BetaGT*Plus* MI 3304
OmegaGT*Plus* MI 3305
User Manual

Ver. 1.1, Code no. 20 751 336

METREL®

Distributor:

Manufacturer:

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CE Mark on your equipment certifies that this equipment meets the requirements of the EU (European Union) concerning safety and electromagnetic compatibility regulations

Table of contents

1 General description

Congratulations on your purchase of the instrument and its accessories from METREL. The instrument was designed on basis of rich experience, acquired through many years of dealing with electrictrical appliance test equipment.

The multifunctional portable test instrument OmegaGT*Plus* / BetaGT*Plus* is intended to perform all measurements for testing the electrical safety of portable electrical equipment. The following tests can be performed:

- earth bond resistance,
- insulation resistance,
- substitute leakage current,
- differential leakage current,
- touch leakage current,
- IEC cord polarity test,
- leakage and TRMS load currents with current clamp,
- portable RCD test,
- functional test,
- flash test (MI 3305 OmegaGT*Plus* only).

The instrument has ability to organize measurements listed above into test sequences that are perfomed as autotests. Generation of autotests is device-dependent and is based on requirements of selected VDE 0701 or VDE 0702 standard.

Some instrument's highlights:

- large graphic LCD display with resolution of 240 × 128 dots, with back-light,
- over 6500 memory locations in data flash memory for autotest results,
- four communication ports (USB and RS232C) for communication with PC, barcode reader or printers,
- soft touch keyboard with cursor keys,
- built in real time clock,
- fully compatible with new METREL PATLink PRO PC software package,
- best suited for periodic testing,
- fast testing with barcode identification systems,
- test data can be uploaded from PC,
- comparisons between old and new test results can be performed on site,
- enables printing of test labels on site.

1.1 Warnings

In order to reach high level of operator safety while carrying out various measurements using OmegaGT*Plus* / BetaGT*Plus* instrument, as well as to keep the test equipment undamaged, it is necessary to consider the following general warnings:

- **Read this user manual carefully, otherwise use of the instrument may be dangerous for the operator, for the instrument or for the equipment under test!**
- **If the test equipment is used in manner not specified in this user manual the protection provided by the equipment may be impaired!**
- **Use only correctly earthed mains outlets to supply the instrument!**
- **Do not use the instrument and accessories if any damage is noticed!**
- **In case a fuse has blown follow the instructions in this user manual to replace it!**
- **Instrument servicing and calibration is allowed to be carried out only by a competent authorized person!**
- **Use only standard or optional test accessory supplied by your distributor!**

1.2 Warning markings on connector panel

Refer to chapter ***2.1 Front panel***!

1.3 Standards applied

The OmegaGT*Plus* / BetaGT*Plus* instrument is manufactured and tested according to the following regulations, listed below.

Electromagnetic compatibility (EMC)

EN 61326	Electrical equipment for measurement, control and laboratory use – EMC requirements Class B (Portable equipment used in controlled EM environments)

Safety (LVD)

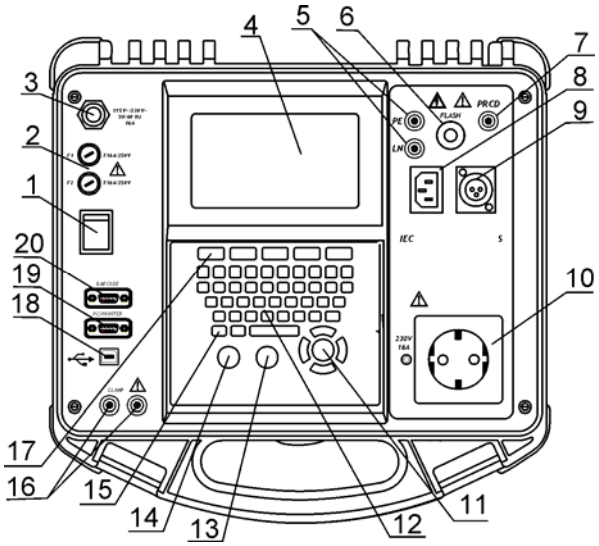
EN 61010 - 1	Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements
EN 61010 - 31	Safety requirements for hand-held probe assemblies for electrical measurement and test

Functionality

VDE404-1	Prüf- und Messeinrichtungen zum Prüfen der elektrischen Sicherheit von elektrischen Geräten Allgemeine Anforderungen
VDE404-2	Prüf- und Messeinrichtungen zum Prüfen der elektrischen Sicherheit von elektrischen Geräten Prüfeinrichtungen für Prüfungen nach Instandsetzung, Änderung oder für Wiederholungsprüfungen
VDE 0701	Instandsetzung, Anderung und Prüfung elektrischer Geräte
VDE 0702	Wiederholungsprüfungen an elektrischen Geräten

2 Instrument description

2.1 Front panel



Front panel

Legend:

1.....Mains switch with indication lamp.
2.....Two T16 A / 250 V fuses for instrument protection.
3.....Mains supply cord.
4.....240 × 128 dots graphic matrix display with backlight.
5.....LN and PE sockets for testing the insulation resistance and substitute leakage current of fixed installed appliances.
Warning! These sockets are intented only for the connection to deenergized appliances.
7.....PRCD socket for testing portable residual current devices.
Warning! This socket is intented only for connection of portable RCDs.
8.....IEC appliance connector for testing supply cords.
Warning! The connector input is only for testing purposes; do not connect it to mains supply!
9.....Test probe (earth bond) connector, also used as an input in some class 2 measurements:
Insulation resistance, substitute and touch leakage currents (reffered to as socket S).
10.....Test socket (230 V).
Warning! Dangerous voltage is present on the test socket during the measurement. Maximum output current is 16 A, test only appliances with maximum rated supply current not higher than 16 A!
11.....Cursor keys and ENTER key.
12.....Alpha-numeric keyboard.
13.....STOP key.
14.....START key.
15.....ESCAPE key.
16.....Current clamp adapter input sockets.

Warning! Do not connect any voltage source on this input. It is intended only for connection of current clamp with current output. Maximum input current is 30 mA!

17.....Function keys.
18.....USB connector.
19.....PC / printer connector.
20.....Barcode reader connector.
21.....Label printer connector on back side (support for PrintekMobile MtP300 serial printer).

Safety pre-tests

Before performing a measurement, the instrument performs a series of pre-tests to ensure safety and to prevent any damage. These safety pre-tests check for:

- any external voltage against earth on test socket,
- excessively high leakage current,
- excessively high touch leakage current,
- Short circuit or too low resistance between L and N on appliance,
- Correctly applied mains voltage to the test socket.

If pre-tests fail, an appropriate warning message will be displayed.
The warnings and measures that have to be taken are described in chapter ***2.2 Symbols and messages***.

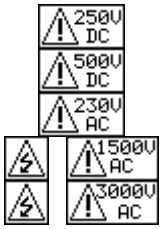
2.2 Symbols and messages

Mains voltage is not correct or PE is not connected. Check mains voltage and PE connection!	Improper supply voltage warning. Possible causes: ‣ No earth connection or other wiring problem on supply socket. ‣ Incorrect mains voltage. **Determine and eliminate the problem before proceeding!**
L and N are crossed. **Press START key to continue.**	The instrument works normally also in the case when L and N are interchanged. Check polarity of line and neutral wires on test socket.
Warning! Instrument is connected to the IT earthing system or PE not connected. Press START key to continue.	Supply voltage warning. Possible causes: ‣ no earth connection, ‣ instrument connected to IT earthing system. **Press the START key to continue if instrument is connected to IT earthing system.**

Resistance L – N too high (>30 kΩ). Check fuse and switch. Are you sure to proceed? (Y/N)	An excessively high resistance was measured in the fuse pre-test. Indication means that appliance has too low consumption or is: ‣ not connected, ‣ switched off, ‣ contains a fuse that has blown. Select **YES** or **NO** with Y or N key.
Resistance L – N low. **Are you sure to proceed? (Y/N)**	A low resistance of the appliance' supply input was measured in the pre-test. This means that it is very likely that an excessively high current will flow after applying power to the tested appliance. If the high current is only of short duration (caused by a short inrush current) the test can be performed, otherwise not. Select **YES** or **NO** with Y or N key.
Resistance L – N too low. **Are you sure to proceed? (Y/N)**	An extremely low resistance of the appliance' supply input was measured in the pre-test. It is likely that fuses will blow after applying power to the tested appliance. If the too high current is only of short duration (caused by a short inrush current) the test can be performed otherwise it must be stopped. Select **YES** or **NO** with Y or N key. **It is recommended to additionally check the appliance before proceeding with the test!**
Leakage LN-PE high. **Are you sure to proceed? (Y/N)**	Dangerous leakage current (higher than 3.5 mA) will flow if power would be connected to the tested appliance. Select **YES** or **NO** with Y or N key. **Proceed with testing only if all safety measures have been taken. It is recommended to perform a thorough earth bond test on the PE of the appliance before proceeding with the test.**
Leakage LN-PE too high. **Are you sure to proceed? (Y/N)**	Dangerous leakage current (higher than 20 mA) will flow if power would be connected to the tested appliance. Select **YES** or **NO** with Y or N key. **Proceed with testing only if all safety measures have been taken. It is recommended to perform a thorough earth bond test on the PE of the appliance before proceeding with the test.**

Leakage LN-PE or EB-PE too high! **Are you sure to proceed? (Y/N)**	Dangerous leakage current (higher than 20 mA) will flow if power would be connected to the tested appliance. Select **YES** or **NO** with Y or N key. **Proceed with testing only if all safety measures have been taken. It is recommended to perform a thorough earth bond test on the PE of the appliance before proceeding with the test.**
Measurement aborted! Differential leakage too high!	An exceptionally high leakage current (higher than about 5 mA) was measured through PE test terminal or PE socket during the pre-test or test.
Leakage test probe-PE too high!	An exceptionally high leakage current (higher than about 5 mA) was measured through S test terminal during the pre-test.
External voltage on test socket too high!	**DANGER!** Voltage on test socket or LN/PE terminals is higher than 20 V (AC or DC) approximately! Disconnect the appliance under test from the instrument immediately and determine why external voltage was detected!
External voltage on test probe too high!	**DANGER!** Voltage on test probe (S) is higher than 25 V (AC or DC) approximately! Disconnect the test probe from the appliance and determine why external voltage was detected!

Test was skipped for safety!	Instrument skipped the required test because of a failed previous test.
Instrument overheated! **Measurement is aborted!**	Temperature of internal components of the instrument reached their top limit. Measurement is prohibited until the internal temperature has reduced.
Warning! **More than 80 % of memory is occupated. Stored data should be downloaded to PC.**	Instrument memory is almost full. Download stored results to PC.
Warning! **Calibration has been expired.**	Recalibration of the instrument is required. Contact your dealer.
	Connect earth bond test probe in this test.
	Remove the earth bond clip, especially if it is connected to any part that will begin to rotate or move when power is applied.



Warning!
A high voltage is / will be present on the instrument output! (Insulation test voltage, flash test voltage (MI 3305 only) or mains voltage).

The appliance under test should be switched on (to ensure that the complete circuit is tested).

Connect the lead to be tested to the IEC plug.

Connect current clamp adapter in this test.

Test passed.

Test failed.

Some tests in the autotest sequence were skipped, but all performed tests passed.

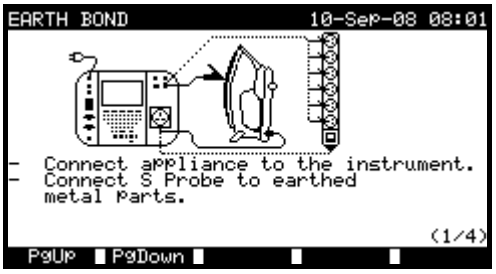
2.3 Help menus

Key:

F2 (HELP)	Opens help screen (if defined).

The help screens are available in single and autotest modes. Help menu contains connection diagrams between appliance under test and the OmegaGT*Plus* / BetaGT*Plus* instrument for test functions.

Possibility for using help function



Help screen example

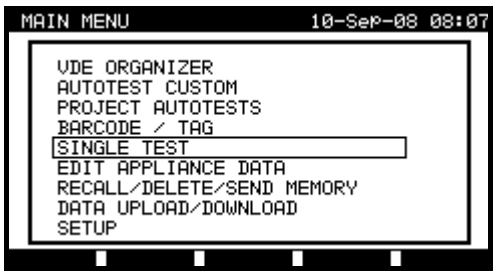
Keys:

F1 (PgUp)	Scroll through additional help screens of selected function if available.
F2 (PgDown)	
START	Close help screen and restore selected test function start menu.
ESC	

3 Main menu and test modes

The OmegaGT*Plus* / BetaGT*Plus* instrument has a user-friendly manipulation. Most of the actions can be done by using only few keys. Menu tree of the instrument is simple to understand and easy to operate.
From the ***Main menu*** different instrument operation modes can be set:

- VDE organizer (see 3.1),
- Custom autotest (see 3.2),
- Project autotests (see 3.3),
- Barcodes / RFID tags (see 3.4),
- Single test menu (see 3.5),
- Modifying data for tested equipment (see 3.6)
- Memory operations (see 3.7),
- Data transfer (see 3.8) and
- Settings (see 3.9).



Main menu

Keys:

⮟ / ⮝	Select the operating mode.
ENTER	Enters selected mode.

After the instrument is switched on, the last accessed menu will be displayed.

Main feature of the instrument are Autotests that can be accessed through three mentioned possibilities:

- VDE Organizer (see 3.1),
- Custom autotest (see 3.2), and
- Project autotest (see 3.3).

Autotest is the fastest and easiest way to test appliances. A pre-programmed autotest sequence runs all the tests needed to verify the selected appliance. Complete autotest results can be stored together with appliance name and all belonging information.

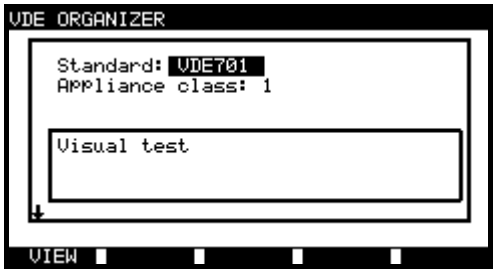
Note:
- Press ESC key one or more times to return to ***Main menu*** from any submenu or selected function

3.1 VDE organizer

This menu offers selection and performing of VDE compatible test sequence. The sequence setup and its parameters are exactly the same as suggested in the VDE701/702 standards.

Following actions can be taken after entering the VDE organizer menu:

- Test sequence can be executed,
- Test sequence can be stored as a configurable autotest.



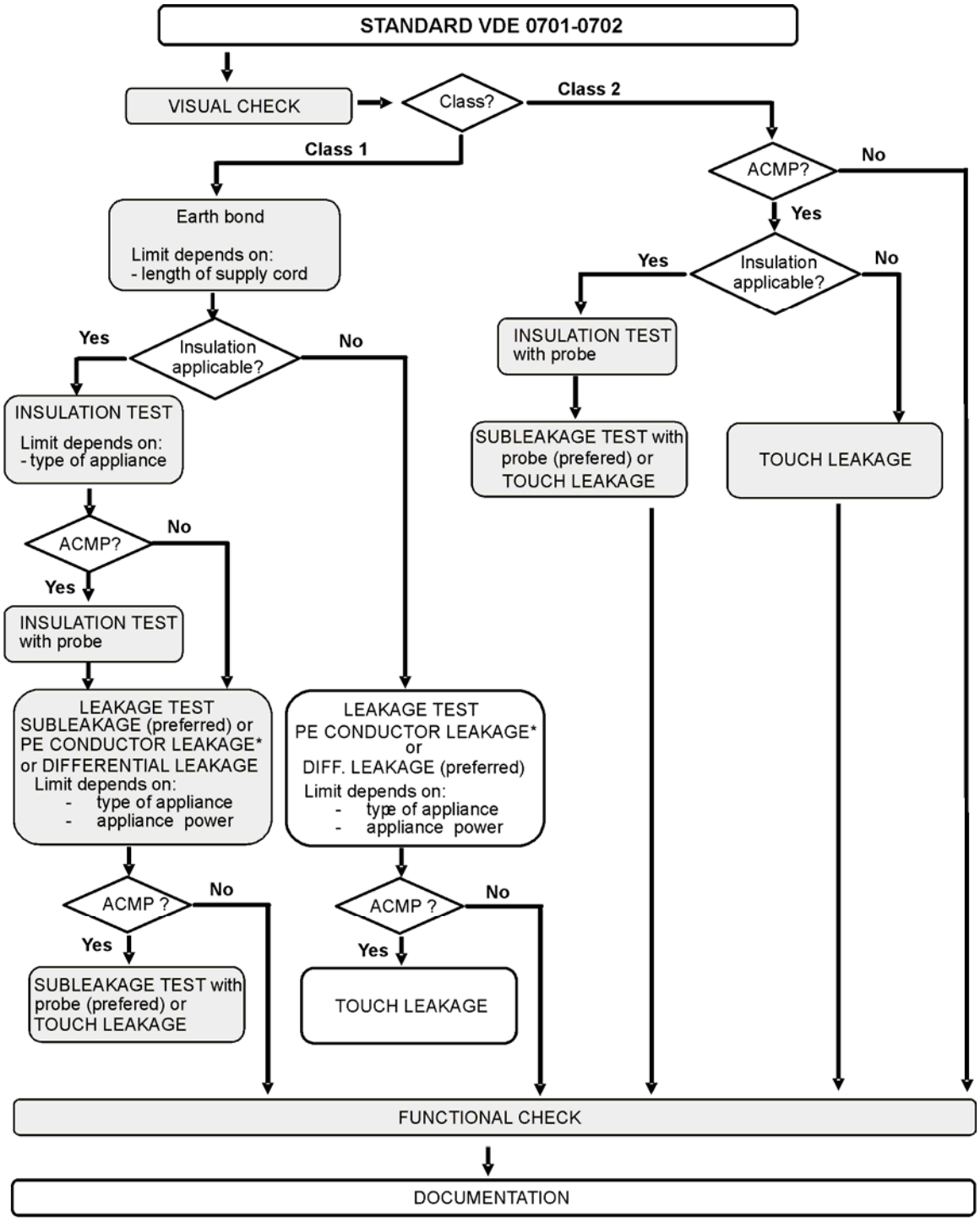
VDE organizer menu

Keys:

⮟ / ⮝	Select the item.
⮜ / ⮞	Modify the item value.
F1 (VIEW)	Opens view of all related tests and their parameters.
START	Opens menu for performing tests according to organizer.
ESC	Returns to Main menu.

3.1.1 VDE organizer – general

VDE organizer is a configuration tool for performing VDE 0701/ VDE 0702 compatible appliance test sequences.
The instrument returns the appropriate test sequence and parameters on base of entered appliance data (class, accessible conductive parts, nominal power etc).
The test sequence is made according to the flowchart below.



VDE Organizer flowchart

With the VDE organizer any VDE 0701 or VDE 0702 compatible test sequence can be created. The sequences cover virtually any maintenance or periodic test, regardless of appliance type, safety class, supply cord length, fuse type, etc.
All limits and tests comply with the currently valid VDE standards and regulations. In case of any changes, a firmware upgrade will be available at your distributor or from Metrel directly.

3.1.2 VDE organizer operation

Displayed data is organized as shown in VDE organizer flowchart. Only data relevant for selected standard and class is displayed, other data is hidden.

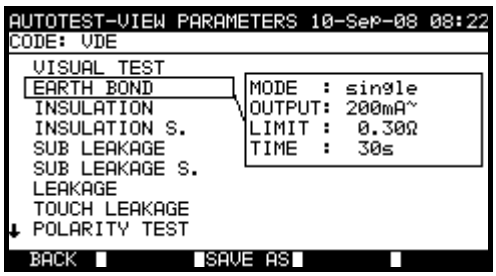
Example of VDE organizer screen

Main entry items - general:

Standard	Organizer reference standard selection [VDE701, VDE702]
Appliance class	Safety classification of tested appliance [1, 2, 3]
Visual test	Selected function will be performed as a part of the test sequence – data cannot be changed.

Keys:

⮝ / ⮟	Select the organizer item.
⮜ / ⮞	Set parameter in selected (highlighted) item.
ESC	Returns to previous menu.
F1 (VIEW)	Enters *View* (test sequence) menu. In this menu test sequence setup can be checked.
START	Starts automatic sequence as currently set in VDE organizer. Refer to chapter ***3.1.3 Performing autotest sequences*** for more information.



VDE organizer view

Keys in View menu:

⮝ / ⮟	Select test item.
START	Starts automatic sequence as currently set in VDE organizer. Refer to chapter ***3.1.3 Performing autotest sequences*** for more information.
F3 (SAVE AS)	Opens dialog for saving current organizer sequence as special autotest.
F1 (BACK)	Returns to mains organizer menu.
ESC	Returns to previous menu.

3.1.3 Performing autotest sequences

Once the any of autotest sequence is selected it can be performed.

Keys:

START	Starts of selected autosequence execution.
ESC	Returns back main menu.

Main principle is that after each successfully finished procedure in the autosequence, the next procedure is automatically prepared for execution and waits for operator to prepare new test setup (optional) and start the test.

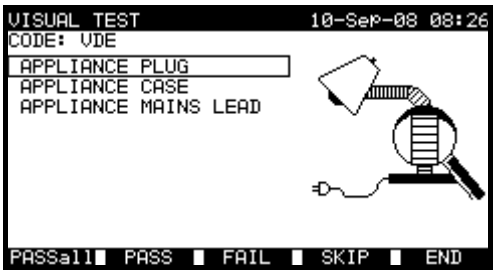
Notes:

- Only visual test waits the operator to press the proper keys.
- Pay attention on correct wiring when preparing test setup. Press Help to see suggested test setup.
- Consider the displayed warnings before starting measurement!
- Attached display figures are mainly selected for VDE Organizer. They are valid also for any other autotest sequence.
- Disabled tests are excluded from decision of proper condition for further tests in autotest sequence.

Visual inspection function

During visual inspection the following items should be checked for damages:

- Appliance plug,
- Appliance enclosure,
- Appliance mains cord.



Visual test menu

Keys:

F1 (PASSall)	All observed items are proper without any damages.
F2 (PASS)	Currently selected observed item is in order.
F3 (FAIL)	Currently selected observed item is damaged.
F4 (SKIP)	Skip inspection to the next test function.
F5 (END)	Finish currently performing autotest.
ESC	Returns back autotest entry menu.

Other measuring functions

Measuring functions use common principle for access.

Keys:

START	Starts the measurement.
F2 (HELP)	Displays test circuit for the measurement (test setup).
F4 (SKIP)	Skip inspection to the next test function.
F5 (END)	Finish currently performing autotest.
ESC	Returns back autotest entry menu.

Key during measurement:

STOP	Stops the measurement.

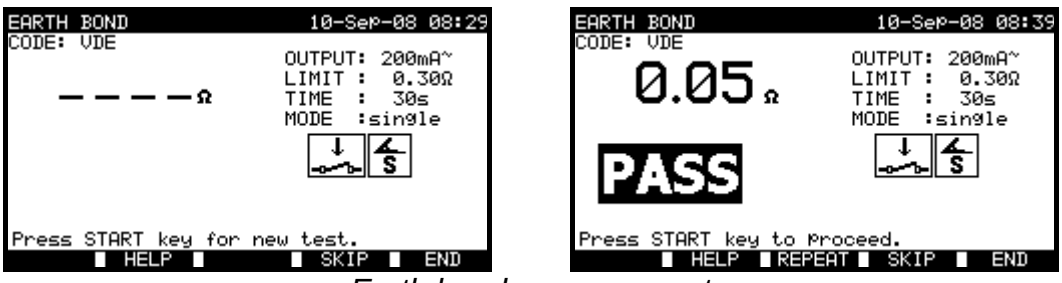
Keys after finished measurement defined as single measurement:

START	Closes current autotest function and opens next.
F2 (HELP)	Displays test circuit for the measurement (test setup).
F3 (REPEAT)	Prepares possibility to repeat the measurement.
F4 (SKIP)	Skip inspection to the next test function.
F5 (END)	Finish currently performing autotest.
ESC	Returns back autotest entry menu.

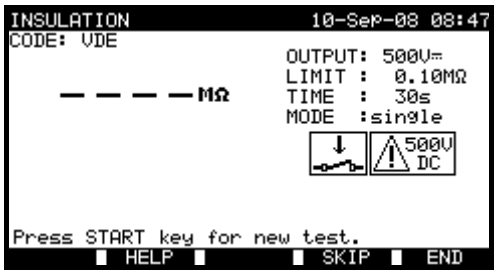
Keys after finished measurement defined as continuous measurement:

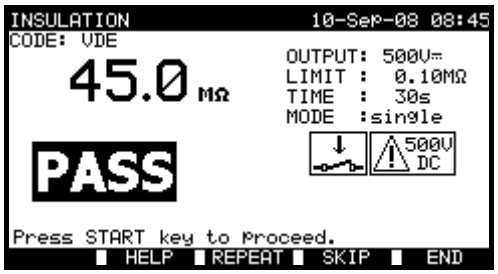
START	Repeats current autotest function again.
ENTER	Closes current autotest function and opens next.
F2 (HELP)	Displays test circuit for the measurement (test setup).
F3 (REPEAT)	Prepares possibility to repeat the measurement.
F4 (SKIP)	Skip inspection to the next test function.
F5 (END)	Finish currently performing autotest.
ESC	Returns back autotest entry menu.

Screen snapshots and notes



Earth bond measurement

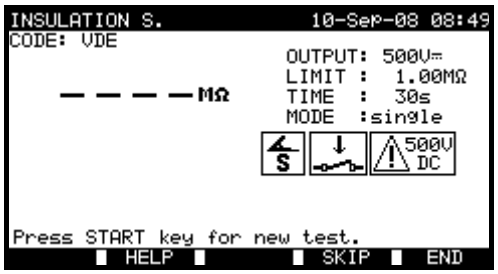




Note:

- The test probe for class II appliances could influence result!

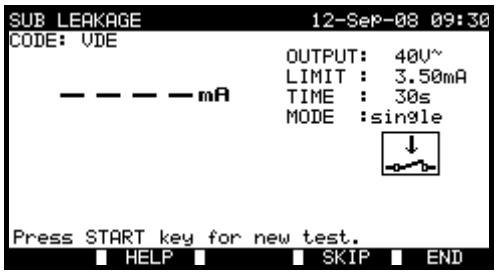
Insulation resistance measurement



Note:

- Use the test probe for class II appliances and class II parts of class I appliances!

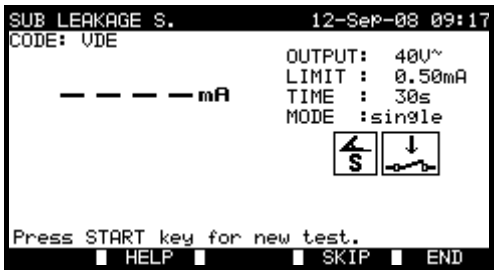
Insulation resistance measurement – Class II



Note:

- The test probe for class II appliances could influence result!

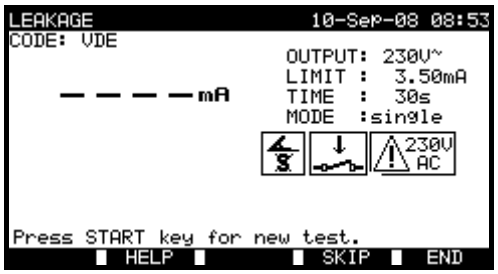
Substitute leakage current measurement



Note:

- Use the test probe for class II appliances and class II parts of class I appliances!

Substitute leakage current measurement - Class II



Notes:

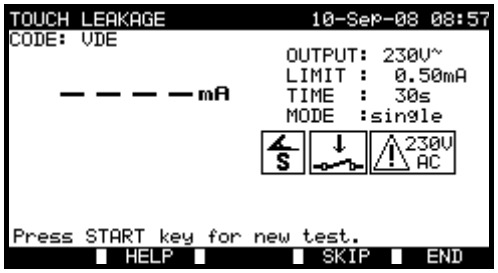
- If any of the earth bond resistance, insulation resistance, or substitute leakage current measurements have failed in selected autotest sequence, the differential current measurement is prohibited!
- If leakage current measurement fails, test sequence will be finished.
- The instrument automatically changes L/N polarity of connected appliance.

Differential current measurement

Note:

- The instrument has possibility to measure substitute and differential leakage and thus not need to measure PE leakage (see * on organizer flowchart).

Leakage current



Note:

- If any of the earth bond resistance, insulation resistance, substitute leakage current or leakage current measurements have failed or were skipped in selected autotest sequence, the touch leakage current measurement is prohibited!
- The earth bond test probe shall be used

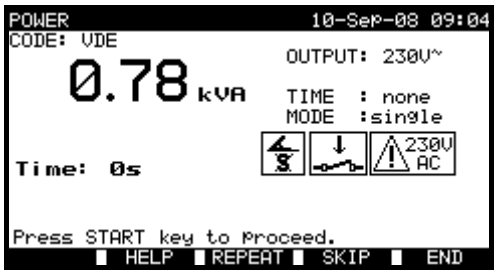
for measuring touch leakage current!

- The instrument automatically changes L/N polarity of connected appliance.

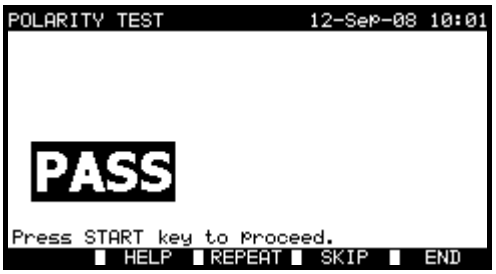
Touch leakage current measurement

Note:

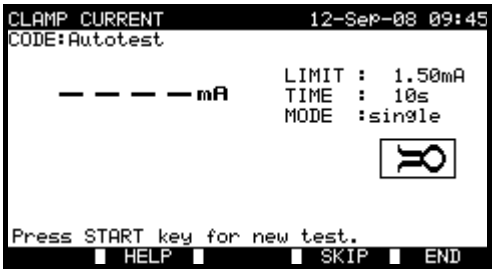
- If any of earth bond resistance, insulation resistance, substitute leakage current, leakage current or touch leakage current measurements have failed or were skipped in selected autotest sequence, the functional test is prohibited!



Functional test – apparent power measurement



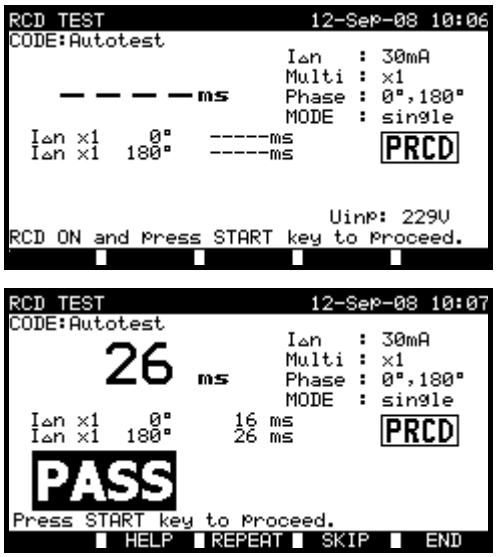
Polarity test



Note:

- If any of earth bond resistance, insulation resistance, substitute leakage current, leakage current or touch leakage current measurements have failed or were skipped in selected autotest sequence, the TRMS clamp current test is prohibited!

TRMS current measurement using current clamps



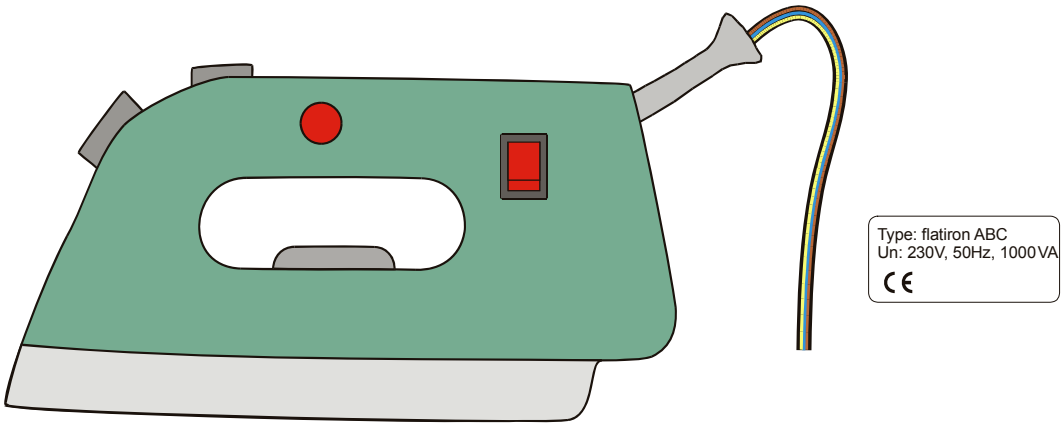
RCD test

Note:

- If any of earth bond resistance, insulation resistance, substitute leakage current, leakage current, touch leakage current or TRMS current clamp measurements have failed or were skipped in selected autotest sequence, the PRCD test is prohibited!

3.1.4 Example of creating a test sequence with VDE organizer

A periodic test of an iron will be performed.



The iron can be classified as followed:

- For a periodic testing a VDE702 test is relevant.
- The iron can be classified as a Class I appliance with isolated metal part and short supply cord.

Example of test sequence configuration:

	Displayed item	***Activity***
1	Standard: VDE702	Selection of standard: - Select VDE702.
2	Appliance class: 1	Selection of appliance safety class: - Select Class 1.
3	Visual test	Information that visual test will be included in the VDE702 / Class1 procedure.
4	Accessible conductive parts? YES	Question if there is an isolated conductive part on the appliance: - Confirm with yes.

5	Cord length (Earth bond) L: < 0.3Ω/<=5m	Selection of Earth bond limit value on base of known supply cable length: - Select appropriate length.
6	Insulation test applicable? YES	Question if insulation test is applicable: - Confirm with yes. Insulation and substitute leakage measurements will be included in the test sequence with this confirmation.
7	Insulation test Heating elements L: >0.3 MΩ	Classification of appliance: - Classify the iron as a standard appliance.
8	Insulation test Accessible cond. Parts L: >2.0 MΩ	Information that insulation resistance measurement of Class 2 parts will be included in the (VDE702 / Class1 / with isolated conductive parts) test procedure.
9	Leakage test method: Leakage	Selection of leakage current test method: - Select substitute leakage measurement.
10	Limit / Appliance type General appliance L < 3.5mA	Classify the iron as an standard appliance with power <3.5 kW.
11	Touch leakage method: Substitute leakage Limit < 0.5mA	Information that substitute leakage current measurement class 2 parts will be included in the (VDE702 / Class1 / with isolated conductive parts) test procedure.

3.2 Custom autotests menu

The menu contains list of custom prepared autosequences. The sequence can be performed or can be modified / adapted for special appliance and stored or sent to the PC for further purposes (as well test reports can be printed out, etc).
24 pre-programmed autotest sequences are added to the list by default.
Up to 50 custom autotest sequences can be pre-programmed in this autotest mode.
An alternative is to pre-program the sequences in the PC software PATLink LITE and upload them to the instrument. Refer to chapter *3.8 Upload test data* for more information.

The initial autotest sequences can be restored to default settings by selecting *Original settings* in *Setup menu*.

Custom autotest menu

Keys:

⮟ / ⮝	Select the specific test sequence.
F1 (VIEW)	Opens view of selected test sequence with all related tests and their parameters.
F3 (DELETE)	Removes selected test, see *chapter **3.2.1 Deleting an existing custom test sequence**.*
F5 (SEND)	Sends autotest sequence to the RFID tag.
START	Opens menu for performing tests according to organizer. See chapter ***3.1.3 Performing autotest sequences***.
ESC	Returns to Main menu.

3.2.1 Deleting an existing custom test sequence

Delete selected custom autotest sequence

Keys:

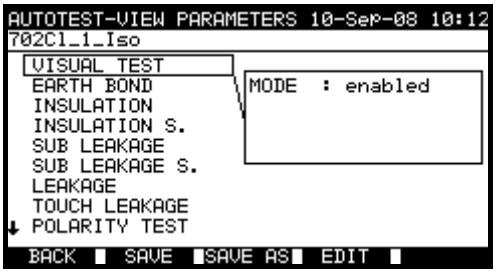
Y	Confirms deleting of selected autotest sequence.
Any other key	Return back to custom autotest menu without changes.

Note:

- First custom autotest sequence can not be deleted from the list.
- If only one custom autotest is defined it cannot be deleted from the list!

3.2.2 Viewing, modifying of existing custom autotest

Existing custom autotest sequence can be viewed, modified and stored. Reason is that test functions and their parameters can be adopted to real test requirements of the appliance under test.



View of selected test sequence

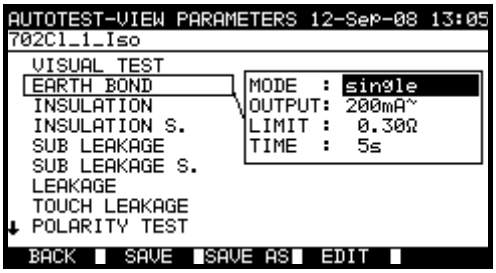
Keys in test sequence view mode:

F1 (BACK)	Returns back to custom autotest menu.
F2 (SAVE)	Stores test sequence with current options under the same name.
F3 (SAVE AS)	Stores test sequence with current options to the different name.

F4 (EDIT)	Opens menu for modifying parameters of selected test function.
⮝ / ⮟	Select test function in the sequence.
START	Starts running the selected function. See chapter *3.1.3 Performing autotest sequences.*
ESC	Returns back to custom autotest menu.

Modification of autotest sequence

The key **F4** (EDIT) as mentioned above enable to modify selected function.



Modification parameters of selected test function

Keys:

⮟ / ⮝	Select the parameter.
⮜ / ⮞	Modify value of selected parameter (highlighted).
F1 (VIEW)	Accepts modified function and returns to the view of selected test sequence.
ESC	Returns to the view of selected test sequence.

Mode is general parameter of each test function in autotest sequence with the following possible values: **[disabled, single, continuous]**.

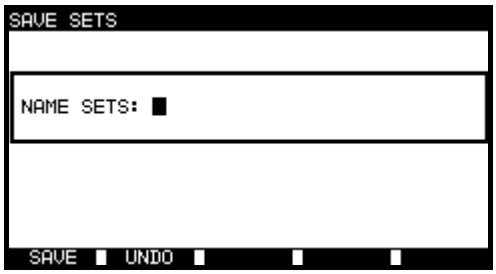
disabled	Test function will not be involved in appliance test, normally it is not needed.
single	The test function is performed only once per autotest sequence run.
continuous	Repeated option where the test function could be preformed as many times as operator needs.

Rest parameters ale directly adjusted to each test function.

3.2.3 Saving custom autotest sequence

Custom autotest sequence can bi saved even if it was or was not modified. There are two options to save the autotest sequence to the same name or save under new name. Saving is possible only in the view of selected autotest sequence menu; see chapter *3.2.2* above.

Save option



Save as option

Autotest custom save menus

Keys:

⮜ / ⮞	Select character in line.
Alphanumeric	Enters character.
SHIFT+ Alphanumeric	Enters small letter or special character.
←	Deletes character left to cursor.
F1 (SAVE)	Confirms saving custom autotest sequence under entered name.
F2 (UNDO)	Cancels saving.
ESC	Returns back to custom autotest menu.

Note:

- Exit without saving will lose all modified settings of selected autosequence immediately after returning to Custom autotest menu.
- If you want to save more than 50 autotests, the »*Out of memory*« message is displayed.

3.3 Project autotest menu

The first step when performing a Project Autotest is to recall stored appliance data from the instruments memory. The procedure is similar as if test results are to be recalled from the instrument's memory.

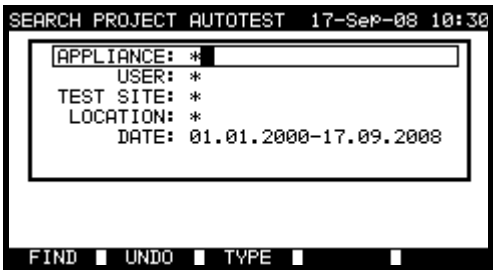
The Project Autotest search menu is a tool that simplifies and speeds up repeated (periodic) testing of appliances. The main idea is to re-use known and stored data about the tested appliance.

Hints

Test sequence	If the sequence is not changed (usually the sequences are not changing for the same appliance) the user does not need to care about setting the right test sequence and parameters.
Appliance data	ID number, names, descriptions, addresses, comments are not needed to be re-entered again. Old data are offered by default
Old test results	Actual Project Autotest test results can be compared with the previous ones. The instrument automatically calculates the trends for each measurement.

Old test results can be uploaded from PC back to the instrument. This brings further advantages:

- Old test results do not occupy the instrument's memory and can be temporarily uploaded only for the purpose of re-testing,
- Test results /appliance data can be moved / shared among different test instruments,
- Appliance data can be pre-entered on the computer and then sent to the instrument.



Project Autotest menu example

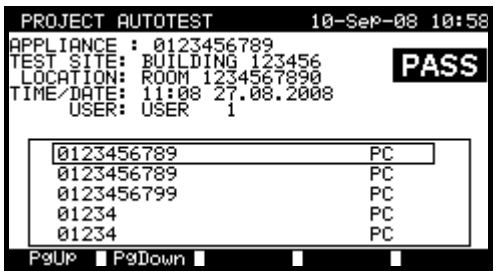
Keys:

⮟ / ⮝	Select the item.
⮜ / ⮞	Select character in line.
Alphanumeric	Enters character.
SHIFT+ Alphanumeric	Enters small letter or special character.
←	Deletes character left to cursor.
F1 (FIND)	Opens menu for searching between existing auotest projects
F2 (UNDO)	Resets modified value to previous state.
F3 (TYPE)	Opens items modifications.
ESC	Returns to Main menu.

When searching for stored autotest results the following filters can be used to narrow the hits:

- Appliance number,
- Test site,
- Location
- Date from and date to,
- User.

To search for all stored results, enter »*« in the all filters.



Project autotest result menu

Keys:

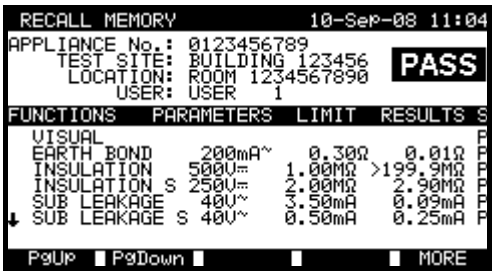
⮟ / ⮝	Select the appliance that should be retested.
F1 (PgUp)	
F2 (PgDown)	
START	Starts execution of the autosequence for selected appliance (retest). See *3.1.3 Performing autotest sequences.*
ENTER	Opens more detailed information of appliance results and data.
ESC	Returns to Main menu.

Appliance tickers
Each appliance is marked with a ticker at the right end of the line. The tickers help to faster find the appliance to be retested from the offered list.
Their meaning is following:

PC The stored appliance data was uploaded from PC
PC✓ The stored appliance data was uploaded from PC
It was already used for a new Project autotest measurement.
I The stored appliance data was performed with the instrument and stored.
I✓ The stored appliance data was performed with the instrument and stored.
It was already used for a new Project autotest measurement.

Keys in appliance view:

⮟ / ⮝	Scroll displayed items.
F1 (PgUp)	
F2 (PgDown)	
ENTER	Opens more detailed information of appliance results and data.
ESC	Returns to Main menu.
F5 (MORE)	Switches between different appliance data views.



View results menu examples

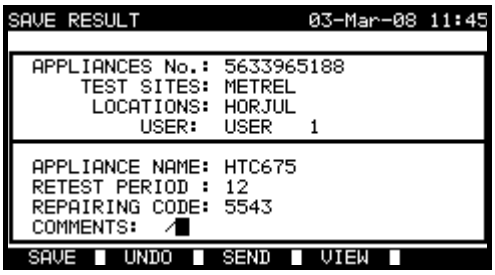
Notes on retesting the selected appliance:

- The Autotest sequence will be the same as it was for the selected Project autotest.
- Exactly same appliance data (except time and user) will be offered as stored in the selected Project autotest.
- The new autotest will get an »**I**« ticker. The original autotest will get a »**I✓**« ticker (if it was made with the instrument, or **PC✓** ticker (if it was uploaded from the PC).

Result of appliance (re)testing

After finished testing the results can be:

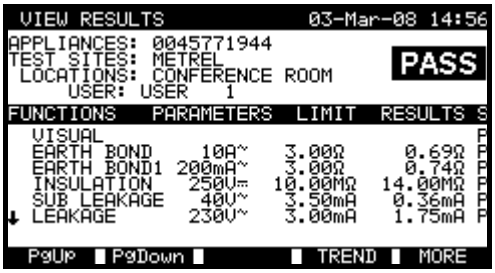
- Viewed,
- Saved,
- Sent to output device or PC.



After finished autotest menu

Keys:

⮟ / ⮝	Select the device data.
⮜ / ⮞	Select character in line.
alphanumeric	Enters character.
SHIFT+ alphanumeric	Enters small letter or special character.
←	Deletes character left to cursor.
F1 (SAVE)	Stores results of test under defined appliance number and returns to project autotest result menu.
F2 (UNDO)	Resets modified value of device data to previous state.
F3 (SEND)	Sends results to one of output devices.
F4 (VIEW)	Opens resultas of autotest
ESC	Returns to Main menu.



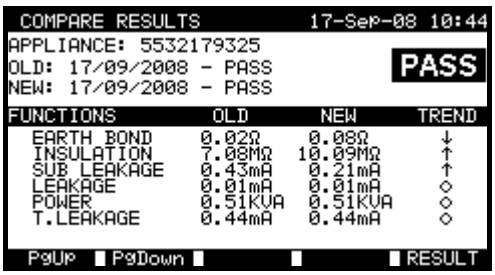
View Project autotest results menu

Keys:

⮟ / ⮝	Scroll displayed items.
F1 (PgUp)	
F2 (PgDown)	
F4 (TREND)	Starts comparison of last measured data with stored to show the trend.
F5 (MORE)	Switches between different appliance data views.
ESC	Returns to Main menu.

3.3.1 Comparison of results (evaluation of result trends)

If an autotest sequence was performed from the Project Autotest menu an additional option TREND is offered in the ***View result*** menu after the autotest is finished but not saved.



Trend of measured data

Keys:

⮟ / ⮝	Scroll displayed items.
F1 (PgUp)	
F2 (PgDown)	
F5 (RESULT)	Return to view the last results.
ESC	Returns to Main menu.

Meaning of trend symbols:

↑	New result of particular test is better than last result. Examples: New insulation resistance result is higher.than old result. New earth bond result is lower than old one.
○	Difference between old and new result of particular test is so small that can be treated as the same. Example: New insulation resistance result stays at the same level as old result.
↓	New result of particular test is worse than last result. Examples: New insulation resistance result is lower than old result. New earth bond result is higher than old one.

Note:

- If the test results are close to the limit they should be compared with old results. If the trends are worsening it must be reconsidered if the appliance is still safe. If the results stay stable the appliance can be treated as safe in general.

3.4 Working with barcodes and RFID tags

Barcode/tag menu supports operation with barcodes and RFID tags. From this menu the following actions can be performed:

- Test sequences for appliances under test can be read from barcode labels.
- Test sequences and stored measurement results for tested appliance can be downloaded (uploaded) from (to) the RFID tags.

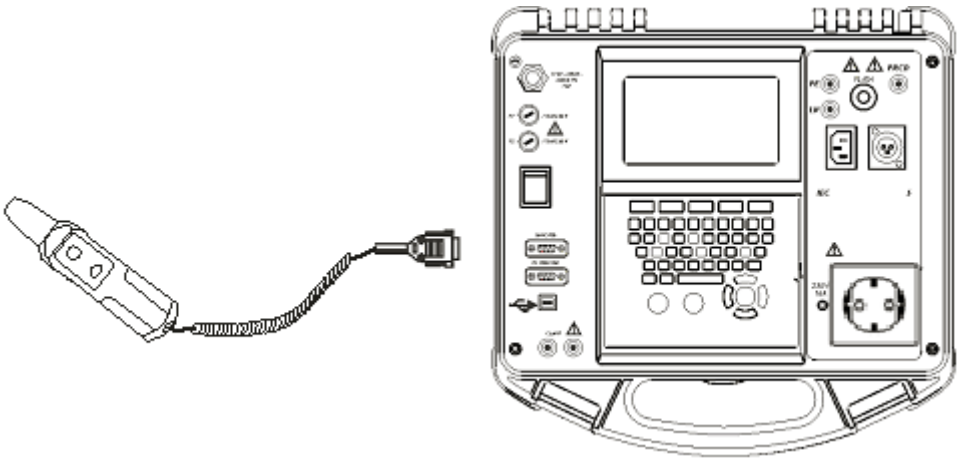
Barcode / TAG menu

Keys:

⮟ / ⮝	Select the device.
ENTER	Opens menu for selected device.
ESC	Returns to Main menu.

3.4.1 Working with RFID tags

To use RFID system connect RFID reader/writer to DB-9 female BARCODE connector first. See *RFID reader/writer user manual* for more information.



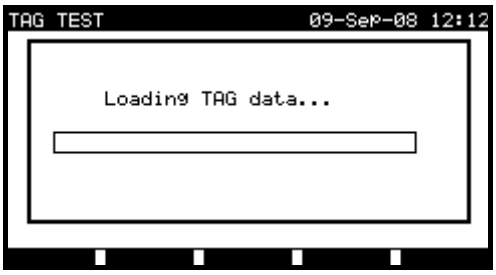
Connecting RFID tag reader/writer to the OmegaGT Plus / BetaGT Plus instrument

Note:

- Because of limited memory space of RFID tags, the following data are not stored in RFID tags:
  - Appliance name
  - Repairing code,
  - Comments.

Loading data from RFID tags to the instrument

Select ***Tag test*** from ***Barcode / tag*** menu and press the ENTER key to confirm. The OmegaGT*Plus* / BetaGT*Plus* instrument is now ready to accept RFID tag data.



RFID tag menu

Once the data from RFID tag have been successfully received, the following menu is displayed:

RFID tag menu

Keys:

⮟ / ⮝	Select the option.
ENTER	Opens menu for selected option.
ESC	Returns to Barcode/tag menu.

If no results were stored in RFID tag, the ***view results*** option won't be displayed.

The following actions can be performed now:

- new reading from RFID tag,
- view autotest sequence,
- view autotest results,
- start autotest sequence.

How to view autotest sequence from RFID tag
From the ***TAG menu*** select ***View autotest*** and press ENTER key to confirm. Refer to chapter ***3.2.2 Viewing/modifying of existing custom autotest***.

How to start autotest sequence from RFID tag
From the ***TAG menu*** select ***Start new autotest*** and press ENTER key. Refer to chapter ***3.1.3 Performing autotest sequences***.

How to view autotest results from RFID tag
From the ***TAG menu*** select ***View results*** and press ENTER key to confirm. Refer to chapter ***6.2.1 Results view***.

How to send an autotest sequence to RFID tag
From the Autotest custom menu press the F5 (SEND) key. Selected autotest sequence is loaded to the RFID tag using RFID reader/writer..
See *RFID reader/writer user manual* for more information.

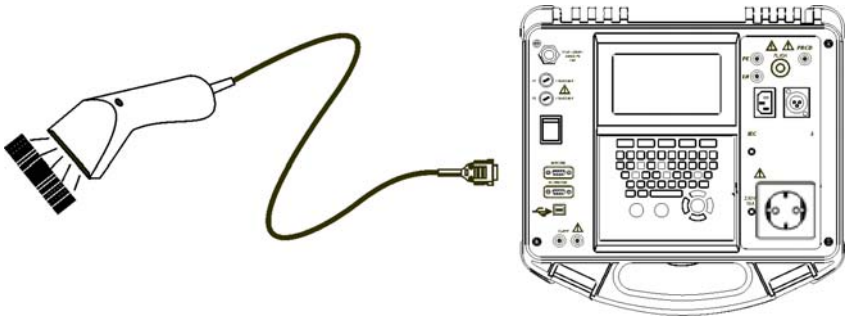
How to send an autotest sequence/results to RFID tag
Autotest sequence/results can be sent to RFID TAG from the Save results or Recall memory menu. Press the F3 (SEND) key. When sending data from Recall results menu select TAG reader/writer option first and press ENTER key to confirm. Selected data from the instrument are loaded to the RFID tag using RFID reader/writer.
See *RFID reader/writer user manual* for more information.

3.4.2 Working with barcode reader

Barcode technology supports the following functions:
- reading 24 pre-defined autotest shortcut codes from barcode labels,
- reading appliance numbers from barcode labels.

Two Barcode systems are supported. Refer to Appendix A for detailed information.

Connect barcode reader to the DB-9 female BARCODE connector first. Use only barcode reader supplied by your distributor or METREL directly.



Connecting barcode reader to the OmegaGT Plus / BetaGT Plus instrument

Reading autotest sequence using barcode

From the ***Barcode/tag menu*** select ***Barcode test*** and press ENTER key. The following menu is displayed:

Barcode test menu

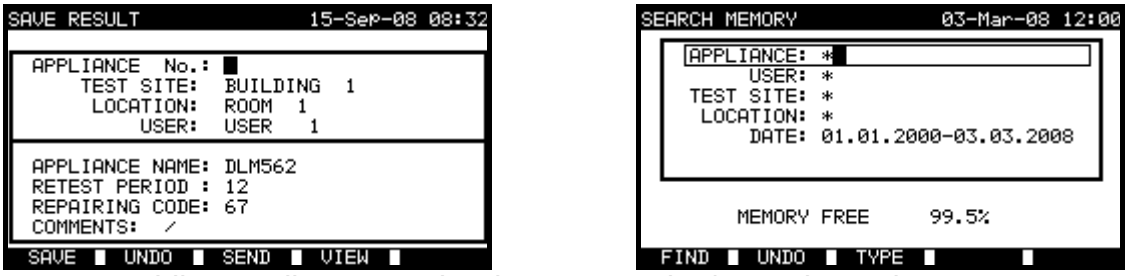
Keys:

F1 (VIEW)	Views selected autotest sequence. Refer to chapter ***3.2.2 Viewing/modifying of existing custom autotest***.
START	Starts selected autotest sequence. Refer to chapter ***3.1.3 Performing autotest sequence***.
⮜ / ⮞ numeric keypad	Selects new autotest sequence.
ESC	Returns to Barcode/tag menu.

Last used autotest sequence is displayed. The two-digit autotest code can also be selected by using the barcode reader.
The code read from the barcode label is accepted, when two short beeps are emitted.

Reading appliance number using barcode

With the barcode reader also appliance number can be read from barcode label.

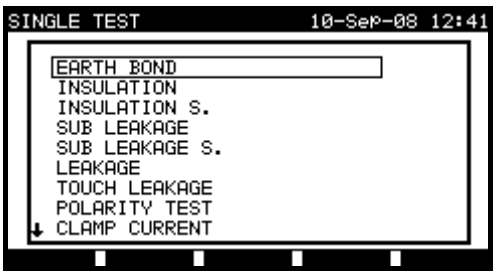


Adding appliance number in save results / search results menu

The appliance number from the barcode label is accepted, when two short beeps are emitted.

3.5 Single test menu

In single test menu individual tests can be performed.



Single test menu

Keys:

⮟ / ⮝	Select the test / measuring function: - <**Earth bond**>, Resistance of bonding to protective earth connection. - <**Insulation**>, Insulation resistance test. - <**Insulation S.**>, Insulation resistance test with probe. - <**Substitute leakage**>, Substitute leakage current test. - <**Substitute leakage S.**> Substitute leakage current test with probe. - <**Leakage**>, Differential current measurement, - <**Touch leakage**>, measurement of touch leakage current. - <**Polarity test**>, test the regularity of cord connections. - <**Clamp current** >, measurement of clamp current. - <**PRCD test**>, Test of portable residual current device. - <**Power**>, Testing consumption of tested appliance.
ENTER	Enters selected test.
ESC	Returns to Main menu.

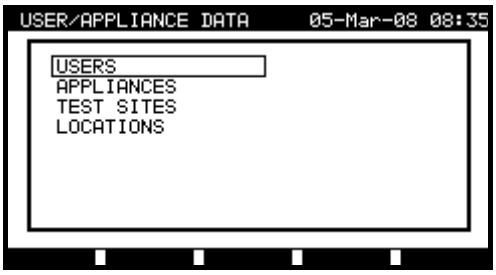
Note:

- That measurement results performed in this mode cannot be stored.

See chapter *5 Single test mode* for detailed description about the single test mode.

3.6 User / appliance data menu

In this menu lists of user / appliance data default names can be edited. An alternative is to upload the lists from PC.



Edit user appliance data main menu

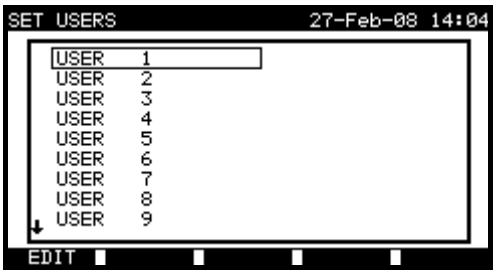
Keys:

↓ / ↑	Select the item.
ENTER	Enters selected item menu.
ESC	Returns to Main menu.

Existing user names and appliance data can also be downloaded and edited using PC software and then uploaded to the instrument. Refer to the chapter ***3.8 Data upload / download menu*** for detailed information.

3.6.1 Users submenu

In this menu user names for up to 15 different users can be entered, edited and selected.

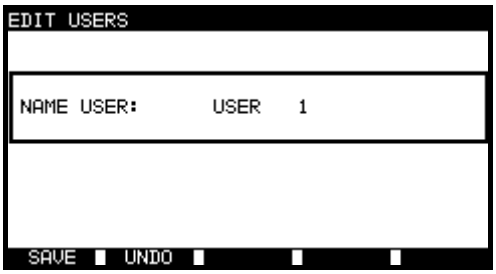


Users list

Keys:

↓ / ↑	Select the user.
F1 (EDIT)	Opens menu for user name modification.
ENTER	Confirms selected user.
ESC	Returns to users / appliance data menu.

User name modification



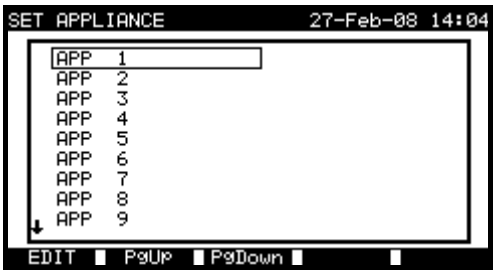
Users name modification menu

Keys:

← / →	Select character in line.
alphanumeric	Enters character.
SHIFT + alphanumeric	Enters small letter or special character.
←	Deletes character left to cursor.
F1 (SAVE)	Opens menu for user name modification.
F2 (UNDO)	Confirms selected user.
ESC	Returns to users list.

3.6.2 Appliances submenu

In this menu, default lists of appliance names (up to 100) can be edited.
An alternative is to upload the names from PC software. Refer to the chapter ***3.8 Data upload / download menu*** for detailed information.



Edit Set appliances menu

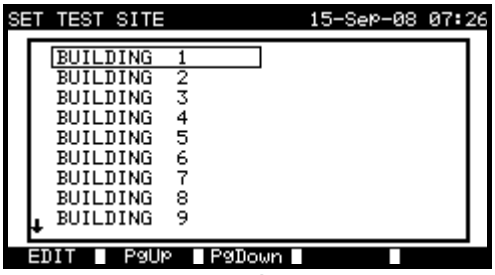
Keys:

↓ / ↑	Select the appliance.
F2 (PgUp)	
F3 (PgDown)	
F1 (EDIT)	Opens menu for appliance name modification.
ENTER	Confirms selected appliance.
ESC	Returns to users / appliance data menu.

Appliance rename
See ***3.6.1 Users submenu*** (*User name modification*).

3.6.3 Test sites submenu

In this menu default lists of test site / building names (up to 100) can be edited.
An alternative is to upload the names from PC software. The existing lists can be downloaded to PC too. Refer to the chapter ***3.8 Data upload / download menu*** for detailed information.



Set test site menu

Keys:

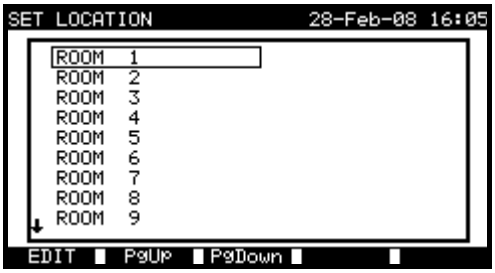
↓ / ↑	Select the building.
F2 (PgUp)	
F3 (PgDown)	
F1 (EDIT)	Opens menu for building name modification.

ENTER	Confirms selected building.
ESC	Returns to users / appliance data menu.

Building rename
See ***3.6.1 Users submenu*** (*User name modification*).

3.6.4 Locations submenu

In this menu default lists of location / room names (up to 100) can be edited.
An alternative is to upload the names from the PC. The existing lists can also be downloaded to PC. Refer to the chapter ***3.8 Data upload / download menu*** for detailed information.



Set locations main

Keys:

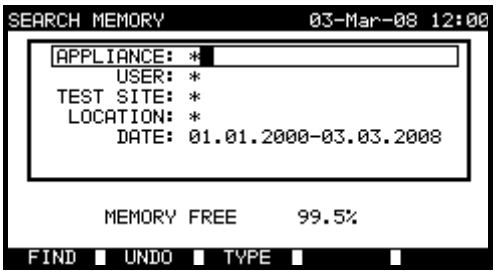
↓ / ↑	Select the location.
F2 (PgUp)	
F3 (PgDown)	
F1 (EDIT)	Opens menu for location name modification.
ENTER	Confirms selected location.
ESC	Returns to users / appliance data menu.

Location rename
See ***3.6.1 Users submenu*** (*User name modification*).

3.7 Memory operation menu

This menu is intended for operation with stored results. Parameter types provide various searching options to optimize selection of stored appliance data and test results that can be:

- recalled,
- sent to printer or PC or any other output and
- deleted.



Memory operation menu

Parameter types are: [----, appliance, user, building, location, date].

Keys:

⮟ / ⮝	Select the item.
F1 (FIND)	Starts searching stored results by applied parameters.
F2 (UNDO)	Resets modified value to previous state.
F3 (TYPE)	Modifies searching options by changing order or disabling (----) of parameter type.
ESC	Returns to Main menu.

See chapter ***6 Data operations*** for more information.

3.8 Data upload / download menu

In this menu it is possible to upload different data from PC to the instrument:

- stored test results and data (results, parameters, notes)
- list of default appliance and test site names.

The data to be uploaded are selected in the PC SW package and are:

- Users,
- Appliances,
- Test sites / buildings,
- Locations / rooms.

Upload of test results menu

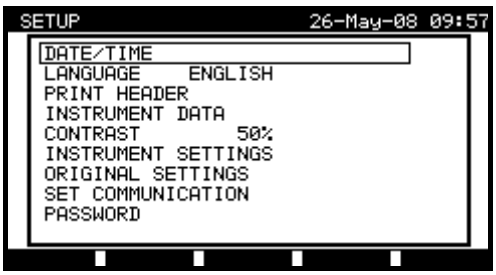
Keys:

⮟ / ⮝	Select the operating mode.
ESC	Returns to Main menu.

For detailed information on data uploading / downloading refer to help menus of PC software PATLink PRO.

3.9 Setup menu

In this menu general instrument parameters can be set.



Setup menu

Keys:

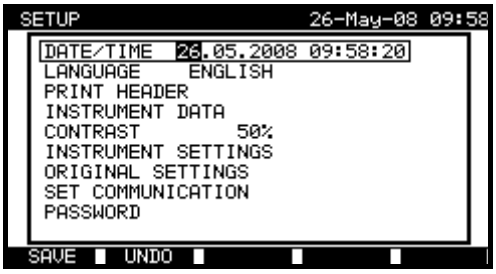
↓ / ↑	Select the setting.
ENTER	Opens menu for modification of selected setting.
ESC	Returns to main menu.

Following settings can be applied:

- Setting date and time,
- Selection of language,
- Preparation of printed header lines,
- Recalling and clearing stored results,
- Setting contrast,
- Other instrument settings,
- Setting the instrument to initial values,
- Selection of communication port,
- Selection of password.

3.9.1 Date and time

Date and time can be set in this menu.



Date and time menu

Keys:

< / >	Select the field to be changed.
˅ / ˄	Select the setting.
F1 (SAVE)	Saves new settings and returns to main settings menu.
F2 (UNDO)	Recovers currently modified setting.
ESC	Returns to main settings menu without changes.

Notes:

- Date is attached to the saved autotest results!
- Date format is DD-MM-YYYY (day–month–year).
- Date entry is checked for regularity and not accepted in case of irregular date!

3.9.2 Language selection

The instrument supports different languages.

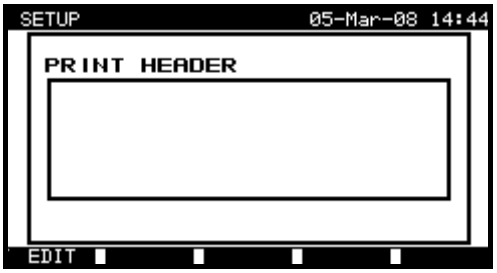
Language menu

Keys:

˅ / ˄	Select language option.
ENTER	Confirms and enter selected language.
ESC	Returns to main settings menu.

3.9.3 Print header

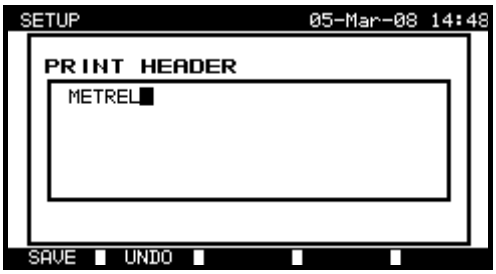
Instrument supports preparing custom defined print header. The header is merged to autotest results when they are directly printed on serial printer.



Printing header menu

Keys:

F1 (EDIT)	Starts editing of print heder.
ESC	Returns to main settings menu.



Editing mode for printing header

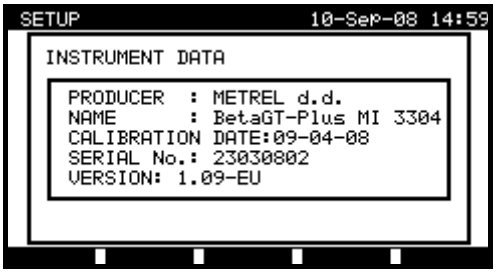
Keys:

⮟ / ⮝	Select line.
⮜ / ⮞	Character in line
alphanumeric	Enters character.
SHIFT+ alphanumeric	Enters small letter or special character.
←	Deletes character left to cursor.
F1 (SAVE)	Saves new print header and returns to main settings menu.
F2 (UNDO)	Recovers currently modified setting.
ESC	Returns to main settings menu.

3.9.4 Instrument data

In this menu the following instrument data are shown:

- Manufacturer,
- Instrument type,
- Calibration date,
- Serial number,
- Version.



Instrument data menu

Key:

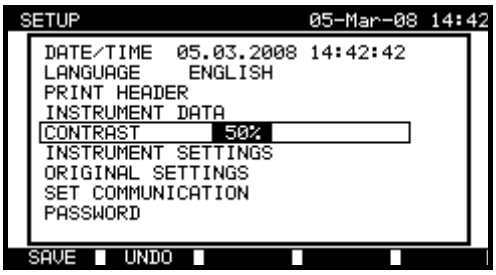
ESC	Returns to main settings menu.

Note:

- Operator cannot change any instrument data!

3.9.5 Contrast adjustment

Contrast can be adjusted with the contrast option.



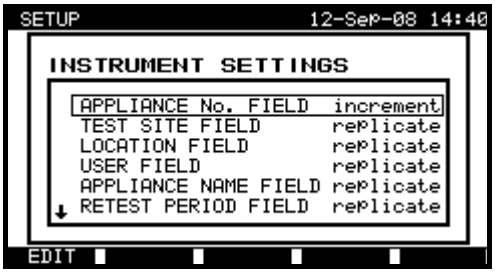
Contrast menu

Keys:

▼ / ▲	Adjust contrast.
F1 (SAVE)	Saves new settings and returns to main settings menu.
F2 (UNDO)	Recovers currently modified setting.
ESC	Returns to main settings menu without changes.

3.9.6 Instrument settings

When autotest is completed, various data about appliance and other belonging data can be added to the autotest results before saving them. *Instrument settings* submenu enables to customize all those data.



Instrument settings menu

Keys:

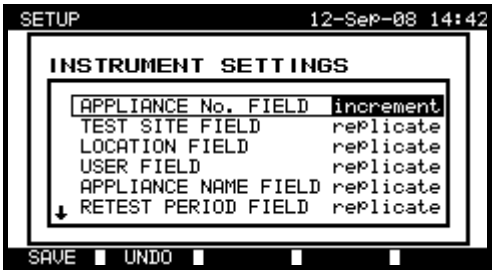
▼ / ▲	Select the setting.
F1 (EDIT)	Opens menu for modification of selected setting.
ENTER	
ESC	Returns to main settings menu.

There are the following instrument settings:

Item	**Possible settings**
Appliance no.	[increment, replicate, blank]
Test site	[replicate, blank]
Location	[replicate, blank]
User	[replicate, blank]
Appliance name	[replicate, blank]
Retest period	[replicate, blank]
Repairing code	[replicate, blank]
Comment	[replicate, blank]
Barcode system	[single, double]

Meaning of possible settings are:

blank	Appropriate field is set to blank in *Save results* menu.
replicate	Last entered string is used in an appropriate field when new autotest sequence is finished.
increment	Appliance number is automatically incremented when new autotest sequence is finished.



Modification of selected setting

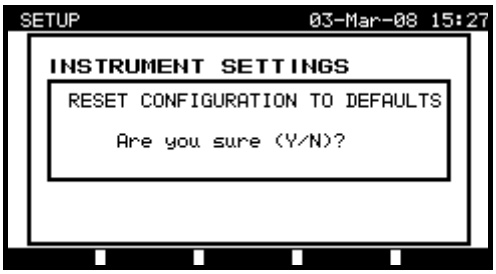
Keys:

⮟ / ⮝	Modify setting of selected item.
F1 (SAVE)	Saves setting of selected item,
F2 (UNDO)	Recovers currently modified setting.
ESC	Returns to main settings menu.

The instrument supports special label printers (*Printek MtP, Intermec EasyCoder C4*). When printing barcodes to the special printer, two different options can be set in ***Barcode systems*** submenu. If ***single*** option is selected, only appliance name is printed out as a barcode on appliance barcode label. When ***double*** is selected, both autotest shortcut code and appliance name are printed out as a barcode on appliance barcode label.

3.9.7 Setting the instrument to initial values

The ***Original settings menu*** sets some parameters of the instrument into their initial values.



Menu for setting initial values

Keys:

Y	Accepts initial settings.
N, ESC	Returns to main setting menu without changes.

Initial values:

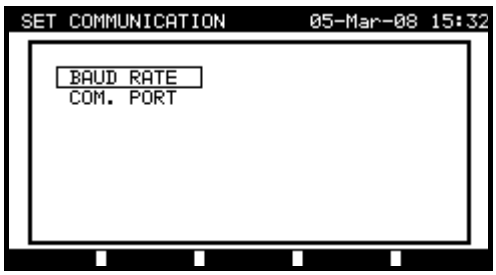
Parameters in single test mode	Reset all
User defined tests	Clear all
Autotest sequences	Added 24 pre-programmed autotests
Menus	All set to initial structure.
Baud rate	115200 baud.
Printer data transfer	Set to hardware flow control (DSR/DTR).

Note:

- The instrument will ask for password before opening menu if the password is enabled, see *chapter **3.9.9 Password***.

3.9.8 Communication settings

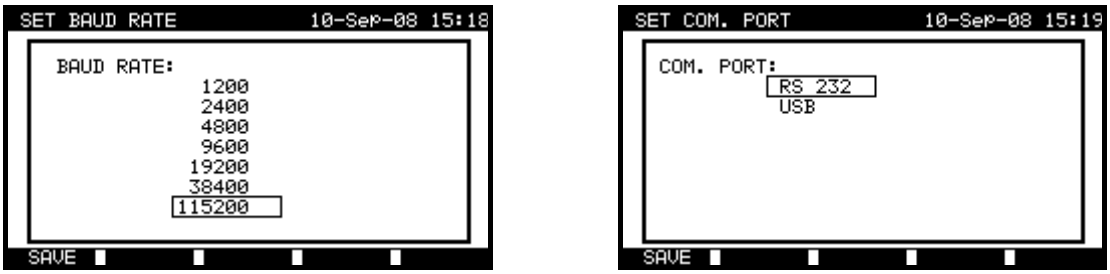
The communication port and baud rate for communication with PC can be selected in this menu.



Communication menu

Keys:

⮟ / ⮝	Select the setting.
ENTER	Opens menu for modification of selected setting.
ESC	Returns to main settings menu.



Communication settings

Keys:

↓ / ↑	Select the option.
F1 (SAVE)	Accepts selected option.
ENTER	
ESC	Returns to communication settings menu.

Note:

- Only one port can be active at one time.

3.9.9 Password

The instrument enables password protection for the following activities:

- Entering *Edit user menu*,
- Entering *Edit measurements menu*,
- Deleting stored results,
- Entering menu for *Setting the instrument to initial values*.

By default, the instrument is delivered from production with disabled password protections. All functions are normal accessible. The protection is activated once the password is entered. After the password is entered, each time the instrument asks for password when the listed activities shall be accessed.

Menu for entering the first password

Setting the first password
Keys:

← / →	Select character in line.
alphanumeric	Enters character.
SHIFT+ alphanumeric	Enters small letter or special character.
←	Deletes character left to cursor.

ENTER	Opens menu for confirmation of new password.
ESC	Returns to main settings menu without changes.

Confirmation request or change the existing password

Confirmation or change existing password
Keys:

⮜ / ⮞	Select character in line.
alphanumeric	Enters character.
SHIFT+ alphanumeric	Enters small letter or special character.
←	Deletes character left to cursor.
ENTER	Confirms the password.
ESC	Returns to main settings menu without changes.

Notes:

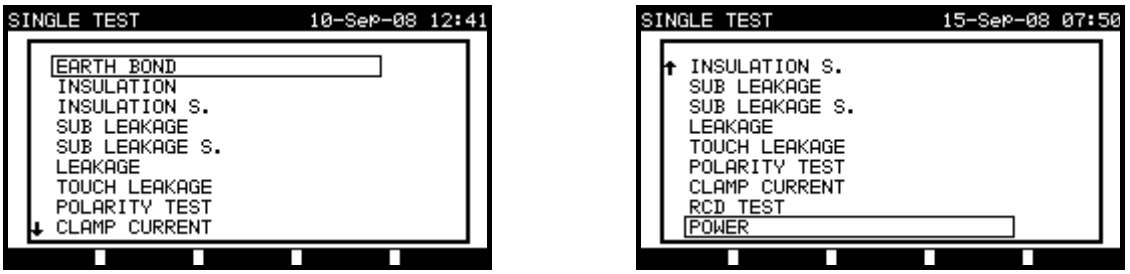
- ***Please take a note of applied password and keep it in a safe place.***
- When first password and later confirmation are confirmed with the key ENTER and without any alphanumeric entry then the password will remain disabled.

4 Single test mode

In single test mode individual tests can be performed. This is especially helpful when you suspect one or more faults in the tested appliance.

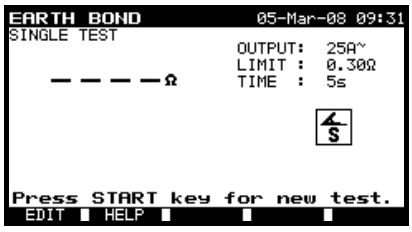
Note:

- The measurement results cannot be saved in this mode!



Single test menu

Entering the selected function will open its menu. Display organization in general can be seen in the figure below.



Typical single test display

EARTH BOND 05-Mar-08 09:31	Menu line
SINGLE TEST	Main function indication
— — — —Ω	Result field
OUTPUT: 25A~ LIMIT : 0.30Ω TIME : 5s	Test parameters field
Press START key for new test.	Message field
EDIT HELP	Function tabs

Keys:

F1 (EDIT)	Enters test parameters field.	
F2 (HELP)	Opens help menu.	
START	Starts running the selected function.	
	STOP	Abort function in progress.
ESC	Returns to Main menu.	

Notes:

- Once the measurement parameters are set, the settings are kept until new changes are made or the instrument is reset to the default configuration.
- To keep new settings in case of power fail return to main menu before turning the power off.

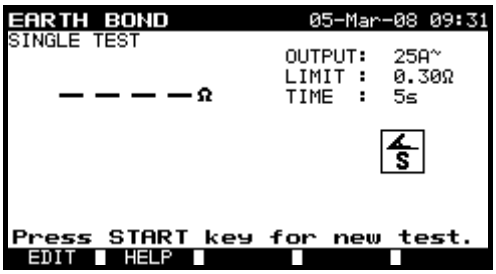
5 Measurements

5.1 Earth bond resistance

This test ensures that the connections between the protective conductor terminal in the mains plug of the appliance and accessible conductive parts of the appliance (metal housing) are satisfactory and of sufficiently low resistance. This test has to be performed on Class 1 (earthed) appliances.

A high current is normally used to stress the connections under fault conditions. 200 mA test current is used to prevent damage that may be caused by testing when using high currents. This is often necessary when sensitive electronics such as computers and other information technology equipment is tested.

The instrument measures the resistance between test socket PE terminal and test probe.

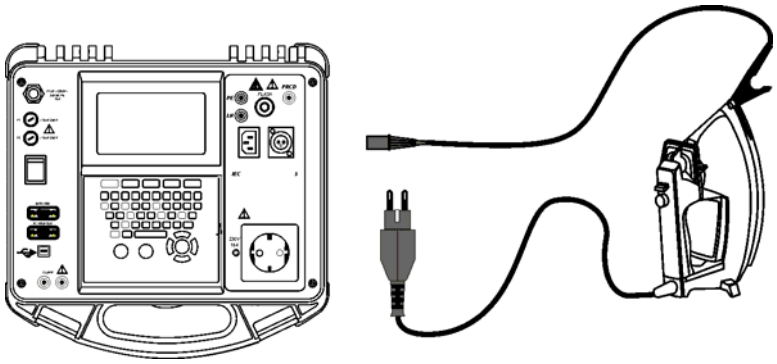


Earth bond menu

Test parameters for earth bond resistance measurement

OUTPUT	**Test current** [200 mA, 10 A, 25 A]
LIMIT	**Maximum resistance** [0.01 Ω ÷ 0.09 Ω, 0.1 Ω ÷ 0.9 Ω, 1 Ω ÷ 9 Ω]
TIME	**Measuring time** [5 s, 10 s, 30 s, 60 s, 120 s, 180 s]

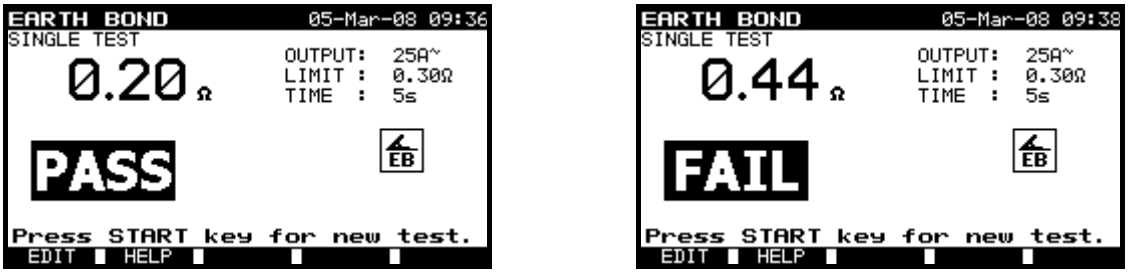
Test circuit for earth bond resistance measurement



Measurement of earth bond resistance of class I appliance

Earth bond resistance measurement procedure

- Select the **EARTH BOND** function.
- Set **output** test current.
- Set **limit** value.
- Set measuring **time**.
- **Connect** device under test to the instrument.
- **Connect** earth bond clip into its socket on the instrument.
- **Connect** alligator of earth bond clip to accessible metal parts of the device under test (see *figure above*).
- Press the **START** key for measurement.



Examples of earth bond resistance measurement results

Note:

- Consider displayed warnings before starting measurement!

5.2 Insulation resistance

Insulation resistance between live conductors and earthed (or isolated) accessible metal parts is checked. This test disclosed fault caused by pollution, moisture, deterioration of insulation metal etc. The capacitive part of leakage currents is not measured because of the DC test voltage.

Test parameters for insulation resistance measurement

OUTPUT	**Test voltage** [250 V, 500 V]
LIMIT (***Insulation***)	**Minimum resistance** [0.10 MΩ, 0.30 MΩ, 0.50 MΩ, 1.00 MΩ, 2.00 MΩ, 4.0 MΩ, 7.0 MΩ, 10.0 MΩ, none]
LIMIT (***Insulation S.)***	**Minimum resistance** [0.10 MΩ, 0.25 MΩ, 0.50 MΩ, 1.00 MΩ, 2.00 MΩ, 4.0 MΩ, 7.0 MΩ, 10.0 MΩ, none]
TIME	**Measuring time** [5 s, 10 s, 30 s, 60 s, 120 s, 180 s]

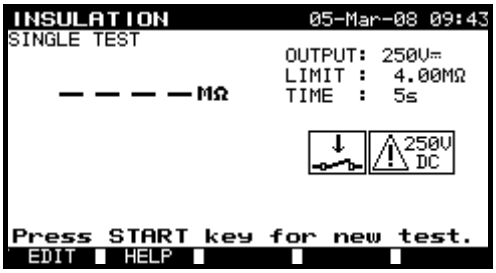
Notes:

- The appliance under test should be de-energized before the measurement!
- Consider any warning on the display before starting the measurement!
- Do not touch the appliance under test during the measurement or before it is fully discharged! The message »*Discharging…*« is displayed while the voltage on appliance under test is higher than 20 V!
- Do not disconnect the appliance under test from the instrument during the measurement or before it is automatically discharged!

5.2.1 Insulation resistance on class I appliances

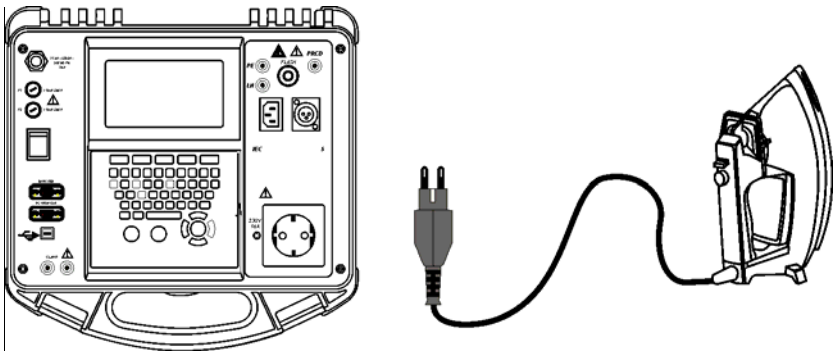
The instrument measures the insulation resistance between:

- Main test socket (L+N) and PE test terminals,
- LN and PE test sockets.

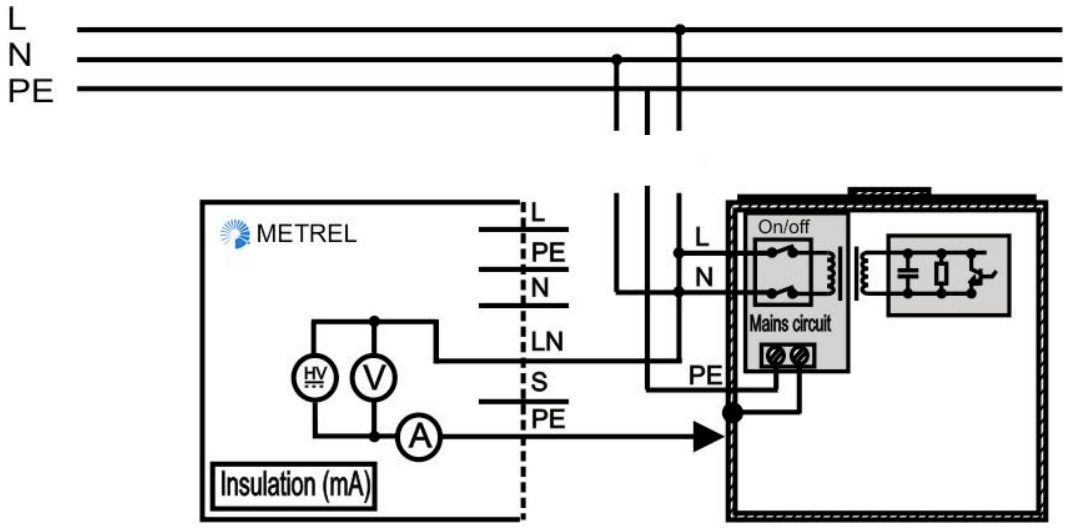


Insulation menu

Test circuits for CLASS I insulation resistance measurement



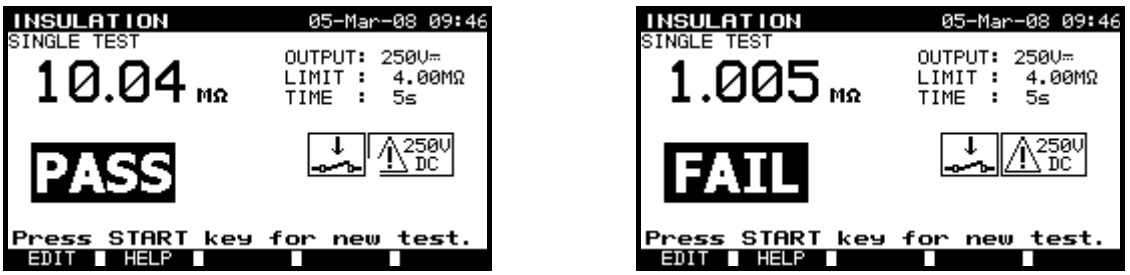
Measurement of insulation resistance of class I appliance



Measurement of insulation resistance of fixed installed appliances of Class I

Insulation resistance measurement procedure for CLASS I

- Select the **Insulation** function.
- Set **output** test voltage.
- Set **limit** value.
- Set measuring **time**.
- **Connect** device under test to the instrument (see *figures above*).
- When appliance has isolated accessible metal parts, use S probe (earth bond clip), see ***5.2.2 Insulation resistance on class 2 appliances***.
- For fixed equipment:
  - **Disconnect** mains supply of the fixed equipment;
  - **Connect** L test socket of the instrument to L and N of the fixed equipment;
  - **Connect** PE test socket of the instrument to metallic enclosure of thefixed equipment.
- Press the **START** key for measurement.



Examples of insulation resistance measurement results

Note:

- When probe is applied during measurement of Class I appliance then the result represents parallel value of both measured insulation resistances.

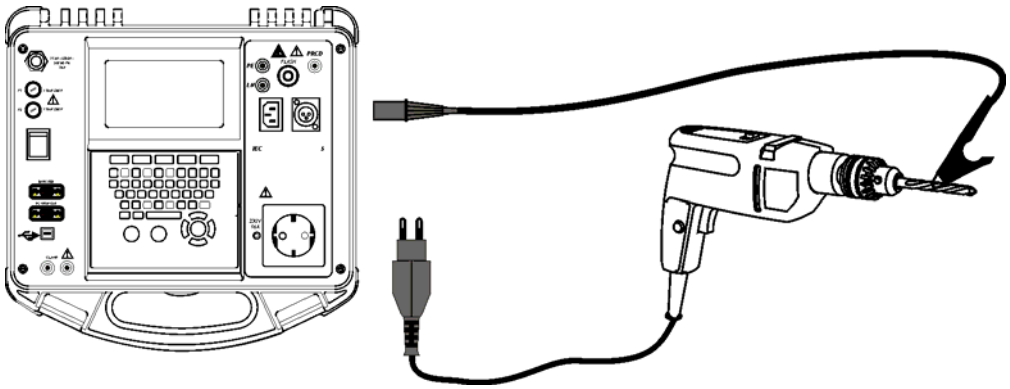
5.2.2 Insulation resistance on class II appliances (Insulation S)

The instrument measures the insulation resistance between:

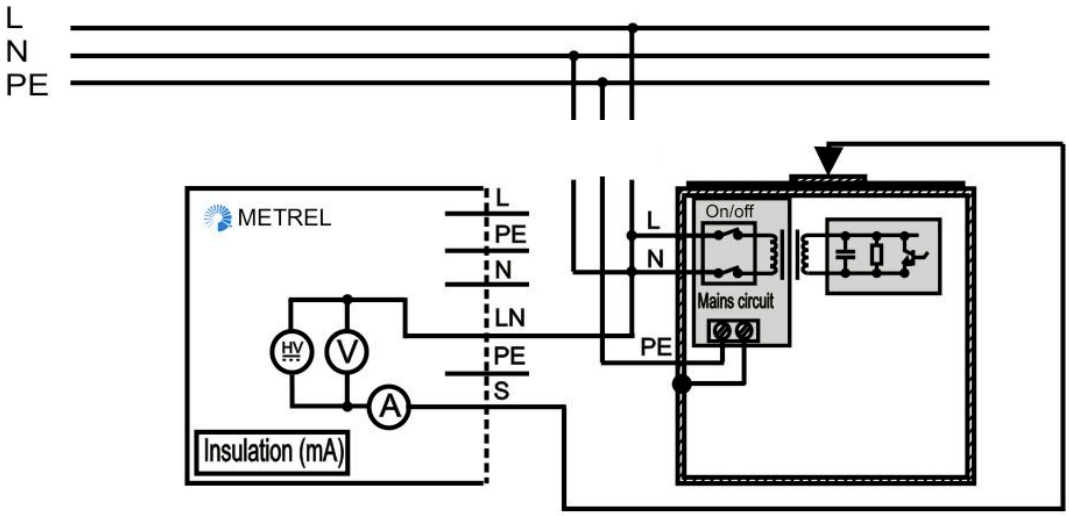
- Main test socket (L+N) and S test terminals,
- LN and S test sockets.

Insulation S. menu

Test circuits for CLASS II insulation resistance measurement



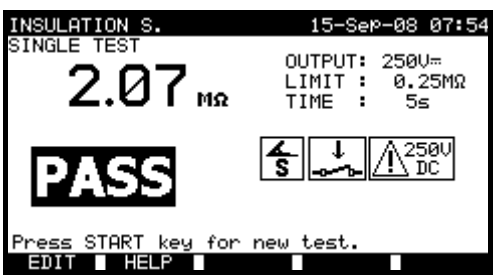
Measurement of insulation resistance of class II appliance



Measurement of insulation resistance of accessible isolated conductive parts of fixed installed appliances

Insulation resistance measurement procedure for CLASS II

- Select the desired **Insulation S.** function.
- Set **output** test voltage.
- Set **limit** value.
- Set measuring **time**.
- **Connect** device under test to the instrument.
- **Connect** probe (earth bond clip) into its socket on the instrument.
- **Connect** probe to conductive accessible part that is insulated from PE (see *figures above*).
- Press the **START** key for measurement.



Example of insulation S. resistance measurement results

5.3 Substitute leakage current

Leakage currents between live conductors and isolated accessible metal parts (housing, screws, handles etc.) are checked with this test. Capacitive leakage paths are included in the result too. The current flowing at test voltage of 40 Vac is measured and scaled to the value at nominal mains supply voltage of 230 Vac.

Test parameters for substitute leakage current measurement

OUTPUT	**Test voltage** [40 V]
LIMIT (***Substitute***)	**Maximum current** [0.25 mA, 0.50 mA, 0.75 mA, 1.00 mA, 1.50 mA, 2.50 mA, 3.50 mA, 4.00 mA, 4.50 mA, 5.00 mA, 5.50 mA, 6.00 mA, 7.00 mA, 8.00 mA, 9.00 mA, none]
LIMIT (***Substitute S.)***	**Maximum current** [0.25 mA, 0.50 mA, 0.75 mA, 1.00 mA, 1.50 mA, 2.50 mA, 3.50 mA, none]
TIME	**Measuring time** [5 s, 10 s, 30 s, 60 s, 120 s, 180 s]

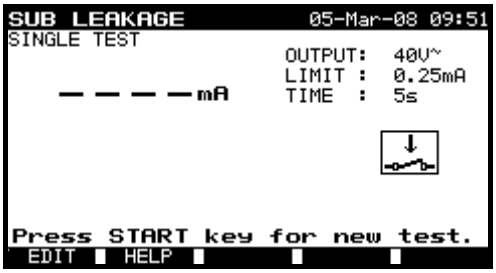
Notes:

- Consider any displayed warning before starting measurement!
- Substitute leakage current may differ substantially from that of conventional leakage current test because of the way the test is performed. For example, the difference in both leakage measurements will be affected by the presence of neutral to earth noise suppression capacitors.

5.3.1 Substitute leakage current on class I appliances

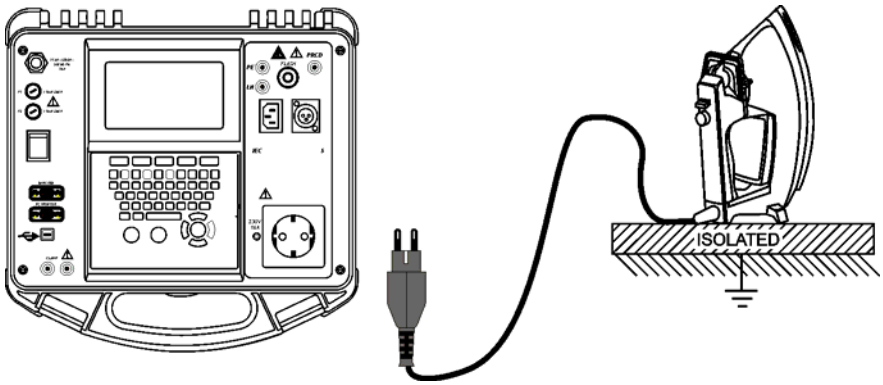
The instrument measures the substitute leakage current between:

- Main test socket (L+N) and PE test terminals,
- LN and PE test sockets.

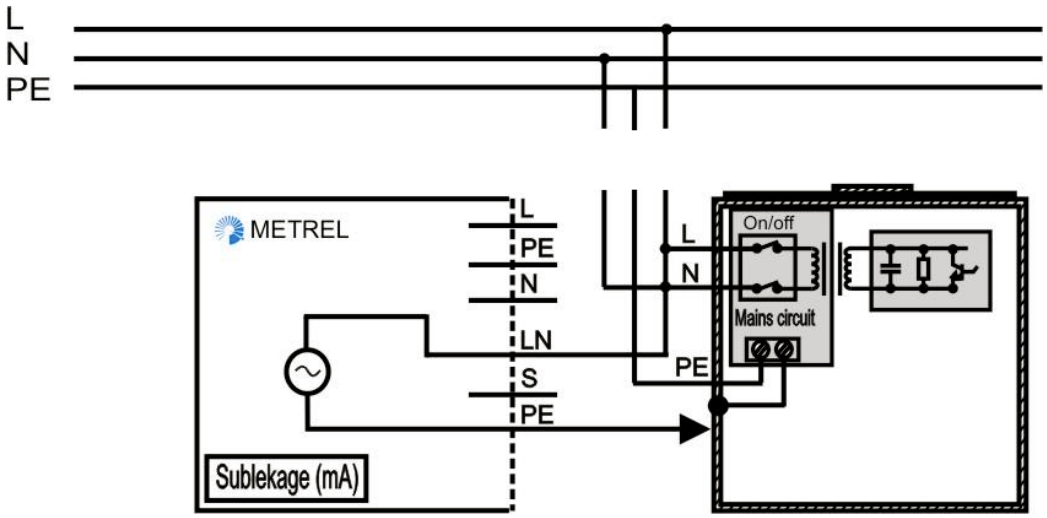


Sub leakage menu

Test circuits for CLASS I substitute leakage current measurement



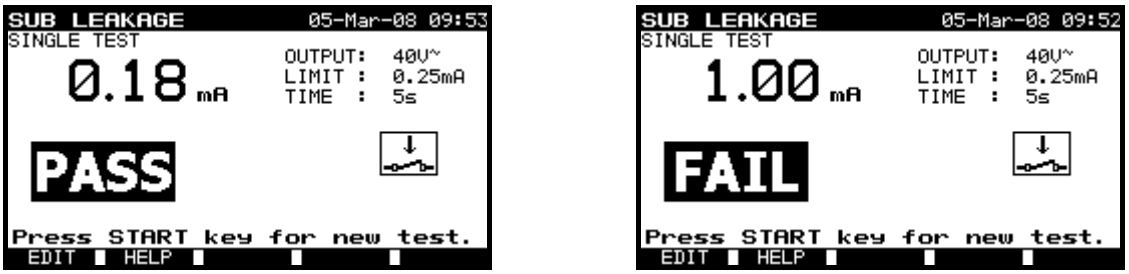
Measurement of substitute leakage current of class I appliance



Measurement of substitute leakage current of fixed installed appliances of class I

Substitute leakage current measurement procedure for CLASS I

- Select the **Sub leakage** function.
- Set **limit** value.
- Set measuring **time**.
- **Connect** device under test to the instrument (see *figures above*).
- When appliance has isolated accessible metal parts, use S probe (earth bond clip), see 5.3.2 ***Substitute leakage current on class 2 appliances***.
- For fixed equipment:
  - **Disconnect** mains supply of the fixed equipment;
  - **Connect** L test socket of the instrument to L and N of the fixed equipment;
  - **Connect** PE test socket of the instrument to metallic enclosure of the fixed equipment.
- Press the **START** key for measurement.

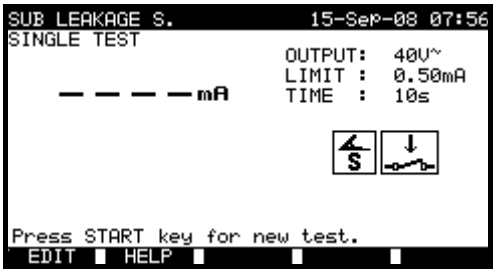


Examples of substitute leakage current measurement results

5.3.2 Substitute leakage current on class II appliances

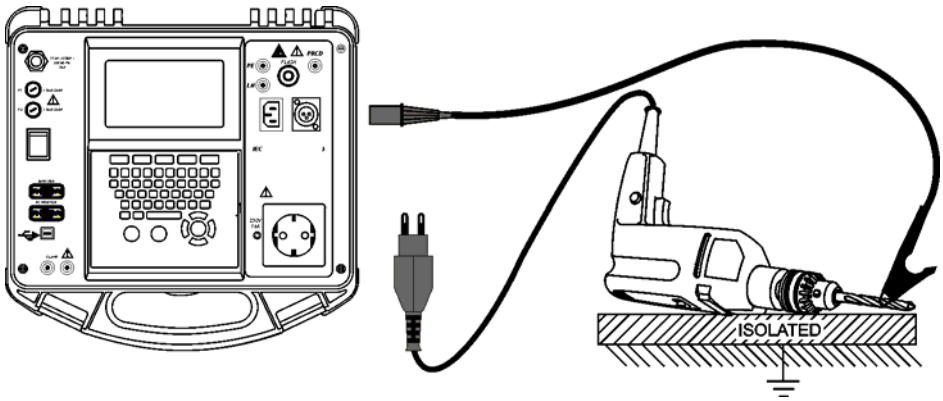
The instrument measures leakage current between:

- Main test socket (L+N) and S test terminals,
- LN and S test sockets.

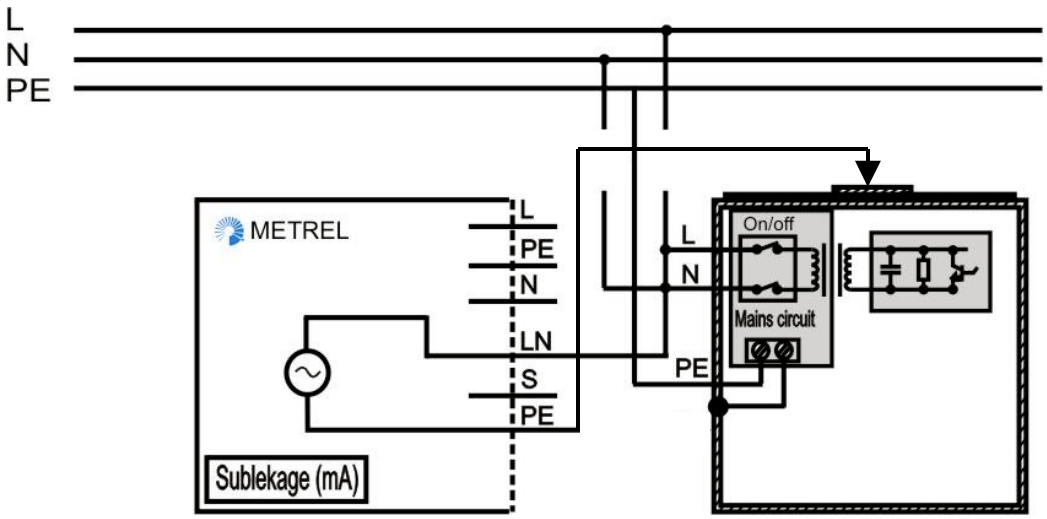


Sub leakage S. menu

Test circuits for CLASS II substitute leakage current measurement



Measurement of substitute leakage current of class II appliance



Measurement of substitute leakage of accessible isolated conductive parts of fixed installed appliances

Substitute leakage current measurement procedure for CLASS II

- Select the **Sub leakage S.** function.
- Set **limit** value.
- Set measuring **time**.
- **Connect** device under test to the instrument (see *figures above*).
- For fixed equipment **connect** PE socket of the instrument to metallic enclosure of fixed equipment.
- Press the **START** key for measurement.

Example of substitute leakage current measurement results

Notes:

- Consider any displayed warning before starting measurement!
- Substitute leakage current may differ substantially from that of conventional leakage current test because of the way the test is performed. For example, the difference in both leakage measurements will be affected by the presence of neutral to earth noise suppression capacitors.

5.4 Differential current

The purpose of this test is to determine the sum of all leakages flowing from the live conductor to the earth. Because the differential method for determining leakage current is used the full and true appliance leakage current is always measured, although there can exist parallel current paths to ground. Differential current measurement is frequency weighted for perception / reaction according the standards IEC 60990 and VDE 0404-3.

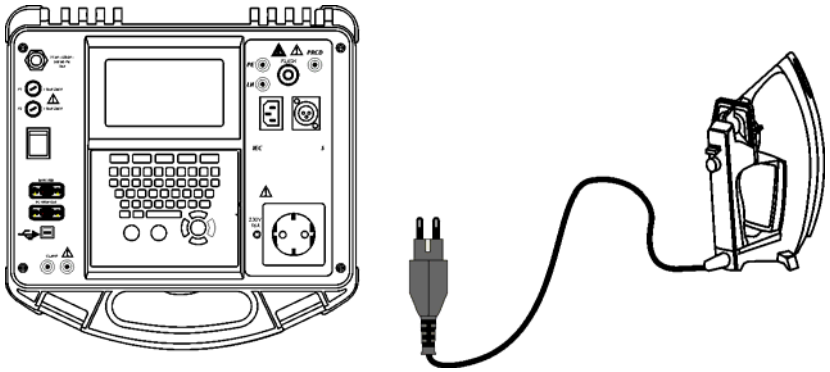
The instrument measures differential leakage current for both polarities of L and N.

Differential current menu

Test parameters for differential current measurement

OUTPUT	**Test voltage** [230 V]
LIMIT	**Maximum current** [0.25 mA, 0.50 mA, 0.75 mA, 1.00 mA, 1.50 mA, 2.50 mA, 3.50 mA, 4.00 mA, 4.50 mA, 5.00 mA, 5.50 mA, 6.00 mA, 7.00 mA, 8.00 mA, 9.00 mA, none]
TIME	**Measuring time** [5 s, 10 s, 30 s, 60 s, 120 s, 180 s]

Test circuit for differential current measurement



Measuring of differential current

Differential current measurement procedure

- Select the **Differential** function.
- Set **limit** value.
- Set measuring **time**.
- **Connect** device under test to the instrument (see *figure above*).
- Press the **START** key for measurement.

Example of differential current measurement result

Notes:

- The appliance is connected to the mains voltage. Make sure that the appliance with moving parts is safely mounted or protected to prevent possible danger to operator or damage to the appliance!
- Consider any displayed warning before starting measurement!
- The instrument automatically changes L/N polarity of connected appliance.

5.5 Touch leakage current

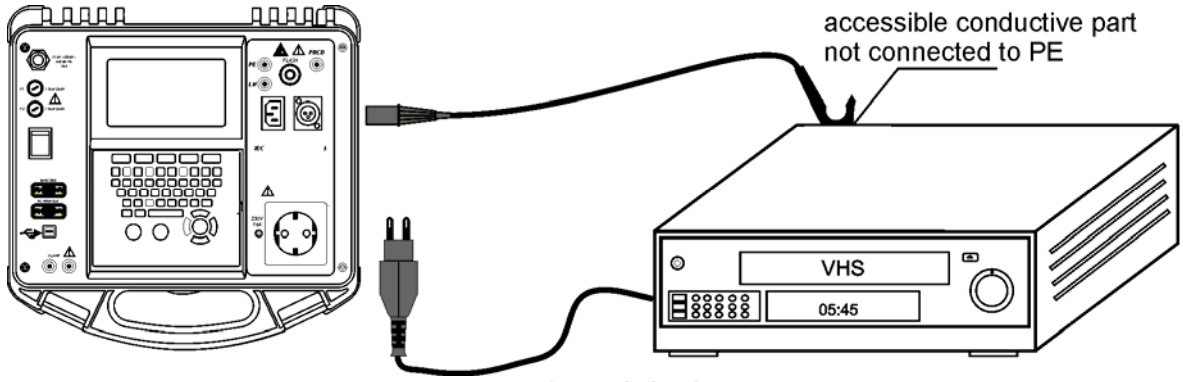
This test determines the current that would flow if a person touches the appliance.
Measurement is based on a human body model with resistance of 2 kΩ and frequency weighted for perception / reaction according the standards IEC 60990 and VDE 0404-3.
Both AC and DC components of touch leakage current are detected.
The instrument measures the leakage current flowing through the S probe into earth.
The appliance under test can be powered from the mains test socket or directly from the installation (fixed installed equipment).
The instrument measures touch leakage current for both polarities of L and N.

Touch leakage menu

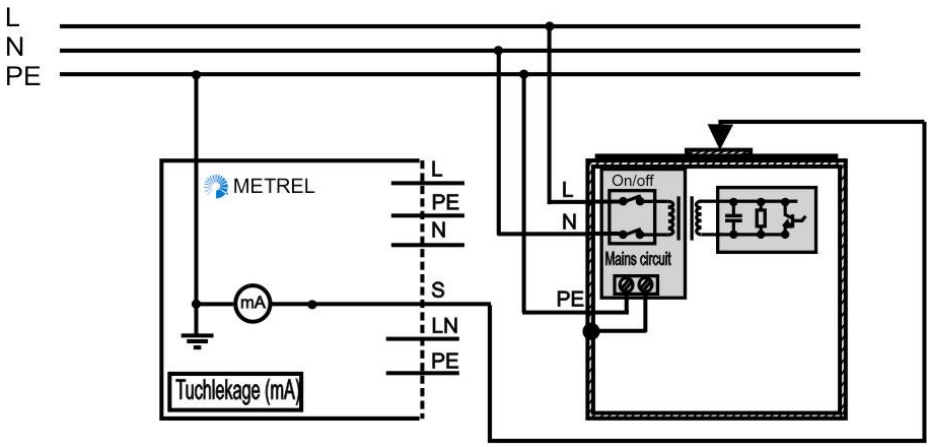
Test parameters for touch leakage current measurement

OUTPUT	**System voltage** [230 V]
LIMIT	**Maximum current** [0.25 mA, 0.50 mA, 0.75 mA, 1.00 mA, 1.50 mA, 2.00 mA, none]
TIME	**Measuring time** [5 s, 10 s, 30 s, 60 s, 120 s, 180 s]

Test circuits for touch leakage current measurement



Measurement of touch leakage current



Measurement of touch leakage current on a fixed installed appliance

Touch leakage current measurement procedure

- Select the **Touch leakage** function.
- Set **limit** value.
- Set measuring **time**.
- **Connect** device under test to the instrument (see *figure above*).
- Press the **START** key for measurement.

*Examples of touch leakage current measurement results **(slika)***

Notes:

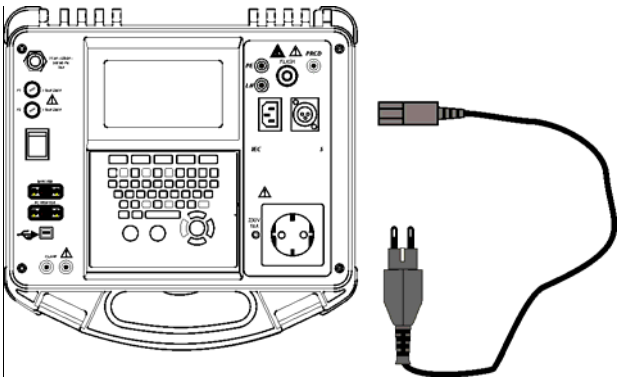
- The appliance is connected to the mains voltage. Make sure that the appliance with moving parts is safely mounted or protected to prevent possible danger to operator or damage to the appliance!
- Consider any displayed warning before starting measurement!
- The instrument automatically changes L/N polarity of connected appliance.

5.6 Polarity test

This test checks the polarity of the mains supply cable. The following faults can be detected: L open, N open, PE open, L-N crossed, L-PE crossed, N-PE crossed, L-N shorted, L-PE shorted, N-PE shorted, multiple faults.

Polarity test menu

Test circuit for polarity test



Polarity test of IEC cord

Polarity test procedure

- Select the **Polarity test** function.
- **Connect** tested cable to the instrument (see *figure above*).
- Press the **START** key for measurement.

Example of polarity test result

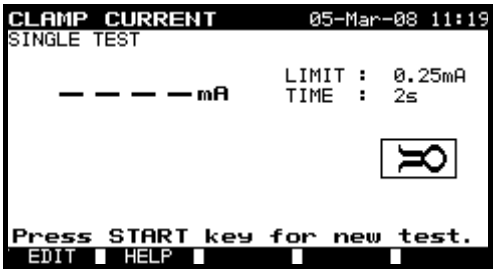
Note:

- Consider any displayed warning before starting test!

5.7 Clamp current measurement

This function enables measuring of AC currents in a wide range from 1 mA up to 25 A. Typical applications are:

- Measuring leakage currents through PE conductor in permanently installed appliances,
- Measuring load currents through L or N conductor in permanently installed appliances,
- Measuring residual current in the group of conductors, etc.

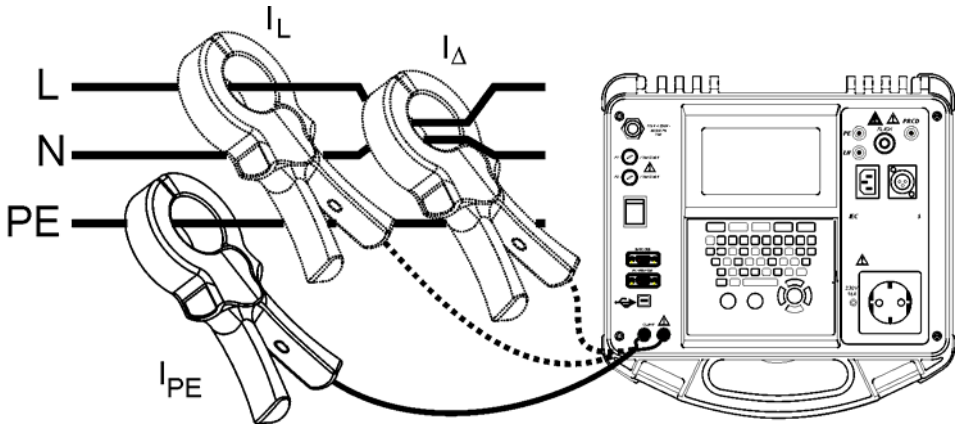


Clamp current menu

Test parameters for touch leakage current measurement

LIMIT	**Maximum current** [0.25 mA, 0.50 mA, 0.75 mA, 1.00 mA, 1.50 mA, 2.25 mA, 2.50 mA, 3.00 mA, 3.50 mA, 5.00 mA, 9.90 mA]
TIME	**Measuring time** [5 s, 10 s, 30 s, 60 s, 120 s, 180 s]

Test circuit for clamp current measurement



Connecting current clamp to the instrument

Clamp current measurement procedure

- Select the **Clamp current** function.
- Set **limit** value.
- Set measuring **time**.
- **Connect** the current clamp to the instrument (see *figure above*).
- **Put** the current clamp around wire(s) that has to be measured.
- Press the **START** key for measurement.

Example of clamp current measurement result

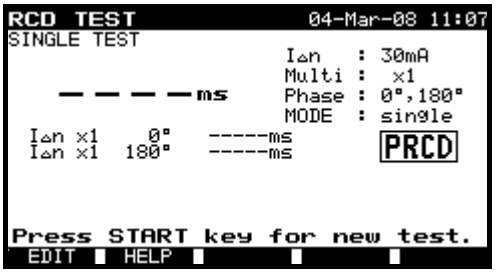
Notes:

- Consider any displayed warning before starting measurement!
- When measuring leakages neighbour magnetic fields and capacitive coupling (especially from the L and N conductors) can disturb the results. It is recommended that the clamp is as close as possible to the grounded surface and away from wires and other objects under voltage or carrying current.
- Displayed current represents r.m.s. value for current clamp with ratio 1000:1.
- Use test clamp supplied by METREL or other with similar characteristics (current output, ratio 1000:1, appropriate measurement range; consider error of test clamp when evaluating measured results)!
- Current clamps Metrel A 1074 and A 1019 are suitable for use with the instrument in range of 0.2 A ÷ 20 A. Below 0.2 A they can be used as indicator only. They are not suitable for leakage current measurements.
- The only Metrel current clamp, suitable for leakage current measurements, is A 1018 (1000 A/1 A).

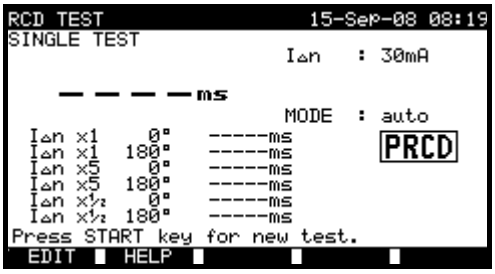
5.8 RCD test

The purpose of this test is to ensure proper operation of residual current devices built-in in appliances and portable residual current devices.
The following measurements and tests can be performed:

- Trip-out time, and
- RCD autotest.



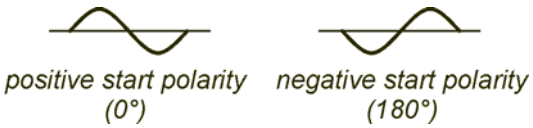
RCD single test menu



RCD autotest menu

Test parameters for RCD test

$I_{\Delta N}$	**Rated RCD residual current** [10 mA, 15 mA, 30 mA]
MODE	Type of **RCD test** [single, auto]
If **MODE = single**	
Multi	**Actual test current** $I_{\Delta N}$ [x ½, x 1, x 5]
Phase	**Starting angle** [0°, 180°, (0°,180°)]



RCD test current starting polarities

Trip-out time limits
Trip-out times according to EN 61008 / EN 61009:

	½×$I_{\Delta N}$ *)	$I_{\Delta N}$	5×$I_{\Delta N}$
General RCDs (non-delayed)	t_Δ > 300 ms	t_Δ < 300 ms	t_Δ < 40 ms

*) Minimum test period for current of ½×$I_{\Delta N}$, RCD shall not trip-out.

Maximum test times related to selected test current for general (non-delayed) RCD

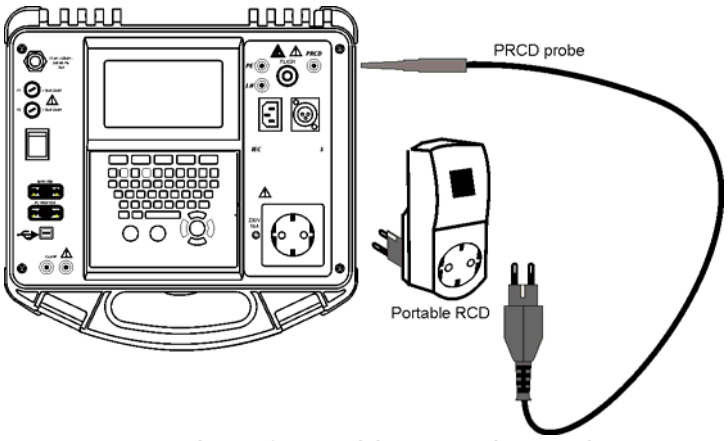
Standard	½×$I_{\Delta N}$	$I_{\Delta N}$	5×$I_{\Delta N}$
EN 61008 / EN 61009	400 ms	400 ms	40 ms

The instrument is intended for testing of **G**eneral (non-delayed) RCDs, which are suited for:

- Alternating residual current (AC type, marked with ⏦ symbol),

PRCD socket of the instrument operates as current sink for fault current which is sourced on L entry of tested appliance.

Circuits for testing RCD



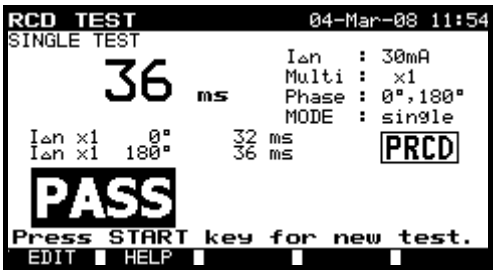
Testing of portable RCD (PRCD)

5.8.1 Single RCD trip-out time test

Trip-out time measurement verifies the sensitivity of an RCD at different residual currents.

Trip-out time measurement procedure

- Select the **RCD test** function.
- Select **Single** test mode.
- Set test **parameters** (if necessary).
- **Connect** tested device to the test socket of the instrument (see *figures above*).
- **Connect** test lead from PRCD socket of the instrument to the secondary side of tested PRCD, terminal L.
- Press the **START** key to perform measurement.
- **Reactivate** tested PRCD when both phases are selected to finish with test with opposite phase.

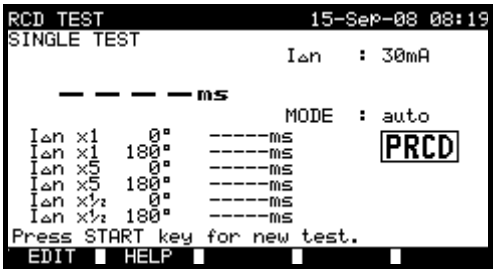


Example of RCD test result

5.8.2 Automatic RCD test

RCD autotest function is intended to perform complete RCD testing and measurement of belonging parameters (contact voltage, fault loop resistance and trip-out time at different residual currents) in one set of automatic tests, guided by the instrument. If any

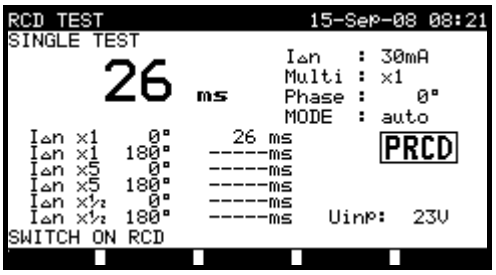
false parameter is noticed during the RCD autotest, then individual parameter test has to be used for further investigation.



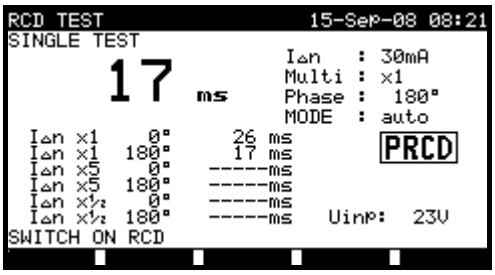
RCD auto test menu

RCD autotest procedure

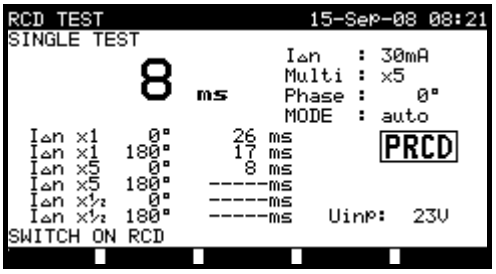
RCD Autotest steps	**Notes**
‣ Select the **RCD test** function. ‣ Set **Auto** test mode. ‣ Select rated $\mathbf{I_{\Delta N}}$ (if necessary). ‣ **Connect** tested device to the test socket of the instrument (see *figures above*). ‣ **Connect** test lead from PRCD socket of the instrument to the secondary side of tested PRCD, terminal L. ‣ Press the **TEST** key.	Start of test
‣ Test with $I_{\Delta N}$, 0° (step 1).	RCD should trip-out
‣ **Re-activate** RCD. ‣ Test with $I_{\Delta N}$, 180° (step 2).	RCD should trip-out
‣ **Re-activate** RCD. ‣ Test with $5\times I_{\Delta N}$, 0° (step 3).	RCD should trip-out
‣ **Re-activate** RCD. ‣ Test with $5\times I_{\Delta N}$, 180° (step 4).	RCD should trip-out
‣ **Re-activate** RCD. ‣ Test with $½\times I_{\Delta N}$, 0° (step 5).	RCD should not trip-out
‣ Test with $½\times I_{\Delta N}$, 180° (step 6).	RCD should not trip-out End of test.



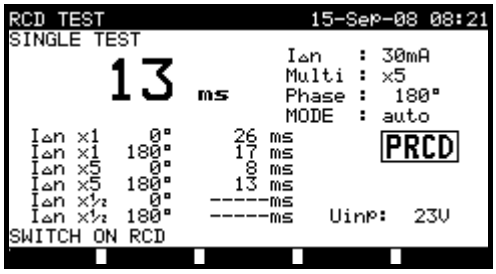
Step 1



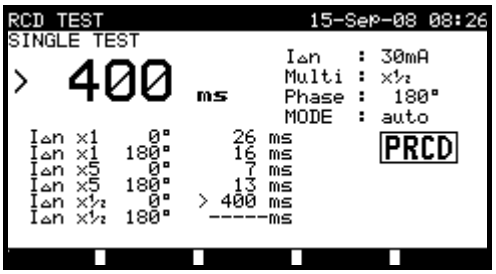
Step 2



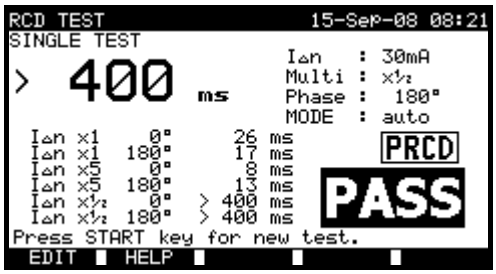
Step 3



Step 4



Step 5 and



Step 6

Individual steps in RCD autotest

The test passes if the RCD:

- Does not trip out at ½×$I_{\Delta N}$ tests,
- Trips inside predefined time limits at $I_{\Delta N}$, and 5×$I_{\Delta N}$ tests.

Notes:

- Consider any displayed warning before starting measurement!
- For appliances with integrated RCD the housing must be opened to access the RCD's L output terminal.
- Mains voltage is applied to the device under test. Do not touch the equipment under test or the test leads during the test.

5.9 Functional test

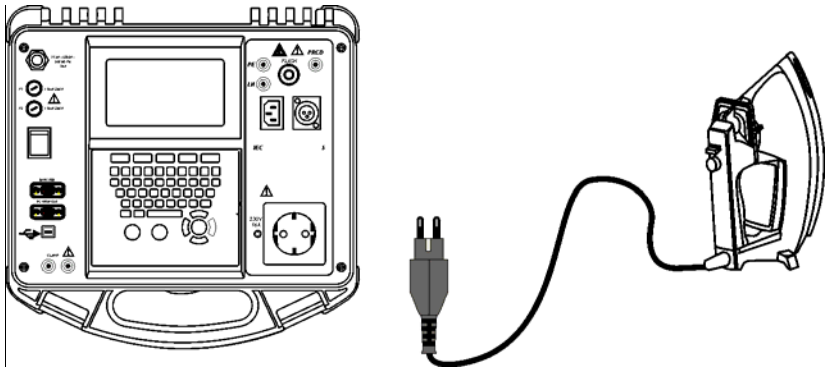
The function is intended to make functional test or check of the appliance and parallel to this, the power consumption is measured and displayed as apparent power.

Leakage menu

Test parameters for Functional test

OUTPUT	**System voltage** [230 V]
TIME	**Measuring time** [5 s, 10 s, 30 s, 60 s, 120 s, 180 s]

Circuit for functional test



Functional test

Functional test procedure

- Select the **Functional test** function.
- Set measuring **time**.
- **Connect** tested appliance to the instrument (see *figure above*).
- Press the **START** key for measurement.

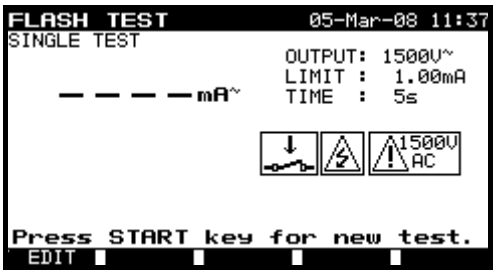
Example of apparent power measurement result

Notes:

- The appliance is connected to the mains voltage. Make sure that the appliance with moving parts is safely mounted or protected to prevent possible danger to operator or damage to the appliance!
- Consider any displayed warning before starting measurement!

5.10 Flash test (MI 3305 – OmegaGT*Plus* only)

The purpose of this test is to ensure that the insulation material of the appliance can withstand high voltage transients and short overvoltages.



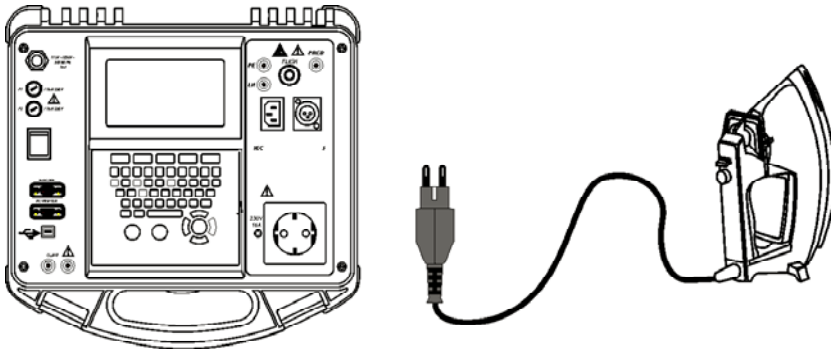
Flash test menu

Test parameters for flash test

OUTPUT	**Test voltage** [1500 V, 3000 V]
LIMIT	**Maximum current** [1.00 mA, 1.50 mA, 2.00 mA, 2.25 mA]
TIME	**Measuring time** [5 s, 10 s, 30 s, 60 s, 120 s, 180 s]

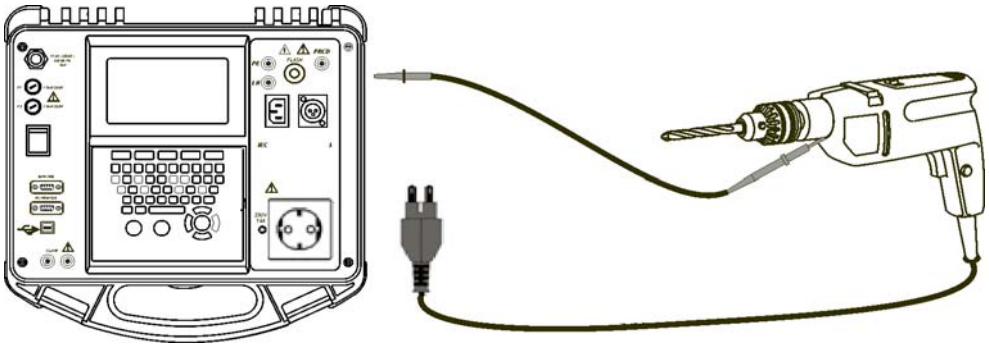
Test circuits for flash test

For Class I appliances, a test voltage of 1.5 kV_{AC} is applied between main test socket (L+N) and PE test terminals.



Flash test on Class I appliance

For Class II appliances, a test voltage of 3 kV_{AC} is applied between main test socket (L+N) and FLASH test terminals.



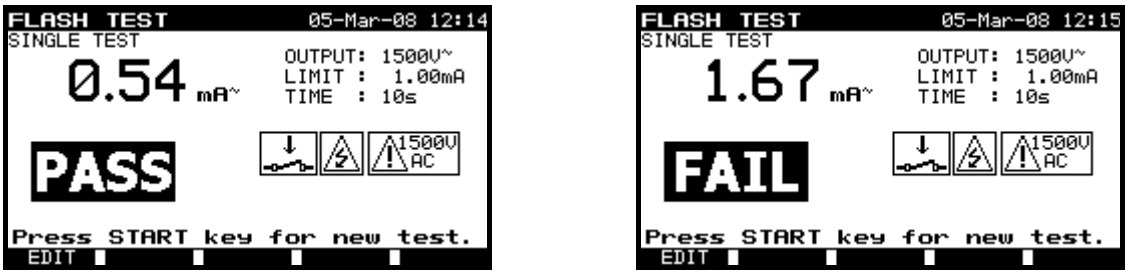
Flash test on Class II appliance

Flash test procedure for CLASS I:

- Select the **Flash test** function.
- Set **output** test voltage.
- Set **limit** value.
- Set measuring **time**.
- **Connect** device under test to the instrument (see *figures above*).
- Press the **START** key for measurement.

Flash test procedure for CLASS II:

- Select the **Flash test** function.
- Set **output** test voltage.
- Set **limit** value.
- Set measuring **time**.
- **Connect** device under test to the instrument (see *figures above*).
- **Connect** flash probe into its socket on the instrument.
- **Connect** flash probe to the device under test (see *figures above*).
- Press the **START** key for measurement.



Examples of flash test results

Notes:

- Consider any warning on the display before starting measurement.
- Do not touch the equipment under test or the test leads during the test – a dangerous voltage will be present.
- Appliance ON/OFF switches must be switched on.
- Before applying the test, check that the components in the appliance can withstand the test voltage without any damage. IT appliances are especially sensitive.

6 Data operations

After the autotest sequence is completed, measurement results can be:

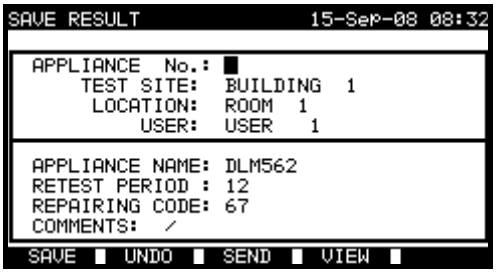
- Viewed,
- Saved to the flash memory of the instrument,
- Send to PC,
- Test report can be send to print out on serial printer,
- Appliance label can be printed out.

6.1 Saving autotest results

After the autotest sequence is completed, ***Save results*** menu is displayed.

Important data can be added to the autotest results in this menu. The following data can be appended to test results for saving:

- Appliance number and its name,
- Test site and location,
- Retest period,
- Repairing code,
- Comments.



Save results menu

Keys:

↓ / ↑	Select the item.
← / →	Select character in line.
alphanumeric	Enters character.
SHIFT+ alphanumeric	Enters small letter or special character.
←	Deletes character left to cursor.
F1 (SAVE)	Saves test results and returns to last autotest menu.
F2 (UNDO)	Resets modified item to previous state.
F3 (SEND)	Sends one of output device.
F4 (VIEW)	Open display of test results.
ESC	Returns to Main menu.

Building data for items

Appliance no.	Up to 10 alphanumeric or special characters can be entered. Appliance number can also be read with a barcode reader.
Test site, ***Location,*** ***Appliance name***	Up to 15 alpha-numeric or special characters can be entered. Names can also be selected from the list of 100 predefined names for each parameter.
Retest period	2 numeric characters can be entered.
Repairing code	Up to 20 alpha-numeric or special characters can be entered.
Comments	Up to 25 alpha-numeric or special characters can be entered.

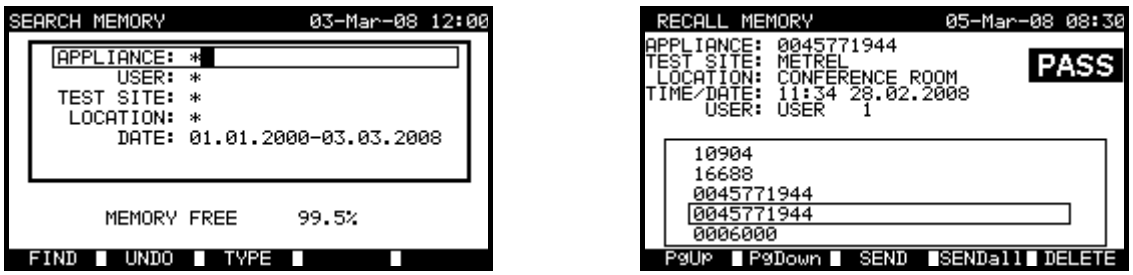
All parameters added to the autotest results have in general a possibility to be replicated or default set to blank when saving new autotest results. Appliance number can also be automatically incremented when new autotest sequence is finished. For detailed description refer to chapter ***3.9.6 Instrument settings***.

Notes:

- The date and time are automatically attached to the saved results.
- The autotest results cannot be stored if the ***Appliance no.*** field is empty.
- ***User*** field cannot be edited.

6.2 Recall / delete / send to output of results

After entering selection and searching the recall menu appears. The instrument shows complete numbers of found results.



Memory recall menu – list of stored autotest results

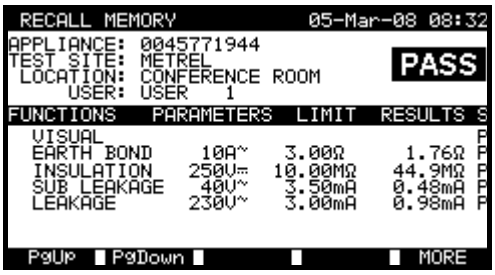
Keys:

⮟ / ⮝	Select stored autotest result.
F1 (PgUp)	Opens previous page in list of test results.
F2 (PgDown)	Opens next page in list of test.
F3 (SEND)	Sends autotest results of selected appliance to one of output devices, see ***6.2.3 Downloading and printing results***.
F4 (SENDall)	Sends all autotest results from selection to one of output devices, see ***6.2.3 Downloading and printing results***.
F5 (DELETE)	Deletes results, see ***6.2.2 Deleting Results***.
ENTER	Opens results view of selected autotest result, see ***6.2.1 Results view***..
ESC	Returns to Main menu.

6.2.1 Results view

For each autotest result can be observed:

- All functions applied,
- Test parameters for each and
- Results with Pass/Fail indication.



View results menu

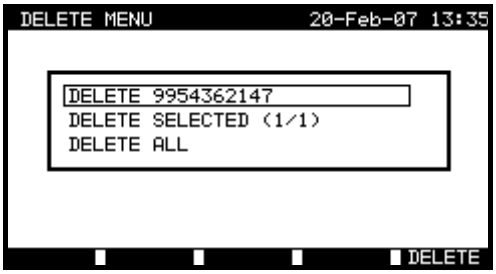
Keys:

⮝, **F1 (PgUp)**	Opens previous page of test results.
⮟, **F2 (PgDown)**	Opens next page of test results.
F5 (MORE)	Switches between detailed results view and complete list of appliance data.
ESC	Returns memory recall menu.

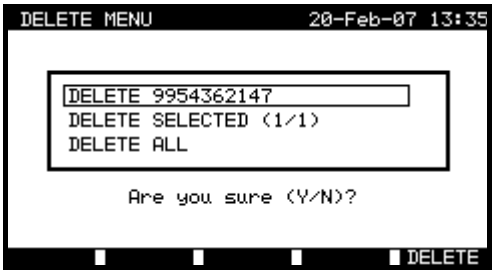
6.2.2 Deleting results

It is possible to delete stored autotest results. There are three possibilities:

- Delete of currently selected autotest result,
- Delete all results found and selected by search criteria and
- Delete complete stored results.



Request



Confirmation

Delete results menu

Keys:

⮟ / ⮝	Select deleting option.
F5 (DELETE)	Deletes results according to selected option.
ESC	Returns to memory recall menu.

Keys to confirm deleting:

Y	Confirms deleting in deletes selected option.
N	Returns to memory recall menu without deleting.
ESC	

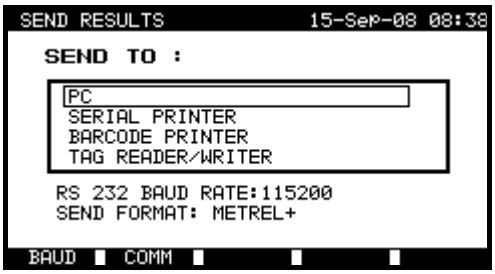
6.2.3 Downloading and printing results

The instrument offers the following possibilities to send selected result or selection to:

- PC (to store and later operations on stored results),
- serial printer for fast report printing,
- label printer, and
- RFID tag.

It is possible to send data to selected output after:

- autotest sequence is completed, or
- recalling stored results from the instrument memory.



Send results menu

Common keys:

↓ / ↑	Select send output option.
ENTER	Starts sending to selected output.
ESC	Returns to memory recall menu.

Output dependent options

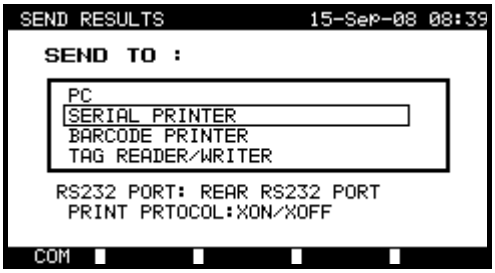
PC

Keys for transfer to PC:

F1 (BAUD)	Opens menu for selection of data transfer speed.
F2 (COMM)	Opens menu for interface selection.

See chapter ***3.9.8 Communication settings***.

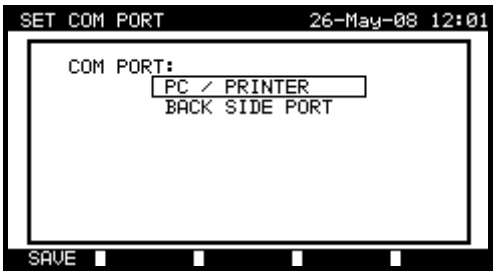
Serial printer



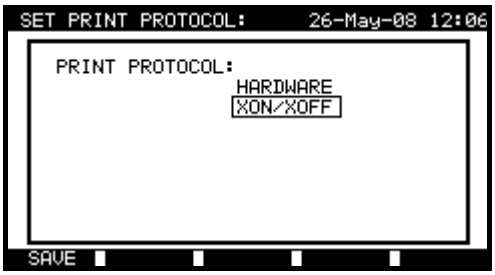
Send to serial printer menu

Keys for transfer to serial printer:

F1 (COM)	Opens menu for interface selection (back site printer or PC/Printer connector).
F2 (Control)	Opens menu for selection of data transfer control option.



Interface option



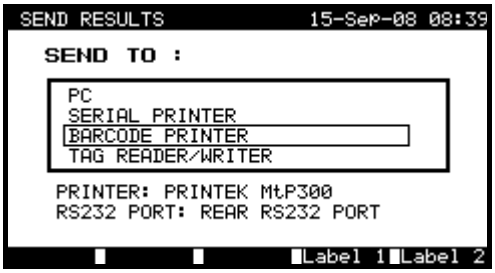
Data transfer control

Serial printer settings

Keys:

⮟ / ⮝	Select the option.
F1 (SAVE)	Accepts selected option.
ENTER	
ESC	Returns to *Send results* menu.

Barcode printer



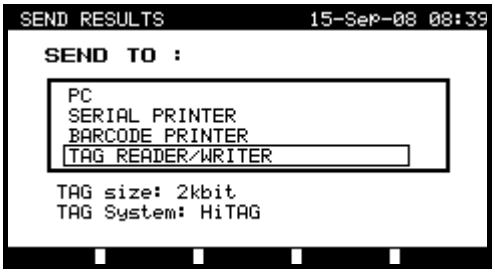
Send to barcodeprinter menu

Keys for transfer to barcode printer:

F4 (Label 1)	Prints one label (for the appliance), the same as the key **ENTER**
F5 (Label 2)	Prints two labels.

Refer to chapters ***3.9.6 Instrument settings*** and ***Appendix B*** for detailed information about barcode systems used when printing barcode labels.

RFID tag



Send to tag menu

Keys:

ENTER	Send data to the RFID tag.
ESC	Returns to *Send results* menu.

Notes:

- When working with a serial printers, baud rate is set by default to 9600 bps.

7 Maintenance

7.1 Periodic calibration

It is essential that all measuring instruments are regularly calibrated in order for the technical specification listed in this manual to be guaranteed. We recommend an annual calibration. The calibration should be done by an authorized technical person only.

7.2 Fuses

There are two fuses available from front panel:

F1 = F2 = T 16 A / 250 V (32 × 6,3 mm): intended for instrument protection.
If the instrument does not respond after connection to mains supply, disconnect the mains supply and accessories and then check these fuses. For position of fuses refer to chapter ***2.1 Front panel***.

Warning!

- Switch off the instrument and disconnect all test accessories and mains cord before replacing the fuses or opening the instrument. Disconnect all test leads and the instrument mains cord before removing fuse cover!
- Replace blown fuse with the same type.

7.3 Service

For repairs under or out of warranty time please contact your distributor for further information.

Unauthorized person is not allowed to open the MI 3304 / MI 3305 instrument. There are no user replaceable components inside the instrument.

7.4 Cleaning

Use soft patch slightly moistened cloth with soap water or alcohol to clean the surface of the instrument. Leave the instrument to dry totally before using it.

Notes:

- Do not use liquids based on petrol or hydrocarbons!
- Do not spill cleaning liquid over the instrument!

8 Technical specifications

8.1 Earth bond resistance

Earth bond resistance readout (4 A, 10 A, 25 A)

Range	Resolution	Accuracy
0.00 Ω ÷ 1.99 Ω	0.01 Ω	±(5 % of reading + 3 digits)
2.00 Ω ÷ 19.99 Ω	0.01 Ω	±10 %

Earth bond resistance readout (200 mA)

Range	Resolution	Accuracy
0.00 Ω ÷ 1.99 Ω	0.01 Ω	±(5 % of reading + 3 digits)
2.00 Ω ÷ 9.99 Ω	0.01 Ω	±(5 % of reading + 5 digits)
10.0 Ω ÷ 19.9 Ω	0.1 Ω	±(5 % of reading + 5 digits)

Test currents..... 25 A and 10 A into 100 mΩ at mains voltage of 230 V AC
200 mA into 2 Ω at mains voltage of 230 V AC
Open circuit voltage.. < 6 V AC at mains voltage of 230 V AC
Pass levels ..... 0.01 Ω ÷ 0.09 Ω, 0.10 Ω ÷ 0.90 Ω, 1.00 Ω ÷ 9.00 Ω
Test duration..... 5 s, 10 s, 30 s, 60 s, 120 s, 180 s
Output..... S test probe connector – test socket (PE)
Test method 4-wire measurement, floating to earth

8.2 Insulation resistance

Class I Insulation resistance readout

Range	Resolution	Accuracy
0.000 MΩ ÷ 0.500 MΩ	0.001 MΩ	±(10 % of reading + 5 digits)
0.501 MΩ ÷ 1.999 MΩ	0.001 MΩ	±(5 % of reading + 3 digits)
2.00 MΩ ÷ 19.99 MΩ	0.01 MΩ	
20.0 MΩ ÷ 199.9 MΩ	0.1 MΩ	

Nominal voltages ..... 250 V DC, 500 V DC (- 0 %, + 10 %)
Measuring current..... min. 1 mA at 250 kΩ (250 V), 500 kΩ (500 V)
Short circuit current... max. 2.0 mA
Pass levels ..... 0.10 MΩ, 0.30 MΩ, 0.50 MΩ, 1.00 MΩ, 2.00 MΩ, 4.0 MΩ,
7.0 MΩ, 10.0 MΩ, none
Test duration..... 5 s, 10 s, 30 s, 60 s, 120 s, 180 s
Output..... test socket
Test method..... floating to earth
Auto discharge after test.

Class II Insulation resistance readout

Range	Resolution	Accuracy
0.000 MΩ ÷ 0.500 MΩ	0.001 MΩ	±(10 % of reading + 5 digits)
0.501 MΩ ÷ 1.999 MΩ	0.001 MΩ	±(5 % of reading + 3 digits)
2.00 MΩ ÷ 19.99 MΩ	0.01 MΩ	
20.0 MΩ ÷ 199.9 MΩ	0.1 MΩ	

Nominal voltages ..... 250 V DC, 500 V DC (- 0 %, + 10 %)
Measuring current..... min. 1 mA at 250 kΩ (250 V), 500 kΩ (500 V)
Short circuit current... max. 2.0 mA
Pass levels ..... 0.10 MΩ, 0.25 MΩ, 0.50 MΩ, 1.00 MΩ, 2.00 MΩ, 4.0 MΩ, 7.0 MΩ, 10.0 MΩ, none
Test duration..... 5 s, 10 s, 30 s, 60 s, 120 s, 180 s
Output..... test socket – S test probe connector
Test method..... floating to earth
Auto discharge after test.

8.3 Substitute leakage current

Class I Substitute leakage current readout

Range	Resolution	Accuracy
0.00 mA ÷ 19.99 mA	0.01 mA	±(5 % of reading + 5 digits)

Open circuit voltage.. < 50 V AC at mains voltage of 230 V AC
Short circuit current... < 40 mA
Pass levels ..... 0.25 mA, 0.50 mA, 0.75 mA, 1.00 mA, 1.50 mA, 2.50 mA, 3.50 mA, 4.00 mA, 4.50 mA, 5.00 mA, 5.50 mA, 6.00 mA, 7.00 mA, 8.00 mA, 9.00 mA, none
Test duration..... 5 s, 10 s, 30 s, 60 s, 120 s, 180 s
Output test socket
Test method..... floating to earth
Displayed current is calculated to rated supply voltage of 230 V.

Class II Substitute leakage current readout

Range	Resolution	Accuracy
0.00 mA ÷ 19.99 mA	0.01 mA	±(5 % of reading + 5 digits)

Open circuit voltage.. < 50 V AC at mains voltage of 230 V AC
Short circuit current... < 40 mA
Pass levels ..... 0.25 mA, 0.50 mA, 0.75 mA, 1.00 mA, 1.50 mA, 2.50 mA, 3.50 mA, none
Test duration..... 5 s, 10 s, 30 s, 60 s, 120 s, 180 s
Output..... test socket – S test probe connector
Test method..... floating to earth
Displayed current is calculated to rated supply voltage of 230 V.

8.4 Differetial current

Differential leakage current readout

Range	Resolution	Accuracy
0.00 mA ÷ 9.99 mA	0.01 mA	±(5 % of reading + 5 digits)

Pass levels ..... 0.25 mA, 0.50 mA, 0.75 mA, 1.00 mA, 1.50 mA, 2.50 mA, 3.50 mA, 4.00 mA, 4.50 mA, 5.00 mA, 5.50 mA, 6.00 mA, 7.00 mA, 8.00 mA, 9.00 mA, none
Test duration..... 5 s, 10 s, 30 s, 60 s, 120 s, 180 s
Output..... test socket
Polarity L-N..... automatic polarity change on test socket
Measurement:..... current measurement circuit according to VDE 0404-3, Anhang A, Figure A1, IEC 60990 Figure F2

8.5 Touch leakage current

Touch leakage current readout

Range	Resolution	Accuracy
0.00 mA ÷ 1.99 mA	0.01 mA	±(10 % of reading + 5 digits)

Pass levels ..... 0.25 mA, 0.50 mA, 0.75 mA, 1.00 mA, 1.50 mA, 2.00 mA, none
Test duration..... 5 s, 10 s, 30 s, 60 s, 120 s, 180 s
Output..... test socket – S test probe connector
Polarity L-N..... automatic polarity change on test socket
Measurement:..... current measurement circuit according to VDE 0404-3, Anhang A, Figure A1, IEC 60990 Figure F2

8.6 Polarity test

Test voltage..... < 50 V AC
Detects ..... Pass, L-open, N-open, PE-open, L-N crossed, L-PE crossed, N-PE crossed, L-N shorted, L-PE shorted, N-PE shorted, multiple faults
Output..... test socket – IEC socket

8.7 Clamp current

True RMS current readout using 1000:1 current clamp

Range	Resolution	Accuracy*)
0.00 mA ÷ 9.99 mA	0.01 mA	±(5 % of reading + 5 digits)
10.0 mA ÷ 99.9 mA	0.1 mA	±(5 % of reading + 5 digits)
100 mA ÷ 999 mA	1 mA	±(5 % of reading + 5 digits)
1.00 A ÷ 9.99 A	0.01 A	±(5 % of reading + 5 digits)
10.0 A ÷ 24.9 A	0.1 A	±(5 % of reading + 5 digits)

***)** Consider accuracy of current transformer.

Pass levels ..... 0.25 mA, 0.50 mA, 0.75 mA, 1.00 mA, 1.50 mA, 2.25 mA, 2.50 mA, 3.00 mA, 3.50 mA, 5.00 mA, 9.90 mA

Test duration..... 5 s, 10 s, 30 s, 60 s, 120 s, 180 s
Input current clamp terminals

8.8 Trip-out time of portable RCD

Portable RCD trip-out time readout

Range	Resolution	Accuracy
0 ms ÷ 1999 ms(½×$I_{\Delta N}$)	1 ms	±3 ms
0 ms ÷ 300 ms ($I_{\Delta N}$)	1 ms	
0 ms ÷ 40 ms (5×$I_{\Delta N}$)	1 ms	

Test currents ($I_{\Delta N}$) ..... 10 mA, 15 mA, 30 mA
Test current multipliers ..... ½×$I_{\Delta N}$, $I_{\Delta N}$, 5×$I_{\Delta N}$
Start angle ..... 0°, 180°, both
Test modes..... single, autotest
Output..... PRCD probe connector – test socket

Trip out times according to EN 61008 / EN 61009

½×$I_{\Delta N}$	$I_{\Delta N}$	5×$I_{\Delta N}$
t_Δ > 300 ms	t_Δ < 300 ms	t_Δ < 40 ms

8.9 Functional test

Apparent power readout

Range	**Resolution**	**Accuracy**
0.00 kVA ÷ 4.00 kVA	0.01 kVA	±(5 % of reading + 3 digits)

Test duration..... 5 s, 10 s, 30 s, 60 s, 120 s, 180 s
Output..... test socket

8.10 Flash test (MI 3305 – OmegaGT*Plus* only)

Flash current readout

Range	**Resolution**	**Accuracy**
0.00 - 2.50 mA	0.01 mA	±(5 % of reading + 5 digit)

Test voltage ..... 1500 V AC, 3000 V AC
Output resistance..... 480 kΩ@1500 V, 960 kΩ@3000 V
Limits ..... 1.00 mA, 1.50 mA, 2.00 mA, 2.25 mA
Timer ..... 2 s, 3 s, 5 s, 10 s, 30 s, 60 s, 120 s, 180 s
Output..... Class 1: test socket
Class 2: test socket (L+N) – flash probe connector

8.11 General data

Rated supply voltage .....230 V AC (±10 %, 50 or 60 Hz)
Max. power consumption.....150 VA (without tested appliance)
Maximum appliance current.....16 A
Overvoltage category.....Cat II / 300 V
Protection classification I
Pollution degree.....2
Degree of protection .....IP 50 (closed and locked cover)
Case .....shock proof plastic / portable

Display.....240*128 dots graphic matrix display with backlight

Dimensions (w×h×d).....33.5 cm × 16.0 cm × 33.5 cm
Weight (with standard accessories)...8.4 kg

Memory.....6800 memory locations

RS232 interfaces ..... 1200 bps ÷ 115200 bps, 1 start bit, 8 data bits, 1 stop bit
RS232 connectors .....9-pin subminiature type D, female
Label printer connector.....6-pin DIN connector, female
USB interface .....1200 bps ÷ 115200 bps
USB connector.....type B

Reference conditions
Reference temperature range.....5 °C ÷ 35 °C
Reference humidity range.....35 % ÷ 65 % RH

Operation conditions
Working temperature range .....-10 °C ÷ +50 °C
Maximum relative humidity .....85 % RH (0 °C ÷ 40 °C), non-condensing

Storage conditions
Temperature range .....-10 °C ÷ +60 °C
Maximum relative humidity .....90 % RH (-10 °C ÷ +40 °C)
80 % RH (40 °C ÷ 60 °C)

The error in operating conditions could be at most the error for reference conditions (specified in the manual for each function) +0.2 % of measured value per °C + 1 digit, unless otherwise specified in the manual for particular function.

Fuses
Instrument protection .....2 x T16 A / 250 V, 6.3 × 32 mm

Safety pre-tests
- External voltage between L and PE or N and PE (DC and AC)
- Excessive leakage between L and PE
- Short circuit or too low resistance between L and N

Connectivity (fuse) pre-test
- Appliance not switched on or too high resistance between L and N

Maximum resistance for connectivity pre-test..... 30 kΩ

9 Instrument set and accessories

Standard set of the instrument

- Instrument MI 3305 – OmegaPATPlus / MI 3304 – BetaPATPlus
- Additional bag for accessories inside carrying case
- Test probe (earth bond clip)
- Flash test probe (MI 3305 only)
- PRCD test probe
- Test lead (1.5 m, green)
- Test lead (1.5 m, black)
- Test tip (green)
- Test tip (black)
- Aligator clip (green)
- Aligator clip (black)
- PC software PATLink PRO with RS232 and USB cables
- User manual
- Production verification data

Optional accessories

See the attached sheet for a list of optional accessories that are available on request from your distributor.

Appendix A

24 pre-programmed autotest sequences

No.	*Name*	*Description*
1	**702_Kl_1_Iso**	Testing according to VDE 702. Class 1 appliance. Insulation resistance and substitute leakage current measurements are selected.
2	**702_Kl1_Iso_BLT**	Testing according to VDE 702. Class 1 appliance with isolated accessible conductive parts. Insulation resistance and substitute leakage current measurements are selected.
3	**702_Kl_1_Ia**	Testing according to VDE 702. Class 1 appliance. Differential leakage current measurement is selected.
4	**702_Kl_1_Ia_BLT**	Testing according to VDE 702. Class 1 appliance with isolated accessible conductive parts. Differential leakage current and touch leakage current measurements are selected.
5	**702_Kl_2_Iso**	Testing according to VDE 702. Class 2 appliance with isolated accessible conductive parts. Insulation resistance and substitute leakage current measurements are selected.
6	**702_Kl_2_Ibs**	Testing according to VDE 702. Class 2 appliance. Touch leakage current measurement is selected.
7	**702_Kl_1_Isola**	Testing according to VDE 702. Class 1 appliance. Insulation resistance and differential leakage current measurements are selected.
8	**702Kl1_IsolaBLT**	Testing according to VDE 702. Class 1 appliance with isolated accessible conductive parts. Insulation resistance, differential leakage current and touche leakage current measurements are selected.
9	**702_Kl_2_Isolbs**	Testing according to VDE 702. Class 2 appliance with isolated accessible conductive parts. Insulation resistance and touch leakage current measurements are selected.
10	**702_Kl_2**	Testing according to VDE 702. Class 2 appliance without any isolated accessible conductive parts.
11	**701_Kl_1_Iso**	Testing according to VDE 701. Class 1 appliance. Insulation resistance and substitute leakage current measurement are selected.
12	**701_Kl1_Iso_BLT**	Testing according to VDE 701. Class 1 appliance with isolated accessible conductive parts. Insulation resistance and substitute leakage current measurements are selected.

24 pre-programmed autotest sequences (cont'd)

No.	*Name*	*Description*
13	**701_Kl_1_Ia**	Testing according to VDE 701. Class 1 appliance. Differential leakage current measurement is selected.
14	**701_Kl_1_Ia_BLT**	Testing according to VDE 701. Class 1 appliance with isolated accessible conductive parts. Differential leakage current and touch leakage current measurements are selected.
15	**701_Kl_2_Iso**	Testing according to VDE 701. Class 2 appliance with isolated accessible conductive parts. Insulation resistance and substitute leakage current measurements are selected.
16	**701_Kl_2_Ibs**	Testing according to VDE 701. Class 1 appliance. Touch leakage current measurement is selected.
17	**701_Kl_1_Isola**	Testing according to VDE 701. Class 1 appliance. Insulation resistance and differential leakage current measurements are selected.
18	**701Kl1_IsolaBLT**	Testing according to VDE 701. Class 1 appliance with isolated accessible conductive parts. Insulation resistance, differential leakage current and touch leakage current measurements are selected.
19	**701_Kl2_Iso_Ibs**	Testing according to VDE 701. Class 2 appliance with isolated accessible conductive parts. Insulation resistance and touch leakage current measurements are selected.
20	**701_Kl_2**	Testing according to VDE 701. Class 2 appliance without any isolated accessible conductive parts.
21	**701_Kl_3_Iso**	Testing according to VDE 701. Class 3 appliance with isolated accessible conductive parts.
22	**702_Kl_3_Iso**	Testing according to VDE 702. Class 3 appliance with isolated accessible conductive parts.
23	**701_Kl_3**	Testing according to VDE 701. Class 3 appliance without any isolated accessible conductive parts.
24	**702_Kl_3**	Testing according to VDE 702. Class 3 appliance without any isolated accessible conductive parts.

24 pre-programmed autotest sequences table

Autotest shortcut code		01	02	03	04
		702_Kl_1_Iso	**702_Kl1_Iso_BLT**	**702_Kl_1_Ia**	**702_Kl_1_Ia_BLT**
Visual test		☑	☑	☑	☑
Earth bond	Output	200 mA	200 mA	200 mA	200 mA
	Limit	0.30 Ω	0.30 Ω	0.30 Ω	0.30 Ω
	Time	5 s	5 s	5 s	5 s
Insulation	Output	500 V	500 V	☒	☒
	Limit	1.00 MΩ	1.00 MΩ	☒	☒
	Time	5 s	5 s	☒	☒
Insulation (probe)	Output	☒	500 V	☒	☒
	Limit	☒	2.00 MΩ	☒	☒
	Time	☒	5 s	☒	☒
Sub leakage	Output	40 V	40 V	☒	☒
	Limit	3.50 mA	3.50 mA	☒	☒
	Time	5 s	5 s	☒	☒
Sub leakage (probe)	Output	☒	40 V	☒	☒
	Limit	☒	0.50 mA	☒	☒
	Time	☒	5 s	☒	☒
Differential leakage	Output	☒	☒	230 V	230 V
	Limit	☒	☒	3.50 mA	3.50 mA
	Time	☒	☒	180 s	180 s
Touch leakage	Output	☒	☒	☒	230 V
	Limit	☒	☒	☒	0.50 mA
	Time	☒	☒	☒	180 s
Power	Output	☒	☒	☒	☒
	Limit	☒	☒	☒	☒
	Time	☒	☒	☒	☒
TRMS clamp current	Output	☒	☒	☒	☒
	Limit	☒	☒	☒	☒
	Time	☒	☒	☒	☒
Polarity test		☒	☒	☒	☒

24 pre-programmed autotest sequences table (cont'd)

Autotest shortcut code		05	06	07	08
		702_Kl_2_Iso	**702_Kl_2_Ibs**	**702_Kl_1_Isola**	**702_Kl1_IsolaBLT**
Visual test		☑	☑	☑	☑
Earth bond	Output	☒	☒	200 mA	200 mA
	Limit	☒	☒	0.30 Ω	0.30 Ω
	Time	☒	☒	5 s	5 s
Insulation	Output	☒	☒	500 V	500 V
	Limit	☒	☒	1.00 MΩ	1.00 MΩ
	Time	☒	☒	5 s	5 s
Insulation (probe)	Output	500 V	☒	☒	500 V
	Limit	2.00 MΩ	☒	☒	2.00 MΩ
	Time	5 s	☒	☒	5 s
Sub leakage	Output	☒	☒	☒	☒
	Limit	☒	☒	☒	☒
	Time	☒	☒	☒	☒
Sub leakage (probe)	Output	40 V	☒	☒	☒
	Limit	0.50 mA	☒	☒	☒
	Time	5 s	☒	☒	☒
Differential leakage	Output	☒	☒	230 V	230 V
	Limit	☒	☒	3.50 mA	3.50 mA
	Time	☒	☒	180 s	180 s
Touch leakage	Output	☒	230 V	☒	230 V
	Limit	☒	0.50 mA	☒	0.50 mA
	Time	☒	180 s	☒	180 s
Power	Output	☒	☒	☒	☒
	Limit	☒	☒	☒	☒
	Time	☒	☒	☒	☒
TRMS clamp current	Output	☒	☒	☒	☒
	Limit	☒	☒	☒	☒
	Time	☒	☒	☒	☒
Polarity test		☒	☒	☒	☒

24 pre-programmed autotest sequences table (cont'd)

Autotest shortcut code		09	10	11	12
		702_Kl_2_Isolbs	702_Kl_2	701_Kl_1_Iso	701_Kl1_Iso_BLT
Visual test		☑	☑	☑	☑
Earth bond	Output	☒	☒	200 mA	200 mA
	Limit	☒	☒	0.30 Ω	0.30 Ω
	Time	☒	☒	5 s	5 s
Insulation	Output	☒	☒	500 V	500 V
	Limit	☒	☒	1.00 MΩ	1.00 MΩ
	Time	☒	☒	5 s	5 s
Insulation (probe)	Output	500 V	☒	☒	500 V
	Limit	2.00 MΩ	☒	☒	2.00 MΩ
	Time	5 s	☒	☒	5 s
Sub leakage	Output	☒	☒	40 V	40 V
	Limit	☒	☒	3.50 mA	3.50 mA
	Time	☒	☒	5 s	5 s
Sub leakage (probe)	Output	☒	☒	☒	40 V
	Limit	☒	☒	☒	0.50 mA
	Time	☒	☒	☒	5 s
Differential leakage	Output	☒	☒	☒	☒
	Limit	☒	☒	☒	☒
	Time	☒	☒	☒	☒
Touch leakage	Output	230 V	☒	☒	☒
	Limit	0.50 mA	☒	☒	☒
	Time	180 s	☒	☒	☒
Power	Output	☒	☒	230 V	230 V
	Limit	☒	☒	☒	☒
	Time	☒	☒	180 s	180 s
TRMS clamp current	Output	☒	☒	☒	☒
	Limit	☒	☒	☒	☒
	Time	☒	☒	☒	☒
Polarity test		☒	☒	☒	☒

24 pre-programmed autotest sequences table (cont'd)

Autotest shortcut code		13	14	15	16
		701_Kl_1_Ia	**701_Kl1_Ia_BLT**	**701_Kl_2_Iso**	**701_Kl_2_Ibs**
Visual test		☑	☑	☑	☑
Earth bond	Output	200 mA	200 mA	☒	☒
	Limit	0.30 Ω	0.30 Ω	☒	☒
	Time	5 s	5 s	☒	☒
Insulation	Output	☒	☒	☒	☒
	Limit	☒	☒	☒	☒
	Time	☒	☒	☒	☒
Insulation (probe)	Output	☒	☒	500 V	☒
	Limit	☒	☒	2.00 MΩ	☒
	Time	☒	☒	5 s	☒
Sub leakage	Output	☒	☒	☒	☒
	Limit	☒	☒	☒	☒
	Time	☒	☒	☒	☒
Sub leakage (probe)	Output	☒	☒	40 V	☒
	Limit	☒	☒	0.50 mA	☒
	Time	☒	☒	5 s	☒
Differential leakage	Output	230 V	230 V	☒	☒
	Limit	3.50 mA	3.50 mA	☒	☒
	Time	180 s	180 s	☒	☒
Touch leakage	Output	☒	230 V	☒	230 V
	Limit	☒	0.50 mA	☒	0.50 mA
	Time	☒	5 s	☒	180 s
Power	Output	230 V	230 V	230 V	230 V
	Limit	☒	☒	☒	☒
	Time	180 s	180 s	180 s	180 s
TRMS clamp current	Output	☒	☒	☒	☒
	Limit	☒	☒	☒	☒
	Time	☒	☒	☒	☒
Polarity test		☒	☒	☒	☒

24 pre-programmed autotest sequences table (cont'd)

Autotest shortcut code		17	18	19	20
		701_Kl1_Isol a	**701Kl1_IsolaBLT**	**701_Kl2_Iso_l bs**	**701_Kl_2**
Visual test		☑	☑	☑	☑
Earth bond	Output	200 mA	200 mA	☒	☒
	Limit	0.30 Ω	0.30 Ω	☒	☒
	Time	5 s	5 s	☒	☒
Insulation	Output	500 V	500 V	☒	☒
	Limit	1.00 MΩ	1.00 MΩ	☒	☒
	Time	5 s	5 s	☒	☒
Insulation (probe)	Output	☒	500 V	500 V	☒
	Limit	☒	2.00 MΩ	2.00 MΩ	☒
	Time	☒	5 s	5 s	☒
Sub leakage	Output	☒	☒	☒	☒
	Limit	☒	☒	☒	☒
	Time	☒	☒	☒	☒
Sub leakage (probe)	Output	☒	☒	☒	☒
	Limit	☒	☒	☒	☒
	Time	☒	☒	☒	☒
Differential leakage	Output	230 V	230 V	☒	☒
	Limit	3.50 mA	3.50 mA	☒	☒
	Time	180 s	180 s	☒	☒
Touch leakage	Output	☒	230 V	230 V	☒
	Limit	☒	0.50 mA	0.50 mA	☒
	Time	☒	180 s	180 s	☒
Power	Output	230 V	230 V	230 V	230 V
	Limit	☒	☒	☒	☒
	Time	180 s	180 s	180 s	180 s
TRMS clamp current	Output	☒	☒	☒	☒
	Limit	☒	☒	☒	☒
	Time	☒	☒	☒	☒
Polarity test		☒	☒	☒	☒

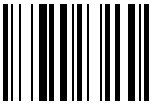
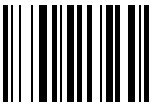
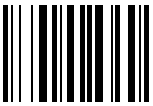
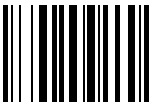
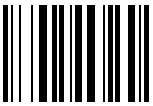
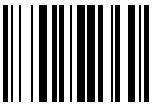
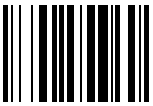
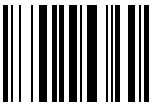
24 pre-programmed autotest sequences table (cont'd)

Autotest shortcut code		21	22	23	24
		701_KI_3_Iso	702_KI_3_Iso	701_KI_3	702_KI_3
Visual test		☑	☑	☑	☑
Earth bond	Output	☒	☒	☒	☒
	Limit	☒	☒	☒	☒
	Time	☒	☒	☒	☒
Insulation	Output	☒	☒	☒	☒
	Limit	☒	☒	☒	☒
	Time	☒	☒	☒	☒
Insulation (probe)	Output	500 V	500 V	☒	☒
	Limit	0.25 MΩ	0.25 MΩ	☒	☒
	Time	5 s	5 s	☒	☒
Sub leakage	Output	☒	☒	☒	☒
	Limit	☒	☒	☒	☒
	Time	☒	☒	☒	☒
Sub leakage (probe)	Output	☒	☒	☒	☒
	Limit	☒	☒	☒	☒
	Time	☒	☒	☒	☒
Differential leakage	Output	☒	☒	☒	☒
	Limit	☒	☒	☒	☒
	Time	☒	☒	☒	☒
Touch leakage	Output	☒	☒	☒	☒
	Limit	☒	☒	☒	☒
	Time	☒	☒	☒	☒
Power	Output	230 V	☒	230 V	☒
	Limit	☒	☒	☒	☒
	Time	180 s	☒	180 s	☒
TRMS current clamp	Output	☒	☒	☒	☒
	Limit	☒	☒	☒	☒
	Time	☒	☒	☒	☒
Polarity test		☒	☒	☒	☒

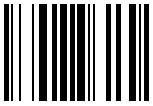
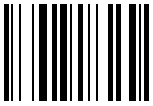
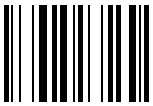
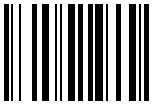
METREL GmbH VDE tester test type card

Code	*Autotest sequence name and descriptions*		*Limits*	*Barcode*
01	**702_Kl _1_Iso**	Testing according to VDE 702. Class 1 appliance. Insulation resistance and substitute leakage current measurements are applicable.	Earth bond: 0.30 Ω Insulation: 1.00 MΩ Sub leakage: 3.50mA	01
02	**702_Kl 1_Iso_ BLT**	Testing according to VDE 702. Class 1 appliance with isolated accessible cinductive parts. Insulation resistance and substitute leakage current measurements are applicable.	Earth bond: 0.30 Ω Insulation: 1.00 MΩ Insulation - S: 2.00 MΩ Sub leakage: 3.50 mA Sub leakage - S: 0.50 mA	02
03	**702_Kl _1_Ia**	Testing according to VDE 702. Class 1 appliance. Prüfung für Differenzstrom wird eingestellt.	Earth bond: 0.30 Ω Leakage: 3.50 mA	03
04	**702_Kl _1_Ia_ BLT**	Testing according to VDE 702. Class 1 appliance with isolated accessible conductive parts. Prüfungen für Differenz- und Berührungsstrom werden eingestellt.	Earth bond: 0.30 Ω Leakage: 3.50 mA Touch leakage: 0.50 mA	04
05	**702_Kl _2_Iso**	Testing according to VDE 702. Class 2 appliance with isolated accessible conductive parts. Insulation resistance and substitute leakage current measurements are applicable.	Insulation - S: 2.00 MΩ Sub leakage - S: 0.50 mA	05
06	**702_Kl _2_Ibs**	Testing according to VDE 702. Class 2 appliance. Prüfung für Berührungsstrom wird eingestellt.	Touch leakage: 0.50 mA	06
07	**702_Kl _1_Isol a**	Testing according to VDE 702. Class 1 appliance. Prüfungen für Isolation und Differenzstrom werden eingestellt.	Earth bond: 0.30 Ω Insulation: 1.00 MΩ Leakage: 3.50 mA	07
08	**702Kl1 _IsolaB LT**	Testing according to VDE 702. Class 1 appliance with isolated accessible conductive parts. Prüfungen für Isolation, Differenz- und Berührungsstrom werden eingestellt.	Earth bond: 0.30 Ω Insulation: 1.00 MΩ Insulation - S: 2.00 MΩ Leakage: 3.50 mA Touch leakage: 0.50 mA	08

METREL GmbH VDE tester test type card (cont'd)

Code	*Autotest sequence name and descriptions*		*Limits*	*Barcode*
09	**702_Kl_2_Isolbs**	Testing according to VDE 702. Class 2 appliance with isolated accessible conductive parts. Prüfungen für Isolation und Berührungsstrom werden eingestellt.	Insulation - S: 2.00 MΩ Touch leakage: 0.50 mA	 09
10	**702_Kl_2**	Testing according to VDE 702. Class 2 appliance without any isolated accessible conductive parts.		 10
11	**701_Kl_1_Iso**	Testing according to VDE 701. Class 1 appliance. Insulation resistance and substitute leakage current measurements are applicable.	Earth bond: 0.30 Ω Insulation: 1.00 MΩ Sub leakage: 3.50 mA	 11
12	**701_Kl1_Iso_BLT**	Prüfung nach VDE 701. Class 1 appliance with isolated accessible conductive parts. Insulation resistance and substitute leakage current measurements are applicable.	Earth bond: 0.30 Ω Insulation: 1.00 MΩ Insulation - S: 2.00 MΩ Sub leakage: 3.50 mA Sub leakage - S: 0.50 mA	 12
13	**701_Kl_1_Ia**	Testing according to VDE 701. Class 1 appliance. Prüfung für Differenzstrom wird eingestellt.	Earth bond: 0.30 Ω Leakage: 3.50 mA	 13
14	**701_Kl_1_Ia_BLT**	Testing according to VDE 701. Class 1 appliance with isolated accessible conductive parts. Prüfungen für Differenz- und Berührungsstrom sind eingestellt.	Earth bond: 0.30 Ω Leakage: 3.50 mA Touch leakage: 0.50 mA	 14
15	**701_Kl_2_Iso**	Testing according to VDE 701. Class 2 appliance with isolated accessible conductive parts. Insulation resistance and substitute leakage current measurements are applicable.	Insulation - S: 2.00 MΩ Sub leakage - S: 0.50 mA	 15
16	**701_Kl_2_Ibs**	Testing according to VDE 701. Class 1 appliance. Prüfung für Berührungsstrom wird eingestellt.	Touch leakage: 0.50 mA	 16

METREL GmbH VDE tester test type card (cont'd)

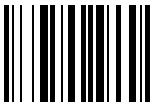
Code	*Autotest sequence name and descriptions*		*Limits*	*Barcode*
17	**701_Kl_1 _Isola**	Testing according to VDE 701. Class 1 appliance. Prüfungen für Isolation und Differenzstrom werden eingestellt.	Earth bond: 0.30 Ω Insulation: 1.00 MΩ Leakage: 3.50 mA	 17
18	**701Kl1_I solaBLT**	Testing according to VDE 701. Class 1 appliance with isolated accessible conductive parts. Prüfungen für Isolation, Differenz- und Berührungsstrom werden eingestellt.	Earth bond: 0.30 Ω Insulation: 1.00 MΩ Insulation - S: 2.00 MΩ Leakage: 3.50 mA Touch leakage: 0.50 mA	 18
19	**701_Kl2_ Iso_Ibs**	Testing according to VDE 701. Class 2 appliance with isolated accessible conductive parts. Prüfungen für Isolation und Berührungsstrom werden eingestellt.	Insulation -S: 2.00 MΩ Touch leakage: 0.50 mA	 19
20	**701_Kl_2**	Testing according to VDE 701. Class 2 appliance without any isolated accessible conductive parts.		 20
21	**701_Kl_3 _Iso**	Testing according to VDE 701. Class 3 appliance with isolated accessible conductive parts.	Insulation - S: 0.25 MΩ	 21
22	**702_Kl_3 _Iso**	Testing according to VDE 702. Class 3 appliance with isolated accessible conductive parts.	Insulation - S: 0.25 MΩ	 22
23	**701_Kl_3**	Testing according to VDE 701. Class 3 appliance without any isolated accessible conductive parts.		 23
24	**702_Kl_3**	Testing according to VDE 702. Class 3 appliance without any isolated accessible conductive parts.		 24

Appendix B

The instrument OmegaGT*Plus* / BetaGT*Plus* supports two barcode formats when printing appliance labels.

Autotest shortcut code and appliance number

Autotest shortcut codes are represented as a two digit code. These autotest codes can also be represented by the barcode.
Using the barcode reader, the instruments can accept autotest shortcut code from barcode label.



01

Autotest shortcut code

Also appliance number can be read from barcode label.

Single / double barcode system

If single barcode system is selected in the instrument, only appliance name is printed out as a barcode on appliance barcode label.
When double barcode system is selected in the instrumen, both autotest shortcut code and appliance name are printed out as a barcode on appliance barcode label.

1 tag, barcode system: single (top label)
1 tag, barcode system: double (bottom label)

2 tags, barcode system: double

2 tags, barcode system: single

Examples of appliance labels

01	Autotest shortcut code
$	Separator
4455821981	Appliance number

Refer to chapter ***3.9.6 Instrument settings*** for barcode system selection.

Notes:

- Special character »$« between autotest shortcut code and appliance name (ID number) is used to distinguish shortcut code from appliance name.
- Only appliance ID is printed out on the 2nd appliance label (power supply cord label).