Do not measure voltages exceeding the limits given in this manual. Exceeding these limits could result in electrical shocks to the user and damage to the instrument.

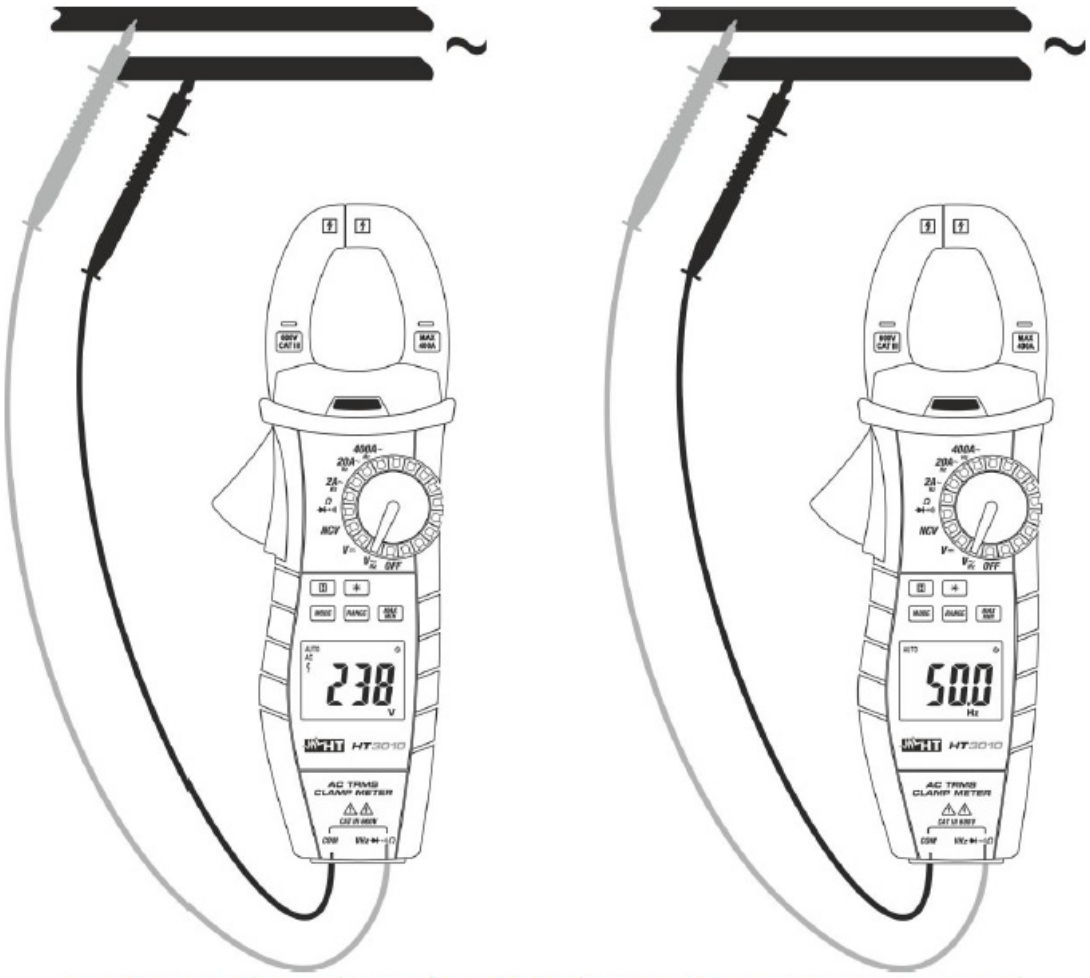


Fig. 5: Use of the instrument for AC Voltage and Frequency measurement

1. Select the position V Hz
2. Insert the red cable into input terminal VΩHz and the black cable into input terminal COM
3. Position the test leads in the desired points of the circuit to be measured (see Fig. 5 –left part). The display shows the value of voltage.
4. If the symbol “O.L” is displayed, this indicates overload status.
5. Press the MODE key until the symbol “Hz” is displayed for measuring frequency (see Fig. 5 – right part)
6. For use the HOLD, RANGE and MAX MIN functions, please refer to § 4.2

RESISTANCE MEASUREMENT

- **CAUTION** Before attempting any resistance measurement, remove power from the circuit under test and discharge all capacitors, if present.

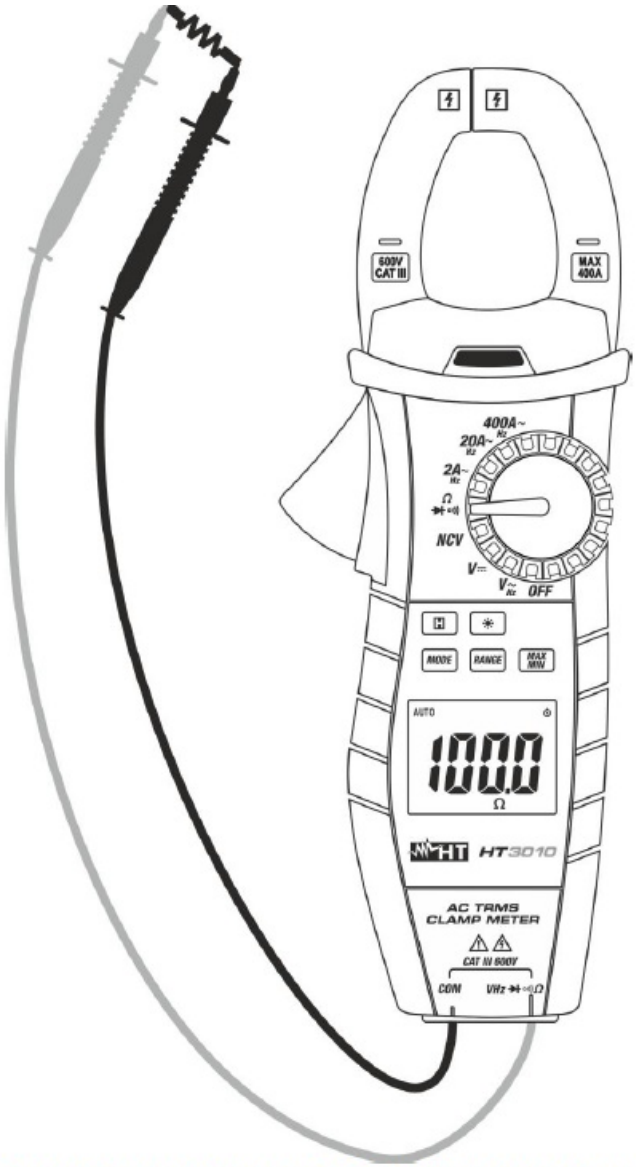
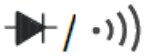
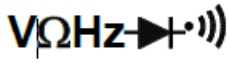


Fig. 6: Use of the instrument for Resistance measurement

1. 1. Select the position 
2. Insert the red cable into input terminal  and the black cable into input terminal COM.
3. Position the test leads in the desired points of the circuit to be measured (see Fig. 6). The display shows the value of resistance.
4. If the symbol “O.L” is displayed, this indicates overload status.
5. For use the HOLD, RANGE and MAX MIN functions, please refer to § 4.2.

CONTINUITY TEST AND DIODE TEST

- **CAUTION** Before attempting any resistance measurement, remove power from the circuit under test and discharge all capacitors, if present.

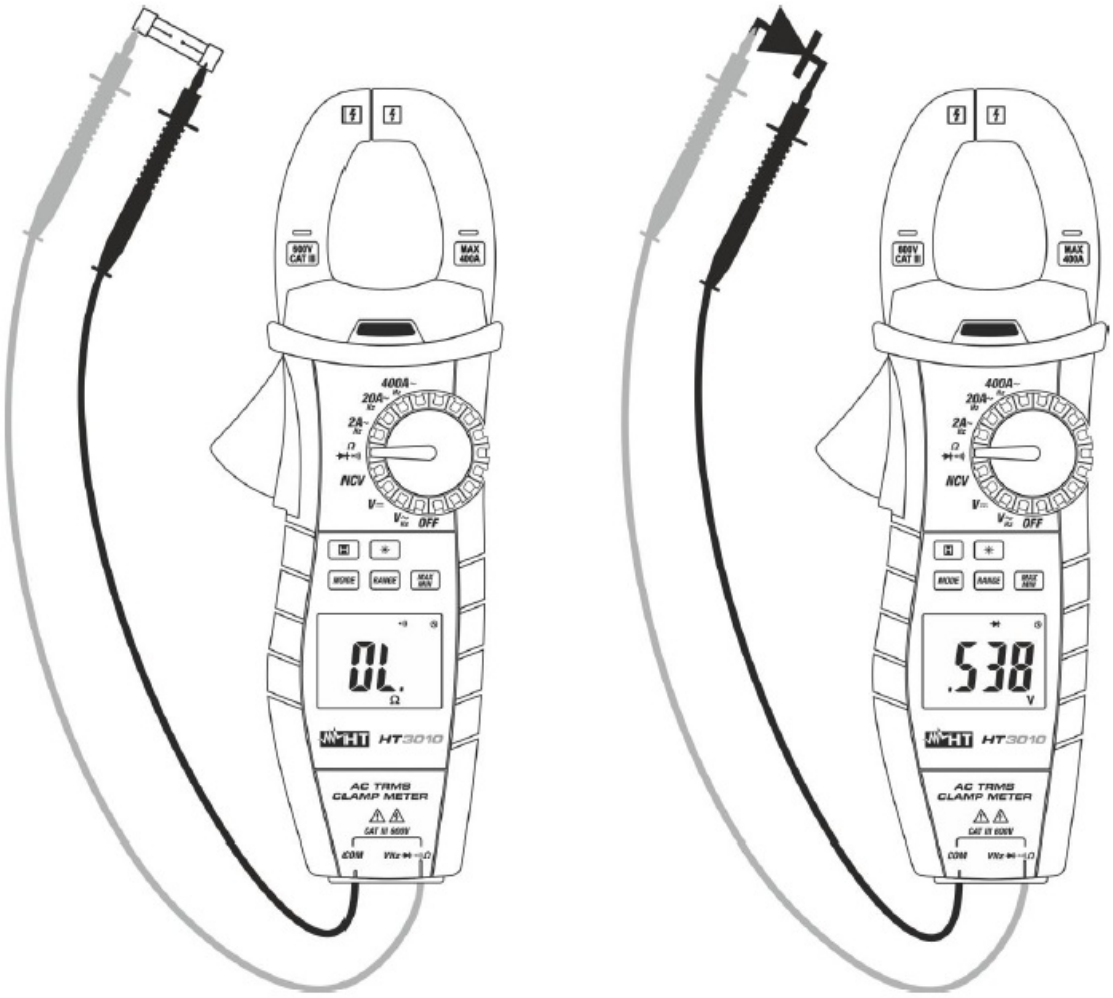
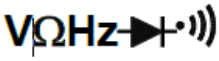


Fig. 7: Use of the instrument for continuity test and diode test

1. 1. Select the position 
   2. Press the MODE key until the symbol " " is displayed to activate the continuity test.
   3. Insert the red cable into the input terminal  and the black cable into the input terminal COM and carry out the continuity test of the object to be measured (see Fig. 7– left side). A buzzer sounds when the measured value of resistance is lower than 30
2. Press the MODE key to select the diode test. The symbol "  " appears on the display.
3. Connect the red lead to the anode of the diode and the black lead to the cathode in case direct polarization measurement is carried out (see Fig. 7 – right side). Invert the position of the leads in case reverse polarization measurement is carried out.
4. Values on the display between 0.4V and 0.7V (direct) and "O.L" (reverse) indicate correct connection. A value "0mV" indicates that the device is short-circuited, while "O.L" in both directions indicates an interrupted device.

AC CURRENT MEASUREMENT

- **CAUTION** Before attempting any measurement disconnect all the test leads from the circuit under test and from the meter's input terminals.

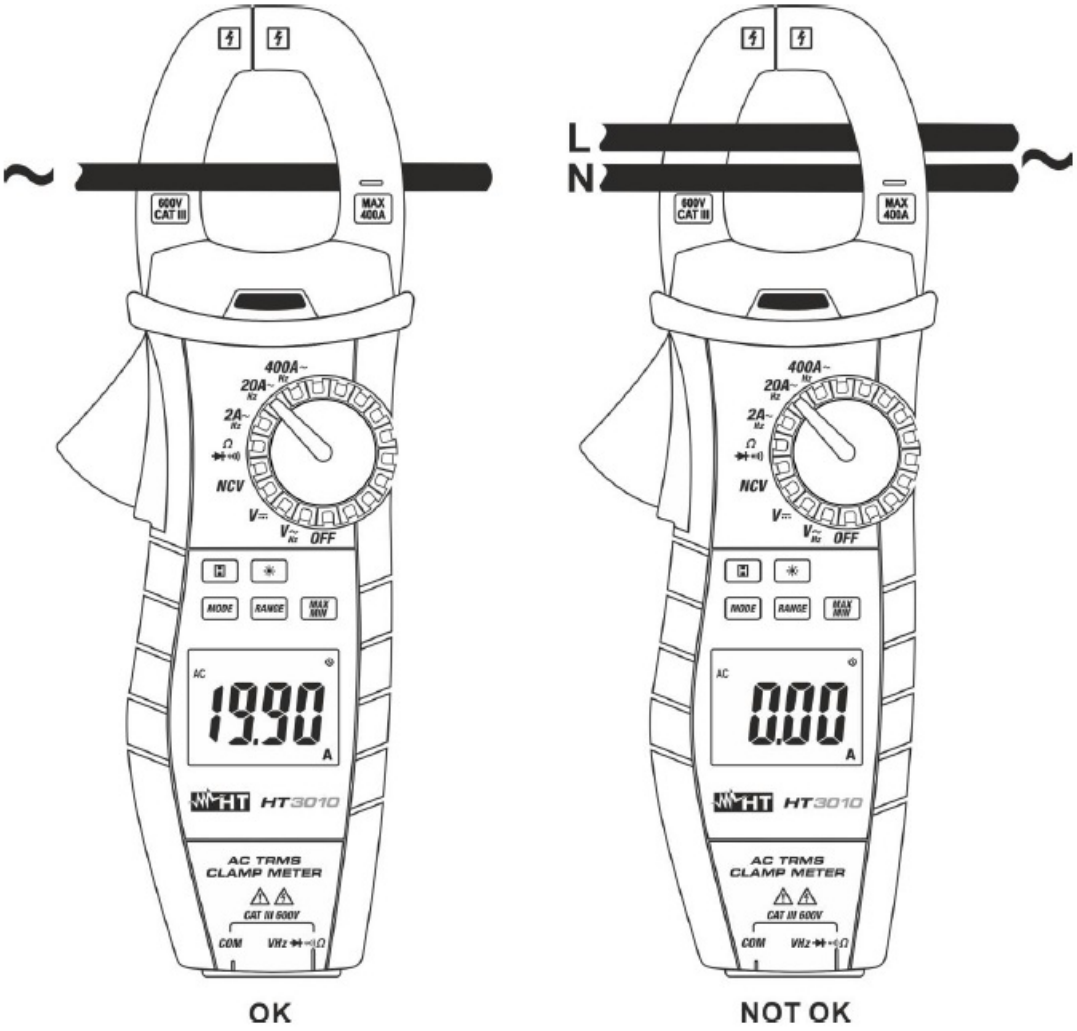


Fig. 8: Use of the instrument for AC current measurement

1. Select position 2A~Hz, 20A~Hz 400A~Hz, V~Hz
   - **CAUTION** A possible value displayed with the instrument not in measuring mode is not to be considered a problem of the instrument and these values are not added by the instrument while carrying out a real measurement
2. Insert the cable in the middle of the clamp jaws, in order to obtain accurate measures (see Fig.11). The display shows the value of AC current
3. Press the MODE key for measuring frequency (Hz) of AC current
4. If the symbol “O.L” is displayed, this indicates overload status. In this case, position the rotary switch to a higher measuring range.
5. For use the HOLD and MAX MIN functions, please refer to § 4.2.

MAINTENANCE

GENERAL INFORMATION

1. While using and storing the instrument, carefully observe the recommendations listed in this manual in order to prevent possible damage or danger during use.
2. Do not use the instrument in environments with high humidity levels or high temperatures. Do not expose to direct sunlight.

3. Always switch off the instrument after use. In case the instrument is not to be used for a long time, remove the battery to avoid liquid leaks that could damage the instrument's internal circuits.

REPLACING THE BATTERY

When the LCD display shows the symbol "  ", it is necessary to replace the batteries.

CAUTION Only expert technicians should perform this operation. Before carrying out this operation, make sure you have removed all cables from the input terminals or the cable being tested from inside the clamp jaw.

1. Turn the rotary switch to the OFF
2. Disconnect the cables from the input terminals and the cable being tested from the clamp jaw.
3. Loosen the battery cover fastening screw and remove the cover.
4. Remove the batteries and replace with new of the same type (see § 7.1.2) paying attention to correct polarity.
5. Position the battery cover back over the compartment and fasten it with the relevant screw.
6. Do not scatter old batteries into the environment. Use the relevant containers for battery disposal.

CLEANING THE INSTRUMENT

- Use a soft and dry cloth to clean the instrument. Never use wet cloths, solvents, water, etc.

END OF LIFE

- **CAUTION**: this symbol found on the instrument indicates that the appliance, its accessories and the battery must be collected separately and correctly disposed of.

TECHNICAL SPECIFICATIONS

TECHNICAL CHARACTERISTICS

- Accuracy indicated as ± [% rdg + (num dgt x resolution] at 18°C÷28°C, <75%RH.

DC Voltage

Range	Resolution	Accuracy	Input impedance	Overload protection
200.0mV	0.1mV	±(1.0%rdg+3dgt)	10MW	600VDC/ACrms
2.000V	0.001V			
20.00V	0.01V			
200.0	0.1V			
600V	1V			

AC TRMS Voltage

Range	Resolution	Accuracy (40Hz ÷ 400Hz)	Input impeda nce	Overload protection
200.0mV	0.1mV	±(1.0%rdg.+3dgt)	10MW	600VDC/ACrms
2.000V	0.001V			
20.00V	0.01V			
200.0V	0.1V			
600V	1V			

- Integrated sensor for AC voltage detection: LED on for phase-earth voltage > 50V, 50/60Hz Reference crest factor: 1.4
- Accuracy for not sinusoidal waveform: ±2.0%rdg + 3dgt (@ max crest factor 2, 50/60Hz)

AC TRMS Current

Range (*)	Resolution	Accuracy (*,**) (40Hz ÷ 400 Hz)	Overload protection
2.000A	0.001A	±(2.0%rdg.+5dgt)	400AACrms
20.00A	0.01A		
200.0A	0.1A		
400A	1A		

- Accuracy specifies from 2% to 100% of measuring range ; Reference crest factor: 1.4 (**) Error due to a not centered cable position: <±1.5%rdg (@ sine waveform)
- Accuracy for not sinusoidal waveform: ±3.0%rdg + 5dgt (@ max crest factor 2, 50/60Hz)

Resistance and Continuity test

Range	Resolution	Accuracy	Buzzer	Overload protection
200.0W	0.1W	±(1.0%rdg+5dgt)	<30W	600VDC/ACrms
2.000kW	0.001kW			
20.00kW	0.01kW			
200.0kW	0.1kW			
2.000MW	0.001MW			
20.00MW	0.01MW	±(1.2%rdg+3dgt)		

Diode test

Range	Resolution	Open voltage	Overload protection
	0.001V	>3VDC	600VDC/ACrms

Frequency with test leads and with jaws

Range	Resolution	Accuracy	Sensitivity	Overload protection
19.99Hz	0.01Hz	±(1.0%rdg+5dgt)	[3]0.1Vrms [3]1Arms	600VDC/ACrms 400ADC/ACrms
199.9Hz	0.1Hz			
1999Hz	1Hz			
19.99kHz	0.01kHz			

- Frequency range: 10Hz ÷ 19.99kHz

Reference standards

- Safety: IEC/EN61010-1, IEC61010-2-032, IEC61010-2-033
- EMC: IEC/EN61326-1
- Insulation: double insulation
- Pollution level: 2
- Measurement category: CAT III 600V to ground

General characteristics

- Size (L x W x H): 220 x 81 x 42mm ; (9 x 3 x 2in)
- Weight (battery included): 320g (11 ounces)
- Max. cable diameter: 30mm (1in)
- Mechanical protection: IP40
- **Power supply**
- Battery type: 3×1.5V batteries AAA LR03
- Battery life: ca 40h (backlight ON), ca 240h (backlight OFF)
- Low battery indication: symbol “  “ is shown at display
- Auto Power OFF: after 15 minutes (maybe disabled)

Display

- Characteristics: 3½ LCD, 2000 point, sign, decimal point and backlight
- Sampling rate: 3 measurements per second
- Conversion type: TRMS

ENVIRONMENT

- Reference temperature: 23°C±5°C; (73°F±41°F)
- Operating temperature: 0°C ÷ 40°C ; (32°F ÷ 104°F)
- Allowable relative humidity: <75%RH
- Storage temperature: -10°C ÷ 50°C ; (-4°F ÷ 140°F)
- Storage humidity: <75%RH
- Max operating altitude: 2000m (6562 ft)

This instrument satisfies the requirements of Low Voltage Directive 2014/35/EU (LVD) and of Directive 2014/30/EU (EMC)
This instrument satisfies the requirements of 2011/65/CE (RoHS) directive and the requirements of 2012/19/CE (WEEE) directive

ACCESSORIES

- Standard accessoriesa
- couple of test leads
- Carrying bag
- Batteries
- User manual

SERVICE

- **WARRANTY CONDITIONS**
- This instrument is warranted against any material or manufacturing defect, in compliance with the general sales conditions. During the warranty period, defective parts may be replaced. However, the manufacturer reserves the right to repair or replace the product. Should the instrument be returned to the After-sales Service or to a

Dealer, transport will be at the Customer charge. However, shipment will be agreed upon in advance. A report will always be enclosed in a shipment, stating the reasons for the product's return. Only use original packaging for shipment; any damage due to the use of non-original packaging material will be charged to the Customer. The manufacturer declines any responsibility for injury to people or property damage.

The warranty shall not apply in the following cases:

- Repair and/or replacement of accessories and batteries (not covered by warranty).
- Repairs may become necessary as a consequence of an incorrect use of the instrument or due to its use together with non-compatible appliances.
- Repairs that may become necessary as a consequence of improper packaging.
- Repairs may become necessary as a consequence of interventions performed by unauthorized personnel.
- Modifications to the instrument are performed without the manufacturer's explicit authorization.
- Use is not provided for in the instrument specifications or the instruction manual.
- The content of this manual cannot be reproduced in any form without the manufacturer's authorization.
- Our products are patented and our trademarks are registered. The manufacturer reserves the right to make changes in the specifications and prices if this is due to improvements in technology

SERVICE

- If the instrument does not operate properly, before contacting the After-sales Service, please check the conditions of batteries and cables and replace them, if necessary. Should the instrument still operate improperly, check that the product is operated according to the instructions given in this manual. Should the instrument be returned to the After-sales Service or to a Dealer, transport will be at the Customer charge. However, shipment will be agreed in advance. A report will always be enclosed to a shipment, stating the reasons for the product's return. Only use original packaging for shipment; any damage due to the use of non-original packaging material will be charged to the Customer.

FAQs

Q: How do I calibrate the HT3010?

A: Calibration instructions can be found in the user manual. It is recommended to follow these guidelines carefully or seek professional calibration services.

Q: Can the HT3010 measure AC voltage?

A: Yes, the HT3010 can measure AC voltage using the appropriate settings and procedures outlined in the manual.

Documents / Resources

	HT INSTRUMENTS HT3010 Trms Clamp Meter [pdf] User Manual HT4013, HT3010, HT3010 Trms Clamp Meter, HT3010, Trms Clamp Meter, Clamp Meter

References

- Instrumentos de medida eléctrica R.E.B.T. para el Instalador eléctrico profesional | HT Instruments
- HT-Instruments GmbH – Messgeräte zur Prüfung von elektrischen Größen, Energie und Elektroinstallationen
- User Manual