



**ENGLISH**

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# User manual



**Table of content:**

1. SAFETY PRECAUTIONS AND PROCEDURES .....	2
1.1. Preliminary .....	2
1.2. During use .....	3
1.3. After use .....	3
1.4. Overvoltage categories - definitions .....	3
2. GENERAL DESCRIPTION .....	4
3. PREPARATION FOR USE .....	4
3.1. Initial .....	4
3.2. Supply voltage .....	4
3.3. Calibration .....	4
3.4. Storage .....	4
4. OPERATING INSTRUCTIONS .....	5
4.1. Instrument description .....	5
4.2. Description of symbols at display .....	5
4.3. Initial autotest .....	5
4.4. DC Voltage measurement .....	6
4.5. AC Voltage measurement .....	7
4.6. AC Voltage measurement with low input impedance .....	8
4.7. 1-wire AC Voltage Detection (polarity) .....	9
4.8. Phase sequence indication .....	10
4.9. Continuity test .....	11
5. MAINTENANCE .....	12
5.1. General information .....	12
5.2. Battery replacement .....	12
5.3. Cleaning .....	12
5.4. End of life .....	12
6. TECHNICAL SPECIFICATIONS .....	13
6.1. Technical characteristics .....	13
6.1.1. Electrical characteristics .....	13
6.1.2. Reference guidelines .....	13
6.1.3. General specifications .....	14
6.2. Environment .....	14
6.2.1. Environmental conditions .....	14
6.3. Accessories .....	14
6.3.1. Standard accessories .....	14
6.3.2. Optional accessories .....	14
7. SERVICE .....	15
7.1. Warranty conditions .....	15
7.2. Service .....	15

## 1. SAFETY PRECAUTIONS AND PROCEDURES

This instrument complies with IEC/EN61010-1 relative to electronic measuring instruments. For your own safety and to avoid damaging the instrument follow the procedures described in this instruction manual and read carefully all notes preceded by this symbol .

When taking measurements:

- Avoid measuring in humid or wet places.
- Make sure that humidity is within the limits indicated in section “environmental conditions”.
- Avoid measuring in presence of explosive gas, combustible gas, steam or excessive dust.
- Do not touch exposed metal (conductive) parts such as test lead ends, sockets, fixing objects, circuits etc.
- Avoid measuring if you note anomalous conditions such as breakages, deformations, fractures, strange substances, blind display etc.
- Avoid measuring voltages higher than 20V as you may risk electrical shocks.

The following symbols are used:



Caution: refer to the instruction manual; an improper use may damage the instrument or its components



Danger high voltage: risk of electrical shocks



Double insulated instrument



AC voltage



DC voltage

### 1.1. PRELIMINARY

- This instrument has been designed for use in environments with pollution degree 2.
- It can be used for **VOLTAGE** measurements on installations of CAT IV 600V or CAT III 1000V.
- When using the instrument always respect the usual safety regulations aimed at protecting you against dangerous electric currents as well as the instrument against incorrect operations.
- Do not test nor connect to any circuit exceeding the specified overload protection.
- Do not take measurements under environmental conditions exceeding the limits indicated in § 6.2.1.
- Make sure that batteries are properly installed.

## 1.2. DURING USE

Read the recommendations which follow and the instructions in this manual:

### CAUTION



An improper use may damage the instrument and/or its components or injure the operator.

- When the instrument is connected to circuits never touch an unused terminal.
- When measuring resistors do not add any voltage. Although there is a protection circuit, excessive voltage would still cause malfunction.

## 1.3. AFTER USE

If you expect not to use the instrument for a long period remove batteries.

## 1.4. OVERVOLTAGE CATEGORIES - DEFINITIONS

IEC/EN61010-1 (Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements) defines what a measurement category (usually called “overvoltage category”) is. At § 6.7.4: Measuring circuits it quotes:

(OMISSIS)

Circuits are divided into the following measurement categories:

- **Measurement category IV** is for measurements performed at the source of low voltage installations.  
*Examples are electricity instruments and measurements on primary overcurrent protection devices and ripple control units*
- **Measurement category III** is for measurements performed in the building installations.  
*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 installations.  
*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 withstanding capability of the equipment is made known to the user.*

## 2. GENERAL DESCRIPTION

HT7 performs the following measurements:

- DC voltage with 2-wire method
- AC voltage with 2-wire method
- AC voltage with 1-wire method (polarity detection)
- Phase sequence indication
- Continuity test with buzzer
- Voltage measurement with low impedance input

The measure is displayed with indication of measurement unit both in numerical mode and as bargraph. A white LED enabled by  key is also available to illuminate dark environments.

## 3. PREPARATION FOR USE

### 3.1. INITIAL

This instrument was checked both mechanically and electrically prior to shipment. All possible cares and precautions were taken to let you receive the instrument under perfect conditions. Notwithstanding we suggest you to check it rapidly (any damage may have occurred during transport).

Make sure that all standard accessories mentioned in § 6.3 are included.

Should you have to return back the instrument for any reason please follow the instructions mentioned in § 7.

### 3.2. SUPPLY VOLTAGE

The instrument is powered by 2x1.5V alkaline batteries type AAA LR03. When batteries are low, a low battery indication " "is displayed. To replace batteries follow the instructions of § 5.2

### 3.3. CALIBRATION

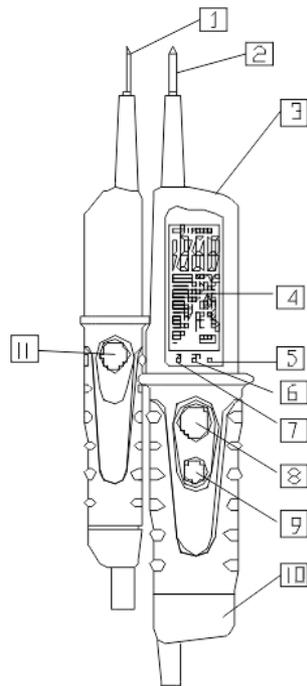
The instrument complies with the technical specifications contained in this manual. Considering its extremely friendly use, the instrument does not need any calibration.

### 3.4. STORAGE

After a period of storage under extreme environmental conditions exceeding the limits mentioned in § 6.2.1, let the instrument restore normal measuring conditions before use.

## 4. OPERATING INSTRUCTIONS

### 4.1. INSTRUMENT DESCRIPTION



#### CAPTION:

1. L1 detachable probe
2. L2 fixed probe
3. White LED illuminator
4. LCD display
5. Voltage measurements warning LED
6. Low impedance test LED
7. Continuity test LED
8. Low impedance switch (L2)
9. Key to activate white LED illuminator
10. Battery cover
11. Low impedance switch (L1)

Fig. 1: Instrument description

### 4.2. DESCRIPTION OF SYMBOLS AT DISPLAY

The following symbols can be displayed on HT7:

Symbol	Description
DC	DC voltage measurement
AC	AC voltage measurement
—	Negative polarity on DC voltage measurement
⚡	This symbol is lighted up whenever the voltage between the probes exceeds 50V, even if the batteries are low or have been removed
•••••	Continuity test
R)	Clockwise phase sequence
(L	Counterclockwise phase sequence
⚠	Detection voltage necessary to perform measurements
BAT	Low battery indication

### 4.3. INITIAL AUTOTEST

Before start any measurements perform the following checks:

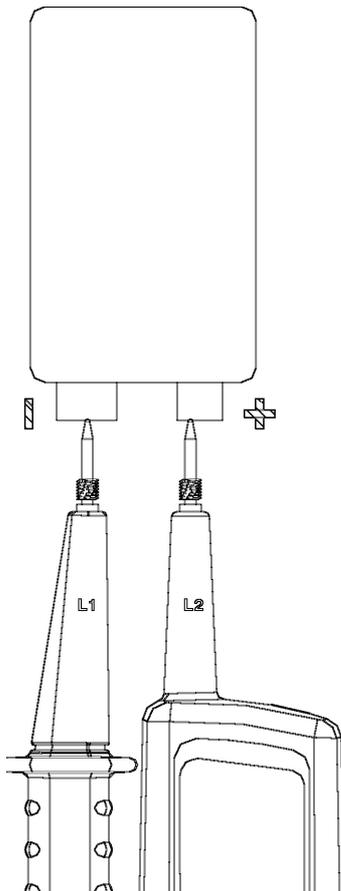
- Use the instrument on a known voltage source.
- The " ⚡ " symbol is lighted up whenever the voltage between the probes exceeds 50V, even if the batteries are low or have been removed.
- Short the L1 and L2 probes. The indicator lights, the buzzer sounds and the LEDs for the continuity test light up. The LEDs for the low impedance test and the single-phase voltage do not light up.

#### 4.4. DC VOLTAGE MEASUREMENT

### CAUTION



- The maximum input for DC voltage is 690V. Do not measure higher voltages to avoid risks of electrical shocks or serious damages to the instrument.
- ⚡ symbol is lighted up whenever the voltage between the probes exceeds 50V, even if the batteries are low or have been removed.



1. Perform the preliminary Autotest (see § 4.3).
2. Connect the L1 and L2 probes to the object under test (see Fig. 2)
3. The instrument turns automatically on and the measured DC voltage value is displayed both in numerical and bargraph modes. DC symbol is displayed. Always keep the instrument in vertical position for an optimal display reading.
4. The symbol "-", if displayed, indicates that the measured voltage is negative.
5. The instrument turns automatically off as soon as the probes are disconnected from the object under test. If the measured voltage is lower than 4.5V DC the instrument turns automatically off.
6. Press the  key to switch on the white LED illuminator to perform measurements in dark environments.

Fig. 2: DC voltage measurement

## 4.5. AC VOLTAGE MEASUREMENT



### CAUTION

- The maximum input for AC voltage is 690V. Do not measure higher voltages to avoid risks of electrical shocks or serious damages to the instrument.
- ⚡ symbol is lighted up whenever the voltage between the probes exceeds 50V, even if the batteries are low or have been removed.

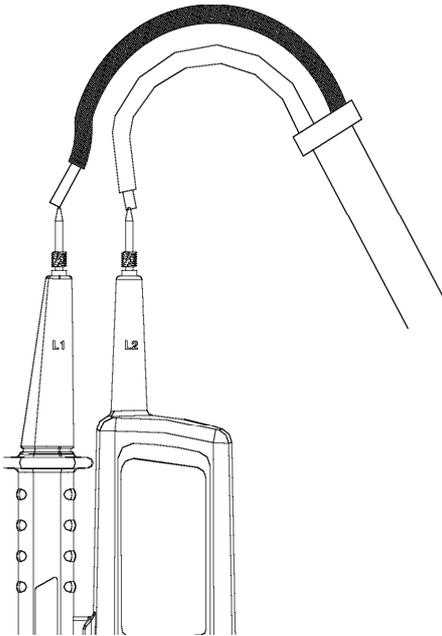


Fig. 3: AC voltage measurement

1. Perform the preliminary Autotest (see § 4.3)
2. Connect the L1 and L2 probes to the object under test (see Fig. 3). The measurement is performed **only when probes are in contact to live conductors**.
3. The instrument turns automatically on and the measured AC voltage value is displayed both in numerical and bargraph modes. AC symbol is displayed. Always keep the instrument in vertical position for an optimal display reading.
4. The symbol ⚡ is lighted up for AC voltage measurements from 100V to 690V, 50/60Hz.
5. The instrument turns automatically off as soon as the probes are disconnected from the object under test. If the measured voltage is lower than 3.0V AC the instrument turns automatically off.
6. While taking measurements in single-phase installations, the symbols R) or (L can be displayed. This is not a malfunction.
7. Press the  key to switch on the white LED illuminator to perform measurements in dark environments.

#### 4.6. AC VOLTAGE MEASUREMENT WITH LOW INPUT IMPEDANCE



### CAUTION

- The maximum input for AC voltage is 690V. Do not measure higher voltages to avoid risks of electrical shocks or serious damages to the instrument.
- ⚡ symbol is lighted up whenever the voltage between the probes exceeds 50V, even if the batteries are low or have been removed.

This function is particularly useful for testing installations. Thanks to the low input impedance, voltage due to stray capacitance coupling is nulled. The reading shows the voltage applied. Similarly, measuring line to earth voltage ( $V_{L-PE}$ ) may trigger residual current circuit breakers (RCD). **This measuring procedure can be used for measurements above 12V.**

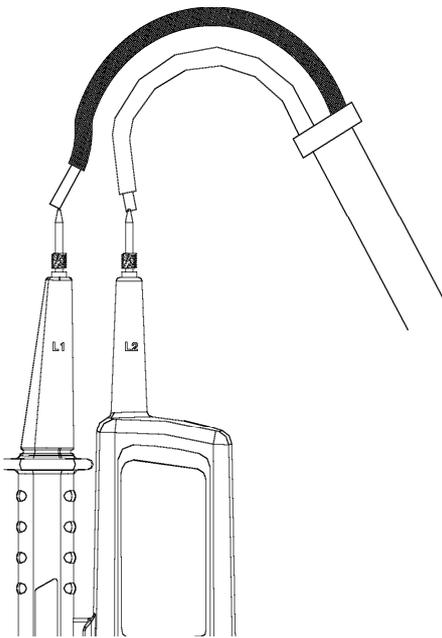


Fig. 4: AC voltage measurement with low impedance

1. Perform the preliminary Autotest (see § 4.3)
2. Connect the L1 and L2 probes to the object under test (see Fig. 3). The measurement is performed **only when probes are in contact to live conductors.**
3. The instrument turns automatically on and the measured AC voltage value is displayed both in numerical and bargraph modes. AC symbol is displayed. Always keep the instrument in vertical position for an optimal display reading.
4. The symbol ⚡ is lighted up for AC voltage measurements from 100V to 690V, 50/60Hz.
5. **Press the two switches (see Fig. 1 part 8 and 11) simultaneously. The applied voltage is displayed on the LCD.**
6. **The low impedance LED indicates the low input impedance voltage measurement (load connection).**
7. Press the  key to switch on the white LED illuminator to perform measurements in dark environments.

### CAUTION



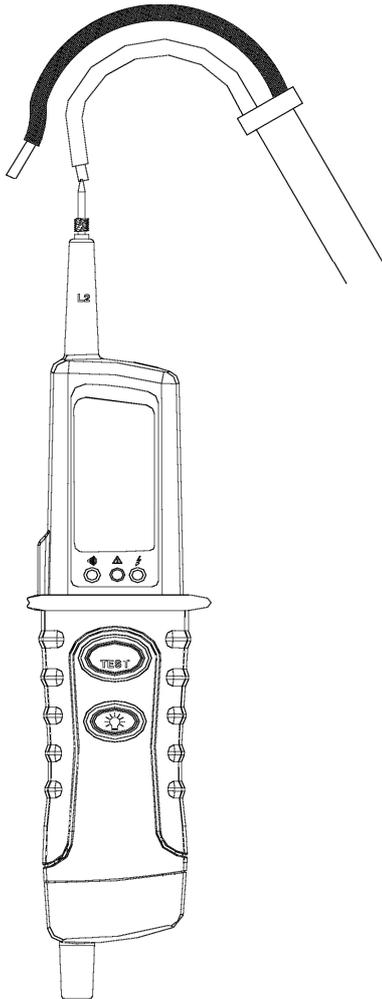
- The maximum allowed use of low input impedance measurement is 5 seconds for voltages up to 250V and 3 seconds for voltages up to 690V. Afterwards, please wait 10 minutes before taking further measurements.
- The single-wire test is not suitable to measure voltage. For this purpose, the two-wire voltage testing is necessary.

#### 4.7. 1-WIRE AC VOLTAGE DETECTION (POLARITY)

### CAUTION



- The maximum input for AC voltage is 690V. Do not measure higher voltages to avoid risks of electrical shocks or serious damages to the instrument.
- The 1-wire AC voltage mode should be used as a quick voltage detection test with no voltage value displaying.
- ⚡ symbol is lighted up whenever the voltage between the probes exceeds 50V, even if the batteries are low or have been removed.



1. Perform the preliminary Autotest (see § 4.3).
2. Connect the L2 probe to the object under test (see Fig. 5). The measurement is performed **only when probe is in contact to live conductors**.
3. The instrument turns automatically on along with LEDs and ⚡ for AC voltage detected from 100V to 690V, 50/60Hz. The display and bargraph values are not significant in this test.
4. The instrument turns automatically off as soon as the measured voltage is lower than 100V AC.
5. While taking measurements in single-phase installations, the symbols **R**) or **(L** can be displayed. This is not a malfunction.
6. Press the key to switch on the white LED illuminator to perform measurements in dark environments.

Fig. 5: 1-wire AC voltage detection

## 4.8. PHASE SEQUENCE INDICATION



### CAUTION

- The maximum input for AC voltage is 690V. Do not measure higher voltages to avoid risks of electrical shocks or serious damages to the instrument.
- ⚡ symbol is lighted up whenever the voltage between the probes exceeds 50V, even if the batteries are low or have been removed.

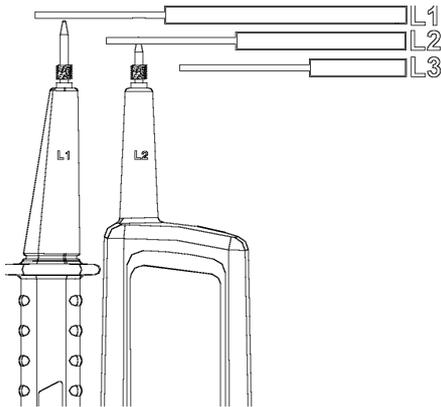


Fig. 6: Phase sequence test

1. Perform the preliminary Autotest (see § 4.3).
2. Connect the L1 probe to phase 1 and the L2 probe to phase 2 of the three-phase system under test (see Fig. 6). The measurement is performed **only when probes are in contact to live conductors**.
3. The instrument turns automatically on and the measured AC voltage value is displayed both in numerical and bargraph modes.
4. AC symbol is displayed. LEDs and are lighted up for AC voltage measurements from 100V to 690V, 50/60Hz.
5. symbol (clockwise) and symbol (counterclockwise) are displayed according to the phase sequence detected.
6. Connect the L1 probe to phase 2 and the L2 probe to phase 3 of the three-phase system under test. symbol (clockwise) and symbol (counterclockwise) are displayed according to the phase sequence detected.
7. Connect the L1 probe to phase 2 and the L2 probe to phase 3 of the three-phase system under test. symbol (clockwise) and symbol (counterclockwise) are displayed according to the phase sequence detected.
8. Press the key to switch on the white LED illuminator to perform measurements in dark environments.

## 4.9. CONTINUITY TEST

### CAUTION



Before taking the continuity test, disconnect the circuit under test from any power source and discharge all capacitors.

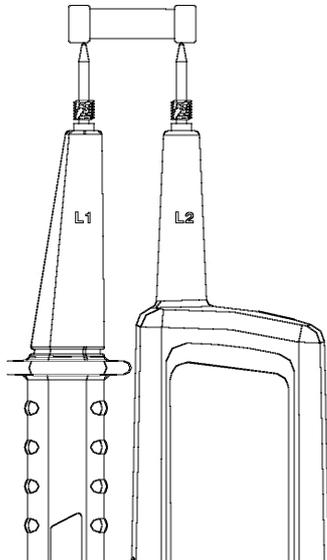


Fig. 7: Continuity test

1. Perform the preliminary Autotest (see § 4.3).
2. Connect the L1 and L2 probes to the object under test (see Fig. 7)
3. Continuity test is active for resistance  $<200\text{k}\Omega$ . The instrument turns automatically on along with LED  and the buzzer indicating a positive test. The display and bargraph values are not significant in this test and do not indicate the resistance value of the object under test.
4. The instrument automatically turns off when the probes are separated from the object under test or the applied voltage is lower than 3V DC.
5. Press the  key to switch on the white LED illuminator to perform measurements in dark environments.

## 5. MAINTENANCE

### 5.1. GENERAL INFORMATION

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

### 5.2. BATTERY REPLACEMENT

When the display shows the low battery symbol “ ” the batteries have to be replaced.

#### CAUTION



Only expert and trained technicians should perform this operation. Before carrying out this operation, make sure you have disconnected all test leads from any energized circuit to avoid risks of electrical shock.

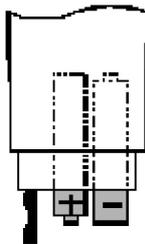


Fig. 8: Battery replacement

1. Unscrew the screw on the bottom of the instrument and remove the battery cover.
2. Remove the batteries from the battery compartment.
3. Insert new batteries of the same kind (see § 6.1.3) respecting polarity signs (see Fig. 8).
4. Restore the battery compartment cover into place and fasten it by mean of the relevant screw.
5. To preserve the environment do not throw used batteries. Dispose used batteries properly.

### 5.3. CLEANING

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

### 5.4. END OF LIFE



**CAUTION:** this symbol on the instrument indicates that the equipment and its accessories must be collected separately and correctly disposed of.

## 6. TECHNICAL SPECIFICATIONS

### 6.1. TECHNICAL CHARACTERISTICS

Accuracy is indicated as  $\pm[\% \text{reading} + (\text{no. of digits}) * \text{resolution}]$  at  $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ,  $< 70\% \text{RH}$

#### AC/DC Voltage

Range	Resolution	Accuracy	Input impedance	Overload protection
6, 12, 24, 50, 120, 230, 400, 690V	1V	$\pm(1.0\% \text{rdg} + 3 \text{dgt})$ (DC voltage)	1M $\Omega$	690VAC/DC
		$\pm(1.5\% \text{rdg} + 5 \text{dgt})$ (AC voltage)		

Max output current: <1mA (400VAC); <1.5mA (690VDC)  
 Detection AC/DC voltage: automatic  
 Measuring range selection: automatic  
 Frequency range: 50/60Hz  
 Minimum detected voltage:  $\geq 3\text{V}$  AC/DC

#### AC Voltage with low internal impedance

Range	Resolution	Measuring time	Input impedance	Overload protection
12 ÷ 230V	1V	max 5s < 250V	< 6k $\Omega$	3s <400VAC , 690VDC

Max output current:  $I_s \leq 200\text{mA}$  @690V, max 30s (ca. 48mA @ 230V)  
 Detection AC voltage: automatic from 12V  
 Measuring range selection: automatic  
 Frequency range: 50/60Hz  
 Minimum detected voltage: 12VAC

#### 1-wire AC voltage detection (polarity)

Voltage range: 100 ÷ 690V AC  
 Frequency range: 50/60Hz

#### Continuity test

Range	Buzzer	Test current	Overload protection
)))	<200k $\Omega$	<1 $\mu\text{A}$	690VDC/400VAC

#### Phase sequence indication

Voltage range: 100 ÷ 400VAC  
 Frequency range: 50/60Hz  
 Measurement method: 2-wire with contact to live parts

#### 6.1.1. Electrical characteristics

Conversion: average value  
 Sampling frequency: 2-3 times for second

#### 6.1.2. Reference guidelines

Safety: IEC/EN61010-1  
 Insulation: double insulation  
 Pollution degree: 2  
 Measurement category: CAT III 1000V, CAT IV 600V  
 Max height of use: 2000m (6561ft)

### 6.1.3. General specifications

#### Mechanical characteristics

Dimensions (L x W x H): 240 x 78 x 40mm (9.4 x 3.1 x 1.6in)

Weight (including batteries): 240g (7.7ounces)

#### Power supply

Battery type: 2x1.5V batteries type AAA LR03

Indication of low batteries: "BAT" is displayed

Auto power off / on fixed

#### Display

Type: 3½ digits LCD, max. 1999 counts + sign, bargraph and backlight

### 6.2. ENVIRONMENT

#### 6.2.1. Environmental conditions

Reference temperature of calibration:  $23 \pm 5^{\circ}\text{C}$  ( $73 \pm 41^{\circ}\text{F}$ )

Operating temperature:  $-10 \div 55^{\circ}\text{C}$  ( $14 \div 131^{\circ}\text{F}$ )

Allowable relative humidity: <85%RH

Storage temperature:  $-10 \div 60^{\circ}\text{C}$  ( $14 \div 140^{\circ}\text{F}$ )

Storage humidity: <85%RH

**This instrument complies with the European Directive on low voltage 2006/95/CE (LVD) and with EMC 2004/108/CE**

### 6.3. ACCESSORIES

#### 6.3.1. Standard accessories

- Plastic protection of metal probes
- 4mm metal sleeves with internal thread, 2x
- Batteries, 2x 1,5V AAA
- User manual

#### 6.3.2. Optional accessories

- Carrying bag B71

## 7. SERVICE

### 7.1. WARRANTY CONDITIONS

This instrument is guaranteed for one year against material or production defects, in accordance with our general sales conditions. During the warranty period the manufacturer reserves the right to decide either to repair or replace the product.

Should you need for any reason to return back the instrument for repair or replacement take prior agreements with the local distributor from whom you bought it. Do not forget to enclose a report describing the reasons for returning (detected fault). Use only original packaging. Any damage occurred in transit due to no original packaging will be charged anyhow to the customer.

The warranty shall not apply to:

- Accessories and battery are not included in warranty.
- Repairs following unsuitable use of the equipment or by combining the latter with incompatible equipment.
- Repairs resulting from a not correct shipping.
- Repairs resulting from servicing carried out by a person not approved by the company.
- Modifications to the equipment without explicit authorization from our technical department.
- Adaptation to a particular application not provided for by the definition of the equipment or by 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.**

### 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 Customer's 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.