



## HT77C Leakage Current Clamp Meter User Manual

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User manual

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## 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.

### CAUTION


Failure to comply with the caution notes and/or instructions may damage the instrument and/or its components and be a source of danger for the operator.

Before and after carrying out the measurements, carefully observe the following instructions:

- Do not carry out any current measurements in humid environments.
- Do not carry out any measurements in case gas, explosive materials or flammables are present, or in dusty environments.
- Avoid contact with the circuit being measured if no measurements are being carried out.
- Avoid contact with exposed metal parts, 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.

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.
	This symbol indicates that the clamp can operate on live conductors
	Double-insulated meter
	AC current
	DC voltage
	Connection to earth
	Do not operate close to low-frequency magnetic fields > 30A/m

## PRELIMINARY INSTRUCTIONS

- This clamp has been designed for use in environments of pollution degree 2.
- It can be used for CURRENT measurements, on installations with CAT III 600V. For a definition of the above-mentioned categories, see § 1.4
- This instrument is not suitable for direct current measurements
- Please take the standard safety precautions aimed at protecting you against dangerous electric currents and protect the instrument against the incorrect use
- Do not test circuits exceeding the specified current and voltage limits
- Check that the battery is correctly inserted

## DURING USE

Please carefully read the following recommendations and instructions:



Failure to comply with the Caution notes and/or Instructions may damage the instrument and/or its components or be a source of danger for the operator.

- Before switching on the clamp, remove the conductor from the clamp jaw.
- When the instrument is connected to the circuit under test, do not touch any unused terminal.
- 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, as described in § 4.3 in order to obtain the most accurate reading.
- While measuring, if the value or the sign of the quantity being measured remains unchanged, check if the HOLD function is enabled

## AFTER USE

- When the measurement is complete, switch off the clamp.
- If the instrument is not to be used for a long time, 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, commonly called the overvoltage category, is. In § 6.7.4: Measured circuits, circuits are divided into the following measurement categories: (OMISSIONS)

- **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 a 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 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:

- AC TRMS current
- AC TRMS leakage current
- Measurement compliance with IEC/EN6157-13 Class 2 guideline
- Bluetooth connection to mobile devices through HTLeakage APP

## 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 replaced, please carefully follow the instructions given in § 8.

## INSTRUMENT POWER SUPPLY

The instrument is supplied with two 1.5V AA LR06 batteries, included in the package. In order to prevent compromising its charge, the battery is not inserted in the instrument. For battery installation, follow the instructions given in § 6.2. The “ ” symbol appears when the battery is nearly discharged. Replace the battery, 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

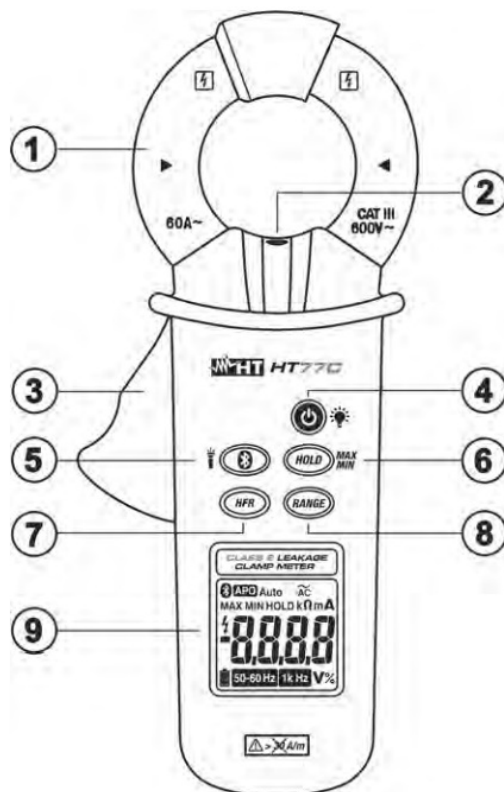




Fig. 1: Instrument description

### CAPTION:

1. Inductive clamp jaw

2. White LED torch
3. Opening lever
4.  key
5.  key
6. HOLD/MAX MIN key
7. HFR key
8. RANGE key
9. LCD display

## ALIGNMENT MARKS AND HAND PROTECTION

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

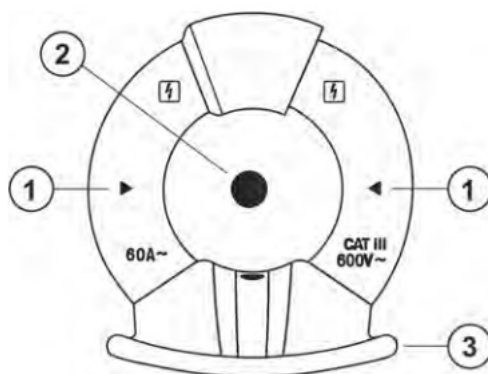


Fig. 2: Alignment marks and hand protection




## CAPTION:

1. Alignment marks
2. Cable
3. Hand protection

Always keep your hands under hand protection. This protection is always located in a suitable position to guarantee a correct safety distance from possible exposed or live parts (see Fig. 2)

## DESCRIPTION OF FUNCTIONS KEYS

### 4.3.1. key

Press and hold the  key for 2s allowing switching on the clamp. While switching on, the display shows the charge percentage of the power supply battery. Replace the batteries when 0% appears (see § 6.2). To switch off the clamp, Press and hold the  key for 3s. With the instrument switching on press the  to activate/deactivate the display backlight.

### 4.3.2. HOLD/MAX MIN key

The press of the HOLD/MAX/MIN key allows activating/deactivating the frozen of value on the display. The "HOLD" message is shown.

Press and hold the HOLD/MAX MIN key for 2s allows to activate the detection of the parameter maximum and minimum values. Both values are stored in memory and they can be shown cyclically when pressing the "MIN MAX" key. The display shows the symbol linked to the selected function: "MAX" for maximum value, the symbol "MIN" for minimum value, and the "MAX MIN" symbol for the simultaneous detection of MAX and MIN. In this case the instrument return to normal measurement mode. Press and hold again the HOLD/MAX MIN key for 2s to exit from the function.

#### 4.3.3. RANGE key



Press the RANGE key to activate the manual mode and to disable the Auto range function.

The symbol "Auto" disappears from the display. Press the RANGE key to change the measuring range: the relevant decimal point will change its position. In Auto range mode, the instrument selects the most appropriate ratio for carrying out the measurement. If the reading is higher than the maximum measurable value, the indication "OL" appears on the display. Press and hold the RANGE key for 2s to exit the manual mode and restore the Auto range mode

#### 4.3.4. HFR key


Pressing the HFR (High-Frequency Rejection) key allows enabling the low-pass filter, which has a cutting frequency of approx. 200Hz (message "50-60Hz" on the display) or a low-pass filter, which has a cutting frequency of approx. 1kHz (message "1kHz" on the display) in order to eliminate the harmonic content on the measured current. Press the HFR key a third time to return to normal measurement mode.

#### 4.3.5. key

Pressing the  key allows activating/deactivating the Bluetooth connection. In this condition is possible to connect the instrument to an external mobile device through the dedicated HTLeakage APP (see § 5.3). Pressing the  key for 2s allows to activate/deactivate the white LED torch (see Fig. 1 – part 2)

#### 4.3.6. Disabling the Auto Power Off function

In order to preserve internal batteries, the instrument switches off automatically approximately 20 minutes after it was last used. To disable the Auto Power Off function, proceed as follows:

- Switch off the instrument (OFF)
- Press and hold the HFR key and switch on the instrument with the  key. The "off" the message is shown for a while and the "APO" symbol disappears on the display
- Switch off and then on again the instrument to enable the function

## OPERATING INSTRUCTIONS

### AC CURRENT MEASUREMENT



#### CAUTION

Insert the cable in the middle of the clamp jaws, in order to obtain accurate measures. Use the marks as a reference (see Fig. 2)

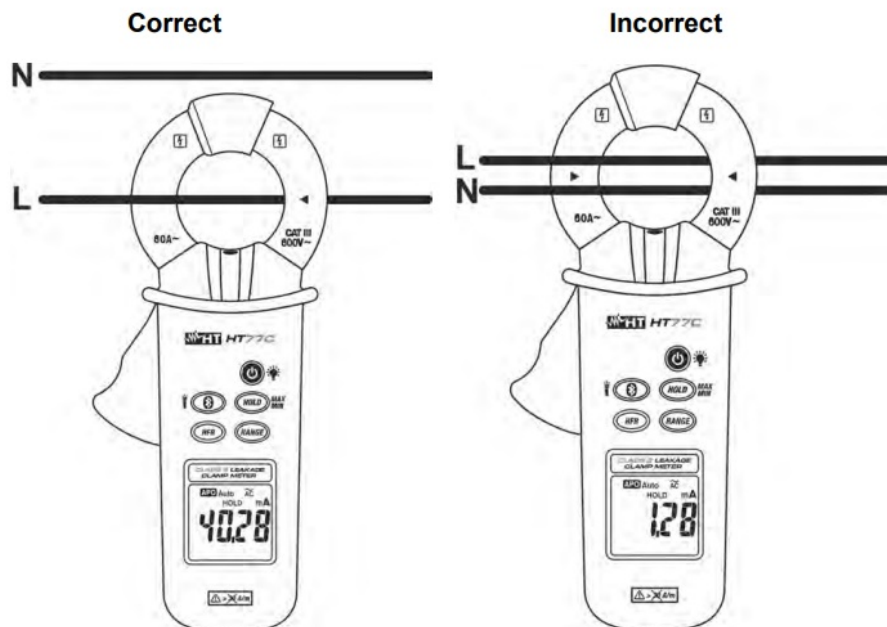



Fig. 3: Use of the clamp for AC current measurement

1. Switch on the clamp by pressing the  key
2. Open the clamp jaw and insert the cable in the middle of it (see Fig. 3 – left part). The current value will be shown on the display
3. For use of HOLD, MAX/MIN, HFR, and RANGE functions refer to § 4.3
4. For use of the instrument in combination with HTLeakage APP see § 5.3

#### LEAKAGE CURRENT MEASUREMENT

##### **CAUTION**

Insert the cable(s) in the middle of the clamp jaws, in order to obtain accurate measures. Use the marks as a reference (see Fig. 2)

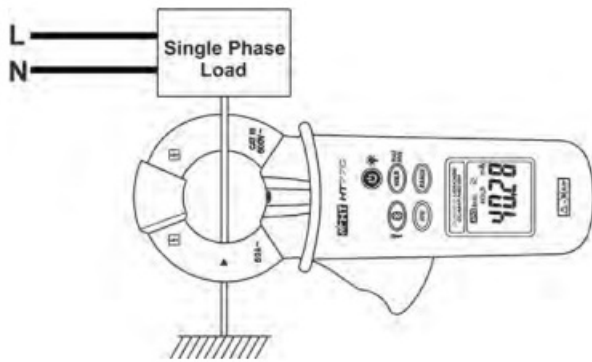


Fig. 4: Measuring leakage current with direct method in a single phase load

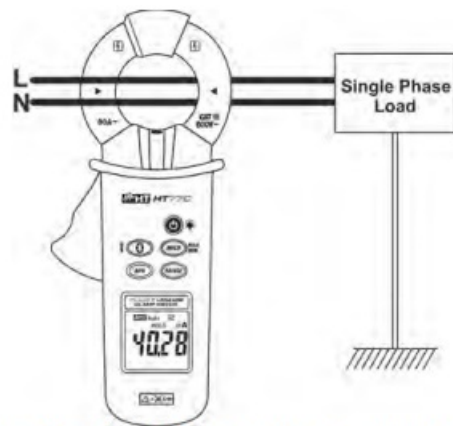


Fig. 5: Measuring leakage current with indirect method in a single phase load

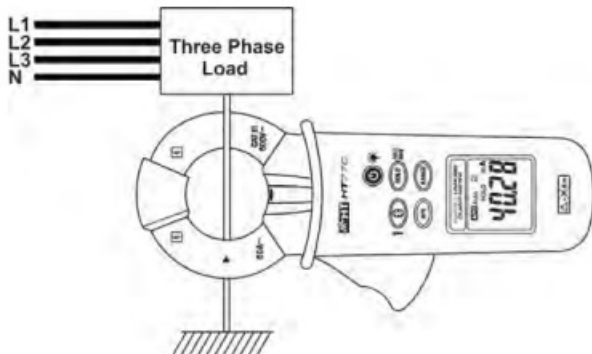


Fig. 6: Measuring leakage current with direct method in a three phase load

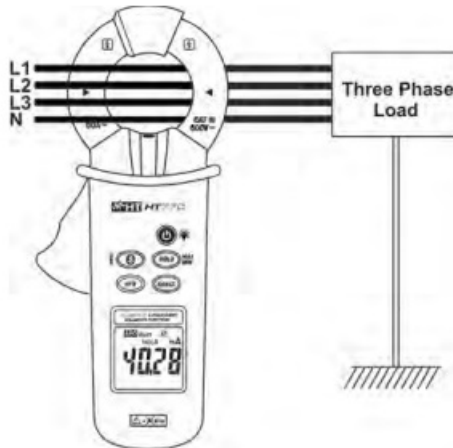




Fig. 7: Measuring leakage current with indirect method in a three phase load

### Leakage current measurement with Direct method on earth conductors

1. Switch on the clamp by pressing the  key
2. Open the clamp jaw and connect the clamp as shown in Fig. 4 or Fig. 6. The leakage of the current value will be shown on the display
3. For use of HOLD, MAX/MIN, HFR, and RANGE functions refer to § 4.3
4. For use of the instrument in combination with HTLeakage APP see § 5.3

### Leakage current measurement with Indirect method

1. Switch on the clamp by pressing the  key
2. Open the clamp jaw and connect the clamp as shown in Fig. 5 or Fig. 7. The leakage of the current value will be shown on the display
3. For use of HOLD, MAX/MIN, HFR, and RANGE functions refer to § 4.3
4. For use of the instrument in combination with HTLeakage APP see § 5.3

### BLUETOOTH CONNECTION WITH THE HTLEAKAGE APP

The instrument is equipped with the integrated Bluetooth BLE 4.0 function that allows a wireless connection to mobile devices (tablets/smartphones) via the dedicated HTLeakage APP which can be freely downloaded for Android and iOS systems using the following QR codes:

## HTLeakage APP



<https://l.ead.me/bbUI6e>

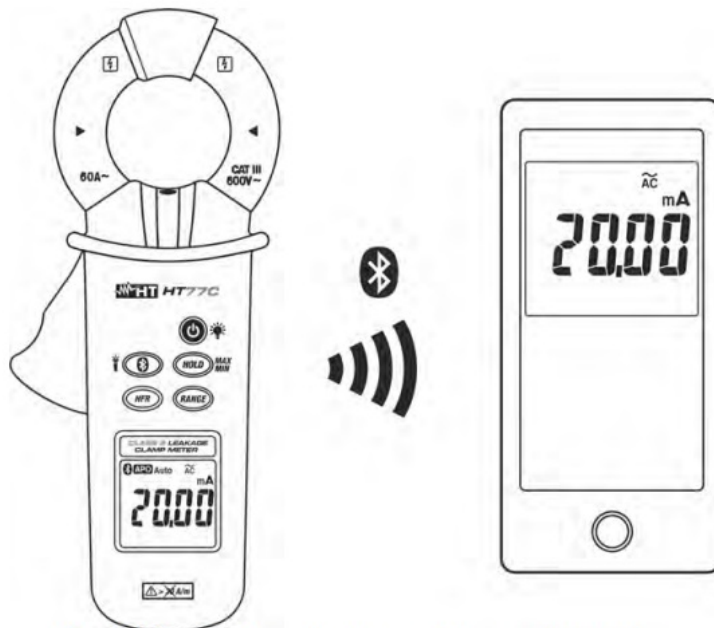


Fig. 8: Connection of instrument to a mobile device

The leakage APP allows the following operations:

- Real-time visualization of the data on the mobile device
- Activation of data logger function for recording with a programmable integration period from 1s to 5min
- The graphical trend is shown on a mobile device
- Saving recording in CSV format
- Sharing by email and/or social networks

## MAINTENANCE

### 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 instrument's internal circuits.

## BATTERIES REPLACEMENT

When the LCD displays the “” symbol, replace the batteries



### CAUTION

Only expert technicians should perform this operation.

Before carrying out this operation, make sure you have removed the cable being tested from inside the clamp jaw.

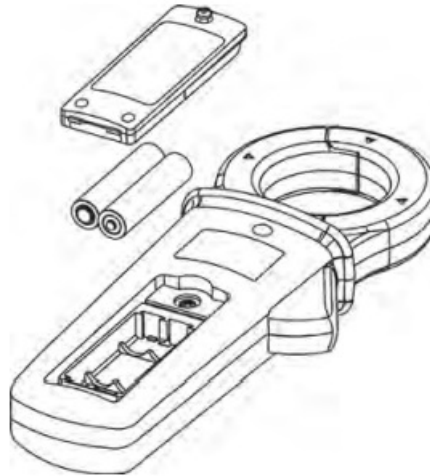


Fig. 9: Batteries replacement

1. Switch off the clamp
2. Remove the cable being tested from the clamp jaw
3. Loosen the three battery cover fastening screws and remove the cover
4. Remove the batteries from the cover
5. Fit two new batteries of the same type (see § 7.1.4) paying attention to the correct polarity
6. Position the battery cover back over the compartment and fasten it with the relevant screws
7. Do not scatter old batteries into the environment. Use the relevant containers for disposal

## CLEANING

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

## END OF LIFE



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

## TECHNICAL SPECIFICATIONS

### TECHNICAL CHARACTERISTICS

Accuracy indicated as [%reading + (digit number\*resolution)] at 23°C±5°C, <80%RH

## AC TRMS Current

Range	Resolution	Accuracy (30Hz ÷ 50Hz)	Accuracy (51 ÷ 60Hz )	Accuracy (61Hz ÷ 1kHz)
6mA (*)	0.001mA	± (2.0%rdg+ 5dgt) (**)	± (1.0%rdg.+ 5dgt)	± (2.0%rdg+5dgt) (***)
60mA	0.01mA			
600mA	0.1mA			
6A	0.001A	± (2.0%rdg+ 5dgt)		± (2.0%rdg+5dgt)
60A	0.01A			

(\*) Minimum reading 10µA ; (\*\*) Frequency response: 15Hz÷50Hz;. For frequency <30Hz add 3%rdg

(\*\*\*) Frequency response: 60Hz+10kHz. For frequency >1kHz add 0.5%rdg to the accuracy

Accuracy declared for sinusoidal waveform; Overload protection 60Arms;

Error due of position cable not in center of jaws: ±1%rdg

### Additional error due to the Crest Factor (CF) of non-sinusoidal signals:

C.F: 1.0 + 2.0 3 Add 1.0%rdg

C.F: 2.0 + 2.5 3 Add 2.5%rdg

C.F: 2.5 + 3.0 3 Add 4.0%rdg

### Max. Crest Factor:

3.0 @ up to 3000dgt ; 2.0 @ 3000 + 4500dgt; 1.5 @ 4500 ÷ 6000dgt

### AC TRMS Current with 50-60Hz low-pass filter

Range	Resolution	Accuracy (30Hz ÷ 50Hz)	Accuracy (51 ÷ 60Hz)
6mA (*)	0.001 mA	± (2.0%rdg+5dgt) (**)	± (1.0%rdg+5dgt)
60mA	0.01mA		
600mA	0.1mA		
6A	0.001A	± (2.0%rdg+5dgt)	
60A	0.01A		

(\*) Minimum reading 10pA ; (\*\*) Frequency response: 15Hz+50Hz;. For frequency <30Hz add 3%rdg

Error due of position cable not in the center of jaws: ±1%rdg

Cutting frequency: approx. 200Hz

Overload protection 60Arms

## AC TRMS Current with kHz low-pass filter

Range	Resolution	Accuracy (30Hz + 50Hz)	Accuracy (51 + 60Hz)	Accuracy (61 + 1kHz)
6mA (*)	0.001 mA	$\pm (2.0\%rdg+5dgt)$ (**)	$\pm (1.0\%rdg+5dgt)$	$\pm (2.5\%rdg+5dgt)$
60mA	0.01mA			
600mA	0.1 mA			
6A	0.001A	$\pm (2.0\%rdg+5dgt)$		
60A	0.01A			

(\*) Minimum reading 10pA ; (\*\*) Frequency response: 15Hz+50Hz;. For frequency <30Hz add 3%rdg  
Error due of position cable not in the center of jaws:  $\pm 1\%rdg$   
Cutting frequency: approx. 1 kHz  
Overload protection 60Arms

### 7.1.1. Technical specifications for measures according to EC/EN61557-13 Class 2

- Reference guideline: IEC/EN61557-13, Class 2,  $\leq 30A/m$  @ In: 3.5mA ÷ 600mA, Fn: 40Hz ÷ 1kHz
- NOTE1 → in the measurements according to IEC/EN61557-13 add the followed conditions to the general specifications
- NOTE2 → conditions valid for 6mA, 60mA e 600mA ranges

Intrinsic accuracy or parameter influencing the measurement	Designation code	Added specification
Position	E1	$\pm 1\%rdg$
Supply voltage	E2	No error added
Temperature	E3	$0.1 \times (\text{accuracy}) \text{ } ^\circ\text{C}$ (<18°C o >28°C)
Non-sinusoidal waveform	E9	No error added
An external magnetic field with frequency from 15Hz to 400Hz according to IEC61000-4-8	E11	Add error $\pm 10\text{pA}$ for 1 pT (magnetic field)
Load current	E12	Add error $\pm 6\text{pA}$ for IA (load current)
Surface current due to the common-mode voltage	E13	No error added
Frequency	E14	No error added
Repeatability	E15	No error added

#### 7.1.2. Electrical specifications

Conversion type: TRMS

Sample rate: 5 times / second

Temperature coefficient:  $0.1 \times (\text{accuracy}) \text{ } ^\circ\text{C}$ , <18°C o >28°C

#### 7.1.3. Reference guidelines

Safety: IEC/EN61010-1, IEC/EN61010-2-032

EMC: IEC/EN61326-1

Application: IEC/EN61557-13, Class 2

Insulation: double insulation

Pollution level: 2

Measurement category: CAT III 600V

#### 7.1.4. General characteristics

##### Mechanical characteristics

Dimensions (L x W x H): 230 x 100 x 24mm (9 x 4 x 1in)

Weight (battery included): 500g (18 ounces)  
Max. cable diameter: 40mm (2in)  
Mechanical protection: IP20

### **Power supply**

Battery type: 2×1.5V batteries type AA LR03

Low battery indication: symbol “” at the display

Battery duration: approx. 60 hours

Auto Power OFF: after 20 min of idleness

### **Communication interface**

Bluetooth: BLE 4.0 (max distance 10m)

### **Display**

Characteristics: 4 LCD, 6000 counts, decimal point, and backlight

Over range indication: “OL” message at the display

## **7.2. ENVIRONMENT**

### **7.2.1. Environmental conditions for use**

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

Operating temperature:  $-10^{\circ}\text{C} \div 30^{\circ}\text{C}$  ( $14^{\circ}\text{F} \div 86^{\circ}\text{F}$ ) ( $\text{RH} \leq 80\%$ )  $30^{\circ}\text{C} \div 40^{\circ}\text{C}$  ( $86^{\circ}\text{F} \div 104^{\circ}\text{F}$ ) ( $\text{RH} \leq 75\%$ )  $40^{\circ}\text{C} \div 50^{\circ}\text{C}$  ( $104^{\circ}\text{F} \div 122^{\circ}\text{F}$ ) ( $\text{RH} \leq 45\%$ )

Allowable relative humidity:  $<80\%\text{RH}$

Storage temperature:  $-20 \div 60^{\circ}\text{C}$  ( $-4^{\circ}\text{F} \div 140^{\circ}\text{F}$ )

Storage humidity:  $<80\%\text{RH}$

Max height of use: 2000m (6562 ft)

Vibration: according to MIL-PRF-28800F Class 2

This instrument satisfies the requirements of Low Voltage Directive 2014/35/EU (LVD) and of EMC Directive 2014/30/EU

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

## **ACCESSORIES**

### **7.3.1. Standard accessories**

- Carrying case
- Batteries (not fitted)
- User manual

## **SERVICE**

### **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 the instrument, all transportation charges must be paid by the customer. The instrument must be accompanied by a delivery note indicating the faults or reasons for returning. The returned tester must be packed in its original box. Any damage that occurred in transit because of a lack of original packaging will be debited to the customer. The manufacturer is not responsible for any damage to persons or things. Accessories and batteries are not covered by warranty.

The warranty shall not apply in the following cases:

- Repair and/or replacement of accessories and battery (not covered by warranty).
- Repairs that may become necessary as a consequence of 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 were performed without the manufacturer's explicit authorization.
- Use not provided for in the instrument's specifications or in 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 the batteries 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 upon in advance. A report will always be enclosed to a shipment, stating the reasons for the product's return. Only use the original packaging for shipment; any damage due to the use of non-original packaging material will be charged to the Customer.



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## **Documents / Resources**

<p>ENGLISH</p> <p>User manual</p>  <p>CE</p>	<p><a href="#">HT HT77C Leakage Current Clamp Meter</a> [pdf] User Manual</p> <p>HT77C, Leakage Current Clamp Meter</p>
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