

- Ⓒ Instruction Manual Cat. No. 2006
- Ⓕ Mode d'emploi Réf. 2006
- Ⓔ Manual de instrucciones N° de ref. 2006


Echometer 3000





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References marked on instrument or in instruction manual:


 Warning of a potential danger, comply with instruction manual.


 Reference. Please use utmost attention.

 Caution! Dangerous voltage. Danger of electrical shock.

 Continuous double or reinforced insulation complies with category II.

 Conformity symbol, the instrument complies with the valid directives. It complies with the EMC Directive (89/336/EEC), Standards EN 50081-1 and EN 50082-1 are fulfilled. It also complies with the Low Voltage Directive (73/23/EEC), Standard EN 61010-1 is fulfilled.

 **The instruction manual contains information and references, necessary for safe operation and maintenance of the instrument.** Prior to using the instrument (commissioning / assembly) the user is kindly requested to thoroughly read the instruction manual and comply with it in all sections.

 **Failure to read the instruction manual or to comply with the warnings and references contained herein can result in serious bodily injury or instrument damage.**

1.0 Introduction / Scope of Supply

You have acquired a high standard measurement instrument supplied by the company Ch. BEHA GmbH which is able to perform reproducible measurements over a very long time period. The company Ch. BEHA GmbH is a member of the world-wide operating BEHA group. The head office of the BEHA group is located in Glottertal/Schwarzwald, together with the technological centre. The BEHA group is a leading enterprise for test and measurement instruments.

The UNITEST Echometers are universally usable cable length measurement instruments. They have been built in compliance with the most recent prescriptions and guarantee safe and reliable measurements. The UNITEST Echometers are a valuable support for trade and industry for tally measurements, inventories, and residual length measurements.

The instruments have the following characteristics:

- Echometer for easy and time efficient measurement of cable lengths in trade, industry, utility companies, and specialist electronic stores.
- Only one cable end is required. Thus, conductors already installed or cable drums can be measured, thus saving time.
- 58 fixed, pre-programmed measurement ranges representing the most common cable cross sections
- 87 variable measurement ranges, individually programmable by the user to measure customer specific conductor and cable types
- Detecting single or multi-wire conductor interruptions or short-circuits for trouble shooting
- Cable and conductor length measurement up to approx. 2000 m (depending on the type of conductor)
- Internal data memory to save 500 measurements for inventories, tally measurements, cable return measurements, etc.
- RS232 interface for transfer and further PC processing of measurement data
- Cumulative memory to measure and cumulate several cable rings of the same type of conductor, saving time and money
- Additional resistance measurement up to 2000 Ohm and acoustic continuity test
- Display light for better visibility while working in badly illuminated environments, such as storage areas
- Automatic power off

The scope of supply comprises of:


- 1 UNITEST Echometer 3000
- 2 Test leads red/black
- 2 Alligator clamps
- 1 Carrying holster
- 1 Battery 9 V, IEC 6LR61
- 3 Concise reference guides
- 1 Instruction manual


Accessories:

Windows Software UNITEST "Report Studio"
Order No: 1207

2.0 Transport and Storage


Please keep the original packaging for later transport, e.g. for calibration. Any transport damage due to faulty packaging will be excluded from warranty claims.


 In order to avoid instrument damage, it is advised to remove accumulators when not using the instrument over a certain time period. However, should the instrument be contaminated by leaking battery cells, you are kindly requested to return it to the factory for cleaning and inspection.


 Instruments must be stored in dry and closed areas. In the case of an instrument being transported in extreme temperatures, a recovery time of minimum 2 hours is required prior to instrument operation.


3.0 Safety Measures


The UNITEST Cable Length Meters have been built and tested in compliance with the valid Regulations and have left the company in safe and perfect condition. To maintain this condition, the user must comply with the safety references contained in this instruction manual.


 **Never apply voltage to any of the instrument measurement ranges. Always verify that the circuits are not live using a dual-pole voltage tester (e.g. UNITEST 2000 alpha)!**

 Prior to any operation, ensure that connecting leads and instrument are in perfect condition.


 The respective accident prevention regulations established by the professional association for electrical systems and equipment must be strictly met at all times.


 The instrument may only be used within the operating ranges as specified in the technical data section.


 Prior to opening, the instrument has to be switched off and disconnected from any circuit.

 Avoid any heating up of the instrument by direct sunlight to ensure perfect functioning and long instrument life.

Appropriate Usage

 The instrument may only be used under those conditions and for those purposes for which it was built. For this reason, in particular the safety references, as well as the technical data including environmental conditions and the usage in dry environments must be followed at all times.

 The operational safety of the instrument is no longer guaranteed after unauthorised modifications or changes.

 The instrument may only be opened by an authorised service technician, e.g. for fuse replacement.

4.0 General Information regarding UNITEST Echometers 3000

The UNITEST Echometers are measurement instruments for swift, easy and precise determination of the length of a cable or a conductor as well as for resistance measurements.

The cable length determination is carried out in accordance with the pulse reflection procedure.

Hereby, pulses are sent into a cable which "travel" at a certain velocity along the cable. If these pulses hit the cable end they are reflected and return to the starting point.

The UNITEST Echometer 3000 calculates the cable length on the basis of time difference between emission and reception of the pulses.

If a short-circuit or an interruption is present in the conductor to be measured the digital display indicates the length of the conductor up to the fault location. This allows an easy and fast fault localization.

The travel time required only depends on the dispersion velocity of the travelling pulse. In turn, the dispersion velocity is determined by the make and structure of a cable. This means, that every cable has a certain characteristic dispersion velocity and, thus, different travel times.

The cable characteristics saved in the Echometer (TAB range) represent a cable mean value established by the various manufacturers and ensure approximate measurements. To carry out precise measurements, the user may calibrate the cable supplied by a certain manufacturer and permanently store the cable characteristics in the instrument memory for subsequent measurements (REF range).

The UNITEST Echometer 3000 enables the measurement of the most conventional cable and conductor cross sections. Additionally, 87 freely adjustable cable and conductor cross sections are available for programming and measurement.

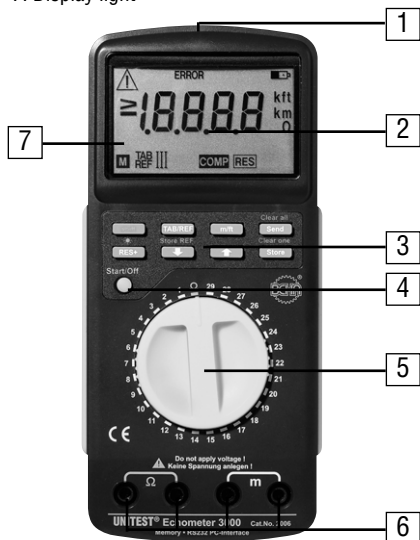
Simply connect the instrument alligator clamps to the ends of a cable or a conductor and set the respective measurement range. The conductor length is clearly indicated on the digital instrument display.

The built-in memory is used to save measurement results and to transfer the data via interface to a PC.

5.0 Control Elements / Display Elements

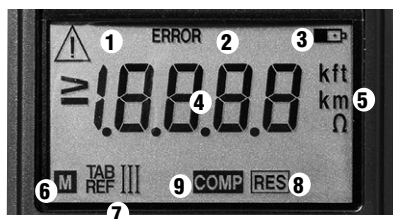
Control Elements:

1. RS232 interface
2. LCD
3. Function keys
4. Push-button on/off/start
5. Selection dial for the measurement ranges
6. Measurement input sockets
7. Display light



Display Elements:

1. Emergency reflective triangle
2. Error display
3. Battery replacement required
4. Measurement value
5. Measurement unit
6. Memory display (M)
7. Table / reference range display
8. Cumulative value memory display (Res)
9. Short-circuit display (COMP)



Description of the Menu Keys:

Shift **Shift**

The second function of the double function keys is only activated when pressing the keys together with the "Shift" key.

TAB/REF **TAB/REF**

The "TAB/REF" key is used to change into different levels: Table I, Table II, Reference range I, Reference range II, and Reference range III.

m/ft **m/ft**

Switching between the measurement units meter/feet.

Send **Send**

The "Send" key is used to start the transfer of the data memorised in the UNITEST Echometer 3000 to the PC.

Shift + **Clear all** **Clear all**

"Clear all" deletes the total internal memory. The cumulative data memory is not cleared. The "Clear all" key is activated when the "Shift" key is pressed at the same time.

RES+ **Res+**

The "Res+" key is used to activate the cumulative data memory. The measurement data within the same measurement range is added, i.e. several rings of the same cable type can be added.

Shift + **RES+** **[Light]**

The "Light" key is used to switch on the display light. To reduce the battery consumption, the display light is switched off after approx. 30s. after the last key option.

The "Light" is only activated when the "Shift" key is pressed at the same time.

Shift + **Arrow down** **[Arrow down]**

When the **Arrow down** key and the **Arrow up** key are pressed at the same time, the reference cable lengths within the reference range can be set.

 +  **Store REF**

The "Store REF" key is used to save the previously set reference cable length.

The "Store REF" is only activated when the "Shift" key is pressed at the same time.

 **[Arrow up]**

The [arrow up] key together with the [arrow down] key are used to set the reference cable lengths within the reference range.

 **Store**

The "Store" key is used to save a measurement result. If several measurement values have been cumulated within the cumulative data memory, the sum can be imported into the data memory by pressing the "Store" key.

 +  **Clear one**

"Clear one" is pressed to clear the last measurement value saved. The cumulative data memory is not affected. The "Clear one" key is only activated when the "Shift" key is pressed at the same time.








6.0 Performance of Measurements


6.1 Performance of Cable Lengths Measurements


- The leads to be measured must be positioned next to each other. It is not possible to measure individual wires.
- For coaxial cable measurements, connect the internal conductors to the red sockets and the sheath to the black socket.
- Only connect one lead per measurement connection.

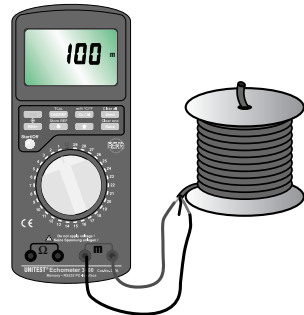
- Additional measurement errors up to 10 % reading may occur due to the differing cable structure and material, depending on the manufacturer.


- ▶ Switch on the UNITEST Echometer pressing the  key.
- ▶ Connect the red test lead to the red socket and the black test lead to the black socket of the m range.
- ▶ Connect two parallel leads of the cable to be measured using the alligator clamps.
- ▶ To set the desired measurement unit (m/ft), press the  and  key. "m" or "ft" is displayed.
- ▶ Set the measurement range selection dial in accordance with the conductor types in Table I or II. The  key is used to switch to the measurement ranges of table II. "TAB II" appears on the display.

 If the message "---" is displayed, the UNITEST Echometer is ready to perform measurements.

- ▶ Start measurement using the  key.

 A single signal sound is audible and the measurement value of the conductor length in the pre-selected unit (m/ft) is displayed.



 It is preferable to carry out the measurement with open cable ends. If the cable end has a short-circuit the message COMP is displayed. Short-circuited cable ends cause an increasing measurement error of the UNITEST Echometer 3000.

Switch position assignment

Table I:

| Switch Position | Table I (TAB I) | Maximum Length |
|-----------------|-----------------------------|----------------|
| 1 | NYM-J 3x1,5 mm ² | 1200 m |
| 2 | NYM-J 4x1,5 mm ² | 1200 m |
| 3 | NYM-J 5x1,5 mm ² | 1200 m |
| 4 | NYM-J 7x1,5 mm ² | 1200 m |
| 5 | NYM-J 3x2,5 mm ² | 1200 m |
| 6 | NYM-J 4x2,5 mm ² | 1200 m |
| 7 | NYM-J 5x2,5 mm ² | 1200 m |
| 8 | NYM-J 7x2,5 mm ² | 1200 m |
| 9 | NYM-J 5x4 mm ² | 1200 m |
| 10 | NYM-J 5x6 mm ² | 1200 m |
| 11 | NYM-J 4x10 mm ² | 1200 m |
| 12 | NYM-J 5x10 mm ² | 1200 m |
| 13 | NYM-J 4x16 mm ² | 1200 m |
| 14 | NYM-J 5x16 mm ² | 1200 m |
| 15 | NYY-J 3x1,5 mm ² | 1200 m |
| 16 | NYY-J 4x1,5 mm ² | 1200 m |
| 17 | NYY-J 5x1,5 mm ² | 1200 m |
| 18 | NYY-J 3x2,5 mm ² | 1200 m |
| 19 | NYY-J 5x2,5 mm ² | 1200 m |
| 20 | NYY-J 4x10 mm ² | 1200 m |
| 21 | NYY-J 5x10 mm ² | 1200 m |
| 22 | NYY-J 4x16 mm ² | 1200 m |
| 23 | NYY-J 4x25 mm ² | 1200 m |
| 24 | NYY-J 4x35 mm ² | 1200 m |
| 25 | JYSTY 2x2x0,6 mm | 500 m |
| 26 | JYSTY 4x2x0,6 mm | 500 m |
| 27 | JYSTY 6x2x0,6 mm | 500 m |
| 28 | JYSTY 2x2x0,8 mm | 500 m |
| 29 | JYSTY 4x2x0,8 mm | 500 m |

Table II:

| Switch Position | Table II (TAB II) | Maximum Length |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| 1 | JYSTY 6x2x0,8 mm | 500 m |
| 2 | SAT:LCD 58 | 1500 m |
| 3 | SAT:LCD 61 | 1500 m |
| 4 | SAT: LCD 79 | 1900 m |
| 5 | SAT:LCD 90 | 1900 m |
| 6 | SAT:LCD 95 | 2000 m |
| 7 | SAT:LCD 99 | 2000 m |
| 8 | SAT:LCM 13 | 1500 m |
| 9 | SAT:LCM 14 | 1900 m |
| 10 | SAT:0,8/3,5 ALG; 1,1/5,0 ALG; 1,65/7,2 ALG; 2,2/9,6 ALG; SAT-MINI 1 (*) | 1900 m |
| 11 | SAT:SAT 3000 (*) | 1900 m |
| 12 | SAT:2-SAT 3000 midi; 2-SAT 3000 mini, 2-SAT 3000 mini round 4-SAT 3000 (*) | 1900 m |
| 13 | Cable TV: 0,6L/3,0 ALG; 0,63/3,0 ALG; 0,4/2,45 ALG; 0,8/3,7 ALG; 0,7/4,4 ALG; 0,7/4,5 ALG-H; 0,7/4,8 C ALG; 0,7/4,8 CW ALG; 1,1/7,3 ALG; 1,1/7,3 ALG-T; 1,8/11,5 FG; A-2YK2YliKx 1,1/7,3 (*) | 1500 m |
| 14 | Cable TV: 0,4/1,75 ALG (*) | 1800 m |
| 15 | Cable TV: 0,4/2,0 ALG (*) | 1900 m |
| 16 | Cable TV: A-2YOK2YInKx 2; 2/8,8 A-2YOK2YlqKx 3,3/13,5(*) | 2000 m |
| 17 | TV:0632-75vz (*) | 1500 m |
| 18 | TV: 0938-60vz 0637-75bl; 0637-75vz; 0637-75vs; 0632-75bl (*) | 1600 m |
| 19 | TV: 1046-75bl (*) | 1900 m |
| 20 | RG6/U; RG8/U; RG11/U; RG58/U; RG058/U; RG59/U; RG174/U; RG213/U; RG214/U; RG215/U; RG216/U; RG217/U; RG218/U; RG223/U; RG316/U | 1500 m |
| 21 | RG178/U; RG179/U; RG180/U; RG187/U | 1600 m |
| 22 | RG62/U; RG71/U | 1600 m |
| 23 | DATA:10BaseT (RG58/U) | 1500 m |
| 24 | DATA:YELLOW-CABLE | 1900 m |
| 25 | DATA:LAN300 J-02YS(C)Y 4x2xAWG22 | 500 m |
| 26 | Phone:JYSTY 2x2x0,6 mm | 500 m |
| 27 | HIFI:NYFAZ 2x0,5 mm (**) | 500 m |
| 28 | HIFI:NYFAZ 2x0,75 mm (**) | 500 m |
| 29 | HIFI:NYFAZ 2x1,5 mm (**) | 500 m |

* Helu Cable ** loudspeaker cable

-The values and reference ranges refer to measurements with open cable ends. Measurements with short-circuited ends lead to results with increased measurement errors.

6.2 Performance of Cable Length Measurements within the Reference Range

To allow measurement of customer specific cable types, reference ranges have been integrated in the UNITEST Echometer 3000. The user can calibrate and save the reference ranges for the specific cable types.

6.2.1 Calibration of Customer Specific Cable Types

- ▶ Switch on UNITEST Echometer using the **Start/Off** key.
- ▶ Change to the reference range pressing the **TAB/REF** key, e.g. reference level I. REF I is indicated on the display.
- ▶ Connect the red test lead to the red socket and the black test lead to the black socket of the m-range.
- ▶ Connect two leads in parallel of the cable to be measured using the alligator clamps.
- ▶ To set the measurement unit (m/ft) press the **m/ft** key. "m" or "ft" is indicated on the display.
- ▶ Set measurement range selection dial to a free memory location, e.g. switch position 1.

100.0 m is indicated on the display.

- ▶ Set the known length of the cable to be calibrated using the **↑** or **↓** keys.
- ▶ Save the length of the reference cable pressing **Store REF** and **↓** keys. A simple signal sound is audible.

Note cable type, switch position and reference level

Now the length measurement of the cable type calibrated can be performed as described in section 6.1.

The reference range accuracy values depend on the calibration accuracy of the customer specific cable type. To comply with the accuracy values in accordance with the specified technical data, the user must perform the calibration of the cable type as described in the instruction manual.

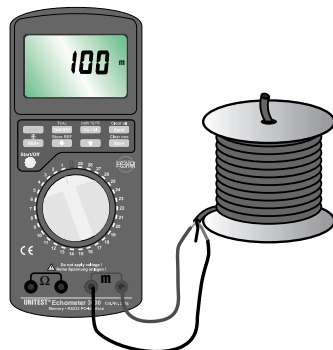
6.2.2 Deletion of Reference Ranges

If the user requires to assign the reference ranges to other cable types, the reference range must first be deleted.

Free memory locations of the reference ranges are indicated by the display "100.0". Already assigned memory locations are indicated by the display "--".

- ▶ Set UNITEST Echometer 3000 to the reference range to be deleted. "--" is indicated on the display.
- ▶ Press the **↑** key once. The message "100.0" is displayed.
- ▶ If the alligator clamps are open press **Store REF** and **↓** keys. An error measurement is generated and indicated by the message "Error".





The reference range is deleted.



6.3 Trouble-Shooting

The UNITEST Echometer 3000 enables to locate faults in cables or conductors.

⚠ The user must check that the circuits are not live !

- ▶ Switch on the UNITEST Echometer 3000 pressing the  key.
- ▶ Change to the reference range pressing the  key, e.g. Reference level I. REF I is indicated on the display.
- ▶ Connect the red test lead to the red socket and the black test lead to the black socket of the m range.
- ▶ Connect the faulty leads of the conductor to be measured using the alligator clamps.
- ▶ Set the measurement unit (m/ft) pressing the  key. "m" or "ft" is displayed.
- ▶ Set the measurement range selection dial in accordance with the conductor types in Tables I or II. The  key is used to change to the measurement ranges of Table II. "TAB II" is indicated on the display.

👉 If the message "--" is displayed, the UNITEST Echometer is ready to perform measurements.

- ▶ Start the measurement pressing the  key.


👉 A single signal sound is audible and the measurement value of the conductor length in the pre-selected unit (m/ft) up to the error location is displayed. If the message "COMP" is displayed, the leads have a short-circuit.

👉 Short-circuited cable ends cause an increasing measurement error of the UNITEST Echometer 3000.

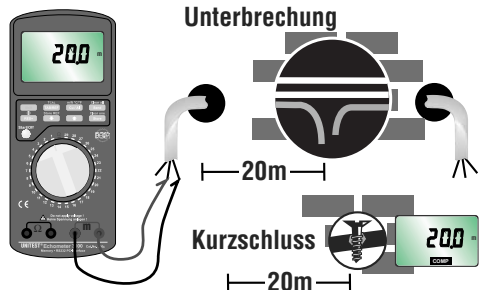
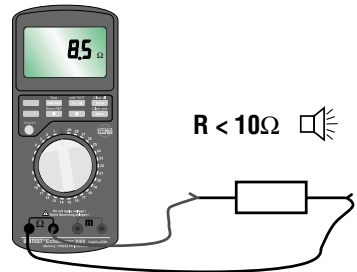
6.4 Performance of Resistance Measurements

The UNITEST Echometer 3000 can easily and precisely determine electrical resistances.

⚠ The user must check that the circuits are not live !

- ▶ Switch on the UNITEST Echometer 3000 pressing the  key.
- ▶ Set the measurement range selection to the position "Ohm".
- ▶ The message ">1999,9 Ohm" is displayed.
- ▶ Connect the red test lead to the red socket and the black test lead to the black socket of the Ohm range.
- ▶ Connect both ends of the resistance to be measured using the alligator clamps.

The resistance measured is indicated on the display. If the resistance is below approx. 10 Ohm an acoustic signal is audible.



7.0 Internal Measurement Data Memory / Cumulative Data memory

7.1 Saving Measurement Results

- ▶ Perform the measurement as described in 6.2.
- ▶ The measurement result is indicated on the display.
- ▶ Press the **Store** key. The result measured is stored in the internal UNITEST Echometer 3000 memory. A single acoustic signal is audible and the memory location, e.g. 1 is briefly displayed. Furthermore, the symbol "M" is displayed and indicates that the measurement data has been saved in the internal memory.

☞ When the **Store** key is pressed again a double acoustic signal is audible and indicates that further saving of this measurement is not possible. After a new measurement, new results can be stored again.

7.1.1 Deletion of all Saved Measurement Results

Press the **Siml** and **Send** keys. Clear all
A brief acoustic signal is audible and "0" is briefly displayed to indicate that the memory has been cleared. The symbol "M" disappears from the display.

The cumulative data memory is not affected by the clearing procedure.

7.1.2 Deletion of the Last Measurement Result

Press the **Siml** and **Store** keys. Clear one
An acoustic signal is audible and the last assigned memory location is briefly displayed. E.g. After deleting measurement no. 5 the number 4 is briefly displayed.

The cumulative data memory is not affected by the clearing procedure.

7.2 Adding and Saving Measurement Results

The UNITEST Echometer is equipped with a cumulative data memory enabling the measurement of several cable rings of the same type, and to perform cumulation of the values.

- ▶ Perform the measurements as described in section 6.2.
- ▶ The measurement result is displayed.
- ▶ Press the **RES+** key. The measurement result is added to the previously stored value in the cumulative data memory (for the first cumulation, the result is added to 0). The sum of the measurement values is displayed. Additionally, the symbol "RES" is displayed and indicates that the measurement data has been stored in the cumulative data memory.
- ▶ Save cumulative data memory by pressing the **Store** key. The memory location of the measurement stored is displayed.

☞ The cumulative data memory is cleared when the measurement range, the table/reference levels, or the cable material are changed.

The previously saved sum in the data memory will not be deleted.


☞ To obtain correct cumulative results, it is important to only add the same cable types.

8.0 Transfer of Saved Data to a PC

The measurement data which has been saved in the UNITEST Echometer 3000 can be downloaded to a PC and further processed using the software UNITEST Report-Studio, available as an accessory.

After pressing the software function "Daten aus Messgerät lesen" ((download data from instrument)), the command is displayed to push the **Send** key on the UNITEST Echometer 3000. After pressing the **Send** key the UNITEST Echometer 3000 display briefly indicates the last memory location assigned.

The stored measurement data has been downloaded to the PC and can now be used for further processing.

 The instruction manual of the software UNITEST "Report-Studio" must be complied with.

Option:

Windows Software UNITEST "Report-Studio"
Order No.: 1207

9.0 Maintenance

When using the instrument in compliance with the instruction manual, no special maintenance is required.


9.1 Cleaning


If the instrument is dirty after daily usage, it is advised to clean it by using a humid cloth and a mild household detergent.


Prior to cleaning, ensure that instrument is switched off and disconnected from external voltage supply and any other instruments connected (such as UUT, control instruments, etc.).


Never use acid detergents or dissolvants for cleaning.


9.2 Battery Replacement

 Prior to battery replacement, disconnect the instrument from all test leads connected.

 Only use the battery in compliance with the specifications of the technical data section!

 Please consider your environment when you dispose of your one-way batteries or accumulators. They belong in a rubbish dump for hazardous waste. In most cases, the batteries can be returned to their point of sale.

 Please, comply with the respective valid regulation regarding the return, recycling and disposal of used batteries and accumulators.

 If an instrument is not used over an extended time period, the accumulators or batteries must be removed. Should the instrument be contaminated by leaking battery cells, the instrument has to be returned for cleaning and inspection to the factory.

- ▶ Loosen the battery case screw on the bottom of the instrument.
- ▶ Carefully lift the battery case.
- ▶ Remove discharged battery.
- ▶ Insert new battery and respect correct polarity.
- ▶ Fix the battery case with the bottom of the casing.

Battery: 9V, IEC 6LR61


Order No.: EZBATT000002

10.0 Calibration Interval

The instrument has to be periodically calibrated by our service department in order to ensure the specified accuracy of measurement results. We recommend a calibration interval of one year.

11.0 Technical Data

Display 4 1/2 digit LCD,
. 19999 digits
Measurement ranges 0...2000 m or
. attenuation limit
Resolution 0,1 m
Basic tolerance \pm (2% rdg. + 3 m)

 Values and measurement ranges relate to open cable ends. Measurements with short-circuited cable ends lead to measurement results with increased measurement errors.

Resistance 0...2000 Ohm
Resolution 0.1 Ohm
Tolerance \pm (2% rdg. + 5 digits)
Continuity < 10 Ohm
Test current approx. 1 mA
Ambient Conditions:
Operation temperature 0°...40° C (0...70%
. rel. humidity)
Storage temperature -20...60° C (0...80%
. rel. humidity)
Height above sea level up to 2000 m
Memory:
Interface RS 232
Memory capacity 500 data strings
. (Length determination)
Battery status display Battery symbol is displayed
Auto power off after approx. 5 min.
Power supply 1 x 9 V, IEC 6LR61
Current consumption 25 mA/ max. 75 mA
. Display light
Dimensions 193 x 91 x 50 mm
Weight approx. 510 g

12 month Warranty

UNITEST instruments are subject to strict quality control. However, should the instrument function improperly during daily use, you are protected by our 12 months warranty (valid only with invoice).

We will repair free of charge any defects in workmanship or material, provided the instrument is returned unopened and untampered with, i.e. with undamaged warranty label.

Any damage due to dropping or incorrect handling are not covered by the warranty.

If the instrument shows failure following expiration of warranty, our service department can offer you a quick and economical repair.