GB

Instruction Manual
Cat. No. 9065

EUROtest

Contents

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, IEC 60536.

CE Conformity symbol, the instrument complies with the valid directives. It complies with the EMC Directive (89/336/EEC), Standards EN 50081-1and 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

You have purchased a high quality measurement instrument of Ch. BEHA GmbH which will allow you to carry out reproducible measurements over a long time period. The company Ch. BEHA GmbH is a member of the world-wide operating BEHA Group with its head office in Glottertal/Schwarzwald which also houses the technological centre. The BEHA Group is a leading manufacturer of Test and Measurement Instruments.

1.1 Model and Type Designation

The type shield sticker is located on the bottom of the instrument. It contains the instrument serial number and product designation. When questions arise regarding the instrument, please always quote product designation and serial number.

1.2 Product Description

The UNITEST EUROtest is a handy test and measurement instrument for testing in systems and installations in compliance with DIN VDE. All values required for FAT (Final Approval Test) reports (e.g. 16th. edition, DIN VDE) can be measured by using the EUROtest. Reporting, filing or further processing of measured values is ensured by means of an internal data memory and built-in interface (for data transfer to PC).

The UNITEST EURO *test* is characterised by the following features

- Loop Impedance- and Prospective Short Circuit Current up to 264V
- Line impedance- and Prospective Short Circuit Current up to 440V
- Earth Voltage Measurement according to Swiss Regulation SEV 413569
- Loop Imopedance N-PE in TT-Systems
- Rotary Field Measurement up to 440V
- RCD-Measurement up 10...1000mA with ramp methode
- RCD-Analysis to test all RCD Parameters
- Low Ohm- and Continuity Test up 0...2000Ω
- Voltage Level Measurement for Overvoltage Protection Devices (Varistors) up to 0...1000V
- Insulation Resistance Measurement with Test Voltage up 50...1000V DC
- Cable Locator Function, Tracing Lines, and Finding Fuses
- Current Measurement with Clamp Adapter 0...200A AC TRMS
- Power- und Energy Measurement

- Harmonics Measurement for Voltage and Current up to the 21. Harmonics
- Several possibilities for Earth Measurement with Probes or Current Clamps
- Built-in memory capability up to 3000 test results.
- Storing Measurement Results under three levels OBJECT-/BLOCK-/FUSE-NUMBER
- Graphic Help with text and pictures of measurements
- Auto-Power-Off-Function

VDE-approved, built- in compliance with IEC 61557 / EN 61557 / VDE 0413, IEC 61010 / EN 61010 / DIN VDE 0411

1.3 Scope of Supply

1 pc. EUROtest
1 pc. COMMANDER 1(1,5m)
1 pc. Test lead 3pol 1,5m
2 pc. Test probe black
1 pc. Test probe blue
3 pc. Croccodile clamps black
1 pc. Carrying Case
1 pc. Carrying Strap
4 pce. Battery 1,5V Baby IEC LR14
1 pc. Battery 9V IEC 6LR61
1 pc. Instruction manual

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 batteries 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 0100-EUROtest has been designed and checked in accordance with the safety regulations for Electronic test and Measurement Instruments EN 61010 and IEC 61010, and left our factory in a safe and perfect condition. In order to maintain this condition and to ensure safe operation, the operator must respect the references and warnings contained in this instruction manual.

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

⚠ In order to avoid electrical shock, the valid safety regulations regarding excessive contact voltages must receive the utmost attention when working with voltages exceeding 120V (60V) DC or 50V (25V)rms AC. The values in brackets are valid for limited ranges (as for example medicine and agriculture).

⚠ Measurements in dangerous proximity of electrical installations are only to be executed when instructed by a responsible electrical specialist, and never alone.

⚠ Prior to usage, inspect the instrument and used test leads for external damage. Prior to any operation, ensure that connecting leads used and instruments are in perfect condition.

⚠ If the operator's safety is no longer guaranteed, the instrument is to be put out of service and protected against use. The safety can no longer be guaranteed if the instrument:

- obvious damage
- does not carry out the desired measurements
- has been stored for too long under unfavourable conditions
- has been subjected to mechanical stress during transport.

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

⚠ When handling isopropanol or isopropyl alcohol, the instructions of handling stated in the safety data sheet complying with the decree on dangerous materials have to be respected. During usage, explosive/easily inflammable vapour-air mixtures may be generated - danger of explosion !

Recommendations for safe handling are among others:

- extinguish all open fire, avoid sparking,
- do not smoke,
- avoid extended or repeated skin contact
- do not pour in drains

3.1 Appropriate Usage

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

⚠ 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 not longer guaranteed after unauthorised modifications or changes.

⚠ Never connect the instrument to any measurement circuit with open battery case.

⚠ The opening of the instrument for fuse replacement, for example, may only be carried out by authorised service personnel. Prior to opening, the instrument has to be switched off and disconnected from any test circuits.

⚠ Service and maintenance may only be carried out by an authorised service technician.

4.0 Operation Elements and Display

4.1 Front Panel

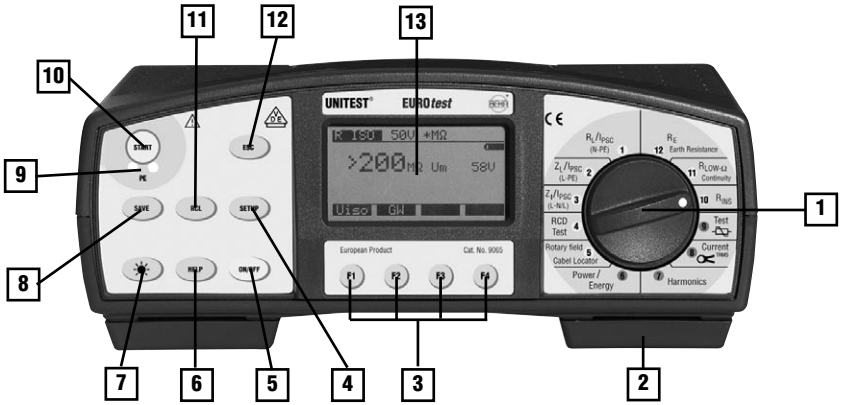


Figure 1: Explanation of individual operation and display elements:

1. **Rotary switch 'Measurement Function'** for selecting the desired measurement function.
2. **Instrument stands** and also for attachment of carrying-strap.
3. **Function keys 'F1, F2, F3, F4'** (soft keys) to set subordinate functions or to select measurement parameters. The function of the individual key depends on the measurement function selected and is always displayed in the botto line of LCD directly above the function keys.
4. **Key 'SETUP'** for instrument settings such as:
   - Setting the display contrast
   - Setting time and date of the real time clock
   - Display of the baud rate for the RS232 interface
   - Clearing the data memory
   - Setting the instrument for TN/TT or IT systems
5. **Key 'ON/OFF'** to switch the instrument on or off. The instrument switches off automatically 10 minutes after the last key operation or after turning the “Measurement Function” switch.
6. **Key 'HELP'** to display the help menu, indicating the connection of test leads and further references for carrying out measurements..
7. **Key 'LIGHT'** to switch the LCD backlight on or off. After pressing this key once, the backlight is switched on. 20 seconds after the last key operation or after turning the Measurement Function switch the backlight is switched off automatically.
8. **Key 'SAVE'** for saving the measurement data and measurement parameter.
9. **Contact electrode 'PE'** for testing the PE connector for voltage or disconnection.
10. **Key 'START'** for testing the measurements.
11. **Key 'RCL'** for recalling saved measurement results.
12. **Key 'ESC'**, to exit displayed menus or interrupt functions, such as saving, recalling measurement results, clearing memory addresses, etc.
13. **Dot matrix LCD**, including backlight, for displayed measurement data, measurement parameter and messages with backlight.

4.2 Measurement connections

⚠ Only original test leads supplied may be used!

⚠ The maximum admissible voltage of test connectors towards earth is 300V AC ! The maximum admissible voltage between the test connectors is 600 V AC!

⚠ The maximum admissible voltage between test connectors and test sockets C1-C2/P is 300V AC ! The maximum continuous current at measurement inputs C1 and C2/P is 0.3A ! Never apply external voltage between measurement sockets C1 and C2/P!

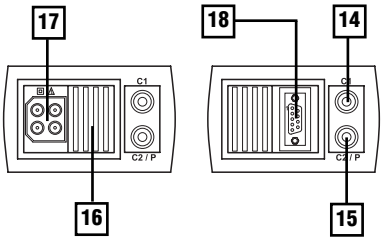


Figure 2: Connector assignment

Explanation of test connectors:

14. Measurement connector for clamp (C1)
15. Measurement connector for clamp or measurement probe (C2/P)
16. Connector cover
17. 4-pole measurement connector
18. RS232 interface connector

4.3 Instrument Bottom

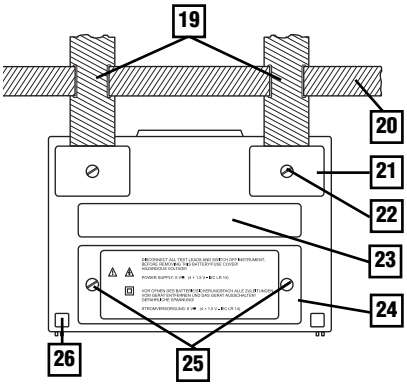


Figure 3: Instrument Bottom

Explanation of individual parts:

19. Carrying strap, for carrying the instrument by hand or over the shoulder
20. Waist strap, for fixing the instrument around the waist
21. Instrument stands and also for attachment of carrying strap (below cover)
22. Fixture screw, must be unscrewed to remove the carrying strap
23. Sticker indicating measurement functions and measurement ranges
24. Battery or fuse casing cover
25. Battery case screw, must be unscrewed for battery or fuse replacement
26. Instrument stands

5.0 General Information for Carrying out Measurements

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

⚠ Measurements in dangerous proximity of electrical installations are only to be executed when instructed by a responsible electrical specialist, and never alone.

⚠ Prior to usage, inspect the instrument and used test leads for external damage. Prior to any operation, ensure that connecting leads used and instruments are in perfect condition.

⚠ Only touch test leads and test probes at handle surface provided. Never directly touch test probes.

⚠ The instrument / leads may only be connected to input voltage (up to 600V) as indicated on the type shield.

⚠ When measuring on earthed sockets or on equipment protected by PE, it must be checked that the PE connection is correct. Prior to measurement, briefly touch the contact electrode on the instrument when test leads connected. If a signal sound is audible and the LCD indicates "Attention PE/N error!", the PE connection must be checked ! The testing can only be carried out once the PE connection is correct ! **During PE testing special care has to be taken that the measurement result is not influenced by an insulating floor or site.**

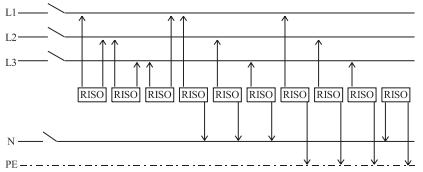
☞ The instrument UNITEST EUROtest automatically reverses the test connection L-N within the required measurement functions (e.g. for RCD measurements, ZL and Zi measurements, etc.). Manual reversing of the test leads or the COMMANDER 1 is not required.

⚠ Measurements have to be carried out in compliance with the respectively valid national and international standards or regulations.

5.1 Measurement of Insulation Resistance R_{INS} (Function 10)

For electrical installations the insulation measurement has to be carried out prior to final commissioning. This measurement is of basic importance as the insulation measurement is considered to be the only measurement for fire protection. If, due to an insulation error, a limited fault current flows between two conductors, this leads to a heating up or even to a fire. Only the insulation measurement procedure can detect such a fault.

Example Insulation Measurement:



According to IEC 60364 (DIN VDE 0100 Part 610) the insulation resistance measurement is carried out:

- from all phase conductors (e.g. L1, L2, L3) towards earth or to protective earth (PE)
- between protective earth (PE) and neutral (N)

Additionally, it is advised to perform the following measurements:

- between all active conductors (e.g. L1, L2, L3, N).

This measurement has to be carried out separately for each current circuit. The measurement is performed using DC voltages from 50...1000V at a maximum test current of approx. 3mA.
Table 2 on page 12 indicates an overview on the type of system to be tested, the required test voltage and the required limit values (acc. national or international standards).

⚠ Prior to any insulation measurement ensure that the system parts to be tested are voltage free.

☞ If a voltage exceeding 30V AC/DC is present at test leads, the respective voltage is displayed. Simultaneously, the following warning message 'Input voltage >30V' is displayed and a signal sound is audible. Further measurement is disabled.

⚠ During insulation measurement all loads must be disconnected from the mains. Furthermore, ensure that all interruptors of the system being tested are switched on.

⚠ During the measurement the UUT/ the system being tested may not be touched. Danger of electrical shock!

⚠ The insulation measurement causes the capactive UUTs to be charged by the test voltage. The instrument UNITEST EUROtest automatically discharges the UUT after the completion of measurement. When interrupting the measurement or when removing the test leads prior to the completion of measurement, a dangerous voltage may be present at UUT. If a dangerous voltage is detected during voltage measurement, the UUT must be discharged manually, using a high-resistant load (not via short-circuit !).

☞ If UUTs with larger capacities are tested (e.g. long cables or conductors), the automatic discharge procedure may take more time. In this case the discharge voltage is displayed on the LCD. Ensure that the test leads stay connected to the UUT until the voltage value falls below 50V or manually discharge using a high-resistant load (not via short-circuit !) !

5.1.1 Carrying out the Measurement

- Connect the desired test lead to the 4-pole test connector (17) of UNITEST EUROtest. Use either the 3-pole test lead or COMMANDER 2 (available as accessory, Cat. No.1223).

☞ For the 3-pole test lead only use the connectors L (black) and N (blue). The connector PE (green) may be connected either with N or left open !

- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn rotary switch 'Measurement Function' to the function 10 (Rins). The following menu is displayed:

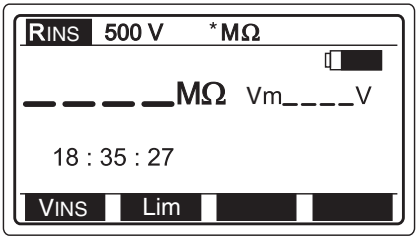


Figure 4: Menu Insulation Resistance

Explanation of displayed values:

500V	selected test voltage
*MΩ	no limit value is set
Vm	Value of test voltage
15:35:27	display of real time clock

- Set the desired test voltage using function key F1 (Vins). Repeated pressing allows the setting of the following test voltage values: 50, 100, 250, 500 or 1000V. The respectively set value is displayed in the upper display line. Table 2 on page 12 indicates an overview on the type of system to be tested, the required test voltage and the required limit values.

- The insulation resistance limit value may be set, if desired. If the measurement value is smaller than the set limit, the message 'Result under limit' and the symbol ⚠ is displayed during measurement.

- For setting the limit value first press function key F2 (Lim) to enter the menu for setting limit values, please refer to figure 5:

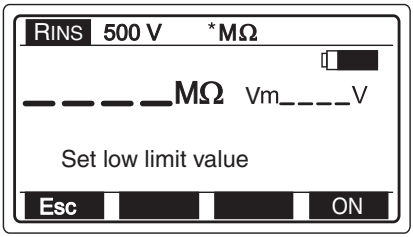


Figure 5: Menu for Setting Limit Values

Then activate the setting of limit values using the function key F4 (On). Press the function key F4 (Off) again if **no** comparison is desired between the test result and the previously set limit value.

Now set the desired limit value using function keys F2 (↑) or F3 (↓) . In accordance with Table 1 limit values between 0.01MΩ and 200MΩ can be set. The respectively set value is displayed in the top display line.

Table: 1
Setting Range for Insulation Limit Setting

Range (MΩ)	Resolution (MΩ)
0.01...0.25	0.01
0.25...1	0.05
1...10	1
10...2000	10

Function key F4 (Off) allows the user to switch off setting of the limit value. '* MΩ' is displayed in the top display line if the setting of the limit value is switched off. After setting the limits press function key F1 (Esc) or key 'ESC' to exit the menu.

- Connect the test leads to UUT in accordance with Figure 6. If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

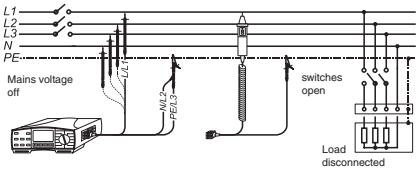


Figure 6: Connection of Test Leads

- Briefly press the 'START' key or keep pressing until the test result is stable. The result is displayed in accordance with the example below. If the key is briefly pressed, the measurement will only last for approx. 2 seconds. If the key is pressed for a longer period, the measurement time matches the key-pressing period.

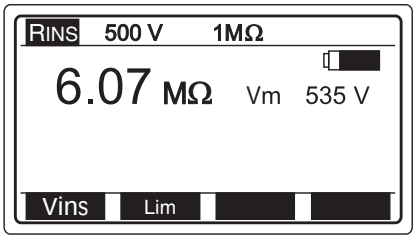


Figure 7: Measurement Value Display

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument or on COMMANDER 2, then enter the desired - OBJECT-/BLOCK-/FUSE-NUMBER - (for further information, kindly refer to section 7.1. "Saving Measurement Results ").

5.1.2 Remarks regarding Measurements

- If a voltage exceeding 30V AC/DC is present at test leads, the respective voltage is displayed. Simultaneously, the following warning message 'Input voltage >30V' is displayed and a signal sound is audible. Further measurement is disabled.
- The UNITEST EUROtest automatically discharges the UUT after the completion of measurement. The actual voltage is displayed during the discharge procedure until the voltage falls below 30 V !
- When interrupting the measurement or when removing the test leads prior to the completion of measurement, a dangerous voltage may be present at UUT.
- If the measurement value exceeds the measurement range (e.g. open test leads), the LCD will indicate the following messages:
  for test voltages 50V or 100V >250MΩ
  for test voltages 250V 500V, 1000V >1000MΩ
- The test voltage negative pole is located at test connectors L/L1 or at the Commander 2 test probe.

Table 2 Test Voltages

System Description / Nominal voltage	Test Voltage	Limit
Other testing Signal systems	50V	-
Derivation ability of flooring materials acc. to DIN 51953	100V	1MΩ
SELV / PELV system	250V	0.25MΩ
Systems up to 500V (except SELV /PELV)	500V	0.5 MΩ
Systems above 500V to 1000V	1000V	1MΩ

5.2 Low Ohm Measurement R LOW Ω (Function 11)

This measurement is used to verify earthed conductors, earthing conductors and equipotential bonding conductors for low-resistant continuity. Furthermore, by opening the bridge between PE and N wrong wired sockets (N and PE exchanged) can be detected. In practical use the low-resistant measurement is always used when low-resistant connections between earthed conductors and equipotential bonding conductors must be verified to ensure protection against dangerous shock currents.
The measurement is carried out at a DC current of >200mA and a maximum test voltage of approx. 4-7V. During the measurement the test current polarity is reversed.

⚠ Prior to any measurement ensure that the system parts to be tested are voltage free.

☞ If a voltage exceeding 10V AC/DC is present at test leads, the respective voltage is displayed. Simultaneously, the following warning message 'Input voltage >10V' is displayed and a signal sound is audible. Further measurement is disabled.

5.2.1 Carrying out the Measurement

- Connect the desired test lead to the 4-pole test connector (17) of UNITEST EUROtest. Either use the 3-pole test lead or COMMANDER 2 (available as accessory Cat. No.1223).

☞ For the 3-pole test lead only use the connectors L (black) and N (blue). The connector PE (green) may be connected either with N or left open !

- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn rotary switch 'Measurement Function' to the function (11) R LOW Ω / CONTINUITY.

- Select the function R LOW Ω via the function key F1 (FUNC). The respectively selected function is indicated again in the top display line, 'R LOW Ω'.

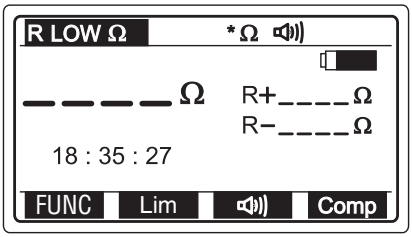


Figure 8: Menu Low-Resistance Measurement

Explanation of displayed values:

*Ω	no limit value is set
R+	measurement value for positive test current
R-	measurement value for negative test current
15:35:27	time display of real time clock

- If desired, set the limit value for Low-Ohm measurement. If the measurement value exceeds the set limit value, the message 'Result over limit' with the symbol [warning sign] is displayed during the measurement.

- For limit value setting first press function key F2 (Lim) to enter the setting menu for limit values, please refer to Figure 9:

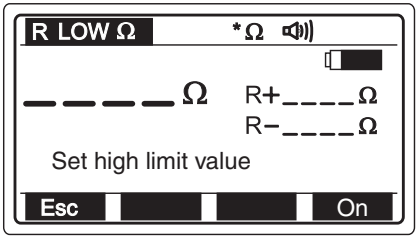


Figure 9: Menu for Setting Limit Values

Then activate the setting of the limit value setting using the function key F4 (On). Press the function key F4 (Off) again if **no** comparison is desired between the test result and the previously set limit value.

Now the desired limit value can be set using the function keys F2 (↑) or F3 (↓) . The limit value can be set to values between 0.1Ω and 20.0Ω.

Function key F4 (Off) allows the user to switch off the setting of the limit value. '*Ω' is displayed in the top display line if the setting of the limit value is switched off. After setting the limits press function key F1 (Esc) or key 'ESC' to exit the menu.

- If desired, any falling below the limit value can be confirmed by an additional acoustic signal (length approx. 2s). Function key F3 (speaker) is used to switch this function on or off in case of set limit value. This setting is indicated by the symbol in the top display line.

- Carry out test lead compensation. If you wish to compensate test leads or measurement accessories, please refer to section 5.4.

- Connect the test leads to UUT in accordance with Figure 10 or Figure 11. If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

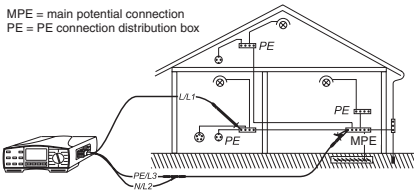


Figure 10: Connection of Test Leads

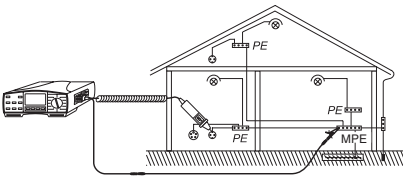


Figure 11: Connection of COMMANDER 2

- Briefly press the key 'START'. The measurement is started. During this measurement the test current used for measurement is +200mA and –200mA (automatic polarity change), two measurement values are obtained. Both values are displayed separately. Additionally, the average value of both data is displayed. An example of a measurement result is given as follows:

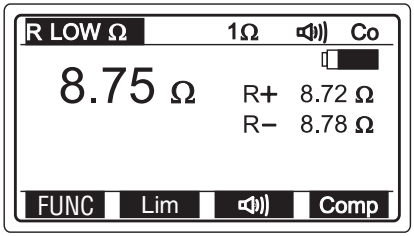


Figure 12: Measurement Value Display

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument or on COMMANDER 2, then enter the desired --OBJECT-/BLOCK-/FUSE-NUMBER (for fu ther information, kindly refer to section 7.1. "Saving Measurement Results ").

5.2.2 Remarks regarding low Ohm Measurement

- If a voltage exceeding 10V AC/DC is present at test leads the respective voltage is displayed. Simultaneously, the following warning message 'Input voltage >30V' is displayed and a signal sound is audible. Further measurement is disabled.
- If the measurement value exceeds the measurement range (e.g. open test leads), the LCD will indicate the value >2000Ω
- During this measurement the test current (±200mA) polarity is automatically reversed, resulting into two measurement values. Both values are indicated separately and the average value of both results is displayed.
- The limit recognition always refers to the average value of both measurement results.

5.3 Continuity Measurement (Function 11)

This function can be used for inspection of a connection, for tracing lines during maintenance or repairs of electrical systems and instruments.
In contrast to the Low Ohm measurement this measurement remains active until repeated pressing of the key 'START'. The measurement is carried out at a DC current of approx. 7mA at a maximum test voltage of approx. 4-7V.

⚠ Ensure prior to any measurement that the systems parts to be tested are voltage free.

☞ If at the start of measurement the voltage present at test leads exceeds 10V AC/DC, the voltage is displayed. Simultaneously the following warning message 'Input voltage >10V' appears and a signal sound is audible. Further measurement is disabled.

⚠ If the test leads are connected to voltage during active measurement, the fuse F3 (0.315A/250V medium time-lag) may be triggered. For fuse replacement, please refer to section 9.4 or 9.4.3.

5.3.1 Carrying out the Measurement

- Connect desired test lead to 4-pole measurement connector (17) of UNITEST EUROtest. Either use the 3-pole test lead or COMMANDER 2 (available as accessory Cat. No.1223).

☞ For 3-pole test lead only use connectors L (black) and N (blue), connector PE (green) may be connected to N or left open !

- Switch on UNITEST EUROtest using key 'ON/OFF', set rotary switch 'Measurement Function' to function (11) R LOWΩ / CONTINUITY.

- Select function CONTINUITY by means of function key F1 (FUNC). The function selected is displayed again in the top display line: ' CONTINUITY '.

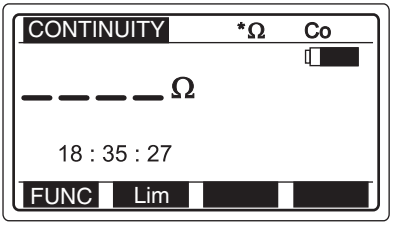


Figure 13: Continuity Measurement Menu

Explanation of displayed values:

*Ω No limit value setting
Co Test leads already compensated

- Set continuity measurement limit value, if desired. An acoustic signal indicates that the measurement value is below the limit. (continuity test function). There is no acoustic signal for exceeding the set limit. The LCD shows the message 'Result over limit' and the symbol ⚠ .

- For the setting of the limit value first press function key F2 (Lim) to enter the limit value setting menu, please refer to Figure 14.

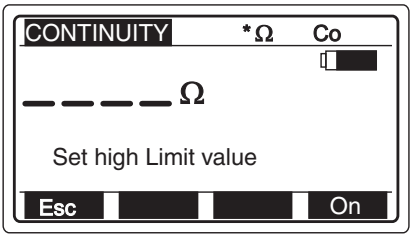


Figure 14: Limit Value Setting Menu

Then activate the limit value setting using function key F4 (On). Press the function key F4 (Off) again if **no** comparison is desired between the test result and the previously set limit value.

Now the desired limit value can be set using function keys F2 (↑) or F3 (↓).The limit setting is possible for values between 0.1Ω up to 20.0Ω.

Function key F4 (Off) allows the user to switch off the setting of the limit value. '*Ω' is displayed in the top display line if the limit value setting is switched off. After limit setting press function key F1 (Esc) or key 'ESC' to exit the menu.

- Proceed with test lead compensation if test lead and test accessory compensation is desired, please refer to section 5.4.

- Briefly press again the key 'START' to start the measurement.

- Connect the test leads to UUT in accordance with Figure 15 or Figure 16 and pay attention to the displayed measurement result or acoustic signals during active measurement.

If desired, this connection information can be retrieved on the measurement instrument prior to starting the measurement using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

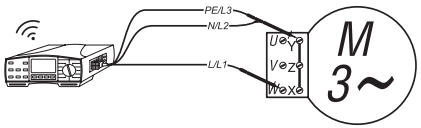


Figure 15: Connection of test leads

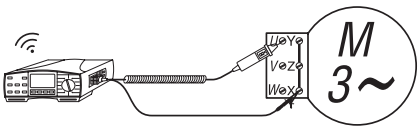


Figure 16: Connection of COMMANDER 2

- Briefly press the key 'START'. The measurement is terminated. The last measurement result remains displayed, please refer to figure 17.

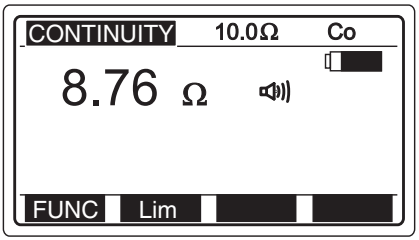


Figure 17: Measurement Value Display

☞ The measurement result displayed cannot be saved.

5.3.2 Remarks regarding Continuity Measurements

- If a voltage exceeding 10V AC/DC is present at test leads, the respective voltage is displayed. Simultaneously, the following warning message 'Input voltage >30V' is displayed and a signal sound is audible. Further measurement is disabled.
- If the measurement value exceeds the measurement range (e.g. open test leads), the LCD will indicate the value >2000Ω !
- The negative test voltage pole is present at test connector L/L1 or at COMMANDER 2.

5.4 Test Lead Compensation

If the test lead resistance strongly affects the test result at Low Ohm or continuity measurements, the user has the option to compensate the resistance of test leads and test accessories.

- Short-circuit test leads in accordance with Figure 18.

Figure 18: Short-circuit of Test Leads

- Select function 11 (R LOW Ω).
- Briefly press key 'START'. The measurement result is displayed.
- Briefly press function key F4 (Comp). The message 'Compens. test leads' is briefly displayed. Then the measurement result displayed is set to 0.00Ω. Simultaneously the symbol 'Co' appears in the top display line and indicates that the compensated value is subtracted from the measurement value.

5.4.1 Remarks regarding Test Lead Compensation

- The compensation directly affects the Low Ohm and continuity functions. If the compensation is active, the message "Co" is displayed.
- The saved compensation value remains saved even when switching off the instrument.
- To cancel the compensation follow the procedure described above with open test leads (or measurement value >2000Ω). The symbol 'Co' disappears from the display indicating that the lead compensation has been cancelled.
- Measurement values >5Ω cannot be compensated. The display shows 'Wire resistance > 5Ω'.
- If during active compensation a resistance value exceeding 5Ω has been measured, a test lead compensation after pressing the key "Comp" will not be carried out. A previously saved compensation is cleared and the message 'Wire resistance > 5Ω' is displayed!

5.5 Earth Resistance Measurement (Function 12)

General Information regarding Earth measurements

The earth resistance is the resistance between reference earth and the connecting point of the earthing system. The earthing system is required to bring each system parts and circuits to a reference potential as close as possible to the reference earth. It is recommended to perform earth measurements in systems as lightning protection, telecommunication and tank parks.

The built-in earth measurement of the UNITEST® EUROtest is an earth resistance measurement in accordance with the voltage/current measurement method. The power is supplied by the built-in batteries. The earth resistance is determined in accordance with the voltage/current measurement method. Earthing represents an essential part of a power supply system. Earthing is required to bring the individual system parts and current circuits to a common reference potential close to the reference earth. Earthing is also used to protect systems from overvoltage or short-circuit currents.

The earth resistance must be of sufficiently low impedance. The limit values are defined within national or international standards. Earthing or earth resistance is comprised of the earth conductor (equipotential bonding conductor or PE), the earth connector (foundation earth, rod earth, band earth...), and the earth connector spreading resistance, which is the resistance between earth connector and reference earth. A voltage funnel is formed around any earth connector depending on the earth connector shape and the surrounding soil. Assuming that the soil is uniform throughout with a uniform temperature as well as uniform humidity, the voltage funnels around the earth are of concentric shape.

The lower the earth resistance, the smaller the voltage funnels. When determining the earth resistance, the voltage drop is measured which is generated by a known and constant current applied to the earth electrode to be measured.

When measuring single earths using a current clamp adapter and probes, the current being tested across the single earth is measured directly via the current clamp adapter. Regarding earth loop measurement using two current lamps, a known measurement current is fed via one current clamp adapter. The actual flowing current within the earth loop is measured. The difference is used to determine the earth resistance of the respective single earth.

The following measurement methods can be applied with the UNITEST EUROtest for earth resistance determination:

- Earth measurement using two probes, two-, three- or four-poles
- Earth measurement using probes and current clamp adapter to measure single earths
- Earth measurement using two clamps to measure single earths in earthing systems (earth loop measurement)
- Measurement of specific earth resistance in accordance with the method 'Wenner'

Definition of terms

Earth connector (E): The earth connector is a connector being inserted into the soil or into a foundation and is a conductive connection to the earth (e.g. foundation earth in concrete).

Earth probe (ES): Probe or earth rod being closest to the earth connector.

Reference earth: An area of the soil which is at such a distance to the respective earthing conductor that no noticeable voltages caused by the earth current occur between any points within this range.

Auxiliary Earth (H): Additional earth connector conducting the measurement current required for the measurement.

Probe (S): An additional probe, preferably an earth rod, used for measurement purposes as potential probe for the reference earth.

Spreading resistance of an earth connector: The soil resistance between earth connector and reference earth.

☞ To perform earth measurements using earth rods (auxiliary earth / probe) the user requires the UNITEST Earth Measurement Set 20m (Cat. No.1227).

☞ To carry out earth measurement using a current clamp adapter, the user requires the UNITEST clamp adapter 500A (Cat. No.1226).

☞ To carry out the earth measurement (earth loop measurement) using two current clamp adapters the user requires the UNITEST clamp adapter 1000A (Cat. No.1225) and the UNITEST clamp adapter 500A (Cat. No.1226).

⚠ The measurement instrument may only be connected to earth connectors which are voltage free.

⚠ Prior to placing the earth connectors or the earth rods the area has to be checked for possibly dangerous installed objects (pipes, cables, etc.).

☞ If a voltage exceeding 20V AC/DC is present at test leads H and E, the respective voltage is indicated. Simultaneously, the following warning messages appear: 'Input voltage >20V' and an signal sound is audible. Further measurement is disabled.

☞ To avoid faulty measurements metal pipes, cables in the soil, or in open areas under earth waterways, or roots installed or located in parallel must be taken into account. Additionally, the specific earth resistance is subject to seasonal weather-related variations.

5.6 Measurement of Earth Resistance in accordance with the Two-Wire Method

The **two-wire method** consists of measuring the resistance between the earth being tested and a known earth. For this purpose the PEN conductor of a TN system can be used, for example. The resistance of the known earth connection has to be subtracted from the measurement result. This measurement is also feasible in a densely populated or in sealed areas where rods and auxiliary earth connections may not be installed.

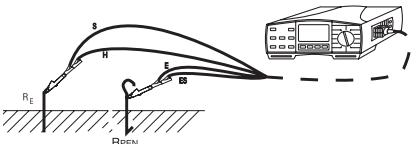


Figure 19: Two-Wire Measurement Method:

☞ To perform this measurement the user requires the Earth Measurement Set UNITEST (Cat. No.1227)

5.6.1 Carrying out the Measurement

- Connect the 4-pole test lead from the Earth Measurement Set (Cat. No.1227) to the 4-pole test connector (17) of UNITEST EUROtest.

- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn rotary switch 'Measurement Function' to the function (12) RE Earth Resistance.

- Select the function R EARTH via the function key F1 (FUNC) by pressing function key F1 several times, if required. The respectively selected function is indicated again in the top display line, 'REARTH'.

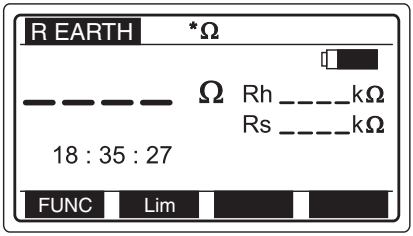


Figure 20: Earth Resistance Menu

Explanation of displayed values:
Rh Auxiliary earth resistance
Rs Probe resistance

- If desired, set the limit value for Earth Resistance. If the measurement value exceeds the set limit value, the message 'Result over limit' with the symbol ⚠ is displayed during this measurement.

- To set the limit value first press function key F2 (Lim) to enter the menu for setting limit values, please refer to Figure 21.

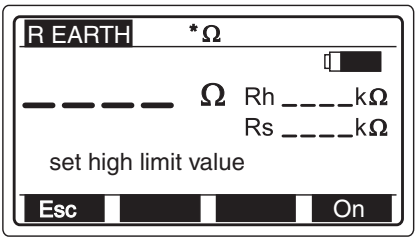


Figure 21: Menu for Setting Limit Values

Then activate the limit value setting using the function key F4 (On). Press the function key F4 (Off) again if **no** comparison is desired between the test result and the previously set limit value.

Now the desired limit value can be set using function keys F2 (↑) or F3 (↓) . In accordance with Table 3, limit values between 1Ω and 5000Ω may be set. The respectively set value is displayed in the top display line.

Table 3
Setting range for limit values R EARTH

Range (Ω)	Resolution (Ω)
1...100	1
166, 250, 500, 833, 1666, 2500, 5000	-

Function key F4 (Off) allows the user to switch off the limit value. '*Ω' is displayed in the top display line if the limit value is switched off. After setting the limit press function key F1 (Esc) or key 'ESC' to exit the menu.

- Connect the test leads to UUT in accordance with Figure 22. If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various connection possibilities.

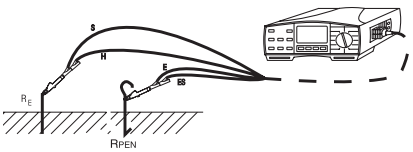


Figure 22: Connection of Test Leads

- Briefly press the key 'START' or keep pressed until test result stabilisation. The result is displayed in accordance with the example below. If the key is briefly pressed, the measurement will only last for approx. 2 seconds. If the key is pressed for a longer period, the measurement will take place as long as the key is depressed.

Earth Resistance and the values for auxiliary earth resistance (Rh) and probe resistance (Rs) are measured and displayed. For two-pole measurement, the measurement values for auxiliary earth and probe should be around zero. Otherwise the measurement connections have to be checked!

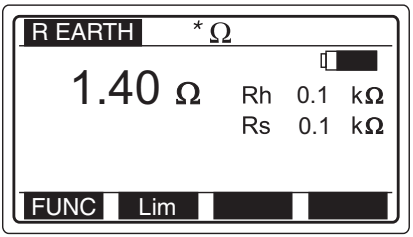


Figure 23: Measurement Value Display

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER (for further information, kindly refer to section 7.1. "Saving Measurement Results ".

5.6.2 Remarks regarding Earth Resistance Measurements

- If the value for auxiliary earth and probe resistance is excessive (>4kΩ + 100*RE) or > 50kΩ, the symbol ⚠ is displayed together with one of the following messages: 'Resistance Rh>xxxΩ' or 'Resistance Rs>xxxΩ'. For two-pole measurement, the measurement values for auxiliary earth and probe should be around zero. Otherwise the measurement connections have to be checked!
- If the measurement result is out of range (e.g. for open test leads), >50kΩ is displayed for Re, Rh, and Rs.

5.7 Earth Resistance Measurement in accordance with the three-wire or four-wire Method

The **three-wire method** consists of inserting two earth rods (one auxiliary earth and one probe) into the soil, at a minimum distance of 20m. This layout can also be realised by triangular shape. The test current is fed between auxiliary earth and earth. The voltage drop between earth and probe is measured. The test lead resistance from measurement instrument to earth is included in the measurement. This measurement is used to determine e.g. earth resistance of foundation earths, building site earths and lighting protection earth connections.

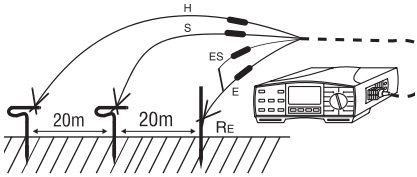


Figure 24: Three-Wire Measurement

The **four-wire measurement** is applied instead of the three-wire measurement when dealing with extremely Low Ohm earth resistance and if the resistance of test lead between instrument and earth connector interfere the measurement result.

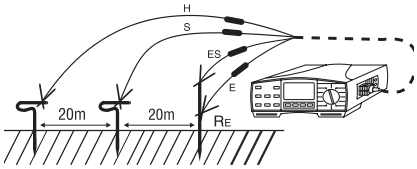


Figure 25: Four-Wire Measurement

☞ To perform this measurement the user requires the UNITEST Earth Measurement Set (Cat. No.1227)

5.7.1 Carrying out the Measurement

- Connect the 4-pole test lead supplied with the Earth Measurement Set (Cat. No.1227) to the 4-pole measurement connector (17) of UNITEST EUROtest.

- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn rotary switch 'Measurement Function' to function (12) RE Earth Resistance.

- Select function R EARTH using function key F1 (FUNC) pressing function key F1 several times, if required. The function selected is shown again in the top display line: 'R EARTH'.

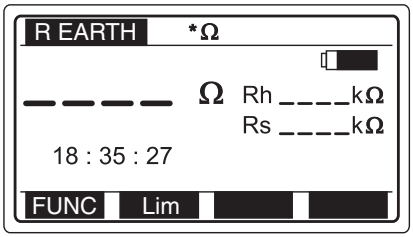


Figure 26: Earth Resistance Menu

Explanation of displayed values:
Rh Auxiliary earth resistance
Rs Probe resistance

- Set earth resistance limit value, if desired. If the measurement value exceeds the set limit value, the LCD shows the message 'Result over limit' and the symbol ⚠ during the measurement.

- For limit value setting first press function key F2 (Lim) to enter the limit value setting menu, please refer to Figure 27.

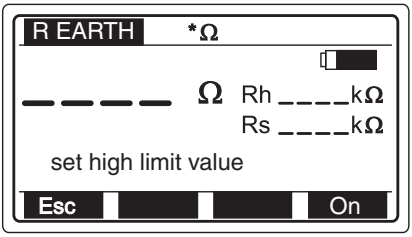


Figure 27: Menu for Limit Value Setting

Then activate the setting of the limit value using function key F4 (On). Press the function key F4 (Off) again if **no** comparison is desired between the test result and the previously set limit value.

Now the desired limit value can be set using function keys F2 (↑) or F3 (↓) . The limit value setting can be selected in accordance with Table 4 between 1Ω and 5000Ω. The respectively set value is shown in the top display line.

Table 4
Limit Value Setting Range REARTH

Range (Ω)	Resolution (Ω)
1...100	1
166, 250, 500, 833, 1666, 2500, 5000	-

Function key F4 (Off) allows the user to switch off the limit value. '*Ω' is displayed in the top display line if the limit value is switched off. After setting the limit press function key F1 (Esc) or key 'ESC' to exit the menu

- Place the earth rods for auxiliary earth and probe in one line, if possible, in accordance with Figure 28. This layout can also be realised by a triangular shape. The distance between probe and earth or probe and auxiliary earth must be a minimum of 20m. Carefully place the test leads making sure that the test leads are not parallel to each other and do not cross to avoid coupling.

- Connect test leads to earth rods according to Figure 28. If desired, this connection information can be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

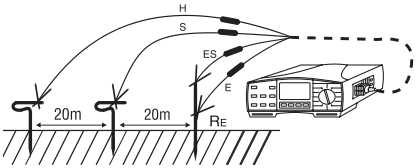


Figure 28: Connection of test leads

- Briefly press the key 'START' or keep pressed until stabilisation of measurement result. The measurement result is displayed in accordance with the example below. If the key is briefly pressed, the measurement will only last for approx. 2 seconds. If the key is pressed for a longer period, the measurement will take place as long as the key is depressed.

The earth resistance and the values for auxiliary earth resistance (Rh) and probe resistance are measured and displayed. During the measurement the instrument monitors the resistance values for auxiliary earth and probe and reports about any excess of the admissible values.

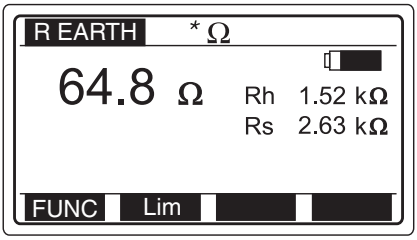


Figure 29: Measurement Value Display

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument or on COMMANDER 2, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER (for further information, kindly refer to section 7.1. "Saving Measurement Results ").

- To verify the measurement, exchange the connections of probe and auxiliary earth or move the earth rod for the probe approx. 1...2m towards the earth connector (or afterwards towards the auxiliary earth) and measure again. If the instrument shows similar measurement results for all measurement layouts, the probe is located in the reference earth area outside the voltage funnel generated by earth and auxiliary earth. Are the measurement not similar the probe could be located inside the voltage funnel. To avoid this there are two possibilities:

  A: increase the distance between earth and auxiliary earth

  or,

  B: position the earth rod for the probe to one point of the line outside the voltage funnel, as shown in Figure 30, and repeat the measurement.

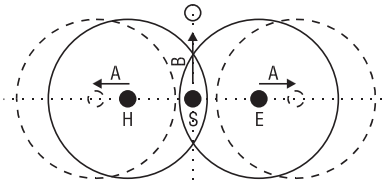


Figure 30: Voltage Funnel

5.7.2 Remarks regarding Earth Resistance Measurements

- If the values for auxiliary earth and probe resistance are too high (>4kΩ + 100*RE) or >50kΩ, the symbol is displayed together with one of the following messages: 'Resistance Rh>xxxΩ' or ' Resistance Rs>xxxΩ'. The maximum value 'xxx' for the displayed measurement result is calculated as follows: Rmax= 4kΩ +100*RE.
- If the measurement result is out of range (e.g. open test leads), >50kΩ is displayed for Re, Rh, and Rs.
- If the auxiliary earth and probe resistance values are too high causing a respective error message, the resistance can be decreased by taking one of the following measures : e.g. humidifying the soil in the earth rod area, increase the depth of the earth rods, use several rods in parallel.

5.8 Earth Resistance Measurement using probes and a current clamp adapter

In earthing systems equipped with several earth connectors in parallel, the total resistance of the earthing system is measured during earth resistance measurements. If single resistance values of the earth have to be determined (e.g. to search for rusty earth connectors), every individual earth conductor has to be disconnected and measured separately which is very time consuming. Furthermore, the compensation currents might present a danger to the user. To solve this measurement problem, the UNITEST EUROtest allows the user to carry out a selective earth measurement using current clamp adapters. For this measurement two earth rods (one auxiliary earth and one probe) are installed. The measurement current is injected between auxiliary earth and the earth connector in order to measure the voltage drop between earth connector and probe. At the same time, only the current which actually flows through the earth connector to be tested is measured using the current clamp adapter. The measurement result is not interfered by measurement currents flowing through earth connectors installed in parallel.

This measurement method allows easy measurement of each earth connectors of an earthing system without time-consuming disconnecting of each earth connector.

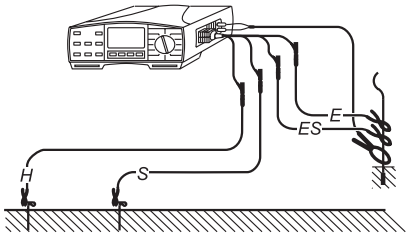


Figure 31: Earth measurement using a Clamp

☞ To perform this measurement the user requires the Earth Measurement Set (Cat. No.1227) and the UNITEST clamp adapter (Cat. No.1245)

5.8.1 Carrying out the Measurement

- Connect the 4-pole test lead supplied with the Earth Measurement Set (Cat. No.1227) to the 4-pole measurement connector (17) of the UNITEST EUROtest. Also connect the UNITEST clamp adapter (Cat. No.1245) to both measurement connectors C1 (14) C2/P (15), please refer to Figure 33.

- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn rotary switch 'Measurement Function' to function (12) RE Earth Resistance.

- Select function R EARTH ✂ via function key F1 (FUNC). Press function key F1 several times, if required. The selected function is shown again in the top display line: R EARTH ✂ .

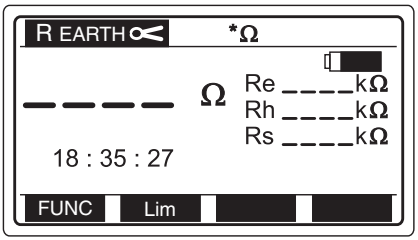


Figure 32: Earth Resistance Menu

Explanation of displayed values:

Re Total system earth resistance
Rh Auxiliary earth resistance
Rs Probe resistance

- If desired, set the earth resistance limit value. If the measurement value exceeds the previously set limit value, the message 'Result over limit' together with the symbol ⚠ is displayed during the measurement. The displayed measurement value of the measured earth is compared and not the total earth resistance. For limit value setting, please refer to section 5.7.1, step 4.

- Place the earth rods for auxiliary earth and probe in one line, if possible, in accordance with Figure 33. This layout can also be realised by a triangular shape. The distance between probe and earth or probe and auxiliary earth must be a minimum of 20m. Carefully place the test leads making sure that the test leads are not parallel to each other and do not cross to avoid coupling.

- Connect test leads to earth rods according to Figure 33. Connect the clamp adapter to the earth connector being tested. If desired, this connection information can be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

☞ The user must make sure that clamp adapter and connectors E and ES are connected correctly to the earth connector to make sure that the measurement current flows from the connectors E and ES through the clamp adapter via the earth connector being tested.

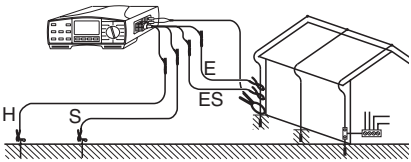


Figure 33: Connection of test leads and clamp adapter

- Briefly press the key 'START' or keep pressed until stabilisation of measurement result. The measurement result is displayed in accordance with the example below. If the key is briefly pressed, the measurement will only last for approx. 2 seconds. If the key is pressed for a longer period, the measurement will take place as long as the key is depressed.

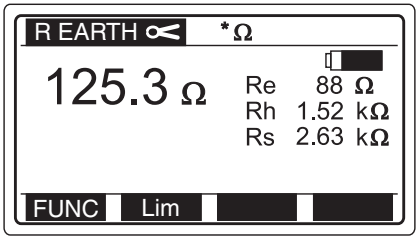


Figure 34: Measurement Value Display

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER (for further information, kindly refer to section 7.1. "Saving Measurement Results ").

- To verify the measurement, exchange the connections of probe and auxiliary earth or move the earth rod for the probe approx. 1...2m towards the earth connector (or afterwards towards the auxiliary earth) and measure again. If the instrument shows similar measurement results for all measurement layouts, the probe is located in the reference earth area outside the voltage funnel generated by earth and auxiliary earth. Are the measurement not similar the probe could be located inside the voltage funnel. To avoid this there are two possibilities:

  A: increase the distance between earth and auxiliary earth

  or,

  B: position the earth rod for the probe to one point of the line outside the voltage funnel, as shown in Figure 30 (page 23) , and repeat the measurement.

5.8.2 Remarks regarding Earth Resistance Measurements

- If the values for auxiliary earth and probe resistance are too high (>4kΩ + 100*RE) or >50kΩ, the symbol is displayed together with one of the following messages: 'Resistance Rh>xxxΩ' or 'Resistance Rs>xxxΩ'. The maximum value 'xxx' for the displayed measurement result is calculated as follows: Rmax= 4kΩ +100*RE.
- If the measurement result is out of range (e.g. open test leads) >50kΩ is displayed for Re, Rh, and Rs.
- If the current measured with the clamp adapter is below 0.5mA, the message 'Clamp current <0.5mA' is displayed. This is an indication that the measurement result could be inaccurate. Although the ratio of the total earth resistance to the earth resistance (Rtot/Re) might be below 20, the measurement result is correct.
- If the current exceeding 2.5A is present within the clamp adapter, the message 'Noise current >2.5A' is displayed. This is an indication that the measurement result could be inaccurate. This error messages indicates the presence of a noise current within the earth connector.
- If the auxiliary earth and probe resistance values are too high causing a respective error message, the resistance can be decreased by taking one of the following measures : e.g. humidifying the soil in the earth rod area, increase the depth of the earth rods, use several rods in parallel.

5.9 Earth Resistance Measurement (earth loop measurement) using two current clamp adapters

For earthing systems equipped with multiple earth connectors forming a closed loop (e.g. lightning protection system of a house) the earth resistance of any earth loop can quickly and safely be determined by using two current clamp adapters. For this purpose, a measurement current is induced into the earth loop by one of the clamps. The second clamp is used to measure the current flowing through the earth connector (at a distance of > 0.25m) to determine the resistance of the earth loop for the measured earth connector. Probes and auxiliary earth rods are not required and allow the user to perform a fast and practical measurement.

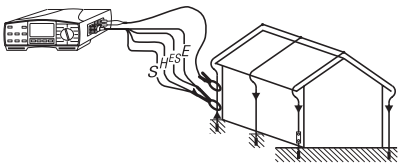


Figure 35: Earth measurement using two Clamps

☞ To perform this measurement the user requires the UNITEST Earth measurement Set (Cat. No.1227), two UNITEST clamp adapter (Cat. No.1245)

5.9.1 Carrying out the Measurement

- Connect the 4-pole test lead supplied with the Earth Measurement Set (Cat. No.1227) to the 4-pole measurement connector (17) of the UNITEST EUROtest. Connect the UNITEST clamp adapter (Cat. No.1245) to the connectors H/S and E/ES. Also connect UNITEST clamp adapter Cat. No.1245) to the measurement connectors C1 (14) and C2/P (15), please refer to Figure 37.

- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn the rotary switch 'Measurement Function' to the function (12) RE Earth Resistance.

- Select the function R EARTH ⚭ ⚭ via function key F1 (FUNC). Press function F1 several times, if required. The function selected is shown again in the top display line: R EARTH ⚭ ⚭

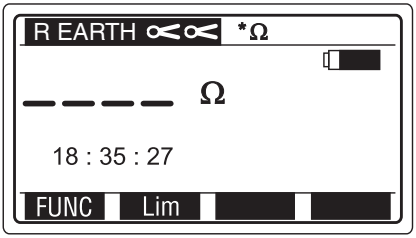


Figure 36: Earth Resistance Menu

- If desired, set the limit value for the earth resistance. If the measurement value exceeds the selected limit value, the message 'Result over limit' is displayed during the measurement, together with the symbol ⚠ . For the setting of the limit value, please refer to section 5.7.1. The limit can be set to values between 1Ω and 100Ω.

- Connect both clamp adapters to the earth connector being tested in accordance with Figure 37. If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

☞ Please note, that the two clamps must installed in a distance of > 0,25 m.

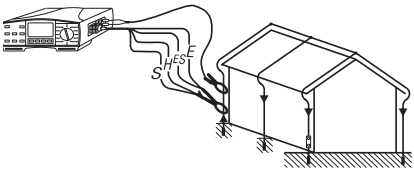


Figure 37: Connection of test leads and clamp adapter

- Briefly press the key 'START'. The measurement is started and runs until the key 'START' is pressed again. The measurement result is displayed in accordance with the example below.

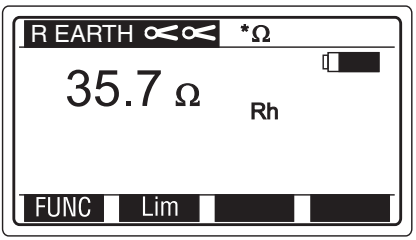


Figure 38: Measurement Value Display

- Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER (for further information, kindly refer to section 7.1. "Saving Measurement Results ").

5.9.2 Remarks regarding Earth Loop Measurements

- If the measurement result is out of range, e.g. open earth loop, or the measurement clamps are not connected, the message >100Ω is displayed.
- If the current exceeding 2.5A is present within the clamp adapter, the message 'Noise current >2.5A' is displayed. This is an indication that the measurement result could be inaccurate. This error messages indicates the presence of a noise current within the earth connector.

⚠ The distance of the clamp adapters must be to >0.25m.

5.10 Measurement of the Specific Earth Resistance in accordance with the 'Wenner' method

To calculate the spreading resistance of earth connectors and earthing systems the specific earth resistance must be determined. To calculate the specific earth resistance, the measured earth resistance is used in the formula: r=2*π*a*RE. The specific earth resistance is calculated and directly displayed by the UNITEST EUROtest.

This measurement is performed using four earth rods inserted into the soil to be tested in one line at the same distance 'a' apart. The four earth rods are inserted into a depth of maximum 1/5th of the distance 'a'. The earth resistance is detected up to the depth of the distance 'a'. To avoid faulty measurements metal pipes, cables in the earth, or in open areas under earth waterways, or roots installed or located in parallel must be taken into account. Additionally, the specific earth resistance is subject to seasonal weather-related variations.

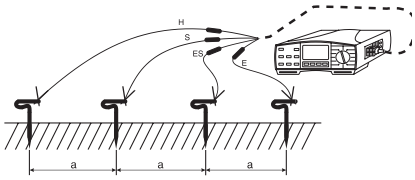


Figure 39: Measurement of Specific Earth Resistance

Table 4
References to evaluating measurement results

Type of soil	Earth Resistance Earth rod		Earth Resistance Band earth	
	Depth 3m	5m	Length 5m	10m
Marshy soil/ Swamp	10Ω	5Ω	12Ω	6Ω
Farmland/ clay	33Ω	17Ω	40Ω	20Ω
Humid sandy soil	66Ω	33Ω	80Ω	40Ω
Dry sandy soil	330Ω	165Ω	400Ω	200Ω
Stony soil	1000Ω	500Ω	1200Ω	60Ω
Concrete 1:5			160Ω	80Ω

☞ To carry out this measurement the user requires the UNITEST Earth Measurement Set (Cat. No.1227)

5.10.1 Carrying out the Measurement

- Connect the 4-pole test lead supplied with the Earth Measurement Set (Cat. No.1227) to the 4-pole test connector (17) of the UNITEST EUROtest.

- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn the rotary switch 'Measurement Function' to function (12) RE Earth Resistance.

- Select function ρ EARTH using function key F1 (FUNC). Press function F1 several times, if required. The selected function is shown in the top display line: 'ρ EARTH'.

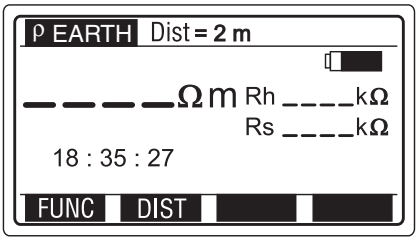


Figure 40: Specific Earth Resistance Menu

Explanation of displayed values:

Dist	Distance between earth rods (probe distance)
Rh	Auxiliary earth resistance
Rs	Probe resistance

- To adjust the probe distance (distance between earth rods) press function key F2 (DIST) to enter the setting menu, please refer to Figure 41.

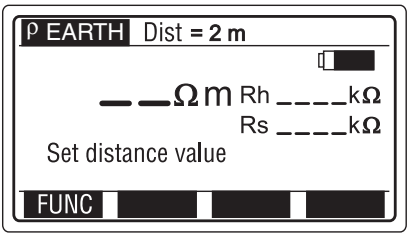


Figure 41: Distance Setting Menu

Now the desired probe distance can be set using function keys F2 (↑) or F3 (↓) . The distance setting can be selected in steps of 1m between 1m and 30m. The respectively set value is shown in the top display line. After setting the distance press the function key F1 (Esc) or the key 'ESC' to exit the menu.

- Place the four earth rods for E, ES, S, H in one line, if possible, in accordance with Figure 42. The distance between each probes must match the previously selected distance. Carefully place the test leads making sure that the test leads are not parallel to each other and do not cross to avoid coupling.

- Connect test leads to earth rods according to Figure 42. If desired, this connection information can be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

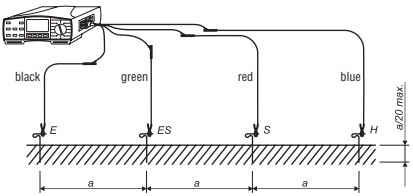


Figure 42: Test Lead Connection

- Briefly press key 'START' and keep depressed until the test result is stable. The result is displayed in accordance with the example below. If the key is briefly pressed, the measurement will only last for approx. 2 seconds. If the key is pressed for a longer period, the measurement will take place as long as the key is depressed.

The Specific Earth Resistance and the values for the auxiliary earth resistance (Rh) as well as the probe resistance (Rs) are measured and displayed. The instrument monitors the resistance values for auxiliary earth and probe during the measurement and signals any excess of the admissible values.

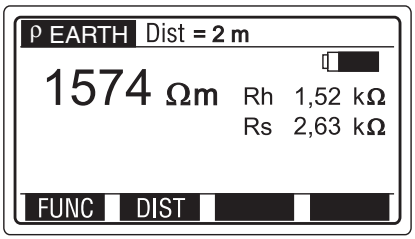


Figure 43: Measurement Value Display

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER (for further information, kindly refer to section 7.1. "Saving Measurement Results ").

- To verify the measurement modify the distance and/or the alignment of the earth rods and repeat the measurement, paying particular attention to the correct probe distance setting on the measurement instrument! If the instrument shows similar measurement results for all measurement layouts, the soil is homogenous. Larger deviations may be due to disturbance factors in the soil (pebbles, rock, under earth waterways, roots, pipings, cables, earth compensation currents, etc.).

5.10.2 Remarks regarding the Specific Earth resistance Measurements

- If the values for auxiliary earth and probe resistance are too high (>4kΩ + 100*RE) or >50kΩ, the symbol is displayed together with one of the following messages: 'Resistance Rh>xxxΩ' or ' 'Resistance. Rs>xxxΩ'. The maximum value 'xxx' for the displayed measurement result is calculated as follows: Rmax= 4kΩ +100*RE.
- If the measurement result is out of range (e.g. open test leads), >50kΩ is displayed for Re, Rh, and Rs.
- If the auxiliary earth and probe resistance values are too high, causing a respective error message, the resistance can be decreased by taking one of the following measures : e.g. humidifying the soil in the earth rod area, increase the depth of the earth rods (paying attention to the measurement distance).

5.11 Voltage and Frequency Measurements (Functions 1, 2, 3)

The UNITEST EUROtest allows measuring voltages of 0...440V AC / DC and frequency of 45...65Hz. Voltages VL-N (or VL-L) and VL-PE can be measured using the following functions:

• Z_L/Ipsc (2) • Z_I/Ipsc (3) • R_L/Ipsc (1)

Additionally, the voltage present is displayed for the following functions (please refer to the detailed description of the respective function):

• RCD (4) • Rotary Field (5) • Cable Locator (5)

⚠ The measurement connectors may not be connected to external voltages exceeding 600 V AC or DC to avoid any instrument damage.

⚠ Prior to usage the test instrument and the test leads have to be tested for correct functioning.

⚠ Test leads and test probes may only be touched at the handles provided. The user must not touch the test probes.

5.11.1 Carrying out the Measurement

- Connect the desired test lead to the 4-pole test connector (17) of UNITEST EUROtest. Either use COMMANDER 1, the 3-pole test lead or COMMANDER 2 (available as accessory Cat. No.1223).
- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn the rotary switch 'Measurement Function' to the desired function.
  - Set to function 3 for measuring VL-N (or VL-L).
  - Set to function 2 (or 1) for measuring VL-PE.
- Connect the test leads to UUT in accordance with Figure 44, Figure 45, or Figure 46. If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

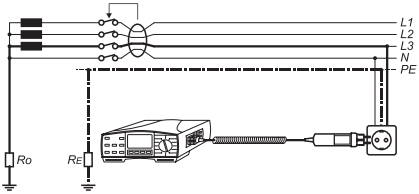


Figure 44: Voltage Measurement using COMMANDER 1

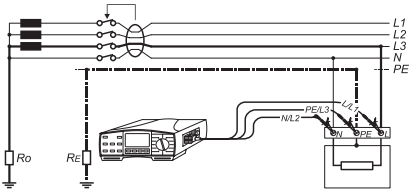


Figure 45: Voltage Measurement using Test Leads

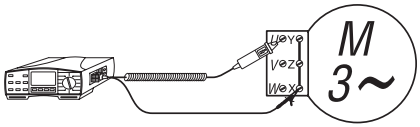


Figure 46: Voltage Measurements using COMMANDER 2

- Do **NOT** press the 'START' key. The voltages are displayed in accordance with the two example results shown below.

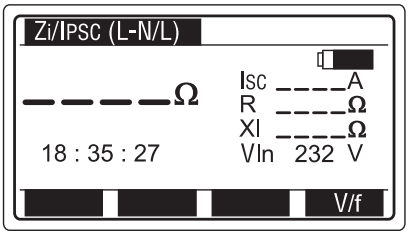


Figure 47: Display of Voltage VL-N (or VL-L)

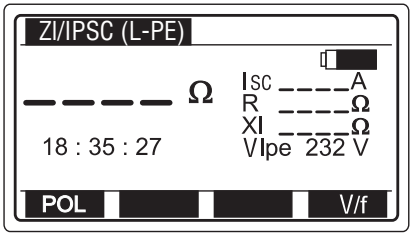


Figure 48: Display of Voltage VL-PE

☞ The function key F4 (U/f) can be used to switch between the voltage/frequency display.

☞ The measurement result displayed cannot be saved.

5.12 Measurement of RCD (Function 4)

General regarding the testing of RCD's:

In order to assess the perfect functioning of a residual current device (RCD), the contact voltage VC, generated during RCD tripping, and the tripping time t, required by the RCD to disconnect the subsequent current circuit from the mains are important measurements.

Therefore, IEC 60364 (DIN VDE 0100) prescribes as follows:

a) the maximum admissible value of the contact voltage (25V / 50V) during tripping at nominal residual current within a system may not be exceeded,
b) the RCD must trip within 300ms.

The RCD must switch off the system within 300ms after occurance of an error prior to the contact voltage reaching the admissible limit value of 25V / 50V.

The system testing should be started with a visual inspection, in particular of the protective earth connections.:

1. In TT systems, the PE must not be connected to the PEN but with the local protective earth.

2. In TN systems, the PE must be connected to the PEN before the RCD.

3. An insulation measurement in accordance with Section 5.1 must be performed. In particular it must be ensured that there is no connection between N and PE after the RCD.

4. The low impedance connection of equipotential bonding conductors must be proofed according to section 5.2.

⚠ To avoid an electrical shock the valid national and international safety standards regarding dangerous contact voltages must be met when working with voltages exceeding 120V (60V) DC or 50V (25V)rms AC. The values in brackets are valid for special areas (e.g. medical and agricultural applications).

⚠ Test and measurement procedures in systems protected by RCD's should only be carried out in agreement with the operator of the system (IT-systems, processing technology, motors, etc.).

⚠ The protective earth must be checked for correct connection when carrying out measurements on earthed sockets or on equipment with protective earth connection. To perform the check briefly touch the contact electrode 'PE' on the measurement instrument after having connected the test leads. If an acoustic signal is audible and the LCD displays the message ‘Attention PE/N error!’, the PE and the N connection must be checked ! The user may only start the tests when the protective earth has been corrected!

During PE test is must be ensured that the measurement result is not interfered by extraneous insulation at the test location (flooring/wooden conductor).

☞ The UNITEST EUROtest automatically carries out the PE test, if the rotary switch 'Measurement Function' is positioned to one of the following functions: Zi/Ipsc (3), ZI/Ipsc (2), RI/Ipsc (1) or RCD (4). To perform the test, the user has to touch the contact electrode 'PE' after having connected the test leads. If an error message appears, further measurement is inhibited.

☞ It is recommended to switch off all loads prior to testing as they could cause erroneous measurement results.

☞ The protective earth must be voltage free to perform the measurement. If a external voltage is present, the instrument only displays the voltages having been generated by the measurement itself. However, the measurement will be interrupted if the contact voltage is exceeded by the actually present voltage between protective earth (PE) and neutral (N).

☞ Correct contact voltage measurement requires the installation of a measurement probe as the voltage caused by an insulation error have to be measured from instrument connector (PE) towards the local earth. The measurement probe has to be placed within the area of the reference earth (for the explanations of terms, please refer to section 5.5, page 18). In built-up areas it is almost impossible to install measurement probe. Therefore, the practical measurements are mostly performed without measurement probes. This measurement is faster and easier to carry out as no installation of the measurement probe and of the test lead is required. The measurement without probe can be carried out by using the neutral conductor (N) as measurement probe.

5.13 Measurement of contact voltage VC and earth resistance Re without RCD Tripping

The instrument UNITEST EUROtest measures in the function 'RCD VC' the contact voltage at a test current of 1/3 IΔN (33%) to avoid RCD tripping. The contact voltage present at the protective earth (PE) is measured towards the neutral conductor (N) or an external measurement probe.
The contact voltage measured is either calculated to nominal residual current (for standard RCD) or to double nominal residual current (for time delayed RCD), multiplied by the safety factor 1.05 and then displayed.

Simultaneously, resistance Re of loop L-PE is calculated by dividing the contact voltage displayed by the nominal residual current (Re=VC/IΔN).

⚠ If the contact voltage value is above the previously selected limit value 25V or 50V, the test is interrupted and an error message will be displayed.

5.13.1 Carrying out the Measurement

- Connect the desired test lead to the 4-pole measurement connector (17) of UNITEST EUROtest. Either use COMMANDER 1 or the 3-pole test leads.

- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn rotary switch 'Measurement Function' to function (4) RCD.

- Select function RCD V_C using function key F1 (FUNC). Press function key F1 several times, if required. The function selected is displayed in the top display line: 'RCD Vc'.

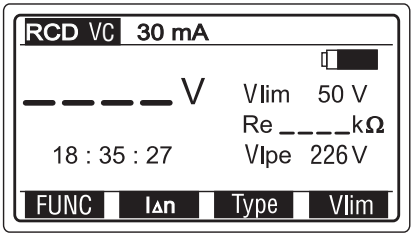


Figure 49: RCD Contact Voltage Menu

Explanation of displayed values:

Vlim	Limit value for contact voltage
Re	Calculated earth resistance (Re=VC/IΔN)
Vlpe	Mains voltage VL-PE

- Set the contact voltage limit value by pressing function key F4 (Vlim). The values 25V (agricultural and medical applications) or 50V (for all other systems) can be set. If the selected limit value is exceeded, the message 'Contact voltage >Vlim' and the symbol ⚠ are displayed.

- Select the RCD nominal residual current (depending on the RCD being tested) using function key F2 (IΔN). Press function key F2 several times, if required. The selected nominal residual current is shown in the top display line. The nominal residual current can be set to the following values: 10, 30, 100, 300, 500, 1000mA.

- Select the type of the RCD being tested using function key F3 (Type). Selection can be made between standard RCD's or time delayed RCD's. When selecting 'time delayed RCD' the character 'S' is shown in the top display line.

☞ In the event of a nominal residual current, time delayed RCD's trip within 130...500ms, at double nominal residual current within 60...200ms. Such RCD's are used as main residual current protection devices (please refer to IEC 61008-1) and are marked as [S] .

- Connect the test leads to UUT in accordance with Figure 50 or 51. If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

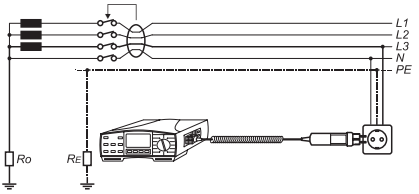


Figure 50: Connection of test leads to COMMANDER 1

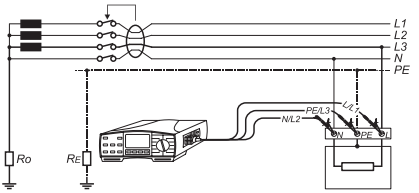


Figure 51: Connection of test leads to 3-pole test lead

☞ The instrument UNITEST EUROtest automatically recognises the measurement probe connected. For this purpose, connect connector C2/P (15) to measurement probe in accordance with Figure 51a.

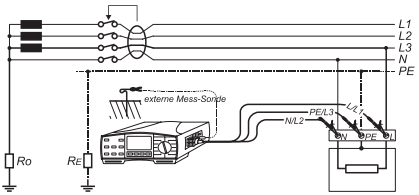


Figure 51a: Connection of test leads to 3-pole test lead and to external measurement probe

- Briefly press the key 'START'. The measurement takes approx. 6s. The measurement result is displayed in accordance with the following example.

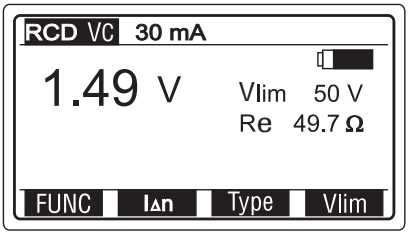


Figure 52: Measurement Value Display

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument or on COMMANDER 2, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER (for further information, kindly refer to section 7.1. "Saving Measurement Results ").

5.13.2 Remarks concerning the Measurement of Contact Voltage

- The input voltage range is 100...264V. If the voltage present is outside this range, the respective warning message 'Voltage Vlpe > 264V' or 'Voltage Vlpe < 100V' is displayed. Simultaneously, the symbol ⚠ is displayed and an acoustic signal is audible. Further measurement is disabled.
- If the RCD trips during this measurement, and the instrument displays the message 'RCD tripped out', then, either the RCD is faulty, the nominal residual current setting is too high, or a residual current is already present within the system causing the RCD to trip when adding to the test current.
- The nominal residual current and type settings of the RCD being tested are taken over into all RCD measurement functions.
- Setting of the contact voltage limit value is only possible in this menu and is valid for all other RCD measurement functions.

5.14 Measurement of the RCD trip time t and contact voltage VC with RCD Tripping

Within the function 'RCD t' the UNITEST EUROtest determines the RCD trip time at a test current of either 1/2*I∆N (50%), 1*I∆N (100%), 2*I∆N (200%), or 5*I∆N (500%), therefore the RCD will be tripped. Hereby, the contact voltage present at the protective earth (PE) is measured towards the neutral conductor (N) or an external measurement probe.
The contact voltage measured is multiplied by the safety factor 1.05 for standard RCD's. For time delayed RCD's the contact voltage is calculated to double the nominal residual current and multiplied by the safety factor 1.05.

⚠ If the contact voltage value is above the selected limit value 25V or 50V, the test is interrupted and an error message appears.

5.14.1 Carrying out the Measurement

- Connect the desired test lead to 4-pole measurement connector (17) of UNITEST EUROtest. Either use COMMANDER or the 3-pole test lead.

- Switch on the UNITEST EUROtest using key 'ON/OFF'. Turn the rotary switch 'Measurement Function' to function (4) RCD.

- Select function RCD t using function key F1 (FUNC). Press function key F1 several times, if desired. The function selected is shown again in the top display line: 'RCD t'.

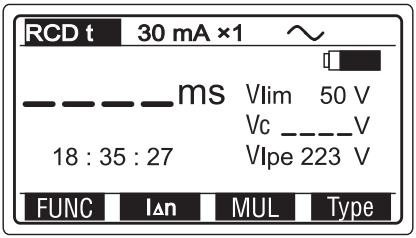


Figure 53: RCD Trip Time Menu

Explanation of displayed values:
Vlim Contact voltage limit value
Vc Contact voltage at nominal residual current
Vlpe Mains voltage VL-PE

- Select the nominal residual RCD current (depending on the RCD being tested) using function key F2 (IΔN) by pressing function key F2 several times, if required. The previously selected nominal residual current is shown in the top display line. The nominal residual current can be set to the following values: 10, 30, 100, 300, 500, 1000mA.

- Select the multiplication factor for the RCD nominal residual current using function key F3 (MUL) by pressing function key F3 several times, if required. The following values may be selected: x**1/2** (50%), x1 (100%), x2 (200%), and x5 (500%). **The value x5 (500%) is not available for a nominal residual current of 1000mA!**

☞ For RCD trip time measurements in accordance with EN 60364, **set the multiplication factor to x1 (100%)**. All other values can be used for trouble shooting for additional tests.

- Select the type of RCD being tested and the test current phase angle using function key F4 (Type).
  - Selection can be made between standard RCD's or time delayed RCD's (display 'S').
  - The test current phase angle can be set either to 0° or to 180°.

The settings are shown in the top display line. When selecting 'time delayed RCD' the message 'S'. is displayed in the top line.

☞ Time delayed RCD's trip for nominal residual current within 130...500ms, for double nominal residual current within 60...200ms. Such RCD's are used as main residual current protection devices (please refer to IEC 61008-1) and are marked as [S].

- Connect the test leads to UUT in accordance with Figure 50 or 51 (page 34). If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

- Briefly press the key 'START'. The measurement result is displayed in accordance with the following example.

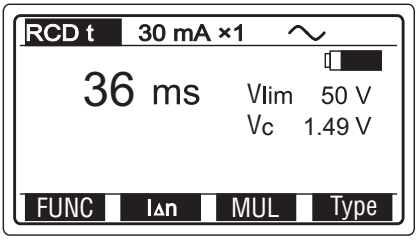


Figure 54: Measurement Value Display

☞ Save the displayed measurement value, if desired. Press the key 'SAVE' on test instrument or on COMMANDER 2, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER (for further information, kindly refer to section 7.1. "Saving Measurement Results ").

5.14.2 Remarks concerning the RCD trip time measurement

- The input voltage range is 100...264V. If the voltage present is outside this range, the respective warning message 'Voltage Vlpe > 264V' or 'Voltage Vlpe < 100V' is displayed. Simultaneously, the symbol ⚠ is displayed and an acoustic signal is audible. Further measurement is disabled.
- For safety reasons, the contact voltage measurement is always performed prior to trip time measurement. This is measured at a preliminary test current of 1/3*IΔN (33%) (please refer to section 5.13).
- For time delayed RCD's a delay time of 30s is required after preliminary test current and prior to performing the proper trip time measurement, as these RCD's work with integration of the residual current. This waiting time is displayed as a countdown with the message 'Wait: 30s'.
- If the RCD trips during this measurement and the instrument does not display a trip time but the message 'RCD tripped out' appears the preliminary test current has already tripped the RCD. Then, either the RCD is faulty, the nominal residual current setting is too high or a residual current is already present within the system causing the RCD to trip when added to the test current.
- If the RCD does not trip or if the trip time displayed is above the limit value of 300ms, the instrument displays the message 'Time out of limit' and the symbol ⚠ . The reasons may be as follows: the RCD is faulty, the nominal residual current setting is too low or a connection exists between the protective earth (PE) and the neutral conductor (N) after the RCD.
- If the trip time for time delayed RCD's is below 130ms (or 60ms or 50ms) the message "Time out of limit" is also displayed.
- The nominal residual current and type settings of the RCD being tested are taken over into all RCD measurement functions.
- The setting of the contact voltage limit value is only possible in the menu RCD V_C.

5.15 Measurement of RCD Trip Current IΔ, of trip time t and contact voltage V_C at rising residual current (Ramp Method)

Within the function 'RCD' the UNITEST EUROtest measures the RCD trip current and trip time using a rising test current of the nominal residual current of 20% to 110% (in steps of 5%) by tripping the RCD. Hereby, the contact voltage present for the trip current is measured at the protective earth (PE) towards the neutral conductor (N) or an external measurement probe.
For standard RCD's the contact voltage measured is displayed.

The rising residual current method is not required, however, for accordance it is an efficient method for trouble-shooting within an installation and sometimes required for certain installations. A RCD trip current may be within a range of 50% to 100% of nominal residual current, the trip time must be below 300ms.

☞ If the contact voltage value is above the selected limit value 25V or 50V, the test is interrupted and an error message is displayed.

5.15.1 Carrying out the Measurement

- Connect the desired test lead to the 4-pole measurement connector (17) of the UNITEST EUROtest. Either use COMMANDER 1 or the 3-pole test leads.

- Switch on the instrument UNITEST EUROtest using the key 'ON/OFF'. Set the rotary switch 'Measurement Function' to function (4) RCD.

- Select the function RCD ⊿ using function key F1 (FUNC). Press function key several times, if required. The selected function is shown again in the top display line: ' RCD ⊿ '.

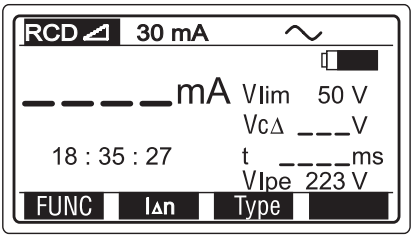


Figure 55: RCD Menu

Explanation of displayed values:

Vlim -Contact voltage limit value
VC∆ -Contact voltage at trip current
t Trip time
Vpe Mains voltage VL-PE

- Select the nominal RCD trip current (depending on the RCD under test using function key F2 (I∆n). Press function key F2 several times if required. The nominal residual current set is shown in the top display line. The nominal residual current can be set to the following values: 10, 30, 100, 300, 500, 1000mA.

- Select test current phase angle using function key F3 (Type). The test current phase angle can be set either to 0°(⁓) or to 180°(⁓). The value selected is shown in the top display line.

- Connect the test leads to UUT in accordance with Figure 50 or 51 (page 34). If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

- Briefly press the key 'START'. The measurement result is displayed in accordance with the following example.

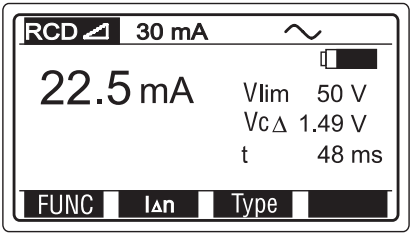


Figure 56: Measurement Value Display

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument or on COMMANDER 2, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER (for further information, kindly refer to section 7.1. "Saving Measurement Results ").

5.15.2 Remarks concerning RCD ID trip current at rising residual current (ramp method)

- The input voltage range is 100...264V. If the voltage present is outside this range, the respective warning message 'Voltage Vlpe > 264V' or 'Voltage Vlpe < 100V' is displayed. Simultaneously, the symbol ⚠ is displayed and an acoustic signal is audible. Further measurement is disabled.
- If the RCD trips during this measurement and the instrument does not display a trip time but the message 'RCD tripped out', the RCD has tripped too fast. Then, either the RCD is faulty, the nominal residual current setting is too high or a residual current is already present within the system causing the RCD to trip when added to the test current.
- If the RCD does not trip or if the trip time displayed is above the limit value of 300ms, the instrument displays the message 'Time out of limit' and the symbol ⚠ . The reasons may be as follows: the RCD is faulty, or a connection exists between the protective earth (PE) and the neutral conductor (N) after the RCD.
- If the RCD trips during this measurement and if the instrument displays the message "Trip current error!", the RCD has not tripped within the limits. Either the RCD is faulty or the nominal residual current setting is too low.
- The nominal residual current and type settings of the RCD being tested are taken over into all RCD measurement functions.
- Time delayed RCD's setting is not possible.
- Setting the contact voltage limit value is only possible in the menu RCD V_C.

5.16 Automatic RCD Analysis

The instrument UNITEST EUROtest is equipped with an automatic RCD analysis enabling the simple and fast testing of the various RCD parameter by simply switching on the RCD again between each test. The following six tests are performed:

- RCD trip behaviour for a test current of 0.5*IΔN (50%), for phase angle 0°, **RCD may NOT trip!**
- RCD trip behaviour for a test current of 0.5*IΔN (50%), for phase angle 180°, **RCD may NOT trip!**
- RCD trip time for a test current of 1*IΔN (100%), for phase angle 0°, **RCD must trip within 300ms('S' 500ms)!**
- RCD trip time for a test current of 1*IΔN (100%), for phase angle 180°, **RCD must trip within 300ms ('S' 500ms)!**
- RCD trip time for a test current of 5*IΔN (500%), for phase angle 0°, **RCD must trip within 40ms ('S' 130ms)!**
- RCD trip time for a test current of 5*IΔN (500%), for phase angle 180°, **RCD must trip within 40ms ('S' 130ms)!**

The contact voltage is continuously monitored during each test and is displayed after completion of the last test. The measured contact voltage is multiplied by the safety factor 1.05 for standard RCD's. For time delayed RCD's the contact voltage is calculated to double nominal residual current and multiplied by safety factor 1.05.

☞ If the contact voltage value is above the pre-selected limit 25V or 50V the test is interrupted and an error message is displayed.

☞ If an error is detected during individual testing the test is interrupted and the error is directly displayed.

5.16.1 Carrying out the Measurement

- Connect the desired test lead to 4-pole test connector (17) of UNITEST EUROtest. Either use COMMANDER 1 or the 3-pole test lead.

- Switch on the UNITEST EUROtest using key 'ON/OFF' . Set rotary switch 'Measurement Function' to function (4) RCD.

- Select function ANALYSE via function key F1 (FUNC). Press function key F1 several times, if required. The function selected is shown again in the top display line: 'ANALY'.

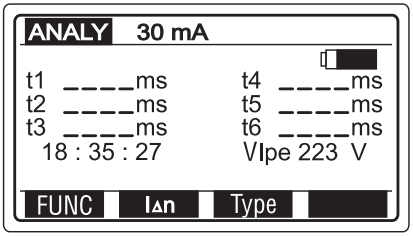


Figure 57: RCD Analysis Menu

Explanation of displayed values:
t1 ... t6 Trip times for each test
Vlpe Mains voltage VL-PE

- Select the nominal residual RCD current (depending on the RCD being tested) using function key F2 (IΔN). Press function key F2 several times, if required. The selected nominal residual current is shown in the top display line. The residual current can be set to the following values: 10, 30, 100, 300, 500mA.

- Select RCD to be tested using function key F3(Type). Selection can be made between standard RCD's or time delayed RCD's (display 'S'). When selecting 'time delayed RCD' the message 'S'. is shown in the top display line.

☞ Time delayed RCD's trip for nominal residual current within 130...500ms, for double nominal residual current within 60...200ms. Such RCD's are used as main residual current protection devices (please refer to IEC 61008-1) and are marked as [S] .

- Connect the test leads to UUT in accordance with Figure 50 or 51 (page 34). If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

- Briefly press the key 'START'. The measurement result is displayed in accordance with the following example.

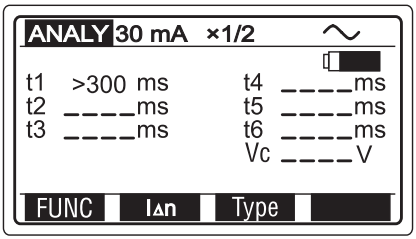


Figure 58: RCD Analysis Menu, Test Sequence 1

Explanation of displayed values:
t1 Trip time during first test sequence
V_C Contact voltage

- After successful performance of the first test sequence, the second test is automatically performed (test current 0.5*IΔN, phase angle 180°). Then, the third test sequence follows (test current 1*IΔN, phase angle 0°). The individual test results are displayed.

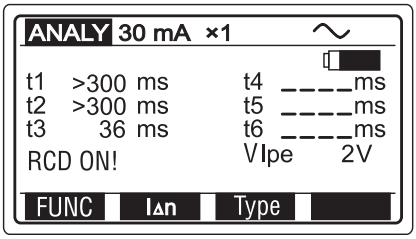


Figure 59: RCD Analysis Menu, Test Sequence 3

- To continue with the test **switch on the RCD after every tripping** complying with the respective message 'RCD ON!'. The following test sequences are performed automatically.

- The measurement results are displayed after successful performance of all six test sequences, please refer to Figure 60.

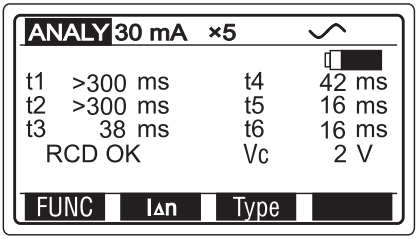


Figure 60: RCD Analysis Menu, Test Sequence 6

- After successful RCD analysis the message 'RCD OK' is displayed and confirms that all test sequences have been passed successfully.

⚠ If the limit values for trip time or contact voltage have been exceeded during one sequence, the test is interrupted and the respective error messages 'Time out of limit' or 'Contact voltage>Vlim' are displayed.

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument or on COMMANDER 2, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER (for further information, kindly refer to section 7.1. "Saving Measurement Results ").

5.16.2 Remarks concerning RCD Analysis Function

- The input voltage range is 100...264V. If the voltage present is outside this range, the respective warning message 'Voltage VIpe > 264V' or 'Voltage VIpe < 100V' is displayed. Simultaneously, the symbol ⚠ is displayed and an acoustic signal is audible. Further measurement is disabled.
- For safety reasons, the contact voltage measurement is always performed prior to trip time measurement. This is measured at a preliminary test current of 1/3*IΔN (33%) (please refer to section 5.13). If the RCD trips during this measurement and the instrument does not display a trip time but the message 'RCD tripped out' the preliminary test current has already caused the RCD to trip. Then, either the RCD is faulty, the nominal residual current setting is too high or a residual current is already present within the system causing the RCD to trip when added to the test current.
- For time delayed RCD's a waiting time of 30s is required prior to test sequences 3 to 6 as these RCD's work with by integrating the residual current. This waiting time is displayed as a countdown with the message 'Wait: 30s'.
- If the RCD does not trip or if the trip time displayed is outside the limits, the instrument displays the message 'Time out of limit!' and the symbol ⚠ . The reasons may be as follows: the RCD is faulty, the nominal residual current setting is too low, or a connection exists between the protective earth (PE) and the neutral conductor (N) after the RCD.

- The nominal residual current and type settings of the RCD being tested are taken over into all RCD measurement functions.
- Setting the contact voltage limit value is only possible in the menu RCD V_C.
- The setting of nominal residual currents for 1000mA is not possible.

5.17 Loop impedance measurement ZI (L-PE) and prospective short-circuit current measurement Ipsc (Function 2)

The loop impedance of a current loop is defined as the impedance sum of the current source; the phase conductor between current source to the measurement point and; the return line from the measurement point to the second pole of the current source (please also refer to Figure 61).

The loop impedance value allows the calculation of the short-circuit current, which is difficult to determine in practical applications.

The short-circuit current value must be known to ensure that installed overcurrent protection device can trip at a sufficiently high current in the event of a short-circuit.
This current is required to ensure a fast cut-out time depending on the current circuit of minimum 0.2 seconds or 5 seconds. For socket current circuits up to 35A to cut-out time is max. 0.2s, for all other circuits it is max. 5s.

The measurement is carried out by short current pulse and the measurement of the voltage drop on the built-in test resistor before and during the current pulse. Due to the test current a voltage drop occurs in the current loop to be measured resulting in a brief voltage drop at the test resistance.

If a RCD is installed, it has to be bridged for loop impedance measurement. However, depending on the national standards this measurement may not be required.

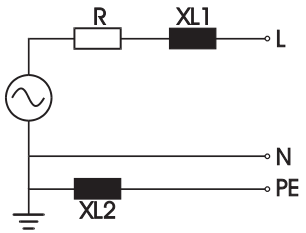


Figure 61: Impedances within the Current Circuit

⚠ The protective earth must be checked for correct wiring when carrying out measurements on earthed sockets or on equipment with protective earth connection. To perform the check, briefly touch the contact electrode 'PE' on the measurement instrument after having connected the test leads. In case an acoustic signal is audible and the LCD displays the message 'Attention PE/N error!' the PE and the N connection must be checked ! The user may only start the tests once the protective earth has been corrected! During the PE test it must be ensured that the measurement result is not interfered by extraneous insulation at the test location (flooring or the location in general).

⚠ Prior to any loop impedance measurement any possibly installed RCD's have to be bridged.

☞ Connected mains loads and the influences due measurement load can cause faulty measurement results. Therefore, several measurements should be carried out and compared. To obtain precise measurement results it is recommended to switch off or disconnect all loads from the mains prior to testing.

5.17.1 Carrying out the Measurement

- Connect the desired test lead to the 4-pole test connector (17) of UNITEST EUROtest. Either use COMMANDER 1 or the 3-pole test lead.

- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn the rotary switch 'Measurement Function' to function (2) Z_L/I_{PSC}.

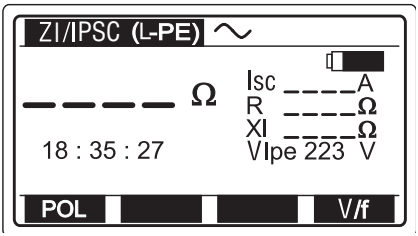


Figure 62: Z_L/I_{PSC} Menu

Explanation of displayed values:

Isc	Prospective short-circuit current
R	Effective resistance part
XI	Reactive resistance part
Vlpe	Mains voltage VL-PE

- Function key F1 (POL) allows additional selection of test current phase angle (polarity). Press key F1. The phase angle selected (0° or 180°) is shown in the top display line by means of the symbol " ~ ".

- Connect test leads to UUT in accordance with Figure 63 or 64. If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

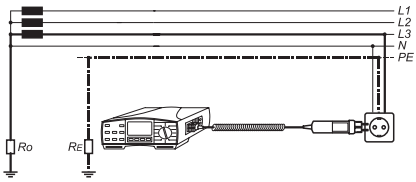


Figure 63: Test leads connection to COMMANDER 1

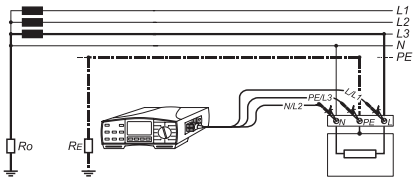


Figure 64: Test leads connection to 3-pole test lead

- Briefly press key 'START'. The measurement result is displayed in accordance with the following example: Prospective short-circuit current Ipsc is calculated as follows: $I_{PSC} = \frac{Vnom}{ZL}$

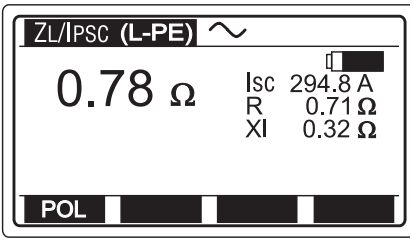


Figure 65: Z_L/I_{PSC} Measurement Values

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument or on COMMANDER 2, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER (for further information, kindly refer to section 7.1. "Saving Measurement Results ").

5.17.2 Remarks regarding Loop Impedance Measurement

- The input voltage range is 100...264V. If the voltage present is outside this range, the respective warning message 'Voltage Vlpe > 264V' or 'Voltage Vlpe < 100V' is displayed. Simultaneously, the symbol ⚠ is displayed and an acoustic signal is audible. Further measurement is disabled.
- The prospective short-circuit current is calculated by means of the nominal mains voltage. The following ranges are valid:

  Nominal voltage 115V for input voltage range of 100...160V

  Nominal voltage 230V for input voltage range of >160...264V
- If many measurements (more than 30 measurements at 230V) are carried out one after the other within a short time period, the message 'Overheated' is displayed. After the instrument cools down, the measurements can resumed. The message appears after pressing the key 'START'.
- If the measurement value exceeds the measurement range the value >2000Ω is displayed !
- The specified accuracy is only valid if the mains voltage stays constant during the measurement!
- In the case the neutral voltage conductor (N) is not connected during measurement, or if commander 2 is used for this measurement the display show the error message “Attention PE/N error”

5.18 Line impedance measurement Zi (L-N/L) and prospective short-circuit current measurement Ipsc (Function 3)

As described in section 5.17 Loop Impedance, the line impedance measurement is performed in accordance with the same measurement principle. However, here, the current loop L-N is measured. According to some national or international standards, this measurement may not be required. In practical applications, however, this measurement is very important and useful for the evaluation of the electrical system as well as for trouble-shooting.

☞ This measurement can be used in systems (TN-Systems) equipped with RCD's to detect wrong wiring of protective earth (PE) and neutral (N) without disconnection of the N in the distribution board. In case of wrong wiring, the RCD trips during line impedance measurement.

☞ Furthermore, this measurement can also be used to proof low resistance of neutral conductor (N).

⚠ The protective earth must be checked for correct wiring when carrying out measurements on earthed sockets or on equipment with protective earth connection. To perform the check, briefly touch the contact electrode 'PE' on the measurement instrument after having connected the test leads. In case an acoustic signal is audible and the LCD displays the message ‘Attention PE/N error!’ the PE and the N connection must be checked ! The user may only start the tests once the protective earth has been corrected! During the PE test it must be ensured that the measurement result is not interfered by extraneous insulation at the test location (flooring or the location in general).

5.18.1 Carrying out the Measurement

Connect the desired test lead to the 4-pole measurement connector (17) of UNITEST EUROtest. Either use COMMANDER 1 or the 3-pole test lead.

- Switch on the UNITEST EUROtest using key 'ON/OFF'. Turn the rotary switch 'Measurement Function' to position (3) Z_l/I_{PSC}.

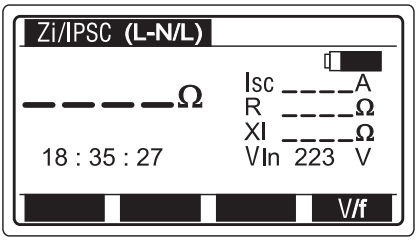


Figure 66: Z_l/I_{PSC} Menu

Explanation of displayed values:

Isc	Prospective short-circuit current
R	Effective resistance part
XI	Reactive resistance part
VIn	Mains voltage VL-N

- Connect test leads to UUT in accordance with Figures 67 or 68. If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

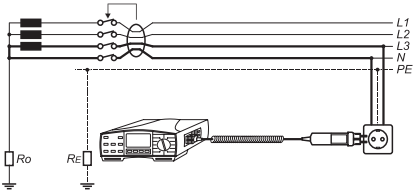


Figure 67: Test leads connection to COMMANDER 1

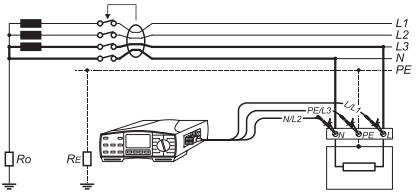


Figure 68: Test leads connection to 3-pole test lead

- Briefly press key 'START'. The measurement result is displayed in accordance with the following example: Prospective short-circuit current Ipsc is calculated as follows: $I_{PSC} = \frac{Vnom}{Zi}$

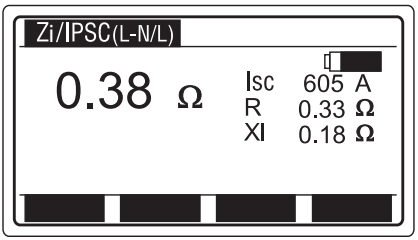


Figure 69: Z_l/I_{PSC} Measurement Values

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument or on COMMANDER 2, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER (for further information, kindly refer to section 7.1. "Saving Measurement Results ").

5.18.2 Remarks regarding Line impedance measurement

- The input voltage range is 100...440V. If the voltage present is outside this range, the respective warning message 'Voltage V_{LN} > 440 or 'Voltage V_{LN} < 100V' is displayed. Simultaneously, the symbol ⚠ is displayed and an acoustic signal is audible. Further measurement is disabled.
- The prospective short-circuit current is calculated by means of the nominal mains voltage. The following ranges are valid:
  Nominal voltage 115V for input voltage range of 100...160V
  Nominal voltage 230V for input voltage range of >160...264V
  Nominal voltage 400V for input voltage range of >264...440
- If many measurements (more than 30 measurements at 230V) are carried out one after the other within a short time period, the message 'Overheated' is displayed. After the instrument cools down, the measurements can be resumed. The message appears after pressing the key 'START'.
- If the measurement value exceeds the measurement range, the value >2000Ω is displayed !
- The specified accuracy is only valid if the mains voltage stays constant during the measurement!
- In the case the protective earth connector (PE) is not connected during measurement, or if commander 2 is used for this measurement the display show the error message “Attention PE/N error”

5.19 Earth voltage measurement using a measurement probe by a loop impedance measurement ZI (Function 2) according to Swiss standard SEV 3569

The determination of the earth voltage is prescribed in the Swiss standard SEV 3569.

The earth voltage is the voltage occurring in the event of an error between the earth connection (PE) of an equipment against a reference earth (please refer to section 5.5). In case of error (e.g. short-circuit to metall housing), the short-circuit current flows from the earth connection (e.g. casing) of an equipment via the PE or PEN to the earth and causes a voltage drop. This function is used to directly measure and display the earth voltage by using an external measurement probe. This probe is either connected to the local earth, and equipotential bonding conductor, or touchable and conductible parts (e.g. radiator).

☞ The instrument UNITEST EUROtest automatically recognises a measurement probe connected.

5.19.1 Carrying out the Measurement

- Connect the 3-pole test lead to the 4-pole test connector (17) of the UNITEST EUROtest.
- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn the rotary switch ‘Measurement Function’ to function (2) Z_L/I_{PSC}.

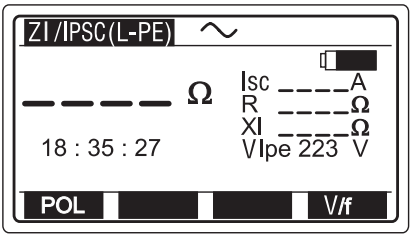


Figure 70: Z_L/I_{PSC} Menu

Explanation of displayed values:

Ipsc	Prospective short-circuit current
R	Effective resistance part
XI	Reactive resistance part
Vlpe	Mains voltage VL-PE

- Function key F1 (POL) allows additional selection of test current phase angle (polarity). Press key F1. The phase angle selected (0° or 180°) is shown in the top display line by means of a corresponding symbol.

- Connect test leads to UUT in accordance with Figure 71. Furthermore, connect measurement probe to connection socket C2/P (15). If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

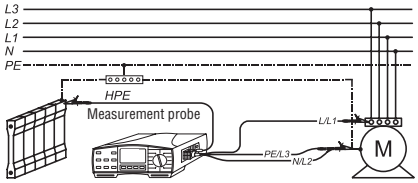


Figure 71: Test leads connection to measurement probe

- Briefly press key 'START'. The measurement result is displayed in accordance with the following example. Prospective short-circuit current Ipsc is calculated as follows: $I_{PSC} = \frac{Vnom}{ZI}$

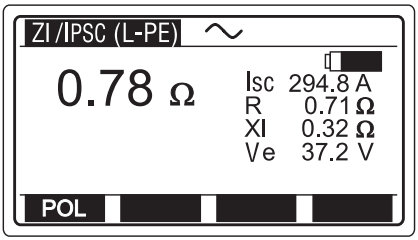


Figure 72: Z_L/I_{PSC} Measurement Values (with probe)

Explanation of displayed values:
Isc Prospective short-circuit current
R Effective resistance part
XI Reactive resistance part
Ve Earth voltage

☞ The earth voltage displayed is calculated as follows: $Ve = \frac{Re}{ZL} \times Vnom$

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument or on COMMANDER 2, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER (for further information, kindly refer to section 7.1. "Saving Measurement Results ").

5.19.2 Remarks regarding Earth Voltage Measurement

- The input voltage range is from 100...264V. If the voltage present is outside this range, the respective warning message 'Voltage VIpe > 264V' or 'Voltage VIpe < 100V' is displayed. Simultaneously, the symbol ⚠ is displayed and an acoustic signal is audible. Further measurement is disabled.
- The prospective short-circuit current is calculated by means of the nominal mains voltage. The following ranges are valid:
  Nominal voltage 115V for input voltage range of 100...160V
  Nominal voltage 230V for input voltage range of >160...264V
- If many measurements (more than 30 measurements at 230V) are successively carried out within a short time period, the message 'Overheated' is displayed. After the instrument cools down, the measurements can be resumed. The message appears after pressing the key 'START'.
- If the measurement value exceeds the measurement range the value >2000Ω is displayed !
- The specified accuracy is only valid if the mains voltage stays constant during the measurement!

5.20 Loop resistance measurement R_L (N-PE) and prospective short-circuit current measurement Ipsc (Function 1)

This loop measurement can be used in TT-systems to determine earth resistance by measuring the loop N-PE. This measurement can be carried out without tripping of installed RCD's.

⚠ The protective earth must be checked for correct wiring when carrying out measurements on earthed sockets or on equipment with protective earth connection. To perform the check, briefly touch the contact electrode 'PE' on the measurement instrument after having connected the test leads. In case an acoustic signal is audible and the LCD displays the message 'Attention PE/N error!' the PE connection must be checked ! The user may only start the tests once the protective earth has been corrected! During the protective earth test it must be ensured that the measurement result is not interfered by extraneous insulation at the test location (flooring or the location in general).

☞ Connected mains loads and the influences due measurement load can cause faulty measurement results. Therefore, several measurements should be carried out and compared. To obtain precise measurement results it is recommended to switch off or disconnect all loads from the mains prior to testing.

5.20.1 Carrying out the Measurement

- Connect the desired test lead to 4-pole measurement connector (17) of the UNITEST EUROtest. Either use COMMANDER 1 or the 3-pole test lead.

- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn rotary switch 'Measurement Function' to the function (1) R_L/I_{PSC}.

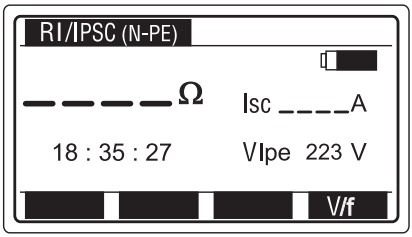


Figure 73: R_L/I_{PSC} Menu

Explanation of displayed values:
Ipsc Prospective short-circuit current
VIpe Mains voltage VL-PE

- Connect the test leads to UUT in accordance with Figure 74 or 75. If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

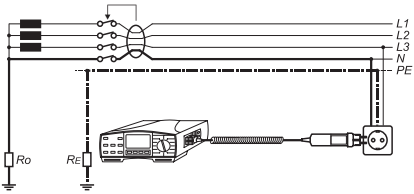


Figure 74: Test Leads Connection to COMMANDER 1

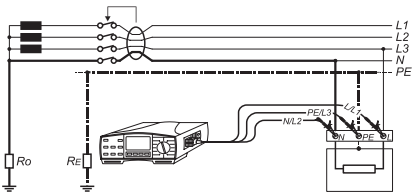


Figure 75: Test Leads Connection to 3-pole Test Lead

- Briefly press the key 'START'. The measurement result is displayed in accordance with the following example. The prospective short-circuit current Ipsc is calculated as follows:

$$I_{PSC} = \frac{Vnom}{RL}$$

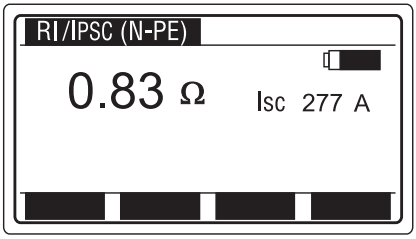


Figure 76: R_L/I_{PSC} Menu

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument or on COMMANDER 2, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER (for further information, kindly refer to section 7.1. "Saving Measurement Results ").

5.20.2 Remarks concerning the Loop Resistance (N-PE) Measurement

- The input voltage range is 100...264V. If the voltage present is outside this range, the respective warning message 'Voltage Vlpe > 264V' or 'Voltage Vlpe < 100V' is displayed. Simultaneously, the symbol ⚠ is displayed and an acoustic signal is audible. Further measurement is disabled.
- The prospective short-circuit current is calculated by means of the nominal mains voltage. The following ranges are valid:

  Nominal voltage 115V for input voltage range of 100...160V

  Nominal voltage 230V for input voltage range of >160...264V
- If the measurement value exceeds the measurement range the value >2000Ω is displayed !
- The specified accuracy is only valid if the mains voltage stays constant during the measurement!
- This measurement is carried out using an internal test voltage. However, it is still necessary that the mains voltage is present at test leads L and N during the measurement. The correct polarity of both connection for phase (L) and neutral (N) are automatically carried out the measurement instrument.

5.21 Rotary Field Measurement (Function 5)

The UNITEST EUROtest allows the measurement of the rotary field at mains voltages of 100...440V. The three phase voltages are also displayed.

⚠ The measurement connectors may not be connected to external voltages exceeding 600V AC or DC to avoid any instrument damage.

⚠ Prior to any usage, inspect the instrument and the test leads for perfect functioning.

⚠ Test leads and test probes may only be touched at handles provided. Direct contact with the test probe must be avoided.

5.21.1 Carrying out the Measurement

- Connect the 3-pole test lead to the 4-pole test connector (17) UNITEST EUROtest. If required, the user may use the Three Phase Adapter (available as accessory, Cat. No.1118).

- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn the rotary switch 'Measurement Function' to function (5) Rotary Field / Cable Locator.

- Select the function ' Rotary Field' using the function key F1 (FUNC) by pressing function key F1. The function selected is shown again in the top display line: 'ROTARY FIELD '.

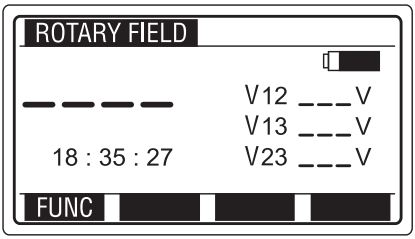


Figure 77: Rotary Field Menu

Explanation of displayed values:

V12 phase voltage L1 - L2
V13 phase voltage L1 - L3
V23 phase voltage L2 –L3

- Connect the test leads to UUT in accordance with Figure 78. Ensure that the connection of the three test leads L1, L2,and L3 is in correct order. If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'.

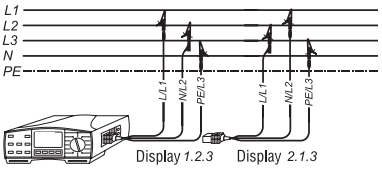


Figure 78: Rotary Field Measurement

- Briefly press the key 'START'. The measurement is started. The measurement result is displayed in accordance with the following example.

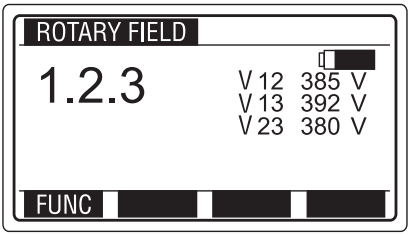


Figure 79: Rotary Field Measurement

Explanation of the displays:

1. 2. 3 Phase sequence RIGHT according to test lead connection L1 L2 and L3

2. 1. 3 Phase sequence LEFT, according to test lead connection L1 L2 and L3

-. -. -. No three-phase current system or no mains voltage present

☞ If no mains voltage is present or if the mains voltage present is too low, the instrument displays the message 'Input voltage <100V'. In the event of a single-phase system or a an asymmetric three-phase system, the message 'No 3-phase system' is displayed.

- Briefly press the key 'START' again. The message is terminated. The last measurement result remains on the display.

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument or on COMMANDER 2, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER (for further information, kindly refer to section 7.1. "Saving Measurement Results ").

5.21.2 Remarks concerning the Rotary Field Measurement

- Measurement values outside the measurement range or measurement values from a single-phase mains or asymmetric three-phase systems may not be saved. The following message is displayed: 'Not for saving'.

•The input voltage range is 100...440. If the voltage present is outside this range, the respective warning message 'Input voltage < 100V' or 'Input voltage >440V' is displayed. Simultaneously, the symbol ⚠ is displayed and an acoustic signal is audible.

5.22 Current and leakage current measurement (Function 8)

Using an external clamp adapter the UNITEST EUROtest can measure currents up to 200A at frequencies of 50...60Hz.

⚠ The safety measures of accident prevention prescriptions regarding manipulations of live parts or in proximity of live parts have to be respected.

⚠ When working with clamp adapters special care must be taken that they are connected to the measurement instrument prior to surrounding a live conductor. Open clamp adapter outputs can present a danger for the user or lead to clamp adapter destruction due to high inductance voltage!

☞ To carry out current measurements between 0.5A...200A the **UNITEST clamp adapter (Cat. No.1245)** is required.

5.22.1 Carrying out the Measurement

- Connect the required clamp adapter to both measurement connectors C1 (14) and C2/P (15), please refer to Figure 81.

- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn the rotary switch 'Measurement Function' to the function (8) "Current".

- Select the function "Current ✂" using the function key F1 (FUNC) by pressing function key F1. The function selected is shown in the top display line: CURRENT ✂.

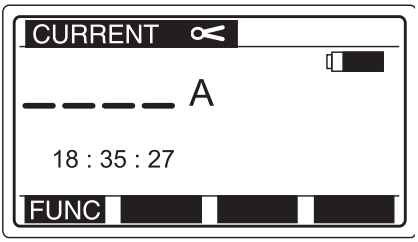


Figure 80: Current Measurement Menu

- Open the clamp adapter and surround the conductor to be measured at UUT. If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'.

☞ To measure **load currents** surround the phase conductor or neutral conductor with the clamp adapter.

☞ For **leakage current measurements**, the PE conductor must be surrounded. For **differential current measurements**, all active conductors (L1, L2, L3, and N) have to be surrounded.

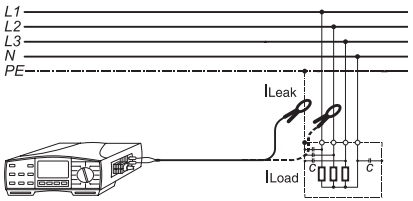


Figure 81: Clamp Adapter Connection for
ILEAK Leakage current
ILOAD Load current

- Briefly press the key 'START'. The measurement is started. The measurement value is displayed in accordance with the following example.

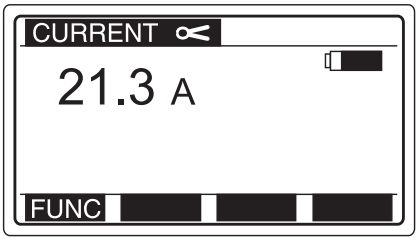


Figure 82: Current Measurement Display

- Briefly press the key 'START' again. The measurement is terminated and the last measurement result remains on the display.

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER (for further information, kindly refer to section 7.1. "Saving Measurement Results ").

5.22.2 Remarks concerning load current and leakage current measurements

- For measurement values outside the measurement range the following message is displayed: >200A!
- The current is measured as True RMS, independently of the shape of the curve.
- Only clamp adapters with a transfer ratio of 1000:1 may be connected. Furthermore, the maximum input current of the measurement instrument of 0.3A must be respected.
  We recommend UNITEST clamp adapter 1000A (Cat. No.1225) and UNITEST clamp adapter 500A (Cat. No.1226).
- The additional error of the connected clamp adapters has to be taken into account regarding measurement error!

5.23 Peak Current Measurements (Function 8)

Using an external clamp adapter the UNITEST EUROtest can measure peak or inrush currents between 5A up to 280A at frequencies of 50...60Hz. The measurement rate is to 0.5ms. Thus, inrush current peaks of loads (e.g. motors, transformers) are measured in a swift and simple way.

⚠ The safety measures of accident prevention prescriptions regarding manipulations of live parts or in proximity of live parts have to be respected.

⚠ When working with clamp adapters special care must be taken that they are connected to the measurement instrument prior to using them to surround a live conductor. Open clamp adapter outputs can present a danger for the user or lead to clamp adapter destruction due to high inductance voltage!

☞ To carry out peak current measurements the or the **UNITEST clamp adapter (Cat. No.1245)** is required.

5.23.1 Carrying out the Measurement

- Connect the required clamp adapter to both measurement connectors C1 (14) and C2/P (15), please refer to Figure 81.

- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn the rotary switch 'Measurement Function' to the function (8) "Current".

- Select the function "PEAK CURRENT" using the function key F1 (FUNC) by pressing function key F1. The function selected is shown in the top display line: PEAK CURRENT ✂ .

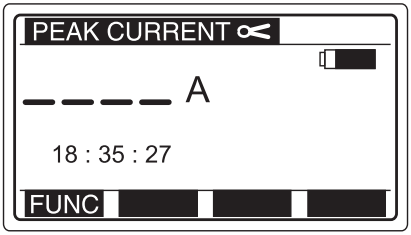


Figure 83: Peak Current Measurement Menu

- Open the clamp adapter and use it to surround one of the active conductors of the UUT to be measured. If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'.

- Briefly press the key 'START'. The measurement is started. The instrument records the maximum current value and shows it on the display. Simultaneously, the message ' Sampling...' is displayed. If a new measurement value exceeds the previously displayed value, the new value is displayed. Only one value is displayed at a time and can be saved, if required. The measurement value is displayed in accordance with the following example.

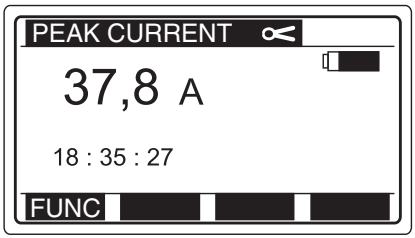


Figure 84: Current Measurement Display

- Briefly press the key 'START' again. The measurement is terminated and the last measurement result remains on the display.

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER (for further information, kindly refer to section 7.1. "Saving Measurement Results ").

5.23.2 Remarks concerning Peak Current Measurements

- For measurement values outside the measurement range the following is displayed: >280A!
- If the current values measured are below 5A, the message "<5A" is displayed.
- Only clamp adapters with a transfer ratio of 1000:1 may be connected. Furthermore, the maximum input current of the measurement instrument of 0.3A must be respected.
  We recommend UNITEST clamp adapter 1000A (Cat. No.1225) and UNITEST clamp adapter 500A (Cat. No.1226).
- The additional error of the clamp adapters connected has to be taken into account regarding the measurement errors!

5.24 Voltage Level Measurement for Overvoltage Protection Devices (Varistors) (Function 9)

The UNITEST EUROtest allows the voltage level measurement for overvoltage protection devices in a swift and easy way. The voltage level is displayed directly as DC voltage or as maximum mains RMS voltage value. The measurement is carried out at a voltage ramp of 0...1000V, at a test current of 1mA. Overvoltage protection devices for AC voltage circuits are usually built for voltages of 15%...20% above the nominal mains voltage peak value.

Example:
Mains nominal voltage: 230V ±10%
Peak value at nominal mains voltage
230V * 1,41 = 324V
Maximum value of nominal mains value:
230V + 10%* 230V = 253V
The peak value of maximum value is calculated as follows 253V *1,41 = 356V
The trigger voltage of the overvoltage protection device should be approx. 15%... 20% above this value to ensure that it does not respond at overvoltages of 10% within the mains system.
Voltage level 356V *1.15 = 409V

⚠ Prior to any measurement it must be ensured that the system parts being tested are voltage free.

☞ If a voltage exceeding 30V AC/DC is present at test leads the voltage is displayed. Simultaneously a warning message 'Input voltage >30V' and a signal sound are audible. Further measurement is disabled.

⚠ During the measurement, all loads must be disconnected from the mains system to avoid erroneous measurements or destruction of the loads caused by the test voltage.

⚠ The UUT and the system to be tested may not be touched during the measurement, danger of electrical shock!

⚠ The measurement causes the capactive UUTs to be charged by the test voltage. The instrument UNITEST EUROtest automatically discharges the UUT after the completion of measurement. When interrupting the measurement or when removing the test leads prior to the completion of measurement, a dangerous voltage may be present at UUT. If a dangerous voltage is detected during voltage measurement the UUT has to be discharged manually, using a high-resistant load (not via short-circuit !).

☞ If UUTs with larger capacities are tested (e.g. long cables or conduits), it may occur that the automatic discharge procedure takes more time. In this case the discharge voltage is displayed on the LCD. Ensure that the test leads stay connected to the UUT until the voltage value falls below 50V or proceed to manual discharge using a high-resistant load (not via short-circuit !) !

5.24.1 Carrying out the Measurement

- Connect the desired test lead to the 4-pole test connector (17) of UNITEST EUROtest. Either use the 3-pole test lead or COMMANDER 2 (available as accessory Cat. No.1223).

☞ For 3-pole test lead only use the connectors L (black) and N (blue). PE (green) may be connected to N or may be left open!

- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn the rotary switch 'Measurement Function' to function (9) Test . The following menu is displayed:

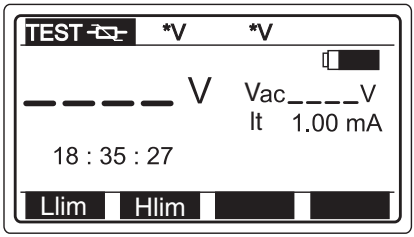


Figure 85: Voltage Level Measurement Menu

Explanation of displayed values:

*V	No limit Selected
Vac	Calculated AC voltage protection level
15:35:27	time display of real time clock

- If desired, set protection level limit. If the measurement values are outside the pre-selected limit, the message 'Result out of limits' and the symbol ⚠ are displayed during the measurement.

- For setting of the limit value, first press function keys F1 (Llim) or F2 (Hlim) to enter the limit setting menu, please refer to Figure 86:

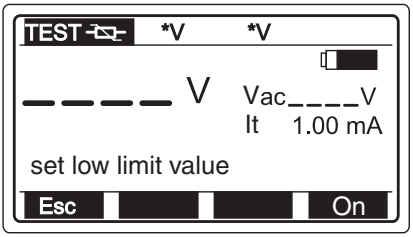


Figure 86: Limit Setting Menu

Then activate the setting of the limit value by pressing function key F4 (On). If the measurement result is **NOT** to be compared with the pre-selected limit value, press again function key F4 (Off).

Now set the desired limit value by pressing function keys F2 (↑) or F3 (↓) . Limits can be set between 0V and 1000V in steps of 5V. The respectively selected value is shown in the top display line.

Function key F4 (Off) allows the user to switch off the respective limit value. '*V' is displayed in the top display line if the limit value is switched off. After setting the limit press function key F1 (Esc) or key 'ESC' to exit the menu.

- Connect the test leads to UUT in accordance with Figure 87. If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

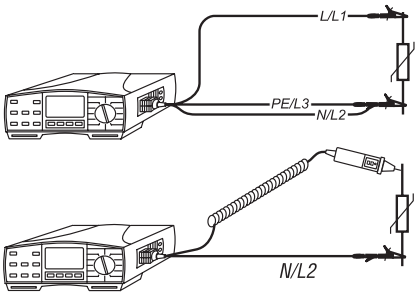


Figure 87: Connection of Test Leads

- Briefly press key 'START'. The measurement is started. A voltage ramp of 0...1000V DC (rising ramp 500V/s) will be present at UUT. As soon as the measurement current has reached the value of 1mA, the voltage will be displayed. The measurement values will be displayed in accordance with the following example.

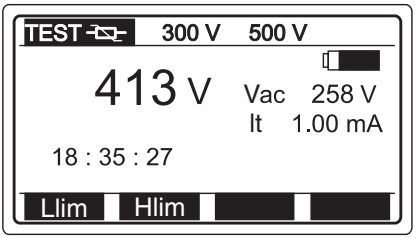


Figure 88: Voltage Level Measurement Value

☞ The AC voltage level (Vac) displayed can directly be compared with the value being indicated on the overvoltage protection device.

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER - (for further information, kindly refer to section 7.1. "Saving Measurement Results ").

5.24.2 Remarks regarding the Voltage Level Measurement

- If possible, the overvoltage protection device should be dismounted or completely disconnected from the circuit prior to measurement.
- If it is not possible to disconnected the overvoltage protection device from the circuit it must be ensured that all loads are disconnected from the circuit to avoid erroneous measurements or load destructions caused by the test voltage.
- A voltage present on the instrument during connection is shown on the LCD.

5.25 Cable Locator Function, Tracing Lines, and Finding Fuses (Function 5)

The UNITEST EUROtest allows the tracing of voltage-free or live conductors as well as the direct assignment of fuses to a current circuit.
Two measurement methods are available:

- Search in live systems: the system is fed with current pulses. The receiver can locate the generated magnetic field and trace the conductor or can find fuses.
- Search in voltage-free systems: the system is fed with voltage pulses. The receiver can located the generated electrical field and trace the conductor or can find fuses.

☞ To perform the cable locator function, the user requires the UNITEST Cable Locator Receiver (Cat. No.1224).

⚠ The safety measures of accident prevention prescriptions regarding manipulations of live parts or in proximity of live parts have to be respected.

⚠ The measurement connectors may not be connected to external voltages exceeding 600V AC or DC to avoid any instrument damage.

5.25.1 Carrying out the Measurement

- Connect the 3-pole test lead to the 4-pole test connector (17) of the UNITEST EUROtest. For measurements in live systems COMMANDER 1 or 2 can be used, as desired.

- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn the rotary switch 'Measurement Function' to the function (5) "Rotary Field / Cable Locator".

- Select the function "LOCATOR" using function key F1 (FUNC) by pressing function key F1. The selected function is shown in the top display line: 'LOCATOR '.

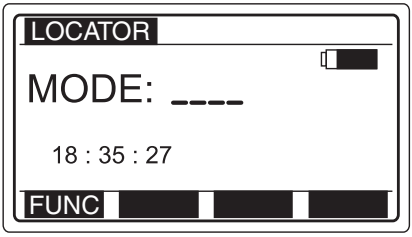


Figure 89: Cable Locator Menu

- Connect the test leads to UUT in accordance with Figure 90 or Figure 91. If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

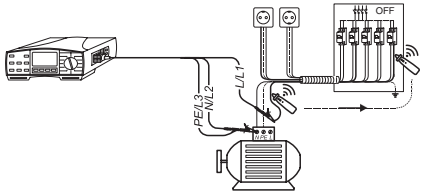


Figure 90: Connection to a voltage-free system

Note: during this measurement the line to be traced must be disconnected from the load (e.g. motor) to ensure that the signal spreads along the line and is not short-circuited by the load.

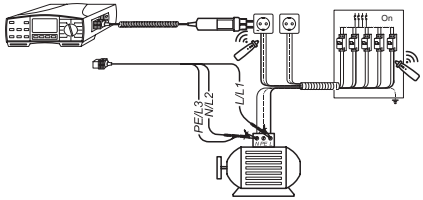


Figure 91: Connection to a live system

- Briefly press the key 'START'. The measurement is started and runs until repeated pressing of the key 'START'. The UNITEST EUROtest automatically detects whether the measurement is carried out on a live or a voltage-free system. This is displayed as follows:

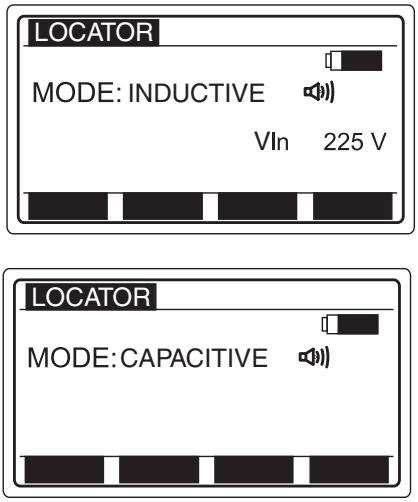


Figure 92: Cable Locator Display

- Select the same mode (IND/CAP) on cable locator receiver to obtain optimum reception conditions. During the searching of lines press the key 'START' on the cable locator receiver. The localisation is carried out by means of an acoustic receiver signal.

☞ Measurement results in Cable Locator Function cannot be saved.

5.25.2 Remarks regarding the Cable Locator Function

For complex installations consisting of long lines and many parallel current circuits, we recommend to switch off or disconnect those parts of the installation which are not required for the measurement. Otherwise, the signal may spread over the complete installation and will cause less selectivity of the search.

5.26 Power Measurements (Function 6)

In single-phase systems using a connected clamp adapter the UNITEST EUROtest allows electrical effective, apparent and reactive power measurements between 0.1W and 88kW (or VA, var).

⚠ The safety measures of accident prevention prescriptions regarding manipulations of live parts or in proximity of live parts have to be respected.

⚠ When working with clamp adapters special care must be taken that they are connected to the measurement instrument prior to surrounding a live conductor. Open clamp adapter outputs can present a danger to the user or lead to clamp adapter destruction due to high inductance voltage!

☞ To carry out power measurements between 0.5A...200A the UNITEST clamp adapter 1000A (Cat. No.1225) is required.

☞ To carry out power measurements between 0.5mA...200A the UNITEST clamp adapter 500A (Cat. No.1226) is required.

5.26.1 Carrying out the Measurement

- Connect the desired test lead to the 4-pole measurement connector (17) of the UNITEST EUROtest. Either use the 3-pole test lead or COMMANDER 2 (available as accessory Cat. No.1223). Also connect the desired clamp adapter to both measurement connectors C1 (14) and C2/P (15), please refer to Figure 94.

- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn the rotary switch 'Measurement Function' to the function (6) Power/Energy.

- The "POWER" function is selected using the function key F1 (FUNC) by pressing the key F1. The function selected is shown in the top display line: POWER.

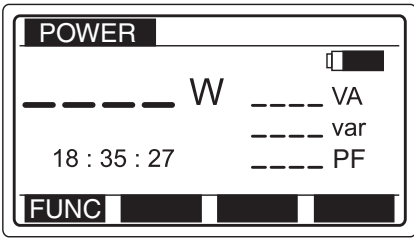


Figure 93: Power Measurement Menu

Explanation of displayed values:

W	Effective power
VA	Apparent power
var	Reactive power
PF	Power factor

- Connect the test leads and the clamp adapter to the UUT in accordance with Figure 94. Open the clamp adapter and use it to surround the UUT conductor to be measured. If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

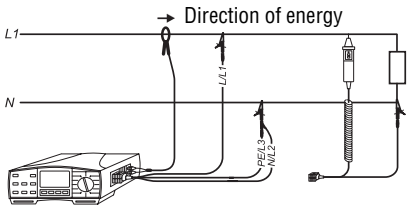


Figure 94: Connection of Test Leads and Clamp Adapter

- Briefly press key 'START'. The measurement is started. The measurement values are displayed in accordance with the example below.

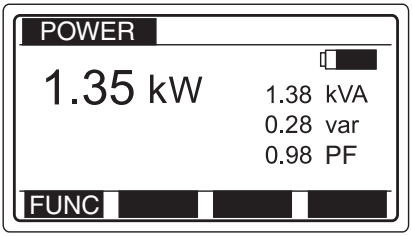


Figure 95: Power Measurement Display

- Briefly press key 'START' again. The measurement is terminated. The last measurement values remain displayed.

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument or on COMMANDER 2, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER (for further information, kindly refer to section 7.1. "Saving Measurement Results").

5.26.2 Remarks regarding Power Measurements

- For correct power measurement, special attention must be paid to the correct test lead connections for voltage and correct clamp adapter connection to avoid negative results. The test lead L1/L must be connected to the conductor in which the current is measured by the clamp adapter. It must also be ensured that the clamp adapter is correctly connected to both measurement connectors C1 (14) and C2/P (15) of the test instrument (S1 to C1 and S2 to C2), and, that the arrow (P1->P2) on the measurement clamp points in the direction of the load connected.
- The input voltage range is 10...440V, the input current range is 10mA ...200A.

If the input values are located outside these ranges, a respective error message is displayed. Simultaneously, the symbol ⚠ is displayed. Then, no measurement values can be displayed. The display for apparent and reactive power as well as for the power factor is: '****'.

5.27 Electrical Energy Measurements (Function 6)

In single-phase circuits using a connected clamp adapter, the UNITEST EUROtest allows the measurement of electrical energy between 0.001Wh and 1999kWh. The measurement time interval can be entered from 1 minute to 25 hours. Simultaneously, the actual load power measured is displayed.

⚠ The safety measures of accident prevention prescriptions regarding manipulations of live parts or in proximity of live parts have to be respected.

⚠ When working with clamp adapters special care must be taken that they are connected to the measurement instrument prior to surrounding a live conductor. Open clamp adapter outputs can present a danger to the user or lead to clamp adapter destruction due to high inductance voltage!

☞ To carry out power measurements between 0.5A...200A the UNITEST clamp adapter 1000A (Cat. No.1225) is required.

☞ To carry out power measurements between 0.5mA...200A the UNITEST clamp adapter 500A (Cat. No.1226) is required.

5.27.1 Carrying out the Measurement

- Connect the desired test lead to the 4-pole measurement connector (17) of the UNITEST EUROtest. Either use the 3-pole test lead or COMMANDER 2 (available as accessory Cat. No.1223). Also connect the desired clamp adapter to both measurement connectors C1 (14) and C2/P (15), please refer to Figure 97.

- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn the rotary switch 'Measurement Function' to the function (6) Power/Energy.

- The function "ENERGY" is selected using the function key F1 (FUNC) by pressing the key F1. The function selected is shown in the top display line: ENERGY.

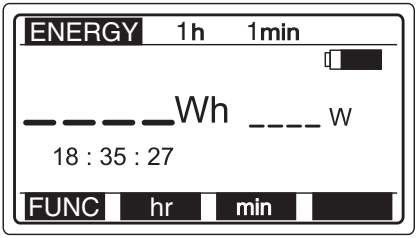


Figure 96: Energy Measurement Menu

Explanation of displayed values:

Wh Electrical energy
W Effective power

- Connect the test leads and the clamp adapter to the UUT in accordance with Figure 97. Open the clamp adapter and surround the conductor to be measured at UUT. If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

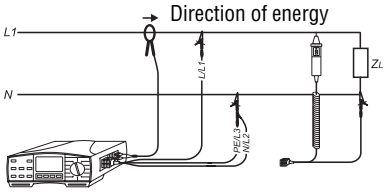


Figure 97: Connection of Test Leads and Clamp Adapter

- Enter the measurement time for the energy consumption to be determined by using the two function keys F2 (hr) and F3 (min). Enter the measurement time by longer or repeated key pressing. A time range between 1 minute up to 24 hours and 59 minutes could be entered.

- Briefly press key 'START'. The measurement is started. The measurement values and the running of the measurement time are displayed in accordance with the example below.

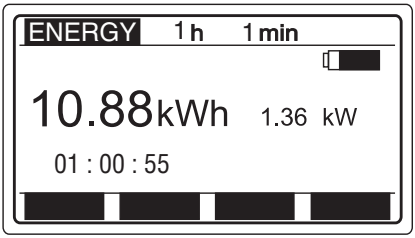


Figure 98: Energy Measurement Display

- The measurement is automatically terminated once the pre-set measurement time has ended. If the user wishes to interrupt the measurement before the end of the pre-set time, press the key 'START' again. The last measurement values remain displayed.

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER (for further information, kindly refer to section 7.1. "Saving Measurement Results").

5.27.2 Remarks regarding Electrical Energy Measurements

- For correct energy measurement, special attention has to be paid to the correct test lead connections for voltage and correct clamp adapter connection to avoid negative results. The test lead L1/L must be connected to the conductor in which the current is measured by the clamp adapter. It must also be ensured that the clamp adapter is correctly connected to both measurement connectors C1 (14) and C2/P) (15) of the test instrument (S1 to C1 and S2 to C2), and, that the arrow (P1->P2) on the measurement clamp points in the direction of the load connected.
- The input voltage range is 10...440V, the input current range amounts to 10mA ...200A. If the input values are outside these ranges, a respective error message is displayed ('Input voltage <10V' or Input current <10mA'). Simultaneously, the symbol [warning sign] is displayed.
- To carry out energy measurements over an extended time period, it must be ensured that the battery charge is sufficient. For permanent measurements of 25 hours always use a new set of batteries!
- The function auto-power-off is disabled when using this function to enable continuous measurements.

5.28 Harmonics Measurements (Function 7)

General Information on Harmonics:
In single-phase systems, the UNITEST EUROtest can directly measure harmonics at voltage or current. The fundamental wave and all odd harmonics can be measured, up to the 21st harmonics. Harmonics are generated by the non-sinus shaped current consumption of loads (e.g. phase angle controls, switching power supplies, electronic ballast). These harmonics can disturb and even damage other loads and cause overvoltages in power supply systems.

⚠ The safety measures of accident prevention prescriptions regarding manipulations of live parts or in proximity of live parts have to be respected.

⚠ When working with clamp adapters special care must be taken that they are connected to the measurement instrument prior to their surrounding a live conductor. Open clamp adapter outputs can present a danger to the user or lead to clamp adapter destruction due to high inductance voltage!

☞ To carry out harmonics measurements between 0.5A...200A the UNITEST clamp adapter 1000A (Cat. No.1225) is required.

☞ To carry out harmonics measurements between 0.5mA...200A the UNITEST clamp adapter 500A (Cat. No.1226) is required.

5.29 Harmonics Measurements for Voltage (Function 7)

5.29.1 Carrying out the Measurement

- Connect the desired test lead to the 4-pole test connector (17) of the UNITEST EUROtest. Either connect the 3-pole test lead or COMMANDER 2 (available as accessory No. 1223), please refer to Figure 100.

- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn the rotary switch 'Measurement Function' to the function (7) HARMONICS.

- Select the function "HARMONICS:VOLTAGE" using key F1 (FUNC). Press function key F1. The function selected is shown again in the upper display line: HARMONICS:VOLTAGE.

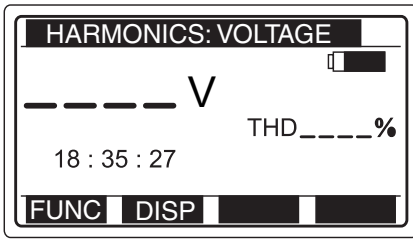


Figure 99: Harmonics Voltage Menu

Explanation of displayed values:

V Total voltage display
THD Total harmonic distortion

- Connect the test leads in accordance with Figure 100 If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'. Repeated pressing of the key 'HELP' indicates the various options for connection.

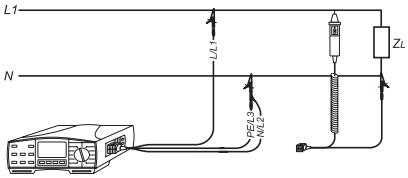


Figure 100: Connection of Test Leads

- Briefly press the key 'START'. The measurement is started. The mains voltage and the THD are displayed. If desired, the function key F2 (DISP) can be used to display the values for the fundamental wave and the harmonics by pressing the key F2 several times. The measurement values are displayed in accordance with the example below.

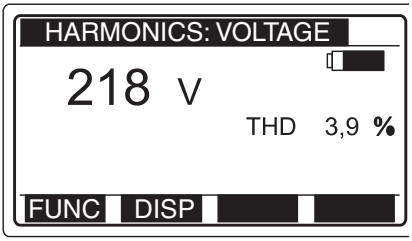


Figure 101: Total Voltage and THD Display

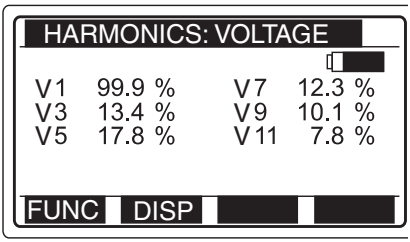


Figure 102: Display of Fundamental wave and 3rd to 11th Harmonics

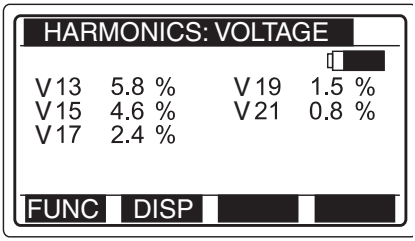


Figure 103: Display of 13th to 21st Harmonics

- Briefly press the key 'START' again. The measurement is terminated. The last measurement values remain displayed.

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER (for further information, kindly refer to section 7.1. "Saving Measurement Results").

5.29.2 Remarks regarding the Harmonics Measurements for Voltage

The input voltage range is 10...440V. If the input values are outside this range the respective message is displayed. No measurement values may then be displayed. The display for the THD and the fundamental wave and harmonics share is '****'.

5.30 Harmonics Measurements for Current (Function 7)

5.30.1 Carrying out the Measurement

- Connect the selected clamp adapter to both measurement connectors C1 (14) and C2/P (15), please refer to Figure 105.

- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Turn the rotary switch 'Measurement Function' to the function (7) Harmonics

- Select the function " HARMONICS CURRENT" using key F1 (FUNC). Press function key F1. The function selected is shown again in the upper display line: HARMONICS: CURRENT ✂.

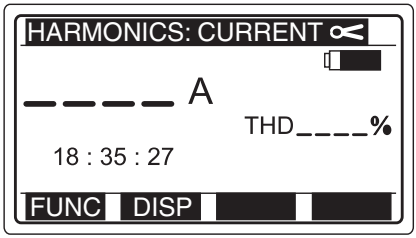


Figure 104: Harmonics Current Menu

Explanation of displayed values:

A Total current display
THD Total harmonic distortion

- Connect the clamp adapter in accordance with Figure 105. Open the clamp adapter and use it to surround one of the active conductors to be measured at UUT. If desired, this connection information can directly be retrieved on the measurement instrument using the key 'HELP'.

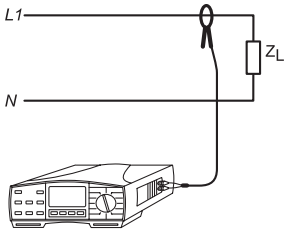


Figure 105: Clamp Adapter Connection

- Briefly press the key 'START'. The measurement is started. The total current and the THD are displayed. If desired, the function key F2 (DISP) can be used to display the values for the fundamental wave and the harmonics by pressing the key F2 several times. The measurement values are displayed in accordance with the example below.

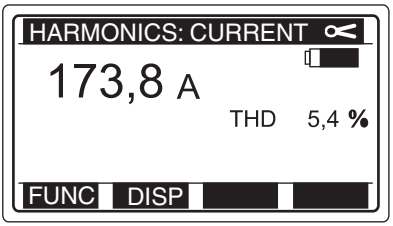


Figure 106: Total Current and THD Display

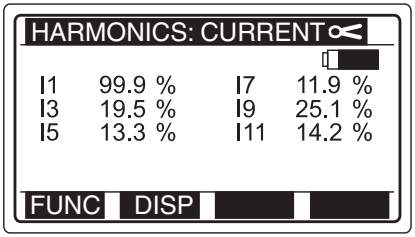


Figure 102: Display Fundamental wave and 3rd to 11th Harmonics

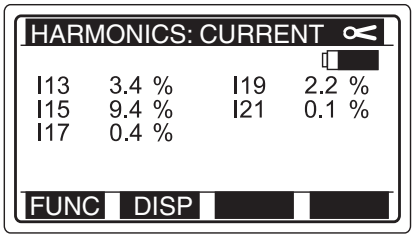


Figure 103: Display 13th to 21st Harmonics

- Briefly press the key 'START' again. The measurement is terminated. The last measurement values remain displayed.

☞ Save the measurement value displayed, if desired. Press the key 'SAVE' on test instrument, then enter the desired OBJECT-/BLOCK-/FUSE-NUMBER (for further information, kindly refer to section 7.1. "Saving Measurement Results").

5.30.2 Remarks regarding Harmonics Current Measurements

The input current range is 10mA...200A. If the input values are outside this range the respective message is displayed. No measurement values may then be displayed. The display for the THD and the fundamental wave and harmonics share is '****'.

6.0 Setup Function in the SETUP Menu

In this menu, the following instrument settings can be performed:

- Setting the display contrast
- Setting time and date of the real time clock
- Display of the baud rate for the RS-232 interface
- Clearing the complete data memory
- Instrument setting for TN/TT or IT systems
- PC connection for initialisation or instrument calibration

☞ All settings and measurement data are saved even after switching off the instrument or in the event of battery replacement.

- Switch on the UNITEST EUROtest using the key 'ON/OFF'. Press the key 'SETUP' (4).
- Select the desired menu item using the function key F2 (↓), as described below. Press function key F2 several times, if required.

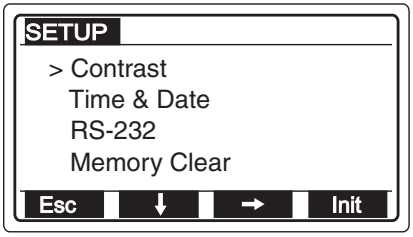


Figure 109: Setup Menu

6.1 Setting the Display Contrast

Position the cursor on the menu item 'Contrast" using the function key F2 (↓) by pressing the function key F2 several times, if required. Then, select the menu item 'Contrast" by means of function key F3 (→).
Select the desired contrast intensity using keys F2 (↑) or F3 (↓) . Finally, press function key F1 (Esc) to exit the menu. The last set value is saved.

6.2 Setting Time and Date of the Real Time Clock

Use the function key F2 (↓) to position the cursor to the menu item 'Time & Date' by pressing the function key F2 several times, if required. Then, select the menu item 'Time & Date' by means of function key F3 (→).
Subsequently enter the values for hours, minutes, day, month, and year using function key F2 (↑) or F3 (↓) . After entering a value use function key F4 (→) to select the next entry. Finally, press function key F1 (Esc) to exit the menu.

☞ The time set only starts after pressing function key F1 (Esc). During time and date setting the real time clock is stopped.

6.3 Baudrate Display for RS-232 Interface

Position the cursor on the menu item 'RS-232' by means of function key F2 (↓) by pressing function key F2 several times, if required. Then select the menu item 'RS-232' using function key F3 (→). The baudrate setting is 9600 Baud and cannot be modified. Press function key F1 (Esc) to exit the menu.

6.4 Clearing the Total Data Memory

Position the cursor on the menu item 'Memory Clear' by means of function key F2 (↓) by pressing function key F1 several times, if required. Then select the menu item 'Memory Clear' using function key F3 (→). The message :

'All memory locations
will be cleared!'
Press Clr to confirm!
is displayed.

To exit the menu **without clearing the memory** press function key F1 (Esc).

If you wish to clear the total data memory confirm with function key F4 (Clr).

Now the following message is displayed
'Wait...'
and the data memory is cleared. Finally press function key F1 (Esc) to exit the menu.

☞ Please keep in mind that this function clears the total data memory. If you only wish to clear individual measurement data, please refer to section 7.3 (page 69).

6.5 Setting for TN/TT or IT system

This menu function allows to switch on or off the disable function of the measurement by the internal PE test. Thus, it is possible to start the measurement functions R_L/I_{PSC} (Function 1), Z_L/I_{PSC} (Function 2), Z_I/I_{PSC} (Function 3), and RCD (Function 4) in spite of missing PE or missing earth connection of the PE. So it is possible to perform of these measurements within an IT system.

⚠ With the PE test disabled, the respective measurements are started. But error messages such as 'Attention PE/N error' are still displayed. However, for loop measurement or RCD tests the user must ensure that there is no danger of too high contact voltage caused by the test current.

For setting, position the cursor on menu item 'TN/TT <-> IT' using function key F2 (↓). Press function key F1 several times if required. Select menu item 'TN/TT <-> IT' by pressing function key F3 (→). Select the desired setting using function keys F2 (↑) or F3 (↓) . Finally press function key F1 (Esc) to exit the menu. The set value is saved.

⚠ This setting should only be selected if respective measurements are carried out within an IT system. For all other applications immediately reset the instrument to the **standard setting 'TN/TT-System'!**

6.6 Function Key F4 (Init)

Function 'Init' is used to establish the communication within the PC during initialisation and instrument calibration. Function key F4 is not used during normal operation. If you have pressed the key by mistake (Message 'Connecting...') press function key F1 (Esc) to exit this submenu.

7.0 General Information regarding Saving of Measurement Data, Memory Structure

The instrument UNITEST EUROtest is able to save approximately 3000 measurement data. The exact number of measurements that can be saved, depends on the type of saved measurement function and the number of contained measurement values. The measurement results are saved into memory addresses with three memory levels (like a directory tree).

Thus, measurement values can be saved directly and clearly into the instrument on the measurement site (e.g. building site), according to OBJECT, BLOCK and FUSE, to be then recalled and transferred to a PC for further processing and recording. This structure allows numbers of 1...999 for each of the three memory levels. Thus, the existing structure of the system to be measured including the existing distribution and current circuit numbers directly can be entered.

☞ **Under certain unfavourable conditions, any electronic memory may lose or modify data. CH. BEHA can not be held liable for financial or other losses resulting from a data loss, wrong handling, or any other reason.**

7.1 Saving Measurement Data

All measurement results and measurement parameters can be saved, except for the following:

- Measurement values for voltages (V_{L-N} / V_{L-PE}) and frequency within functions Z_I/I_{PSC}, Z_L/I_{PSC}, and R_L/I_{PSC}
- Measurement values in continuity function
- Measurements with displayed error messages such as insulation measurement during voltage presence

☞ If the user tries to save such measurement results the following message is displayed:
'Not for saving'

To save measurement results from a test into the data memory of the instrument, proceed as follows:

- Prior to the measurement ensure that the data memory is cleared to ensure that already existing measurement results will not be wrongly assigned or recorded.

☞ Clear the data memory only once you are sure that the measurement data are no longer used, or that they have already been transferred to the PC and further processed!

- To clear the total memory (also refer to 7.3.3) press the key 'SETUP'. Select the menu item 'Memory Clear' using function key F2 (↓). Press the function key F2 several times. Then confirm the menu item 'Memory Clear' by pressing function key F3(→). Confirm the message 'All memory locations will be cleared! Press Clr to confirm!' by pressing function key F4 (Clr). Now, the total memory is cleared. Exit the setup menu by means of the key 'ESC'.

- Perform the desired measurement as described in the respective sections.

- Press key 'SAVE' (8). The following menu is displayed:

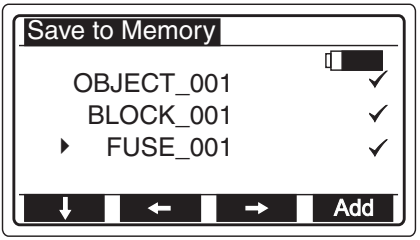


Figure 110: Menu 'Save to Memory'

- Position the cursor to the desired lines (OBJECT / BLOCK / FUSE) using function key F1 (↓). Press function key F1 several times, if required. Enter the respectively desired memory address using function keys F2 (←) or F3 (→). After memory address entry press the key 'SAVE' (8) again to save the entry. The messages 'Wait...' and 'Saved to Memory!' are displayed. After the saving process the measurement instrument automatically returns to the measurement value display.

☞ Pressing the respective function key F2 or F3 for a longer time period accelerates the data address entering. Short pressing increases or decreases the value one by one.

☞ The last entered memory address for OBJECT / BLOCK / FUSE is displayed. When entering the menu, the cursor is always positioned on the field FUSE.

7.1.1 Remarks regarding the Saving of Measurement Data

- The displayed measurement values and parameter are saved.
- The last used memory addresses for OBJECT / BLOCK / FUSE indicated during the saving procedure are saved. Therefore, for any later saving procedures, in which data should be saved under the same address, only press the key 'SAVE' twice. The key 'SAVE' on the COMMANDER 1 or 2 may also be used.
- It is only possible to save each measurement result once. If the user tries to save the same result into the same or into a different memory address, the message 'Already saved' is displayed.
- If the measurement results of measurements that cannot be saved or of measurements containing displayed error messages are to be saved, the message 'Not for saving' appears. These measurement data cannot be saved.
- It is possible to exit the menu 'Save to Memory' by pressing the key 'ESC' (12) without data saving.
- In case the data memory is full, the message 'Memory full!' is displayed.

7.2 Recalling Measurement Results

☞ All measurement results and measurement parameter can be saved and recalled, except for the following:

- The measurement data for voltages (V_{L-N} / V_{L-PE}) and frequency in functions Z_l/I_{PSC}, Z_L/I_{PSC}, and R_L/I_{PSC}
- Measurement data in function continuity.

If one or several saved measurement data are to be recalled, proceed as follows:

- Press key 'RCL' (11), the following menu is displayed:

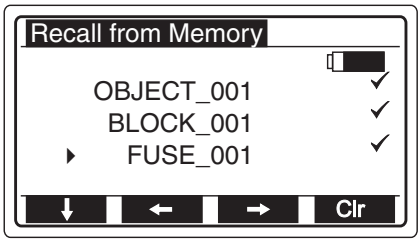


Figure 111: 'Recall from Memory' menu

- Position the cursor subsequently to the desired line (OBJECT / BLOCK / FUSE) using function key F1 (↓). Press function key several times if required. Enter the desired memory address using function keys F2 (←) or F3 (→). To display the measurement results of the memory address selected, press again the key 'RCL' (11).

☞ Pressing of respective function key F2 or F3 for a longer time period accelerates the data address selection. Short pressing increases or decreases the value one by one.

☞ The last-entered memory address for OBJECT / BLOCK / FUSE is displayed. When entering the menu, the cursor is always positioned on the field FUSE.

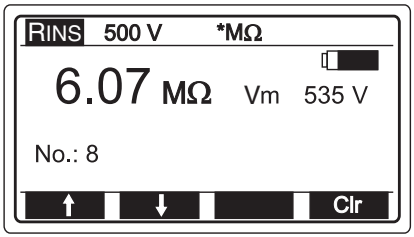


Figure 112: 'Display of Measurement values' Menu

- Now, all measurement results can be displayed using function key F1 (↑) or F2 (↓) which have been saved within the selected memory address. These two function keys are used to scroll with the additional display of the sequential number within the memory address. When trying to scroll at the first or the last memory address, the messages 'First measurement' or 'Last measurement' is displayed.

7.2.1 Remarks regarding the Recalling of Measurement Data

- All displayed measurement data parameter are displayed.
- The last used memory addresses for OBJECT / BLOCK / FUSE indicated during the saving procedure are saved. Therefore, for any later recalling of the last measurement results, press the key 'RCL' twice.
- The menu 'Recall from Memory' (Figure 111) can be aborted by pressing key 'ESC' (12) or key START (10). Here, the key 'START' does not start any measurement.
- The menu 'Display of Measurement values' (Figure 112) can be aborted by pressing key 'ESC' (12).
- If function key F2 (↓) is pressed again when displaying the first (oldest) measurement value the message 'First measurement' is displayed.
- If function key F1 (↑) is pressed again when displaying the last (newest) measurement value the message 'Last measurement' is displayed.

7.3 Clearing the Measurement Results

The instrument UNITEST EUROtest offers three options to delete saved measurement data again.

- Individual measurement results
- All measurement results in one memory address
- The total data memory.

7.3.1 Clearing of Individual Measurement Results

To clear one or several measurement results, proceed as follows:

- Press the key 'RCL' (11). The following menu is displayed:

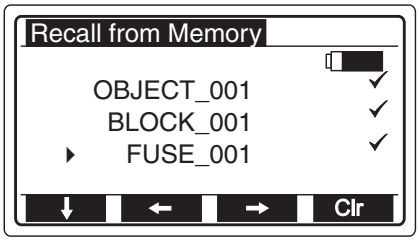


Figure 113: 'Recall from Memory' Menu

- Subsequently position the cursor to the desired line (OBJECT / BLOCK / FUSE) using function key F1 (↓). Press function key several times if required. Enter the desired memory address using function keys F2 (←) or F3 (→)To display the measurement results of the memory address selected, press again the key 'RCL' (11).

- Now, all measurement results can be displayed using function key F1 (↑) or F2 (↓) which are saved within the selected memory address. These two function keys are used for scrolling. Select the measurement result to be cleared.

- Now press function key F4 (Clr) to clear the memory result displayed. An acoustic signal is audible. The measurement result with the next lower number of the memory address is displayed. If this is the last measurement result of this memory address, the brief message 'Last measurement' is displayed.

- To clear further displayed measurement results repeatedly press function key F4 (Clr). Once all measurement results in this memory address have been cleared, the brief message 'Memory location empty ' is displayed.

7.3.2 Clearing all Measurement Results in one Memory Address

To clear one or several saved measurement data, proceed as follows:

- Press the key 'RCL' (11). The following menu is displayed:

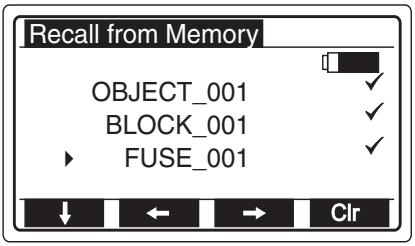


Figure 114: 'Recall from Memory' Menu

- Position the cursor to the desired lines (OBJECT / BLOCK / FUSE) using function key F1 (↓). Press function key F1 several times, if required. Enter the respectively desired memory address using function keys F2 (←) or F3 (→).

- Now press function key F4 (Clr) to clear the memory address displayed. The message 'Press Clr to clear !' appears. To exit the menu without clearing the menu, press key 'Esc'. If the total memory address is to be cleared confirm again by pressing function key F4 (Clr). Now the following message is briefly displayed 'Wait...' and the selected memory address is cleared. Finally press function key 'Esc' (12) to exit the menu.

7.3.3 Clearing the Total Data Memory

To clear all measurement data, proceed as follows:

- Press the key 'SETUP' (4). The following menu is displayed:

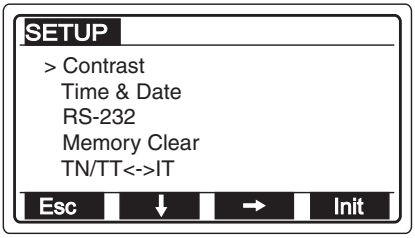


Figure 115: Setup Menu

- Position the cursor on the menu item 'Memory Clear' by means of function key F2 (↓) by pressing function key F2 several times, if required. Then select the menu item 'Memory Clear' using function key F3 (→). The message

'All memory locations
will be cleared!'
Press Clr to confirm!
is displayed.

☞ To exit the menu without clearing the memory press function key F1 (Esc). If you wish to clear the total data memory confirm with function key F4 (Clr). Now the following message is displayed 'Wait...'and the data memory is cleared. Finally press function key F1 (Esc) to exit the menu.

7.3.4 Remarks regarding the Clearing of Measurement Data

- The respectively selected measurement data and parameters are cleared.
- Clearing measurement results can be aborted at any time without data clearing by pressing the key 'ESC' (12).
- The memory address structure entered (OBJECT / BLOCK / FUSE) is also cleared during the clearing process of the total data memory.

8.0 Other Instrument Function

8.1 Data Transfer via the RS-232 Interface

The built-in RS-232 interface allows the transfer of saved data memory to a PC for recording, filing and further processing.
For this purpose, we offer the *Windows® Software UNITEST Expert-Manager (Cat. No.1124). As from Version 1.54 this software can process measurement data from the UNITEST EUROtest.

The transfer is started directly from the Software UNITEST Expert-Manager. For detailed information, please refer to the Software Instruction Manual.

8.2 Instrument Reset

If a malfunction occurs during conventional operation of the UNITEST EUROtest we recommend to initialising the instrument again, i.e. to perform an instrument reset. All measurement parameter are reset to the standard factory settings. **Any data saved are not cleared.**

- Switch off UNITEST EUROtest using the key 'ON/OFF'.

- Press function key F1 and keep it pressed and switch on the UNITEST EUROtest using the key 'ON/OFF'. Release function key F1. The message 'Instrument reset' is briefly displayed. All measurement parameter are reset to the factory settings, please refer to Table 5, Page 72.

8.3 Auto Power Off

After approx. 10 minutes following the last key operation the instrument automatically switches off. To perform measurements the instruments must be switched on again.
If the battery voltage is low the battery symbol (please refer to Figure 118) is displayed, the batteries must be changed.
If the instrument is used further and the battery voltage reaches the minimum level the instrument switches off. For the measurement function "ENERGY" the auto-power-off function is disabled.

*Windows is a registered trademark of the Microsoft Corporation.

Table 5 Factory settings

Measurement function	Parameter	Value
Loop impedance (Function 2)	Phase polarity of test current	Positive (0°)
RCD measurements (Function 4)	Nominal test current	30mA
RCD measurements (Function 4)	RCD type	Standard
RCD measurements (Function 4)	Contact voltage limit value	50V
RCD measurements (Function 4)	Multiplication factor of test current	*1 (100%)
RCD measurements (Function 4)	Phase polarity of test current	Positive (0°)
Energy (Function 6)	Measurement time 'hr.'	1h
Energy (Function 6)	Measurement time 'min'	1min
Voltage Level (Function 9)	Higher Limit	off
Voltage Level (Function 9)	Lower Limit	off
Rins (Function 10)	Test voltage	500V
Rins (Function 10)	Limit	off
R LOW Ω (Function 11)	Test lead compensation	off
R LOW Ω (Function 11)	Limit	off
R LOW Ω (Function 11)	Signal outside Limit	on
Continuity (Function 11)	Limit	off
Earth resistance (Function 12)	Limit	off
Specific Earth resistance (F. 12)	Distance	2m
Instrument settings	Contrast	40%

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

The battery condition is continuously displayed via the battery symbol in the LCD:

- For fully charged batteries, the symbol is full (please refer to Figure 116).
- The batteries have to be replaced if the battery symbol is empty (please refer to Figure 118) or if the message 'Low battery during m.' is displayed during the measurement.

Examples of Battery Symbol:

Figure 116 Full batteries

Figure 117 Partly discharged batteries

Figure 118 Empty batteries

☞ If the instrument shows the message **'Instrument reset'** the internal buffer battery is empty or faulty. For battery replacement and calibration the instrument must be returned.

☞ The battery condition must also be monitored during measurements. The display of the message 'Low battery during m.' during measurements can lead to erroneous measurement results.

⚠ Prior to battery replacement switch off the instrument and disconnect from all measurement circuits and test leads.

⚠ The correct positioning of the batteries is shown on the battery casing bottom.

⚠ Respect battery polarity to avoid instrument destruction, explosion or fire.

⚠ Only use batteries complying with the technical data specifications!

Measurement Instrument: 4 batteries 1.5V, Type IEC LR 14 / Baby.

COMMANDER 1, 2 and **Cable Locator:** 1 battery 9V Type IEC 6 LR 61.

⚠ Never try to disassemble battery cells !The battery contains highly alkaline electrolyte. Danger of causticization ! If electrolyte gets in contact with skin or clothing, rinse immediately with water. If electrolyte gets in contact with the eyes, immediately flush by using pure water and consult a doctor.

☞ 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.

For battery replacement, please proceed as follows:

- Switch off the instrument and disconnect from all measurement circuits and test leads.
- Remove the battery case cover (24) using of both battery case screws (25)
- Remove the discharged batteries and replace with four Alkaline batteries 1.5V type IEC LR 14. Respect the polarity of batteries inserted, please refer to Figure 119, Page 74.
- Close the battery case cover (24) again by tightening both battery case screws (25).

☞ A new set of batteries (Alkaline) allows an operation time of approx. 50 hours at a ratio of measurement and pause of 5s to 25s.

9.3 Battery Replacement for COMMANDER 1 / 2 or CABLE LOCATOR

If the red LED is illuminated when pressing the key 'START' die LED the battery must be replaced.

⚠ Prior to battery replacement disconnect COMMANDER from all connected measurement circuits.

For battery replacement, please proceed as follows:

- Disconnect the COMMANDER from all connected measurement circuits!
- Remove both screws on the COMMANDER rear side and remove the battery case cover.

- Remove the discharged batteries and insert a new Alkaline battery 9V Type IEC 6 LR 61. Respect correct polarity of inserted battery

- Close the battery case cover and retighten the battery case screw.

9.4 Built-in Fuses

If a fuse has blown due to overload or improper handling, the fuse has to be replaced. The battery case is equipped with three fuses (please refer to Figure 119).

⚠ Exclusively use fuses of voltage, current and breaking capacity values in compliance with the technical data section.

⚠ Using temporary fuses, in particular short-circuiting fuse holders is prohibited and can cause instrument destruction or serious bodily injury of operator.

⚠ Prior to fuse replacement disconnect the instrument from all measurement circuits and test leads.

9.4.1 Error Messages after Fuse Tripping

If one of the following messages or displays appears during measurement, the respective fuses have to be checked.

Check fuses F1 /F2 for:

- '**RCD tripped out'** after starting the measurement in functions RCD as well as for the functions Loop Impedance Z_L/I_{PSC} and Line impedance Z_I/I_{PSC}.
- **>1999**Ω' in functions R LOW Ω or continuity in spite of short-circuit of test leads.
- **>200M**Ω' or' **>1000M**Ω' in function Rins in spite of short-circuit of test leads.
- **'>1000V**' in function Voltage Level in spite of short-circuit of test leads.

Check fuses F3 for:

- Message on LCD ´Change FUSE F3' in functions R LOW Ω or continuity in spite of short-circuit of test leads.

9.4.2 Description of Fuses Used

- **Fuses F1 and F2:**
  Type T 4A/500V, 38 x 10 mm, 10kA/500V, (i.e. Type LFQ4 Littelfuse)
  input fuse for measurement connectors L/L1 and N/L2.

- **Fuse F3:**
  Type M 0.315A/250V, 5 x 20 mm.
  to protect the internal circuit in case of applying external voltage in measurement functions R LOW Ω or Continuity during active measurement.

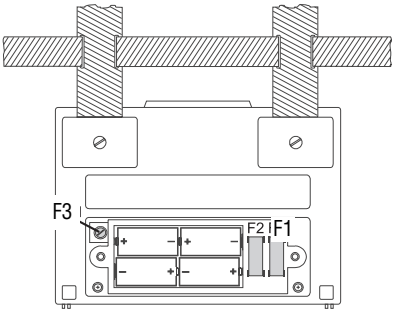


Figure 119: Battery and Fuse Replacement

9.4.3 Fuse Replacement

⚠ Prior to fuse replacement disconnect the instrument from all measurement circuits and test leads.

⚠ Exclusively use fuses with voltage, current and breaking capacity values in compliance with the technical data section, see 9.4.2.

For fuse replacement, please proceed as follows:

- Switch off the instrument and disconnect from all measurement circuits and test leads.
- Remove the battery case cover (24) using both battery case screws (25)
- Remove the respective fuse (please refer to Figure 119) and replace by a new fuse of the same type, please refer to section 9.4.2.
- Close the battery case cover (24) again by tightening both battery case screws (25).

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

Insulation Resistance Rins

Measurement range	0.008...1.999 / 19.99 / 199.9 / 1000MΩ((Vn≥250V)	
	0.012...1.999 / 19.99 / 199.9MΩ((Vn<250V)	
Resolution	0.001 / 0.01 / 0.1 / 1MΩ	
Accuracy	±(2% rdg. + 2 D)	(at <200MΩ)
	±10% rdg.	(at ≥200MΩ)
Test voltage	50, 100, 250, 500, 1000V DC	
Test current	>1mA	
Display test voltage		
Measurement range / Resolution	0...1200V / 1V	
Accuracy	±(2% rdg.+ 3D)	

Low Ohm measurement (R LOW Ω) / Continuity

Measurement range	0.08...19.99 / 199.9 / 1999Ω	
Resolution	0.01 / 0.1 / 1Ω	
Accuracy	±(2% rdg.+ 2D)	(at <20Ω)
	±(3%rdg.)	(at ≥20Ω)
	for continuity:	±(3% rdg. + 3D)
Test voltage	4...7V DC	
Test current	>200mA (for continuity <7mA)	
Test lead compensation	up to approx. 5Ω	
Automatic polarity change		

RCD Test

Nominal residual currents:	10, 30, 100, 300, 500, 1000mA, sinus
	Standard or time delayed,
	Test at 0 or 180°
Contact voltage, Measurement with or without probe	
Measurement range	10.00...100.0V
Resolution	0.01 / 0.1V
Accuracy	(-0 / +10% rdg.)
Test current	<0.5•IΔN
Earth resistance Re, Display range	0.00...19.99 / 199.9 / 1999Ω / 10kΩ (Re=VC/ IΔN)
Resolution	0.01 / 0.1 / 1Ω / 0.01kΩ

RCD Trip time

Measurement range (standard)	0...300ms (at 0.5xIΔN, IΔN)
	0...150ms (at 2xIΔN)
	0...40ms (at 5xIΔN)
Measurement range (time delayed)	0...500ms (at 0.5xIΔN, IΔN)
	0...200ms (at 2xIΔN)
	0...150ms (at 5xIΔN)
Accuracy	±3ms

RCD Trip current (ramp method)

Range	(20.....110%) I∆N ∆I=5% I∆N
Measurement range trip current	10...300ms
Accuracy	±3ms
Measurement range contact voltage (for I∆)	10...100.0V
Accuracy	(-0 / +10% rdg.)

Loop impedance, Loop resistance (L-PE) / Prospective short-circuit current Ipsc

Measurement ranges Zl, Rl, Xs	0.11...19.99 / 199.9 / 1999Ω
Resolution	0.01 / 0.1 / 1Ω
Accuracy	±(2% rdg. + 3D)
Display range Ipsc	0.06A...2.22kA
Nominal voltage / Frequency	100...264V / 45...65Hz
Test current	approx. 23A (at 230V)

Earth voltage measurement (according to SEV 3569)

Measurement range	0.00...9.99 / 99.9 / 264V
Resolution	0.01 / 0.1 / 1V
Accuracy	±(3% rdg.+ 0.02ΩxIpsc)

Line impedance, Line resistance RL (L-N/L) / Prospective short-circuit current Ipsc

Measurement ranges Zi, Ri, Xi	0.11...19.99 / 199.9 / 1999Ω
Resolution	0.01 / 0.1 / 1Ω
Accuracy	±(2% rdg. + 3D)
Display range Ipsc	0.06A...3.85kA
Nominal voltage / Frequency	100...440V / 45...65Hz
Test current	approx. 23A (at 230V)

Loop resistance RL (N-PE) / Prospective short-circuit current Ipsc

Measurement range	0.11...19.99 / 199.9 / 1999Ω
Resolution	0.01 / 0.1 / 1Ω
Accuracy	±(2% rdg. + 3D)
Display range Ipsc	0.06A...2.22kA
Test method	with internal generator
Test voltage/ frequency	20V AC / 125Hz
Test current	< 15mA

Rotary field

Display	1.2.3 or 2.1.3
Nominal voltage/ Frequency	100...440V / 45...65Hz

Voltage

Measurement range / Resolution	0...440V / 1V
Accuracy	±(2%rdg. + 2D)
Frequency range	DC, 45...65Hz

Frequency

Measurement range / Resolution	45.0...65.0Hz / 0.1Hz
Accuracy	±0.2Hz
Voltage range	10...440V

Current (True RMS)

Measurement principle with Clamp Adapter (Option) Cat. No.1225 or 1226

Measurement range	0.0mA...99.9 / 999mA / 9.99A / 99.9A / 200A	
Resolution	0.1 / 1mA / 0.01A / 0.1A / 1A	
Accuracy	±(5% rdg. + 3D)	(at <100mA)
	±5% rdg.	(at ≥100mA)
Frequency range	50/60Hz	

Peak current (True RMS)

Measurement range	5A...280A
Resolution	1A
Accuracy	±(5%)
Measurement time	approx. 0.5ms
Frequency range	50/60Hz

Voltage level of overvoltage protection devices (Varistors)

Measurement principle	voltage ramp 500V/s DC
Measurement range	0...1000V
Resolution	1V
Accuracy	±(5% rdg. + 10V)
Test voltage	0...1100V DC
Test current	approx. 1mA

Cable Locator with additional Receiver (Option) Cat. No.1224

Measurement principle: modulated test voltage in open current circuit (capacitve) or
modulated test current in closed circuit (inductive)

Test voltage/Current /Frequency (capacitive)	pulse <7V / <50mA / 3600Hz
Test current /Frequency (inductive)	pulse <1A / 3600Hz
Nominal mains voltage/Frequency	30...264V / 45...65Hz

Effective, Apparent, Reactive Power (single-phase)

Measurement ranges P (S, Q)	0.0...9.99 / 99.9 / 999W / 9.99kW / 88,0kW (VA, var)
Resolution	0.01W / 0.1W / 1W / 0.01kW / 0.1kW (VA,var)
Accuracy	±(7% + 1D)
Voltage range	10...440V
Current range	10mA...200A
Frequency	50/60Hz
Display range PF	0...1

Electrical energy (single-phase)

Calculation	$W = \Sigma P^{*}\Delta t$
Display range	0.001Wh...2000kWh
Accuracy	±(7% + 1D)
Time range	1min ...24h: 59min

Harmonics, Voltage and Current

Display	1...21. odd harmonics
Measurement range (harmonics)	0.0...100.0%
Measurement range (THD)	0.0...100.0%
Resolution	0.1%
Accuracy	±(5% rdg. + 5D)
Voltage range (True RMS)	10...440V
Resolution	1V
Accuracy	±(5% rdg. + 3D)
Current range (True RMS)	10...99.9 / 999mA / 9.99 / 99.9 / 200A
Resolution	0.1 / 1mA / 0.01 / 0.1 / 1A
Accuracy	±(5% rdg.+ 3D)
Frequency range	50/60Hz

Earth resistance RE

Measurement principle	two- three- four-pole with probes	
	Or with probes and current clamp adapters	
Display range	0.00...19.99 / 199.9 / 1999Ω / 19.99kΩ	
Measurement range	0.11...19.99 / 199.9 / 1999Ω / 19.99kΩ	
Resolution	0.01 / 0.1 / 1Ω / 0.01kΩ	
Accuracy	±(2% rdg.+ 3D)	(at <2kΩ)
	±(5% rdg.)	(at ≥2kΩ)
Test voltage	<40V Sinus	
Test current	<20mA	
Frequency	125Hz	

Automatic monitoring and display of auxiliary earth and probe resistance

Specific earth resistance

Automatic calculation	$r = 2 \times \pi \times a \times Re$
Display range	0.00...19.99 / 199.9 / 1999Ωm / 19.99 / 199.9 / 1999kΩm
Resolution	0.01 / 0.1 / 1Ωm / 0.01 / 0.1 / 1kΩm
Accuracy	±(2%rdg. + 3D)
Adjustable probe distance	1...30m

Earth resistance (Earth loop resistance)

Measurement principle:	Measurement of earth loop using two current clamp adapters	
Measurement range	0.08...19.99 / 100.0Ω	
Resolution	0.01 / 0.1Ω	
Accuracy	±(10% rdg.+ 2D)	(at Re<20Ω)
	±(20% rdg.)	(at Re≥20Ω)
Test current	approx. 30mV/Re	
Frequency	125Hz	
Additional error for currents > 2,5 A	±(10% rdg. +10D)	

Attention! Respect clamp distance >0.25m

General Technical Data

Graphical LC Display 128*64 Pixel, with backlight	
Power supply	4 pcs. 1.5V IEC LR14
Internal buffer battery	1 pc. Type IEC CR 2450
Adjustable limits for all measurement functions	
Optical and acoustic warning for limit exceeding	
Auto-Power-Off	after approx. 10min
Memory capacity	approx. 3000 measurement data
Interface	RS 232
Protection class	II (double insulated)
Overvoltage category	CAT III/300V CAT II/600V
Pollution degree	2
Protection degree	IP 44
Built according	IEC 61557, EN 61557, DIN VDE 0413
	IEC 61010, EN 61010, DIN VDE 0411
VDE	VDE certificate of approval No. 126 659
Operation temperature range	0...+40°C max 85% rel. humidity
Reference temperature range	+10...+30°C 40...60% rel. humidity
Dimnesions	265 * 120 * 185mm
Weight (with batteries, without accessories)	approx. 2.1kg

Qualitätszertifikat • Certificate of Quality
Certificat de Qualité • Certificado de calidad

D

Die BEHA-Gruppe bestätigt hiermit, daß das erworbene Produkt gemäß den festgelegten Beha Prüfanweisungen während des Fertigungsprozesses kalibriert wurde. Alle innerhalb der Beha-Gruppe durchgeführten, qualitätsrelevanten Tätigkeiten und Prozesse werden permanent durch ein Qualitätsmanagementsystem nach ISO 9000 überwacht.

Die BEHA-Gruppe bestätigt weiterhin, daß die während der Kalibrierung verwendeten Prüfeinrichtungen und Instrumente einer permanenten Prüfmittelüberwachung unterliegen. Die Prüfmittel und Instrumente werden in festgelegten Abständen mit Normalen kalibriert, deren Kalibrierung auf nationale und internationale Standards rückführbar ist.

GB

The BEHA Group confirms herein that the unit you have purchased has been calibrated, during the manufacturing process, in compliance with the test procedures defined by BEHA. All BEHA procedures and quality controls are monitored on a permanent basis in compliance with the ISO 9000 Quality Management Standards.

In addition, the BEHA Group confirms that all test equipment and instruments used during the calibration process are subject to constant control. All test equipment and instruments used are calibrated at determined intervals, using reference equipment which has also been calibrated in compliance with (and traceable to) the calibration standards of national and international laboratories.

F

Le groupe BEHA déclare que l´appareil auquel ce document fait référence a été calibré au cours de sa fabrication selon les procédures de contrôle définies par BEHA. Toutes ces procédures et contrôles de qualité sont régis par le système de gestion ISO 9000.

Le groupe BEHA déclare par ailleurs que les équipements de contrôle et les instruments utilisés au cours du processus de calibrage sont eux-mêmes soumis à un contrôle technique permanent.

Ces mêmes équipements de contrôle sont calibrés régulièrement à l´aide d´appareils de référence calibrés selon les directives et normes en vigueur dans les laboratoires nationaux et internationaux.

E

El grupo BEHA declara que el producto adquirido ha sido calibrado durante la producción de acuerdo a las instrucciones de test BEHA. Todos los procesos y actividades llevados a cabo dentro del grupo BEHA en relación con la calidad del producto son supervisados permanentemente por el sistema ISO 9000 de control de calidad.

Adicionalmente, el grupo BEHA constata que los equipos e instrumentos de prueba utilizados para la calibración también son sometidos a un permanente control. Estos equipos e instrumentos de prueba son a su vez calibrados en intervalos regulares valiéndose de equipos de referencia calibrados de acuerdo a directivas de laboratorios nacionales e internacionales.

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UNITEST instruments are subject to strict quality control. However, should the instrument function improperly during daily use, your are protected by our 24 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.

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

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