BEHA·AMPROBE®

GT-650/GT-900

Portable Appliance Tester

GB

User's Manual

GT-650/GT-900

User’s Manual

Table of Contents:

Safety information, Warning

Measurements of the electrical safety of appliances should only be carried out by properly trained and competent persons!
Carefully read the safety information before using the appliance tester GT-650/GT-900.

Symbols used on the instrument or in this user's manual:

	**Warning of a potential danger, comply with the user's manual.**
	**Reference, please pay utmost attention.**
	**Earth (ground) terminal**
	**Do not touch, hazardous voltage, risk of electric shock.**
	**Read the user's manual.**
	**Symbol for marking of electrical and electronic equipment (WEEE Directive).**
	**Conformity symbol, confirms compliance with the applicable European directives. The requirements of the EMC Directive and the Low Voltage Directive with the relevant regulations Standards are also fulfilled.**

 **WARNING**

- **The user's manual contains information and references, necessary for safe operation and maintenance of the instrument. Prior to using the instrument, the user is kindly requested to thoroughly read the user's manual and comply with it in all sections.**

- **If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.**

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

Introduction

You have acquired a high-quality measurement instrument manufactured by BEHA-AMPROBE, which will enable you to perform repeatable measurements for a very long period of time.

The portable appliance tester GT-650/GT-900 is a measurement instrument for testing the effectiveness of the protective measures of electrical equipment/appliances complying with VDE 0701-0702, DIN VDE 0404-1/-2 and EN 61557-1/-2/-4/-10/-16 and documentation of test results.

Available measurements, product description:

- Visual inspection as an independent function.
- Protective earth bond resistance measurement (R_{PE}), test current 0.2 A AC and 5 A AC. The test is carried out on plugged and also on fixed connected appliances.
- Insulation resistance measurement (R_{INS}), test voltage 500 VDC and 250 VDC (250V GT-900 only). Appliances PC I, PC I-HEATER (with heater), PC II and PC III can be tested.
- Substitute leakage current measurement (I_{SUB}), test voltage 45 V AC. Appliances PC I and PC II can be tested.
- Earth leakage current measurement ($I_{PE(\Delta)}$) by differential method.
- Touch leakage current measurement (I_T) by direct method with probe resistance of 1kΩ.
- Functional test (P/I_L) including apparent power, active power, mains voltage, load current and power factor measurement.
- Earth leakage current I_{PE} and load current I_L measurement (⦾▭) with external current clamp adapter (GT-900 only).
- IEC CORD test (protective earth bond resistance, insulation resistance, L continuity, N continuity, L/N shorted).
- Test of portable RCD (PRCD): Standard PRCD, PRCD-S, PRCD-S+ and PRCD-K can be tested in accordance with producer's instructions (GT-900 only).
- Protective extra low voltage (PELV) measurement.
- Safety extra low voltage (SELV) measurement.
- AUTO-TEST mode / automatic test sequence (18 factory-programmed AUTO-TESTS for NON UK region and 16 AUTO-TESTS for UK region, 50 customer-created AUTO-TESTS) (GT-900 only).
- Fully compatible with "es control" software to create data base of appliances with their attributes and to create final test certificates. Data base of appliances can be transferred from "es control" to GT-650/900 tester and measurement results can be transferred from GT-650/900 tester to "es control".
- Extremely easy operation using rotary switch and START/STOP button.
- Automatic start function for protective earth bond resistance measurement allows both-hands measurements on measured objects that are difficult to access.
- Compensation of test lead resistance for protective earth bond resistance measurement, CORD and PRCD measurements.
- Calculation of limit values for protective earth bond resistance.
- Automatic mains voltage polarity exchange at earth leakage current and touch leakage current measurements (GT-900 only).

- GT-900: Data memory for 10.000 appliance codes and 5.000 measurement results.
  GT-650: Data memory for 1.000 appliance codes and 500 measurement results.
- Integrated interface (USB 2.0) for transfer of measurement results to PC.
- Additional double interface (USB 2.0) for connection of optional USB barcode reader (HID), USB keyboard (HID) or USB memory stick.
- Graphic LCD for measurement values, limit values and test parameters.
- Compact plastic housing with accessory bag attached to the lid.
- Removable instrument's lid.
- Connection diagrams and limit values attached to instrument's lid.
- Limit values adjustable through measurement range in all functions (except P/IL and CLAMP (range 0 … 60 A)).
- Visual and acoustic warnings in case of exceeded limit value.
- Adjustable acoustic signal intensity.
- Limits predefined for NON UK and UK region.
- Standard and combined mode for barcode reader.
- Real time clock for documentation of test results.
- Single or continuous measurements.
- Adjustable measurement times in single measurement mode and separately in AUTO-TEST mode.
- Standard and fast mode in AUTO-TEST mode.
- Two selectable languages (English and German)
- Two keyboards supported (English and German)

Scope of Supply

1 pc Portable Appliance Tester GT-650/GT-900 with permanently connected mains cable (Schuko, except GT-900 CH) and with removable lid
1 pc PRCD-Adapter (GT-900 only)
1 pc PRCD test finger tip (extension) (GT-900 only)
1 pc Test lead, 1.5 m, 600 V CAT IV, black
1 pc Alligator clip 32 A, 1000 V, CAT III, black
1 pc Test tip 4 mm, 36 A, 1000 V CAT II, black
1 pc USB interface cable
1 pc CD with USB drivers and user's manuals
1 pc User's manual in English and German
1 pc Accessory bag (fixed to the housing's lid)

Available Optional Accessories

PC software "es control" for generating test certificates (No. 2390081)
USB barcode reader (BC-MT204S, No. 3504407)
USB keyboard English version (KBUK-MT204S, No. 3504395)
USB keyboard German version (KBGE-MT204S, No. 3504388)
Current clamp adapter CHB-1 (No. 2390055) measuring range 0.001 A ... 60 A (for Earth leakage/load current measurements)
Clamp adapter ACF-6A (No. 2743889)
PE socket adapter Adapter-PE (No. 4151659)
Brush test probe PAT-BRUSH (No. 4151667)

Transport and Storage

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

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

Safety Measures

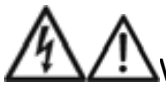
The GT-650/GT-900 appliance tester has been built and tested in compliance with the valid safety regulations and left the factory in safe and perfect condition. In order to maintain this condition and to ensure safe instrument operation, the user must pay attention to the references and warnings contained within this user's manual.

WARNING, DANGER OF ELECTRICAL SHOCK

- In order to avoid electrical shock, the valid safety and national regulations regarding excessive contact voltages must receive utmost attention when working with voltages exceeding 120V DC or 50V RMS AC.
- The respective accident prevention regulations established by the national health & safety board for electrical systems and equipment must be strictly met at all times.
- Prior to any operation, ensure that the instrument, test leads, mains cable and accessories are in perfect condition.
- The instrument may only be connected to mains voltage as indicated in the technical specification section.
- The instrument must obligatory be connected to and supplied by properly wired mains socket (PE connector must be earthed) prior to connecting any test lead to test socket PROBE 1 or PROBE 2 and/or prior to connecting any DUT (Cord or PRCD) to IEC test connector! This is to assure the instrument to be grounded before any further use, otherwise the situation may be hazardous!
- The instrument may only be used within the operating ranges as specified in the technical specification section.
- Only touch test leads and test probes at hand-held area behind the protective fingerguard. Never directly touch test probes. Direct contact to measurement connectors or test probes must be avoided at any time.
- The instrument may only be used in dry and clean environments. Dirt and humidity reduce insulation resistance and may lead to electrical shocks, in particular for high voltages.
- Never use the instrument in precipitation such as dew or rain. In case of condensation due to temperature jumps, the instrument may not be used.
- A perfect display of measurement values may only be ensured within the temperature range of 0 °C to +40 °C.
- Prior to opening the instrument ensure that it is switched off and disconnected from all current circuits.
- To ensure a safe measurement only use original test leads and accessories.

- 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 (or test leads):
  – shows 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.
- Dangerous voltages may be present on appliances/devices under test (DUT) caused by defective insulation. Do not touch the appliance/device under test, danger of electrical shock!
- Start any test series by visual inspection and protective earth bond resistance measurement.
- For protective earth bond resistance test, insulation test and substitute leakage test, appliance/device under test must be voltage-free (mains supply). If necessary, check the appliance/device if it is voltage-free i.e. by using a two pole tester acc. to IEC/EN 61243-3.
- Accidental measurement of a defective appliance/device may trip an RCD (residual current device) of supply.
- During the earth leakage current test, the touch leakage current test and the function (load) test, the DUT will be energized at mains voltage. DUT driven by motors or equipped with heating elements may present a danger for the person testing or others (Comply with the user's manual of the DUT!). Please ensure that the DUT is in a safe condition to run and secure prior to testing.

Appropriate Usage

 WARNING

- The instrument may only be used under conditions and for the purposes for which it was conceived. For this reason, and particular the safety references, the technical data including environmental conditions and the usage in dry environments must be followed.
- When modifying the instrument, the operational safety is no longer ensured.
- The instrument may only be open by an authorised service technician. Before opening the instrument must be switched off and disconnected from any electrical circuit.

Description of warning marks on the front panel

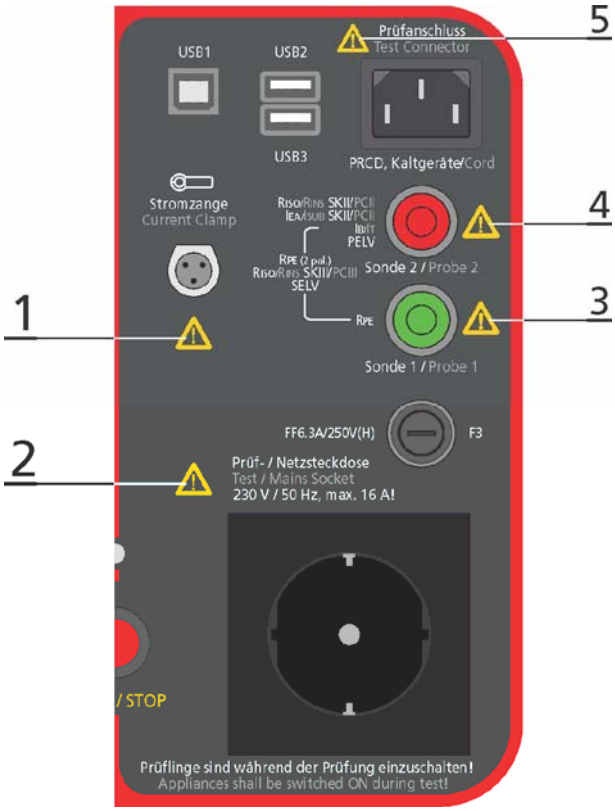


Figure 1: Explanation of safety and measurement category (CAT) rating of input / output terminals

Warning 1:
Use this test socket for CLAMP connection only! Use the clamp listed in chapter "Scope of Supply" on page 8 only!
Input: Max. 60 mA / max. 0.5 V!
Note! One terminal is earthed!

Warning 2:
Use this test / mains socket for test purpose only!
Output: CAT II 300 V ⏚!
IPE, IT and POWER measurements: Intermittent use!
Max. 4 minutes measurement duration / 3 minutes pause!

Warning 3:
100 V is max. allowed voltage between PROBE 1 and earth ⏚!
100 V is max. allowed voltage between PROBE 1 and PROBE 2.
RPE 5A measurement: Intermittent use!
Max. 2 minutes measurement duration / 3 minutes pause!

Warning 4:
230 V CAT II is max. allowed voltage between PROBE 2 and earth ⏚ in function Touch Leakage Current (IT). While this measurement the DUT must be powered from mains socket of GT-650/GT-900 tester and it is allowed only to connect PROBE 2 to touchable parts of the DUT.
100 V is max. allowed voltage between PROBE 2 and earth ⏚ in functions Protective Extra Low Voltage (PELV) and Safety Extra Low Voltage (SELV).
Do not apply any external voltage to PROBE 2 in any other function.
100 V max. is allowed voltage between PROBE 1 and PROBE 2.

Warning 5:
Use this socket for test purpose only!
Do not feed in any external voltage (touchable conductive parts of the tester may not be earthed, if GT-650/GT-900 is not powered with mains)!
This socket is allowed to be supplied from GT-650/GT-900 test / mains socket (schuko socket) only while performing measurements on CORD or PRCD (while performing the measurements GT-650/GT-900 is powered with mains supply and touchable conductive parts of the tester are earthed in this case)!

Operation Elements and Connectors

Front panel of the GT-650 Tester

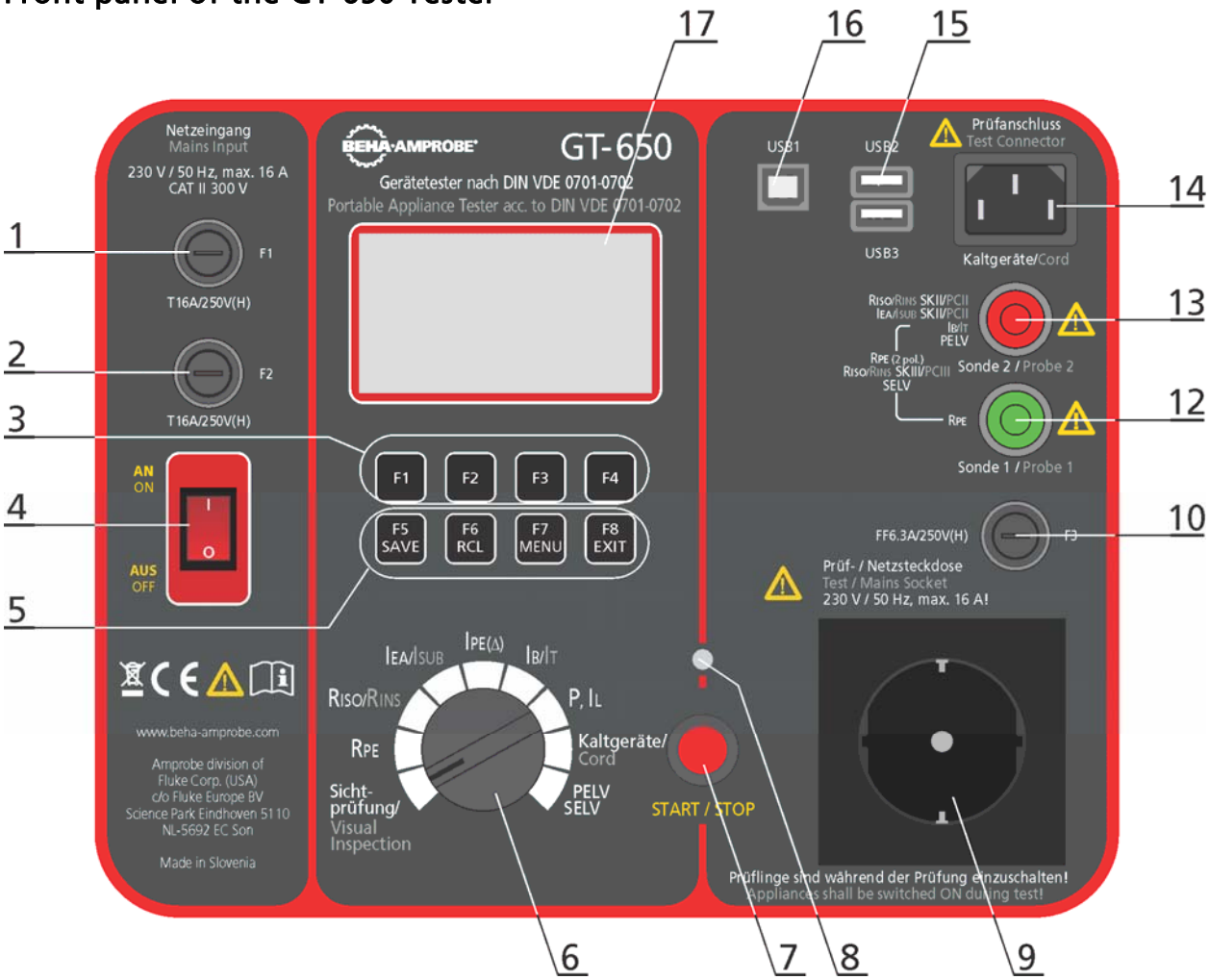


Figure 2: Operational elements and connectors on GT-650 tester

1 ..... Mains input fuse F1 T16 A (H) / 250 V, 5 × 20 mm
2 ..... Mains input fuse F2 T16 A (H) / 250 V, 5 × 20 mm
3 ..... Menu keys F1 ... F4
4 ..... ON/OFF mains switch with red pilot lamp
5 ..... Function keys F5 ... F8, SAVE (to save test result), RCL (to recall saved test result), MENU (to use menu functions) and EXIT (to exit current menu level)
6 ..... Rotary switch to select measurement function
7 ..... START/STOP button (to start or stop selected measurement function)
8 ..... ON red pilot lamp, measurement active
9 ..... Test / mains socket
10 .... Fuse for RPE function F3 FF6.3 A (H) / 250 V, 5 × 20 mm
12 .... Green test socket (PROBE 1)
13 .... Red test socket (PROBE 2)
14 .... IEC test connector (for CORD test)
15 .... USB2 and USB3 interface for USB barcode reader, USB keyboard or USB memory stick
16 .... USB1 interface for connection to PC
17 .... Graphic LCD for measurement values, limit values and parameters.

Front panel of the GT-900 Tester

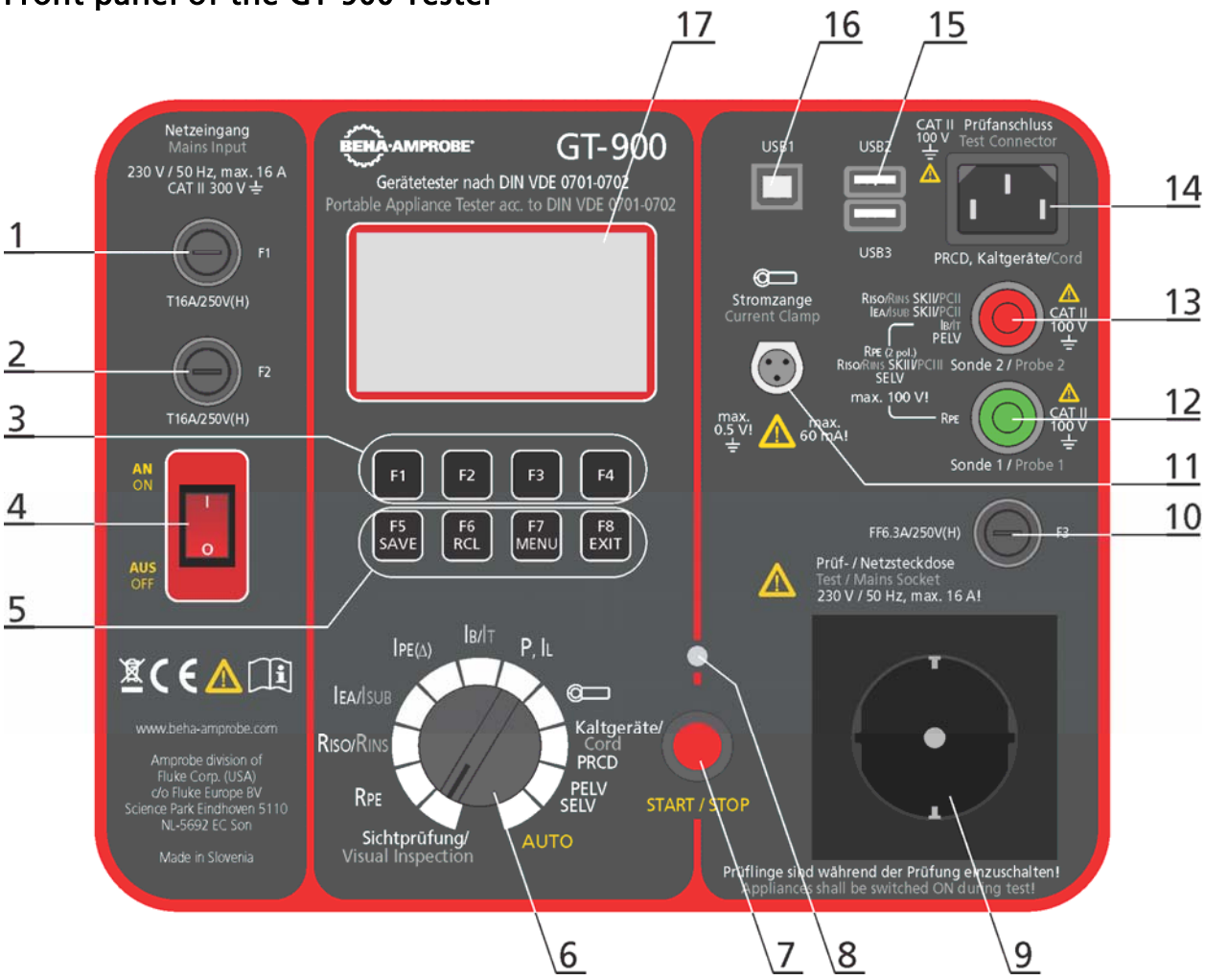


Figure 3: Operational elements and connectors on GT-900 tester

1 ..... Mains input fuse F1 T16 A (H) / 250 V, 5 × 20 mm
2 ..... Mains input fuse F2 T16 A (H) / 250 V, 5 × 20 mm
3 ..... Menu keys F1 ... F4
4 ..... ON/OFF mains switch with red pilot lamp
5 ..... Function keys F5 ... F8, SAVE (to save test result), RCL (to recall saved test result), MENU (to use menu functions) and EXIT (to exit current menu level)
6 ..... Rotary switch to select measurement function
7 ..... START/STOP button (to start or stop selected measurement function)
8 ..... ON red pilot lamp, measurement active
9 ..... Test / mains socket
10 .... Fuse for RPE function F3 FF6.3 A (H) / 250 V, 5 × 20 mm
11 .... CLAMP input connector
12 .... Green test socket (PROBE 1)
13 .... Red test socket (PROBE 2)
14 .... IEC test connector (for CORD test and PRCD test)
15 .... USB2 and USB3 interface for USB barcode reader, USB keyboard or USB memory stick
16 .... USB1 interface for connection to PC
17 .... Graphic LCD for measurement values, limit values and parameters.

Quick instruction card GT-650 Tester, connection diagrams and limit values

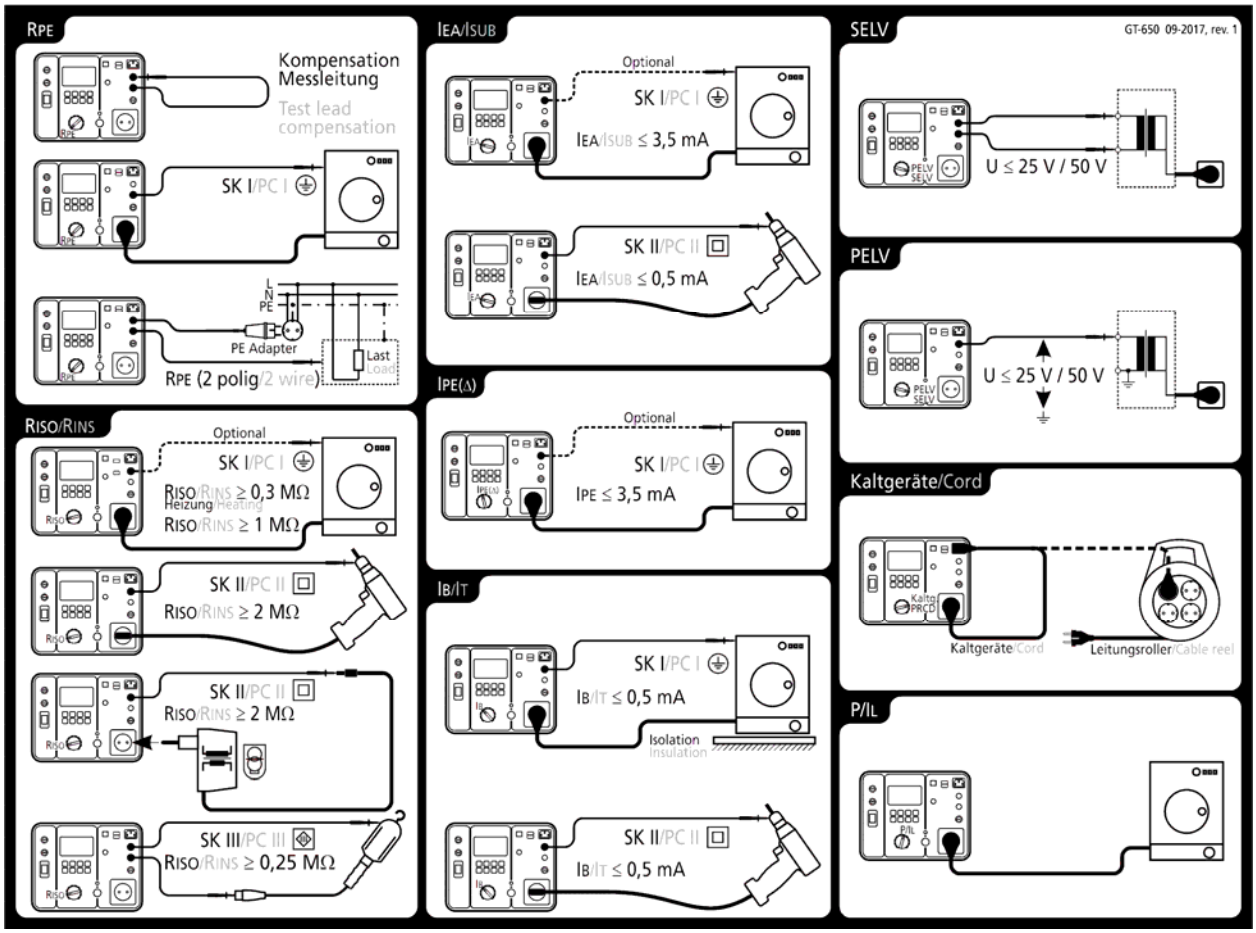


Figure 4: Brief instructions with limit values (GT-650 tester)

Quick instruction card GT-900 Tester, connection diagrams and limit values

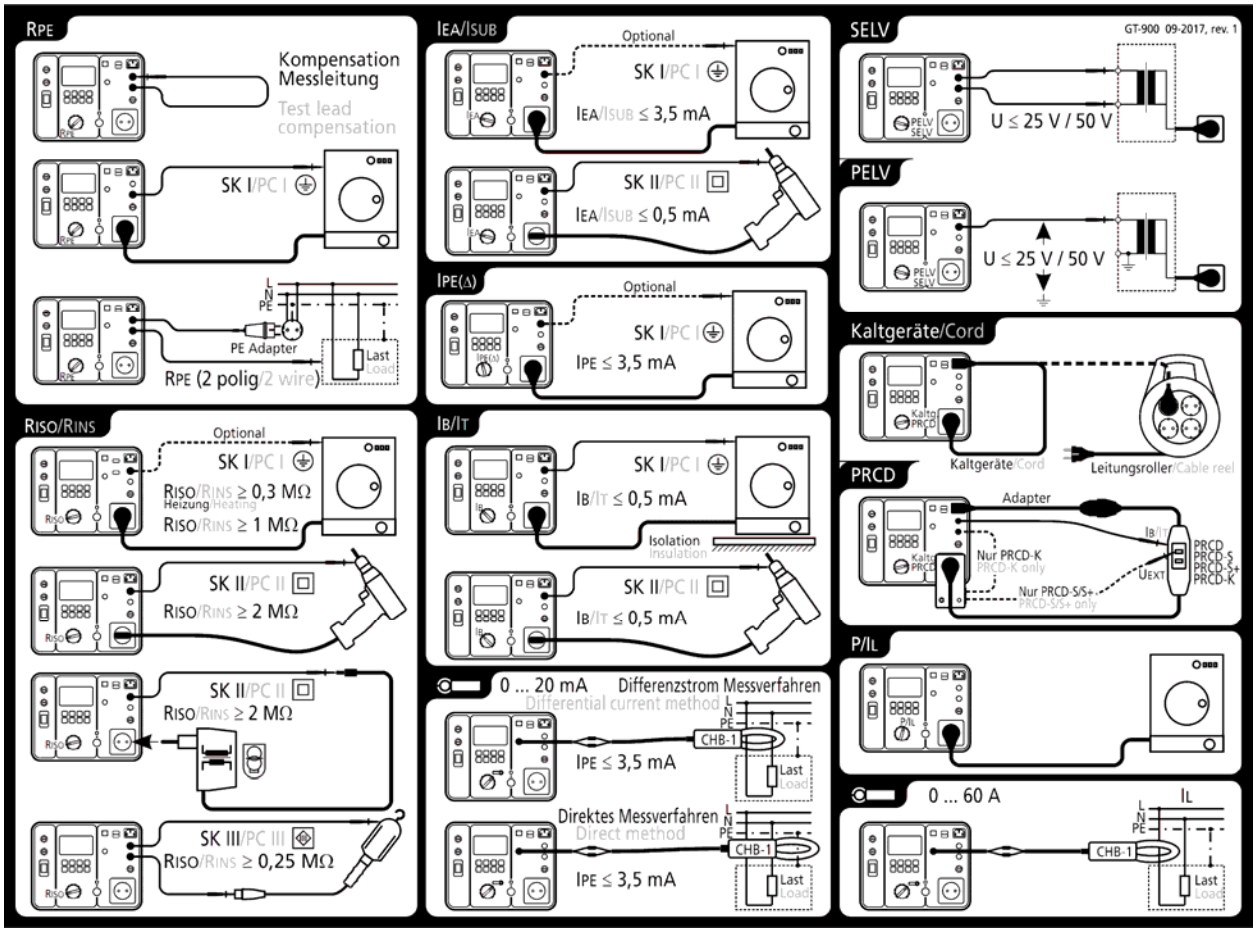


Figure 5: Brief instructions with limit values (GT-900)

Measurement accessories are stored in the accessory bag on the top of the tester.

Description of PRCD-Adapter

The PRCD-Adapter is intended to be used in combination with GT-900 tester only, for testing all types of PRCDs in accordance with PRCD producer's test instructions.

View:

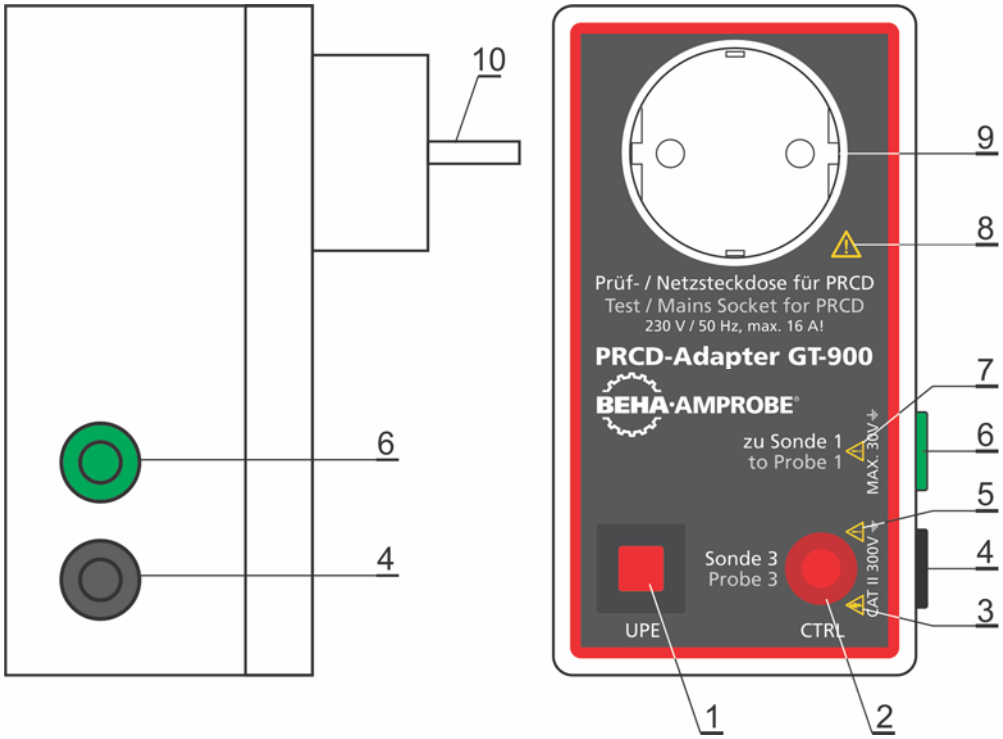


Figure 6: View with control elements, connectors and marking of measurement category (CAT)

1 ..... UPE button, to apply external voltage to input PE terminal of PRCD device under test, as long as the button is pressed.
2 ..... Control neon lamp. It is ON when UPE button is pressed or when Probe 3 sufficiently touches ON button of the PRCD under test.
3 ..... Warning sign: Do not touch Probe 3, hazardous voltage may be applied to it.
4 ..... Test socket "Probe 3" is an output, used to apply external voltage to ON button of the PRCD under test.
5 ..... Warning sign: Output Probe 3, external voltage CAT II 300 V max. against Earth ⏚!
6 ..... Test socket "to Probe 1", to be connected to Probe 1 of GT-900 tester when testing PRCD-K devices.
7 ..... Warning sign: Output Probe 1, external voltage 30 V max. against earth ⏚!
8 ..... Warning sign: Use this test / mains socket for test purpose only!
9 ..... Schuko socket, to connect PRCD under test.
10 .... Schuko plug, to be connected to GT-900 tester.

Preparation of the GT-650/GT-900 Tester

Turning on the GT-650/GT-900 tester

1) Connect the GT-650/GT-900 tester to a correctly installed Schuko mains socket.
2) Use the mains switch "ON/OFF" (4) to turn on the GT-650/GT-900 tester.
3) After turning on the GT-650/GT-900 tester, pilot lamp of the power switch (4) will switch on and the display (17) will show idle readout of selected function. The GT-650/GT-900 tester is now ready for use.

Test lead compensation

The GT-650/GT-900 tester leaves the factory with uncompensated test lead in RPE function and uncompensated test adapter in CORD/PRCD function. We recommend to compensate test lead/adapter before starting the RPE, CORD or PRCD tests, otherwise result may not be correct There are two compensations available (two independent compensation values).

- Compensation of test lead when carrying out RPE measurements (single measurements or AUTO-TESTS). Warning note "TEST LEAD NOT COMPENSATED" will be displayed for a moment after pressing the "START" key as long no test lead is compensated or compensation value was deleted.
- Compensation of test adapter when carrying out CORD measurements (CORD on reel only) or PRCD measurements (single measurements or AUTO-TESTS). Take care when test adapter is to be compensated, there will be no warning if test adapter is not compensated.

Procedure for compensation in RPE measurements:

1) Set the measurement function selector (6) to RPE position.
2) Connect test lead, which will be used later on to perform the RPE measurement, according to the figure below.
3) Press the "COMP" menu key (F2), then start the measurement by pressing the "START" button (7). Pilot lamp "ON" (8) indicates the active measurement, then the result using uncompensated test lead is displayed for a moment. Another regular measurement is done automatically using compensated test lead, now the result should be nearly zero. In the upper display line the character "C" (compensated) appears as the information that test lead is compensated.

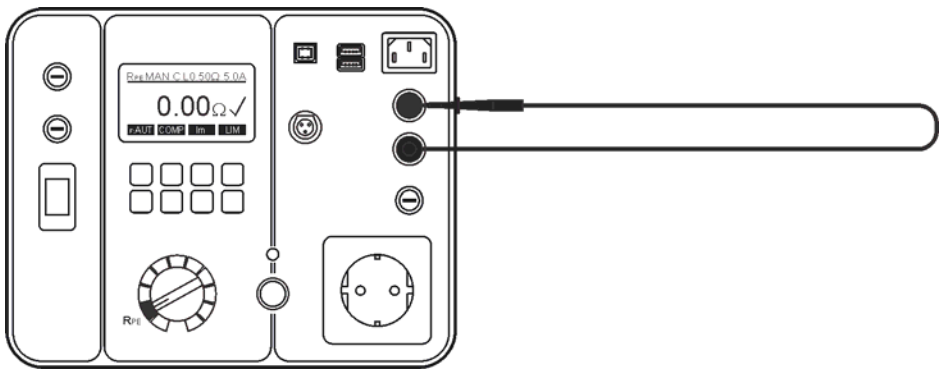


Figure 7: Connection for test lead compensation

☞ This compensation will be used in all further single or AUTO-TEST RPE measurements. It will be active even after switching off and on the GT-650/GT-900 tester.

☞ CORD and PRCD functions are using their own compensation (the same for both functions) independent from above described one. See the information on how to compensate/uncompensated test adapter in chapters "**IEC CORD Test (CORD/PRCD)**" starting on page 39 and "**PRCD Test (CORD/PRCD)** (GT-900 only)" starting on page 43".

☞ Whenever test lead or adapter is changed, the compensation has to be redone. Wrong compensation will direct influence the test result and may give wrong judgement for limit.

☞ Compensation is always carried out using test current of 5 A, while second measurement (self-test) is using selected test current (0.2 or 5.0 A).

How to cancel actual test lead compensation:

Open test loop (disconnect test lead from terminal PROBE 2) and carry out the compensation as described above. The result >11.00Ω will be displayed and "C" symbol will disappear from the top display line.

Limit value setting

Limit value is offered in all functions except in P/IL and CLAMP (range 0 … 60 A). For limit value setting press the "LIM" (or "PAR", see explanation in each function separately) menu key, then use the menu keys "+", "–", "STD" (Standard) or "CALC" (Calculation). The menu key F8 "EXIT" can be used to exit limit value setting display.

☞ In case test result comply with set limit value, the symbol "✓" is displayed and two short sound signals are present after finishing the measurement. In case of non-compliance, the symbol "X" is displayed and one longer sound signal is present after finishing the measurement (see the details in chapter "ACOUSTIC SIGNAL" on page 77). The limit value is saved as a parameter of the measurement result and is transferred to PC in case of data transfer.

Start of the measurement

- For single measurement press the START key and release it. In this case measurement time is defined in MENU / SETUP / MEASUREMENT TIMES menu, see the chapter "SETUP menu" on page 76. Watch elapsed time on displayed bar graph during the measurement.
- For continuous measurements press and keep pressing the START key for at least 2 seconds until "CONT" (continuous) information is displayed. Measurement time is limited to 5 minutes maximum in this case. Continuous measurement is available in all functions except in CORD, PRCD and AUTO-TESTS.

External Voltage Display

- If there is a dangerous external voltage present on test terminals prior to a test or during it, the warning message "EXTERNAL VOLTAGE!" will appear on the display and the start of the measurement will be blocked. Remove the external voltage!
- If an external voltage is applied to test terminals during the test in RINS function, wrong measurement values may be displayed.

⚠ **Please remove external voltage from any test terminal immediately if "EXTERNAL VOLTAGE!" warning is displayed.**

Testing Appliances

 WARNINGS

- Before starting the tests, you must familiarize yourself with the DIN VDE 0701-0702 "Testing after repairs, alteration of electrical equipment - re-testing of electrical devices".
- Before commencing the tests, you are strongly advised to make reference to the local regulations and standards for safety at works regulations and any relevant publications from the Health and Safety Executive.
- The DUT (Device Under Test = Appliance) must be switched on for all tests (mains switch must be turned ON even if the DUT is disconnected from mains voltage e.g. in RPE, RINS and ISUB tests).
- When conducting tests do not touch the DUT as some tests involve higher voltages and higher currents.
- Do not touch the test specimen during the measurements, as a high risk may arise in the case of faulty test specimens.
- The tests should only be performed by competent persons who are familiar with the requirements of the type of tests suitable for portable appliances.
- It is potentially hazardous for both, user and the DUT if the wrong type of tests be undertaken or if testing is carried out in an incorrect sequence.
- It is important that you fully understand the various tests required and how they should be performed.
- The appliance must have passed the visual inspection, the protective earth bond resistance test (PC I appliances) and the insulation test (in this sequence) prior to any other test. If any of these tests fail further testing must be stopped and any faults must be fixed.
- During the earth leakage current test (IPE(Δ)), the touch leakage current test (IT) and the function test (load power/current (P/IL)), the DUT will be energized at mains voltage. For this purpose, switch on the DUT. DUT driven by motors or equipped with heating elements may present a danger for the person testing or others (comply with the user's manual of the DUT!). Please ensure that the DUT is in a safe condition to run and secure prior to testing.

Visual Inspection

Visually inspect the appliance before starting electrical tests.

Check the appliance for the following:

- Condition of the appliance cables, i.e. no cuts, cracks or any physical damage to the outer insulation layer.
- Condition of the plug, cable securely attached, strain relief, bend protection.
- No signs of damage or overheating.
- Fuses are correctly fitted, rated and acc. specification.
- Any signs of damage, and that any mains or control switches will physically switch on and off.
- Any signs of overheating or physical damage.

Display explanation:

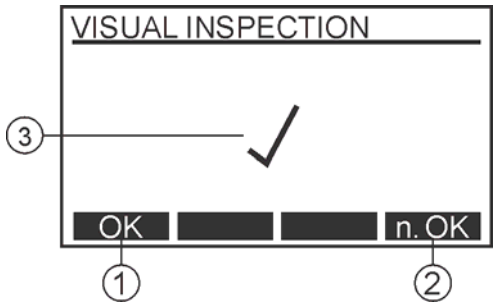


Figure 8: Display in visual inspection function (example)

1 ..... "OK" menu key for confirmation of successful visual inspection.
2 ..... "n. OK" (not OK) menu key for confirmation of unsuccessful visual inspection.
3 ..... Test result (✓... result OK, X ... result not OK).

- In order to save displayed test result, see the "Memorizing example" section.

Protective Earth Bond Test 5 A / 0.2 A (RPE)

The protective earth bond test measures the resistance between PE terminal of test socket and PROBE 1 terminal. This test applies to PC I appliances only.

Test procedure and instructions:

- To obtain correct protective earth bond test results you must have compensated (zeroed) test lead, see the section "Test lead compensation" on page 17.
- Connect the appliance and the PROBE 1 test lead according to the figure 9 or 10.
- You should use the lower test current 0.2 A for certain appliances. Please refer to local appliance test standards and guidance material.
- During the measurement flex the flexible cord along its length to help find any broken conductors or poor connection joints.

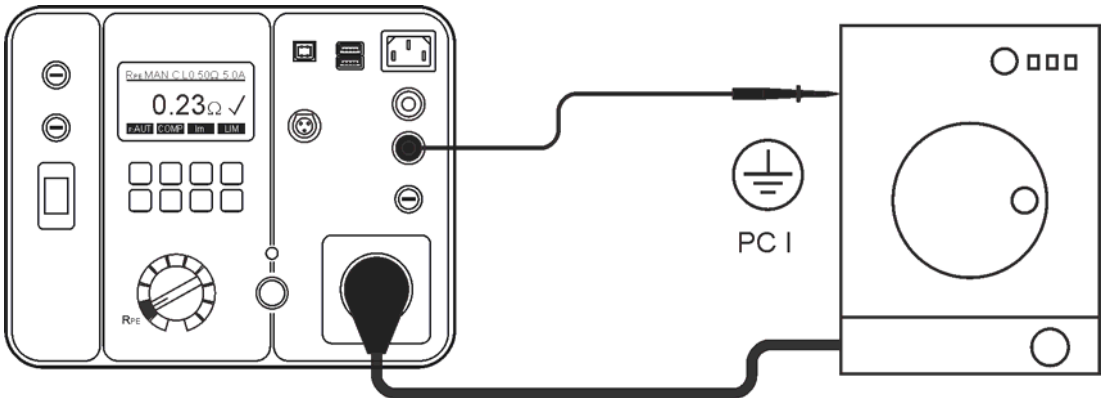


Figure 9: Protective earth bond test connections at appliance with mains plug. Use probe 1

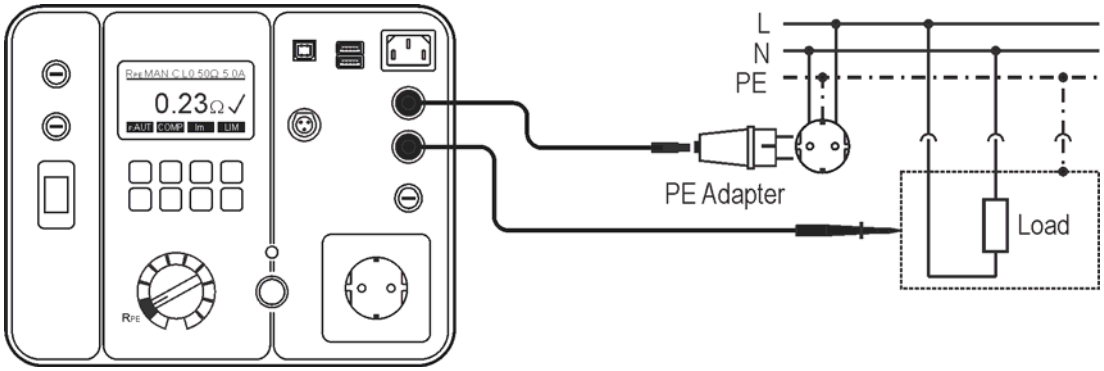


Figure 10: Protective earth bond test connections at permanently connected appliance. Use probe 1 and 2

☞ An example for this application could be to test a cooker, oven or a fridge where it is not possible to plug the mains supply to the test socket of GT-650/GT-900 tester.

☞ This test is not intended to test the protective earth bond connection of an installation.

Display explanation:

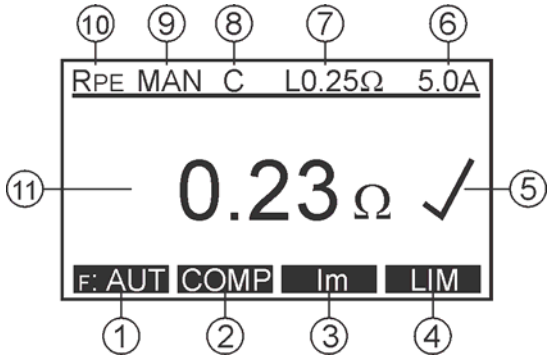


Figure 11: Display in protective earth bond test R_{PE} (example)

1 ..... "F: AUT" / "F: MAN" menu key for selection of auto/manual start of the measurement.
2 ..... "COMP" menu key for test lead compensation.
3 ..... "Im" menu key for test current selection (0.2 A or 5 A).
4 ..... "LIM" menu key for pass/fail limit value setting.
5 ..... Test result status (✓... result OK, X ... result not OK).
6 ..... Selected test current (0.2 A or 5 A).
7 ..... Pre-set pass/fail limit value.
8 ..... Test lead compensation symbol (C ... compensated, blank … not compensated).
9 ..... Selected mode of start of the measurement (MAN, AUT).
MAN (manual) ... Use START key to start the measurement.
AUT (automatic) ... The test is started automatically after connecting PROBE 1 to conductive part of tested appliance. START key is not active in this mode.
10 .... Function selected by the rotary switch (6).
11 .... Test result and unit.

Note:
In case that protective earth bond test fails, the pass/fail limit value can be recalculated by using the "LIM" and "CALC" menu keys and entering the length and cross section of the mains conductor.

Pass/fail limit value calculation:

Cross section A	Cable length L	Limit value
≤ 1.5 mm²	≤ 5 m	0.3 Ω
	> 5 ... 12.5 m	0.4 Ω
	> 12.5 ... 20 m	0.5 Ω
	> 20 ... 27.5 m	0.6 Ω
	> 27.5 ... 35 m	0.7 Ω
	> 35 ... 42.5 m	0.8 Ω
	> 42.5 ... 50 m	0.9 Ω
	> 50 m	1.0 Ω
2.5 ... 50 mm²	1 ... 50 m (res. 0.5 m)	$R_{LIM} = \rho \times L/A$

Where:
ρ ... 0.01786 $\Omega mm^2/m$ (specific resistance of copper)
L .. Cable length in m
A .. Cross section in mm^2

Specific information that can be shown on the display:

Information displayed	Description
TEST LEAD NOT COMPENSATED	Test lead is not compensated (no "C" symbol on the display)! It is recommended to compensate test lead.
>5Ω, NOT COMPENSATED	Compensation was not successfully done due to too high compensation value (>5.00 Ω)!
COMP?	Test lead is wrong compensated (negative R_{PE} result ≥0.05 Ω). Compensate the test lead again.
⚠ EXTERNAL VOLTAGE	External voltage is applied to one or more test terminals, see the explanation in section "Pre-Tests and Protection".
⚠ USE PROBE 1	Test lead is not connected to PROBE 1.
>11.00Ω X	R_{PE} value higher than 11.00 Ω (over-range), possibly because of open test lead.

- In order to save displayed measurement results, see the "Memorizing example" section.

Insulation Resistance Test 250 V / 500 V (RINS)

The insulation resistance test measures the resistance of the insulation between:

- L/N terminals of test socket and PE terminal of test socket in parallel with PROBE 2 (at PC I, PC I-HEATER (with heater) and PC II). L/N terminals are shorted by the GT-650/GT-900 tester for this test.
- Test probe PROBE 1 and test probe PROBE 2 (at PC III).

⚠ Warnings

- **The test voltage is either 500 V (or 250 Vd.c. at GT-900 only). Do not touch the appliance during the insulation test! If the test fails, any metal part of the appliance could become live!**
- **Always make sure that the test has completed before disconnecting the appliance leads to ensure that all capacitances have discharged!**

⚠ Cautions

- **Do not perform the Insulation test on appliances that failed the protective earth bond test or the visual inspection test.**
- **Please ensure that the mains switch of the appliance is closed.**
- **The insulation test may not be suitable for some types of appliances (i.e. electronic devices or IT-devices). For these appliances an alternative test may be conducted such as touch leakage current, earth leakage current or substitute leakage current test. It is essential to refer to the local appliance test standards and/or reference material for the safe applicability of these alternative tests.**
- **Test voltage of 500 V may not be suitable for some appliances that contain overvoltage protection devices (e.g. varistors) in their input circuits. For these appliances test voltage of 250 V shall be used, refer to the local appliance test standards and/or follow the manufacturer recommendations.**

Test procedure and instructions:

- Connect the appliance and the test lead according to one of the figures 12, 13, 14 or 15, depending on appliance protection class (PC).
- For PC I appliances no probe is required except if there are some conductive parts on the appliance which are not connected to PE terminal. In this case use probe 2 in addition.
- For PC II appliances apply the test probe to any exposed conductive part on the appliance. Do the test for all exposed conductive parts on the appliance, partial results must pass pre-set limit value. Use therefore probe 2.

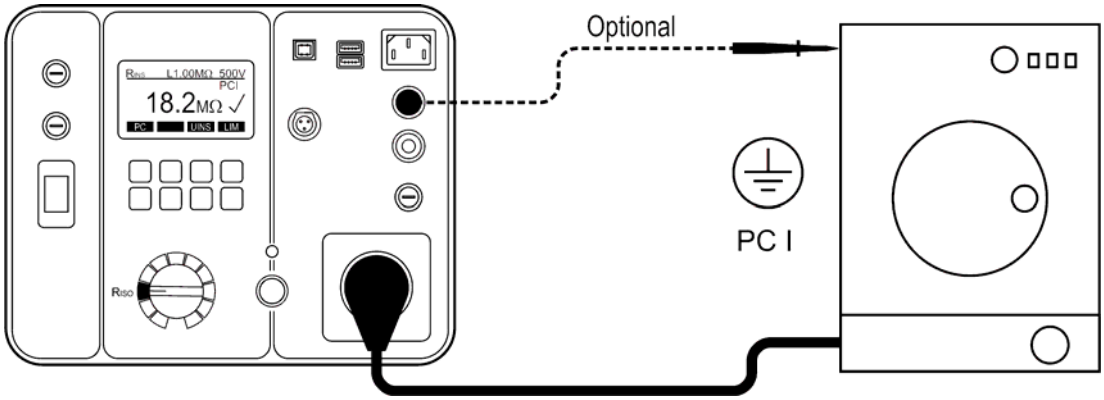


Figure 12: Insulation resistance test connections at appliance PC I

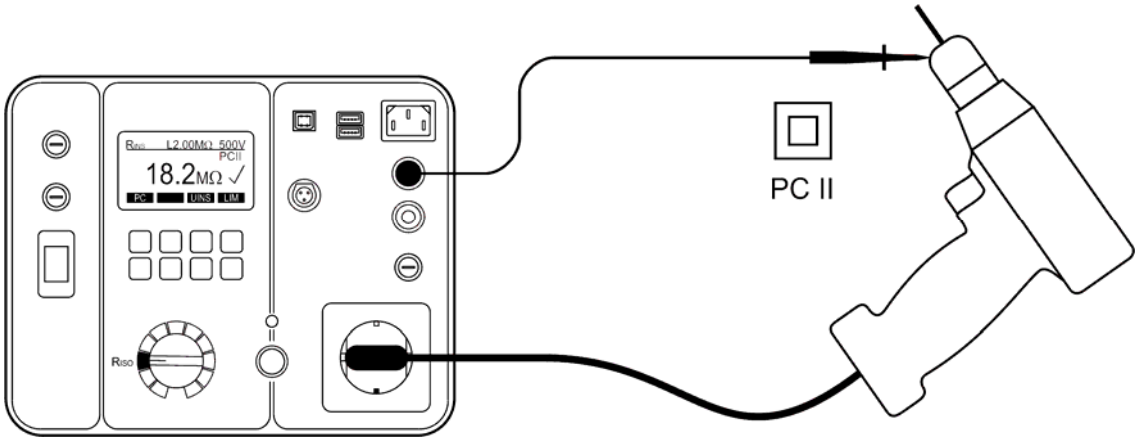


Figure 13: Insulation resistance test connections at appliance PC II.
Use probe 2.

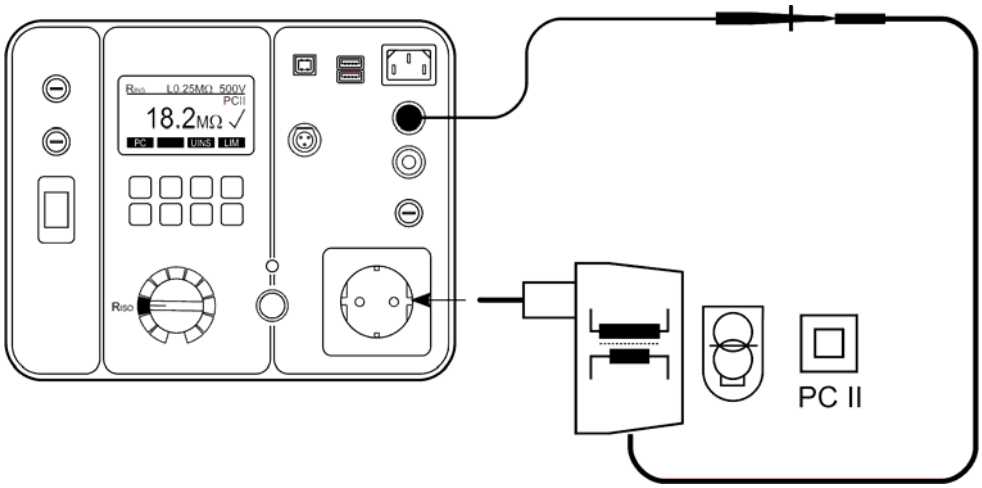


Figure 14: Insulation resistance test connections for power supply (PC II).
Use probe 2.

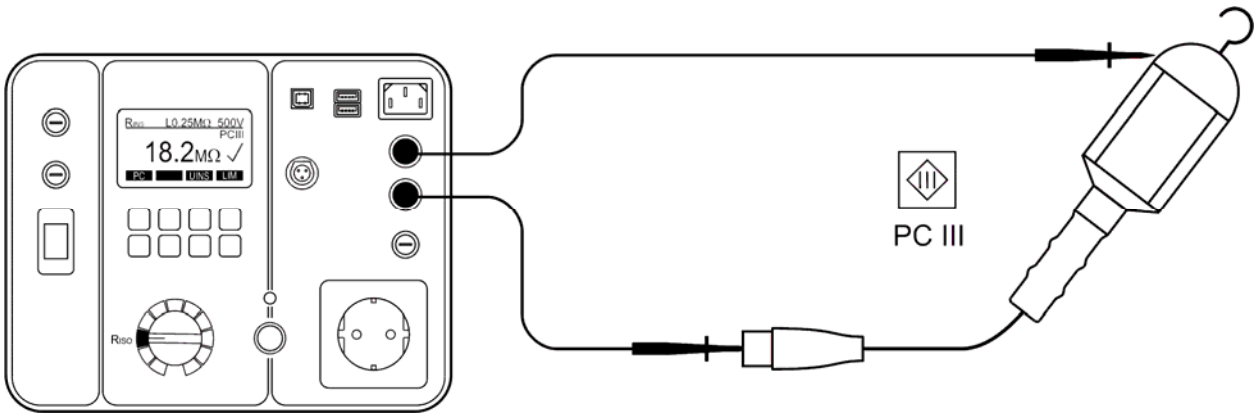


Figure 15: Insulation resistance test connections at appliance PC III.
Use probe 1 and 2.

Display explanation:

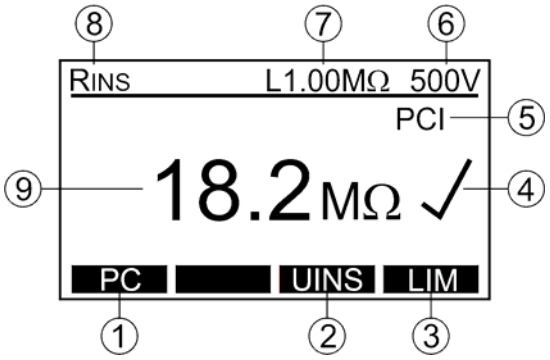


Figure 16: Display in insulation resistance test RINS (example)

1 ..... "PC" menu key for selection of protection class (PC I, PC I-HEATER (with heater), PC II or PC III).
2 ..... "UINS" menu key for selection of test voltage (250 V or 500 V) (GT-900 only).
3 ..... "LIM" menu key for pass/fail limit value setting.
4 ..... Test result status (✓... result OK, X ... result not OK).
5 ..... Selected protection class (PC I, PC I-HEATER (with heater), PC II or PC III).
6 ..... Selected test voltage 500 V (or 250 V at GT-900 only).
7 ..... Pre-set pass/fail limit value.
8 ..... Function selected by the rotary switch (6).
9 ..... Test result and unit.

Specific information that can be shown on the display

Information displayed	Description
⚠ EXTERNAL VOLTAGE	External voltage is applied to one or more test terminals, see the explanation in section "Pre-Tests and Protection".
⚠ USE PROBE 2	Test lead is not connected to PROBE 2 (at PC II appliances).
>100MΩ ✓	RINS value higher than 100 MΩ (over-range). Measurement range in PC I/II is 100 MΩ.
>20.0MΩ ✓	RINS value higher than 20.0 MΩ (over-range). Measurement range in PC III is 20.0 MΩ.

- In order to save displayed measurement results, see the "Memorizing example" section.

Substitute Leakage Current Test (ISUB)

The substitute leakage current test measures the leakage current between L/N terminals of test socket and PE terminal of test socket in parallel with PROBE 2 (at PC I and PC II). L/N terminals are shorted by the GT-650/GT-900 tester for this test.

This measurement is an alternative measuring method for the Earth leakage current measurement and Touch leakage current measurement.

It is essential to refer to the local appliance test standards and/or guidance material for the safe applicability of this test.

Test procedure and instructions:

- Connect the appliance and the test lead according to the figure 17 or 18, depending on appliance protection class (PC).
- For PC I appliances no probe is required except if there are some conductive parts on the appliance not connected to PE terminal. In this case use probe 2 in addition.
- For PC II appliances apply the test probe to any exposed conductive part on the appliance. Do the test for all exposed conductive parts on the appliance. Use then probe 2.

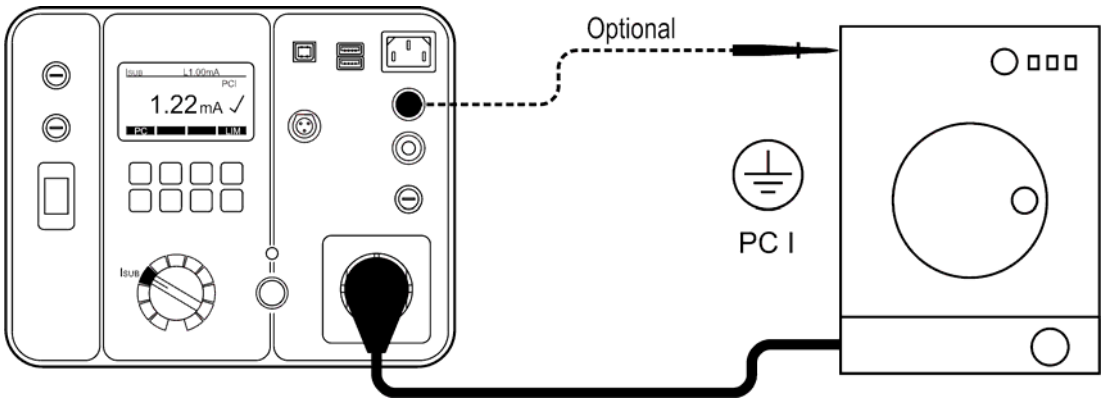


Figure 17: Substitute leakage current test connections at appliance PC I

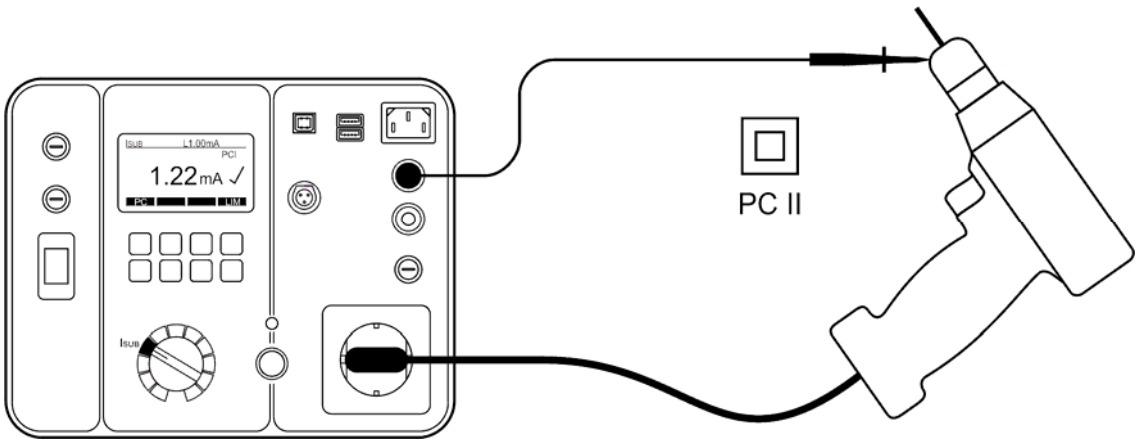


Figure 18: Substitute leakage current test connections at appliance PC II. Use probe 2.

Display explanation:

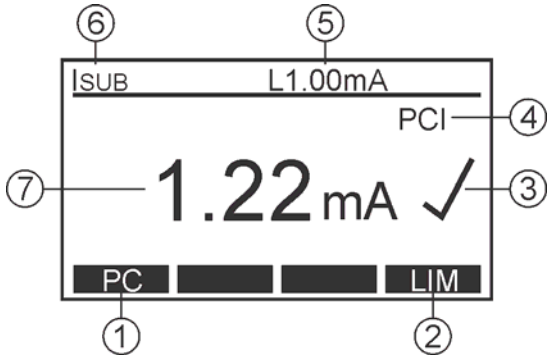


Figure 19: Display in substitute leakage current test ISUB (example)

1 ..... "PC" menu key for selection of protection class (PC I or PC II).
2 ..... "LIM" menu key for pass/fail limit value setting.
3 ..... Test result status (✓... result OK, X ... result not OK).
4 ..... Selected protection class (PC I or PC II).
5 ..... Pre-set pass/fail limit value.
6 ..... Function selected by the rotary switch (6).
7 ..... Test result and unit.

Specific information that can be shown on the display

Information displayed	Description
⚠ EXTERNAL VOLTAGE	External voltage is applied to one or more test terminals, see the explanation in section "Pre-Tests and Protection".
⚠ USE PROBE 2	Test lead is not connected to PROBE 2 (at PC II appliances).
>20.0mA X	ISUB result >20.0mA (over-range).

- In order to save displayed measurement results, see the "Memorizing example" section.

Earth Leakage Current Test ($I_{PE(\Delta)}$) (differential method)

Earth leakage current test measures the earth leakage current in the protective conductor (PE) of appliances connected to the mains socket of the GT-650/GT-900 tester. The measurement is carried out by the differential method.

Warning

- **NEVER carry out this test unless you have first carried out a thorough visual inspection followed by a test of the protective earth bond resistance (for PC I appliances) and then a test of insulation resistance. You must verify that these tests have passed before engaging the earth leakage current test.**
  Please observe the relevant standards and regulations.

Caution

- **Live test! The appliance will be energized at mains voltage. For this purpose switch on the appliance. Appliances driven by motors or equipped with heating elements may present a danger for the person testing or others (comply with the user's manual!). Ensure that the appliance is in a safe condition to run and secure it prior to testing.**

Test procedure and instructions:

- Connect the appliance according to the figure 20.
- If the earth leakage current is higher than 25.00 mA for 2 seconds, the test will be interrupted automatically and "RANGE OVERLOAD" message will be displayed.
- The measurement must be performed with both polarities of mains voltage, the highest of the two values obtained must be recorded.
  For GT-650 the reversal of the mains voltage must be done manually by reversing schuko mains plug.

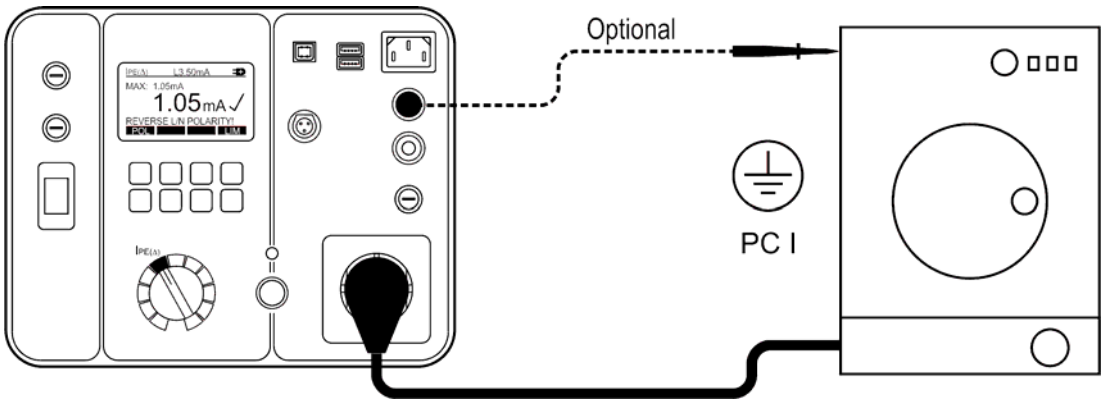


Figure 20: Earth leakage current test connections

Display explanation:

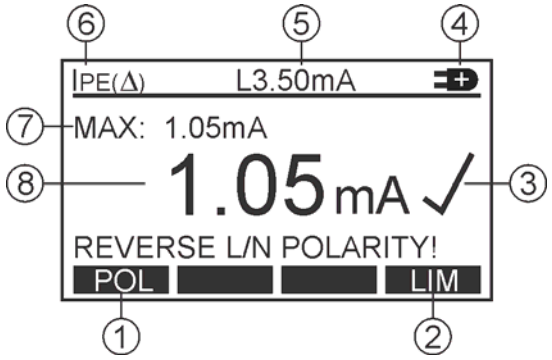


Figure 21: Display in earth leakage current test IPE (example)

1 ..... "POL" menu key for selection of mains voltage polarity (GT-900 only).
2 ..... "LIM" menu key for pass/fail limit value setting.
3 ..... Test result status (✓... result OK, X ... result not OK).
4 ..... Selected mains polarity (GT-900 only).
⊕ ... phase connected to the right terminal of mains socket.
⊖ ... phase connected to the left terminal of mains socket.
5 ..... Pre-set pass/fail limit value.
6 ..... Function selected by the rotary switch (6).
7 ..... Max. value detected during the measurement.
8 ..... Last test result and unit.

Specific information that can be shown on the display

Information displayed	Description
⚠ EXTERNAL VOLTAGE	External voltage is applied to one or more test terminals, see the explanation in section "Pre-Tests and Protection".
⚠ MAINS SWITCH ON CONTINUE?	Warning! Mains voltage will be applied to mains socket after confirming this message!
⚠ NO DEVICE	Note! No appliance is connected to mains socket, or mains switch on the appliance is switched OFF!
>20.00mA X	IPE current higher than 20.00 mA (over-range).
⚠ VOLTAGE OVER RANGE	Voltage higher than 30 V approx. is present on PROBE 2. Remove the voltage.

- In order to save displayed measurement results, see the "Memorizing example" section.

Touch Leakage Current Test (I_T) (direct method)

The touch leakage current test measures the leakage current from exposed conductive parts of tested appliance via test probe PROBE 2 and internal resistance of approx. 1 kΩ to earth.
The measurement is carried out by the direct method.

Warning

- **NEVER carry out this test unless you have first carried out a thorough visual inspection, followed by a test of the protective earth bond resistance (for PC I appliances) and then a test of insulation resistance. You must verify that these tests have passed before engaging the touch leakage current test.**
  Please observe the relevant standards and regulations.

Caution

- **Live test! The appliance will be energized at mains voltage. For this purpose, switch on the appliance. Appliances driven by motors or equipped with heating elements may present a danger for the person testing or others (comply with the user's manual!). Ensure that the appliance is in a safe condition to run and secure it prior to testing.**

Test procedure and instructions:

- Connect the appliance and the test lead according to the figure 22 or 23, depending on appliance protection class (PC).
- For PC I appliances apply the test probe to any exposed conductive part not connected to PE terminal.
- For PC II appliances apply the test probe to any exposed conductive part on the appliance.
- The measurement must be performed in both polarities of the mains plug, the highest of the two values obtained must be recorded.
  For GT-650 the reversal of the mains voltage must be done manually by reversing schuko mains plug.

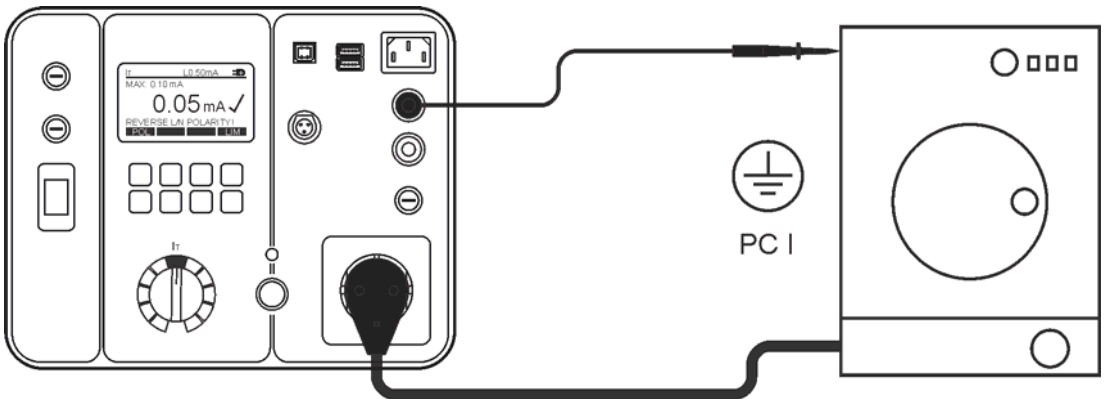


Figure 22: Touch leakage current test connections at appliance PC I.
Use probe 2.

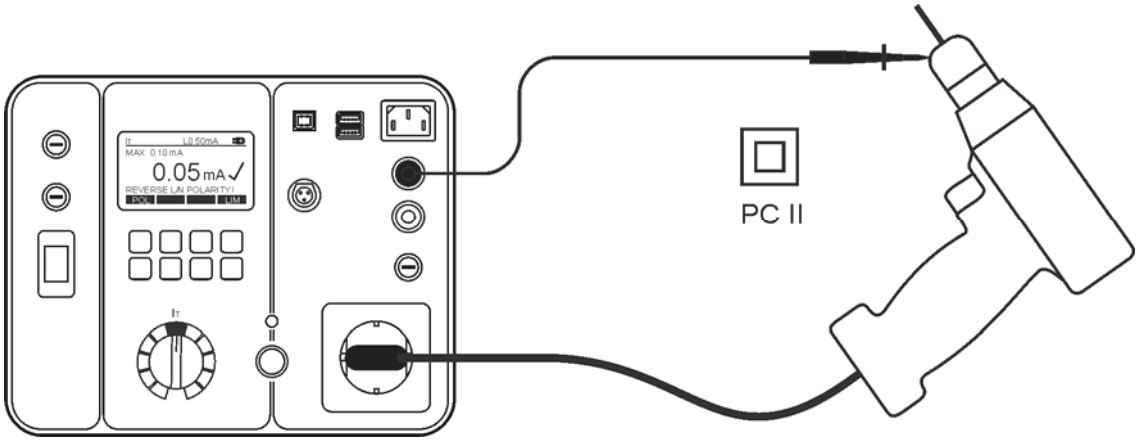


Figure 23: Touch leakage current test connections at appliance PC II.
Use probe 2.

Display explanation:

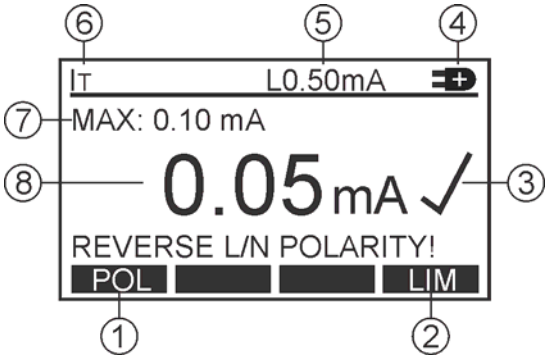


Figure 24: Display in touch leakage current test IT (example)

1 ..... "POL" menu key for selection of mains voltage polarity (GT-900 only).
2 ..... "LIM" menu key for pass/fail limit value setting.
3 ..... Test result status (✓... result OK, X ... result not OK).
4 ..... Selected mains polarity (GT-900 only).
⊕ ... phase connected to the right terminal of mains socket,
⊖ ... phase connected to the left terminal of mains socket.
5 ..... Pre-set pass/fail limit value.
6 ..... Function selected by the rotary switch (6).
7 ..... Max. value detected during the measurement.
8 ..... Last test result and unit.

Specific information that can be shown on the display

Information displayed	Description
⚠ MAINS SWITCH ON CONTINUE?	Warning! Mains voltage will be applied to mains socket after confirming this message!
⚠ NO APPLIANCE	Note! No appliance is connected to mains socket, or mains switch on the appliance is switched OFF!
⚠ USE PROBE 2	Test lead is not connected to PROBE 2.
>20.00mA X	IT value higher than 20.00 mA (over-range).
⚠ VOLTAGE OVER RANGE	Voltage higher than 30 V approx. is present on PROBE 2. Remove the voltage.

- In order to save displayed measurement results, see the "Memorizing example" section.

Functional test (P/IL), Power and Load Current measurement

The functional test measures the apparent power S, active power PA, mains voltage ULN, load current IL and power factor PF of the appliance, connected to mains socket. While performing this test also the functional testing of the appliance could be performed.

Warning

- **NEVER carry out this test unless you have first carried out a thorough visual inspection, followed by a test of the protective earth bond resistance (for PC I appliances) and then a test of insulation resistance and earth leakage current or touch leakage current test. You must verify that these tests have passed before engaging this test.**
  Please observe the relevant standards and regulations.

Caution

- **Live test! The appliance will be energized at mains voltage. For this purpose, switch on the appliance. Appliances driven by motors or equipped with heating elements may present a danger for the person testing or others (comply with the user's manual!). Ensure that the appliance is in a safe condition to run and secure it prior to testing.**

Test procedure and instructions:

- Connect the appliance according to the figure 25.
- If the load current is higher than 18.0 A for 10 seconds, the test will be interrupted automatically and "RANGE OVERLOAD" message will be displayed.

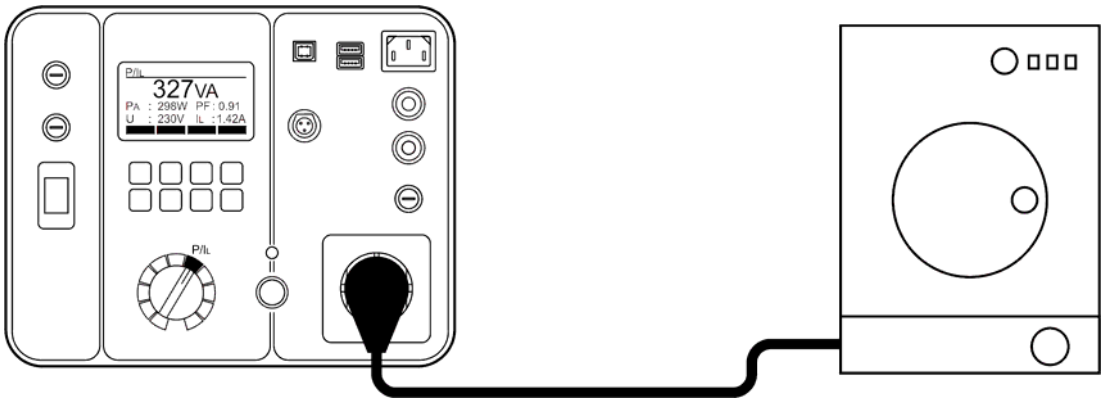


Figure 25: Functional test connection

Display explanation:

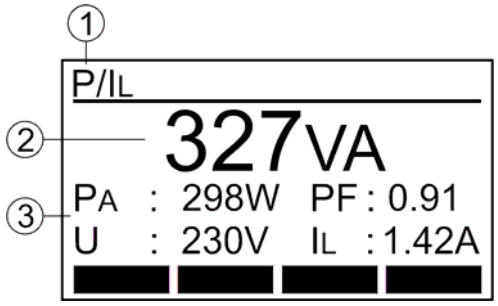


Figure 26: Display for Functional test P/IL (example)

1 ..... Function selected by the rotary switch (6).
2 ..... Main result (apparent power in VA).
3 ..... Sub-results (active power PA in W, mains voltage ULN in V, power factor PF and load current IL in A)

Specific information that can be shown on the display

Information displayed	Description
⚠ EXTERNAL VOLTAGE	External voltage is applied to one or more test terminals, see the explanation in section "Pre-Tests and Protection".
⚠ MAINS SWITCH ON CONTINUE?	Warning! Mains voltage will be applied to mains socket after confirming this message!

- In order to save displayed measurement results, see the "Memorizing example" section.

Clamp Current Test (⊂⊃) (GT-900 only)

The test with the external clamp adapter measures the current in clamped conductor. The function is intended to measure:

- The earth leakage current in the protective conductor (PE).
- The load current in line (or neutral) conductor.

Test procedure and instructions:

- Connect the clamp according to one of the figures 27, 28 or 29, depending on which current one wish to measure.
- Select appropriate measurement range by using menu key "RNG" (F1), (0 ... 20 mA for earth leakage current or 0 ... 60 A for load current).

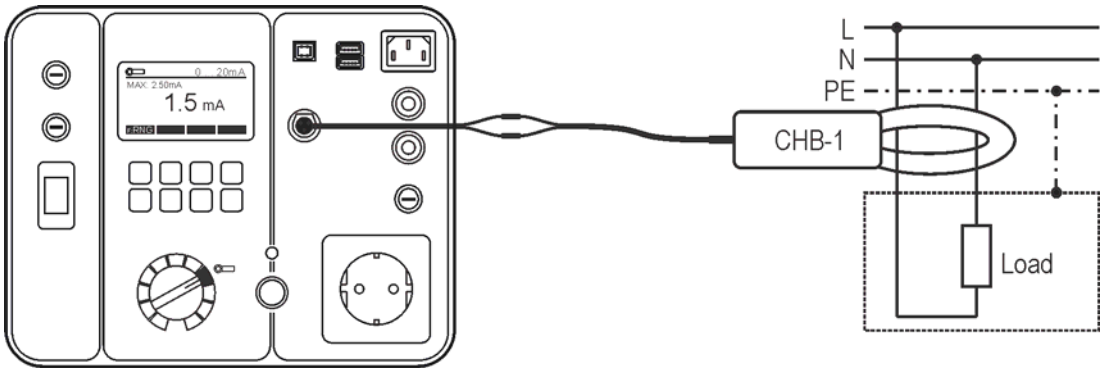


Figure 27: Earth leakage current test connection (differential method)

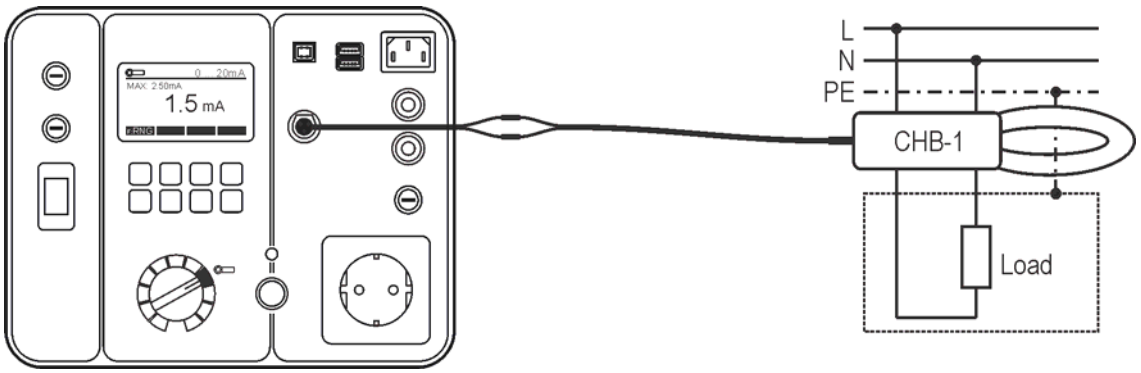


Figure 28: Earth leakage current test connection (direct method)

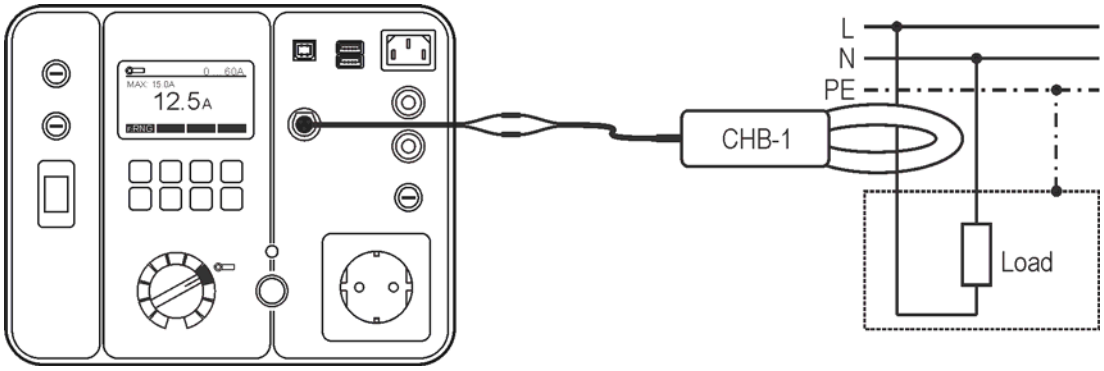


Figure 29: Load current test connection

Display explanation:

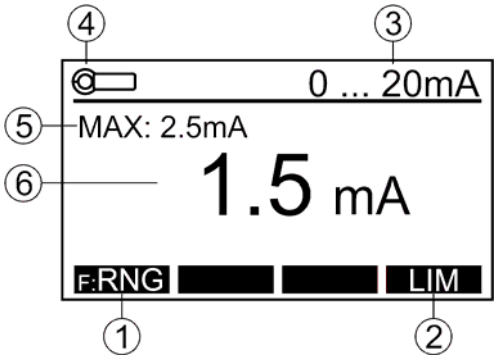


Figure 30: Display in CLAMP current test ( ) (example)

1 ..... "RNG" menu key for selection of measurement range (0...20 mA or 0...60 A).
2 ..... "LIM" menu key for pass/fail limit value setting (0 … 20 mA range only).
3 ..... Selected measurement range (6).
4 ..... Function selected by the rotary switch.
5 ..... Max. value detected during the measurement.
6 ..... Last test result and unit.

- In order to save displayed measurement results, see the "Memorizing example" section.

IEC CORD Test (CORD/PRCD)

The IEC CORD test does a full test of IEC cords, extension leads, multiple sockets and cable reels. Following parameters are tested and measured:

- Visual inspection
- Protective earth bond resistance RPE
- Insulation resistance RINS between PE and L/N conductors (L/N conductors are shorted by the GT-650/GT-900 tester). Test voltage of 500 VDC is used for this test.
- L conductor continuity
- N conductor continuity
- L and N condition (OK/shorted).

Test procedure and instructions for testing standard IEC cords:

Set test parameters.

Select auto or manual start mode by using the "F: AUT/F: MAN" menu key. If auto start mode is selected (AUT is displayed on upper display line), then the test will start automatically after connecting the cord to be tested to test / mains socket and to test connector CORD. START key is not active in this start mode. If manual start mode is selected (MAN is displayed on upper display line), then use the START key to start the measurement.

- Select appropriate test current of RPE step (0.2 or 5.0 A) by using the "PAR" and then "Im" menu keys. Confirm selected test current by pressing the "↵" menu key.
- Adjust limit value (0.01 … 11.00 Ω) of RPE step by pressing the "PAR" and then "CALC" (calculation) menu keys. Enter appropriate SECTION and LENGTH of tested cable and confirm them by pressing the "↵" menu key, calculated limit value will be offered. Modify it if needed by using the "+" and "-" menu keys, then confirm it by pressing the "↵" menu key. In order to enter the limit value with "+" and "-" menu keys directly without calculation, press the "▭" menu key first.

Note!
Compensation of test adapter shall not be carried out when testing standard IEC cords (as no adapter is used), see the figure 31. The symbol "C" (compensated (8)) must not be present on the upper line, see the figure 32 – right picture.

Test procedure (manual start mode).

- Connect the IEC cord according to the figure below.
- Press the START key, VISUAL INSPECTION step will be offered. Do the visual inspection of tested cord and confirm the result by pressing the "OK" (visual inspection passed) or "n.OK" (visual inspection failed) menu key.

  Note!
  Visual inspection (positive result) can be confirmed also directly by pressing the START key instead of pressing the "OK" menu key.

- RPE measurement starts to run after positive confirmation of visual inspection. During the measurement flex the cord along its length to help find any broken conductors or poor connection joints.
  Press the STOP key when the cable is checked by flexing it.
- RINS measurement will be carried out automatically after finishing RPE step.

- Continuity of L and N conductors will be carried out automatically after finishing RINS step.
- L/N condition test (OK/shorted) will be carried out automatically after finishing previous step. CORD test is thus finished.

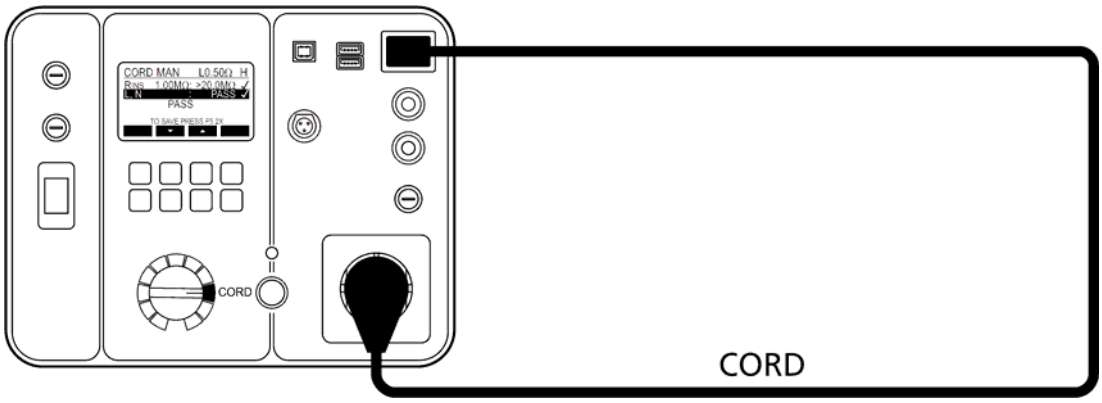


Figure 31: CORD test connection

Display explanation:

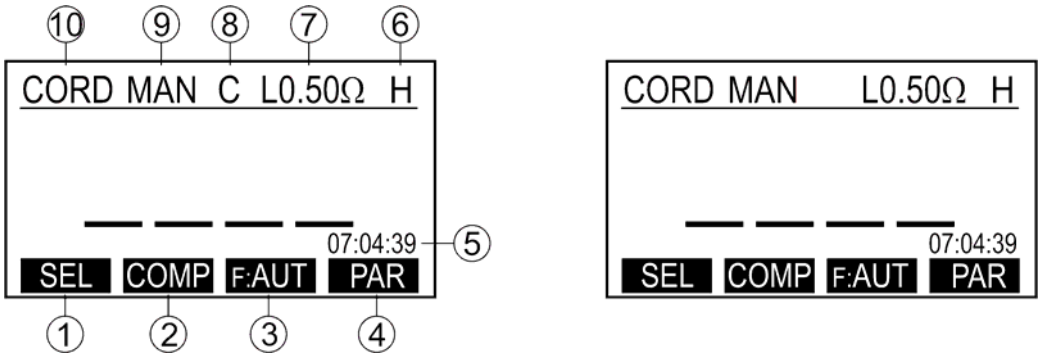


Figure 32: Idle display in CORD test (example), left picture - test adapter compensated (C present), right picture – test adapter not compensated (C not present)

1 ..... "SEL" menu key (GT-900 only), for selection of measurement function (CORD, PRCD, PRCD-S, PRCD-S+ or PRCD-K).
2 ..... "COMP" menu key for compensation of test adapter.
3 ..... "F: AUT" / "F: MAN" menu key for selection of automatic / manual start of the measurement.
4 ..... "PAR" menu key for pass/fail limit value setting of protective earth and for selecting test current (0.2 or 5.0 A).
5 ..... Clock.
6 ..... Used test current (0.2 A = L or 5.0 A = H).
7 ..... Pre-set pass/fail limit value for protective earth bond RPE.
8 ..... "C" symbol (compensation) (test adapter is compensated).
9 ..... Selected mode of start of the measurement (MAN or AUT).
MAN (manual) ... Use START key to start the measurement.
AUT (automatic) ... The test is started automatically after connecting the cord to be tested to Test Socket and to Test Connector CORD. START key is not active in this mode.
10 .... Function selected by the rotary switch (6) and the "SEL" menu key.

Test procedure and instructions for testing cable extensions or cable reels:

Cable extensions with single and multiple sockets or cable reels can also be tested with GT-650/GT-900 tester.

Note!
An additional test adapter is used when testing cable extensions (see the figure 34), multiple sockets or cable reels (see the figure 35). That is why the adapter shall be compensated prior to carrying out the cable extension or cable reel test. The symbol "C" (compensated (8)) must be present on the upper line, see the figure 32 – left picture. Any good IEC cord could be used as test adapter.

Compensation of test adapter's resistance:

- To obtain correct protective conductor resistance result you must have compensated (zeroed) the internal resistance of the adapter, see the connection information below.
- Press the "COMP" menu key, then press "START" key. Compensation will be automatically done and an additional measurement will be carried out to check effectiveness of performed compensation, result 0.00 Ω should be displayed. Now the GT-650/GT-900 tester is ready for further use.

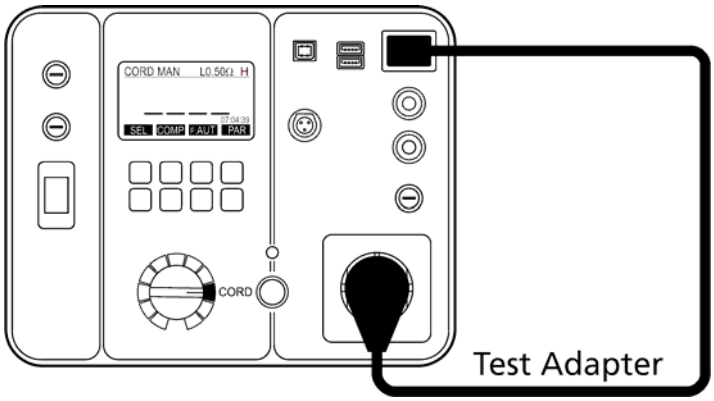


Figure 33: Connection of the Test Adapter for compensation purpose

- Connect the cable extension or cable reel according to the figure 34 or 35 below. Use compensated standard IEC cable as a test adapter to connect tested cable extension or cable reel to IEC connector (14) of the GT-900/GT-650 tester.
- Repeat the procedure described for standard IEC cable.

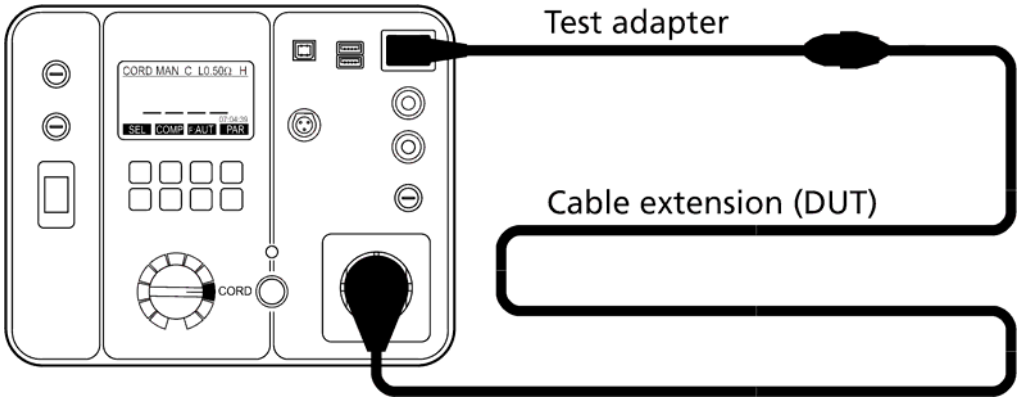


Figure 34: Cable extension test connection

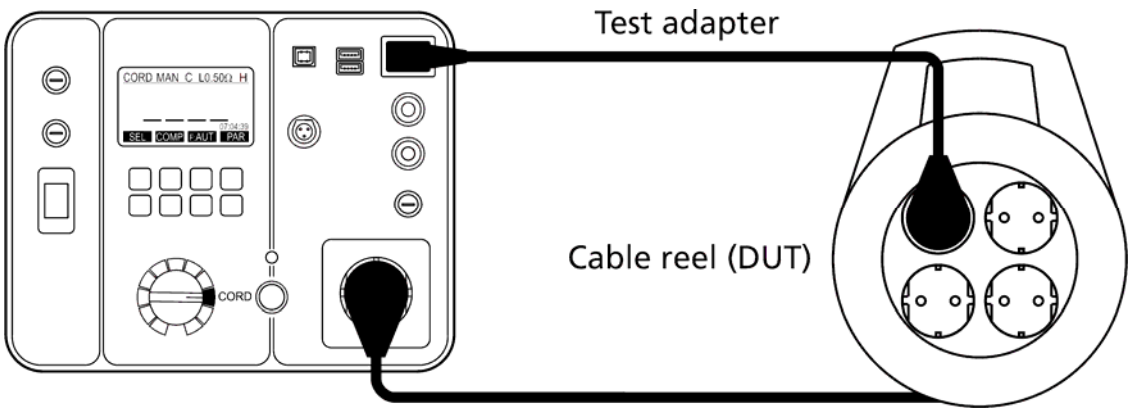


Figure 35: Cable reel test connection

Note!
Repeat the CORD test at all sockets in case multiple-socket cable extension or cable reel is tested.

Cancel actual test lead compensation:

Remove any cable from IEC connector (14) and carry out the compensation. Result >11.00Ω will be displayed and "C" symbol will disappear from the top display line.

Specific information that can be shown on the display

Information displayed	Description
⚠ EXTERNAL VOLTAGE	External voltage is applied to one or more test terminals, see the explanation in section "Pre-Tests and Protection".

- In order to save displayed measurement results, see the "Memorizing example" section.

PRCD Test (CORD/PRCD) (GT-900 only)

The PRCD test function of the GT-900 does a full test of the following PRCDs in accordance with producer's instructions:

- PRCD (PE conductor not interrupted when the device is in OFF mode)
- PRCD-S (interrupted PE conductor when the device is in OFF mode)
- PRCD-S+ (interrupted PE conductor when the device is in OFF mode, additional safety measures implemented)
- PRCD-K (varistor installed in PE conductor)

The following test steps will be carried out depending on selected PRCD type:

Note!
The test procedure is prescribed by PRCD producers and therefore BEHA-AMPROBE cannot bear any responsibility for completeness, actuality and correctness.

Step No.	Type PRCD	Type PRCD-S	PRCD-S+	PRCD-K
	Producer Kopp	Producer Kopp	Producer PCE	Producer Kopp
1	Visual inspection	Visual inspection	Visual inspection	Visual inspection
2	RPE Test current selectable 0.2 or 5.0 A, *Limit value adjustable 0.01 to 11.00 Ω*	RPE Test current selectable 0.2 or 5.0 A, *Limit value adjustable 0.01 to 11.00 Ω*	RPE Test current selectable 0.2 or 5.0 A, *Limit value adjustable 0.01 to 11.00 Ω*	-
3	-	-	RINS input Test voltage 500V *Limit value 0.15 MΩ*	-
4	RINS output Test voltage 500V *Limit value 1 MΩ*	RINS output Test voltage 500V *Limit value 1 MΩ*	RINS output Test voltage 500V *Limit value 1 MΩ*	RINS output Test voltage 500V *Limit value 1 MΩ*
5	IPE +polarity *Limit value 3.50 mA*	IPE +polarity *Limit value 3.50 mA*	IPE +polarity *Limit value 3.50 mA*	IPE +polarity *Limit value 3.50 mA*
6	IPE -polarity *Limit value 3.50 mA*	IPE -polarity *Limit value 3.50 mA*	IPE -polarity *Limit value 3.50 mA*	IPE -polarity *Limit value 3.50 mA*
7	IT +polarity *Limit value 0.50 mA*	IT +polarity *Limit value 0.50 mA*	IT +polarity *Limit value 0.50 mA*	IT +polarity *Limit value 0.50 mA*
8	IT -polarity *Limit value 0.50 mA*	IT -polarity *Limit value 0.50 mA*	IT -polarity *Limit value 0.50 mA*	IT -polarity *Limit value 0.50 mA*
9	Test button *PRCD must trip*	Test button *PRCD must trip*	-	Test button *PRCD must trip*
10	t/IΔN/2 IΔN selectable 30 or 10 mA, AC current *PRCD must not trip*	t/IΔN/2 IΔN selectable 30 or 10 mA, AC current *PRCD must not trip*	t/IΔN/2 IΔN selectable 30 or 10 mA, AC current *PRCD must not trip*	t/IΔN/2 IΔN selectable 30 or 10 mA, AC current *PRCD must not trip*
11	t/IΔN IΔN selectable 30 or 10 mA, AC current *PRCD must trip within 0.3 s*	t/IΔN IΔN selectable 30 or 10 mA, AC current *PRCD must trip within 0.3 s*	t/IΔN IΔN selectable 30 or 10 mA, AC current *PRCD must trip within 0.2 s*	t/IΔN IΔN selectable 30 or 10 mA, AC current *PRCD must trip within 0.3 s*
12	t/IΔN/2 IΔN selectable 30 or 10 mA, +pulsed current *PRCD must not trip*	t/IΔN/2 IΔN selectable 30 or 10 mA, +pulsed current *PRCD must not trip*	t/IΔN/2 IΔN selectable 30 or 10 mA, +pulsed current *PRCD must not trip*	t/IΔN/2 IΔN selectable 30 or 10 mA, +pulsed current *PRCD must not trip*

13	t/I∆N I∆N selectable 30 or 10 mA, +pulsed current *PRCD must trip within 0.3 s*	t/I∆N I∆N selectable 30 or 10 mA, +pulsed current *PRCD must trip within 0.3 s*	t/I∆N I∆N selectable 30 or 10 mA, +pulsed current *PRCD must trip within 0.2 s*	t/I∆N I∆N selectable 30 or 10 mA, +pulsed current *PRCD must trip within 0.3 s*
14	t/I∆N/2 I∆N selectable 30 or 10 mA, -pulsed current *PRCD must not trip*	t/I∆N/2 I∆N selectable 30 or 10 mA, -pulsed current *PRCD must not trip*	t/I∆N/2 I∆N selectable 30 or 10 mA, -pulsed current *PRCD must not trip*	t/I∆N/2 I∆N selectable 30 or 10 mA, -pulsed current *PRCD must not trip*
15	t/I∆N I∆N selectable 30 or 10 mA, -pulsed current *PRCD must trip within 0.3 s*	t/I∆N I∆N selectable 30 or 10 mA, -pulsed current *PRCD must trip within 0.3 s*	t/I∆N I∆N selectable 30 or 10 mA, -pulsed current *PRCD must trip within 0.2 s*	t/I∆N I∆N selectable 30 or 10 mA, -pulsed current *PRCD must trip within 0.3 s*
16	IRAMP and t/I∆ I∆N selectable 30 or 10 mA, AC current *PRCD must trip within 0.5 … 1.0 I∆N* *Trip time within 0.3 s*	IRAMP and t/I∆ I∆N selectable 30 or 10 mA, AC current *PRCD must trip within 0.5 … 1.0 I∆N* *Trip time within 0.3 s*	IRAMP and t/I∆ I∆N selectable 30 or 10 mA, AC current *PRCD must trip within 0.5 … 1.0 I∆N* *Trip time within 0.2 s*	IRAMP and t/I∆ I∆N selectable 30 or 10 mA, AC current *PRCD must trip within 0.5 … 1.0 I∆N* *Trip time within 0.3 s*
17	L-TEST *PRCD must trip*	L-TEST *PRCD must trip*	L-TEST S+ *PRCD must trip & Disabled switch on & No self-switch on after L is back*	L-TEST *PRCD must trip*
18	N-TEST *PRCD must trip*	N-TEST *PRCD must trip*	N-TEST S+ *PRCD must trip & Disabled switch on & No self-switch on after N is back*	N-TEST *PRCD must trip*
19	-	PE-OFF TEST *PRCD must trip & disabled switch on*	PE-OFF TEST *PRCD must trip & disabled switch on*	-
20	-	-	-	Varistor test *UVAR/1mA = 15 … 25V*
21	-	Voltage at PE *PRCD must trip & Disabled switch on*	Voltage at PE *PRCD must trip & Disabled switch on*	-
22	-	Voltage at PRCD ON button *PRCD must trip*	Voltage at PRCD ON button *PRCD must trip*	-

Note!
Modified set of test steps (some steps added or deleted) can be reached by creating a new PRCD AUTO-TEST. There are two ways to create new PRCD AUTO-TEST:

- To copy one of existing factory-programmed PRCD AUTO-TESTS (410 … 413) to a new AUTO-TEST location (500 … 999) and then to modify it freely, see the sections “COPY AUTO-TEST” on page 74 and “EDIT/VIEW AUTO-TEST” on page 71.
- To create new AUTO-TEST from scratch like any other AUTO-TEST. See the instructions for creating new AUTO-TEST in section “CREATE AUTO-TEST” on page 72.

Description of test steps (all available test steps are described below, please see the table above which test steps are implemented depending on selected PRCD type):

- **Visual inspection**
  Follow the instructions in section “Visual inspection” on page 20. Confirm pass of the visual test by the “OK” menu key.
- **Protective earth continuity R_{PE}**
  The measurement is carried out by using the test current of 0.2 or 5.0 A (selectable parameter). Limit value is adjustable from 0.01 to 11.0 Ω. Both parameters (test current and limit value) can be set by using the “PAR” menu key in idle display mode. Limit value can be also calculated on bases of entered cross section and length of the PRCD cable. In order to enter the limit value with "+" and "-" menu keys directly without calculation, press the "▭" menu key first.
- **Insulation resistance R_{INS} input**
  The insulation resistance is measured on the input side of the PRCD by using test voltage of 500 V (fixed parameter). Limit value for R_{INS} is fixed and pre-set to 0.15 MΩ.
- **Insulation resistance R_{INS} output**
  The insulation resistance is measured on the output side of the PRCD at open PRCD switch by using test voltage of 500 V (fixed parameter). The limit value for R_{INS} is fixed and pre-set to 1.00 MΩ.
- **Earth leakage current I_{PE} (differential method)**
  The measurement is done at closed PRCD switch in two steps (two mains voltage polarities). The polarity is exchanged automatically. Limit value for I_{PE} is fixed and pre-set to 3.50 mA.
- **Touch** leakage **current I_T (direct method)**
  The measurement is done at closed PRCD switch in two steps (two mains voltage polarities). The polarity is exchanged automatically. Limit value for I_T is fixed and pre-set to 0.50 mA. While this test all conductive parts which are not connected to PE of the PRCD must be tested, the worst one has to be saved. Note: The ON button would be such a conductive part.
- **Functionality of the TEST button (TEST SWITCH)**
  After pressing the TEST button of the PRCD, both L and N conductors must be switched off from mains by the PRCD switch. The test result is displayed as PASS or FAIL.
- **Trip out time at $I_{\Delta N/2}$, AC current**
  Test current is AC.
  PRCD must not trip at this current, max. measurement time/range is 300 ms
- **Trip out time at $I_{\Delta N}$, AC current**
  Test current is AC.
  PRCD must trip within 300 ms (200 ms for PRCD-S+).
- **Trip out time at $I_{\Delta N/2}$, +pulsed current**
  Test current is positive pulsed (required for A type of PRCD).
  PRCD must not trip at this current, max. measurement time/range is 300 ms.
- **Trip out time at $I_{\Delta N}$, +pulsed current**
  Test current is positive pulsed (required for A type of PRCD).
  PRCD must trip within 300 ms (200 ms for PRCD-S+).

- **Trip out time at $I_{\Delta N/2}$, -pulsed current**
  Test current is negative pulsed (required for A type of PRCD).
  PRCD must not trip at this current, max. measurement time/range is 300 ms.
- **Trip out time at $I_{\Delta N}$, -pulsed current**
  Test current is negative pulsed (required for A type of PRCD).
  PRCD must trip within 300 ms (200 ms for PRCD-S+).
- **Tripping current I_{Δ}**
  The test is carried out by using a ramp current starting at 0.5 $I_{\Delta N}$ and increasing the test current by 0.05×$I_{\Delta N}$ per step up to 1.1 $I_{\Delta N}$. There are 13 test steps, duration 300 ms per step, pause duration is 30 ms.
  PRCD must trip within (0.5 … 1) $I_{\Delta N}$.
- **Trip out time t_{Δ} at tripping current I_{Δ}**
  The test is done in previous step, limit value is 300 ms (200 ms for PRCD-S+).
- **Functional test at L disconnection (L-TEST/L-TEST S+)**
  The GT-900 disconnects input L terminal, then both L and N conductors must be switched off from mains by the PRCD switch, reactivation by pressing the PRCD ON button must be disabled and there must be no self-reactivation after returning L. The test result is displayed as PASS or FAIL.
- **Functional test at N disconnection (N-TEST/N-TEST S+)**
  The GT-900 disconnects input N terminal, then both L and N conductors must be switched off from mains by the PRCD switch, reactivation by pressing the PRCD ON button must be disabled and there must be no self-reactivation after returning N. The test result is displayed as PASS or FAIL.
- **Functional test at PE disconnection (PE-OFF TEST)**
  The GT-900 disconnects input PE terminal, then both L and N conductors must be switched off from mains by the PRCD switch and reactivation by pressing the PRCD ON button must be disabled. The test result is displayed as PASS or FAIL.
- **Varistor test**
  The test is done by measuring varistor voltage at 1 mA. The test is considered to PASS if varistor voltage is within 15 … 25 V.
- **Voltage at PE test (VOLT. ON PE)**
  An operator applies an external test voltage via a safety network into PE of tested PRCD by pressing the "UPE" button on PRCD-Adapter, then the GT-900 disconnects PE connection of mains socket.
  ATTENTION: All to PE connected parts are potentially hazardous while performing this test. Don't touch PE (input or output) of the PRCD or any metal or conductive part of the PRCD.
  PRCD must trip and reactivation by pressing the PRCD ON button must be disabled.
- **Voltage at PRCD ON button (VOLT. SENSOR/PROBE)**
  An operator applies an external test voltage via a safety network to ON button of PRCD under test by using test probe 3 of PRCD-Adapter (simulation of phase tester), PRCD must trip.
  ATTENTION: Don't touch test probe of probe 3 while performing this test as this probe is potentially hazardous and it may influence the test result.

Note!
Before performing PRCD test you have to plug PRCD Adapter to test / mains socket of the GT-900 tester and run a compensation including test adapter.

Compensation of PRCD Adapter's internal resistance:

- To obtain correct protective conductor resistance result you must have compensated (zeroed) the internal resistance of both adapters, see the connection information below in picture 36. Connect test adapter (=IEC cord) to test / mains socket of the PRCD adapter and to Test Connector PRCD of the GT-900 tester.
- Press the "COMP" menu key, then press "START" key. Compensation will be automatically done and an additional measurement will be carried out to check effectiveness of performed compensation, result 0.00 Ω should be displayed. Now the GT-900 tester and PRCD adapter are ready for further use.

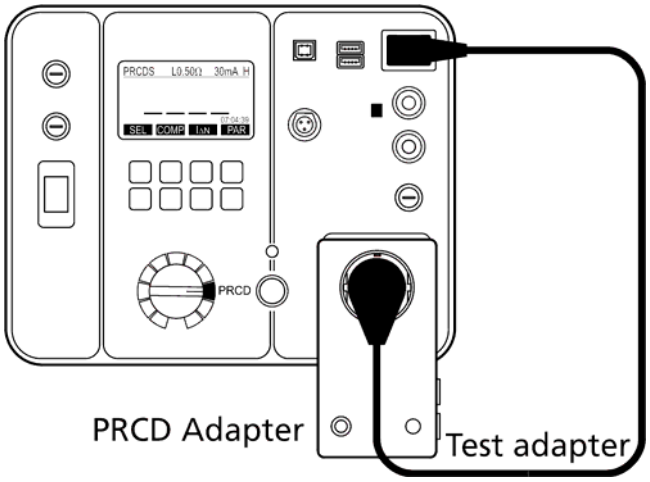


Figure 36: Connection of the PRCD Adapter for compensation purpose

Cancel actual PRCD Adapter compensation:
Remove any cable from IEC connector (14) and carry out the compensation. Result >11.00Ω will be displayed and "C" symbol will disappear from the top display line.

Test procedure and instructions:

- Connect the PRCD according to one of the figures 37, 38, 39 or 40 below, depending on type of the PRCD under test. Use PRCD-Adapter and test adapter for any type of PRCD.
- Select appropriate nominal differential current by using the "$I_{\Delta N}$" menu key (10 or 30 mA).
- Select appropriate test current (0.2 or 5.0 A) and adjust limit value (0.01 … 11.00 Ω) in R_{PE} step by using the "PAR" menu key.
- During the measurement of protective conductor resistance flex the flexible cord along its length to help find any broken conductors or poor connection joints.

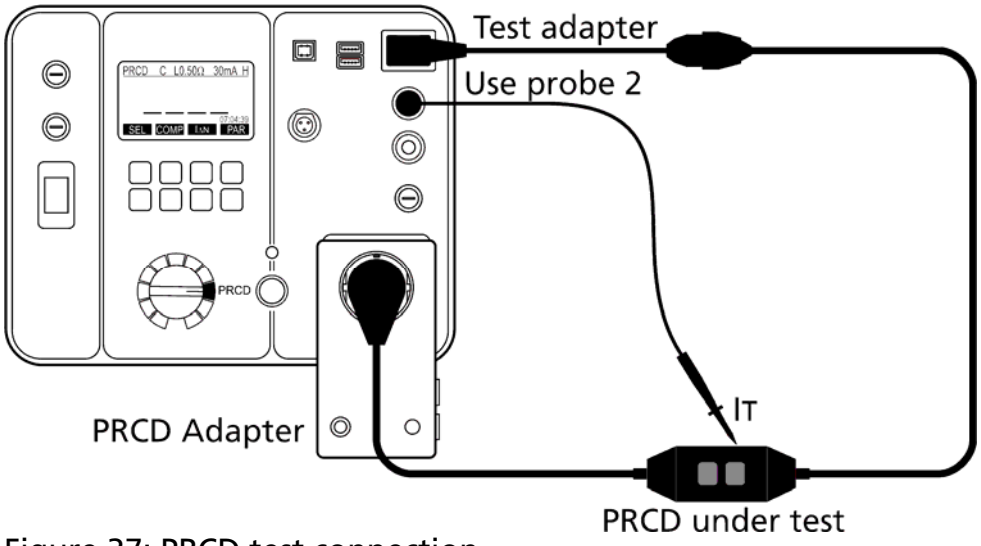


Figure 37: PRCD test connection

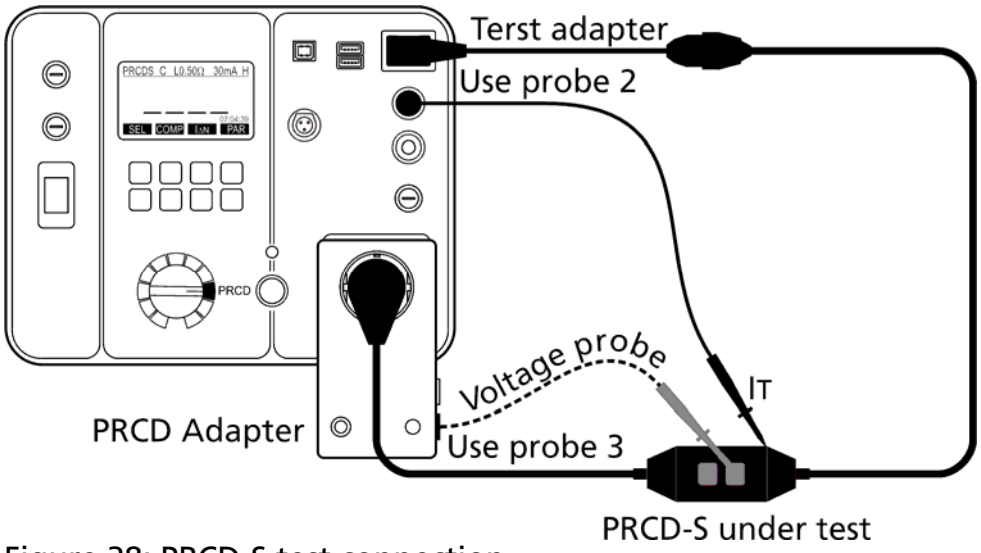


Figure 38: PRCD-S test connection

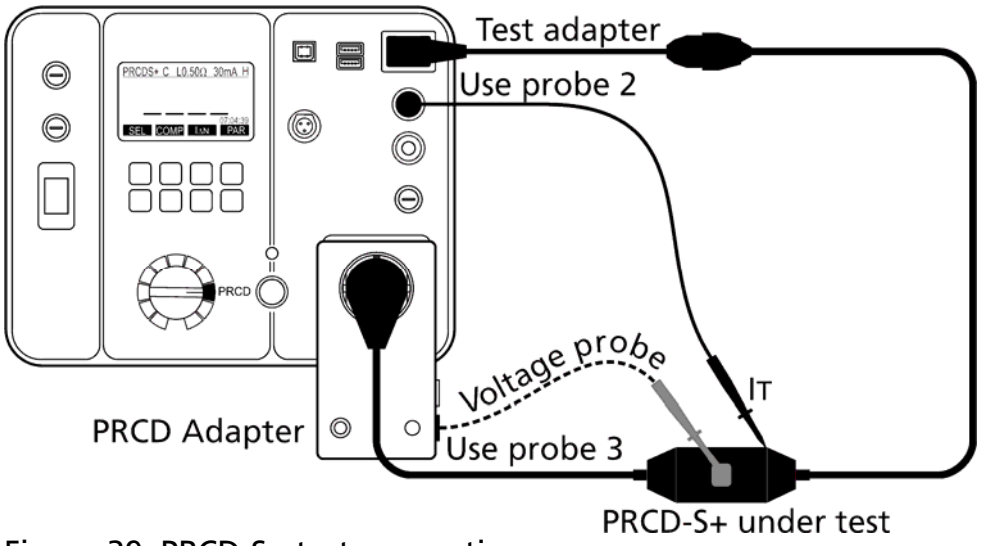


Figure 39: PRCD-S+ test connection

Notes!

- Operator may use the same test lead for IT and for VOLT. SENSOR/PROBE (voltage on PRCD ON button) tests. Respect also the note below (test finger).
- In VOLT. SENSOR/PROBE test (voltage on PRCD ON button) touch PRCD ON button with test tip equipped with test finger listed in chapter "Scope of Supply" on page 8, PRCD must trip. Test finger is required to reach sufficient contact surface (simulation of real finger), otherwise trip out of tested PRCD may not be reliable.

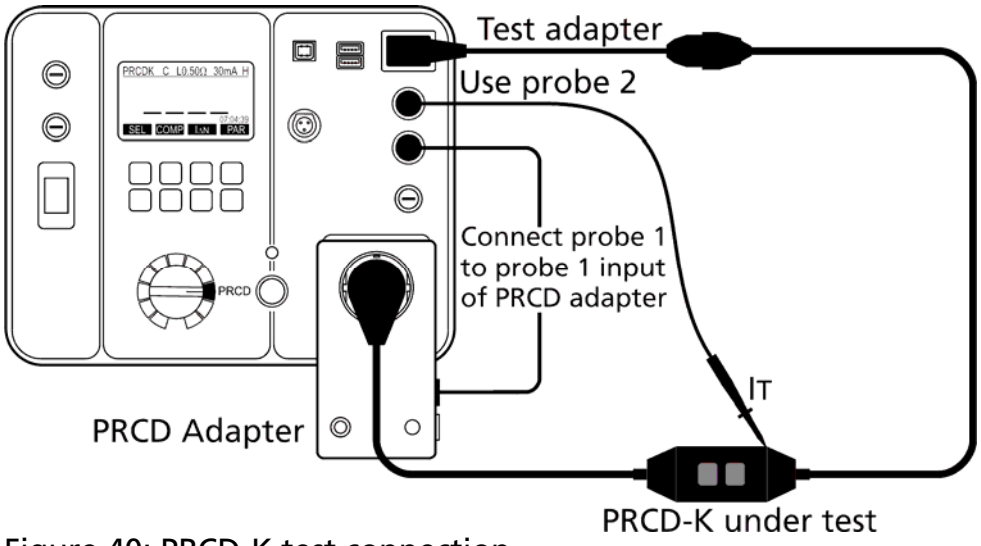


Figure 40: PRCD-K test connection

Note!
When testing PRCD-K make sure to connect PROBE 1 (GT-900) to TO PROBE 1 (PRCD-Adapter) by using e.g. standard test lead, see the figure above, otherwise the test will fail.

Display explanation:

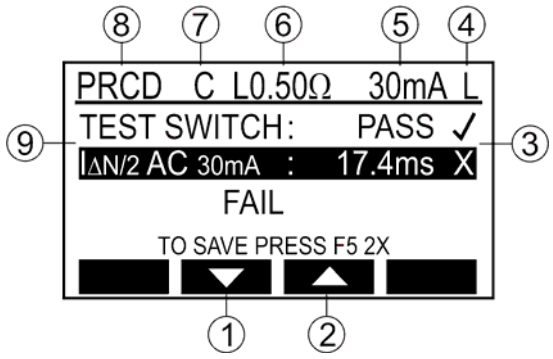


Figure 41: Display with test result in PRCD test (example)

1 ..... "▼"menu key, to move the cursor down when checking test sub-results.
2 ..... "▲"menu key, to move the cursor up when checking test sub-results.
3 ..... Test result status (✓... results OK, X ... results not OK).
4 ..... Selected nominal differential current IΔN (10 mA or 30 mA).
5 ..... Pre-set pass/fail limit value for protective earth bond RPE.
6 ..... Function selected by the rotary switch and the "SEL" menu key.
7 ..... Test parameters, test results and units.

Specific information that can be shown on the display

Information displayed	Description
⚠ EXTERNAL VOLTAGE	External voltage is applied to one or more test terminals, see the explanation in section “Pre-Tests and Protection”.
⚠ SWITCH ON MAINS CONTINUE?	Warning! Mains voltage will be applied to mains socket after confirming this message!
LN-PE > 10mA	Substitute leakage current is higher than 10 mA. Dangerous, check the appliance!
TIME OUT OR PRCD FAILED	There was no action (no key pressed) for more than 1 minute (repeat the test from the beginning) or the PRCD is faulty.
PRESS PRCD ON	Press ON button on PRCD!
PRESS PRCD TEST	Press TEST button on PRCD!
PRESS STOP	Press STOP button on GT-900!

- In order to save displayed measurement results, see the “Memorizing example” section.

Protective Extra Low Voltage Test (PELV)

The test measures the protective extra low voltage between any accessible conductive part of tested appliance and earth (PE).

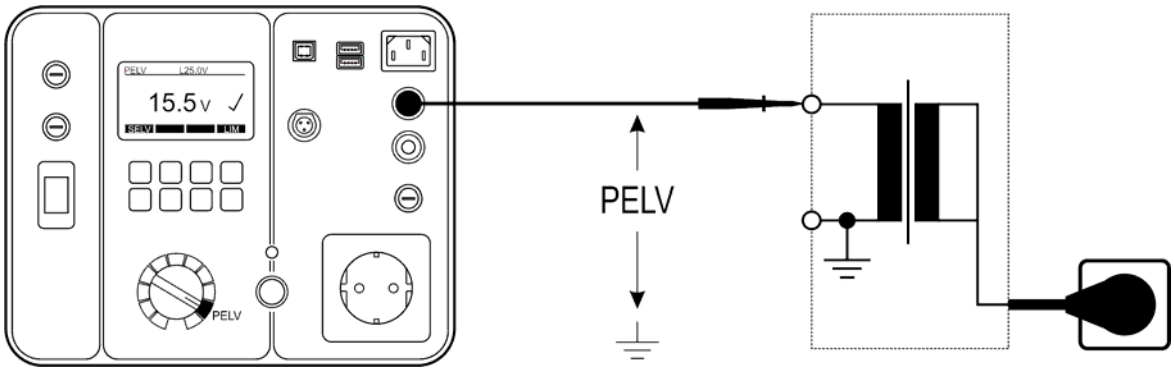


Figure 42: PELV test connection

Display explanation:

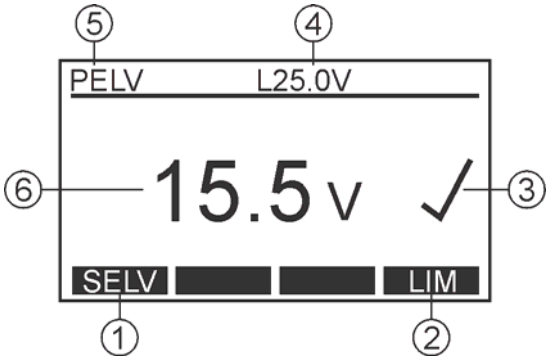


Figure 43: Display in PELV test (example)

1 ..... "SELV/PELV" menu key for selection of measurement function (SELV or PELV).
2 ..... "LIM" menu key for pass/fail limit value setting (standard values are 25 or 50 V).
3 ..... Test result status (✓... result OK, X ... result not OK).
4 ..... Pre-set pass/fail limit value.
5 ..... Function selected by the rotary switch and the "SELV/PELV" menu key.
6 ..... Test result and unit.

Specific information that can be shown on the display

Information displayed	Description
<10.0V	PELV value lower than 10.0 V.
>100.0V	PELV value higher than 100.0 V, remove the probe immediately.

☞ Warning!
Dangerous situation may arise if voltage higher than 100 V is applied to probe 2, remove the probe immediately!

- In order to save displayed measurement results, see the "Memorizing example" section.

Safety Extra Low Voltage Test (SELV)

The test measures the safety extra low voltage between two accessible conductive parts of tested appliance.

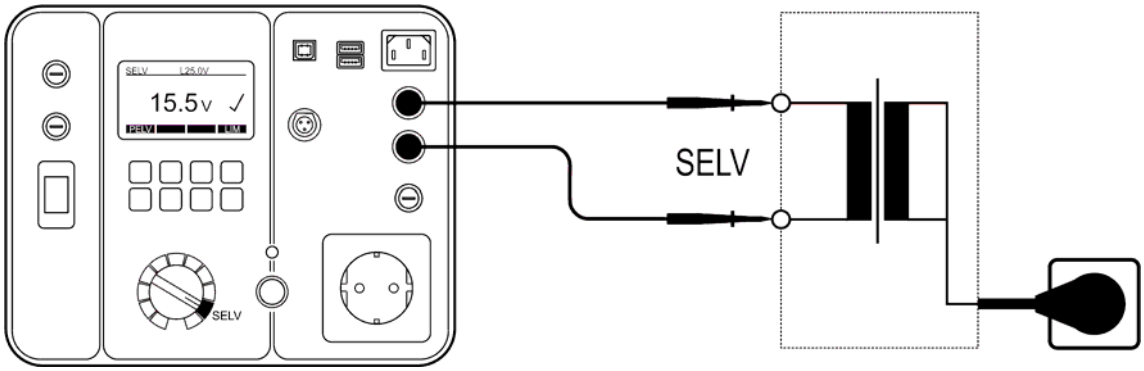


Figure 44: SELV test connection

Display explanation:

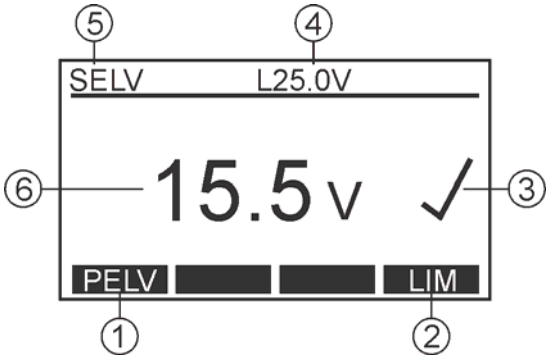


Figure 45: Display in SELV test (example)

1 ..... "PELV/SELV" menu key for selection of measurement function SELV or PELV).
2 ..... "LIM" menu key for pass/fail limit value setting (standard values are 25 or 50 V).
3 ..... Test result status (✓... result OK, X ... result not OK).
4 ..... Pre-set pass/fail limit value.
5 ..... Function selected by the rotary switch and the "SELV/PELV" menu key.
6 ..... Test result and unit.

Specific information that can be shown on the display

Information displayed	Description
<10.0V	SELV value lower than 10.0 V.
>100.0V	SELV value higher than 100.0 V, remove the probe immediately.

☞ Warning!
Dangerous situation may arise if voltage higher than 100 V is applied between probes 1 and probe 2, remove the probes immediately!

- In order to save displayed measurement results, see the "Memorizing example" section.

AUTO-TEST MODE (GT-900 only)

This is most common used test mode as it leads the operator through the whole test procedure. There are 18 factory-programmed AUTO-TESTS for NON UK region and 16 AUTO-TESTS for UK region and free space for additional 50 customer-created ones.

Factory-programmed AUTO-TESTS for PC I appliances (NON UK REGION)
(listed figures present limit values in each test)

Tests (TC#)	145	146	147	148
AUTO-TEST description	Standard appliance PC I, mains cord max. 5m, R_{PE} test current low (200mA)	Standard appliance PC I, mains cord max. 5m, R_{PE} test current high (5A)	Appliance PC I with heating elements, mains cord max. 5m, substitute leakage test	IT appliance PC I, mains cord max. 5m, no insulation test, earth leakage test
AUTO-TEST name (default)	APP. 200MA PC I	APP. 5A PC I	HEATING PC I	IT PC I
Visual Inspection	Yes	Yes	Yes	Yes
Protective earth bond resistance 200 mA (Ω)	0.30	-	0.30	0.30
Protective earth bond resistance 5 A (Ω)	-	0.3	-	-
Insulation resistance 500 V (MΩ)	1.00	1.00	0.30	-
Insulation resistance 250 V (MΩ)	-	-	-	-
Substitute leakage current (mA)	-	-	3.50	-
Earth leakage current with differential method (mA)	3.50	3.50	-	3.50
Touch leakage current (mA)	-	-	-	-
Apparent power (kVA)	3.7	3.7	-	3.7

Tests (TC#)	149	150	151	152
AUTO-TEST description	IT appliance PC I, mains cord max. 5m, no insulation test, earth leakage test, with touch leakage test (for accessible parts not connected to earth)	Extension cord or cable reel max. 5m, R_{PE} test current low (200mA), substitute leakage test	Extension cord or cable reel > 50m, R_{PE} test current low (200mA), substitute leakage test	Appliance PC I with overvoltage protection devices, mains cord max. 5m, R_{PE} test current low (200mA), reduced insulation test voltage to 250V, earth leakage test
AUTO-TEST name (default)	IT W ITOUCH PC I	CORD ≤ 5M PC I	CORD > 50M PC I	200MA 250V PC I
Visual Inspection	Yes	Yes	Yes	Yes
Protective earth bond resistance 200 mA (Ω)	0.30	0.30	1.00	0.30
Protective earth bond resistance 5 A (Ω)	-	-	-	-
Insulation resistance 500 V (MΩ)	-	1.00	1.00	-
Insulation resistance 250 V (MΩ)	-	-	-	1.00
Substitute leakage current (mA)	-	3.50	3.50	-
Earth leakage current with differential method (mA)	3.50	-	-	3.50
Touch leakage current (mA)	0.50	-	-	-
Apparent power (kVA)	3.7	-	-	3.7

Tests (TC#)	153	160	161
AUTO-TEST description	Appliance PC I with overvoltage protection devices, mains cord max. 5m, R_{PE} test current high (5A), reduced insulation test voltage to 250V, earth leakage test	Appliance PC I w/o accessible PE, with insulation test, earth leakage test	Appliance PC I w/o accessible PE, with insulation test, earth leakage and with touch leakage test
AUTO-TEST name (default)	5A 250V PC I	NO PE PC I	NO PE+ITOUCH PC I
Visual Inspection	Yes	Yes	Yes
Protective earth bond resistance 200 mA (Ω)	-	-	-
Protective earth bond resistance 5 A (Ω)	0.30	-	-
Insulation resistance 500 V (MΩ)	-	1.00	1.00
Insulation resistance 250 V (MΩ)	1.00	-	-
Substitute leakage current (mA)	-	-	-
Earth leakage current with differential method (mA)	3.50	3.50	3.50
Touch leakage current (mA)	-	-	0.50
Apparent power (kVA)	3.7	3.7	3.7

Factory-programmed AUTO-TESTS for PC II appliances (NON UK REGION)
(listed figures present limit values in each test)

Tests (TC#)	241	242	243	244
AUTO-TEST description	Standard appliance PC II, with insulation test, touch leakage test	Appliance PC II, with insulation test, substitute leakage test	IT appliance PC II, w/o insulation test, touch leakage test	IT appliance PC II, w/o insulation test, touch leakage test by differential method
AUTO-TEST name (default)	WITH ITOUCH PC II	WITH ISUB PC II	W/O RINS PC II	WITH IDIFF PC II
Visual Inspection	Yes	Yes	Yes	Yes
Protective earth bond resistance 200 mA (Ω)	-	-	-	-
Protective earth bond resistance 5 A (Ω)	-	-	-	-
Insulation resistance 500 V (MΩ)	2.00	2.00	-	-
Insulation resistance 250 V (MΩ)	-	-	-	-
Substitute leakage current (mA)	-	0.50	-	-
Earth leakage current with differential method (mA)	-	-	-	0.50
Touch leakage current (mA)	0.50	-	0.50	-
Apparent power (kVA)	3.7	-	3.7	3.7

Factory-programmed AUTO-TESTS for CORD and PRCD (NON UK and UK REGION)
(listed figures present limit values / expected action in each test)

Note!
The test procedures presented in the table below are prescribed by PRCD producers and therefore BEHA-AMPROBE cannot bear any responsibility for completeness, actuality and correctness.

Tests (TC#)	400	410	411	412	413
AUTO-TEST names (default)	CORD	PRCD	PRCD-S	PRCD-S+	PRCD-K
Producer	Any	Kopp	Kopp	PCE	Kopp
Visual Inspection	Yes	Yes	Yes	Yes	Yes
$R_{PE\ 200mA}$ (Ω)	0.30	0.30	0.30	0.30	-
$R_{INS\ 500V}$ at input side (MΩ)	1.00	-	-	0.20	-
$R_{INS\ 500V}$ at output side (MΩ)	-	1.00	1.00	1.00	1.00
L/N condition	Yes	-	-	-	-
$I_{PE(\Delta)}$ + polarity (mA)	-	3.50	3.50	3.50	3.50
$I_{PE(\Delta)}$ - polarity (mA)	-	3.50	3.50	3.50	3.50
I_T + polarity (mA)	-	0.50	0.50	0.50	0.50
I_T - polarity (mA)	-	0.50	0.50	0.50	0.50
TEST button	-	Trip out	Trip out	-	Trip out
$t/I_{\Delta N/2}$ ($I_{\Delta N}$ = 30 mA) AC current	-	No trip	No trip	No trip	No trip
$t/I_{\Delta N}$ ($I_{\Delta N}$ = 30 mA) AC current	-	300 ms	300 ms	200 ms	300 ms
$t/I_{\Delta N/2}$ ($I_{\Delta N}$ = 30 mA) +pulsed current	-	No trip	No trip	No trip	No trip
$t/I_{\Delta N}$ ($I_{\Delta N}$ = 30 mA) +pulsed current	-	300 ms	300 ms	200 ms	300 ms
$t/I_{\Delta N/2}$ ($I_{\Delta N}$ = 30 mA) -pulsed current	-	No trip	No trip	No trip	No trip
$t/I_{\Delta N}$ ($I_{\Delta N}$ = 30 mA) -pulsed current	-	300 ms	300 ms	200 ms	300 ms
I_{RAMP} ($I_{\Delta N}$ = 30 mA) and t/I_{Δ} ($I_{\Delta N}$ = 30 mA) AC current	-	(½ … 1) $I_{\Delta N}$ 300 ms	(½ … 1) $I_{\Delta N}$ 300 ms	(½ … 1) $I_{\Delta N}$ 200 ms	(½ … 1) $I_{\Delta N}$ 300 ms
L-TEST	-	Trip out	Trip out	Trip out & Disabled switch on & No self switch on after L is back	Trip out
N-TEST	-	Trip out	Trip out	Trip out & Disabled switch on & No self switch on after N is back	Trip out
PE-OFF TEST	-	-	Trip out & disabled switch on	Trip out & Disabled switch on	-
Varistor test (U at 1 mA)	-	-	-	-	15 … 25V
Voltage at PE	-	-	Switch off & Disabled switch on	Switch off & Disabled switch on	-
Voltage at ON button	-	-	Switch off	Switch off	-

Factory-programmed AUTO-TESTS for PC I appliances (UK REGION)
(listed figures present limit values in each test)

Tests (TC#)	131	132	133	134	135	136	137
AUTO-TEST name (default)	131	132	133	134	135	136	137
Visual Inspection	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Protective earth bond resistance 200 mA (Ω)	-	-	0.10	0.10	-	0.1	-
Protective earth bond resistance 5 A (Ω)	0.1	0.1	-	-	0.1	-	-
Insulation resistance 500 V (MΩ)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Insulation resistance 250 V (MΩ)	-	-	-	-	-	-	-
Substitute leakage current (mA)	-	-	-	-	-	-	-
Earth leakage current with differential method (mA)	3.50	0.75	3.5	0.75	-	-	3.50
Touch leakage current (mA)	-	-	-	-	-	-	-
Apparent power (kVA)	3.0	3.0	3.0	3.0	-	-	3.7

Factory-programmed AUTO-TESTS for PC II appliances (UK REGION)
(listed figures present limit values in each test)

Tests (TC#)	231	232	233	234
AUTO-TEST name (default)	231	232	233	234
Visual Inspection	Yes	Yes	Yes	Yes
Protective earth bond resistance 200 mA (Ω)	-	-	-	-
Protective earth bond resistance 5 A (Ω)	-	-	-	-
Insulation resistance 500 V (MΩ)	2.00	2.00	2.00	2.00
Insulation resistance 250 V (MΩ)	-	-	-	-
Substitute leakage current (mA)	-	-	-	-
Earth leakage current with differential method (mA)	-	-	-	0.25
Touch leakage current (mA)	0.25	0.25	-	-
Apparent power (kVA)	3.0	-	-	3.0

Notes!

- AUTO-TEST names (see the header in each table above) are default names and can be freely changed by an operator. Max. 11 characters are available for new name.
- AUTO-TEST codes (TC#) 500 up to 999 are reserved for customer-created AUTO-TESTS.

How to create new (customer-created) AUTO-TEST, see also chapter “CREATE AUTO-TEST” on page 72:

There are two ways

- To create new AUTO-TEST from scratch step by step or
- To copy one of existing AUTO-TESTS to a new location and then modify it.

Note!
When new AUTO-TEST is created regardless of selected region, it will be offered in both regions.

AUTO-TEST modes

There are two AUTO-TEST modes available:

- STANDARD mode
  This mode is advised to be used when operator is starting with AUTO-TESTS in generally in order to easily follow the AUTO-TEST procedure step by step. Each new measurement has to be started with START button. Once the operator is familiar with AUTO-TESTS, FAST mode is advised to be used.
- FAST mode
  This mode enables the operator to carry out AUTO-TEST quickly. The whole AUTO-TEST procedure will be carried out automatically.

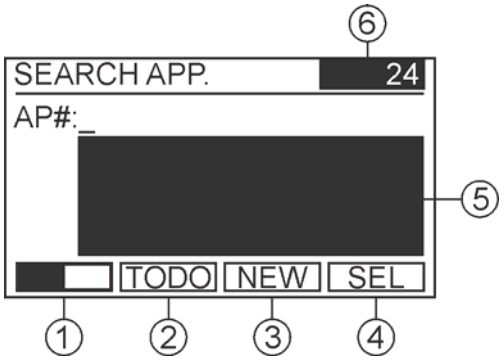
How to select AUTO-TEST mode:
See the description in section “AUTO-TEST MODE” on page 78.

REGION:
Select the region before starting with AUTO-TESTS. Region to be selected depends on the country where the GT-650/GT900 tester is to be used, see more in SETUP / REGION menu on page 76.

Compensation of test leads in RPE, RPE CORD and RPE PRCD test steps:
When carrying out AUTO-TESTS it is important to be aware that compensations from single measurements are used in AUTO-TESTS too.

- Currently active compensation in single RPE function is used in RPE AUTO-TEST steps.
- Currently active compensation in single CORD or PRCD functions is used in CORD and PRCD AUTO-TEST steps.

Idle display explanation (present after switching rotary switch to AUTO position):



Note!
AP# = Appliance Code

Figure 46: Idle display in AUTO function (example)

1 ..... "▭" menu key, to switch between two selections of menu keys.
2 ..... "TODO" menu key, to check the list of all appliance codes* in the database which are not tested yet. TODO will be displayed at the upper line as a header and number of not tested appliances* will be displayed in window 6. After pressing the "TODO" menu key desired appliance codes* to be tested can be selected. Use the "EXIT" function key to exit TODO mode.
3 ..... "NEW" menu key, to create/enter new appliance code*.

Note! Each appliance code must be unique under the same client (two equal appliance codes are not allowed, the GT-650/GT-900 tester will block double entering the same appliance code).

4 ..... "SEL" menu key, to display list of all appliance codes* (no appliance root is entered) or just a list of appliance codes* containing entered root (appliance root is entered). Wished appliance root can be entered after changing the selection of menu keys by pressing the "▭" menu key.
5 ..... Window reserved for displaying the first three of all appliance codes* (no appliance root is entered) or just the first three of appliance codes* containing entered root (appliance root is entered). These Appliance Codes* will be selectable after pressing the "SEL" menu key.
6 ..... Window reserved for displaying the number of all appliance codes* in database or for displaying the number of only not tested appliances*, if "TODO" mode is used.

Notes!

- In both cases (TODO mode used or TODO mode not used) the number in window 6 depends also on entered appliance root. If no appliance root is entered, then number of all appliance codes* will be displayed.
- If there are no appliance codes* in database yet (= empty), then keys "TODO" and "SEL" will not be offered.
- Explanation of the star sign (*) used in this manual: Parameters/expressions marked with the * sign refer to selected client code only (client code is selected in MENU / CLIENT menu) or to all client codes in database (client code is disabled – FILTER DISABLED is displayed in MENU / CLIENT menu), see the section "CLIENT menu" on page 70.

Test procedure for AUTO-TEST standard way in STANDARD mode:

Standard way means that an appliance code* with belonging attributes is selected/entered before starting the AUTO-TEST as offered on the display. STANDARD mode means that test steps are done one after another with manual start (START key) of each step.

STEP 1

As shown in the figure 46 above, the first step in AUTO function is to select an appliance code where the AUTO-TEST will be carried out.

Select one of existing appliance codes* from database:
Press the "SEL" menu key in idle display, the list of first four entered appliance codes* will be displayed. Select wished appliance code by using the "▼" and "▲" menu keys and confirm it by pressing the "↵ " (Enter) menu key.

Notes!

- If there is only one appliance code* available in database, the one will be selected and entered immediately after pressing the "SEL" menu key", see the figure 47, screen 1/3.
- If the list of displayed appliance codes* is too long (it would take too much time to select wished appliance code by using the "▼" and "▲" menu keys), then it is advisable to shorten the list by entering a root of wished appliance code. In order to enter the root, press the "▭" menu key (1) in idle display first, then enter the root by using the "A◄", "A►" and "←" menu keys. Once the list of appliance codes is short enough, press the "▭" menu key again and then "SEL" menu key.
- If you wish to select an appliance code* only among not tested ones, then press the "TODO" menu key in idle display first, then carry out the procedure described above, respect also the first note.

How to enter a new appliance code* (not yet entered in the GT-650/GT-900 tester database):
Press the "NEW" menu key, then enter new appliance code by using the "A◄", "A►" and "←" menu keys and confirm it by pressing the "↵ " (Enter) menu key.

Note!
For operator's information, a list of already entered appliance codes* containing entered appliance root will be displayed in window 5 (see the figure 46) during entering new appliance code.

STEP 2
Once the appliance code is selected or newly added, the appliance's attributes are to be entered. The following display will appear after confirming the appliance code:

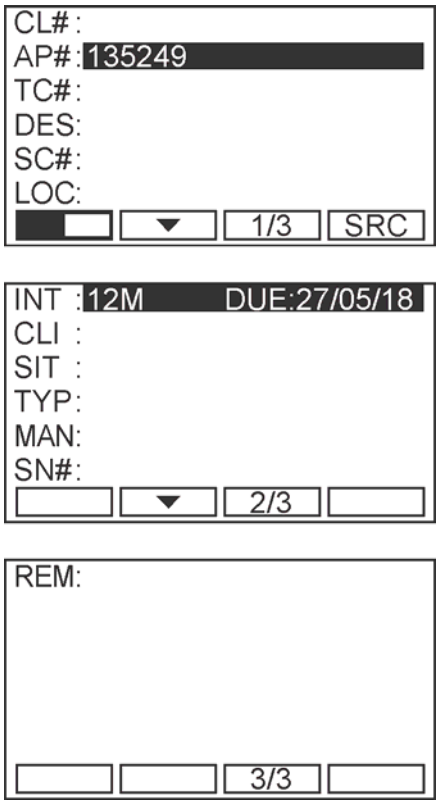


Figure 47: Display turned out after confirmation of the appliance code (example). One of three screens can be selected by using the "1/3", "2/3" and "3/3" menu keys (example)

The following attributes can be entered:

CL# ..... Client code (17 characters max.)

Notes!

- Client code selected in CLIENT menu will be automatically offered. Offered one can be changed.
- EDIT CLIENT CODE submenu is available after pressing the “EDIT” menu key and SELECT CLIENT CODE submenu is available after pressing the “SEL” menu key afterwards. As long no client code is entered at all, "SEL" menu is not offered.

AP#..... Appliance Code (it was selected or newly added already in previous step).

TC# ..... Test code / AUTO-TEST code (three-digit code must be selected i.e. one of factory-programmed or customer-created AUTO-TEST codes must be selected)

Notes!

- SELECT submenu is available after pressing the “SEL” menu key. You will get a list of favourite AUTO-TESTS in this submenu.
- EDIT submenu is available after pressing the “EDIT” menu key. One of factory-programmed or customer-created AUTO-TEST codes must be entered directly as number/code.
  Warning “INVALID AUTO-TEST” will be displayed if entered TC# does not fit to any possible AUTO-TEST code (possible AUTO-TEST code means one of factory-programmed AUTO-TEST codes or one of the TC# 500 … 999 reserved for customer-created AUTO-TEST codes). Warning “TEST NOT DEFINED” will be displayed if entered TC# corresponds to possible customer-created AUTO-TEST codes (e.g. 520) but no AUTO-TEST steps are created under this code.

DES ..... Description of the appliance (17 characters max.)

Note!
EDIT DESCRIPTION submenu is available after pressing the “EDIT” menu key and SELECT DESCRIPTION submenu is available after pressing the “SEL” menu key afterwards. As long no description is entered at all, "SEL" menu is not offered.

SC# ..... Site code (17 characters max.)

Notes!

- EDIT SITE CODE submenu is available after pressing the “EDIT” menu key and SELECT SITE CODE submenu is available after pressing the “SEL” menu key afterwards. As long no site code is entered at all, "SEL" menu is not offered.
- Only SC# under selected client code in MENU / CLIENT menu are selectable when “SEL” menu key is pressed. Only SC# under selected client code are displayed when entering the ST# root after pressing the “EDIT” menu key. As long no site code is entered at all, "SEL" menu is not offered.

LOC..... Location (17 characters max.)

Notes!

- EDIT LOCATION submenu is available after pressing the “EDIT” menu key and SELECT LOCATION submenu is available after pressing the “SEL” menu key afterwards. As long no location is entered at all, "SEL" menu is not offered.
- Only locations under selected client code in MENU / CLIENT menu are selectable when “SEL” menu key is pressed. Only locations under selected client code are displayed when entering the location root after pressing the “EDIT” menu key. As long no location is entered at all, "SEL" menu is not offered.

INT..... Interval (validity of test certificate), fixed parameter i.e. 12 months (it can be edited by “es control” software only).
Also due date is displayed i.e. date of expiring the certificate validity. The DUE date will be recalculated on the date of saving the test result of the DUT.

CLI ..... Client name (it can be edited by “es control” software only)

SIT ..... Site name (it can be edited by “es control” software only)

TYP ..... Appliance type or AUTO-TEST name. It will be offered on bases of already selected TC# (AUTO-TEST code) and cannot be changed in this menu.

MAN..... Manufacturer of the appliance (it can be edited by “es control” software only)

SN# ..... Serial Number of the appliance (it can be edited by “es control” software only)

REM..... Remarks (it can be edited by “es control” software only) (750 characters max.)

Notes!

- If the appliance code was selected among the ones already entered in GT-650/GT-900 tester, then all belonging entered attributes will be offered too. If the appliance code was newly created, then all attributes except INT (Interval) and CL# (client code) will be empty. Default offered INT value is 12 months and can be changed by “es control” software only. CL# (client code) will be offered on bases of selected CL# in MENU / CLUENT menu. If none of CL#s is selected, then CL# line will be empty.
- Mandatory fields are only AP# (appliance code) and TC# (AUTO-TEST), all other attributes are not mandatory.

STEP 3
Carry out the measurements

Next description is valid for STANDARD AUTO-TEST mode only, FAST mode description see in section “AUTO-TEST modes” on page 59.

Once all wished attributes are entered/edited, press the START key, the following display will appear:

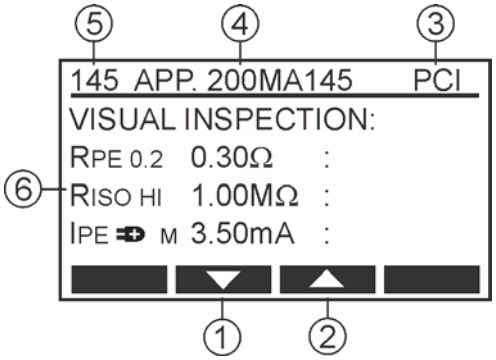


Figure 48: AUTO-TEST display after pressing the START key (example, TC# 145 was selected as an attribute to the appliance code)

1 ..... "▼" menu key, to move the cursor down in order to check the set of tests to be done.
2 ..... "▲" menu key, to move the cursor up in order to check the set of tests to be done.
3 ..... Protection class of selected AUTO-TEST. The PC is fixed for all factory-programmed AUTO-TESTS.
4 ..... Name of the AUTO-TEST (it can be freely edited in MENU / AUTO-TEST / EDIT/VIEW menu, 11 characters max.).
5 ..... TC# (Test code) / AUTO-TEST code (fixed for factory-programmed AUTO-TESTS).
6 ..... Tests, test parameters and limit values. Here are some explanations of possible test parameters below:

RPE 0.2 C .... Measurement current 0.2 A (0.2) / 5 A (5.0)
RPE 0.2 C .... Test lead compensated (C) / not compensated (blank)
RINS LO..... Measurement voltage 250 V (LO) / 500 V (HI)
IPE A..... Phase connected to the right (⏛) / left (⏚) terminal of mains socket
IPE A..... Actual value (A) / max. value (M) displayed
Actual value can be changed to max. value by pressing the "MAX" menu key during the measurement or after finishing it. Actual value will be displayed after finishing the measurement in any case.
IT A ..... Phase connected to the right (⏛) / left (⏚) terminal of mains socket
IT A ..... Actual value (A) / max. value (M) displayed
Actual value can be changed to max. value by pressing the "MAX" menu key during the measurement or after finishing it. Actual value will be displayed after finishing the measurement in any case.
LO A ... Measurement range 0 … 20 mA (LO) / 0 … 60 A (HI)
LO A ... Actual value (A) / max. value (M) displayed
Actual value can be changed to max. value by pressing the "MAX" menu key during the measurement or after finishing it. Actual value will be displayed after finishing the measurement in any case.
RINS I ..... Measurement will be done on input (I) / output side (O) of tested PRCD.

- Press the START key, the first test step of used AUTO-TEST will be carried out (usually VISUAL INSPECTION is the first step), proceed as follows:
- Do the visual inspection (see the section "Visual Inspection" on page 20). If the visual test passes, confirm the action by pressing the "OK" menu key or START key, then the next test is offered e.g. RPE.
- Connect the appliance and test leads as required for the next test, e.g. RPE (see the instructions for single tests).
- Connect test lead to accessible conductive part and press the "START" key (single measurement) or press and keep pressing the "START" key for approx. 2 seconds until CONT mark is displayed instead of bargraph (continuous measurement), measurement is carried out and test result is displayed. Next measurement e.g. RINS is offered automatically if previous one was inside required limit.
- Do all tests required by selected AUTO-TEST following the similar procedure as for the test before.
- Press the "END" menu key after finishing all tests, display turns to "check" mode, you may check all sub-results by using the "▼" and "▲"menu keys.

Notes!

- Some tests are carried out as single measurements only and do not allow continuous mode (like some tests in CORD or PRCD functions).
  Some tests are carried out in continuous mode only (for example RPE in CORD and PRCD functions). Press the "STOP" key after finishing the measurement in this case. All other tests can be carried out in either mode.
- If test result is out of set limit value, "PAR" menu key will be offered in position F4 in the following test steps: RPE, RINS, ISUB, IΔ, IT, P/IL, ICLAMP, PELV, SELV, CORD-RPE, PRCD-RPE, PRCD-t/IΔ/2 AC, PRCD-t/IΔ AC, PRCD-t/IΔ/2 A+, PRCD-t/IΔ A+, PRCD-t/IΔ/2 A-, PRCD-t/IΔ A-, PRCD-RAMP. An operator can check test parameters and modify them if needed before repeating the test. The modification will not be possible in factory-programmed AUTO-TESTS.

- In order to save displayed measurement results see the "Memorizing example" section. Without further action none of the measurement results is saved!

Test procedure for AUTO-TEST – quick approach way:

Quick approach way means that an operator presses the "START" key directly after selecting AUTO function by rotary switch without selecting/entering an appliance code and it's attributes. All further steps are equal to standard way described above. Appliance code and it's attributes will be required when saving the AUTO-TEST results after finishing the measurements.

Note!
For quick approach wished AUTO-TEST can be also scanned by barcode reader. Display will turn to the AUTO-TEST as soon as it is scanned.
Warning "INVALID AUTO-TEST" will be displayed when scanning AUTO-TEST code if the first three digits do not fit to any possible AUTO-TEST code e.g. 005 (possible AUTO-TEST code means one of factory-programmed AUTO-TEST codes or one of the codes 500 … 999 reserved for customer-created AUTO-TESTS).
Warning "AUTO-TEST NOT DEFINED" will be displayed if first three digits do fit to possible customer-created AUTO-TEST (e.g. 520) but no AUTO-TEST steps are created under this number.

During the AUTO-TEST procedure (STANDARD AUTO-TEST mode only) the following menu keys can be offered:

BACK After pressing the "BACK" menu key the GT-900 tester will move back to previous test (for example from RINS to RPE test).

NEXT After pressing the "NEXT" menu key the GT-900 tester will move to the next test (for example from RPE to RINS test). "NEXT" will be offered only after pressing the "BACK" menu key.

END After pressing the "END" menu key the GT-900 tester will end the AUTO-TEST procedure and move to "check" mode, an operator may check all sub-results by using the "▼" and "▲" menu keys.

During the AUTO-TEST procedure (STANDARD and FAST AUTO-TEST mode) the following menu keys may be offered:

MAX Maximal value will be displayed after pressing the "MAX" menu key during or after finishing the measurement.

ACT Actual value will be displayed after pressing the "ACT" menu key during the measurement.

PAR Parameter of current test step can be modified by using the "PAR" menu key.

Menu Mode

For further selections, entries and display of instrument's settings, press the "MENU" function key (F7), the following selection menu appears.

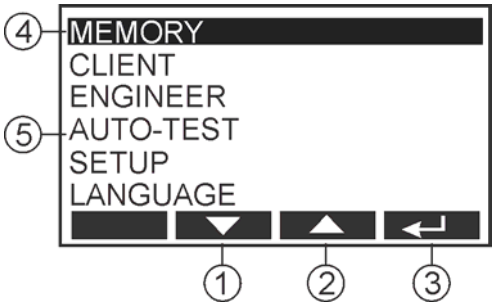


Figure 49: "Menu" display

1 ..... "▼" menu key (down) to move the cursor down
2 ..... "▲" menu key (up) to move the cursor up
3 ..... "↵ " menu key (Enter)
4 ..... Selected menu function
5 ..... Other available menu functions

General operation instructions

- Use the "▼" and "▲" menu keys to select desired menu function, then confirm it by pressing the "↵"menu key.
- Entered menu function may be aborted by pressing the "EXIT" function key (F8).
- By pressing the "↵" menu key selected function will be activated.

MEMORY Menu

This menu allows you to export/import data from/to USB, to delete the memory and to show the memory allocation.
The following menu selections are available:

EXPORT TO USB: Transfers stored data/parameters to USB memory stick.
EXPORT RESULTS … All stored test results will be transferred after pressing the "↵" menu key. Create file name (8 characters) and select file format (.CSV or .ESC) before transferring.
EXPORT AUTO-TESTS … All AUTO-TESTS and list of favourite AUTO-TESTS will be transferred after pressing the "↵" menu key. Create file name (8 characters) before transferring.
EXPORT SETTINGS … All settings (parameters of each measurement and parameters set in MENU, see the list of mentioned parameters in chapter "Reset of the GT-650/ GT-900 tester" on page 92) will be transferred after pressing the "↵" menu key. List of favourite AUTO-TESTS will not be transferred. This will happen by EXPORT AUTO-TESTS function. Create file name (8 characters) before transferring.

Notes!

- EXPORT AUTO-TESTS and EXPORT SETTINGS is a welcome feature to copy this information from one GT-900 to another GT-900 to ensure that both instruments have the same behaviour. This feature can be also used as backup to restore this setting on GT-900.
- USB memory stick should be connected to USB2 or USB3 connector, three sound signals will follow in a few seconds after plugging it as a confirmation the memory stick is recognized by the GT-650/GT-900 tester.
- The USB memory stick has to be FAT32 formatted.

IMPORT FROM USB: Transfers data from USB memory stick to GT-650/GT-900 tester.
IMPORT APPLIANCES … List of appliance codes will be transferred from USB memory stick after pressing the "↵" menu key. Select wished .CSE file name generated by "es control" software before transferring.
IMPORT AUTO-TESTS … List of AUTO-TESTS and list of favourite AUTO-TESTS will be transferred from USB memory stick after pressing the "↵" menu key. Select wished file name before transferring.
IMPORT SETTINGS … All settings (parameters of each measurement and parameters set in MENU, see the list of mentioned parameters in chapter "Reset of the GT-650/ GT-900 tester" on page 92) will be transferred after pressing the "↵" menu key. List of favourite AUTO-TESTS will not be transferred. This will happen by IMPORT AUTO-TESTS function. Select wished file name before transferring.

Notes!

- IMPORT AUTO-TESTS and IMPORT SETTINGS is a welcome feature to copy this information from one GT-900 tester to another GT-900 to ensure that both instruments have the same behaviour. This feature can also be used as backup to restore this setting on GT-900.
- USB memory stick shall be connected to USB2 or USB3 connector, three sound signals will follow in a few seconds after plugging it as a confirmation the memory stick is recognized by the GT-650/GT-900 tester.
- The USB memory stick has to be FAT32 formatted.

DELETE MEMORY: This menu deletes appliances, results or the total memory.
DELETE APPLIANCES … Selected appliance code database with their attributes will be deleted.
DELETE RESULTS … All test results will be deleted (apliance codes with their attributes will stay untouched).
DELETE TOTAL MEMORY … All test results and appliance code database with their attributes will be deleted.

USED SPACE: This menu shows the number of used Appliances (= appliance code database) (GT-900: max. 10.000, GT-650: max. 1.000) and number of stored results (GT-900: max. 5.000, GT-650: max. 500).

CLIENT Menu

This menu allows you to setup or delete clients, to list or filter clients and to select client code. The following display will appear after selecting CLIENT:

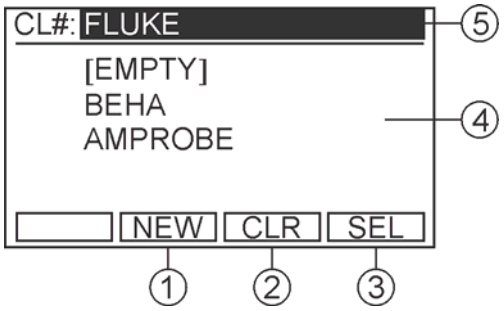


Figure 50: "CLIENT" menu (example)

1 ..... "NEW" menu key to create new client code that is not in database yet
2 ..... "CLR" menu key to disable client filter

Notes!

- If a client code is selected, all further appliance code selections in any menu will refer to this client only. If client is disabled by pressing the "CLR" menu key ("FILTER DISABLED" will be displayed on the upper line), all further appliance code selections will refer to all clients in database.
- Client codes cannot be removed from database until any Appliance Code is dedicated to the client. As soon as all appliance codes dedicated to the client code are cleared, the client code will disappear too.

3 ..... "SEL" menu key to select client code that will be used as a filter, see the note above.
4 ..... List of the first four available client codes in database. Last entered client code will not be listed here until an appliance code under this client is created.
5 ..... Selected client code. It will be offered in AUTO function while creating new appliance code. Recall menu will show only results of this client. All selectable appliance codes will be filtered by this client.

ENGINEER Menu

This menu allows you to setup or delete engineers and to select engineers. The following display will appear after selecting ENGINEER menu (operator selection):

Figure 51: "ENGINEER" menu (example)

1 ..... “ADD” menu key to add new engineer
2 ..... “DEL” menu key to delete one of already entered engineers
3 ..... “SEL“ menu key to select one of already entered engineers
4 ..... The first four from the list of all entered engineers
5 ..... Selected engineer (it will be attached automatically to any stored result)

Note!
Setup of 10 engineers max. can be entered. Warning “ENG. MEMORY FULL” will be displayed for a while when an additional one is tried to be entered (after pressing the “↵” menu key).

AUTO-TEST Menu

This menu allows you to handle with AUTO-TESTS as follows:
- edit/view
- create new
- copy
- delete
- set favourites.

In this menu the following selections are available:

EDIT/VIEW AUTO-TEST: This menu edit/views wished AUTO-TESTS.

- First select the AUTO-TEST you wish to edit/view by using the “F1” (page selection), “▼” and “▲” menu keys, then confirm it by pressing the “↵” menu key. The following display will appear:

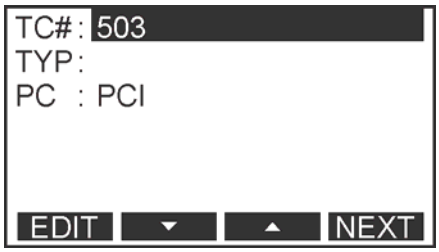


Figure 52: EDIT/VIEW AUTO-TEST menu (example)

- Edit/view TC# (test code / AUTO-TEST code), TYP (name of the AUTO-TEST) and PC (protection class).

  Note!
  In factory-programmed AUTO-TESTS it is only possible to modify TYP (name of the AUTO-TEST).

- Switch to the next page by pressing the “NEXT” menu key. Now you get a list of all test steps.
- Select wished test step to be edited/viewed by using the “▼” and “▲” menu keys, then edit it by using the “▭” menu key. Then “DEL” or “ADD” menu key (delete or add some test step) or “PAR” for other sub menu keys (adjust test parameters and/or limit values) could be chosen. For detailed description on how to delete/add test steps and modify test parameters see the next section.

Note!
In factory-programmed AUTO-TESTS it is not possible to modify any test step. "▭", "PAR", "DEL" and "ADD" menu keys are not available in this case.

- Press the "EXIT" function key to exit EDIT/VIEW AUTO-TEST menu.

CREATE AUTO-TEST: This menu creates a new AUTO-TEST.

- The following display will appear after confirming CREATE AUTO-TEST mode by pressing the "↵ " (Enter) menu key.

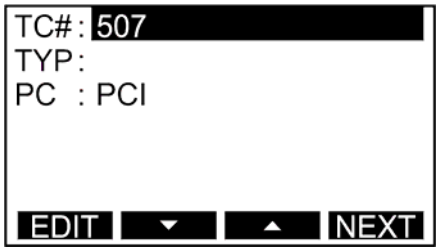


Figure 53: CREATE AUTO-TEST menu (example)

- Select AUTO-TEST code (TC#) of the new AUTO-TEST by using the "EDIT" and then "-", "+" and "+100" menu keys and confirm it by pressing the "↵" menu key.

  Notes!
  - AUTO-TEST code is a three-digit number, available values are 500 to 999. First free code will be offered automatically.
  - AUTO-TEST codes will be rotating, so next code after 999 will be 500 again.

- Set cursor to TYP (type) line, then edit the type of the new AUTO-TEST by using the "EDIT" and then "A◄", "A►" and "←" menu keys and confirm it by pressing the "↵" menu key.

  Note!
  TYP (type) is an up to eleven-character long string used as a name of the AUTO-TEST.

- Set cursor to PC (protection class) line, then select wished PC by using the "EDIT", "◄" and "►" menu keys. PC I (standard PC I), PC I-H (with heater), PC II and PC III can be selected. Confirm selected PC by pressing the "↵" menu key.
- Switch to the next page by pressing the "NEXT" menu key, the following display will appear.

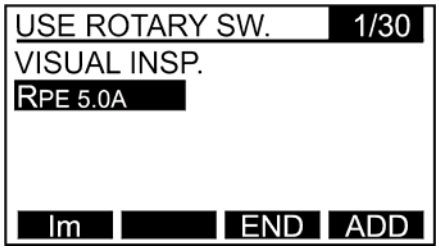


Figure 54: Test step selection menu (example, rotary switch is in RPE position)

Note!
VISUAL INSP. step is automatically added as the first test step and cannot be removed/edited while creating the AUTO-TEST. It can be removed/edited later in EDIT/VIEW menu.

- Select test steps one by one by using the rotary switch and confirm each test by the "ADD" menu key.

  Note!
  Customer-created CORD AUTO-TEST or PRCD AUTO-TEST or combined AUTO-TEST (combined means AUTO-TEST for standard appliance with built in CORD or PRCD test steps like water pump with PRCD) can also be created. When rotary switch is in CORD/PRCD position, TYPE (CORD, PRCD, PRCD-S, PRCD-S+ or PRCD-K) can be selected by using the "TYPE" menu key. Individual test step inside selected TYPE can be selected by using the "SEL" menu key. Default test step offered is ALL. It means all test steps from selected TYPE will be added.
- End the selection by pressing the "END" menu key, the display turns to EDIT/VIEW mode, see the figure below. All settings are saved now.

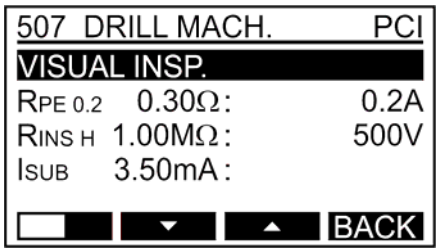


Figure 55: EDIT/VIEW mode (example, standard appliance)

- Check all steps by using the "▼" and "▲" menu keys.
- Edit test steps (add or delete some step) by using the " ▭■" and then "DEL" and "ADD" menu keys.
- Adjust test parameters and/or limit values by using the "PAR" and "SEL" menu keys.
- Press the "EXIT" function key to exit CREATE AUTO-TEST menu.

Notes for setup of a new AUTO-TEST!

- 50 customer created AUTO-TESTS max. can be entered. Message "AUTO-TEST MEMORY FULL" will be displayed for a while when an additional one is tried to be entered after confirming CREATE AUTO-TEST by "↵" menu key.
- Type of visual inspection (VISUAL INSP., VI PE, VI CORD/PLUG, VI HOUSING, VI SUITABIL., VI CONTROLS, VI MARKING, VI OTHERS) can be selected by using the "▭", "PAR" and then "SEL" menu keys.
- Test current in RPE test (5.0 A or 0.2 A) and test voltage in RINS test (500 V (HI) or 250 V (LO)) can be selected by using the "Im" and "UISO" menu keys during setup of a new AUTO-TEST.
- Measurement range in CLAMP test (0 ... 60 A (HI) or 0 ... 20 mA (LO)) can be selected by using the menu key "RNG" during setup of new AUTO-TEST.
- Limit value in RPE test is always copied from single RPE test. How to change limits is shown in section "EDIT/VIEW AUTO-TEST" on page 71.
- Limit value of function P/IL is always set to 3.7 kVA.
- There is no limit value available in CLAMP function (range 0 … 60 A only).
- Limit values in all other tests are always set to standard value.

COPY AUTO-TEST: This menu copies an existing AUTO-TEST.

- First select the AUTO-TEST you wish to copy by using the "F1" (page selection), "▼" and "▲" menu keys, then confirm the selection by pressing the "↵" menu key.
- Select the new AUTO-TEST code where you wish to copy the AUTO-TEST to, by using the "-", "+" and "+100" menu keys and confirm the new code by pressing the "↵" menu key.

  Note!
  AUTO-TEST codes will be rotating, so next code after 999 will be 500 again.

Note!
50 customer created AUTO-TESTS max. can be entered. Warning "AUTO-TEST MEMORY FULL" will be displayed for a while when an additional one is tried to be copied after confirming the COPY AUTO-TEST by "↵" menu key.

DELETE AUTO-TEST: This menu deletes an AUTO-TEST.

- First select the AUTO-TEST you wish to delete by using the "F1" (page selection), "▼" and "▲" menu keys, then confirm the selection by pressing the "↵" menu key.
- Confirm the deletion by pressing the "YES" menu key.

  Note!
  Only customer-created AUTO-TESTS can be deleted (codes within 500 and 999).

FAVOURITES AUTO-TEST: This menu defines favourite AUTO-TESTS which are offered when quick approach is used or when dedicating AUTO-TEST to an appliance in AUTO-TEST function.

- First select wished AUTO-TEST by using the "▼" and "▲" menu keys, then select favourite or non-favourite status by using the "SEL" menu key (✓ or ×).
- Repeat above procedure for all wished AUTO-TESTS.
- Confirm the selection by pressing the "↵" menu key.

Notes!

- After performing SET FACTORY RESET (see the instructions on page 92) AUTO-TESTS 150 and 151 will not be defined as favourites as GT-900 offers TC# 400 for cord testing.
- List of favourite AUTO-TESTS will be offered in AUTO function when quick approach is used (direct pressing the "START" key without selecting an appliance code and it's attributes). See an explanation for quick approach on page 65.
- If there is no selection of favourite AUTO-TEST, then "NO FAVOURITES" will be displayed after pressing the "START" key for quick approach.
- List of favourite AUTO-TESTS will be offered also when selecting TC# for an appliance after pressing the "SEL" menu key.

SETUP Menu

This menu allows you setup instrument parameters and default settings as:
- transferred results (actual or maximal)
- default measurement times
- date/time of real time clock (RTC)
- region (UK, NON UK)
- keyboard type (English, German)
- acoustic signal (for key press/error)
- bar code mode (standard/combined)
- AUTO-TEST mode (standard/fast)

In this menu the following selections are available:

TRANSFERRED RESULTS: This menu selects which values (actual or maximal) are transferred. ACTUAL VALUES or MAXIMAL VALUES can be selected. In case of IΔ, I$\top$ or CLAMP (both ranges) measurements, both values (actual and maximal one) are continuously displayed during the single measurement. When saving the test result both values are saved and can also be recalled later. But when transferring saved results to PC, only selected values (ACTUAL or MAXIMAL) will be transferred to PC.

MEASUREMENT TIMES: This menu selects the measurement times. Four different measurement times can be selected here:
MAN, WITH MAINS (manual tests that require mains voltage on mains socket). Measurement time can be adjusted to 5 ... 300 seconds.
MAN, W/O MAINS (manual tests that do not require mains voltage on test socket). Measurement time can be adjusted to 3 ... 60 seconds.
AUTO, WITH MAINS (AUTO-TESTS that require mains voltage on mains socket). Measurement time can be adjusted to 5 ... 300 seconds.
AUTO, W/O MAINS (AUTO-TESTS that do not require mains voltage on test socket). Measurement time can be adjusted to 3 ... 60 seconds.

DATE / TIME: This menu is used to setup time/date of real time clock (RTC). Use the "-", "+" and "►" menu keys to set the date and time. Set date and time is memorised when it is confirmed by pressing the "↵" menu key.

REGION: This menu selects the region which affects the pre-set of AUTO-TESTS. Two regions are available: NON UK and UK. The difference is in factory-programmed AUTO-TESTS, see the section "**AUTO-TEST** (GT-900 only)" starting on page 53. Selection depends on the region where the tester is used. Set cursor to appropriate line by using the "▼" and "▲" menu keys, then select the region by pressing the "SEL" menu key and confirm it by pressing the "↵" menu key.

KEYBOARD: This menu selects the type of keyboard which is used. ENGLISH and GERMAN keyboards are supported. Set cursor to appropriate line by using the "▼" and "▲" menu keys, then select the keyboard by pressing the "SEL" menu key and confirm it by pressing the "↵" menu key.

ACOUSTIC SIGNAL: This menu selects the settings of acoustic signals. The following general intensity can be selected for all sounds: HIGH, OFF or LOW.
Besides, sound intensity defined above can be individually enabled or disabled for KEYS (keys F1 … F8), KEYBOARD, FAIL BEEP @ TEST (failed result is accompanied with beep sound during measurement), FAIL BEEP > TEST 1s (failed result is marked with beep sound lasting 1 s after finishing the measurement) or FAIL BEEP > TEST 3s (failed result is marked with beep sound lasting 3 s after finishing the measurement). Confirm the selection by pressing the "↵" menu key.

Note!
All settings can be set to default values by pressing the "DFLT" menu key. It means general intensity for all sounds will be set to HIGH, KEYS, KEYBOARD and FAIL BEEP @ TEST will be activated and FAIL BEEP > TEST will be set to 1 s.

BARCODE MODE: This menu selects the settings of the barcode reader (STANDARD or COMBINED). The mode relates only to barcode reading of the appliance code in AUTO mode. There will be no effect when reading any other parameter/text like client, site, location, description etc.).

STANDARD mode: The appliance barcode consists of appliance code only, meaning all up to 17 digits are dedicated to appliance code.

COMBINED mode: The appliance barcode consists of the AUTO-TEST code (first three digits) and the appliance code (next up to 17 digits). First three digits must obligatory fit to one of available AUTO-TEST codes (145-151, 160, 161, 241-244, 131-137, 231-234, 400, 410-413, 500-999), see the chapter "AUTO-TEST (GT-900 only)" starting on page 53.

Notes!
When selecting TC# for an appliance the following warnings can appear:

- Warning "INVALID LABEL" will be displayed if barcode is too short or too long (it must contain 3 … 17 characters in STANDARD mode and 4 … 20 characters in COMBINED mode).
- Warning "TEST NOT DEFINED" will be displayed in COMBINED mode if first three digits do correspond to possible customer-created AUTO-TEST (e.g. 520) but

no AUTO-TEST steps are created under this number.

- Warning “INVALID AUTO-TEST” will be displayed in COMBINED mode when scanning an appliance code if the first three digits do not correspond to any possible AUTO-TEST e.g. 005. The same warning will be displayed also when scanning AUTO-TEST code in AUTO function – quick approach (see the explanation on page 65) if the first three digits do not correspond to any possible AUTO-TEST e.g. 005.

Purpose of COMBINED mode:
Some operators may already possess combined appliance labels that were created for operation e.g. in combination with GT-800 tester. In order to use them in combination with GT-900 tester COMBINED mode can be selected.

AUTO-TEST MODE: This menu selects the settings of the AUTO-TEST. There are two AUTO-TEST modes available: STANDARD mode and FAST mode.
Set cursor to appropriate line by using the “▼” and “▲” menu keys, then select the mode by pressing the “SEL” menu key and confirm it by pressing the “↵” menu key.

LANGUAGE Menu

This menu selects the menu language. There are two languages available: ENGLISH and GERMAN.
Set cursor to appropriate line by using the “▼” and “▲” menu keys, then select the language by pressing the “SEL” menu key and confirm it by pressing the “↵” menu key.

CONTRAST Menu

This menu is used to set the display contrast. The contrast can be adjusted by using the “-“ and “+” menu keys. It can also be set to default value by pressing the “DFLT” (Default) menu key. Confirm set contrast by pressing the “↵” menu key.

TESTER INFO Menu

This menu shows instrument information as hardware and firmware version.
The following information can be read in this menu: Model, serial number, catalogue number, firmware version and hardware version.

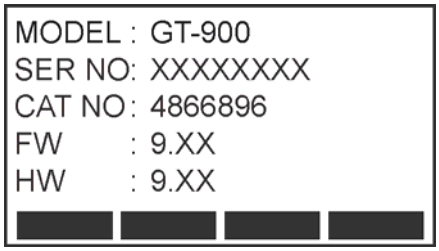


Figure 56: Tester info menu (example for GT-900)

Memorizing Example

In order to save measurement result (single function or AUTO-TEST carried out with quick approach way (see an explanation for quick approach on page 65)) follow the next instructions. The instructions are given for manual saving without using barcode reader or keyboard.

1) Carry out the measurement, result will be displayed.
If current measurement was carried out on the same appliance as previous measurement (saved) and if all appliance's attributes suit to previous measurement (saved), then just press the "SAVE" (F5) menu key twice, SAVING information will be displayed for a while and the result will be saved.
If the measurement was carried out on another appliance or if one or more attributes do not suit to current measurement, then follow the procedure as follows:

2) Press the "SAVE" function key (5), display turns to 1/3 SAVE screen, level "AP#" (appliance code) is selected, last used appliance code with all attributes is offered.

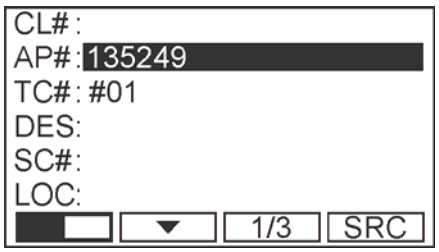


Figure 57: 1/3 SAVE screen (example)

Note!

- If there is no appliance code* in database yet, then display will turn to SEARCH APP. mode (see the figure below) after the first pressing the "SAVE" function key. Keys "TODO" and "SEL" will not be offered in this case. Press the "NEW" menu key and enter new appliance code.

Select/edit/create new all needed attributes as follows:
AP# ..... Appliance code (17 characters max.)
Example: 32679
How to select wished appliance code* from database:
a) If there are many appliance codes* in database, then press the "SRC" menu key first, display will turn to SEARCH APP. mode, see the figure below.

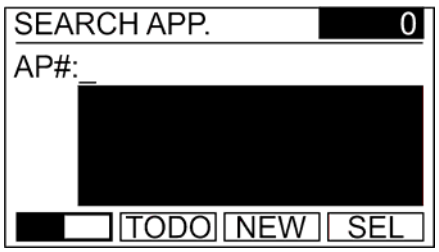


Figure 58: SEARCH APP. mode (example)

Notes!

- New appliance code can always be created, even if there are some appliance codes already in database, by using the "NEW" menu key first and then entering new appliance code.
- Explanation of the star sign "*" used in this manual: Parameters/expressions marked with the "*" sign refer to selected client code only (client code is selected in MENU / CLIENT menu) or to all client codes in database (client code is disabled – FILTER DISABLED is displayed in MENU / CLIENT menu), see the section "CLIENT menu" on page 70.

Press the "▭" menu key to switch to another selection of menu keys, then enter start characters of an appliance code you wish to select by using the "A◄", "A►" and "←" menu keys. When whished appliance code is listed below on white field or it is expected to be listed below displayed ones, press the "▭" menu key again to change selection of menu keys again and press the "SEL" key. SELECT APP. screen will appear with listed first four appliance codes containing corresponding entered appliance root.

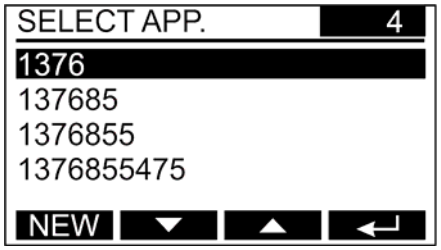


Figure 59: SELECT APP. display (example)

Select wished appliance code by using the "▼" and "▲" menu keys and confirm it by pressing the "↵" menu key. Display turns back to 1/3 SAVE screen, all attributes that belong to selected appliance code will be displayed too.

b) If there are not many appliance codes* in database, then press the "▭" menu key to change selection of menu keys and select appropriate appliance code by using the "◄" and "►" keys. Press the "▭" menu key again when wished appliance code is selected, display turns back to 1/3 SAVE screen, all data that belong to selected appliance code will be displayed too.

TC#..... Test code / AUTO-TEST code (it cannot be modified, it is automatically attached on bases of which measurement was done):

Visual Inspection	#00
RPE	#01
RINS	#02
ISUB	#03
IPE(Δ)	#04
IT	#05
P/IL	#06
CLAMP	#07
CORD	#20

PRCD	#30
PRCD-S	#31
PRCD-S+	#32
PRCD-K	#33
PELV	#10
SELV	#11
AUTO-TEST	AUTO-TEST code

DES..... Description of the appliance (17 characters max.)
Example: WASHING MACHINE

SC# ..... Site code (For example some clients may have several companies, but on different locations. Through this site code, the different sites can be distinguished.) (17 characters max.)
Example: MUNICH 001

LOC ..... Location of the appliance (17 characters max.)
Example: DEVELOPMENT DPT.

CL# ..... Client code (17 characters max.)
Example: AMPROBE001

Note!
If the appliance code was selected among the ones already entered in GT-650/GT-900 tester, then all belonging entered attributes will be offered too. If the appliance code was newly created, then all attributes except TC# (test code / AUTO-TEST code), INT (Interval) and TYP (function in single measurements or AUTO-TEST name in AUTO-TEST function) will be empty. TC# will be offered on bases of which measurement function was done, see the explanation above.
INT value is 12 months and can be changed by "es control" software only.
TYP will be defined on bases of which measurement function was carried out like VISUAL INSPECTION, RPE, RINS, ISUB, IPE(Δ), IT, P/IL, CLAMP, CORD, PRCD, PRCD-S, PRCD-S+, PRCD-K, PELV, SELV or the name of carried out AUTO-TEST.

Once all needed appliance's attributes on 1/3 SAVE screen are selected/edited/created new, select 2/3 SAVE screen and check offered attributes as follows:

Note!
For newly entered appliances it makes no sense to check page 2/3 and 3/3. Please skip this and once all attributes on page 1/3 suit to current measurement press the "SAVE" function key again, SAVING information will be displayed for a while and the test result will be saved.

INT ..... Interval i.e. validity of test certificate (fixed parameter 12 months, (it can be edited by "es control" software only).
Also due date is displayed in this line i.e. date of expiring the certificate. The due date will be recalculated on the date of saving the test result of the DUT.

CLI ..... Client name (it can be edited by "es control" software only) (17 characters max.
Example: BEHA-AMPROBE

SIT ..... Site name (it can be edited by "es control" software only) (17 characters max.)

Example: MUNICH

TYP..... Type (function in single measurements or AUTO-TEST name in AUTO-TEST function). It is attached automatically on bases of carried out measurement.
Example: RPE (for TC#: #01)

MAN ... Manufacturer of the appliance (it can be edited by "es control" software only) (17 characters max.)
Example: BOSCH

SN#..... Serial Number of the appliance (it can be edied by "es control" software only) (17 characters max.)

Once all attributes on 2/3 SAVE screen are checked (they cannot be modified without "es control" software) select 3/3 SAVE screen and check offered attribute as follows:

REM .... Remarks (it can be edited by "es control" software only) (750 characters max.)

Once all attributes suit to current measurement press the "SAVE" menu key again, SAVING information will be displayed for a while and the result will be saved.

Notes!

- Max. number of entered appliances is 10.000 (GT-900) / 1.000 (GT-650). Max. number of saved results is 5.000 (GT-900) / 500 (GT-650). When any of them reaches 80% of total value, the message MEMOPRY ALLOCATION - 82,5% (example) will be displayed for a while after switching on the tester. If both (number of entered appliances and number of saved results) are higher than 80% of total value, then higher percentage will be displayed.
- When the number of entered appliances reaches 100% of total value (full memory), message APP. MEMORY FULL will be displayed for a while after pressing the "NEW" (new appliance) menu key.
  When the number of saved results reaches 100% of total value (full memory), message RESULT MEMORY FULL will be displayed for a while after pressing the "SAVE" function key.
- SAVE operation can be much easier done by using an USB keyboard. All selections/entries can be done by the keyboard instead of using four menu keys F1 … F4 and four function keys F5 … F8. See detailed information on how to use USB keyboard in section "Entry of Appliance Code and it's Attributes by Using an External Keyboard" on page 85. It is recommended to use original keyboard supplied by the GT-650/GT-900 tester supplier (the operation of the keyboard in combination with GT-650/GT-900 tester is approved).
- SAVE operation can be much easier done also by using an USB barcode reader. Entries like AP# (appliance code), CL# (client code), DES (description), SC# (Site code) and LOC (location) can be done by the barcode reader when cursor is blinking on the GT-650/GT-900 screen. See detailed information on how to use USB barcode reader in section "Entry of Appliance Code and it's attributes by using a Bar Code Reader" on page 88. It is recommended to use original barcode reader supplied by the GT-650/GT-900 tester supplier (the operation of the barcode reader in combination with GT-650/GT-900 tester is approved).
- SAVE operation can be done also by using both, keyboard and barcode reader simultaneously.

Recall Data

In order to recall stored measurement result, follow the next instructions:

1) Press the "RCL" menu key (5), recall screen will turn out as follows:

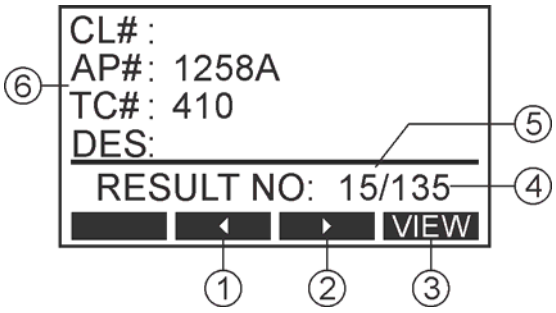


Figure 60: RCL display (example)

1 ..... "◄" menu key to scroll inside recall data and reduce RESULT NO
2 ..... "►" menu key to scroll inside recall data and increase RESULT NO
3 ..... "VIEW" menu key to view saved result under selected RESULT NO
4 ..... Number of all saved results* (under selected client code). The client code can be selected/disabled in MENU / CLIENT menu. If client is disabled, then the number of all saved results will be displayed (regardless of client).
5 ..... Current number of selected result* (under selected client code). The client code can be selected/disabled in MENU / CLIENT menu. If client is disabled, then current number of all saved results will be displayed (regardless of client).
6 ..... Appliance code and it's attributes (client code, test code / AUTO-TEST code and description) that belong to saved result under selected current number.

2) Select wished current number of saved result by using the "◄" and "►" menu keys. Confirm selected current number by pressing the "VIEW" menu key, display will turn to 1/Y RCL screen, see an example below. Check all screens by using the "F4" menu key.

   Note!
   - Figure Y is the number of all pages used for recalled result and depends on the complexity of recalled result. For example, single RPE result will occupy only 5 pages while PRCD-S+ result will occupy 10 pages. Figure X is actual page.

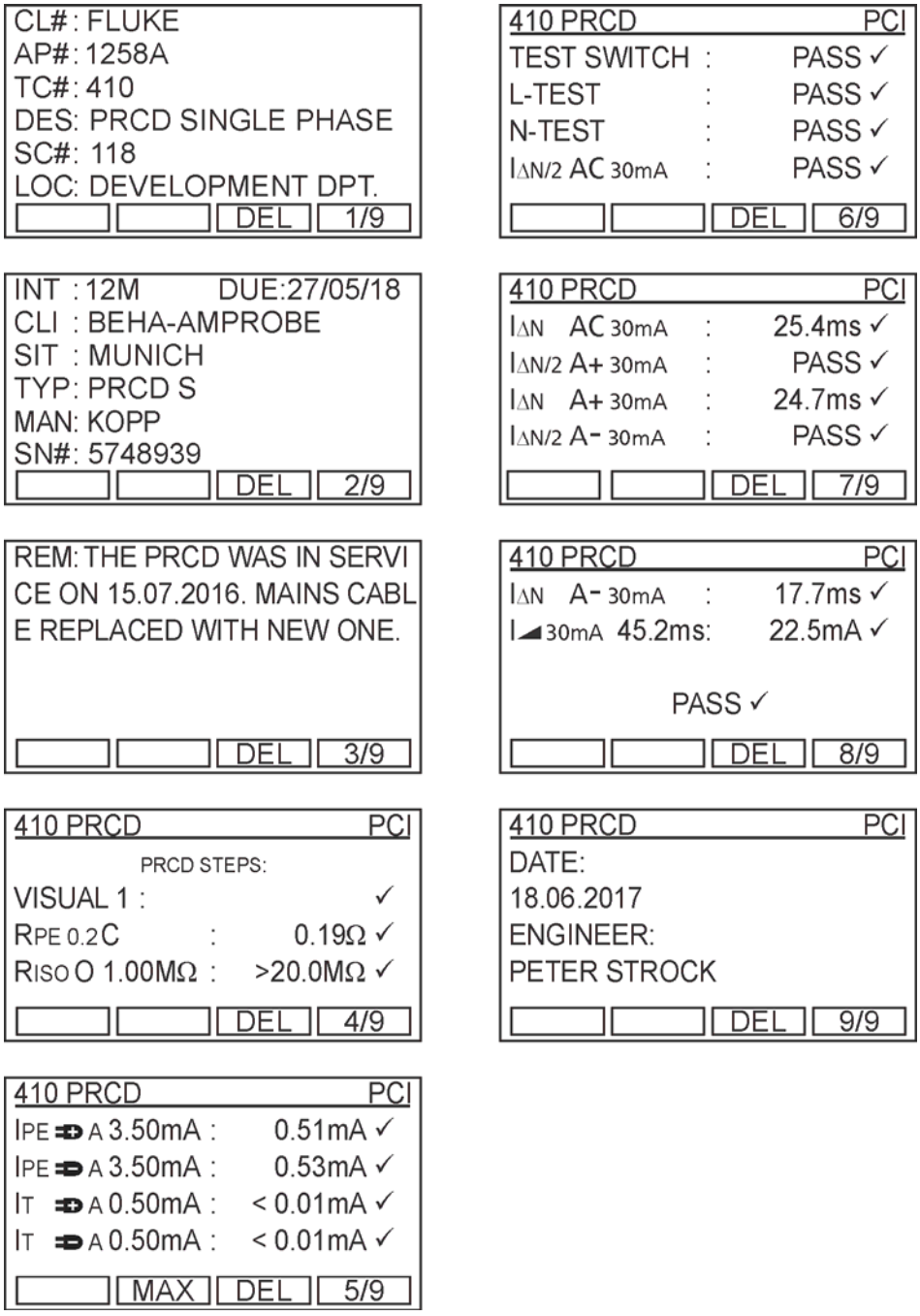


Figure 61: Recalled result (example for PRCD)

Note!

- Individual recalled measurement results can be directly deleted by pressing the "DEL" menu key.

Entry of Appliance Code and it's Attributes by Using an External Keyboard

The optional USB keyboard is a welcome accessory when selecting/entering appliance code and it's attributes like client code, description, site code and location in order to do the job quickly and simply. Connect the USB keyboard to USB2 or USB3 connector, three sound signals follow after plugging it (please wait a few seconds), as a confirmation of USB-device recognition. Now, the external keyboard is operational. The following keyboard keys are active to control the GT-650/GT-900 tester:

German language, German keyboard layout

USB keyboard	Function GT-650/GT-900 tester
F1, F2, F3, F4	Menu keys F1 to F4 (3)
F5, F6, F7, F8	Function keys SAVE, RCL, MENU, EXIT (5)
Esc	Function key EXIT (5)
ENTER	Menu key "↵" (3)
↓, ↑	Menu keys "▼", "▲" (3)
←, →	Menu keys "◄", "►" (3) Moves cursor to left/right position when entering appliance code and it's attributes
A, B, C … Z, Ä, Ö, Ü	Entry of appliance code and it's attributes
0, 1, 2 … 9	Entry of appliance code and it's attributes
° ∧ ! § $ % & / \ ( ) = ? ` ´ ² ³ { } [ ] β @ * + ~ ' # ; , : . _ - > < ¦	Entry of appliance code and it's attributes, special symbols
Space	Entry of appliance code and it's attributes, space
Pos 1	Moves cursor to start position when entering appliance code and it's attributes
Ende	Moves cursor to end position when entering appliance code and it's attributes
← (Back Space)	Deletes character left from the cursor when entering appliance code and it's attributes
Entf	Deletes character at the cursor when entering appliance code and it's attributes

Table 1: Functions of the USB keyboard (German version)

Notes!

- It is recommended to use the USB keyboard listed in the “Available Accessories” section, otherwise it may not be recognized by the GT-650/GT-900 tester or it may have some malfunctions.
- All three USB inputs/outputs (USB1, USB2 and USB3) can be used simultaneously!
- Before using the German keyboard please make sure this keyboard is selected in MENU / SETUP / KEYBOARD menu.

English language, GB keyboard layout

USB keyboard	Function GT-650/GT-900 tester
F1, F2, F3, F4	Menu keys F1 to F4 (3)
F5, F6, F7, F8	Function keys SAVE, RCL, MENU, EXIT (5)
Esc	Function key EXIT (5)
ENTER	Menu key "↵" (3)
↓, ↑	Menu keys "▼", "▲" (3)
←, →	Menu keys "◄", "►" (3) Moves cursor to left/right position when entering appliance code and it's attributes
A, B, C … Z	Entry of appliance code and it's attributes
0, 1, 2 … 9	Entry of appliance code and it's attributes
^ ! $ % & / \ ( ) = ? ` { } [ ] @ * + ~ ' # ; , : . _ - > < ¦	Entry of appliance code and it's attributes, special symbols
Space	Entry of appliance code and it's attributes, space
Home	Moves cursor to start position when entering appliance code and it's attributes
End	Moves cursor to end position when entering appliance code and it's attributes
Back Space	Deletes character left from the cursor when entering appliance code and it's attributes
Del	Deletes character at the cursor when entering appliance code and it's attributes

Table 2: Functions of the USB keyboard (English version)

Notes!
- It is recommended to use the USB keyboard listed in the "Available Accessories" section, otherwise it may not be recognized by the GT-650/GT-900 tester or it may have some malfunctions.
- All three USB inputs/outputs (USB1, USB2 and USB3) can be used simultaneously!
- Before using the GB keyboard please make sure this keyboard is selected in MENU / SETUP / KEYBOARD menu.

Entry of Appliance Code and it's attributes by using a Bar Code Reader

The optional USB barcode reader is a welcome accessory when entering appliance code and it's attributes like AP# (appliance code), CL# (client code), DES (Description), SC# (site code) and LOC (location) in order to do the job quickly and simply. Connect the USB barcode reader to USB2 or to USB3 connector, three sound signals follow after plugging it (wait a few seconds), as a confirmation of USB device recognition.

Above mentioned data can be entered when cursor is blinking on the GT-650/GT-900 tester screen.

Notes!

- Use the USB barcode reader listed in the "Available Accessories" section only, otherwise it may not be recognized by the GT-650/GT-900 tester.
- All three USB inputs/outputs (USB1, USB2 and USB3) can be used simultaneously!

Instruction how to configure the Barcode reader Honeywell type Voyager 1250G-2USB-1 (Firmware version 8.09 and higher)

Before first use of the above mentioned barcode reader, it is required to configure it as follows:

- If the Barcode reader was purchased new from the GT-650/GT-900 tester supplier, then no initialization is required (the reader was already initialized by the producer). If the reader was already used in combination with some other product except GT-650/GT-900 tester, then follow the next instructions.
- Connect the barcode reader to GT-650/GT-900 tester (or to PC) and switch on the GT-650/GT-900 tester (or PC) in order to assure proper power supply.
- Do the start configuration of the barcode reader by scanning the following two codes one after another, then disconnect the barcode reader and connect it again.

Removable Lid

In case the plastic lid of the GT-650/GT-900 tester is disturbing to the operator, one can simply remove it following the next steps:

- Release two press & pull latches (one on the left, one on the right side of the tester) and lift up the plastic lid.
- Pull out two metal axes from the hinges on the back side (one on the left, one on the right side).
- Remove the lid and push metal axes back to original holes of the lid hinges (in order not to lose them).

Note!
Metal axes are fixed to the lid by a thiny nylon rope.

Maintenance

When using the instrument in compliance with the user's manual, no special maintenance is required. However, should functional errors occur during normal operation, our after sales service will repair your instrument without delay.

Cleaning

If the instrument is needed to be cleaned after daily usage, it is advisable to use a wet cloth and a mild household detergent.

Prior to cleaning, disconnect the GT-650/GT-900 tester from all measurement circuits and from mains.

Never use acid-based detergents or dissolvent liquids for cleaning.

After cleaning it, do not use the instrument until it is completely dried up.

Calibration Interval

We suggest a calibration interval of one year. If the instrument is rarely used the calibration interval can be extended on to 3 years.

Fuse Replacement

If, due to overload or improper operation, a fuse blows, it is necessary to obey the following notes for replacement:

⚠WARNING

Prior to replacement of blown fuse, the appliance tester GT-650/GT-900 tester must be disconnected from all measuring circuits and mains supply cord must be disconnected from mains supply.

- Use only fuses specified and rated in technical specifications.
- Use of unspecified fuses and in particular shorting fuse-holders is prohibited.
- Spare fuses can be obtained in electric supplies wholesale shops or in our factory service.

Fuse replacement, mains input fuse F1:
The fuse F1 (T 16 A (H) / 250 V, 5 x 20 mm) may be blown if display stays "dead" after connecting the GT-650/GT-900 tester to mains voltage and switching it on by using the ON/OFF mains switch (4).

Fuse replacement, mains input fuse F2:
The fuse F2 (T 16 A (H) / 250 V, 5 x 20 mm) is blown if text "FUSE F2!" appears on the display. This message may appear in any test that requires presence of mains voltage on the mains socket. This fuse blows in case there is too high-power load connected to mains socket (current higher than 16 A).

Fuse replacement, RPE function fuse F3:
The fuse F3 (FF 6.3 A (H) / 250 V, 5 x 20 mm) is blown if text "FUSE F3" appears on the display in RPE, CORD or PRCD test. This fuse blows for example if test points are connected to mains voltage during the test by mistake.

To replace the blown fuse, proceed as follows:

1) Unscrew corresponding fuse holder cap (1, 2 or 10) by using an appropriate screwdriver.
2) Remove the defective fuse and replace it with a new one (use only specified fuse as defined in technical specification).
3) Replace the fuse holder cap.

☞ If any fuse blows several times (for example in case of operating error) the instrument must be sent in to the service department in order to be checked.

☞ Use only fuses as defined in technical specification. Using alternative fuses may cause a safety risk!

List of Possible Displayed Errors

The following errors can be displayed during operation the GT-650/GT-900 tester:

ERROR 1:
Internal measurement path (in any test except CLAMP, PELV and SELV) is interrupted, probably due to blown internal fuse. Please send the instrument to a service department in order to be serviced.

Note!
Internal fuse is not customer replaceable!

ERROR 2:
Internal relay may be damaged so mains voltage may be constantly present at schuko test / mains socket – hazardous situation. Please send the instrument to a service department in order to be serviced.

ERROR 3:
Internal relay may be damaged so dangerous voltage may be present at accessible parts – hazardous situation. Please send the instrument to a service department in order to be serviced.

Reset of the GT-650/GT-900 Tester

There are many adjustable parameters in the GT-650/GT-900 tester. If an operator due to any reason wishes to reset all adjustable parameters to factory-set values, this operation can be done by performing RESET function as follows:

Switch off the GT-650/GT-900 tester by using the mains switch (4). Press and keep pressing the function key "SAVE" (F5) while switching on the GT-650/GT-900 tester, the two options described below will be offered, release the function key "SAVE" (F5):

- SET DEFAULT SETTINGS
- SET FACTORY RESET

Select appropriate one by using the "▼" and "▲" menu keys and confirm it by pressing the "↵" menu key. Reconfirm the operation by pressing the "YES" menu key.

The following parameters will be reset after performing SET DEFAULT SETTINGS operation:

Function	Parameters
RPE	- Test current - 5 A - Limit value - 0.3 Ω - Measurement mode (MAN/AUTO) - MAN - Test lead compensation - NO
RINS	- Test voltage - 500 V - PC - I - Limit value - 1.00 MΩ (PC I) - Limit value - 0.30 MΩ (PC I-HEATER) - Limit value - 2.00 MΩ (PC II) - Limit value - 0.25 MΩ (PC III)
ISUB	- PC - I - Limit value - 3.50 mA (PC I) - Limit value - 0.50 mA (PC II)
IPE(Δ)	- Limit value - 3.50 mA
IT	- Limit value - 0.50 mA
CLAMP (GT-900 only)	- Range - 0 ... 60 A
CORD / PRCD / PRCD-S / PRCD-S+ / PRCD-K (GT-900 only)	- CORD
CORD	- Measurement mode (MAN/AUTO) - MAN - Limit value RPE - 0.30 Ω - Test current RPE - 0.2 A (L) - Test cable compensation - NO
PRCD, PRCD-S, PRCD-S+, PRCD-K (GT-900 only)	- IΔN - 30 mA - Limit value RPE - 0.30 Ω - Test current RPE - 0.2 A (L) - Test cable compensation - NO
PELV/SELV	- PELV

PELV	- Limit value - 50 V
SELV	- Limit value - 50 V
FAVOURITE AUTO-TESTS	All factory-programmed AUTO-TESTS will be set to favourite except TC# 150 and TC# 151

MENU	- TRANSFERRED RESULTS (ACTUAL/MAXIMAL RESULTS) - ACTUAL
	- CLIENT filter - disabled
	- MEASUREMENT TIMES
	  - MAN, MAINS - 10 seconds
	  - MAN, MAINS FREE - 3 seconds
	  - AUTO, MAINS - 10 seconds
	  - AUTO, MAINS FREE - 3 seconds
	- REGION - NON UK
	- KEYBOARD - GERMAN
	- ACOUSTIC SYGNAL
	  - ALL SOUNDS - HIGH
	  - KEYS - ON
	  - KEYBOARD - ON
	  - FAIL BEEP @ TEST - ON
	  - FAIL BEEP > TEST - 1 second
	- BARCODE MODE - STANDARD
	- AUTO-TEST MODE - STANDARD
	- LANGUAGE - GERMAN
	- CONTRAST - 50 %

The following actions will be carried out in addition to the ones described above after performing SET FACTORY RESET operation:

Parameter	Status
APPLIANCES (appliance code database)	Cleared
RESULTS (all test results)	Cleared
CLIENTS	Cleared
ENGINEERS	Cleared
AUTO-TESTS	All customer-created AUTO-TESTS will be cleared. Names of all factory-programmed AUTO-TESTS will be set to default ones, see default names in chapter “AUTO-TEST (GT-900 only)” starting on page 53.

Pre-Tests and Protection

Function	Tests, protections	Notes
Switching ON the instrument	- Protective earth (PE) of mains socket	Pre-test. If the PE terminal is not correctly connected to earth, then "PE DISCONNECTED! TURN OFF NOW!" message will be displayed and any further operation will be disabled. **Switch off the tester immediately, danger!**
	- Fuse F2	Pre-test. If the F2 fuse is blown, then "FUSE 2!" message will be displayed and any further operation will be disabled.
RPE	- $U_{EXT\ PE/PROBE1}$ ≤3.75 V	Pre-test. If an external voltage higher than 3.75 V is detected before starting the test, then "EXTERNAL VOLTAGE!" message will be displayed and further RPE tests will be disabled.
	- $I_{SUB\ INT}$ ≥0.15 mA	Path pre-test (self-test). If the instrument's measurement path is interrupted e.g. due to blown internal fuse, then "ERROR 1" message will be displayed and further tests will be disabled.
	- Fuse F3	Pre-test and during the test. If the F3 fuse is blown, then "FUSE 3!" message will be displayed and further RPE tests will be disabled.
	- $U_{EXT\ PROBE1/GND}$ ≤50 V - $U_{EXT\ PROBE2/GND}$ ≤50 V	Pre-test and during the test. If an external voltage higher than 50 V is detected before starting the RPE test or during it, then "EXTERNAL VOLTAGE!" message will be displayed and further RPE tests will be disabled.
	- $U_{EXT\ PE/PROBE1}$ ≤7.60 V	During the test. If an external voltage higher than 7.6 V is detected during the RPE test, then the test will be stopped and "EXTERNAL VOLTAGE!" will be displayed.
RINS	- $U_{LN/PE}$ ≤50 V	Pre-test. If an external voltage higher than 50 V is detected before starting the RINS test, then "EXTERNAL VOLTAGE" message will be displayed and further RINS tests will be disabled.
	- $I_{SUB\ INT}$ ≥0.15 mA	Path pre-test (self-test). If the instrument's measurement path is interrupted e.g. due to blown internal fuse, then "ERROR 1" message will be displayed and further tests will be disabled.
	- $U_{EXT\ PROBE1/GND}$ ≤50 V - $U_{EXT\ PROBE2/GND}$ ≤50 V (PC II and PC III only) - $U_{EXT\ PE/GND}$ ≤50 V - $U_{EXT\ LN/GND}$ ≤50 V	Pre-test. If an external voltage higher than 50 V is detected before starting the RINS test, then "EXTERNAL VOLTAGE" message will be displayed and further RINS tests will be disabled.
ISUB	- $I_{SUB\ INT}$ ≥0.15 mA	Path pre-test (self-test). If the instrument's measurement path is interrupted e.g. due to blown internal fuse, then "ERROR 1" message will be displayed and further tests will be disabled.
	- $U_{EXT\ PROBE1/GND}$ ≤50 V - $U_{EXT\ PROBE2/GND}$ ≤50 V - $U_{EXT\ PE/GND}$ ≤50 V	Pre-test. If an external voltage higher than 50 V is detected before starting the ISUB test, then "EXTERNAL VOLTAGE" message will be displayed and further ISUB tests will be disabled.

$I_{PE(\Delta)}$	- $I_{SUB\ INT} \geq 0.15$ mA	Path pre-test (self-test). If the instrument's measurement path is interrupted e.g. due to blown internal fuse, then "ERROR 1" message will be displayed and further $I_{PE(\Delta)}$ tests will be disabled.
	- $I_{SUB} \leq 20.00$ mA	Pre-test. If the substitute leakage current exceeds 20.00 mA (damaged appliance), then "LN-PE SHORTED!" message will be displayed and further $I_{PE(\Delta)}$ tests will be disabled.
	- $I_L \geq 25$ mA	Pre-test. If the load current is lower than 25 mA (open mains ON switch), then "NO DEVICE!" message will be displayed for a while and the measurement will be continued.
	- Protective earth (PE) of mains socket.	Pre-test. If the PE terminal is not correctly connected to earth, then "PE DISCONNECTED! TURN OFF NOW!" message will be displayed and any further operation will be disabled. **Switch off the tester immediately, danger!**
	- Fuse F2	Pre-test. If the F2 fuse is blown, then "FUSE 2!" message will be displayed and further $I_{PE(\Delta)}$ tests will be disabled.
	- $U_{EXT\ PROBE1/GND} \leq 50$ V	Pre-test. If an external voltage higher than 50 V is detected, then "EXTERNAL VOLTAGE!" message will be displayed and further $I_{PE(\Delta)}$ tests will be disabled.
I_T	- $I_{SUB\ INT} \geq 0.15$ mA	Path pre-test (self-test). If the instrument's measurement path is interrupted e.g. due to blown internal fuse, then "ERROR 1" message will be displayed and further I_T tests will be disabled.
	- $I_{SUB} \leq 10.00$ mA	Pre-test. If the substitute leakage current exceeds 10.00 mA (damaged appliance), then "LN-PE SHORTED!" message will be displayed and further I_T tests will be disabled.
	- $I_L \geq 25$ mA	Pre-test. If the load current is lower than 25 mA (open mains ON switch), then "NO DEVICE!" message will be displayed for a while and the measurement will be continued.
	- Protective earth (PE) of mains socket	Pre-test. If the PE terminal is not correctly connected to earth, then "PE DISCONNECTED! TURN OFF NOW!" message will be displayed and any further operation will be disabled. **Switch off the tester immediately, danger!**
	- Fuse F2	Pre-test. If the F2 fuse is blown, then "FUSE 2!" message will be displayed and further tests will be disabled.
P/I_L	- $I_{SUB\ INT} \geq 0.15$ mA	Path pre-test (self-test). If the instrument's measurement path is interrupted e.g. due to blown internal fuse, then "ERROR 1" message will be displayed and further P/I_L tests will be disabled.
	- $I_{SUB} \leq 10.00$ mA	Pre-test. If the substitute leakage current exceeds 10.00 mA (damaged appliance), then "LN-PE SHORTED!" message will be displayed and further P/I_L tests will be disabled.
	- Protective earth (PE) of mains socket	Pre-test. If the PE terminal is not correctly connected to earth, then "PE DISCONNECTED! TURN OFF NOW!" message will be displayed and any further operation will be disabled. **Switch off the tester immediately, danger!**
	- Fuse F2	Pre-test. If the F2 fuse is blown, then "FUSE 2!" message will be displayed and further P/I_L tests will be disabled.

CORD	- $U_{L\ IEC} \leq 50$ V - $U_{N\ IEC} \leq 50$ V	Pre-test. If an external voltage higher than 50 V is detected after pressing START key, then "EXTERNAL VOLTAGE!" message will be displayed and further CORD tests will be disabled.
	- $U_{EXT\ PROBE1/GND} \leq 50$ V	Pre-test and during the R_{PE} test. If an external voltage higher than 50 V is detected, then "EXTERNAL VOLTAGE!" message will be displayed and further CORD tests will be disabled.
	- Fuse F3	Pre-test. If the F3 fuse is blown, then "FUSE 3!" message will be displayed and further CORD tests will be disabled.
PRCD	- $U_{L\ IEC} \leq 50$ V - $U_{N\ IEC} \leq 50$ V	Pre-test and during the R_{PE} test. If an external voltage higher than 50 V is detected, then "EXTERNAL VOLTAGE!" message will be displayed and further PRCD tests will be disabled.
	- $I_{SUB\ INT} \geq 0.15$ mA	Path pre-test (self-test). If the instrument's measurement path is interrupted e.g. due to blown internal fuse, then "ERROR 1" message will be displayed and further PRCD tests will be disabled.
	- Protective earth (PE) of mains socket	Pre-test. If the PE terminal is not correctly connected to earth, then "PE DISCONNECTED! TURN OFF NOW!" message will be displayed and any further operation will be disabled. **Switch off the tester immediately, danger!**
	- Fuse F2	Pre-test. If the F2 fuse is blown, then "FUSE 2!" message will be displayed and further PRCD tests will be disabled.
	- $I_{SUB} \leq 10.00$ mA Note! Limit value for the pre-test done before $I_{PE(\Delta)}$ measurement is 20 mA.	Pre-test. If the substitute leakage current exceeds 10.00 mA (20 mA) (damaged appliance), then "LN-PE >10mA" message will be displayed and further PRCD tests will be disabled.
	- Fuse F3	Pre-test in R_{PE} measurement.
	- $U_{EXT\ PROBE1/GND} \leq 50$ V	Pre-test and during the measurement in R_{PE} measurement
	- $U_{EXT\ PROBE2/GND} \leq 50$ V	Pre-test and during the measurement in R_{PE}, I_{PE} and I_T steps

Technical Specifications GT-650/GT-900 Tester

General Features

Standards used	VDE 0701-0702, DIN VDE 0404-1/-2, EN 61010-1, EN 61557-1 (General requirements), EN 61557-2 (Insulation resistance), EN 61557-4 (Resistance of earth connection), EN 61557-10 (Combined measuring equipment), EN 61557-16 (Appliance tester for electrical and/or medical equipment)
Power supply (fixed mains cord)	230 V +10%/-15%, 50 Hz
Max. inter. power consumption	45 VA (RPE-5A function)
Max. load output current	16 A
Fuses F1 and F2	T 16 A / 250 V, ceramic type, breaking capacity 1500 A, dimensions 6.3 x 32 mm, *use only type 189140.16IP produced by Siba*
Fuse F3	F 6.3 A / 250 V, ceramic type, breaking capacity 1500 A, dimensions 5 x 20 mm, *use only type SP 5×20, Order code 0001.1012 produced by Schurter*
Display	Blue graphic LCD 128x64 dots with white backlight
Function selection	11-pos. (GT-900 tester) / 9-pos. (GT-650 tester) rotary switch
Result limits	Adjustable, refer to the adjustment range in each function (visual and acoustic signal in case of exceeded value)
Memories	GT-900: 10.000 appliance codes, 5.000 measurement results - regardless of type of test (visual, any single, CORD, PRCD, AUTO-TEST...) GT-650: 1.000 appliance codes, 500 measurement results - regardless of type of test (visual, any single, CORD ...)
Buzzer for acoustic signal	Built in
Real time clock (RTC)	Built in
Internal battery for RTC	Li 3V/230 mAh type IEC CR2032
1× USB 2.0 communication with PC	Yes
2× USB for:	
USB Bar code reader connection	Yes (HID)
USB Keyboard connection	Yes (HID)
USB Stick connection	Yes
Measurement time:	
Single mains-free meas.	Adjustable 3 ... 60 s
Single mains supplied meas.	Adjustable 5 ... 300 s
Continuous measurements	Limited to 5 minutes (save function active)
AUTO mains-free meas.	Adjustable 3 ... 60 s
AUTO mains supplied meas.	Adjustable 5 ... 300 s
Protection against mains socket overload	Fuses F1 and F2, T16 A (H) / 250 V, 5×20 mm

Protection against excessive earth leakage current	No, the protection must be assured by external overcurrent device or RCD of installation
Dimensions	299 × 248 × 119 mm
Weight	Approx. 4 kg
IP protection class	IP40
Position of the tester	Horizontal
CE directives	Low Voltage Directive LVD 2014/35/EU Electromagnetic Compatibility EMC 2014/30/EU
Safety	EN 61010-1:2010 IEC 61010-1:2010 EN 61010-2-030:2010 IEC 61010-2-030:2010 EN 61010-031:2003+A1:2008
EMC	EN 61326-1:2013
Reference temperature range	+23 °C ± 5 °C
Working temperature range	0 ... +40 °C
Storage temperature range	-10 ... +50 °C
Reference humidity range	10 ... 60 % relative humidity w/o condensation
Working humidity range	10 ... 85 % relative humidity w/o condensation
Pollution degree	2
Protection class	I
Measurement category	CAT II 300 V
Altitude above sea level	2000 m max.
Pre-Tests and Protection	Refer to page 94

Functions

Protective Earth Bond Resistance - 5A (RPE)

Measurement range	0.05 ... 11.00 Ω
Display range	0.00 ... 11.00 Ω
Resolution	0.01 Ω
Accuracy	± (5% rdg. + 3 digits)
Operational error	± 30% (within 0.20 … 11.00 Ω acc. to EN 61557-4) ± 15% (@ 0.30 Ω acc. EN 61557-16)
Limit value	Adjustable 0.01 ... 11.00 Ω, calculation (by length and cross section) available
Test current	>5.0 A AC @ (mains voltage 230 V, standard test lead 1.5 m / 0.75 mm² and external resistance of 0.1 Ω)
Operation mode	Intermittent use! Max. 2 minutes measurement duration / 3 minutes pause
Short-circuit test current	Approx. 6 A AC (at mains voltage 230 V)
Open-circuit test voltage	Approx. 6 V AC, SELV (floating output)
Test lead compensation	Up to 5.00 Ω by using the COMP menu key
Protection against ext. voltage	Fuse F3, blown fuse automatically detected
AUTO-START mode	Yes, automatic start and save after connecting to PE of DUT

Protective Earth Bond Resistance - 0.2A (RPE)

Measurement range	0.05 ... 11.00 Ω
Display range	0.00 ... 11.00 Ω
Resolution	0.01 Ω
Accuracy	± (5% rdg. + 3 digits)
Operational error	± 30% (within 0.20 … 11.00 Ω) acc. EN 61557-4 ± 15% (@ 0.30 Ω) acc. to EN 61557-16
Limit value	Adjustable 0.01 ... 11.00 Ω, calculation available
Test current	> 0.2 A AC @ 2 Ω
Short-circuit test current	Approx. 0.45 A AC (at mains voltage 230 V)
Open-circuit test voltage	Approx. 6 V AC, SELV (floating output)
Test lead compensation	Up to 5.00 Ω by using the COMP menu key
Protection against ext. voltage	Fuse F3, blown fuse automatically detected
AUTO-START mode	Yes, automatic start after connecting test lead to PE of DUT

Insulation Resistance (RINS)

Available protection classes	PC I, PC I-HEATER (with heater), PC II and PC III
Measurement terminals PC I, PC I-HEATER	L/N against PE on test socket in parallel with PROBE 2
Measurement terminals PC II	L/N against PROBE 2
Measurement terminals PC III	PROBE 1 against PROBE 2
Measurement range PC I, II	0.10 ... 100 MΩ
Measurement range PC III	0.10 ... 20 MΩ
Display range PC I, II	0.00 ... 9.99 MΩ, 10.0 ... 49.9 MΩ, 50 ... 100 MΩ
Display range PC III	0.00 ... 9.99 MΩ, 10.0 ... 20.0 MΩ
Resolution	0.01 MΩ, 0.1 MΩ, 1 MΩ (see display ranges above)
Accuracy, PC I, II	± (5% rdg. + 2 digits) 0.00 ... 10.0 MΩ ± (8% rdg.) 10.1 ... 50.0 MΩ ± (15% rdg.) 51 ... 100 MΩ
Accuracy, PC III	± (7% rdg. + 2 digits)
Operational error PC I, II, III	± 30% (within 0.10 … 10.0 MΩ) acc. to EN 61557-2
Operational error PC I, II	± 15% (@ 0.30 MΩ) acc. to EN 61557-16
Operational error PC III	± 15% (@ 0.25 MΩ) acc. to EN 61557-16
Limit value	Adjustable 0.01 ... 20.0 MΩ Standard limit values: 0.30 MΩ (PC I-HEATER), 2.00 MΩ (PC II), 0.25 MΩ (PC III)
Test voltage (UN)	500 V DC (and 250 V DC GT-900 only), (floating output)
Test voltage tolerance	-0% ... +25%
Test current (500 V range)	>1 mA DC (at 500 kΩ load)
Test current (250 V range)	>1 mA DC (at 250 kΩ load) (GT-900 only)
Short-circuit current	< 2 mA DC
Capacitive load	2 µF max. in parallel with RINS

Discharge (PC I, II)	Via internal resistance of 100 kΩ after finishing the measurement
Discharge PC III	Via internal resistance of 3 MΩ after finishing the measurement

Notes!
PC I, PC I-HEATER and PC II: Do not ground LN terminals of test socket. The grounding will influence test result with parallel connection of 3.3 MΩ approx. as a result of tester's internal resistance.
PC III: DUT must be insulated from ground, otherwise test result will not be correct.

Substitute Leakage Current TRMS (ISUB)

Available protection class	PC I and PC II
Measurement terminals PC I	L/N against PE on test socket in parallel with PROBE 2
Measurement terminals PC II	L/N against PROBE 2
Measurement range	0.12 ... 20.00 mA
Display range	0.02 ... 20.00 mA
Resolution	0.01 mA
Accuracy	+/- (5% rdg. + 3 digits)
Operational error	± 30% (0.12 … 20.00 mA) acc. to EN 61557-1
Operational error	± 15% (@ 0.5 mA) acc. to EN 61557-16
Limit value	Adjustable 0.02 ... 20.00 mA Standard limit values: 3.50 mA (PC I) 0.50 mA (PC II)
Open-circuit test voltage	Approx. 45 V / 50 Hz at 230 V, SELV (floating output)
Short-circuit test current	Approx. 300 mA
Protection against external voltage between test terminals	Software protection

Earth Leakage Current TRMS (IPE(Δ)) (differential method)

Measurement range	0.10 ... 20.00 mA
Display range	0.05 ... 20.00 mA
Resolution	0.01 mA
Accuracy	+/- (5% rdg. + 2 digits)
Operational error	± 30% (within 0.10 … 20.00 mA) acc. to EN61557-1
Operational error	± 15% (@ 3.5 mA) acc. to EN 61557-16
Load influence	+/- 0.01 mA / A
Limit value	Adjustable 0.05 ... 20.00 mA, standard limit value 3.50 mA
Frequency range	40 Hz ... 100 kHz (characteristics according to DIN EN 61557-16 Annex A, fig. A.1, A.2)
Measurement method	Differential
Mains cord polarity exchange	Automatic by pressing the POL menu key (GT-900 only)
Mains on switch test (DUT)	Yes, the test done by measuring load current, limit value 25 mA
Over-range limit	Yes, the measurement will be automatically interrupted 2 s after exceeding measurement range

Operation mode (I_L > 10A)	Intermittent use! Max. 4 minutes measurement duration / 3 minutes pause

Touch Leakage Current TRMS (I_T) (direct method)

Measurement range	0.10 ... 20.00 mA
Display range	0.01 ... 20.00 mA
Resolution	0.01 mA
Accuracy	+/- (5% rdg. + 2 digits)
Operational error	± 30% (within 0.10 … 20.00 mA) acc. to EN 61557-1
Operational error	± 15% (@ 0.5 mA) acc. to EN 61557-16
Limit value	Adjustable 0.01 ... 20.00 mA, standard value 0.50 mA
Frequency range	DC ... 100 kHz (characteristics according to DIN EN 61557-16 Annex A, fig. A.1, A.2)
Measurement method	Direct
Internal resistance (via probe)	1 kΩ
Max. ext. voltage at PROBE 2	250 V
Mains cord polarity exchange	Automatic by pressing the POL menu key (GT-900 only)
Mains on switch test (DUT)	Yes, the test done by measuring load current, limit value 25 mA
Over-range limit	Yes, the measurement will be automatically interrupted 2 s after exceeding measurement range
Operation mode (I_L > 10A)	Intermittent use! Max. 4 minutes measurement duration / 3 minutes pause

Functional test (P/I_L)
Apparent power VA

Calculation	S (VA) = U × I_L
Display range	0.0 ... 99.9 VA, 100 ... 999 VA, 1.00 ... 5.06 kVA
Resolution	0.1 VA, 1 VA, 10 VA
Accuracy	+/- (5% rdg. + 10 digits) 5.8 ... 99.9 VA +/- (5% rdg. + 3 digits) 100 VA ... 5.06 kVA
Limit value	Adjustable 6 ... 999 VA, 1.00 kVA ... 5.06 kVA (in AUTO-TEST function only)

Functional test (P/I_L)
Load current TRMS

Display range	0.00 ... 0.99 A, 1.0 ... 20.0 A
Resolution	0.01 A, 0.1 A
Accuracy	+/- (3% rdg. + 3 digits)
Frequency range	15 ... 723 Hz
Over-range limit	Yes, the measurement will be automatically interrupted 10 s after exceeding 18 A

Functional test (P/IL)
Mains voltage TRMS

Display range	195 ... 253 V
Resolution	1 V
Accuracy	+/- (2% rdg. + 2 digits)
Input resistance	5 MΩ
Frequency range	15 ... 723 Hz

Functional test (P/IL)
Active power W

Calculation	P (W) = 1/T ∫ ui×dt
Display range	0.0 ... 99.9 W, 100 ... 999 W, 1.00 ... 5.06 kW
Resolution	0.1 W, 1 W, 10 W
Accuracy	+/- (5% rdg. + 10 digits) 5.8 ... 99.9 W +/- (5% rdg. + 3 digits) 100 W ... 5.06 kW

Functional test (P/IL)
Power factor (PF)

Display range	0.00 ... 1.00
Tolerance	Not specified

Operation mode (IL > 10A)	Intermittent use! Max. 4 minutes measurement duration / 3 minutes pause

Clamp Current TRMS (⦾▭) / Range 0...20 mA (GT-900 only)

Measurement range	1.0 ... 20.0 mA
Display range	0.5 ... 20.0 mA
Resolution	0.1 mA
Accuracy (without clamp error)	+/- (5% rdg. + 2 digits)
Operational error	± 30% (1.0 … 20.00 mA) acc. to EN 61557-1
Operational error	± 15% (@ 3.5 mA) acc. to EN 61557-16
Input resistance	15 Ω
Frequency range (20 mA)	40 Hz ... 100 kHz (characteristics according to DIN EN 61557-16 Annex A, fig. A.1, A.2)
Clamp type	AC, input max. 60 A, output 1mA/A (Type CHB1, No. 2390055)

Clamp Current TRMS (⦾▭) / Range 0...60 A (GT-900 only)

Display range	0.2 ... 60.0 A
Resolution	0.1 A
Accuracy (without clamp error)	+/- (5% rdg. + 3 digits)
Input resistance	0.5 Ω
Frequency range	50 Hz
Clamp type	AC, input max. 60 A, output 1mA/A (Type CHB1, No. 2390055)

IEC Cord Test (CORD)

Measurements / test steps	- RPE protective earth bond test (used RPE-5A or RPE-0.2A function), limit value adjustable 0.01 ... 11.00 Ω, see other details in section "Protective Earth Bond Test 5 A / 0.2 A (RPE)" on page 21. - RINS insulation resistance test L/N against PE (used RINS-500V function), fixed limit value 1.00 MΩ), see other details in section "Insulation Resistance Test 250 V / 500 V (RINS)" on page 24, respect PC I details. - L/N shorted - pass/fail (used RINS-250V function, limit value 1 MΩ). - N continuity - pass/fail (used RINS-250V function, fixed limit value approx. 1 MΩ). - L continuity - pass/fail (used RINS-250V function, fixed limit value approx. 1 MΩ).
Cord RPE test lead compensation	Yes, up to 5.00 Ω

PRCD Test (GT-900 only)

Types of PRCD	PRCD PRCD-S PRCD-S+ PRCD-K
Nominal differential current $I_{\Delta N}$	Selectable 10 mA or 30 mA
Measurements / Test steps	See the list of test steps for each PRCD TYPE in section "Factory-programmed AUTO-TESTS for CORD and PRCD (NON UK and UK REGION)" on page 57
Timeout (PRCD not activated / deactivated)	60 s
PRCD RPE test lead compensat.	Yes, up to 5.00 Ω
Accuracy of test current $I_{\Delta N/2}$	+0/-10% of $I_{\Delta N/2}$
Accuracy of test current $I_{\Delta N}$	-0/+10% of $I_{\Delta N}$
Display range trip out time types PRCD, PRCD-S and PRCD-K	0 ... 300 ms ($I_{\Delta N}$)
Display range trip out time type PRCD-S+	0 ... 200 ms ($I_{\Delta N}$)
Resolution trip time	0.1 ms
Accuracy of trip time	+/- (3% rdg. + 2 ms)
Display range ramp current	(0.5 ... 1.1) $I_{\Delta N}$
Shape of test current	Sine wave, half-wave pulse+, half-wave pulse- and 
Max. N conductor resistance	5 Ω

Protective Extra Low Voltage TRMS (PELV)

Measurement terminals	PROBE2 against earth
Display range	10.0 ... 100.0 V
Resolution	0.1 V
Accuracy	+/- (2% + 2 V)

Limit value	Adjustable 10.0 ... 100.0 V, standard values 25 V and 50 V
Input resistance	2.35 MΩ
Frequency range	0 ... 723 Hz

Safety Extra Low Voltage TRMS (SELV)

Measurement terminals	PROBE1 against PROBE2 socket
Display range	10.0 ... 100.0 V
Resolution	0.1 V
Accuracy	+/- (2% + 2 V)
Limit value	Adjustable 10.0 ... 100.0 V, standard values 25 V and 50 V
Input resistance	20 MΩ
Common mode input voltage	50 V max.
Frequency range	0 ... 723 Hz

AUTO-TEST measurements (GT-900 only)

Number of factory-programmed AUTO-TESTS (fixed)	20 - non UK region 16 - UK region (in blocked number range 001…499)
Number of available customer-created AUTO-TESTS	50 (number range 500…999)
Number of steps in each AUTO-TEST	30 max.

Technical Specifications PRCD-Adapter

General Features

Operation	In combination with GT-900 only
Power supply input (mains plug)	230 V +10%/-15%, 50/60 Hz, 16 A max. (via GT-900 only)
Output voltage (mains socket)	Equal to power supply input, 16 A max.
Protection against mains socket overload	Fuses F1 and F2 of GT-900
Max. int. power consumption	2 VA
Dimensions	120 × 65 × 55 mm (55 mm without mains plug)
Weight	0.3 kg approx.
Protection degree	IP40
CE directives	Low Voltage Directive LVD 2014/35/EU Electromagnetic Compatibility EMC 2014/30/EU
Safety	EN61010-1:2010 Edition 3.0 Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements. EN 61010-031:2003+A1:2008 Accessories
EMC	EN61326-1:2013 Electromagnetic compatibility
Reference temperature range	+23 °C ± 5 °C
Working temperature range	0 ... +40 °C
Storage temperature range	-10 ... +50 °C
Reference humidity range	10 ... 60 % relative humidity w/o condensation
Working humidity range	10 ... 85 % relative humidity w/o condensation
Pollution degree	2
Protection class	I
Measuring category (supply)	CAT II 300 V
Altitude above sea level	2000 m max.

Functions

PRCD-K (Varistor test step)

Test method	Voltage measurement by GT-900 @ 1 mA, test current generated by the PRCD-Adapter

PRCD-S / S+ (Voltage at PRCD ON button test)

Test method	A test voltage generated by a safety network is applied to PROBE 3

Variation Factor Errors

Influencing quantity	Designation code	(%) Variation Error
Position	E1	2.0
Mains supply voltage	E2	3.0
Temperature	E3	4.0
Distorted waveform	E9	2.0
External low frequency magnetic field	E11	4.0
Load current	E12	4.0
Touch current caused by common mode voltage	E13	2.0
Repeatability	E15	2.0

Limited Warranty and Limitation of Liability

It is guaranteed that this BEHA-AMPROBE product is free of material and manufacturing damages for the time period of 24 months starting from the date of purchase. This warranty does not include fuse malfunctions, as well as damages caused by accidents, negligence, misusage, unauthorised modifications, abnormal operating conditions or improper handling. The sales offices do not have the right to extend the warranty on behalf of BEHA-AMPROBE.

Service

All instruments that are sent in for repair or calibration within or beyond the warranty period must contain the following data: Name of the client, name of the company, address, contact telephone number and a proof of purchase. Please enclose also the test leads and a short description (or a service form) of the problem detected or of desired maintenance.

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List of abbreviations:

PC I ..... Protection class I (appliances with PE conductor)
PC I-HEATER .... Protection class I (appliances with PE conductor and with heating elements)
PC II ..... Protection class II (appliances with double/reinforced insulation)
PC III ..... Protection class III (appliances with protection by low voltage)
DUT ..... Device under test
PRCD ..... Portable Residual Current Device
TRMS ..... True Root Mean Square
LCD ..... Liquid Crystal Display
PELV ..... Protective Extra Low Voltage
SELV ..... Safety Extra Low Voltage

Subject to technical changes without notice!
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Visit www.amprobe.eu for:

- Catalog
- Application notes
- Product specifications
- User's Manual