


# ENGLISH


## User manual



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## 1. 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

### 1.1. 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.

## 1.2. 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.

## 1.3. 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.

## 1.4. 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.*

## 2. GENERAL DESCRIPTION

The instrument carries out the following measurements:

- DC and AC voltage up to 600V
- AC current up to 400A
- Resistance and continuity test with buzzer
- Capacitance
- Frequency with leads
- Duty Cycle
- Diode test
- Temperature with K probe
- Detection of presence of AC voltage with and without contact with in-built sensor.

Each of these functions may be selected through a 8-position rotary switch, including the OFF position and a key for enabling the HOLD function. The instrument also has a “MODE”, “Hz%”, “REL” and “” keys. For their use, please refer to § 4.2. The selected quantity appears on the LCD display with the indication of the measuring unit and of the enabled functions.

### 2.1. 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.

### 2.2. 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 RMS value:  $CF (G) = \frac{G_p}{G_{RMS}}$  This value changes with the signal waveform, for a purely

sinusoidal wave it is  $\sqrt{2} = 1.41$ . In case of distortion, the Crest Factor takes higher values as wave distortion increases.

### **3. PREPARATION FOR USE**

#### **3.1. 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 § 6.3. In case of discrepancy, please contact the Dealer.

In case the instrument should be returned, please follow the instructions given in § 7.

#### **3.2. INSTRUMENT POWER SUPPLY**

The instrument is supplied with 1x9V IEC 6F22 battery, included in the package. The “+ III” symbol appears when the battery is nearly flat. Replace the battery by following the instructions given in § 5.2. The instrument is also equipped with an Auto Power OFF function (which cannot be disabled) which automatically switches off the instrument approx. 30 minutes after the last operation was carried out.

#### **3.3. CALIBRATION**

The instrument has the technical specifications described in this manual. The instruments performance is guaranteed for 12 months.

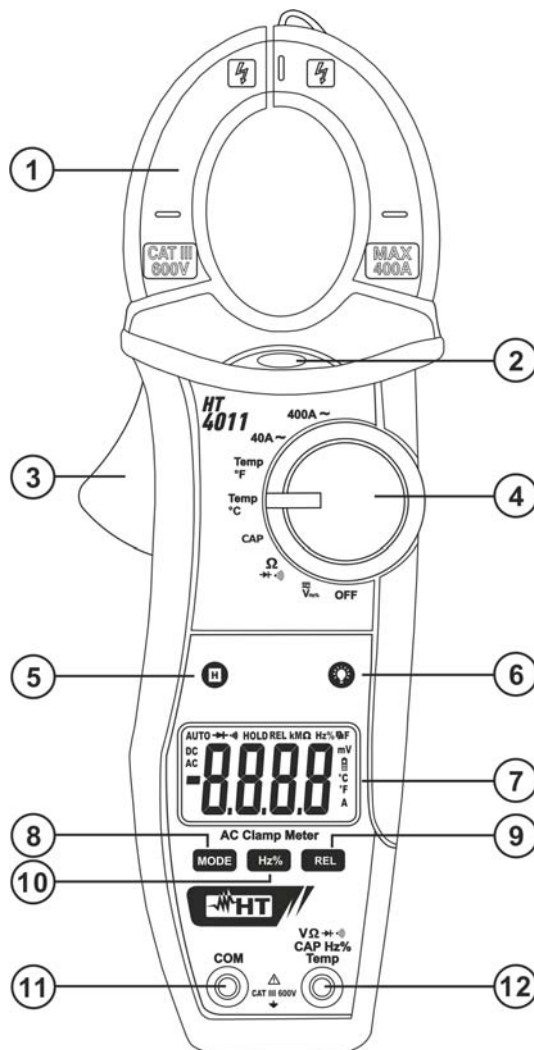
#### **3.4. STORAGE**

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 § 6.2.1).

## 4. OPERATING INSTRUCTIONS

### 4.1. INSTRUMENT DESCRIPTION

#### 4.1.1. Description of the controls



#### CAPTION:

1. Inductive clamp jaw
  2. AC voltage detector
  3. Rotary selector switch
  4. Jaw trigger
  5. **HOLD** key
  6. **Backlight** (💡) key
  7. LCD display
  8. **MODE** key
  9. **REL** key
  10. **Hz%** key
  11. Input terminal **COM**
  12. Input terminal **VΩ**
- VΩ → CAP Hz% Temp**

Fig. 1: Instrument description

#### 4.1.2. Alignment marks

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

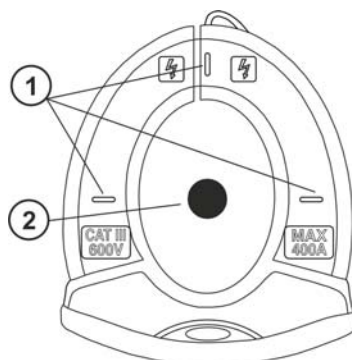


Fig. 2: Alignment marks

#### CAPTION

1. Alignment marks
2. Conductor

## 4.2. DESCRIPTION OF FUNCTION KEYS

### 4.2.1. HOLD key

Short pressing the “HOLD” key activates the function Data HOLD, i.e. the value of the measured quantity is frozen. The message “HOLD” appears on the display. This operating mode is disabled when the “HOLD” key is pressed again or the switch is operated.


### 4.2.2. REL key

With the instrument's switch set to positions  $\bar{V}_{Hz\%}$  (**VAC**, **VDC**), **40A~**, **400A~** and **CAP**, this key allows zeroing the displayed value and carrying out a relative measurement of the quantity being tested. When pressing the **REL** key for the first time, the value of the quantity being tested is saved as offset for the following measurements. The message “REL” appears on the display. The instrument shows the relative value obtained as current value – offset. This function is not active in resistance measurements, continuity, temperature duty cycle tests and diode test. Press the **REL** key again or turn the rotary switch to exit the function.

### 4.2.3. Hz% key

With the instrument's rotary switch set to positions  $\bar{V}_{Hz\%}$ , by pressing the **Hz%** key you can switch to frequency (Hz) or duty cycle measurement (%).

### 4.2.4. key

Press more times the  key to adjust backlight contrast. This light could help the operator reading the display while he's measuring in dark sites. For sake of battery saving after 10 seconds the light is automatically switched off.

### 4.2.5. MODE key

The **MODE** key is used to select resistance measurement, continuity test with buzzer, and diode test with the instrument's rotary switch set to position  $\Omega$  and to select AC and DC voltage measurement with the switch set to position  $\bar{V}_{Hz\%}$ .



### 4.3. DESCRIPTION OF ROTARY SWITCH FUNCTIONS

#### 4.3.1. 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.

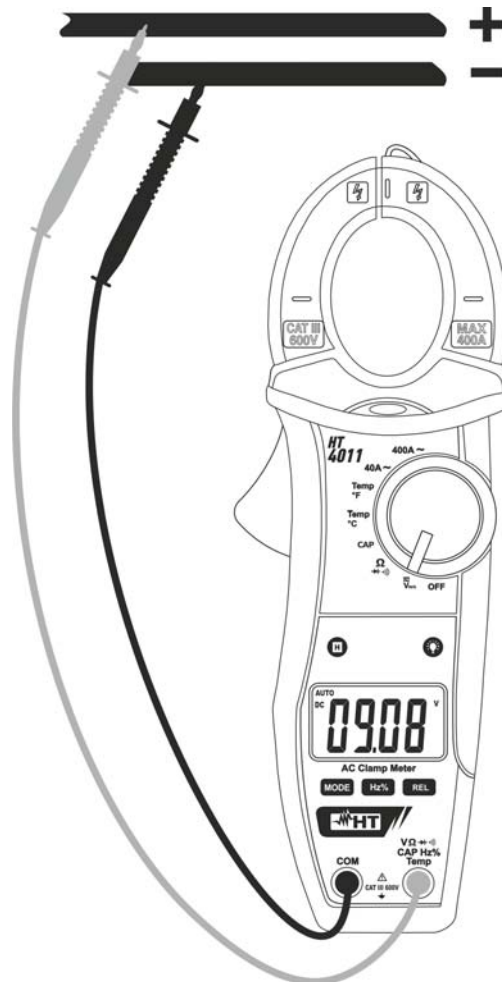


Fig. 3: Use of the clamp for DC Voltage measurement

1. Select the position.  $\overline{V}_{Hz\%}$
2. Insert the red cable into input terminal **VΩ▶Hz%CAPHz%Temp** 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. To use the HOLD and REL functions, please refer to § 4.2.

#### CAUTION



- Due to the high input impedance, it may take some time for the instrument to zero the display.
- The changing value shown on the display with open input terminals **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.

### 4.3.2. AC Voltage measurement



#### 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.

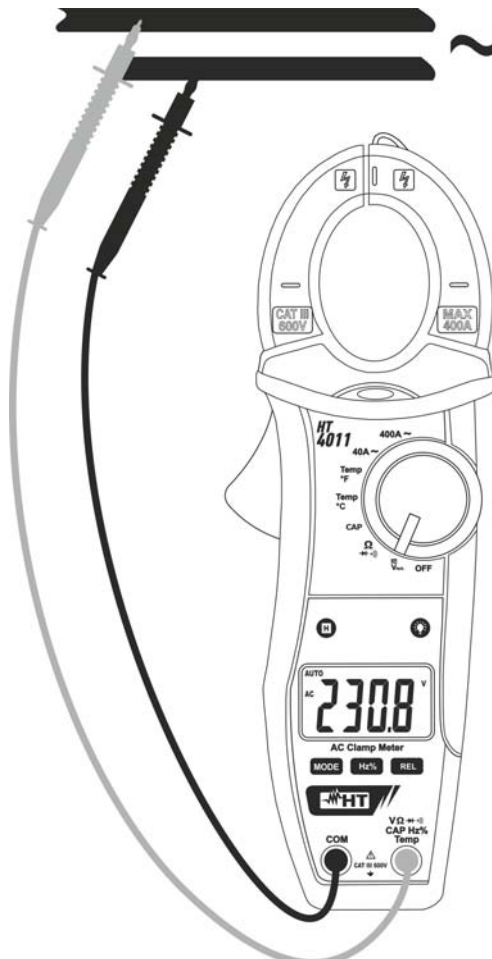


Fig. 4: Use of the clamp for AC Voltage measurement

1. Switch on the instrument in any position of selector, near it an AC source and look for the red LED at the clamp's base (see Fig. 1 – Part 2) to turn on. This indicates that the instrument has detected the AC source's presence
2. Select the position  $\bar{V}_{Hz\%}$
3. Press the **MODE** key to activate “AC” mode
4. Insert the red cable into input terminal **VΩ▶+•)CAPHz%Temp** and the black cable into input terminal **COM**
5. Position the test leads in the desired points of the circuit to be measured (see Fig. 4). The display shows the value of voltage
6. If the symbol “**O.L**” is displayed, this indicates overload status.
7. To use the HOLD and REL functions, please refer to § 4.2.

#### CAUTION



- Due to the high input impedance, it may take some time for the instrument to zero the display.
- The changing value shown on the display with open input terminals **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.

### 4.3.3. Frequency and Duty Cycle measurement



#### CAUTION

- When measuring frequency with leads, 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.
- When measuring frequency with the clamp, make sure that all the instrument's input terminals are disconnected.

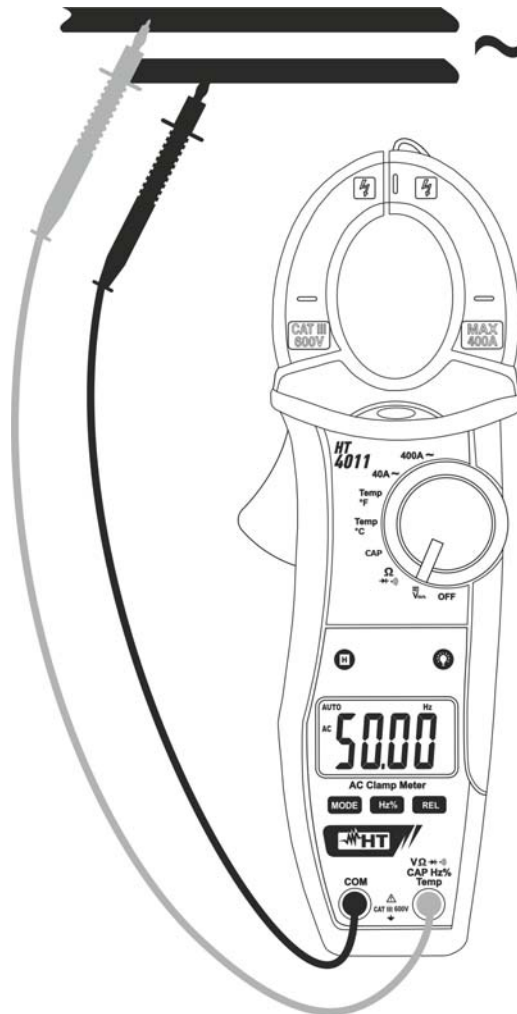


Fig. 5: Use of the clamp for frequency measurement and duty cycle

1. Select position  $\bar{V}_{Hz\%}$
2. Press the **Hz%** key until the symbol “Hz” is displayed for measuring frequency or the symbol “%” for duty cycle measurement.
3. Insert the red cable into input terminal **VΩHz%Temp** and the black cable into input terminal **COM** for measuring frequency with leads
4. Position the test leads in the desired points of the circuit to be measured (see Fig. 5). The value of frequency (Hz) or of duty cycle (%) is shown on the display.
5. If the symbol “O.L” is displayed, this indicates overload status.
6. To use the HOLD function, please refer to § 4.2.

#### 4.3.4. Resistance measurement



#### CAUTION

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

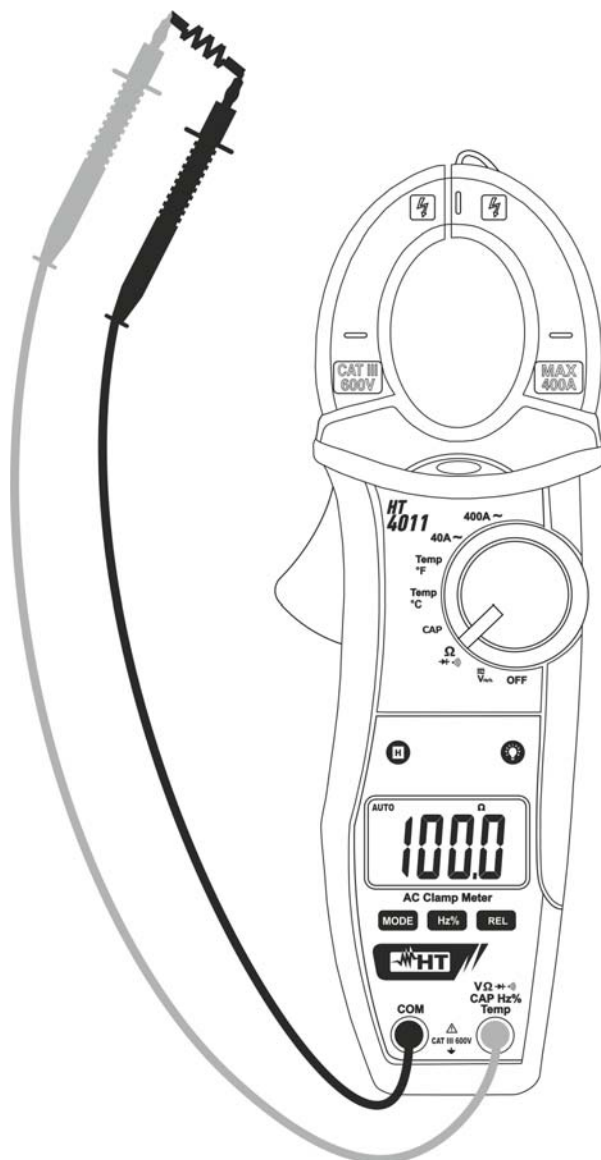


Fig. 6: Use of the clamp for Resistance measurement

1. Select the position  $\Omega$
2. Insert the red cable into input terminal **VΩ→→→CAPHz%Temp** 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. To use the HOLD function, please refer to § 4.2.

### 4.3.5. Continuity test and diode test



#### CAUTION

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

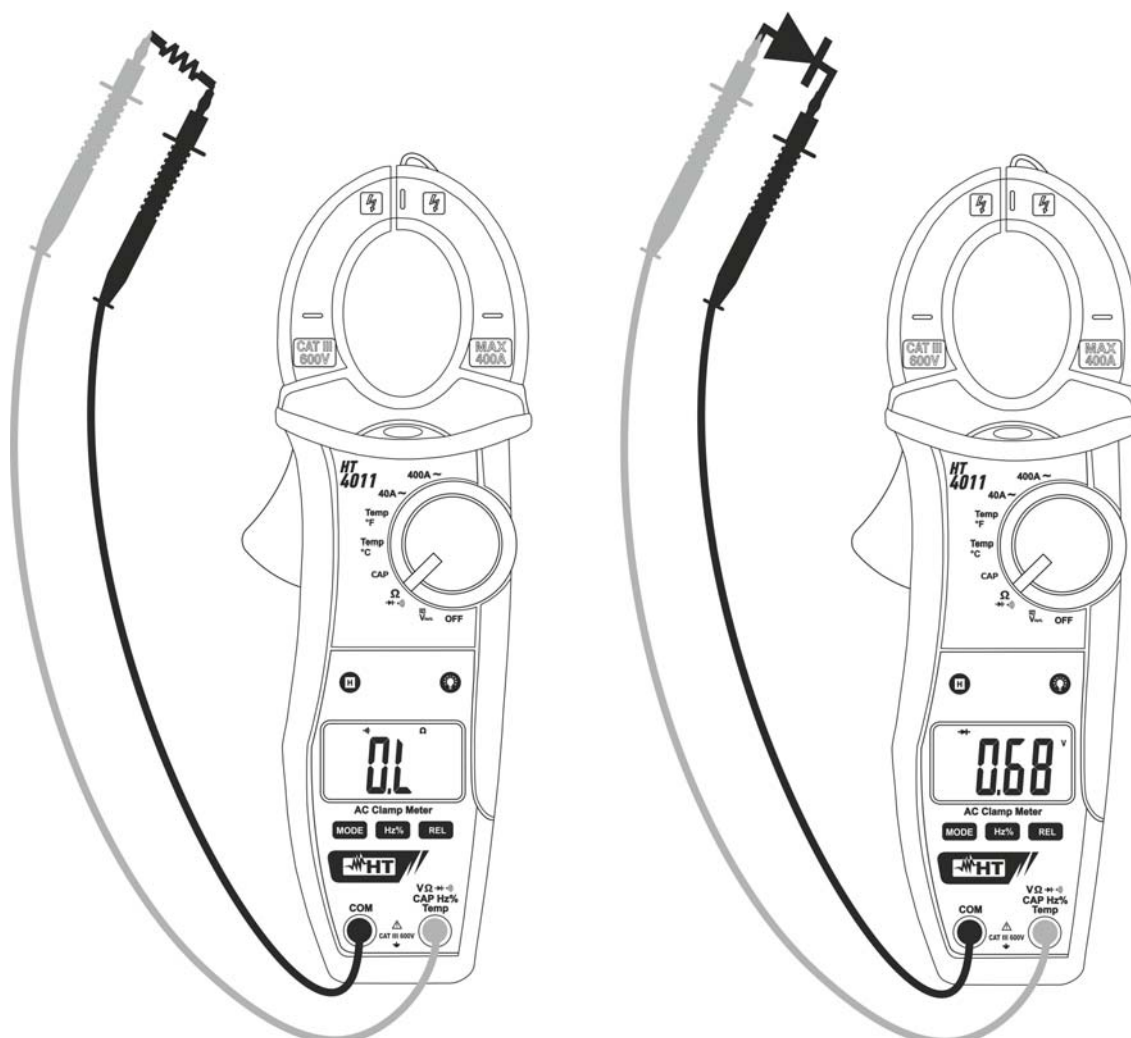


Fig. 7: Use of the clamp for continuity test and diode test

1. Select the position  $\Omega$
2. Press the **MODE** key until the symbol “ $\rightarrow$ ” is displayed to activate continuity test.
3. Insert the red cable into input terminal **VΩ $\rightarrow$  CAP Hz % Temp** and the black cable into input terminal **COM** and carry out the continuity test of the object to be measured (see Fig. 7– left side). An buzzer sounds when the measured value of resistance is lower than 150Ω
4. Press the **MODE** key to select diode test. The symbol “ $\rightarrow$ ” appears on the display.
5. 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.
6. Values on the display between 0.4V and 0.7V (direct) and “**OL**” (reverse) indicate correct connection. A value “0mV” indicates that the device is short-circuited, while “**OL**” in both directions indicated an interrupted device.

#### 4.3.6. Capacitance measurement



#### CAUTION

Before carrying out capacitance measurements on circuits or capacitors, cut off power supply from the circuit being tested and let all capacitance in it be discharged.

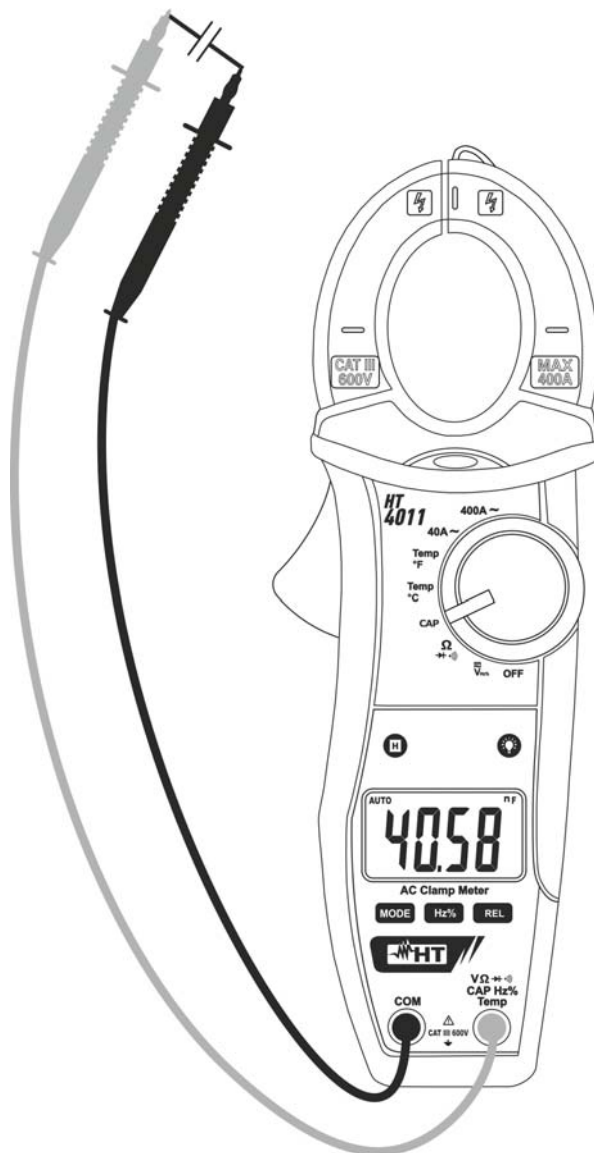


Fig. 8: Use of the clamp for capacitance measurement

1. Select the **CAP** position.
2. Insert the red cable into input terminal **VΩHz%Temp** 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. 8). The value of capacitance is shown at display
4. If the symbol "**O.L**" is displayed, this indicates overload status.
5. To use the HOLD and REL functions, please refer to § 4.2

#### 4.3.7. Temperature measurement with type K probe



#### CAUTION

Do not put the temperature probe into contact with live surfaces. Voltages higher than 30Vrms or 60VDC imply electrical shock hazard.

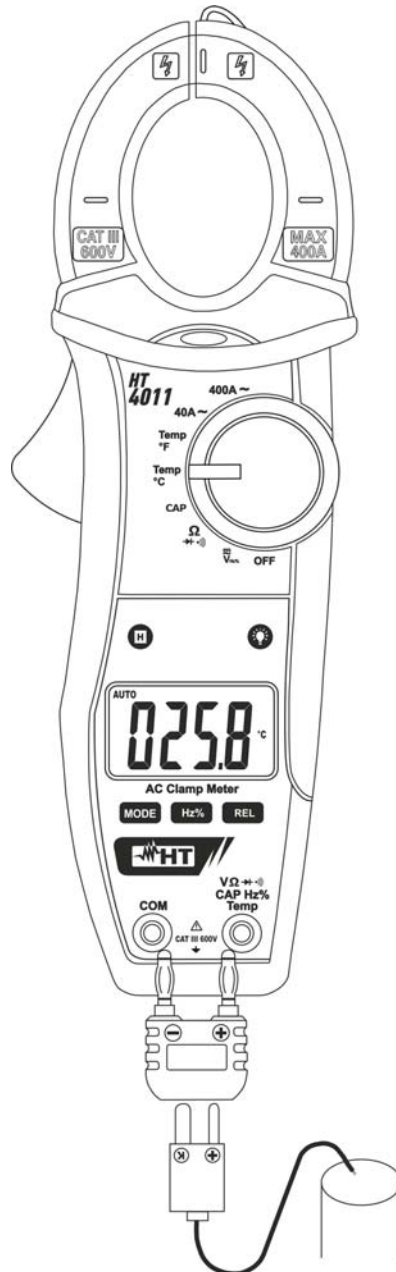


Fig. 9: Use of the clamp for temperature measurement with type K probe

1. Select the **Temp°C** or **Temp°F** position.
2. Insert the K wire probe provided into input terminal **VΩ→+·»CAPHz%Temp** and **COM** by means of the relevant adapter, respecting the polarity indicated in Fig. 9. The display shows the value of temperature.
3. To use the HOLD function, please refer to § 4.2.



#### 4.3.8. 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.

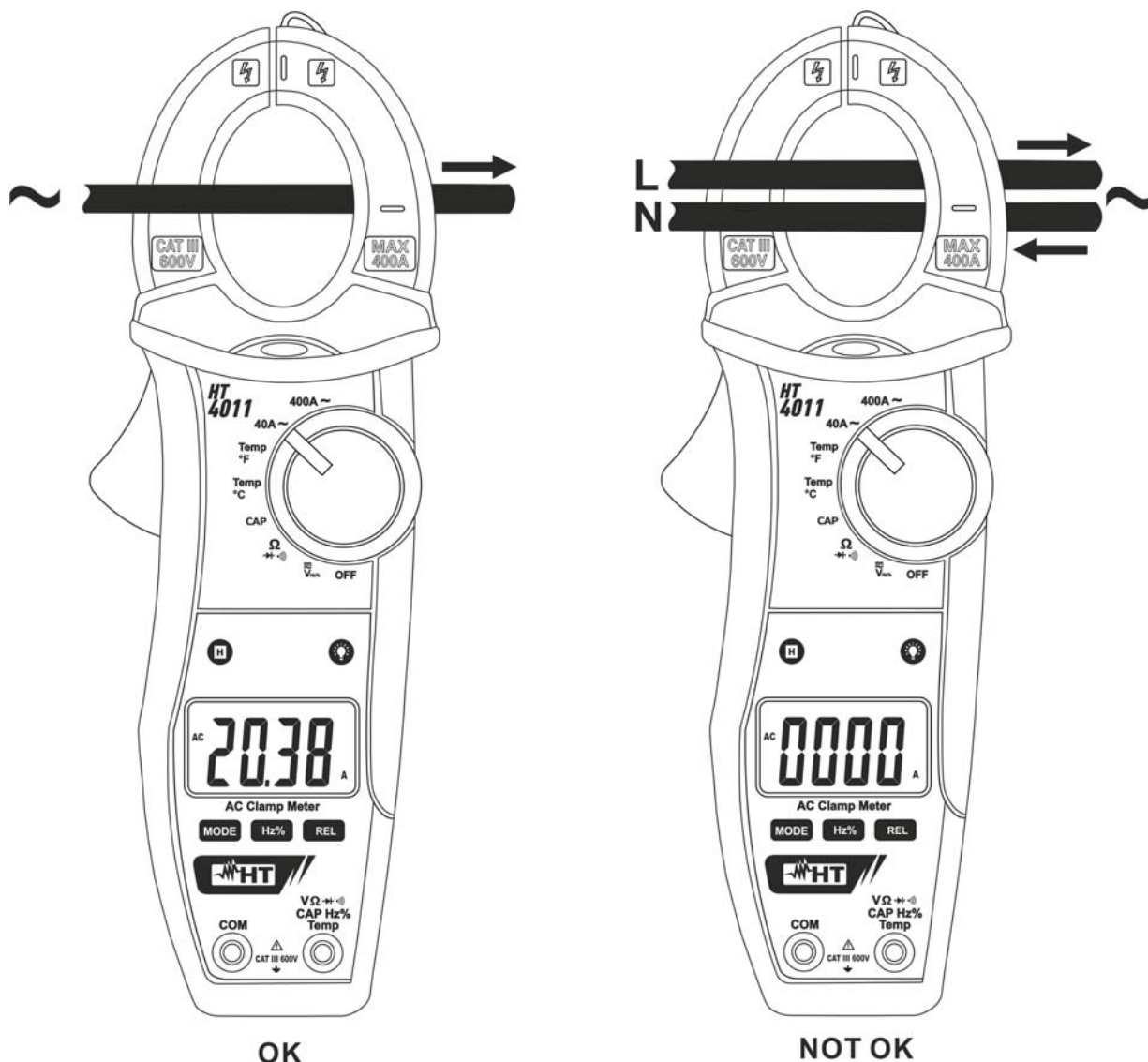


Fig. 10: Use of the clamp for AC current measurement

1. Select position **40A~** or **400A~**
2. Insert the cable in the middle of the clamp jaws, in order to obtain accurate measures (see Fig. 10 – left side). The display shows the value of AC current
3. If the symbol “**O.L**” is displayed, this indicates overload status. In this case, position the rotary switch to the higher measuring range.
4. To use the HOLD and REL functions, please refer to § 4.2.



#### 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.



## 5. MAINTENANCE

### 5.1. GENERAL INFORMATION

1. The instrument you purchased is a precision instrument. 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 instruments internal circuits.

### 5.2. REPLACING THE BATTERY

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



#### 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 position.
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. Disconnect the battery from the connector.
5. Connect the new battery of the same type (see § 6.1.2) to the connector and pay attention to correct polarity.
6. Position the battery cover back over the compartment and fasten it with the relevant screw.
7. Do not scatter old batteries into the environment. Use the relevant containers for battery disposal.

### 5.3. CLEANING THE INSTRUMENT

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

### 5.4. 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.

## 6. TECHNICAL SPECIFICATIONS

### 6.1. TECHNICAL CHARACTERISTICS

Accuracy is calculated as  $\pm [\% \text{ reading} + (\text{number of digits}) \times \text{resolution}]$ . It is referred to a temperature  $18^{\circ}\text{C} \div 28^{\circ}\text{C}$  with relative humidity  $<75\% \text{ RH}$ .

#### AC Voltage (Autorange)

Range	Resolution	Accuracy	Input impedance	Bandwidth	Overvoltage protection
4,000V	0,001V	$\pm(1.8\% \text{rdg} + 8 \text{digits})$	10M $\Omega$	50-400Hz	600V DC/ACrms
40.00V	0.01V				
400.0V	0.1V				
600V	1V	$\pm(2.5\% \text{rdg} + 8 \text{digits})$			

Integrated sensor for AC voltage detection: LED on for phase-earth voltage  $> 100\text{V}$ , 50/60Hz.

#### DC Voltage (Autorange)

DC Voltage (Auto range)				
Range	Resolution	Accuracy	Input impedance	Overvoltage protection
400.0mV	0.1mV	$\pm(0.8\%rdg+2digits)$	10M $\Omega$	600AACrms
4.000V	0,001V	$\pm(1.5\%rdg + 2digits)$		
40.00V	0.01V			
400.0V	0.1V			
600V	1V	$\pm(2\%rdg + 2digits)$		

#### AC Current

Range	Resolution	Accuracy	Bandwidth	Overvoltage protection
40.00A	0.01A	$\pm(2.5\% \text{rdg} + 8 \text{digits})$	50-60Hz	400AACrms
400.0A	0.1A	$\pm(2.8\% \text{rdg} + 8 \text{digits})$		

#### Resistance and continuity test (Autorange)


Range	Resolution	Accuracy	Buzzer	Overvoltage protection
400.0Ω	0.1Ω	±(1.0%rdg + 4digits)	<150Ω	600VDC/ACrms
4.000kΩ	0.001kΩ	±(1.5%rdg+2digits)		
40.00kΩ	0.01kΩ			
400.0kΩ	0.1kΩ			
4.000MΩ	0.001MΩ	±(2.5%rdg+3digits)		
40.00MΩ	0.01MΩ	±(3.5%rdg+5digits)		

Continuity test current:  $< 0.5\text{mA}$

#### Capacitance (Autorange)

Range	Resolution	Accuracy	Overvoltage protection
40.00nF	0.01nF	$\pm(4.0\% \text{rdg}+20 \text{digits})$	600VDC/ACrms
400.0nF	0.1nF	$\pm(3\% \text{rdg}+5 \text{digits})$	
4.000μF	0.001μF		
4000μF	0.01μF		
100.0μF	01μF	$\pm(4.0\% \text{rdg}+10 \text{digits})$	

#### Diode test

Range	Test current	Open-circuit voltage
	0.3mA typical	1.5VDC

### Frequency with leads (Autorange)

Range	Resolution	Accuracy	Sensitivity	Overvoltage protection
10.00Hz ÷ 49.99Hz	0.01Hz	$\pm(1.5\%rdg+2digits)$	$\geq 15V_{rms}$	600VDC/ACrms
50.0Hz ÷ 499.9Hz	0.1Hz			
0.500kHz ÷ 4.999kHz	0,001kHz			
5.00kHz ÷ 10.0kHz	0.01kHz			

### Duty cycle (Autorange)

Range	Resolution	Accuracy
0.5% ÷ 99.0%	0.1%	$\pm(1.2\%rdg + 2digits)$

100 $\mu$ s ≤ Pulse width ≤ 100ms ; Pulse frequency: 100Hz ÷ 150kHz; Sensitivity >10Vrms

### Temperature with K probe (Autorange)

Temperature with K probe (Autorange)			Overvoltage protection  250VDC/ACrms
Range	Resolution	Accuracy (*)	
-20.0 ÷ 399°C	0.1°C	±(3%rdg+5°C)	
400 ÷ 760°C	1°C		
-4 ÷ 400°F	0.1°F	±(3%rdg+9°F)	
400 ÷ 1400°F	1°F		

(\*) Accuracy of K-probe not considered

### 6.1.1. Reference standards

Safety:	IEC/EN61010-1
EMC:	IEC/EN61326
Insulation:	double insulation
Pollution level:	2
Max operating altitude:	2000m (6562 ft)
Overvoltage category:	CAT III 600V to ground

### 6.1.2. General characteristics

#### Mechanical characteristics

Dimensions (L x W x H):	215 x 74 x 43mm ; (8 x 3 x 2in)
Weight (battery included):	285g (10 ounces)
Max. cable diameter:	30mm (1in)

#### Power supply

Battery type:	1 battery 9V NEDA 1604 IEC 6F22 JIS 006P
Low battery indication:	symbol “+ III” is shown at display
Auto Power OFF:	after 30 minutes (not be disabled)

#### Display

Characteristics:	4 dgt LCD max 4000 point, sign and decimal point
Sampling rate:	2 measurements per second
Conversion type:	Mean value

### 6.2. ENVIRONMENT

#### 6.2.1. Environmental conditions for use

Reference temperature:	18°C ÷ 28°C ; (64°F ÷ 82°F)
Operating temperature:	5 ÷ 40 °C ; (41°F ÷ 104°F)
Allowable relative humidity:	<80%RH
Storage temperature:	-20 ÷ 60 °C ; (-4°F ÷ 140°F)
Storage humidity:	<80%RH

This instrument satisfies the requirements of Low Voltage Directive 2006/95/EC (LVD) and of Directive 2004/108/EC (EMC)

This instrument satisfies the requirements of 2011/65/CE (RoHS) directive and the requirements of 2012/19/CE (WEEE) directive

**6.3. ACCESSORIES PROVIDED**

- Pair of 2mm test leads
- Adapter + K-type wire probe
- Carrying bag
- Battery (not fitted)
- User manual

**6.4. OPTIONAL ACCESSORIES**

Model	Description	Temperature range	Accuracy (at 100°C)	Probe length (mm)	Probe diameter (mm)
<b>TK107</b>	Air and gas temperature	-40 ÷ 800 °C	± 2.2rdg	200	1.5
<b>TK108</b>	Internal temperature of semisolid substances	-40 ÷ 800 °C	± 2.2rdg	200	3
<b>TK109</b>	Internal temperature of liquids	-40 ÷ 800 °C	± 2.2rdg	200	4
<b>TK110</b>	Surface temperature	-40 ÷ 400 °C	± 2.2rdg	200	5
<b>TK111</b>	Surface temperature with fixed tip at 90°C	-40 ÷ 400 °C	± 2.2rdg	260	5

## 7. SERVICE

### 7.1. 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 Customers charge. However, shipment will be agreed in advance. A report will always be enclosed to a shipment, stating the reasons for the products 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 damage to property.

The warranty shall not apply in the following cases:

- Repair and/or replacement of accessories and batteries (not covered by warranty).
- Repairs that 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 which may become necessary as a consequence of interventions performed by unauthorized personnel.
- Modifications to the instrument performed without the manufacturers explicit authorization.
- Use not provided for in the instruments specifications or in the instruction manual.

The content of this manual cannot be reproduced in any form without the manufacturers 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.**

### 7.2. 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 Customers charge. However, shipment will be agreed in advance. A report will always be enclosed to a shipment, stating the reasons for the products return. Only use original packaging for shipment; any damage due to the use of non-original packaging material will be charged to the Customer.