

ENGLISH

User manual



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Table of contents:

1. SAFETY PRECAUTIONS AND PROCEDURES	2
1.1. Preliminary	2
1.2. Before use	3
1.3. After use	3
1.4. Measuring (overvoltage) categories definitions	3
2. GENERAL DESCRIPTION	4
2.1. TRMS and MEAN VALUE measuring instruments	4
2.2. TRUE ROOT MEAN SQUARE VALUE and CREST FACTOR definitions	4
3. PREPARATION FOR USE	5
3.1. Initial	5
3.2. Power supply	5
3.3. Calibration	5
3.4. Storage	5
4. OPERATING INSTRUCTIONS	6
4.1. Instrument description	6
4.1.1. Front panel	6
4.2. Description of parts	7
4.2.1. Range and ON/OFF selector	7
4.2.2. D-H key	7
4.2.3. FILTER selector	7
4.2.4. LOCK selector	7
4.2.5. AutoPowerOFF	7
4.2.6. DC analogical output	8
4.3. How to perform the measurements	9
4.3.1. AC Current measurement	9
4.3.2. Leakage current measurement on Single phase system	10
4.3.3. Leakage current measurement on Three phase system	11
5. MAINTENANCE	12
5.1. General informations	12
5.2. Batteries replacement	12
5.3. Cleaning	12
5.4. End of life	12
6. TECHNICAL SPECIFICATIONS	13
6.1. Characteristics	13
6.1.1. Safety	13
6.1.2. General data	13
6.2. Environmental conditions	14
6.2.1. Climatic conditions	14
6.3. Accessories	14
6.3.1. Standard accessories	14
7. SERVICE	15
7.1. Warranty conditions	15
7.2. Service	15

1. SAFETY PRECAUTIONS AND PROCEDURES

This meter 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 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.

The followings symbols are used on meter and user's 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 Current



DC Voltage

1.1. PRELIMINARY

- This apparatus has been designed for use in an environment of pollution degree 2. Indoor use
- It measures **AC CURRENT** on CAT II 600V or CAT III 300V plants. For overvoltage and 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
- Do not test or connect to any circuit whose current exceeds the specified overload protection
- Make sure that the batteries are installed correctly

1.2. BEFORE USE

Always keep to the instructions contained in this manual:



CAUTION

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

- When the clamp is connected to the circuits to be tested, never touch unused terminals
- When measuring current, any strong current near or 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 OFF the meter
- If you expect not to use the clamp for a long time, remove the batteries

1.4. MEASURING (OVERVOLTAGE) CATEGORIES DEFINITIONS

The norm IEC/EN61010-1: 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

HT78 meter can performs the herewith features:

- AC TRMS current measurement up to 3000A
- AC leakage current measurement with 0.1mA resolution
- DC voltage analogical output for connection with external data loggers
- 150Hz low-pass filter for reduce harmonic components of input signal

Each feature can be selected by using rotation selector on meter's front panel. The Data HOLD, FILTER and LOCK functions are still available (see § 4.2). The selected quantity appears on a LCD display with indication of measurement units and functions. Analogical bargraph it's also displayed on meter. The meter disposes of an Auto Power Off function consisting in an automatic switching off 10 minutes after last operation.

2.1. TRMS AND MEAN VALUE MEASURING INSTRUMENTS

Safety testers for alternate quantities 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, instead, 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 meter 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 eventual damages 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 § 6.3.1 are contained in the package. In case of discrepancies contact the dealer.

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

3.2. POWER SUPPLY

The instrument is batteries supplied. 2x1.5V type AAA LR03 are included in the package. Battery life: about 200 hours. When batteries are low, the symbol "" appears on the display. Replace them immediately, following the instructions given in § 5.2

3.3. CALIBRATION

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

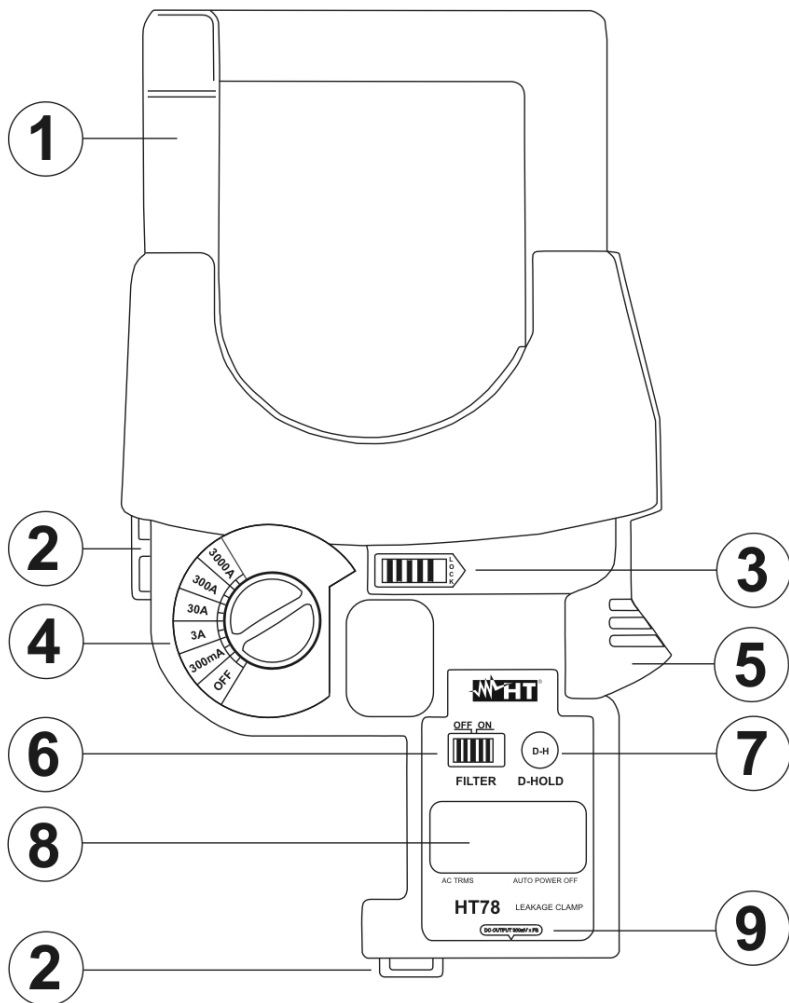
3.4. STORAGE

In order to guarantee the accuracy of the measurements, after a period of storage in 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. Front panel



LEGEND:

1. Inductive clamp jaw
2. Holes for carrying straps
3. **LOCK** selector
4. Selector with measurement ranges and ON/OFF feature
5. Jaw trigger
6. **FILTER** selector
7. **D-HOLD** key
8. LCD display
9. DCV analogical output terminal

Fig. 1: Instrument description

4.2. DESCRIPTION OF PARTS

4.2.1. Range and ON/OFF selector

Rotate the function selector from “**OFF**” position to any other position to turn on the meter. Rotate again the selector to “**OFF**” position to switch off the meter

4.2.2. D-H key

Press **D-HOLD** key to enable Data HOLD feature. The “DH” message is shown and the measured value is frozen on the display. Press the same key to exit from the function.

4.2.3. FILTER selector

Move the “**FILTER**” selector to enable (ON) or disable (OFF) the “Low-pass 150Hz filter” during an AC current measurement. In this condition a low-pass filter with cut-off frequency of 150Hz is active on meter in order to reduce the harmonic components of input signal. It is recommended always to enable this feature to perform accurate and stable measurement of leakage current

4.2.4. LOCK selector

While slowly closing CT during the measurement on strong magnetic fields generated by big currents, there might be a case where CT cannot be closed completely. In this case use the **LOCK** selector to lock/unlock the jaws of clamp during a measurement

4.2.5. AutoPowerOFF

In order to preserve the internal batteries, the meter automatically switch off after about 10 minutes of idleness. Press the **D-H** key or turn on again the meter after 10 second from switch off to restore of normal functionality.

The AutoPowerOFF feature is automatically disabled by the meter during the connection to DCV analogical output by external datalogger

4.2.6. DC analogical output

The meter is designed with a DC voltage analogical output depending on the measured current value and can be used for connection with external data loggers, digital multimeters, etc.. (see Fig. 2) by using customized cables



CAUTION

Do not apply any voltage to the DCV output of meter during the recording operation

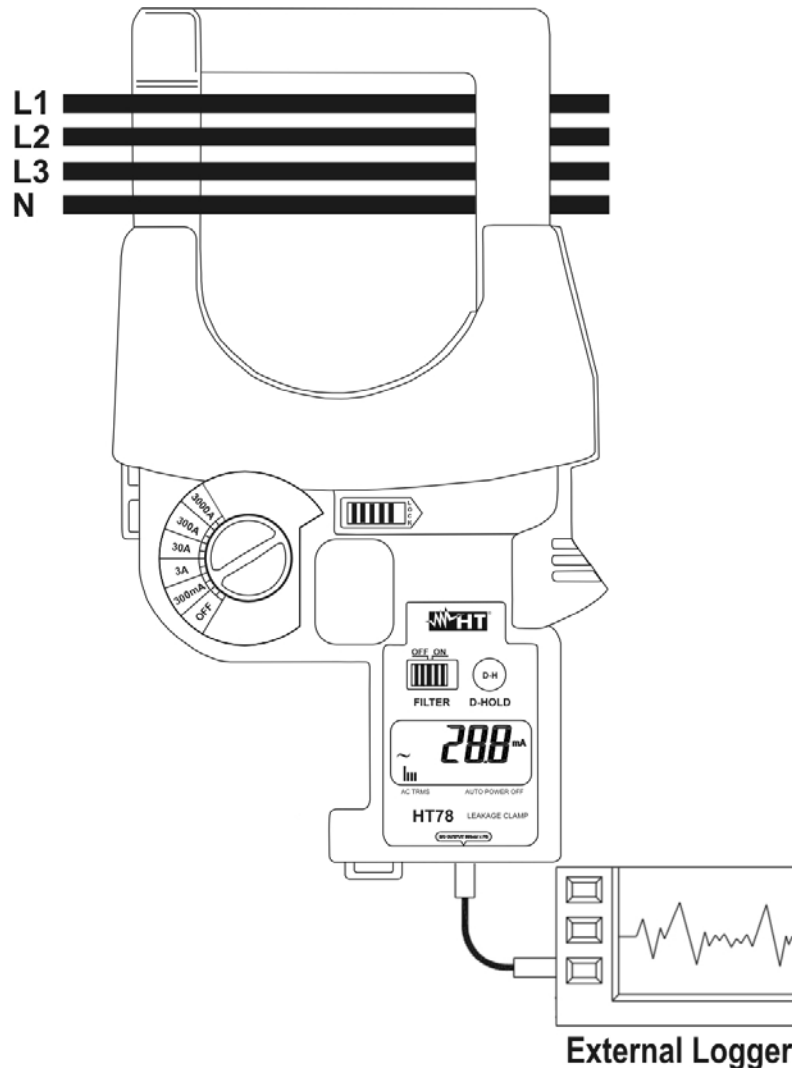


Fig. 2: Connection of meter with external logger

1. Select the desired measuring range and consider the herewith conversion values:

AC current range	DC output voltage range
300mA	1mV/1mA
3A	1mV/0.01A
30A	1mV/0.1A
300A	1mV/1A
3000A	1mV/10A

Table 1: Conversion values of DCV analogical output

2. Connect the external logger to the DCV output of meter
3. Perform the current measurement (see § 4.3)

4.3. HOW TO PERFORM THE MEASUREMENTS

4.3.1. AC Current measurement



CAUTION

Do not perform any AC current measurement on circuit with nominal voltage higher to 500V to round to avoid possible electrical shocks and to damage the meter

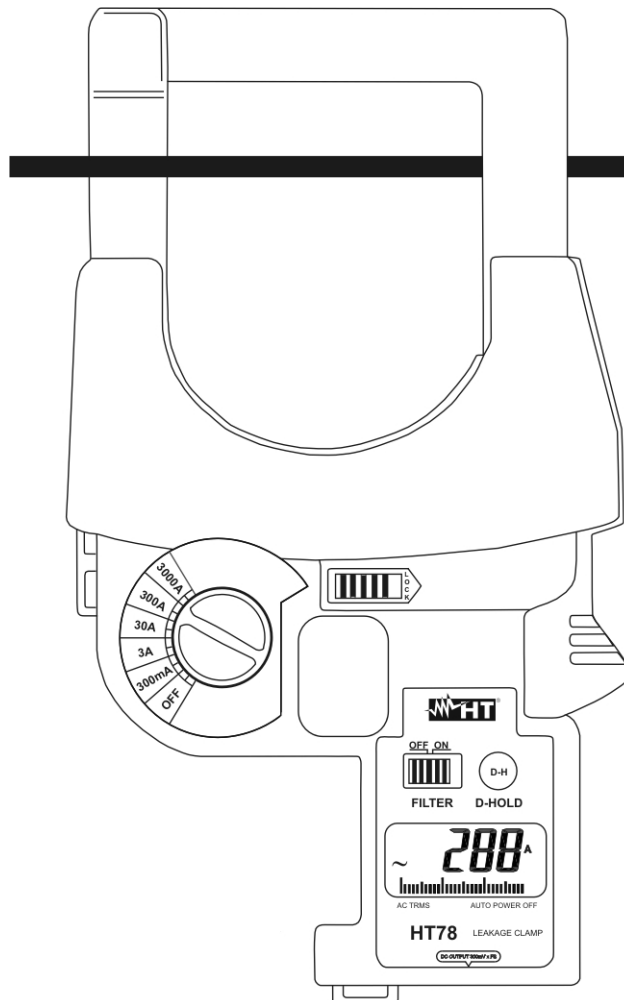


Fig. 3: Taking AC current measurement

1. Select a measurement range among the **3A**, **30A**, **300A** or **3000A** options
2. Move the **FILTER** selector on ON position to activate the “Low-pass 150Hz filter” (see § 4.2.3)
3. Open the clamp and put the conductor to be tested in the middle of the clamp jaw, then reading will be displayed
4. For using of Data HOLD and see § 4.2.2. For using of analogical output see § 4.2.6

4.3.2. Leakage current measurement on Single phase system



CAUTION

Do not perform any AC current measurement on circuit with nominal voltage higher to 500V to round to avoid possible electrical shocks and to damage the meter

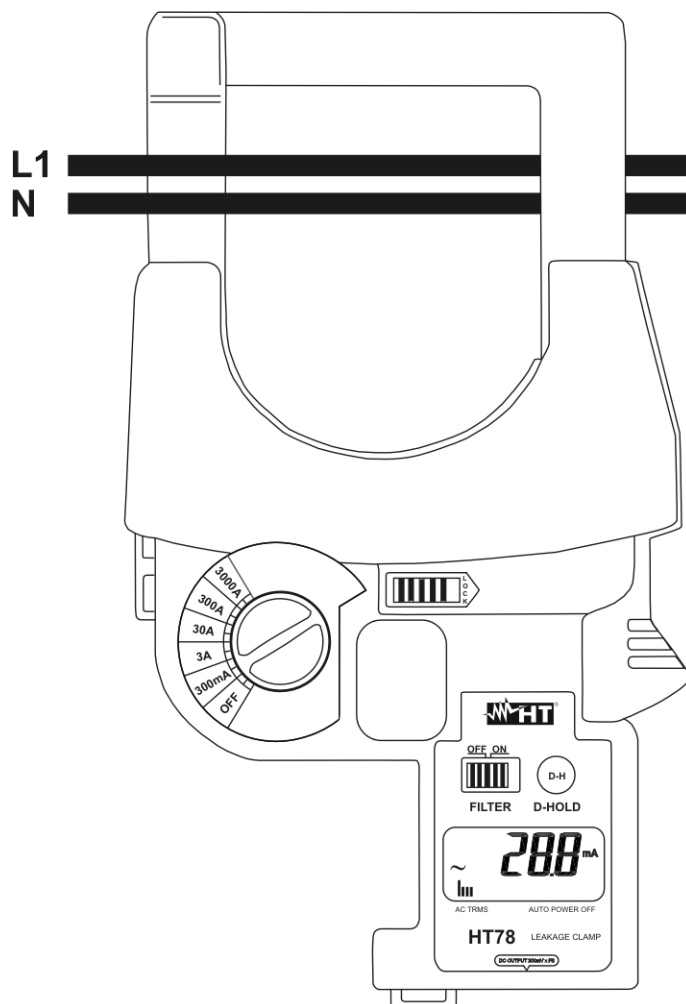


Fig. 4: Taking leakage current measurement on Single phase systems

1. Select the **300mA** range on the meter
2. Move the **FILTER** selector on ON position to activate the “Low-pass 150Hz filter” (see § 4.2.3)
3. Open the clamp and put inside:
 - The cables L1 and N if use the **Differential** method as shown in
 - Fig. 4 obtaining the result as addition of instantaneous values of the currents flowing in the wires
 - The PE conductor if use the **Direct** method
4. The measured result is shown at display
5. For using of Data HOLD and see § 4.2.2. For using of analogical output see § 4.2.6

4.3.3. Leakage current measurement on Three phase system



CAUTION

Do not perform any AC current measurement on circuit with nominal voltage higher to 500V to round to avoid possible electrical shocks and to damage the meter

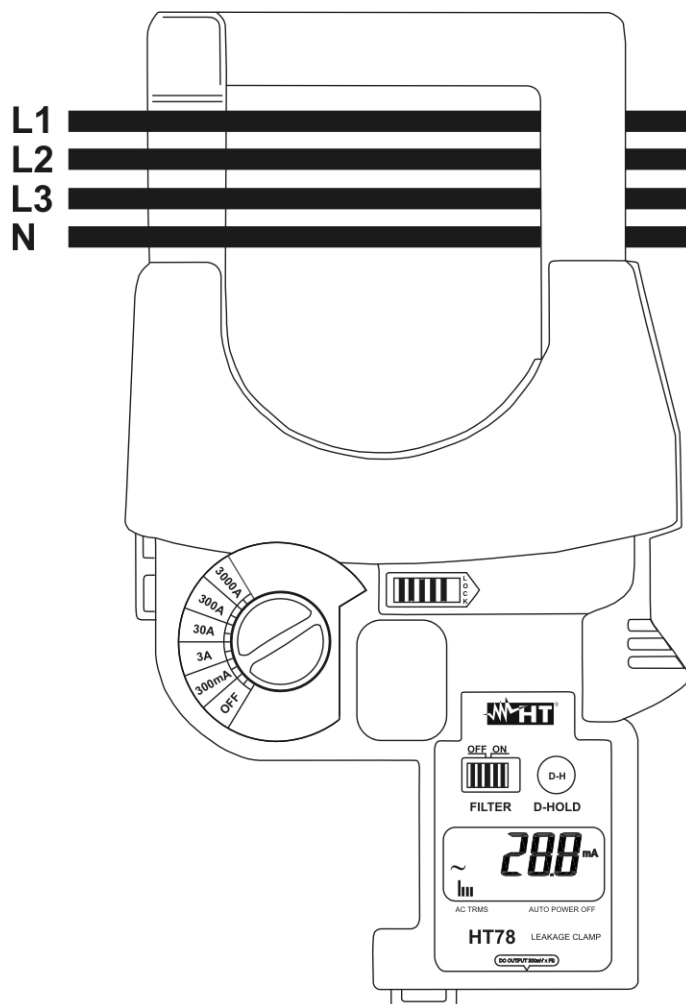


Fig. 5: Taking leakage current measurement on Three phase systems


1. Select the **300mA** range on the meter
2. Move the **FILTER** selector on ON position to activate the “Low-pass 150Hz filter” (see § 4.2.3)
3. Open the clamp and put inside:
 - The cables L1, L2, L3 and N if use the **Differential** method as shown in Fig. 5 obtaining the result as addition of instantaneous values of the currents flowing in the wires
 - The PE conductor if use the **Direct** method
4. The measured result is shown at display
5. For using of Data HOLD and see § 4.2.2. For using of analogical output see § 4.2.6

5. MAINTENANCE

5.1. GENERAL INFORMATIONS

1. This clamp is an accured 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. BATTERIES REPLACEMENT

When “” appears on the display, replace the batteries



WARNING

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

1. Switch off the meter rotate the selector in “OFF” position
2. Remove the cable from the jaws
3. Remove the screw from the battery cover, and detach the batteries cover
4. Remove the batteries
5. Replace batteries with a same type new one (see § 6.1.2). Take care to polarity
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 batteries shall be subject to a separate collection and correct disposal.

6. TECHNICAL SPECIFICATIONS

6.1. CHARACTERISTICS

Accuracy is indicated as [% rdg + (number of dgt) * resolution] referred to: 23°C(73°F) ± 5°C(41°F); RH< 80%

AC TRMS Current

Range	Resolution	Accuracy	Bandwidht	Max input current
300mA	0.1mA	±(1.5%rdg+ 8dgt)	50 ÷60Hz	3Arms
3A	0.001A			30Arms
30A	0.01A			300Arms
300A	0.1A			3000Arms
3000A	1A	±(2.0%rdg+ 8dgt)		

DC analogical output

Range	Resolution	Accuracy	Bandwidht	Max input current
300mA	1mV/1mA	±(1.5% FS)	50 ÷60Hz	3Arms
3A	1mV/0.01A			30Arms
30A	1mV/0.1A			300Arms
300A	1mV/1A			3000Arms
3000A	1mV/10A			

FS = full scale of any range

Internal filter

Type of filter	Cut-off frequency
Low-pass	150Hz

6.1.1. Safety

Comply with: IEC/EN61010-1, IEC/EN61010-2-032
 Insulation: double insulation
 Pollution degree: 2
 Max height: 2000m (6562 ft)
 Installation category: CAT II 600V, CAT III 300V to the ground

6.1.2. General data

Mechanical characteristics

Size: 341(L) x 194(W) x 52(H)mm ; 13(L) x 8(W) x 2(H) inch
 Weight (including batteries): 1.9kg (67 ounces)
 Max conductor size: 108mm (4")

Supply

Batteries type: 2x1.5V alkaline batteries type AAA LR03
 Low battery indication: "⎓" symbol is displayed when the level is low
 Battery life: approx 200 hours of continuous use
 AutoPowerOFF: approx 10 minutes of idleness

Display

Characteristics: 4 LCD 3200 points plus decimal point, sign and bargraph
 Sample rate: 2 times/sec
 Conversion mode: TRMS
 Over range symbol: "O.L" indication at display

6.2. ENVIRONMENTAL CONDITIONS

6.2.1. Climatic conditions

Reference temperature:	$23 \pm 5^{\circ}\text{C}$; ($73^{\circ}\text{F} \pm 41^{\circ}\text{F}$)
Operating temperature:	$0 \div 40^{\circ}\text{C}$; ($32^{\circ}\text{F} \div 104^{\circ}\text{F}$)
Operating humidity:	<80%RH
Storage temperature:	$-10 \div 60^{\circ}\text{C}$; ($-44^{\circ}\text{F} \div 140^{\circ}\text{F}$)
Storage humidity:	< 80%RH

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

6.3. ACCESSORIES

6.3.1. Standard accessories

The content of a standard package is the following:

- Instrument HT78
- Carrying bag
- Batteries
- Set of belt straps
- User manual

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 approved 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 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.