

ENGLISH

User manual

optec
energie ist messbar

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1. SAFETY PRECAUTIONS AND PROCEDURES

This clamp complies with IEC/EN61010-1. For your own safety and in order to avoid damaging the instrument, you're recommended to keep to the instructions contained in this manual and read carefully all the notes preceded by the symbol .

Take extreme care for the following conditions while measuring:

- Do not measure voltage or current in humid or wet environment.
- Do not use the meter in presence of explosive gas (material), combustible gas (material), steam or dust.
- Insulate yourself from the object to be tested.
- Do not touch exposed metal (conductive) parts such as test lead ends, sockets, fixing objects, circuits, etc.
- If you detect anomalies of testing end (metal part) and attachment of the meter such as breakages, deformations, foreign substances, no display, etc., do not take any measurement.
- Measuring voltage over 20V as it might cause human body electricity conduction.

The followings symbols are used on meter and in this manual:



Caution: refer to the instruction manual. An incorrect use may damage the tester or its components



High Voltage ranger: electrical shock risk



Double insulated instrument



AC Voltage or Current



DC Voltage or Current



Ground reference

1.1. PRELIMINARY

- This apparatus has been designed for use in an environment of pollution degree 2. Indoor use.
- It measures **CURRENT** and **VOLTAGE** on CAT IV 600V and CAT III 1000V plants. For measurement categories please see § 1.4.
- You must comply with the usual safety regulations aimed at protecting you against the dangerous electric current and protecting the instrument against an incorrect operation.
- Only the leads supplied with the instrument guarantee compliance with the safety standards. They must be in good conditions and they must be replaced, if necessary, with an identical model.
- Do not test or connect to any circuit whose voltage or current exceeds the specified overload protection.
- Make sure that the batteries are installed correctly.
- Before connecting the test probes to the installation, check that the function selector is positioned on the required measurement.
- Make sure that the LCD and the range indicator show the same as the function desired.

1.2. DURING USE

Always keep to the instructions contained in this manual.



CAUTION

Non compliance with the CAUTIONs and/or the instructions may damage the tester and/or its components or injure the operator.

- Before changing the switch position, take off the clamp jaw from the tested conductor or the electrical circuit in order to avoid any accident
- When the clamp is connected to the circuits to be tested, never touch unused terminals
- When testing resistors, do not add voltage. Although there is a protection circuit, excessive voltage would cause malfunctioning
- Before measuring current, remove the voltage-resistance test leads
- When measuring current, any strong current close to the clamp jaw will affect the accuracy
- When measuring current, always put the tested conductor in the middle of the clamp jaw in order to obtain a more accurate reading
- If the reading value or the sign indication remains unchanged during the measurement, check if the HOLD function is active

1.3. AFTER USE

- Once the measurements are completed, turn the rotary switch to OFF.
- If you expect not to use the clamp for a long time, remove the battery.

1.4. MEASURING (OVERVOLTAGE) CATEGORIES DEFINITIONS

The norm EN 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements, defines what measuring category, usually called overvoltage category, is. On § 6.7.4: Measuring circuits, it says:

(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 in the building installation.
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, portable tools 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 norm requires that the transient withstand capability of the equipment is made known to the user.

2. GENERAL DESCRIPTION

HT9021 meter can perform the herewith measurements:

- DC and AC TRMS Voltage up to 1000V
- DC and AC TRMS Current up to 1000A
- Resistance and continuity test with buzzer
- Capacitance
- Frequency with test lead and jaws
- Duty cycle
- Diode test
- Temperature with type K probe
- AC voltage detection with and without contact with integrated sensor

Each parameter can be selected by rotating the 8 positions switch. To abilitate the hold function the HOLD key is available. There are also the following keys: **"MODE "MAX/MIN"**, **"Hz%"**, **"PEAK/REL"** and **"**". For their use please see § 4.2. The selected quantity appears on a LCD display with indication of measurement units and functions. An analogical bargraph it is also availbale

2.1. TRMS AND MEAN VALUE MEASURING INSTRUMENTS

Safety testers for alternate parameters are divided into two big families:

- MEAN VALUE instruments: instruments which measure only the value of the wave at the fundamental frequency (50 or 60 Hz)
- TRUE ROOT MEAN SQUARE instruments, also defined as TRMS: instruments which measure the true root mean square value of the quantity under test.

In presence of a perfectly sinusoidal wave, both families provide identical results. In presence of distorted waves the readings are different. Mean value instruments provide only the value of the fundamental wave while True RMS instruments provide the value of the entire wave, including harmonics (within the passband of the instrument). Accordingly, if the same quantity is measured with both kinds of instruments, the measured values are identical only if the wave is purely sinusoidal. Should it be distorted, True RMS instruments provide higher values than medium value instruments.

2.2. TRUE ROOT MEAN SQUARE VALUE AND CREST FACTOR DEFINITIONS

The current effective value is defined as follows: "In an interval of time equivalent to a period, an alternate current with effective value having an intensity of 1A, by passing on a resistor, disperses the same energy which would be dispersed in the same period of time by a direct current having an intensity of 1A". From this definition comes the numerical

expression: $G = \sqrt{\frac{1}{T} \int_{t_0}^{t_0+T} g^2(t) dt}$ The effective value is indicated as RMS (*root mean square*).

The Crest Factor is defined as the ratio between the Peak Value of a signal and its effective value: $CF (G) = \frac{G_p}{G_{RMS}}$. This value varies according to the waveform of the signal,

for a purely sinusoidal wave it's worth $\sqrt{2} = 1.41$. In presence of distortions the Crest Factor assumes higher values as long as the wave distortion is higher.

3. PREPARATION FOR USE

3.1. INITIAL

The tester has been checked from a mechanical and electrical point of view before shipment.

Every care has been taken to make sure that the instrument reaches you in perfect conditions.

However, it's advisable to make a rapid check in order to detect any damage which may have occurred in transit. Should this be the case, enter immediately the usual claims with the carrier.

Make sure that all the accessories listed in § 6.3 are contained in the package. In case of discrepancies contact Your dealer.

In case of returning of the tester please keep to the instructions given in § 7.

3.2. POWER SUPPLY

The instrument is battery supplied. One battery 9V NEDA 1604 IEC 6F22 JIS 006P is included in the package. Battery life: about 200 hours. When batteries are low, the symbol “+ III” appears on the display. Replace them immediately, following the instructions given in § 5.2.

The instrument disposes of the Auto Power OFF function (not disable) consisting in an automatic switching off 15 minutes of idleness

3.3. CALIBRATION

The tester complies with the technical features listed in this manual. Its performances are guaranteed for one year.

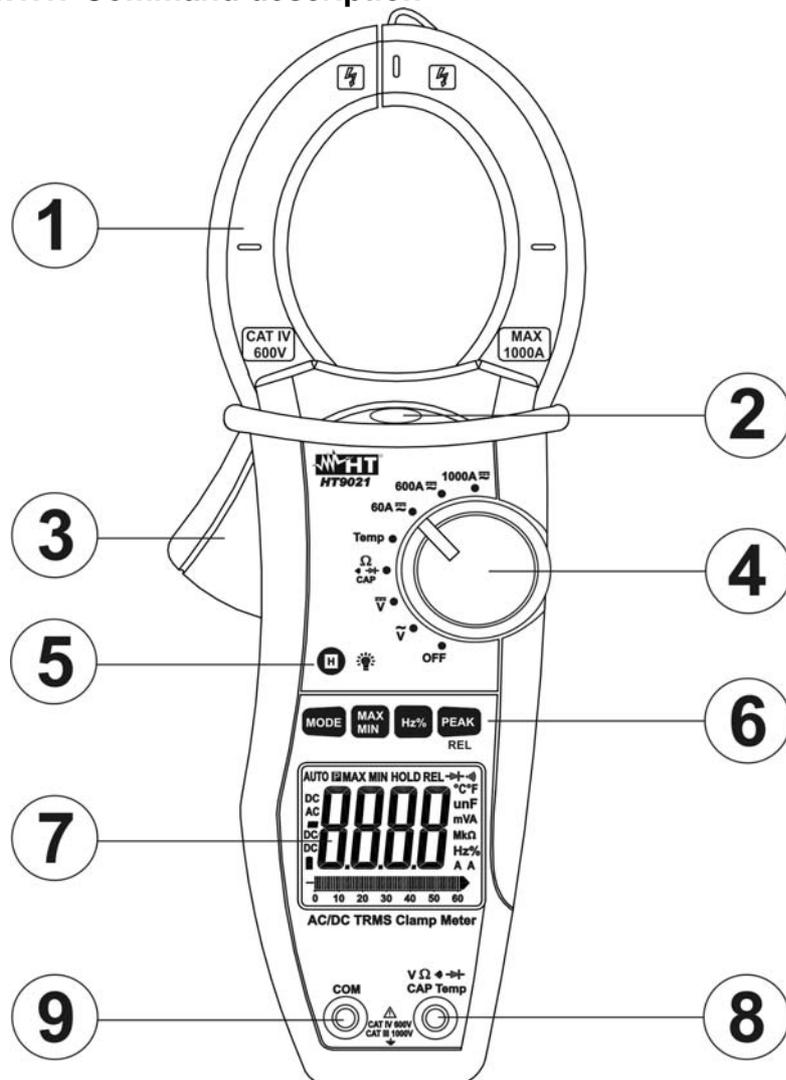
3.4. STORAGE

In order to guarantee the accuracy of the measurements, after a period of storage under extreme environmental condition, wait for the necessary time so that the tester returns to normal measuring conditions (see environmental specifications, § 6.2.1).

4. OPERATING INSTRUCTIONS

4.1. INSTRUMENT DESCRIPTION

4.1.1. Command description



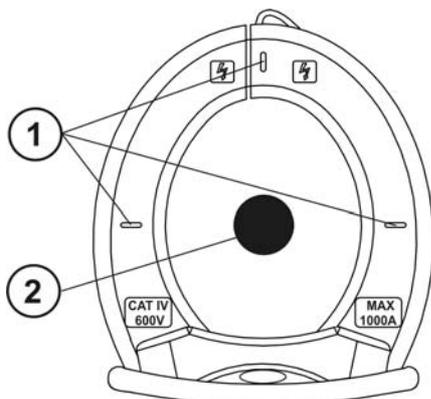
LEGEND:

1. Inductive clamp jaw
2. LED for AC voltage detection
3. Jaw trigger
4. Function selector
5. **HOLD** / key
6. **MODE**, **MAX/MIN**, **Hz%**, **PEAK/REL** function keys
7. LCD display
8. **V Ω → CAP Temp** input jack
9. **COM** input jack

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



LEGEND:

1. Alignment marks
2. Conductor

Fig. 2: Alignment marks

4.2. FUNCTION KEY DESCRIPTION

4.2.1. H key

By pushing “H” key the parameter measured value is frozen on the display and the symbol “HOLD” appears on it.

This mode is disabled by pushing “H” key or moving the rotary switch.

4.2.2. key

Keep pressed the “H” key for the backlight activation. 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.

4.2.3. MODE key

By pushing **MODE** key the selection of double measured functions which are present at display is possible. In particular this key is active in Ω  **CAP** position to select among resistance test, diode test, continuity test and capacitance test, and in **Temp** position to select between °C and °F in temperature test and in **60A**, **600A**, **1000A** position to select between AC or DC current measurements

4.2.4. MAX/MIN key

By pushing **MAX/MIN** key the parameter maximum and minimum values are measured. Both values are stored in memory and they can be shown cyclically when pressing “MIN MAX” key. The display shows the symbol linked to the selected function: “MAX” for maximum value, the symbol “MIN” for minimum value.

This mode is activated on each measurement except for continuity test, diode test capacitance test, frequency test and duty cycle test

This mode is disabled keeping pressed **MAX/MIN** key or moving the rotary switch.

4.2.5. Hz% key

With rotary switch on \tilde{V} , **60A**, **600A** and **1000A** positions, the **Hz%** key permits to select the frequency test (Hz) or the duty cycle test (%)

4.2.6. PEAK/REL key

With rotary switch on \tilde{V} , \bar{V} , **CAP** and **DC current** the **PEAK/REL** key permits to perform the zeroing of value at display and a relative measurement of the parameter under test.

By pushing **PEAK/REL** key the instrument takes the actual parameter’s value as on offset and performs a relative measurement. The relative value is displayed, it’s calculated as actual value – offset value, the “REL” symbol is shown at display and the bargraph is disabled.

This mode is disabled for resistance test, continuity test, AC current test, temperature test, frequency test, duty cycle test and diode test and with **MAX/MIN** mode activated. This mode is disabled pressing **PEAK/REL** key or moving the rotary switch

With rotary switch on **60A**, **600A** or **1000A** positions the **PEAK/REL** key permits to activated the maximum peak measurement of **AC current** (calculated with response time <10ms). The  symbol is shown at display and the value is continuously updated by the meter.

This mode is disabled pressing **PEAK/REL** key or moving the rotary switch

4.3. FUNCTIONS OF ROTARY SWITCH DESCRIPTION

4.3.1. AC Voltage measurement



CAUTION

Maximum input for AC Voltage measurements is 1000Vrms. Do not take any voltage measurement exceeding this limit in order not to risk electrical shock or damaging the tester

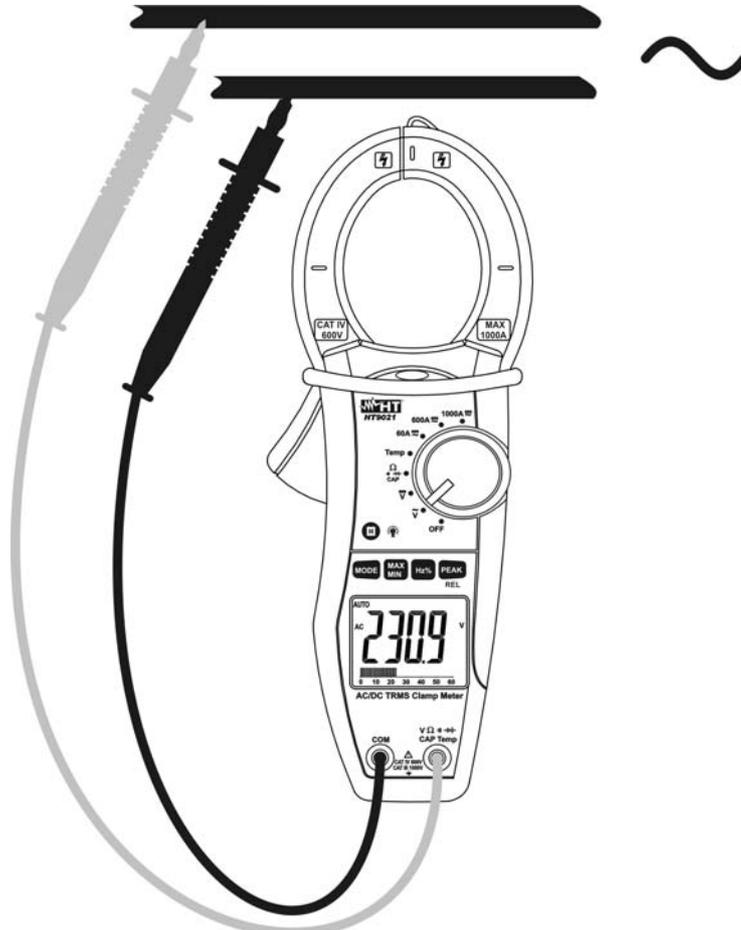


Fig. 3: Taking AC voltage measurements

1. Approach the meter closest to AC source and note the turn on of red LED which is placed to the bottom of clamp jaws (see Fig. 1 – part 2) which detect the AC voltage
2. Rotate the switch on \tilde{V} position
3. Insert the red test lead plug into $V\Omega$ (CAP Temp) jack and the black test lead plug into **COM** jack (Fig. 3)
4. Connect the two long ends of test leads to the desired circuit, then reading will be displayed
5. When “O.L.” symbol is displayed, the result exceeds the maximum value that the instrument is capable of measuring
6. For HOLD, MAX/MIN and REL features please refer to § 4.2

CAUTION



- Due to the high input impedance is possible that the meter performs the zero of the display taking longer
- The possible blinking values shown at display with open input terminals **are not a problem of the meter** and these values will not be added to the measured value

4.3.2. DC Voltage measurement



CAUTION

Maximum input for DC Voltage measurements is 1000V. Do not take any voltage measurement exceeding this limit in order not to risk electrical shock or damaging the tester.

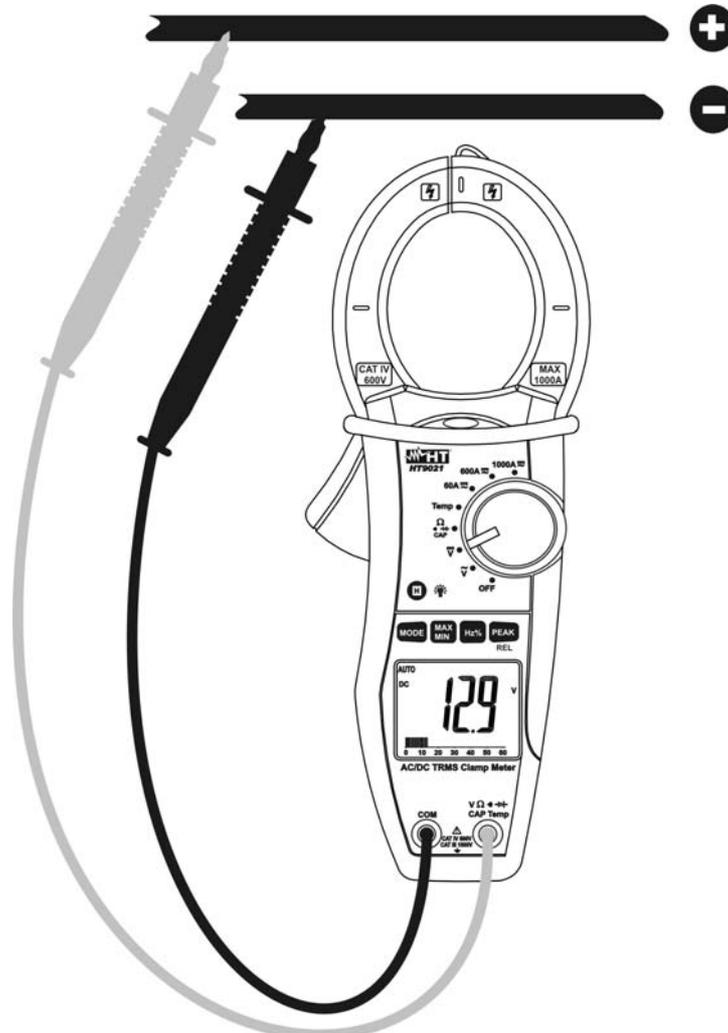


Fig. 4: Taking DC voltage measurements

1. Rotate the switch on \overline{V} position
2. Insert the red test lead plug into $V\Omega$ jack and the black test lead plug into **COM** jack (Fig. 4)
3. Connect the two long ends of test leads to the desired circuit, then reading will be displayed
4. When "O.L." symbol is displayed, the result is over the maximum value that the instrument is able to measure
5. For HOLD, MAX/MIN and REL features please refer to § 4.2

CAUTION



- Due to the high input impedance is possible that the meter performs the zero of the display taking longer
- The possible blinking values shown at display with open input terminals **are not a problem of the meter** and these values will not be added to the measured value

4.3.3. Resistance measurement



CAUTION

Before taking any in circuit resistance measurement, remove power from the circuit to be tested and discharge all the capacitors.

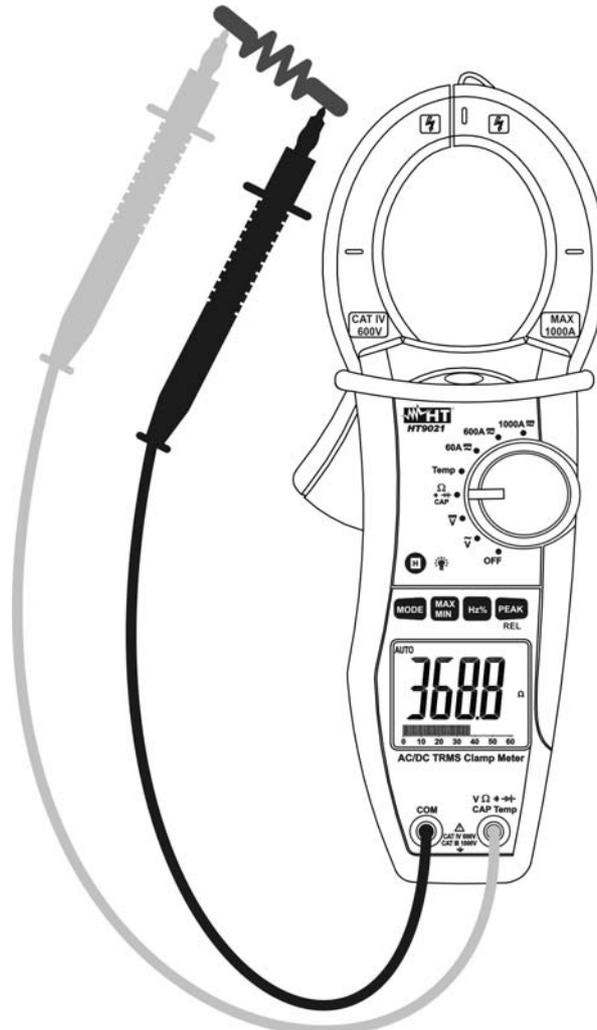


Fig. 5: Taking Resistance measurement

1. Rotate the switch on $\Omega \cdot \text{CAP}$ \rightarrow **CAP** position
2. Insert the red test lead plug into $V \Omega \cdot \text{CAP Temp}$ \rightarrow **CAP Temp** jack and the black test lead plug into **COM** jack (Fig. 5)
3. Connect the two long ends of test leads to the desired circuit, then reading will be displayed
4. When “O.L.” symbol is displayed, the result under test exceeds the maximum value that the instrument is capable of measuring
5. For HOLD and MAX/MIN features please refer to § 4.2

4.3.4. Continuity test and Diode test



CAUTION

Before taking any in circuit resistance measurement, remove power from the circuit to be tested and discharge all the capacitors.

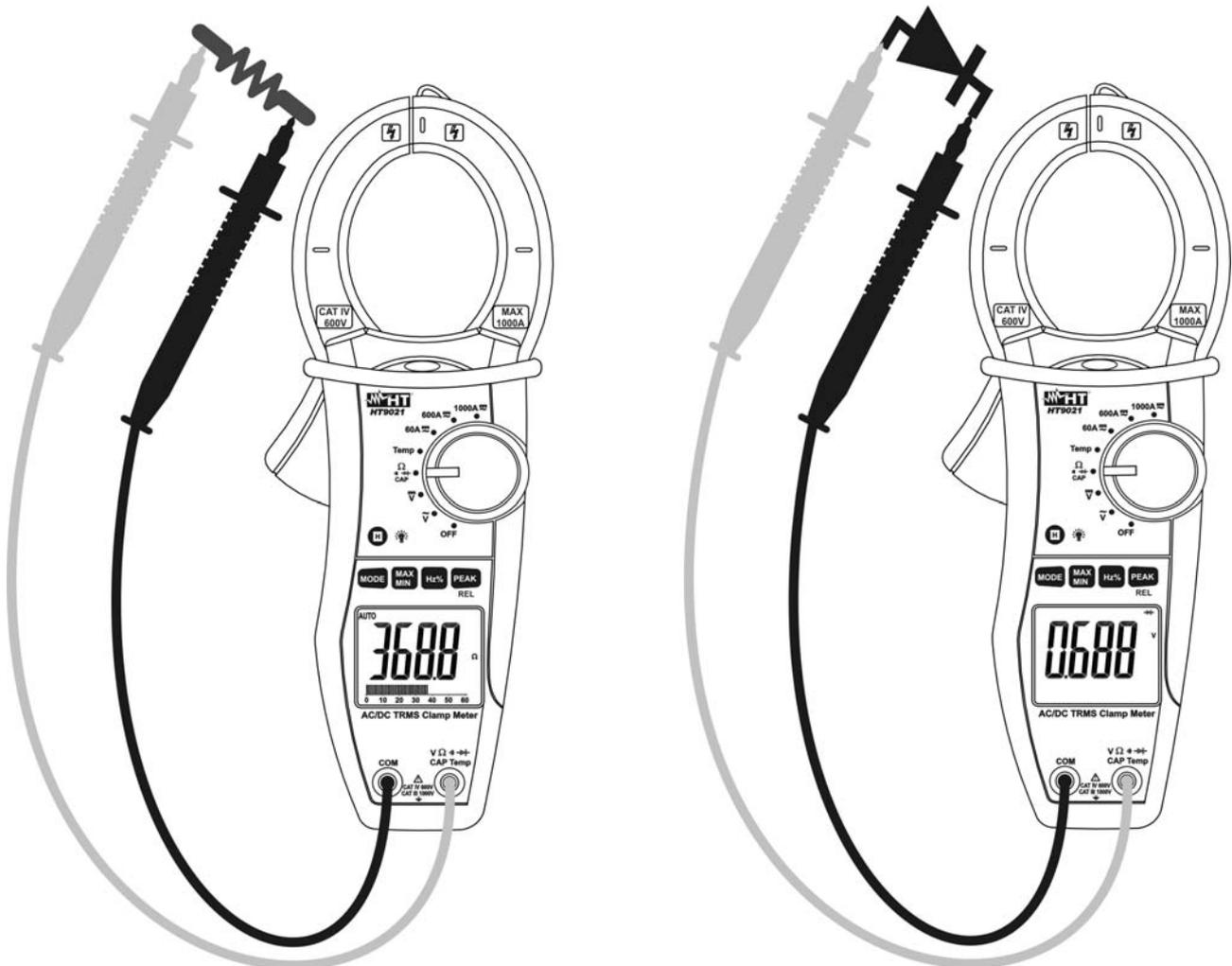


Fig. 6: Taking Continuity test and Diode test

1. Rotate the switch on $\Omega \cdot \text{CAP}$ position
2. Pushing **MODE** key and select continuity test. The $\cdot \text{CAP}$ symbol is shown at display
3. Insert the red test lead plug into $V \Omega \cdot \text{CAP Temp}$ jack and the black test lead plug into **COM** jack and perform continuity test on the object under test (see Fig. 6 – left side). Buzzer emits sound if the measured resistance value is less about 60Ω
4. Pushing **MODE** key and select diode test. The “ $\rightarrow +$ ” symbol is shown at display
5. Connect the red test leads to the anode of diode on test and the black test lead on the cathode ones (see Fig. 6 – right side). Reverse position of test leads to reading reverse polarization voltage
6. The correspondent threshold voltage of P-N junction is showed on display. Bargraph is disabled in diode test

4.3.5. Capacitance measurement



CAUTION

When testing in-circuit capacitors, turn off the power of the circuit to be tested and discharge all the capacitors



Fig. 7: Taking Capacitance measurement

1. Rotate the switch on $\Omega \cdot \text{CAP}$ \rightarrow **CAP** position
2. Pushing **MODE** key and select capacitance test. The “nF” symbol is shown at display
3. Insert the red test lead plug into $V \Omega \cdot \text{CAP Temp}$ jack and the black test lead plug into **COM** jack (Fig. 7)
4. Connect the two long ends of test leads to the desired circuit, then reading will be displayed. Bargraph is disabled in capacitance measurement
5. When “O.L.” symbol is displayed, the result under test exceeds the maximum value that the instrument is capable of measuring
6. For HOLD and REL features please refer to § 4.2



CAUTION

For readings of capacitance <40nF push **PEAK/REL** key before making test in order to improve the measured result

4.3.6. Temperature measurement



CAUTION

Do not allow the temperature sensor to contact a surface that is energized above 30 V RMS or 60 V DC, such voltages pose a shock hazard



Fig. 8: Taking Temperature measurement

1. Rotate the switch on **Temp** position
2. Pushing **MODE** key and select the kind of measure. “°C” or “°K” symbols are shown at display respectively for Celsius or Farheneit temperature measurements
3. Insert the type K bead probe in **VΩ** → **CAP Temp** and **COM** inputs terminals using the standard adapter and observing the correct polarity (see Fig. 8). The temperature value is shown at display
4. For HOLD and MAX/MIN features please refer to § 4.2

4.3.7. AC and DC Current measurement



CAUTION

Make sure that all the test leads are disconnected from the meter terminals for current measurement.

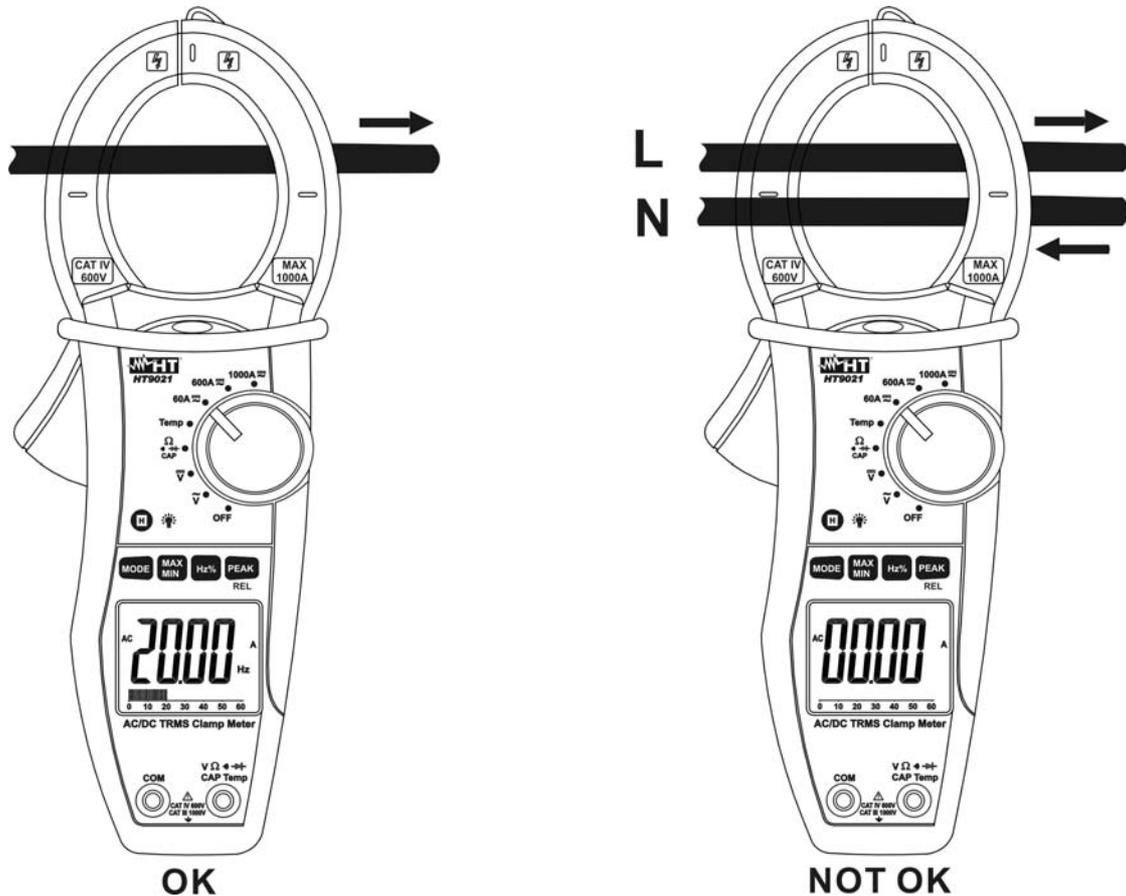


Fig. 9: Taking AC and DC current measurements

1. Rotate the switch on **60A**, **600A** or **1000A** position
2. Pushing **MODE** key and select the kind of measure “AC” or “DC”
3. **On DC measure** pushing **PEAK/REL** key to perform the zeroing of residual magnetization current

CAUTION



On AC measure the possible blinking values shown at display with open input terminals **are not a problem of the meter** and these values will not be added to the measured value.

On DC measurement the zeroing operation of residual magnetization current is essential to obtain accurate results

4. Put the conductor to be tested inside to the center of clamp jaw to perform accurate measurements. Consider the notches on jaws as reference (see Fig. 2). The reading will be displayed
5. On DC current measurement the “-” symbol at display means that the meter is connected in the opposite side compared with current direction (see Fig. 9)
6. When “O.L.” symbol is displayed, the result exceeds the maximum value that the instrument is capable of measuring. Select an higher range
7. For HOLD, MAX/MIN, REL and PEAK features please refer to § 4.2

4.3.8. Frequency and Duty cycle measurement



CAUTION

- On frequency test with test leads the maximum input for AC Voltage measurements is 1000Vrms. Do not take any voltage measurement exceeding this limit in order not to risk electrical shock or damage the tester
- On frequency test with jaws make sure that all the test leads are disconnected from the meter terminals for current measurement.

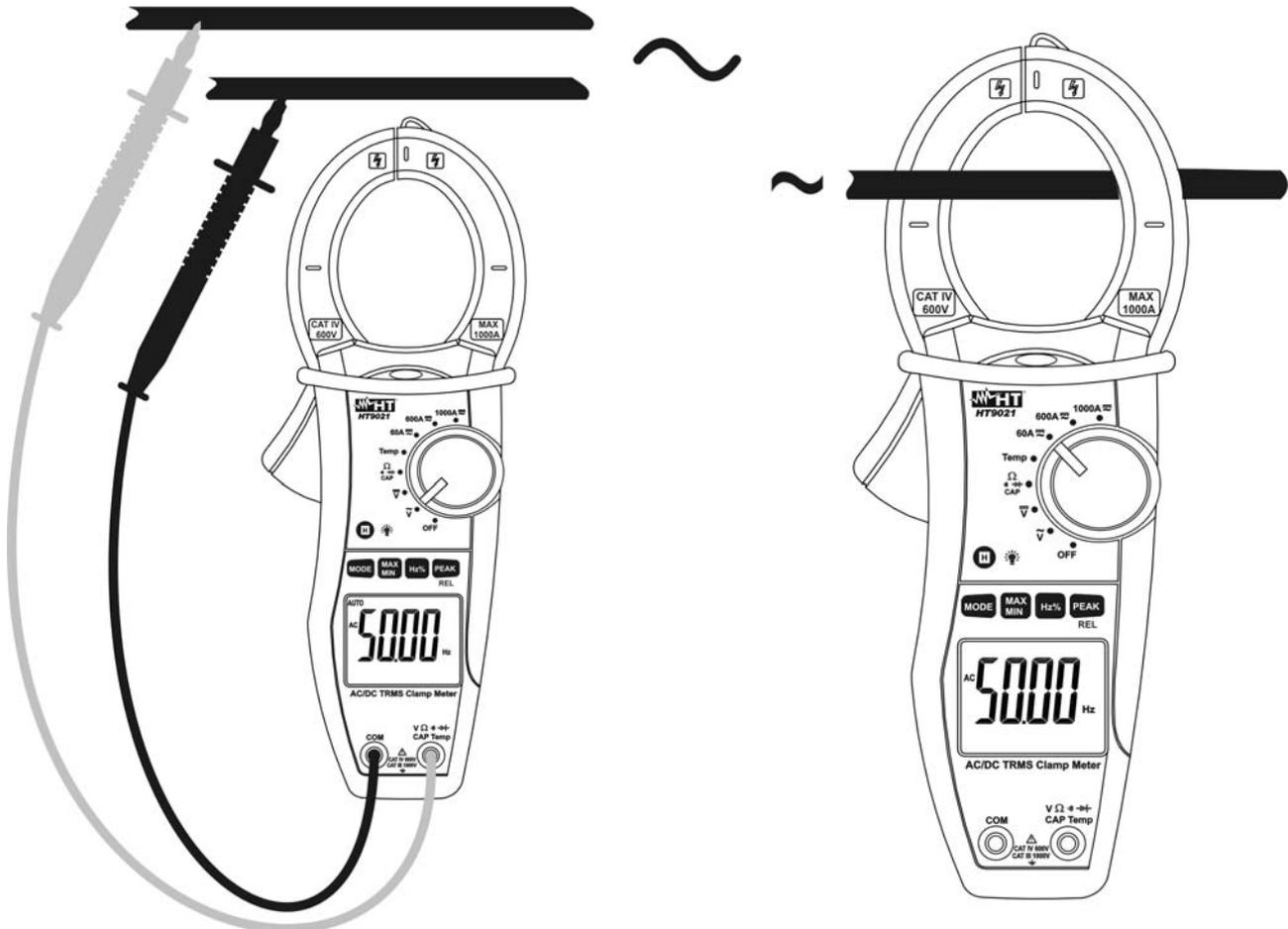


Fig. 10: Taking frequency and duty cycle measurements

1. Rotate the switch on \tilde{V} position for frequency measurement with test leads or **60A**, **600A** or **1000A** positions for frequency measurements with jaws
2. Pushing **Hz%** key the “Hz” symbol for frequency measurement or the “%” symbol for duty cycle measurement are shown at display
3. Insert the red test lead plug into **VΩ/Hz/CAP/Temp** jack and the black test lead plug into **COM** jack (see Fig. 10 – left side) for frequency measurement with test leads. Open the clamp and put the conductor to be tested in the middle of the clamp jaw (see Fig. 10 – right side) for frequency measurements with jaws, then reading will be displayed. Bargraph is disabled in frequency and duty cycle test
4. When “O.L.” symbol is displayed, the result exceeds the maximum value that the instrument is capable of measuring
5. For HOLD feature please refer to § 4.2

5. MAINTENANCE

5.1. GENERAL INFORMATIONS

1. This digital clamp meter is a precision instrument. Whether in use or in storage, please do not exceed the specification requirements to avoid possible damages or dangers.
2. Do not place this meter at high temperatures or humidity or expose it to direct sunlight.
3. Be sure to turn off the meter after use. If you expect not to use the tester for a long time, remove the battery in order to avoid leakages of battery liquid that would damage the internal parts.

5.2. BATTERY REPLACEMENT

When “+ III” appears on the display, replace the battery.



CAUTION

Only expert and trained technicians must perform this operation. Remove the test leads or the conductor under test before replacing the battery

1. Rotate the switch on OFF.
2. Remove the test leads or the objects to be tested.
3. Remove the screw from the battery cover, and detach the battery cover from the bottom cover.
4. Remove the battery
5. Replace the battery with a new one same type (see § 6.1.2)
6. Replace the battery cover and screw
7. Use the appropriate battery disposal methods for Your area

5.3. CLEANING

For cleaning the instrument use a soft dry cloth. Never use a wet cloth, solvents or water, etc.

5.4. END OF LIFE



CAUTION: this symbol indicates that equipment its accessories and battery shall be subject to a separate collection and correct disposal.

6. TECHNICAL SPECIFICATIONS

6.1. CHARACTERISTICS

Accuracy is calculated as [% rdg + (number of dgt) x resolution]. It is referred to the following reference conditions: 18°C ÷ 28°C (65°F ÷ 83°F), < 75%RH

DC Voltage (Autorange)

Range	Resolution	Accuracy	Input impedance	Overload protection
600.0mV	0.01mV	$\pm(1.0\%rdg + 3dgt)$	10M Ω	1000VDC/ACrms
6.000V	0.001V			
60.00V	0.01V			
600.0V	0.1V			
1000V	1V			

The meter emits a "bip-bip" sound with VDC >1000V

AC Voltage TRMS (Autorange)

Range	Resolution	Accuracy	Input impedance	Bandwidth	Overload protection
6.000V	0.001V	$\pm(1.0\%rdg+4dgt)$ (50 ÷ 60Hz)	10M Ω	50-400Hz	1000VDC/ACrms
60.00V	0.01V				
600.0V	0.1V	$\pm(3.5\%rdg+5dgt)$			
1000V	1V	$\pm(3.5\%rdg+5dgt)$ (61 ÷ 400Hz)			

Integrated sensor for AC voltage detection: LED turn on for phase-earth voltage > 100V, 50/60Hz

The meter emits a "bip-bip" sound on 1000V range for VAC>770V

Resistance and Continuity test (Autorange)

Range	Resolution	Accuracy	Buzzer	Overload protection
600.0 Ω	0.1 Ω	$\pm(1.0\%rdg+5dgt)$	$\leq 60\Omega$	600VDC/ACrms
6.000k Ω	0.001k Ω			
60.00k Ω	0.01k Ω			
600.0k Ω	0.1k Ω			
6.000M Ω	0.001M Ω			
60.00M Ω	0.01M Ω	$\pm(2.0\%rdg.+10dgt)$		

Test current of continuity test: < 0.35mA

DC Current

Range	Resolution	Accuracy (*)	Overload protection
60.00A	0.01A	$\pm(2.2\%rdg.+10dgt)$	1000AACrms
600.0A	0.1A	$\pm(2.0\%rdg+8dgt)$	
1000	1A		

(*) Referred to cable inside to the center of clamp jaws. Position sensitivity: $\pm 2.0\%rdg$

AC TRMS Current

Range	Resolution	Accuracy (*)	Bandwidth	Overload protection
60.00A	0.01A	$\pm(2.2\%rdg+12dgt)$	50 ÷ 60Hz	1000AACrms
600.0A	0.1A	$\pm(2.2\%rdg+8dgt)$		
1000A	1A			
60.00A	0.01A	$\pm(3.5\%rdg+12dgt)$	61 ÷ 400Hz	
600.0A	0.1A	$\pm(3.5\%rdg+8dgt)$		
1000A	1A			

PEAK function: response time <10ms ; Accuracy PEAK function: $\pm(5\%rdg+10dgt)$

(*) Referred to cable inside to the center of clamp jaws. Position sensitivity: $\pm 2.0\%rdg$

Capacitance (Autorange)

Range	Resolution	Accuracy	Overload protection
40.00nF	0.01nF	$\pm(3.5\%rdg+40dgt)$	600VDC/ACrms
400.0nF	0.1nF	$\pm(2.5\%rdg+5dgt)$	
4.000 μ F	0.001 μ F		
40.00 μ F	0.01 μ F		
400.0 μ F	0.1 μ F	$\pm(5.0\%rdg+5dgt)$	
4000 μ F	1 μ F		

Diode test

Range	Test current	Open voltage
	0.9mA typical	2.8VDC

Frequency with test leads (Autorange)

Range	Resolution	Accuracy	Sensitivity	Overload protection
99.99Hz	0.01Hz	$\pm(1.0\%rdg+5dgt)$	$\geq 15V_{rms}$	600VDC/ACrms
999.9Hz	0.1Hz			
9.999kHz	0.001kHz			
60.00kHz	0.01kHz			

Input current for frequency measurement with jaws: > 8% selectable full scale

Frequency with jaws (Autorange)

Range	Resolution	Accuracy	Sensitivity	Overload protection
99.99Hz	0.01Hz	$\pm(1.0\%rdg+5dgt)$	$\geq 10A (60A)$	1000VACrms
999.9Hz	0.1Hz		$\geq 50A(600A)$	
9.999kHz	0.001kHz			

Duty Cycle (Autorange)

Range	Resolution	Sensitivity	Accuracy
0.5% \div 99.0%	0.1%	$\geq 15V_{rms}$	$\pm(1.2\%rdg+2dgt)$

Pulse width: 100 μ s \div 100ms ; Pulse frequency: 5.000Hz \div 100.0kHz

Temperature with type K probe (Autorange)

Range	Resolution	Accuracy (*)	Overload protection
-20.0 \div 400.0 $^{\circ}$ C	0.1 $^{\circ}$ C	$\pm(2.0\%rdg + 3^{\circ}C)$	600VDC/ACrms
400 \div 760 $^{\circ}$ C	1 $^{\circ}$ C	$\pm(2.0\%rdg + 5^{\circ}C)$	
-4.0 \div 752.0 $^{\circ}$ F	0.1 $^{\circ}$ F	$\pm(2.0\%rdg + 6^{\circ}F)$	
752 \div 1400 $^{\circ}$ F	1 $^{\circ}$ F	$\pm(2.0\%rdg + 9^{\circ}F)$	

(*) Accuracy of type K probe not considered

6.1.1. Safety

Comply with:	IEC/EN 61010-1
Insulation:	double insulation
Pollution:	Level 2
Max height of use:	2000m (6562 ft)
Installation category:	CAT IV 600V, CAT III 1000V to ground,

6.1.2. General data
Mechanical characteristics

Dimensions (L x W x H):	252 x 88 x 44mm ; 10 x 3 x 2 in
Weight (including battery):	442g (16 ounces)
Max conductor size:	45mm (2 in)

Supply

Battery type:	1 battery 9V NEDA 1604 IEC 6F22 JIS 006P.
Low battery indication:	“+ III” is displayed when the battery level is low
Battery life:	about 200 hours
AutoPowerOff:	after 15 minutes of idleness

Display

Characteristics:	4 LCD (max 6000 counts), decimal point, unit symbol indication, bargraph and backlight
Sample rate:	2 times/sec
Conversion mode:	TRMS

6.2. ENVIRONMENTAL CONDITIONS

6.2.1. Climatic conditions

Reference temperature:	18°C ÷ 28°C (65°F ÷ 83°F)
Operating temperature:	0 ÷ 40 °C (32°F ÷ 104°F)
Operating humidity:	< 75%RH
Storage temperature:	-20 ÷ 60 °C (-4°F ÷ 140°F)
Storage humidity:	< 80% RH

This product conforms to the prescriptions of the European directive on low voltage 2006/95/EEC and to EMC directive 2004/108/EEC

6.3. STANDARD ACCESSORIES

- Test leads – Code 4413-2
- Adapter + type K bead probe
- Carrying bag
- User manual
- Battery

6.4. OPTIONAL ACCESSORIES

The herewith type K probes are available:

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

7. SERVICE

7.1. WARRANTY CONDITIONS

This equipment is guaranteed against material faults or production defects, in accordance with the general sales conditions. During the warranty period (one year), faulty parts may be replaced. The manufacturer reserves the right to decide either to repair or replace the product.

In case of returning of the instrument, all transport charges must be paid by the customer. The instrument must be accompanied by a delivery note indicating the faults or reasons of returning. The returned tester must be packed in its original box. Any damage occurred in transit because of lack of original packaging will be debited to the customer.

The manufacturer is not responsible for any damage against persons or things.

Accessories and batteries are not covered by warranty.

The warranty won't be applied to the following cases:

- faults due to improper use of the equipment
- faults due to combination of the tester with incompatible equipment.
- faults due to improper packaging.
- faults due to servicing carried out by a person not authorized by the company.
- faults due to modifications made without explicit authorisation of our technical department.
- faults due to adaptation to a particular application not provided for by the definition of the equipment or by the instruction manual.

The contents of this manual cannot be reproduced in any form without our authorization.

Our products are patented. Our logotypes are registered. We reserve the right to modify characteristics and prices further to technological developments.

7.2. SERVICE

If the equipment doesn't work properly, before contacting the SERVICE, test the batteries, the test leads, etc., and change them if necessary.

If the equipment still doesn't work, make sure that your operating procedure complies with the one described in this manual.

In case of returning of the instrument, all transport charges must be paid by the customer.

The instrument must be accompanied by a delivery note indicating the faults or reasons of returning. The returned tester must be packed in its original box. Any damage occurred in transit because of lack of original packaging will be debited to the customer.