MI 3340 AlphaEE XA
Instruction manual

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METREL®

Distributor:

Manufacturer:

Metrel d.o.o.
Ljubljanska cesta 77
SI-1354 Horjul
e-mail: info@metrel.si
https://www.metrel.si

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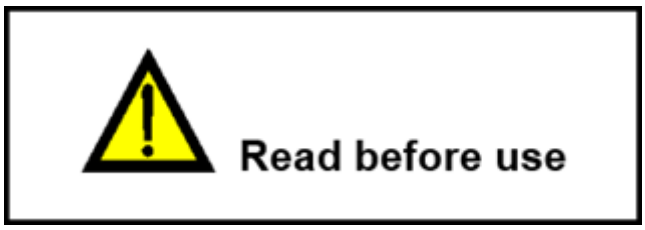


1.1.1 Safety warnings

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

- Read this instruction manual carefully, otherwise use of the instrument may be dangerous for the operator, for the instrument or for the equipment under test!
- Consider warning markings on the instrument!
- If the test equipment is used in manner not specified in this instruction manual the protection provided by the equipment may be impaired!
- Do not use the instrument and accessories if any damage is noticed!
- Regularly check the instrument and accessories for correct functioning to avoid hazard that could occur from misleading results.
- Use only *Metrel* standard or optional test accessories!
- Consider all generally known precautions in order to avoid risk of electric shock while dealing with hazardous voltages!
- Instrument servicing and calibration is allowed to be carried out only by a competent authorized person!
- *Metrel* Auto Sequences® are designed as guidance to tests in order to significantly reduce testing time, improve work scope and increase traceability of the tests performed. *Metrel* assumes no responsibility for any Auto Sequence by any **means. It is the user's responsibility, to check adequacy for the purpose of use of** the selected Auto Sequence. This includes type and number of tests, sequence flow, test parameters and limits.
- Connect only to earthed mains outlets!
- Disconnect all test leads, remove the power supply cable and switch off the instrument before opening the battery compartment.
- In case a fuse has blown refer to the chapter *Maintenance*.

1.1.2 Warnings related to batteries

- Use only batteries provided by the manufacturer.

- Do not attempt to disassemble, crush or puncture the batteries in any way.
- Do not use a damaged battery.
- If a battery has leaking fluids, do not touch any fluids.
- In case of eye contact with fluid, do not rub eyes. Immediately flush eyes thoroughly with water for at least 15 minutes, lifting upper and lower lids, until no evidence of the fluid remains. Seek medical attention.

1.1.3 Warnings related to safety of measurement functions

Leakage current tests (with mains voltage), power test	Load currents higher than 10 A can result in high temperatures of fuse holders! It is advisable not to run tested devices with load currents above 10 A for more than 15 minutes. Recovery period for cooling is required before proceeding with tests! Maximum intermittent duty cycle for measurements with load currents higher than 10 A is 50 %.
Leakage current tests with internal generator (subleakage, leakage-alternative method, leakages with use of Vext)	The voltage and current of the internal voltage source generator is safe but relatively close to the safety limits (> 3.5 mA@ > 50 V). Touching conductive parts with voltage of internal source applied could potentially be harmful. Therefore, consider generally known precautions against risk of electric shock!
Insulation resistance tests	Do not touch the test object during the measurement or before it is fully discharged! Risk of electric shock!
Enhanced TRMS test	The Enhanced TRMS test is intended to measure voltages and loop resistance on mains sockets. With this test it is not possible to evaluate the appropriateness of safety measures of the tested socket. For example, this test can not disclose if phase voltage is accidentally connected to the PE terminal. For testing the appropriateness of safety measures according to standards dedicated installation testers should be used.

1.1.4 Markings on the instrument

	Read the Instruction manual with special care to safety operation«. The symbol requires an action!
	Mark on your equipment certifies that it meets requirements of all subjected EU regulations.
	Mark on your equipment certifies that it meets requirements of all subjected UK regulations.

This equipment should be recycled as electronic waste.

1.1.5 Note related to measurement procedure

- In general, the procedure for measurement consists of the following steps in exact order.
  1. Select measurement function
  2. Connect test leads / accessories to the test instrument and to the device under test
  3. Start and stop the measurement
  4. Disconnect device under test from the test instrument

1.1.6 General notes

- LCD screenshots in this document are informative only. Screens on the instrument may be slightly different.
- *Metrel* reserve the right to make technical modifications without notice as part of the further development of the product.

1.2 Battery and charging of Li-ion battery pack

1.2.1 Battery and charging characteristics

Battery type	18650T22A2S2P
Rated capacity	4400 mAh (type: 18650T22A2S2P)
Typical charging time	3 hours (type: 18650T22A2S2P)

1.2.2 Li – ion battery pack guidelines

Li – ion rechargeable battery pack requires routine maintenance and care in their use and handling. Read and follow the guidelines in this Instruction manual to safely use Li – ion battery pack and achieve the maximum battery life cycles.
Do not leave batteries unused for extended periods of time – more than 6 months (self – discharge). Rechargeable Li – ion battery pack has a limited life and will gradually lose their capacity to hold a charge. As the battery loses capacity, the length of time it will power the product decreases.
Storage:

- Charge or discharge the instruments battery pack to approximately 50% of capacity before storage.

- Charge the instrument battery pack to approximately 50% of capacity at least once every 6 months.

1.3 Power management

1.3.1 Testing 230 V electrical equipment

230 V equipment can be fully tested, except if testing in IT or CT supply system.
See *Appendix F – Testing in IT and CT supply systems* for limitations.

1.3.2 Testing 110 V electrical equipment

Support for testing of 110 V equipment depends on instrument's profile.
See *Appendix B – Profile Notes* for more information.

1.4 Standards applied

The instrument is manufactured and tested according to the following regulations, listed below.

Electromagnetic compatibility (EMC)

EN 61326-1	Electrical equipment for measurement, control and laboratory use - EMC requirements – Part 1: General requirements
EN 61326 - 2-2	Electrical equipment for measurement, control and laboratory use - EMC requirements – Part 2-2: Particular requirements - Test configurations, operational conditions and performance criteria for portable test, measuring and monitoring equipment used in low-voltage distribution systems

Safety (LVD)

EN 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements
EN 61010-2-030	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 2-030: Particular requirements for testing and measuring circuits
EN 61010-031	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 031: Safety requirements for hand-held probe assemblies for electrical measurement and test
EN 61010-2-032	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 2-032: Particular requirements for hand-held and hand-manipulated current sensors for electrical test and measurement

EN 61557	Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. – Equipment for testing, measuring or monitoring of protective measures Instrument complies with all relevant parts of EN 61557 standards.

Functionality

Code of Practice	Household and similar electrical appliances
EN 50699	Recurrent Test of Electrical Equipment
EN 50678	General procedure for verifying the effectiveness of the protective measures of electrical equipment after repair
IEC/EN 62368-1	Audio/video, information and communication technology equipment - Part 1: Safety requirements
NEN 3140	Operation of electrical installations – Low voltage
AS/NZS 3760	In-service safety inspection and testing of electrical equipment
IEC/EN 62752	In-cable control and protection device for mode 2 charging of electric road vehicles (IC-CPD)
IEC/EN 61851-1	Electric vehicle conductive charging system - Part 1: General requirements

2 Instrument set and accessories

2.1 Standard set of the instrument

- Instrument MI 3340 AlphaEE XA
- A 1493 Power cable, 3 x 1.5 mm^2, 2 m, CAT II 300 V, 2 pcs
- A 1340 Test lead, Black, 2.5 mm^2, 1.5 m, CAT II 1000 V, CAT III 600 V, 1 pc
- A 1014 Test probe, Black, CAT III 1000 V, 1 pc
- A 1013 Crocodile clip, Black, CAT III 1000 V, 1 pc
- A 1271 Soft padded carrying bag
- A 1727 USB cable, 1 m
- Calibration certificate
- Short form instruction manual (Quick Guide)
- SW 1201 Metrel ES Manager*

*SW 1201 Metrel ES Manager and all documentation can be downloaded free of charge from Metrel Web server (*https://www.metrel.si/en/downloads/*) or Metrel Documentation center (*https://doc.metrel.si/*).

2.2 Optional accessories

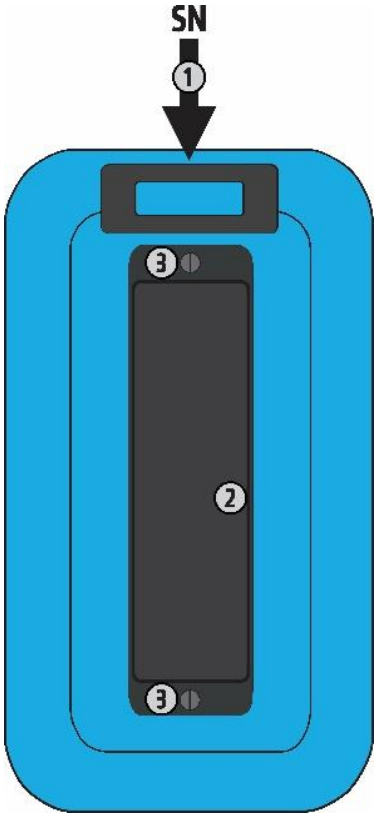
For a list of optional accessories, approved with this test instrument, visit *www.metrel.si*.

3 Instrument description

3.1 **Front panel**

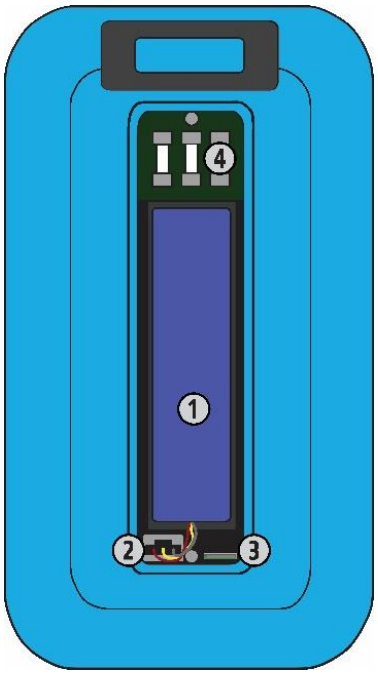
1	Mains supply connector
2	Mains test socket
3	IEC test connector
4	PE, COM / Clamp terminal
5	LN / Clamp terminal
6	P/S (probe), V terminal
7	USB communication port
8	Colour TFT display with touch screen
9	Pass / fail LED bar
10	Set of keys (for details, see chapter *General meaning of keys*)

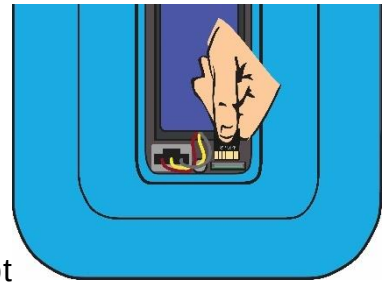
3.2 Bottom side



1	Serial number label
2	Battery / fuse compartment cover with information label
3	Battery / fuse compartment cover screws

3.2.1 Battery / fuse compartment

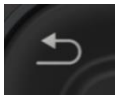
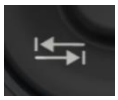
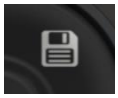


1	Li-ion battery pack
2	Battery connector
3	 Micro SD card slot
4	F1, F2, F3 fuses (for details, see chapter *Fuses*)

4 Instrument operation

The instrument can be manipulated via a keypad or touch screen.

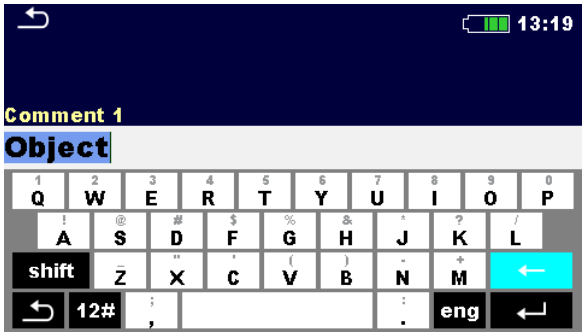
4.1 General meaning of keys

	Cursor keys are used to: • Select appropriate option. • Left, right, up, down. • In some functions: page up, page down.
	RUN key is used to: • Confirm selected option. • Start and stop measurements.
	Escape key is used to: • Return to previous menu without changes. • Abort measurements.
	Option key is used to: • Expand column in control panel. • Show detailed view of options.
	Save key is used to: • store test results.
	General Settings key is used to: • enter General Settings menu.
	On / Off key is used to: • switch On / Off the instrument; • switch Off and reset the instrument if pressed and held for 5 s.
	Shortcut keys for immediate access to the Memory Organizer, Auto Sequences® menu and Single Tests menu

4.2 General meaning of touch gestures

	Tap (briefly touch surface with fingertip) is used to: • Select appropriate option. • Confirm selected option. • Start and stop measurements.
	Swipe (press, move, lift) up/ down is used to: • Scroll content in same level. • Navigate between views in same level.
long 	Long press (touch surface with fingertip for at least 1 s) is used to: • Select additional keys (virtual keyboard).
	Tap Escape icon is used to: • Return to previous menu without changes. • Abort / stop measurements.

4.3 Virtual keyboard



Note

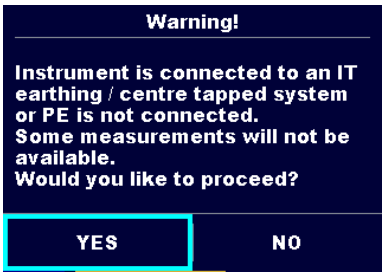
- If Backspace is held for 2 s, all characters will be selected.
- Set English, Greek, Russian, Hebrew character set: eng, GR, RU, HEB.

Hint

Long press on some keys opens additional keys.

4.4 Safety checks, symbols, messages

At start up and during operation the instrument performs various safety checks to ensure safety and to prevent any damage. If a safety check fails, an appropriate warning message will be displayed and safety measures will be taken.

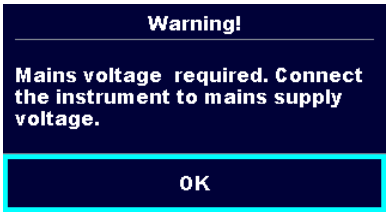


Supply voltage warning I

- No earth connection.
- Instrument is connected to an IT earthing system.

YES: continue normally, NO: continue in a limited mode (measurements are disabled).

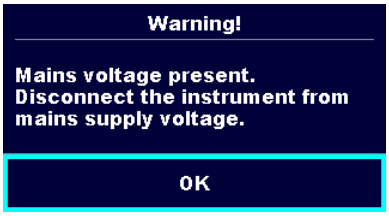
WARNING
The instrument must be earthed properly to work safely.



Supply voltage warning II

Instrument must be connected to mains supply voltage for this test.

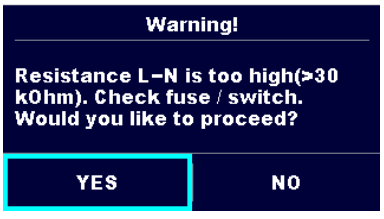
The measurement was cancelled.



Supply voltage warning III

Instrument must be disconnected from mains supply voltage for this measurement.

The measurement was cancelled.



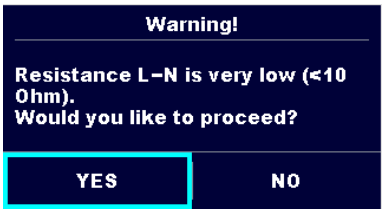
Resistance L-N > 30 kΩ

In pre-test a high input resistance was measured.

- Device under test is not connected or switched on.
- Input fuse of device under test is blown.

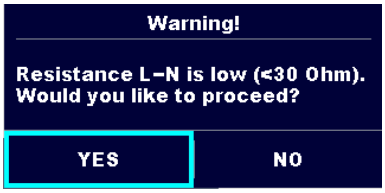
Resistance L-N < 10 Ω

In pre-test a very low resistance of the device under test supply input was measured. This can



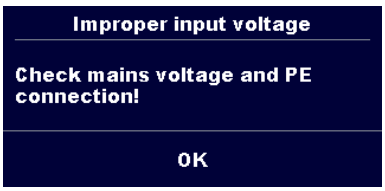
result in a high current after applying power to the device under test. If the too high current is only of short duration (caused by a short inrush current) the test can be performed otherwise not.

Resistance L-N < 30 Ω



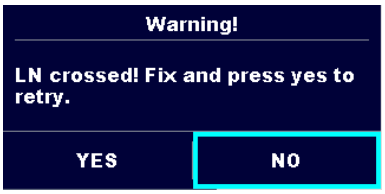
In pre-test a low input resistance of the device under test was measured. This can result in a high current after applying power to the device. If the high current is only of short duration (caused by a short inrush current) the test can be performed, otherwise not.

In 2nd step of Itou+Ifi test the DUT should be disconnected from mains test socket. Disconnect DUT from mains test socket and press OK to continue.

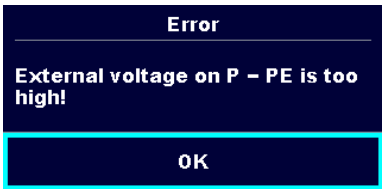


Warning for improper supply voltage condition.

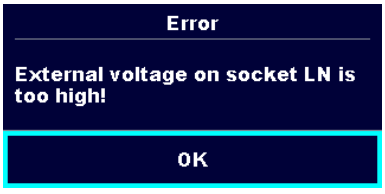
OK: Continue in limited mode (measurements are disabled)



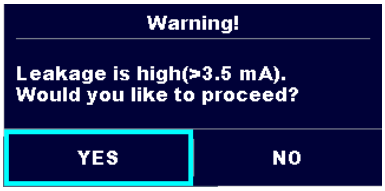
Warning for proper connection in some PRCD measurements. Connection of PRCD's plug must be changed in order to proceed.



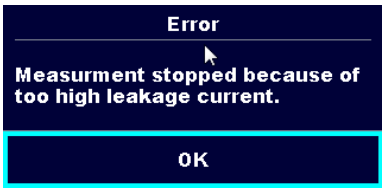
In pre-test a too high external voltage was detected between P and PE terminals. The measurement was cancelled.



In pre-test a too high external voltage was detected between LN and PE terminals. The measurement was cancelled.

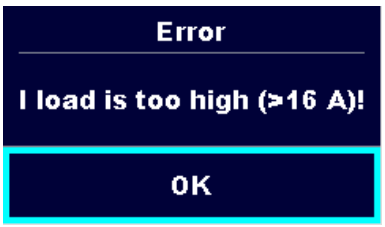


In pre-test a possible high leakage current was detected. It is likely that a dangerous leakage current (higher than 3.5 mA) will flow after applying power to the device under test.

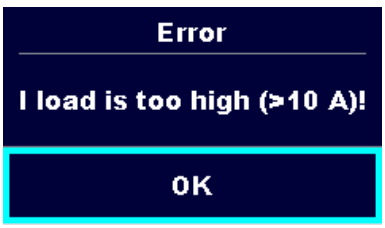


The measured leakage current was higher than 20 mA. Measurement was aborted.

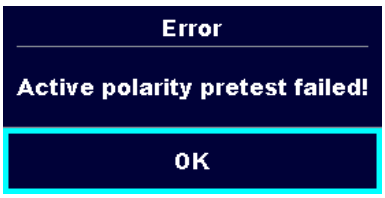
- In pre-test a high overall leakage current was detected. The measurement results could be compromised due to heavy loading of the Vext generator.



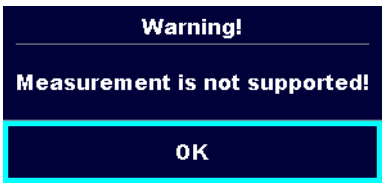
The load current higher than 16 A is detected. Measurement is aborted.



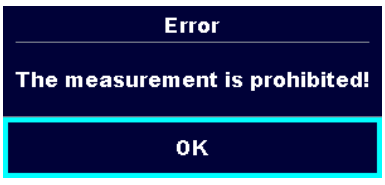
The average load current higher than 10 A over the last 5 min test interval is detected. Measurement is stopped. Recovery period for cooling is required before proceeding with tests!



The polarity pre-test of the cable / PRCD has failed.



The selected test is not supported.



The measurement is prohibited due to safety reasons. Refer to *Appendix F – Testing in IT and CT supply systems*.

RCD tripped-out during the measurement (in RCD/PRCD functions).

	The device under test should be switched on (to ensure that the complete circuit is tested).
	In case of simultaneously measuring of Riso, Riso-S or Isub, Isub-S: if the voltage has dropped because of one measurement the other measurement is also compromised.
	Measurement result Isub, Isub-S is scaled to 110 V.
	WARNING A high voltage is / will be present on the instrument output! (high test voltage, or mains voltage).
	WARNING Instrument is connected to an IT earthing / centre tapped system or PE is not connected. DO NOT USE THE INSTRUMENT IF PE FAULT!
	Test leads resistance in Continuity is not compensated.
	Test leads resistance in Continuity is compensated.
	The measurement is configured for working with 3 phase adapter A 1830.
	Test passed. Result is inside predefined limits.
	Test failed. Result is out of predefined limits.
	Conditions on the input terminals allow starting the measurement; consider other displayed warnings and messages.

	Conditions on the input terminals do not allow starting the measurement, consider displayed warnings and messages.
	Stop the measurement.
	Bluetooth communication active / inactive.

Hint

For some icons more information is displayed if  on icon.

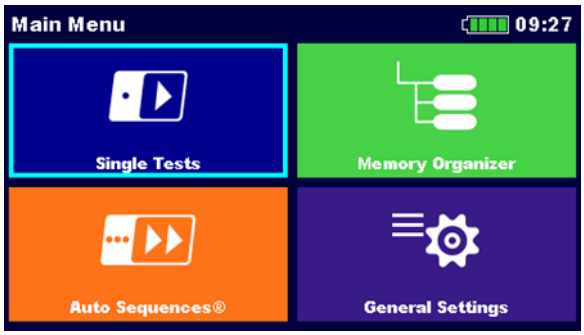
4.4.1 Battery indication

The battery indication indicates the charge condition of battery and connection to a.c. power supply.

	Battery is in good condition.
	Battery is full.
	Low battery. Battery is too weak to guarantee correct result. Recharge the battery.
	Empty battery or no battery.
	Charging in progress (if instrument is connected to mains).
	Charging finished.

4.5 Instrument main menu

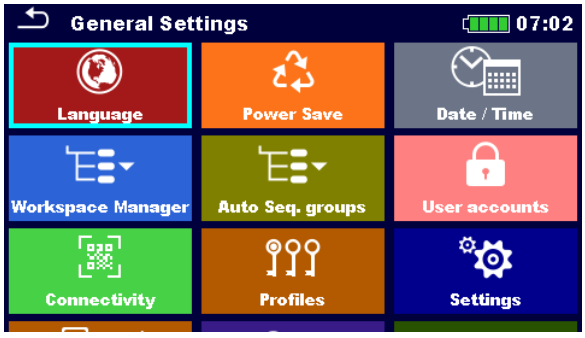
From the instrument Main Menu four main operation menus can be selected.



Single Tests	Menu for selecting single tests
Auto Sequences®	Menu for selecting Auto sequences
Memory Organizer	Menu for working with structured test objects and measurements
General Settings	Menu for setup of the instrument

4.6 General settings menu

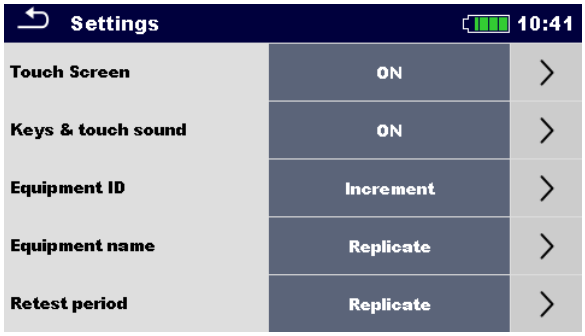
In the General Settings menu general parameters and settings of the instrument can be viewed or set.



Language	Language selection
Power Save	Power saving options
Date / Time	Setting date and time
Workspace Manager	Managing project files
Auto Sequence® groups	Managing lists of Auto Sequences®
User accounts	Managing user accounts
Connectivity	Menu with QR code link for connection to Metrel Cloud app
Profiles	Instrument profiles

	(This setting is visible only if more than one profile is available.)
Settings	Setting different system and measuring parameters
Devices	Setting external devices
Bluetooth init.	Bluetooth initialization
Initial Settings	Factory settings
About	Instrument data

4.6.1 Settings



Touch screen	Set Touch screen on / off.
Keys & touch sound	Set keys touch sound on / off.
Equipment ID	Offered equipment ID in Memory Organizer: • Increment – offered ID will be incremented +1. • Replicate – offered ID will be the same as last used. • Blank – ID will not be offered.
Equipment name	Offered equipment Name in Memory Organizer: • Replicate – name will be the same as last used. • Blank – name will not be offered.
Retest period	Offered retest period in Memory Organizer: • Replicate – offered retest period will be the same as last used. • Blank– retest period will not be offered.
PRCD standard	Selection of appropriate standard for PRCD tests.
RCD standard	Selection of appropriate standard for RCD tests.
Ch_1 clamp type	Setting of current clamp type.
Result	General rule:

	• Worst – the worst result of the measurement will be displayed at the end of test. • Last – the last result will be displayed at the end of test. Notes and exceptions: • In general, the worst result(s) of the main result is considered. Sub-result(s) taken at the same time as the worst case of the main result are displayed. • In the function Leak's & Power the worst case of Idiff and I touch are considered. The Power result measured at the time of worst Idiff is displayed. • In the functions Riso, Riso-S and Isub, Isub-S the worst case of Riso, Riso-S and Isub, Isub-S are considered. The Um result measured at the time of worst Riso is displayed. • For the Power measurement the last result is considered regardless of the Result setting. • Idiff, Ipe, Itouch (Mains polarity = all): Last: worst of all last results of each step is displayed. • Continuity (Start mode = auto): Last: worst of all last results of each step is displayed.
Test mode	The setting applies only when using Auto Sequences. • Standard – Visual and Functional inspection status fields should be set manually. • Expert – Visual and Functional inspection status fields are filled automatically with PASS status.
Auto seq. flow	• Ends if fail – Auto Sequence will end if a measurement / inspection failed. Proceeding tests will be skipped. • Proceeds if fail – Auto Sequence will proceed if fail status of measurement / inspection is detected.
Result View	• All – All individual measured results and details are shown • Standard – Simplified view - one result for normal and reversed mains is shown - test results made at normal condition are not indicated with 'NC'
Load pretest	• ON – DUT connection to test socket is checked before test • OFF – DUT connection pretest is omitted.
Bluetooth	• Enabled • Disabled – Instrument not visible to other Bluetooth devices.
Limit Uc	• Touch voltage limit [Custom, 25 V, 50 V]

4.6.2 Bluetooth initialization

In this menu the Bluetooth module is reset.

4.6.3 Initial Settings

In this menu internal Bluetooth module will be initialized and the instrument settings, measurement parameters and limits will be set to initial (factory) values.

WARNING

Following customized settings will be lost when setting the instruments to initial settings:

- Measurement limits and parameters.
- Global parameters, System settings and Devices in General settings menu.
- Opened Workspace and Auto Sequence® group will be deselected.
- User will be signed out.

Note

Following customized settings will stay:

- Profile settings
- Data in memory (Data in Memory organizer, Workspaces, Auto Sequence® groups and Auto Sequences®)
- User accounts

4.6.4 About

In this menu instrument data (name, serial number, FW (firmware) and HW (hardware) version, profile code, HD (hardware documentation) version, and date of calibration) can be viewed.

Note

- Info of some test adapters is also displayed if they are connected.

4.6.5 User Accounts

The demand to sign in can prevent from unauthorized persons to work with the instrument.
In this menu user accounts can be managed:

- Setting if signing in to work with the instrument is required or not.
- Adding and deleting new users, setting user permissions, user names and passwords.

The user accounts can be managed by the administrator.
Factory set administrator password: ADMIN
It is recommended to change factory set administrator password after first use. If the custom password is forgotten the second administrator password can be used. This password always unlocks the Account manager and is delivered with the instrument.

If a user account is set and the user is signed in the user's name will be stored in memory for each measurement.
Individual users can change their passwords.

4.6.5.1 Signing in

If signing in is demanded the user must enter the password in order to work with the instrument.

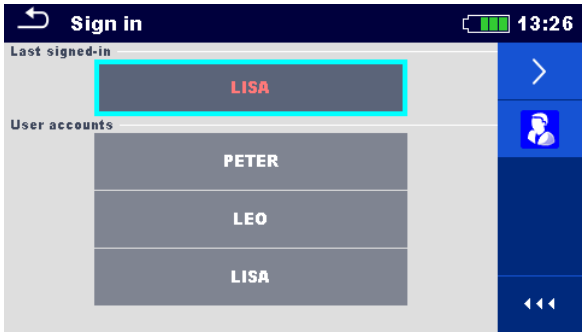
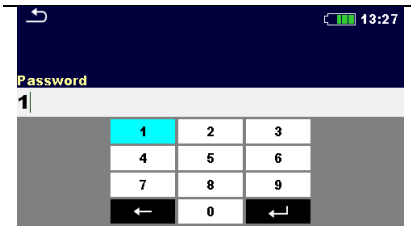


Figure 4.1: Sign in menu

Options

User signing in

	The user should be selected first. The last used user is displayed in the first row.
	Goes to Password entry menu.

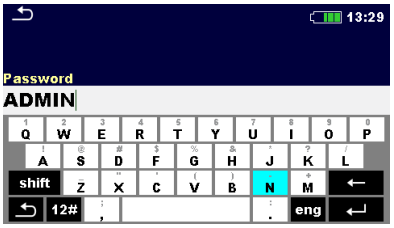


To sign in, the selected user password must be entered and confirmed.

The user password consists of a up to 4 digit number.

Administrator signing in

Enters Account manager menu.



The administrator password must be entered and confirmed first.

Administrator password consists of letters and/or numbers. Letters are case sensitive.

4.6.5.2 Changing user password, signing out

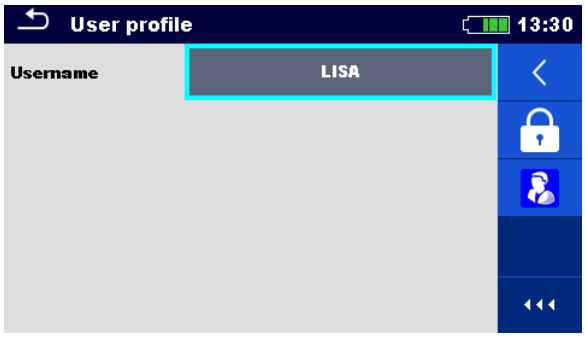
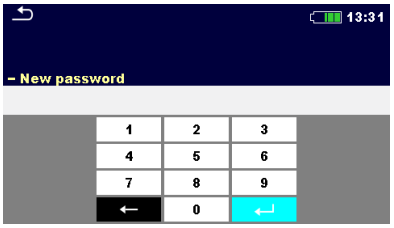


Figure 4.2: User profile menu

Options

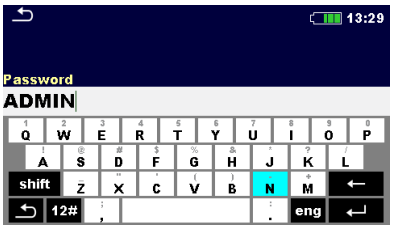
Signs out the set user.

Enters procedure for changing the user's password.



The actual password must be entered first followed by the new password.

Enters the Account manager menu.



The Account manager menu is accessed by selecting Account Manager in Sign in menu or User profile menu. The administrator password must be entered and confirmed first.

The factory set default administrator password is: ADMIN

4.6.5.3 Managing accounts

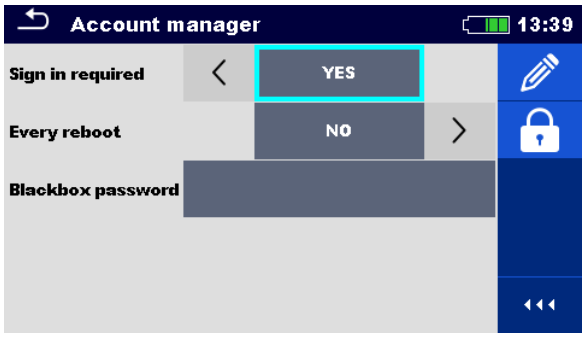


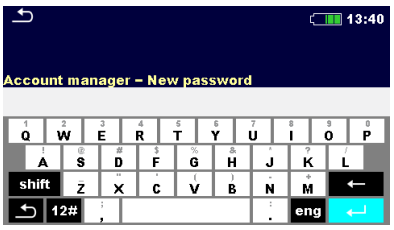
Figure 4.3: Account manager menu

Options

Field for setting if signing in is required to work with the instrument.

Field for setting if signing is required once or at each power on of the instrument.

Enters procedure for changing the administrator password.



The actual password must be entered first followed by the new password.

Enters menu for editing user accounts.

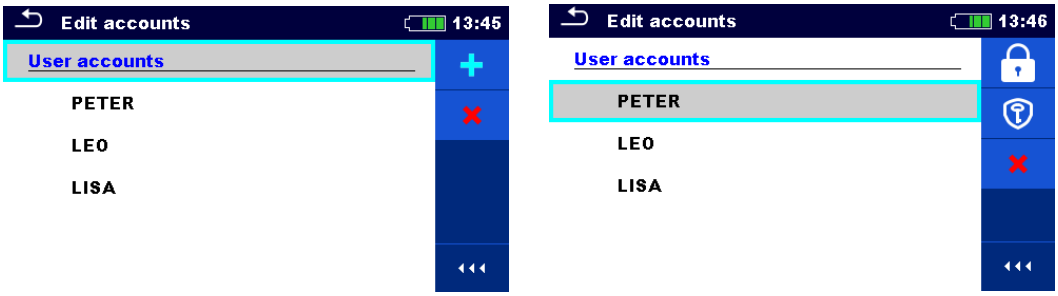


Figure 4.4: Edit accounts menu

Options

	Opens the window for adding a new user account.
	In the Add New window the name and initial password of the new user account are to be set. 'Add' confirms the new user account.
	Changes password of the selected user account.
	Enters menu for setting user permissions
	Deletes all user accounts. Deletes the selected user account.

4.6.5.4 Setting user permissions

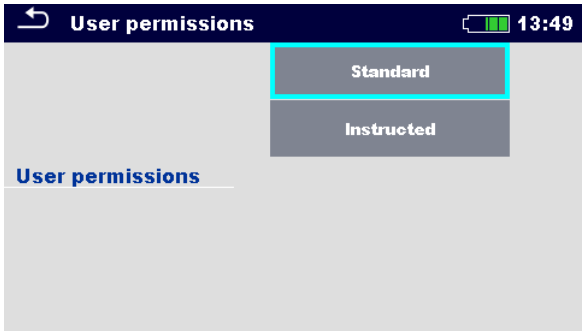


Figure 4.5: User permissions menu

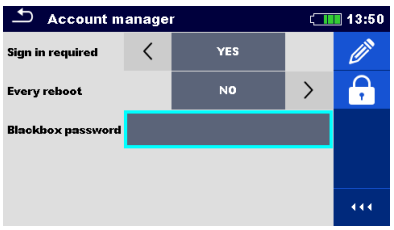
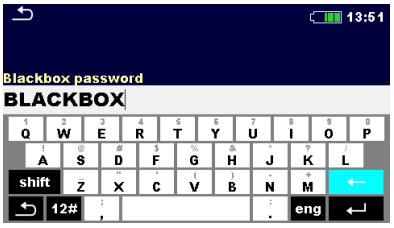
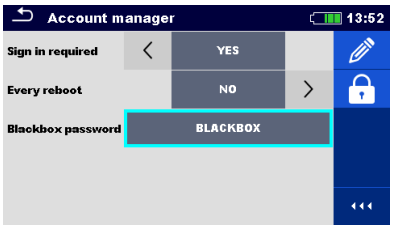
Options

	Options with different user permissions. For more information see *Appendix G – User permissions*.

4.6.5.5 Setting Black-box password

Black-box password can be set by administrator from the Account manager menu. Set Black-box password is valid for all users. Default Black-box password is empty (disabled).

Options

	Add or edit Black-box password. Enter to modify.
	Keyboard for entering new Black-box password is opened. Empty string disables password. Confirm entry.
	Black-box password is changed.

4.6.6 Connectivity

In this menu QR code link for connection to Metrel Cloud App is displayed. Refer to Metrel Cloud help for more information.

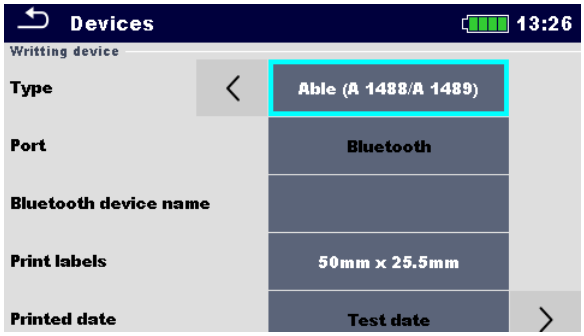
Note

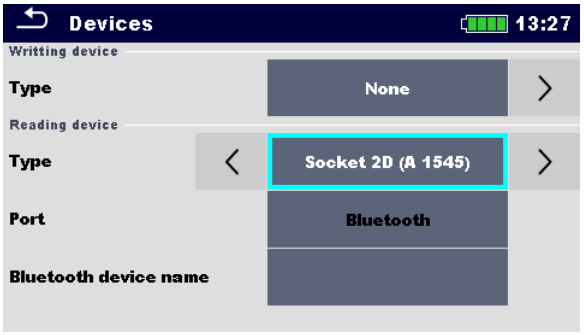
- Metrel Cloud app is available for Android and iOS.

Google Play App Store

4.6.7 Devices

In this menu operation with external devices (printers, scanners) is configured.





Writing devices

Type	Set appropriate writing device [Bluetooth printer].
Port	Set / view communication port of selected writing device.
Bluetooth device name	Go to menu for pairing with selected Bluetooth device.
Print labels	Select label form size. See *Appendix C – Print labels and read NFC tags*.
Printed date	Select date printed on label: [Test date, Retest date].
Auto save	Set simultaneous saving of finished Auto Sequence when label is printed [On print, OFF] See chapter *Auto Sequence result screen*.

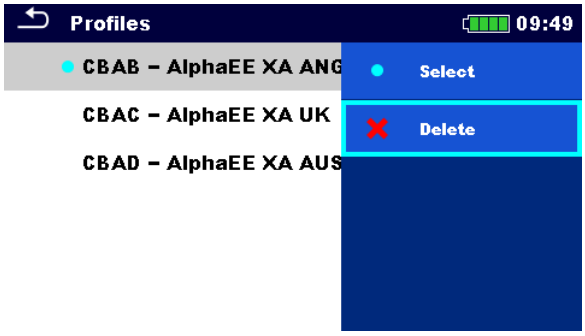
Tag format	Set tag / label format: [PAT, generic]. See *Appendix C – Print labels and read NFC tags*.
Tag type	Select tag type to be printed: [simple, classic, QR]. See *Appendix C – Print labels and read NFC tags*.
Tags	Select number of tags: [1 tag, 2 tags]

Reading devices

Type	Set appropriate reading device (QR or barcode scanner, RFID reader, Android phone...).
Port	Set / view communication port of selected reading device.
Bluetooth device name	Go to menu for pairing with selected Bluetooth device.

4.7 Instrument profiles

The instrument uses specific system and measuring settings in regard to the scope of work or country it is used. These specific settings are stored in instrument profiles. By default, each instrument has at least one profile activated. Proper licence keys must be obtained to add more profiles to the instrument. See *Appendix B_– Profile Notes* for more information about functions specified by profiles.



Select	Select profile
Delete	Delete profile

Note

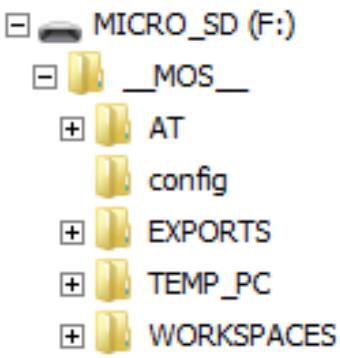
- This menu is visible only if more than one profile is available.

4.8 Workspace Manager

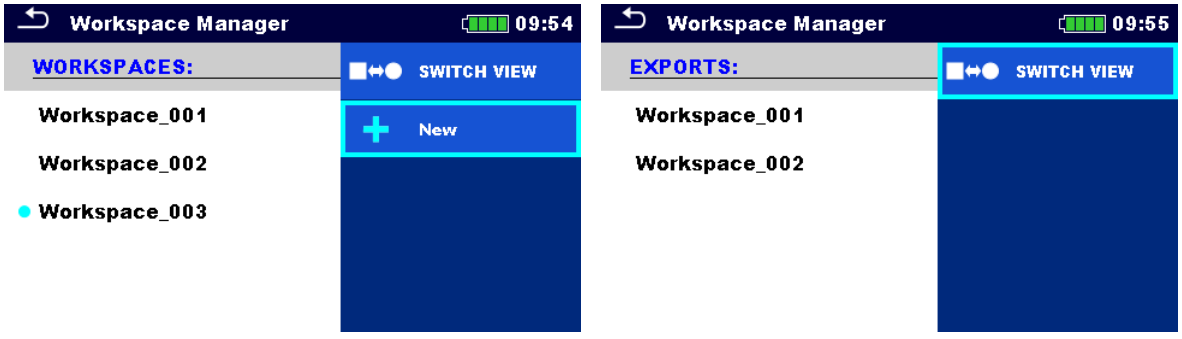
The Workspace Manager is intended to manage with different Workspaces and Exports stored on the microSD card.

4.8.1 Workspaces and Export

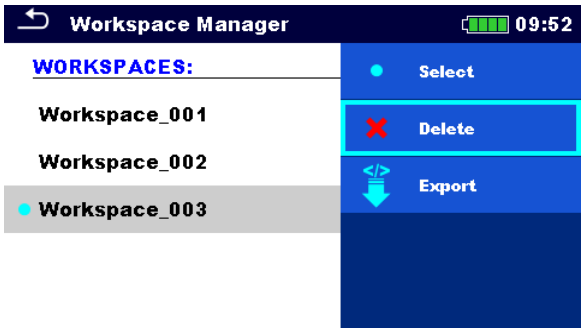
The works can be organized with help of Workspaces and Exports. Both Exports and Workspaces contain all relevant data (measurements, parameters, limits, structure objects) of an individual work.



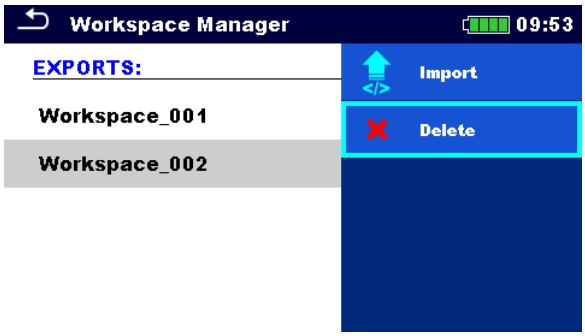
Workspaces are stored on microSD card on directory WORKSPACES, while Exports are stored on directory EXPORTS. Export files can be read by Metrel applications that run on other devices. Exports are suitable for making backups of important works or can be used for storage of works if the removable microSD card is used as a mass storage device. To work on the instrument an Export should be imported first from the list of Exports and converted to a Workspace. To be stored as Export data a Workspace should be exported first from the list of Workspaces and converted to an Export. In the Workspace manager menu Workspaces and Exports are displayed in two separated lists.



Header line (Workspaces, Exports), Switch View	Switch between Exports and Workspaces
Header line (Workspaces), New	Add new Workspace



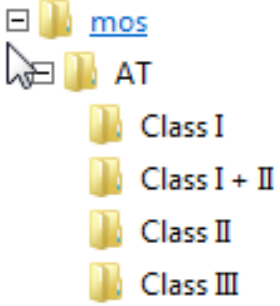
Select	Open selected Workspace in Memory Organizer
Delete	Delete selected Workspace
Export	Export selected Workspace into an Export



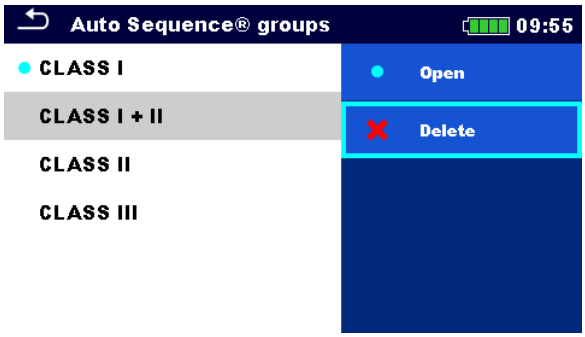
Import	Import selected Export to a Workspace
Delete	Delete selected Export

4.9 Auto Sequence® groups

The Auto Sequences in the instrument can be organized by using lists. In a list a group of similar Auto Sequences is stored. The Auto Sequence® groups menu is intended to manage with different lists. Folders with lists of Auto Sequences are stored in *Root__MOS__\AT* on the microSD card.



In Auto Sequence® groups menu lists of Auto Sequences® are displayed.



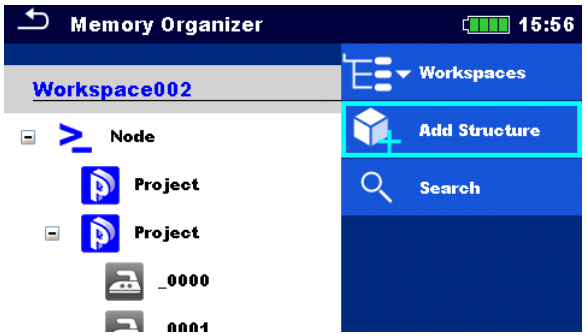
Open	Open the selected Auto Sequence group in the Auto Sequences® main menu.
Delete	Delete the selected Auto Sequence group.

5 Memory Organizer

Memory Organizer is an environment for storing and working with test data. The data is organized in a multilevel tree structure with Structure objects and Measurements. For a list of available structure objects see *Appendix A – Structure objects in AlphaEE XA*.

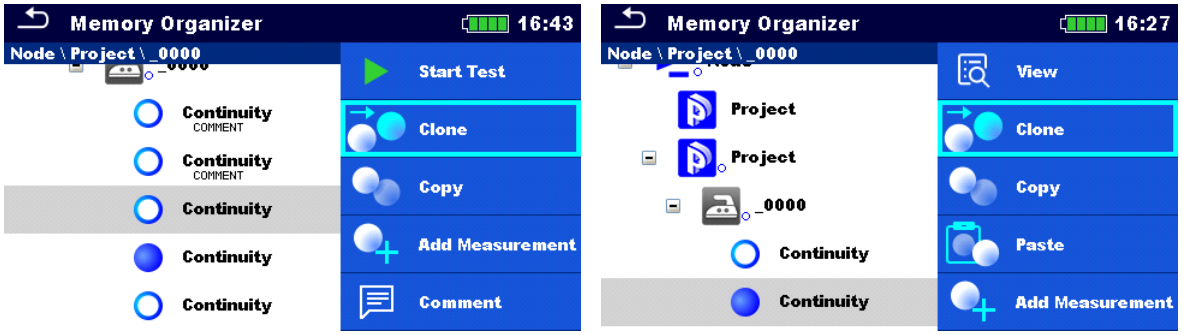
5.1 Operations in Memory Organizer

5.1.1 Operations on Workspace



Header line (Workspace), Workspaces	Go to Workspace Manager from Memory Organizer
Header line (Workspace), Search	Search for structure elements
Node: Node is the highest-level structure element. One Node is a must; others are optional and can be created or deleted freely.	
Add a new node	Header line (Workspace), Add structure

5.1.2 Operations on measurements



Start Test	Start a new measurement
Clone	Copy selected measurement as an empty measurement under the same Structure object
Copy, Paste	Copy a selected measurement as an empty measurement to any location in structure tree
Add	Add an empty measurement
Comment	View / add a comment to the measurement
Delete	Delete a measurement
Retest, Start Test	Run a new measurement or Auto Sequence with same settings as selected measurement

Parameters	View / edit parameters
View	Enter menu for viewing details of Single test or Auto Sequence
Configurator	See chapter *Auto Sequence® Configurator*.

5.1.3 Measurement statuses

Measurement statuses indicate the status of a measurement or a group of measurements in the Memory Organizer.

Statuses of Single tests

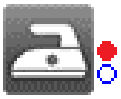
	Passed finished single test with test results
	Failed finished single test with test results
	Finished single test with test results and no status
	Empty single test without test results

Overall statuses of Auto Sequence

	At least one single test in the Auto Sequence passed and no single test failed
	At least one single test in the Auto Sequence failed
	At least one single test in the Auto Sequence was carried out and there were no other passed or failed single tests
	Empty Auto Sequence with empty single tests

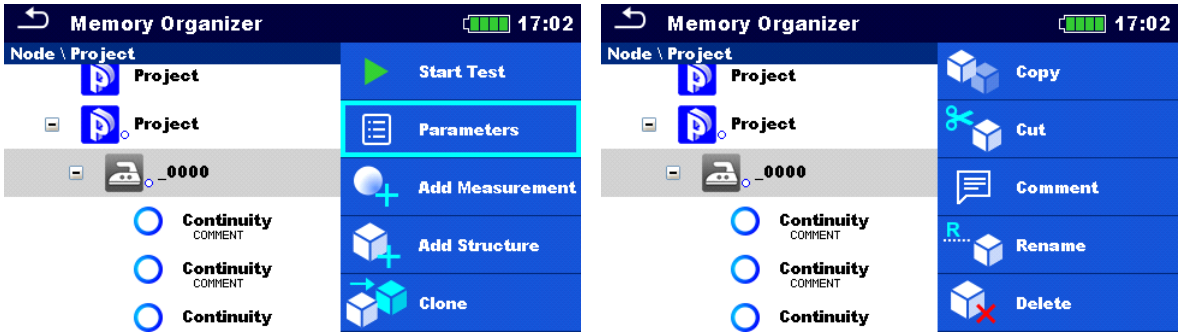
Overall status of measurements under structure elements
Overall status of measurements under each structure element gives a fast information on tests without expanding tree menu.

Options

	There are no measurement result(s) under selected structure object. Measurements should be made.
	One or more measurement result(s) under selected structure object has failed. Not all measurements under selected structure object have been made yet.
	All measurements under selected structure object are completed but one or more measurement result(s) has failed.

	No status indication if all measurement results under each structure element / sub-element have passed or are without measurements.

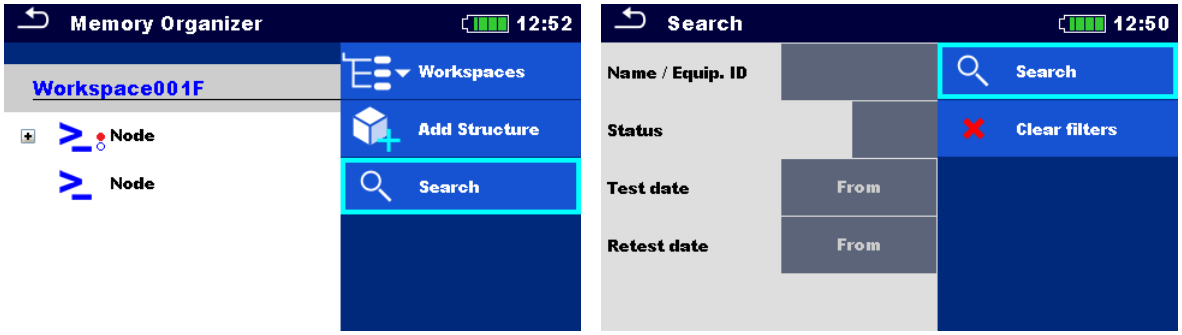
5.1.4 Operations on Structure objects



Start Test	Start a new measurement (proceeds to menus for selection of measurement)
Parameters	View / edit parameters
Clone	Copy selected element as to same level in the structure tree
Copy, Paste	Copy selected element to any allowed location in structure tree
Cut, Paste	Move selected Structure with child items (sub-structures and measurements) to any allowed location in structure tree
Print label	Print / write RFID (if printing device is set) For details, see *Appendix C – Print labels and read NFC tags*.
Add	Add a new empty measurement. Menu for adding new measurement will open
Attachment	View link of attachment
Comment	View/edit/add a comment to the structure element
Rename	Rename the structure element
Delete	Delete the structure element

5.1.5 Searching in Memory Organizer

In Memory organizer it is possible to search for different structure objects and their parameters.



Header line (Workspace), Search	Enter Search menu
Search	Search according to parameter, status...
Clear filters	Clear set filters in Search menu

Operations on found structure objects

Header line (Page x/y), Next Page, Previous Page	Go Page Up / Down
Go to location	Jump to selected location in Memory organizer
Parameters	View/edit parameters
Rename	Rename the found object

Note

Equipment ID, Test date, Retest date refer only to the following structure objects:

- Appliance
- Appliance FD

6 Single tests

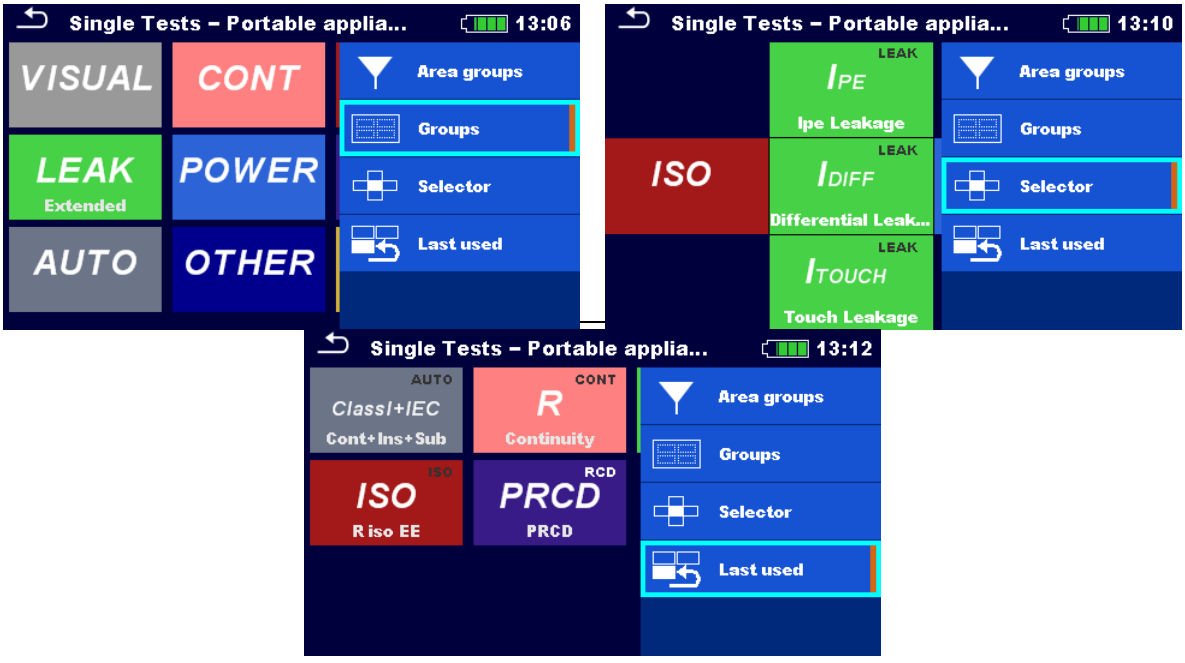
Different modes for selecting single tests are available.

6.1 Selection modes

6.1.1 Area groups

With help of area groups, it is possible to limit the number of offered single tests, according to the field of use.

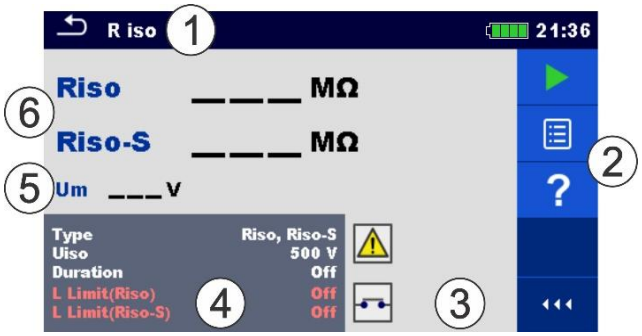
Select Area Group	Select appropriate Area group or All single tests
Groups of single tests, Last used single tests	In selected area group, three views are available.



Groups	View groups, (sub-groups) of available measurements
Selector	This view mode is suited for fast work with the keypad
Last used	View last made measurements
Area groups	Change area group

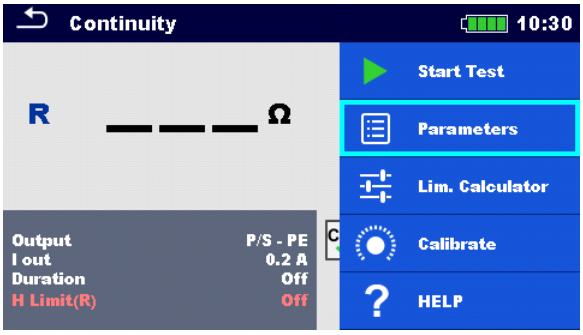
6.2 Single test screens

In the Single test screens main measuring results, sub-results, limits and parameters of the measurement are displayed. In addition, on-line statuses, warnings and other information are displayed.



1	Name of function
2	Options
3	Statuses, infos, warnings
4	Parameters (white) and limits (red)
5	Sub-result
6	Main result

6.2.1 Single test start screen

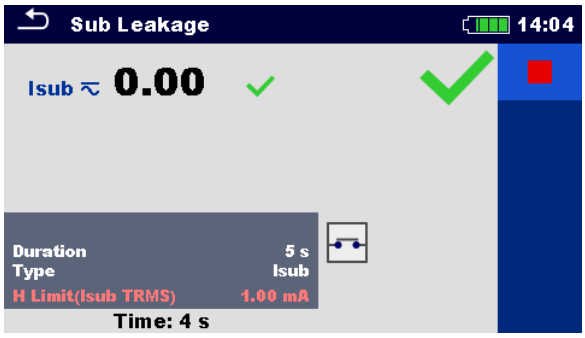


Start test	Start single test
Parameters, or tap on Parameters field	Set parameters/ limits of single test
Help	View help screens

Lim. Calculator, Calibrate: other options are available, depending on the test.
See chapter *Single test measurements* for more information.

Add comments before the test (applicable on some single tests): In the Parameters menu comments can be stored as a part of the single test Parameters, Comment 1, Comment 2.

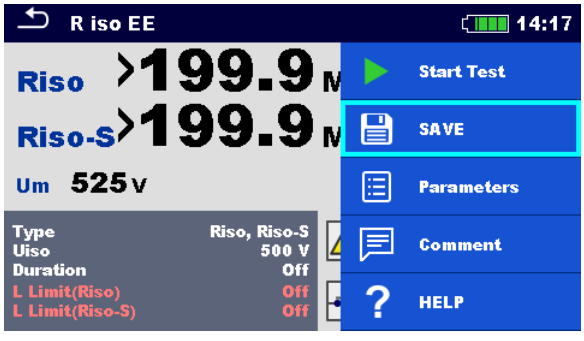
6.2.2 Single test screen during test



	End single test
	Proceed to the next step of a single test
	Reconnect and proceed with the next step of a single test
 , 	Previous, next test screen

Testing procedure (during the test)
Observe the displayed results and statuses
Check for eventual messages, warnings

6.2.3 Single test result screen

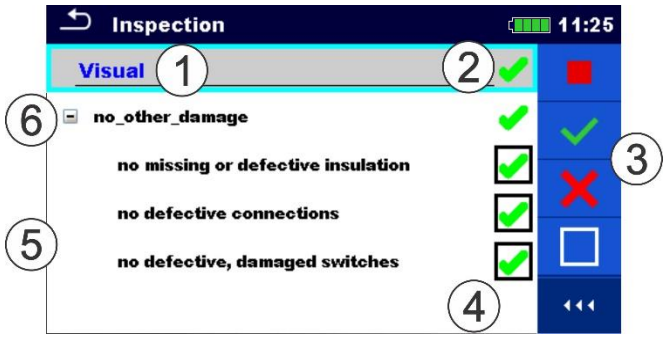


Start test	Start a new single test
Save	Save the result

A new measurement was started from a Structure object in the structure tree	The measurement will be saved under the selected Structure object
A new measurement was started from the Single test main menu	Saving under the last selected Structure object will be offered by default. The user can select another Structure object or create a new Structure object. By pressing the Save key in Memory organizer menu the measurement is saved under selected location.
An empty measurement was selected in Memory Organizer and started	The result(s) will be added to the measurement. The measurement will change its status from 'empty' to 'finished'.
An already carried out measurement was selected in Memory Organizer, viewed and then restarted	A new measurement will be saved under the selected Structure object.
Comment	Add comment to the measurement
Prev / Next	Previous / Next result screen

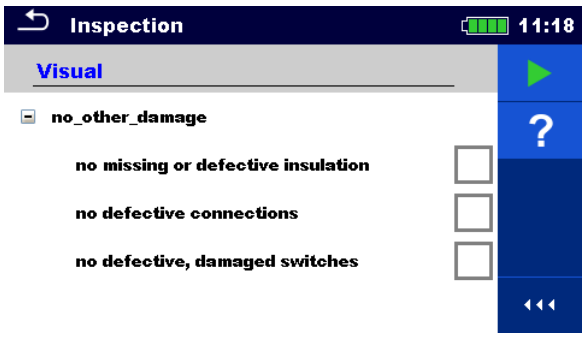
6.3 Single test (inspection) screens

Visual and Functional inspections are a special type of single tests. Items to be visually or functionally checked are displayed. Appropriate statuses can be applied.



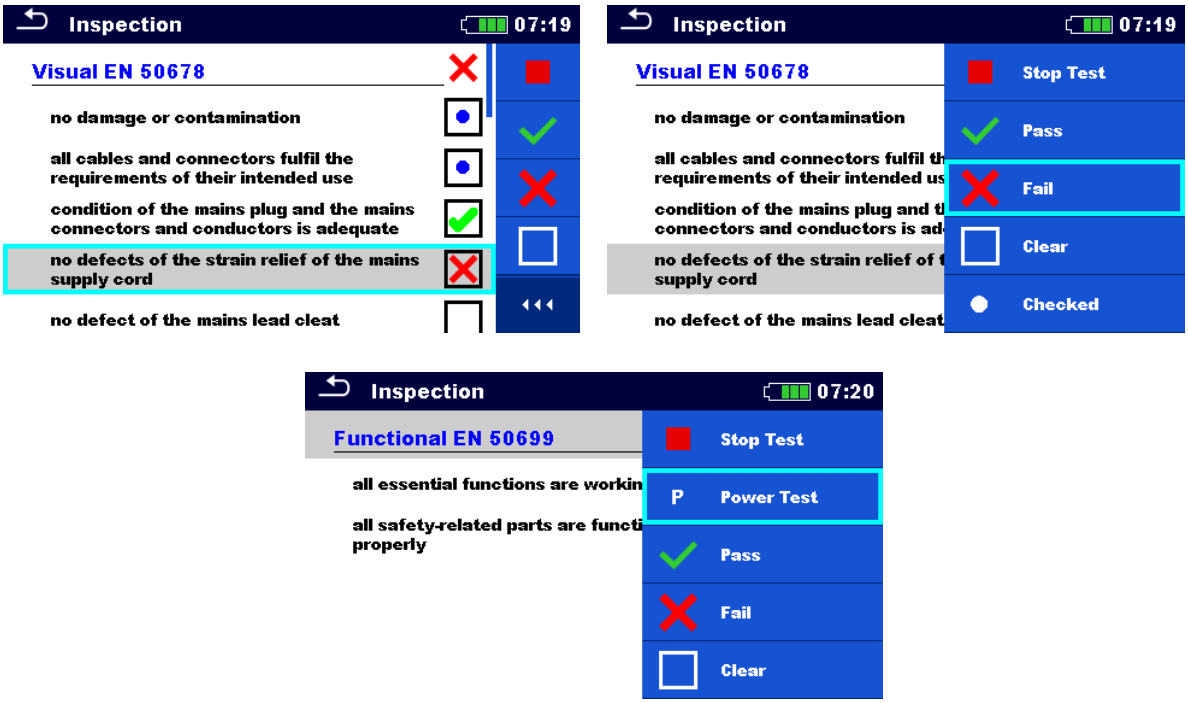
1	Selected inspection
2	Overall status
3	Options
4	Status fields
5	Child items
6	Item

6.3.1 Single test (inspection) start screen



Start test	Start the inspection
Help	View help screens

6.3.2 Single test (Inspection) screen during test



Header line (name of inspection), apply Pass or Fail or Checked or Clear	Apply or clear the overall status to complete inspection
Select group of items, apply Pass or Fail or Checked or Clear	Apply or clear the status of group of items

Select items, apply Pass or Fail or Checked or Clear	Apply or clear the status of an individual item
Power Test	Power is applied to the mains test socket to power up the tested equipment during a functional inspection.

Hint

Tap on ☐ or use  key to set status.

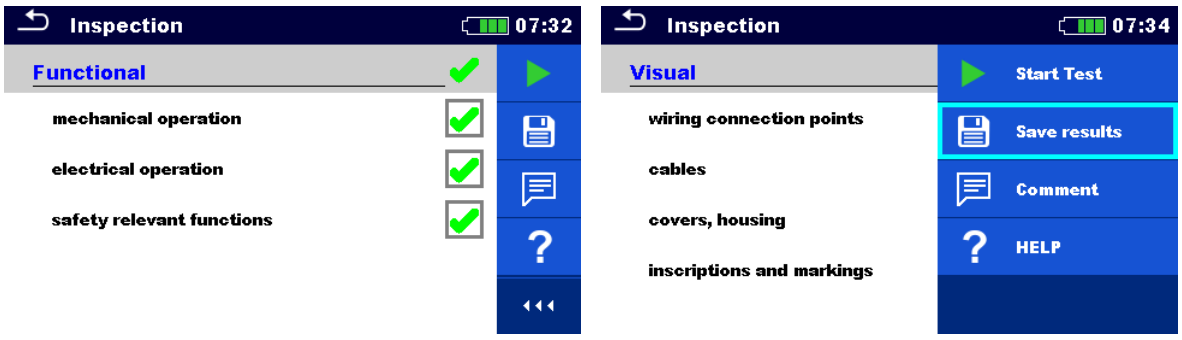
Rules for automatic applying of statuses

The parent items will automatically get a status on base of statuses in child items	• A fail status has highest priority. A fail status for any item will result in a fail status in all parent items and an overall fail result. • If there is no fail status in child items the parent item will get a status only if all child items have a status. • Pass status has priority over checked status.
The child items will automatically get a status on base of status in the parent item	All child items will get the same status as applied to the parent item.

Note

- Inspections and even inspection items inside one inspection can have different status types. For example, some inspections don't have the 'checked' status.
- Only inspections with an overall status can be saved.

6.3.3 Single test (Inspection) result screen



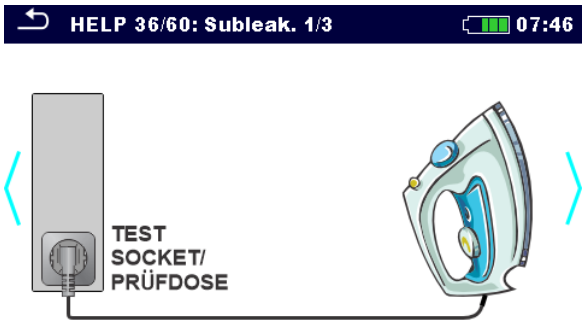
Start test	Start a new inspection

Save results	Save the result
Comment	Add comment to the inspection
Help	View help screens

A new inspection was started from a Structure object in the structure tree	The inspection will be saved under the selected Structure object.
A new inspection was started from the Single test main menu	Saving under the last selected Structure object will be offered by default. The user can select another Structure object or create a new Structure object. By pressing the Save key in Memory organizer menu the inspection is saved under selected location.
An empty inspection was selected in Memory Organizer and started	The result(s) will be added to the inspection. The inspection will change its status from 'empty' to 'finished'.
An already carried out inspection was selected from Memory Organizer, viewed and then restarted	A new inspection will be saved under the selected Structure object.

6.3.4 Help screens

Help screens contain diagrams for proper connection of the instrument.



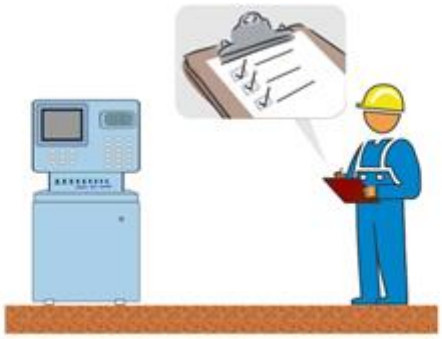
Help	Open help screen
on ,	Go to other help screens

6.4 Single test measurements

6.4.1 Visual inspection

Test results / sub-results
Pass, Fail, Checked

Test circuit



6.4.2 Continuity

Test results / sub-results	
R	Resistance

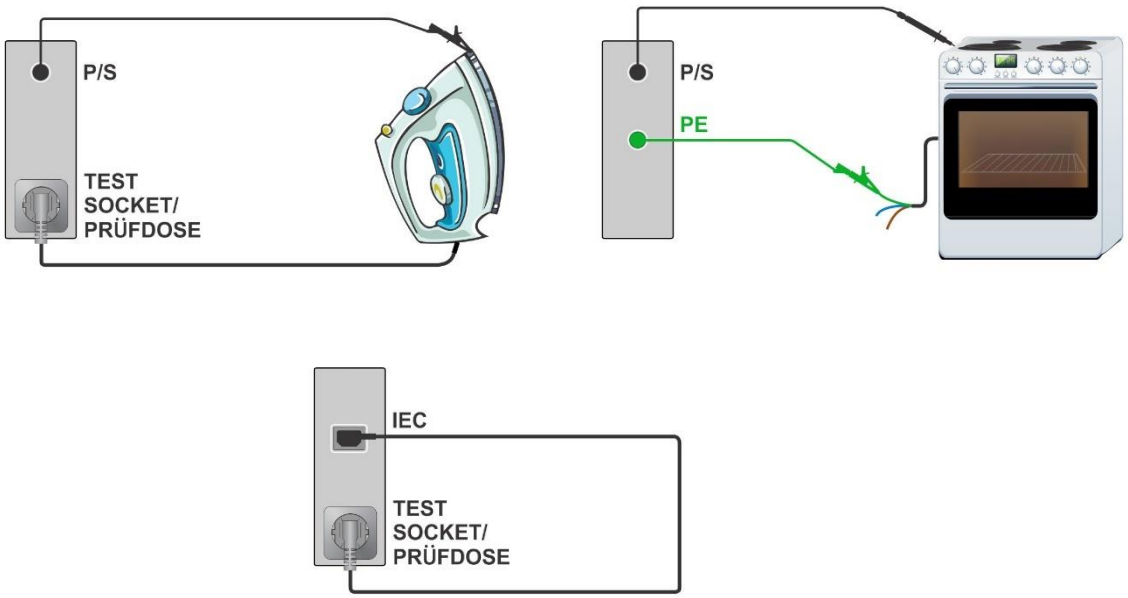
Test parameters	
Output	Output: [P/S – PE, MS_PE – IEC_PE]
Test current	I out: [0.2 A]
Start mode[1]	Start mode: [Manual, Auto]
Duration	Duration: [Off, 2 s ... 180 s]

[1)] Parameter is available only if Output: P/S – PE is selected.

Test limits	
Limit (R)	H Limit (R): [Off, Custom, 0.01 Ω ... 9 Ω]

Additional options	
Calibrate	Calibrate – see chapter *Compensation of test lead(s) / IEC test cable resistance*.
Limit Calculator	Lim. Calculator see chapter *Limit calculator*.

Test circuits



Measurement procedure (Start mode = Auto)

In this mode, multiple measurements can be taken at different test points within a single test.

1. Start the test:
   The instrument checks for a low resistance connection.
2. Connect to the first test point:
   The instrument will automatically detect the low resistance connection and begin measuring. A beeping buzzer indicates that the measurement is in progress. Measuring results are displayed.
3. Disconnect from the first test point:
   The instrument will detect the disconnection and end the measurement. Displayed result will be cleared and beeping buzzer sound will end. Last buzzer sound will indicate status of the ended measurement for the first test point:
   - Pass (two tone sound)
   - Fail (long single-tone beep).

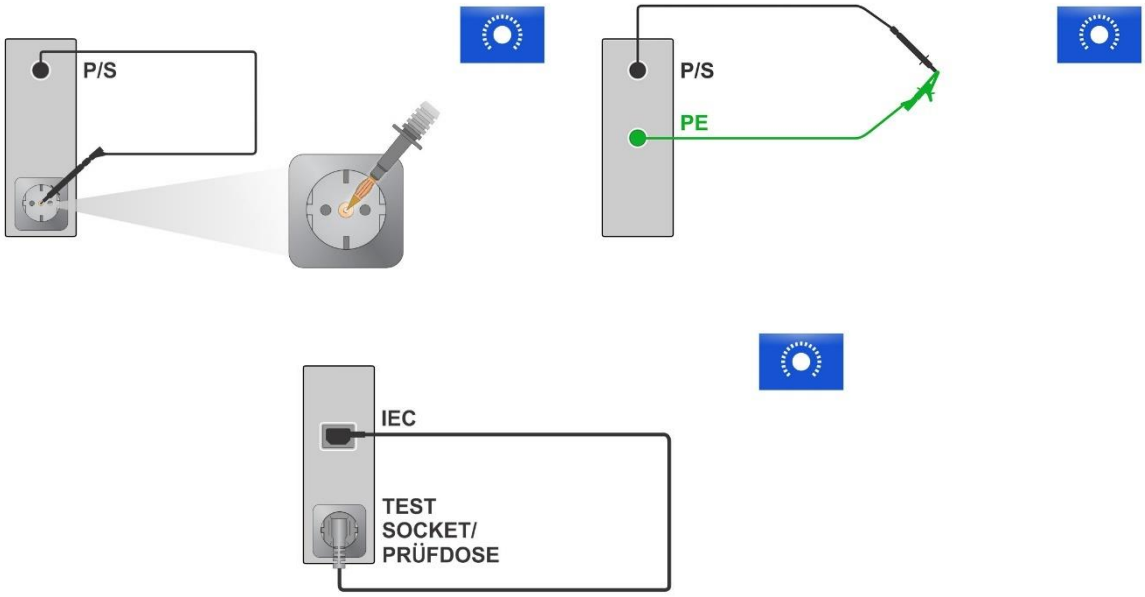
   The instrument will then check for a low resistance connection again.
4. Connect to the next test point.
   The instrument will automatically detect the low resistance connection of the next test point and begin measuring. A beeping buzzer again indicates that the new measurement is in progress. New measuring results are displayed. When disconnection is detected, measurement will end.
5. This procedure can be repeated for all test points, until the test is stopped manually or by the timer. The worst result, or the worst of all last results at each test point is displayed as a final test result. Final status is also calculated accordingly.

6.4.2.1 Compensation of test lead(s) / IEC test cable resistance

Resistance of test lead(s) and cables can be compensated. Compensation is possible in following functions:

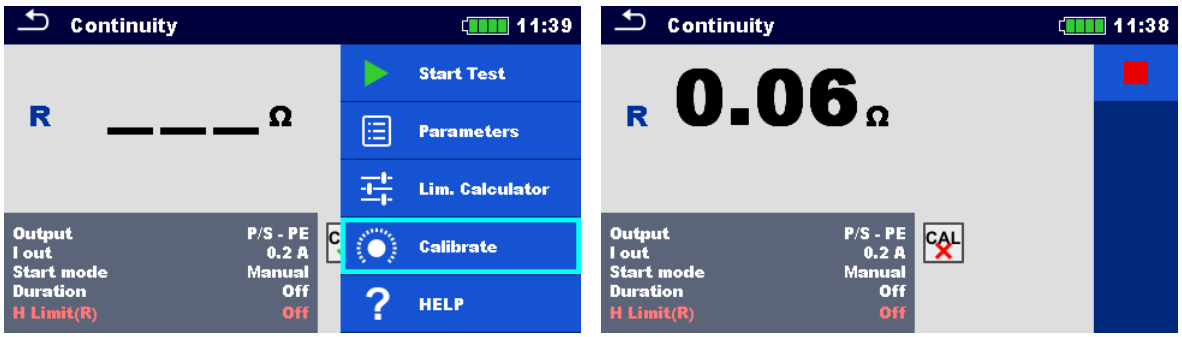
- Continuity (Output = P/S – PE, MS_PE – IEC_PE)
- PE_conductor (PRCD)
- PE_conductor (EV RCD)

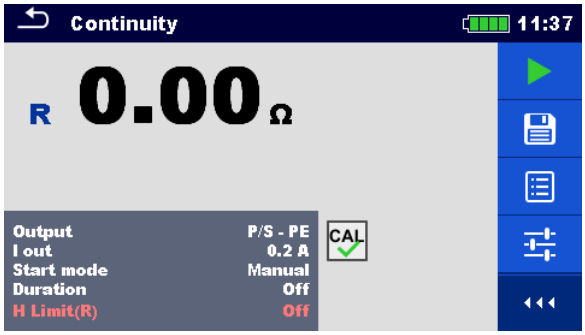
Connection for compensating the resistance of test lead(s) / IEC test cable



Compensation of test lead(s) / IEC test cable resistance procedure

Select single test and its parameters.
Connect test lead to the instrument between P/S terminal and PE terminal on test socket or short-circuit test leads connected to P/S and PE banana sockets, or connect IEC test cable between IEC connector and test socket.
Calibrate: Compensate test lead(s) / IEC test cable resistance
Symbol CAL is displayed if the compensation was carried out successfully.





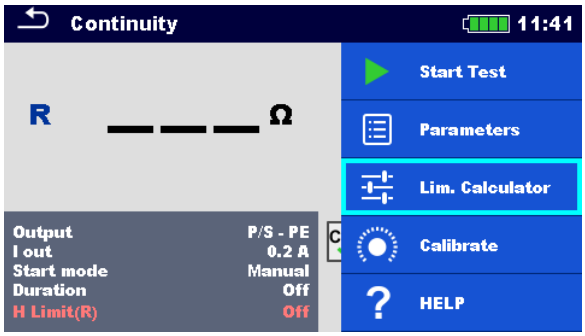
Note

- The compensation value is correct only for the output (P/S terminal – PE terminal on test socket or P/S terminal – PE terminal) at which the calibration was carried out.

Hint

- To reset compensation value, carry out compensation with open leads.

6.4.2.2 Limit calculator



Limit calculator is a tool for determining the resistance high limit.

Open Limit calculator	Lim. Calculator
Define the limit value	Set Limit rule: Length, Cross-section, Custom

Limit rules:

A: EN / CSA ≤ 1.5 mm^2
Resistance limit is set in accordance with the EN 50678 and EN 50699 standards, for cross section areas up to 1.5 mm^2.

L wire length	R Limit [**Ω**]
L <= 5 m	0.3
5 m < L <= 12.5 m	0.4
12.5 m < L <= 20 m	0.5
20 m < L <= 27.5 m	0.6
27.5 m < L <= 35 m	0.7
35 m < L <= 42.5 m	0.8
42.5 m < L <= 50 m	0.9
50 m < L <= 57.5 m	1.0

B: Calculator

Resistance limit is calculated by the formula:

$$R = \rho \frac{L}{A} + 0.1\Omega$$

ρ	Specific resistance of copper 1.68×10^{-8} Ωm
L	Wire length selected from a list (1 m...100 m) or custom numeric entry
A	Wire cross section selected from a list ($0.50\ mm^2$...$16\ mm^2$) or custom numeric entry

C: NEN 3140*

Resistance limit is derived from table on wire length and wire cross-section basis. Table is based on NEN 3140 standard.

	Wire cross-section [mm^2]			
	1.5	2.5	4	6
L wire length	R Limit [**Ω**]			
L <= 2 m	0.22	0.21	0.21	0.21
2 m < L <= 5 m	0.26	0.24	0.22	0.21
5 m < L <= 10 m	0.32	0.27	0.24	0.23
10 m < L <= 15 m	0.38	0,31	0.27	0.24
15 m < L <= 20 m	0.43	0.34	0.29	0.26

20 m < L <= 25 m	0.49	0.38	0.31	0.27
25 m < L <= 30 m	0.55	0.41	0.33	0.29
30 m < L <= 35 m	0.61	0.45	0.35	0.30
35 m < L <= 40 m	0.67	0.48	0.38	0.32
40 m < L <= 45 m	0.73	0.52	0.40	0.33
45 m < L <= 50 m	0.78	0.55	0.42	0.35

*) Not applicable in AUS/NZ and UK versions.

	Wire cross-section [mm²]		
	10	16	25
L wire length	R Limit [**Ω**]		
L <= 2 m	0.20	0.20	0.20
2 m < L <= 5 m	0.21	0.21	0.20
5 m < L <= 10 m	0.22	0.21	0.21
10 m < L <= 15 m	0.23	0.22	0.21
15 m < L <= 20 m	0.24	0.22	0.21
20 m < L <= 25 m	0.24	0.23	0.22
25 m < L <= 30 m	0.25	0.23	0.22
30 m < L <= 35 m	0.26	0.24	0.22
35 m < L <= 40 m	0.27	0.24	0.23
40 m < L <= 45 m	0.28	0.25	0.23
45 m < L <= 50 m	0.29	0.25	0.24

D: Custom
Resistance limit is directly selected from a list (Off, 0.01 Ω ... 0.09 Ω, 0.1 Ω ... 0.9 Ω, 1 Ω ... 9 Ω) or set via keypad (Custom).

6.4.3 Insulation resistance (Riso, Riso-S)

Test results / sub-results

Riso	Insulation resistance
Riso-S	Insulation resistance-S
Um	Test voltage

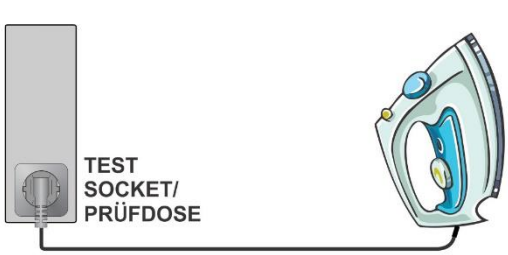
Test parameters

Type of test	Type: [Riso, Riso-S, (Riso, Riso-S)]
Nominal test voltage	Uiso: [50 V, 100 V, 250 V, 500 V]
Duration	Duration: [Off, 2 s ... 180 s]

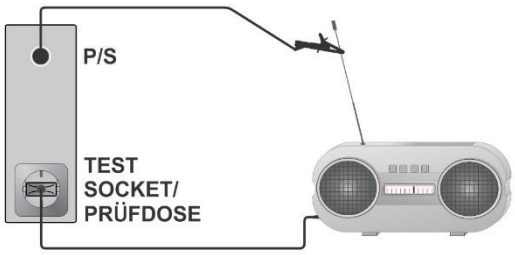
Test limits

Limit (Riso)	L Limit (Riso): [Off, Custom, 0.01 MΩ ... 10.0 MΩ]
Limit (Riso-S)	L Limit (Riso-S): [Off, Custom, 0.1 MΩ ... 10.0 MΩ]

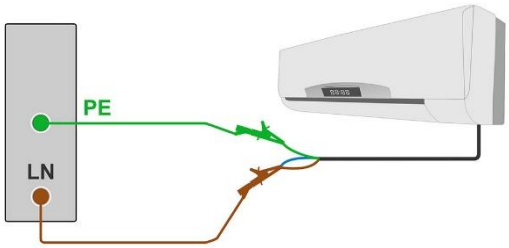
Test circuits



Riso



Riso-S



Riso (fixed installed DUT)

Note

- The current through the P/S probe is also considered in the Riso result.

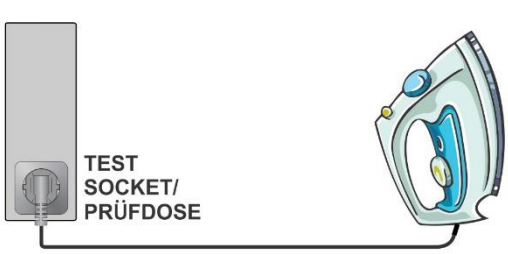
6.4.4 Sub-leakage (Isub, Isub-S)

Test results / sub-results	
Isub (+result)	Sub-leakage current Result [TRMS]
Isub-S (+result)	Sub-leakage current-S Result [TRMS]

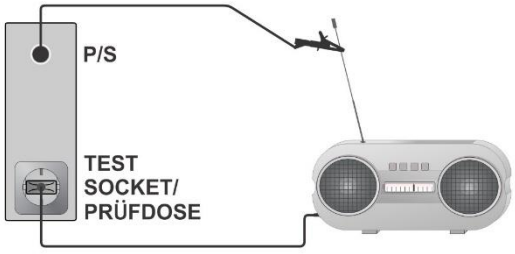
Test parameters	
Type	Type of test: [Isub, Isub-S, Isub Isub-S]
Duration	Duration: [Off, 2 s ... 180 s]

Test limits	
Limit (Isub)	H Limit (Isub TRMS): [Off, Custom, 0.25 mA ... 15.0 mA]
Limit (Isub-S)	H Limit (Isub-S TRMS): [Off, Custom, 0.25 mA ... 15.0 mA]

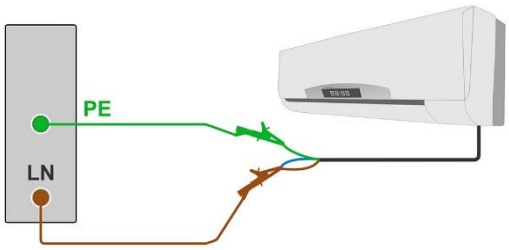
Test circuits



Isub



Isub-S



Isub (fixed installed DUT)

Note

- When P/S probe is connected during the Sub-leakage measurement, then the current through it is also considered.

6.4.5 Auto test: Cont+Ins+Sub

Test results / sub-results

R	Resistance
Isub (+result)	Sub-leakage current Result [TRMS]
Riso	Insulation resistance
Um	Test voltage

Test parameters

Output	Output: [P/S – PE, MS_PE – IEC_PE]
Test current	I out: [0.2 A]
Nominal test voltage	Uiso: [50 V, 100 V, 250 V, 500 V]
Duration Rlow	Duration: [Off, 2 s ... 180 s]
Duration Riso	Duration: [2 s ... 30 s] No test: test won't be carried out

Duration Isub	Duration [2 s ... 30 s] No test: test won't be carried out

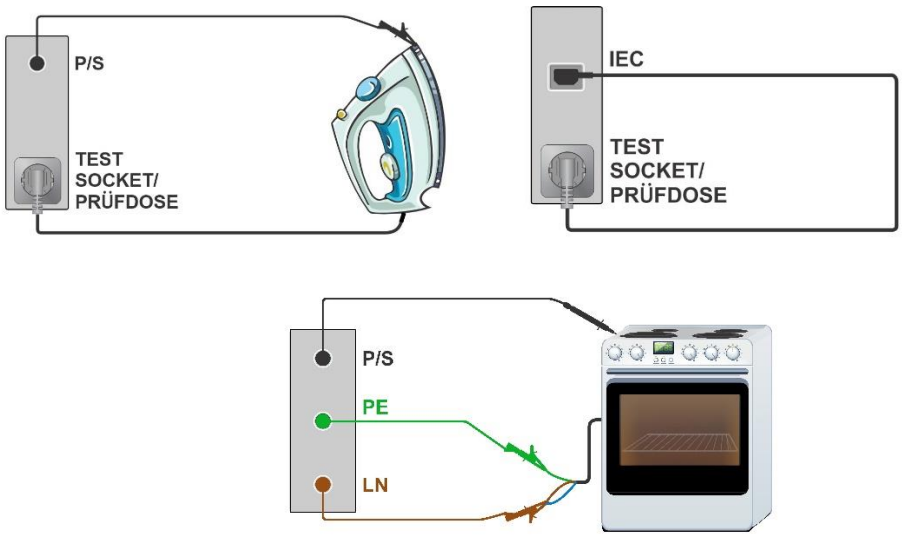
Test limits

Limit (Row)	H Limit (R): [Off, Custom, 0.01 Ω ... 9 Ω]
Limit (Isub)	H Limit (Isub): [Off, Custom, 0.25 mA ... 15.0 mA]
Limit (Riso)	L Limit (Riso): [Off, Custom, 0.01 MΩ ... 10.0 MΩ]

Additional options

Calibrate	Calibrate – see chapter *Compensation of test lead(s) / IEC test cable resistance*.
Limit Calculator	Lim. Calculator see chapter *Limit calculator*.

Test circuits



Note

This test is intended to make the Rlow, Isub and Riso tests faster than if they are carried out by two or three successive individual tests.

- Rlow and Riso tests can run at the same time
- Rlow and Isub tests can run at the same time
- If both, Riso and Isub tests are enabled, Riso will be carried out first and Isub afterwards

For example, if the Rlow test lasts 5 seconds, Riso test 2 seconds and Isub test 2 seconds, the overall test time will be 5 seconds.

6.4.6 Differential Leakage

Test results / sub-results

Idiff (+ mains, result)	Diff: Differential Leakage current Mains: [nor, rev] [1] Result [TRMS]
P [2]	Power

[1)] not shown separately in Result view = Standard

Test parameters

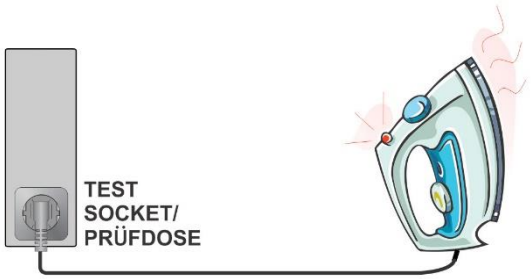
Duration	Duration: [Off, 2 s ... 180 s]
Mains polarity [2]	[All, Normal, Reversed] Normal: Phase voltage is applied to the right output of the mains test socket. Reversed: Phase voltage is applied to the left output of the mains test socket. All: Tests at both polarities will be carried out.
Delay [2]	Delay between the two steps, if Mains polarity = All, [0.2 s ... 5 s]
Adapter	[No, A 1830] No: Adapter is disabled in measurement A 1830: Adapter is enabled in measurement

[2)] result or parameter not available for measurements with 3-phase adapter A 1830
See *A 1830 Instruction manual* for more information.

Test limits

H Limit (Idiff TRMS)	H limit (Idiff TRMS): [Off, Custom, 0.25 mA ... 15.0 mA]

Test circuit



6.4.7 Point to point Leakage

Test results / sub-results

Ileak (result)	Ileak: Point to Point Leakage current

	Result [TRMS, AC, DC]

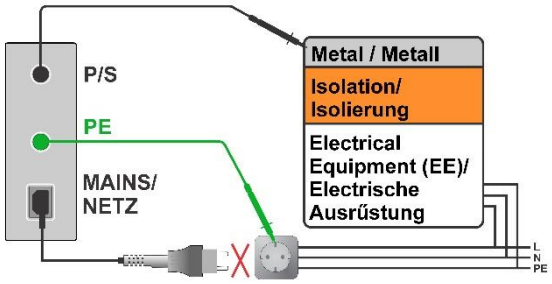
Test parameters

Duration	Duration: [Off, 2 s ... 180 s]

Test limits

H Limit (Ileak TRMS)	H limit (Ileak): [Off, Custom, 0.25 mA ... 15.0 mA]
H Limit (I_AC)	H limit (I_ac): [Off, Custom, 0.25 mA ... 15.0 mA]
H Limit (I_DC)	H limit (I_dc): [Off, Custom, 0.25 mA ... 15.0 mA]

Test circuit



Note

- For this test instrument shall be battery powered (not connected to the mains).

Hint

- This test can be used to test leakage current between any two conductive points. Potential application:
  Measuring touch leakage of fixed installed devices in case the mains socket for connection of the instrument is not available.

6.4.8 Ipe Leakage

Test results / sub-results

Ipe (+ mains, condition, result)	PE Leakage current Mains [nor, rev] [1] Condition [NC, sfN] [2] Result [TRMS, AC, DC]
P [2]	Power

[1)] not shown separately in Result view = Standard

Test parameters

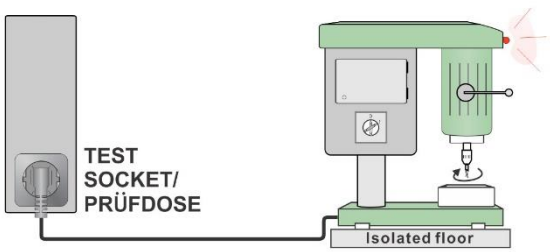
Duration	Duration: [Off, 2 s ... 180 s]
Mains polarity [2]	[All, Normal, Reversed] Normal: Phase voltage is applied to the right output of the mains test socket. Reversed: Phase voltage is applied to the left output of the mains test socket. All: All tests will be carried out.
Condition [2]	[NC, SFC-N] NC: normal condition SFC-N: single fault, N open
Delay [2]	Delay between the two steps, if Mains polarity = All, [0.2 s ... 5 s]
Adapter	[No, A 1830] No: Adapter is disabled in measurement A 1830: Adapter is enabled in measurement

[2)] result or parameter not available for measurements with 3-phase adapter A 1830
See *A 1830 Instruction manual* for more information.

Test limits

H Limit (Ipe TRMS, NC)	H limit: [Off, Custom, 0.25 mA ... 15.0 mA]
H Limit (Ipe AC, NC)	H limit: [Off, Custom, 0.50 mA, 5.00 mA]
H Limit (Ipe DC, NC)	H limit: [Off, Custom, 2.0 mA, 25 mA]
H Limit (Ipe TRMS, sfN)	H limit: [Off, Custom, 0.25 mA ... 15.0 mA]
H Limit (Ipe AC, sfN)	H limit: [Off, Custom, 0.50 mA, 5.00 mA]
H Limit (Ipe DC, sfN)	H limit: [Off, Custom, 2.0 mA, 25 mA]

Test circuit



> **Note**
>
> - Single Fault Condition Adapter (A 1789) should be used, to simulate single fault condition connections.

6.4.9 Touch Leakage

Test results / sub-results

Itou (+ mains, condition, result)	Touch Leakage current Mains [nor, rev] [1] Condition [NC, sfN, sfPE] [2] Result [TRMS, AC, DC]
P [2]	Power

[1)] not shown separately in Result view = Standard

Test parameters

Duration	Duration [Off, 2 s ... 180 s]
Mains polarity [2]	[All, Normal, Reversed] Normal: Phase voltage is applied to the right output of the mains test socket. Reversed: Phase voltage is applied to the left output of the mains test socket. All: Tests at both polarities will be carried out.
Delay [2]	Delay between the two steps, if Mains polarity = All, [0.2 s ... 5 s]
Condition [2]	[NC, SFC-N, SFC-PE] NC: normal condition SFC-N: single fault, N open SFC-PE: single fault, PE open
Adapter	[No, A 1830] No: Adapter is disabled in measurement A 1830: Adapter is enabled in measurement

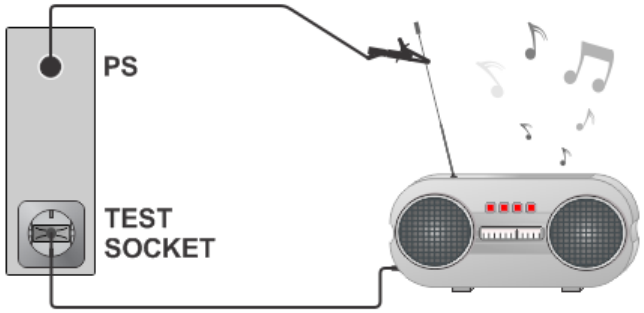
[2)] result or parameter not available for measurements with 3-phase adapter A 1830
See *A 1830 Instruction manual* for more information.

Test limits

H Limit (Itou TRMS, NC)	H limit (Itou TRMS): [Off, Custom, 0.25 mA ... 15.0 mA]
H Limit (Itou AC, NC)	H limit (Itou AC): [Off, Custom, 0.50 mA, 5.00 mA]
H Limit (Itou DC, NC)	H limit (Itou DC): [Off, Custom, 2.0 mA, 25 mA]

H Limit (Itou TRMS, sfN)	H limit (Itou TRMS): [Off, Custom, 0.25 mA ... 15.0 mA]
H Limit (Itou AC, sfN)	H limit (Itou AC): [Off, Custom, 0.50 mA, 5.00 mA]
H Limit (Itou DC, sfN)	H limit (Itou DC): [Off, Custom, 2.0 mA, 25 mA]
H Limit (Itou TRMS, sfPE)	H limit (Itou TRMS): [Off, Custom, 0.25 mA ... 15.0 mA]
H Limit (Itou AC, sfPE)	H limit (Itou AC): [Off, Custom, 0.50 mA, 5.00 mA]
H Limit (Itou DC, sfPE)	H limit (Itou DC): [Off, Custom, 2.0 mA, 25 mA]

Test circuit



Note

- Single Fault Condition Adapter (A 1789) should be used, to simulate single fault condition connections.

6.4.10 Itouch+Ifloating input

Test results / sub-results

Itou+Ifi (+ result)	Sum of Touch Leakage and Floating Input currents Mains [nor, rev][1] Result [TRMS]
Itou (+ mains, result)	Touch Leakage current Mains [nor, rev][1] Result [TRMS]
Ifi (+ result)	Floating Input Leakage current Result [TRMS]
no caption	Actual current measurement (Itou or Ifi)

[1)] not shown separately in Result view = Standard

Test parameters

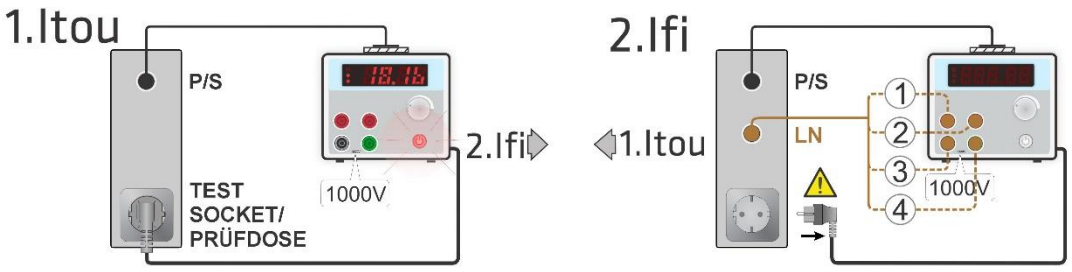
Duration	Duration [Off, 2 s ... 180 s]

Mains polarity	[All, Normal, Reversed] Normal: Phase voltage is applied to the right output of the mains test socket. Reversed: Phase voltage is applied to the left output of the mains test socket. All: Tests at both polarities will be carried out.
Delay	Delay between the two steps, if Mains polarity = All, [0.2 s ... 5 s]
Uinp max	Maximal voltage on floating inputs [Custom, 250 V..1000 V]

Test limits

H Limit (Itou)	H limit (Itou) [Off, Custom, 0.25 mA ... 15.0 mA]
H Limit (Itou+ Ifi)	H limit (Itou + Ifi) [Off, Custom, 0.25 mA ... 15.0 mA]

Test circuit



Step 1 Step 2

Note

- The measurement consists of three steps.
  Step 1 - Itou is measured.
  Step 2 - Ifi is measured. If there are more floating inputs, individual inputs can be measured successively and the results are added together.
  Step 3 - The end result Itou + Ifi is calculated as sum of touch current and Ifi (the overall value).

WARNING

- In Step 2, DUT shall be disconnected from mains test socket in order to avoid unwanted leakage paths through PE. Appropriate message is displayed.

6.4.11 Ipe+Ifloating input

Test results / sub-results

Ipe+Ifi (+ result)	Sum of PE and Floating Input leakage currents Mains [nor, rev] [1] Result [TRMS]
Idiff+Ifi (+ result)	Sum of Differential and Floating Input leakage currents Mains [nor, rev] [1] Result [TRMS]
Ipe (+ mains, result)	Touch Leakage current Mains [nor, rev] [1] Result [TRMS]
Idiff (+ mains, result)	Touch Leakage current Mains [nor, rev] [1] Result [TRMS]
Ifi (+ result)	Floating Input leakage current Result [TRMS]
no caption	Actual current measurement (Ipe, Idiff or Ifi)

[1)] not shown separately in Result view = Standard

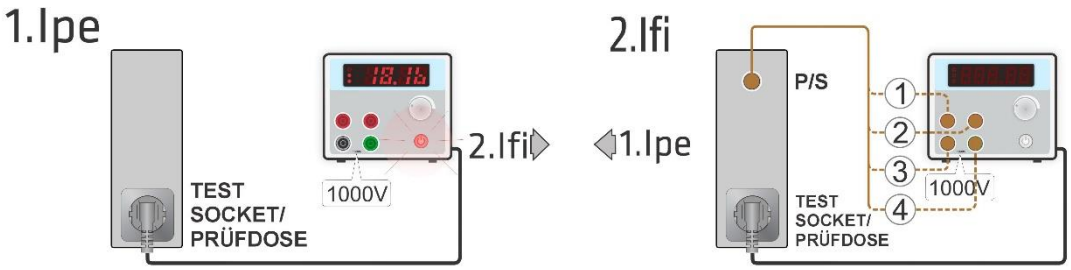
Test parameters

Duration	Duration: [Off, 2 s ... 180 s]
Mains polarity	[All, Normal, Reversed] Normal: Phase voltage is applied to the right output of the mains test socket. Reversed: Phase voltage is applied to the left output of the mains test socket. All: Tests at both mains polarity will be carried out.
Delay	Delay between the two steps, if Mains polarity = All, [0.2 s ... 5 s]
Uinp max	Maximal voltage on floating inputs [Custom, 250 V ... 1000 V]

Test limits

H Limit (Ipe)	H --limit (Ipe): [Off, Custom, 0.25 mA ... 15.0 mA]
H Limit (Ipe+ Ifi)	H limit (Ipe + Ifi): [Off, Custom, 0.25 mA ... 15.0 mA]
H Limit (Idiff)	H limit (Idiff): [Off, Custom, 0.25 mA ... 15.0 mA]
H Limit (Idiff+ Ifi)	H limit (Idiff + Ifi): [Off, Custom, 0.25 mA ... 15.0 mA]

Test circuit



Step 1 Step 2

Note

- The measurement consists of three steps.
  Step 1 - Ipe or Idiff is measured.
  Step 2 - Ifi is measured. If there are more floating inputs, individual inputs can be measured successively and the results are added together.
  Step 3 - The end result Ipe + Ifi or Idiff + Ifi is calculated as sum of Ipe or Idiff current and Ifi (the overall value).

6.4.12 Power

Test results / sub-results

P	Active power
S	Apparent power
Q	Reactive power
PF	Power factor
THDu	Total harmonic distortion – voltage
THDi	Total harmonic distortion – current
Cos **Φ**	Cosine Φ
I	Load current
U	Voltage

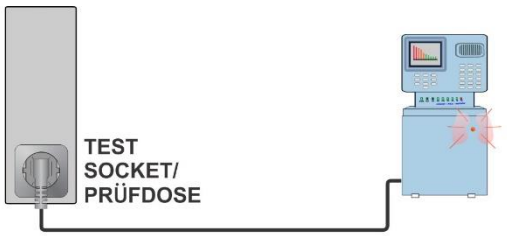
Test parameters

Duration	Duration: [Off, 2 s ... 180 s]

Test limits

H Limit (P)	H limit (P): [Off, Custom, 10 W ... 3.50 kW]
L Limit (P)	L limit (P): [Off, Custom, 10 W ... 3.50 kW]

Test circuit



6.4.13 Leak's & Power

Test results / sub-results

P	Active power
Itou (+ mains, condition, result)	Touch Leakage current Mains [nor, rev] [1] Condition [NC, sfN, sfPE] Result [TRMS, AC, DC]
Idiff TRMS (+ mains)	Diff: Differential Leakage current Mains [nor, rev] [1] Condition [NC]
S	Apparent power
Q	Reactive power
PF	Power factor
THDu	Total harmonic distortion – voltage
THDi	Total harmonic distortion – current
Cos **Φ**	Cosine Φ
I	Load current
U	Voltage

[1)] not shown separately in Result view = Standard

Test parameters

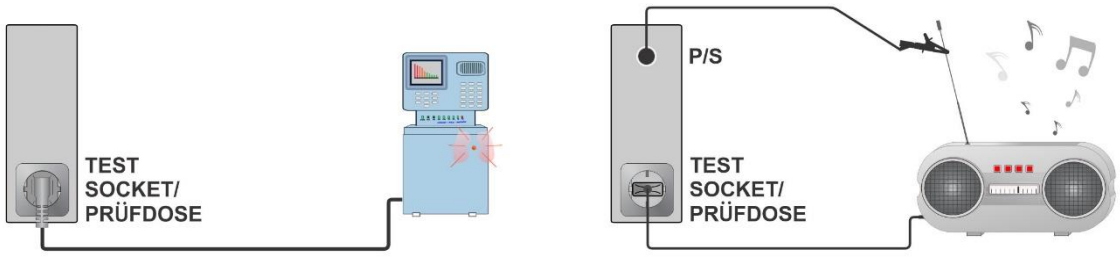
Duration	Duration [Off, 2 s ... 180 s]
Mains polarity	[All, Normal, Reversed] Normal: Phase voltage is applied to the right output of the mains test socket. Reversed: Phase voltage is applied to the left output of the mains test socket. All: Test with main polarities will be carried out.
Delay	Delay between the two steps, if Mains polarity = All,

	[0.2 s ... 5 s]
Condition	[NC, SFC-N, SFC-PE] NC: normal condition SFC-N: single fault, N open SFC-PE: single fault, PE open

Test limits

H Limit (P)	H limit (P) [Off, Custom, 10 W ... 3.50 kW]
L Limit (P)	L limit (P): [Off, Custom, 10 W ... 3.50 kW]
H Limit (Idiff TRMS)	H limit (Idiff): [Off, Custom, 0.25 mA ... 15.0 mA]
H Limit (Itou TRMS, NC)	H limit (Itou TRMS): [Off, Custom, 0.25 mA ... 15.0 mA]
H Limit (Itou AC, NC)	H limit (Itou AC): [Off, Custom, 0.50 mA, 5.00 mA]
H Limit (Itou DC, NC)	H limit (Itou DC): [Off, Custom, 2.0 mA, 25 mA]
H Limit (Itou TRMS, sfN)	H limit (Itou TRMS): [Off, Custom, 0.25 mA ... 15.0 mA]
H Limit (Itou AC, sfN)	H limit (Itou AC): [Off, Custom, 0.50 mA, 5.00 mA]
H Limit (Itou DC, sfN)	H limit (Itou DC): [Off, Custom, 2.0 mA, 25 mA]
H Limit (Itou TRMS, sfPE)	H limit (Itou TRMS): [Off, Custom, 0.25 mA ... 15.0 mA]
H Limit (Itou AC, sfPE)	H limit (Itou AC): [Off, Custom, 0.50 mA, 5.00 mA]
H Limit (Itou DC, sfPE)	H limit (Itou DC): [Off, Custom, 2.0 mA, 25 mA]

Test circuit



Note

- Single Fault Condition Adapter (A 1789) should be used, to simulate single fault condition connections.

6.4.14 PRCD test

Test results / sub-results

t ΔN	trip out time

t IΔN x1, (+)	trip-out time ($I_Δ=I_{ΔN}$, (+) positive polarity)
t IΔN x1, (-)	trip-out time ($I_Δ=I_{ΔN}$, (-) negative polarity)
t IΔN x5, (+)	trip-out time ($I_Δ=5×I_{ΔN}$, (+) positive polarity)
t IΔN x5, (-)	trip-out time ($I_Δ=5×I_{ΔN}$, (-) negative polarity)
t IΔN x0.5, (+)	trip-out time ($I_Δ=½×I_{ΔN}$, (+) positive polarity)
t IΔN x0.5, (-)	trip-out time ($I_Δ=½×I_{ΔN}$, (-) negative polarity)
IΔ	trip-out current
IΔ (+)	trip-out current at (+) positive polarity
IΔ (-)	trip-out current at (-) negative polarity

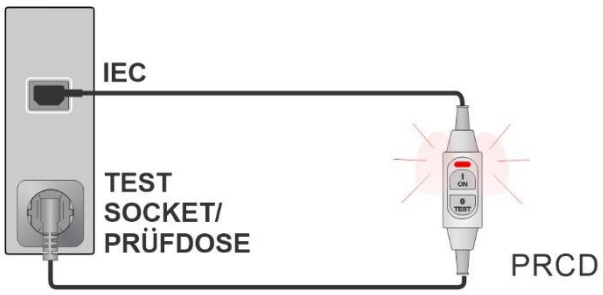
Test parameters

RCD Type	Type: [AC, A, B, B+, F]
Nominal current	IΔN: [10 mA, 15 mA, 30 mA]
Test mode	Mode: [single, auto]
Multiplication factor IΔN	Multiplier: [0.5, 1, 5]
Starting polarity in single mode	Phase: [+, -, (+,-)]
Design type	Design: [2 pole, 3 pole, K/Di (varistor), S (3 pole), S+]
PRCD Standard	PRCD standard: [General, AS/NZS 3017]

Test limits

Test limits for Pass / Fail statuses are set automatically, depending on set parameters.

Test circuit



6.4.15 RCD test

Test results / sub-results

t ΔN	trip out time
t IΔN x1, (+)	trip-out time ($I_Δ=I_{ΔN}$, (+) positive polarity)
t IΔN x1, (-)	trip-out time ($I_Δ=I_{ΔN}$, (-) negative polarity)
t IΔN x5, (+)	trip-out time ($I_Δ=5×I_{ΔN}$, (+) positive polarity)

t IΔN x5, (-)	trip-out time ($I_Δ$=5×$I_{ΔN}$, (-) negative polarity)
t IΔN x0.5, (+)	trip-out time ($I_Δ$=½×$I_{ΔN}$, (+) positive polarity)
t IΔN x0.5, (-)	trip-out time ($I_Δ$=½×$I_{ΔN}$, (-) negative polarity)
IΔ	trip-out current
IΔ (+)	trip-out current at (+) positive polarity
IΔ (-)	trip-out current at (-) negative polarity
Uc	Contact voltage

Test parameters

RCD type	Type: [AC, A, B, B+, F]
Nominal current	IΔN: [10 mA, 15 mA, 30 mA]
Test mode	Mode: [single, auto]
Multiplication factor IΔN	Multiplier: [0.5, 1, 5]
Phase Starting polarity in single mode	Phase: [+, -, (+,-)]
RCD Standard	RCD standard: [EN 61008 / EN 61009, AS/NZS 3017]
Random phase	Random phase: [No, Yes] [1]

[1)] only if AS/NZS 3017 RCD Standard is selected

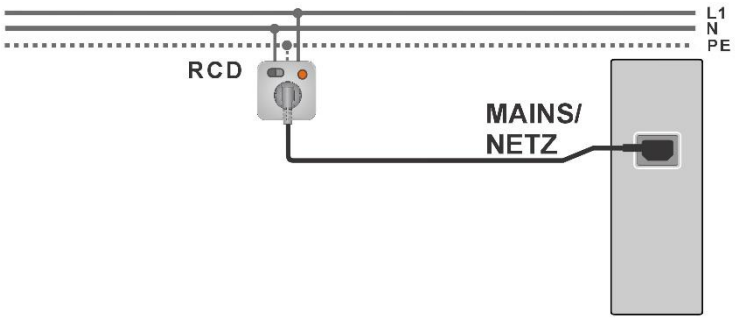
Test limits

Limit Uc	Contact voltage limit [Custom, 25 V, 50 V]

Note

- Test limits for Pass / Fail statuses are set automatically, depending on set parameters.

Test circuit



6.4.16 PE conductor (PRCD)

Test results / sub-results

R	Resistance

Result	Indication that the protection of the varistor in PE connection works properly

Test parameters

Type of PRCD	Design: [2 pole, 3 pole, S (3 pole), S+]
Duration	Duration: [Off, 2 s ... 180 s]
Nominal current	IΔN: [10 mA, 15 mA, 30 mA]
Nominal current (K/Di varistor)	IΔN: [10 mA, 30 mA]

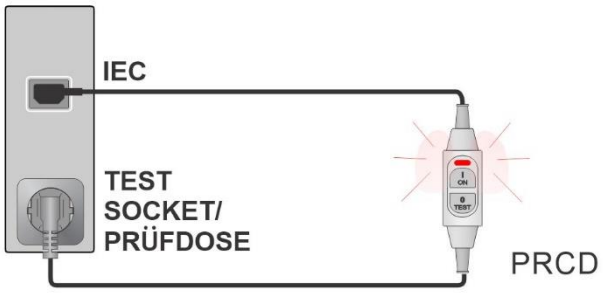
Test limits

Limit	H Limit (R): [Off, Custom, 0.01 Ω ... 9 Ω]

Additional options

Calibrate	Calibrate – Compensation of test lead / IEC test cable resistance. Refer to chapter *Compensation of test lead(s) / IEC test cable resistance*.
Limit Calculator	Lim. Calculator - PE_conductor(PRCD) resistance H_Limit(R) calculator. Refer to chapter *Limit calculator*.

Test circuit



Notes

- Mains voltage is applied to the PRCD during the test.
- The instrument uses different test methods in regard to the set PRCD type. For 2 pole, 3 pole, S (3 pole) and S+ PRCDs the resistance of PE conductor is measured.
- L and N conductors are not allowed to be crossed in this test. Reconnect the PRCD's plug if necessary.
- PE resistance of IEC plug adapter can be compensated. See chapter *Compensation of test lead(s) / IEC test cable resistance* for details.

6.4.17 Open conductor (PRCD)

In this test the instrument disconnects individual conductors on the supply side and the response of the PRCD is checked.

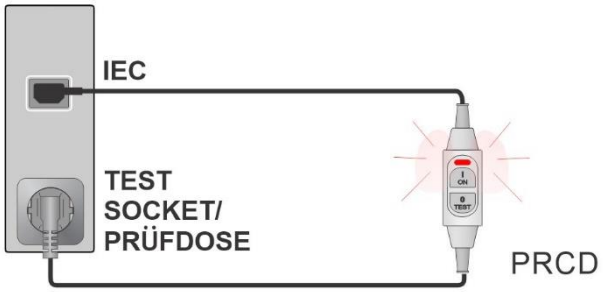
Test results / sub-results

L open	Result for open L conductor [Pass, Fail]
N open	Result for open N conductor [Pass, Fail]
PE open	Result for open PE conductor [Pass, Fail]

Test parameters / limit

Conductor opened by the instrument	Open: [L, N, PE, (auto L,N), (auto L,N,PE)]
Type of PRCD	Design: [2 pole, 3 pole, K/Di (varistor), S (3 pole), S+]

Test circuit



6.4.18 PRCD PE probe test

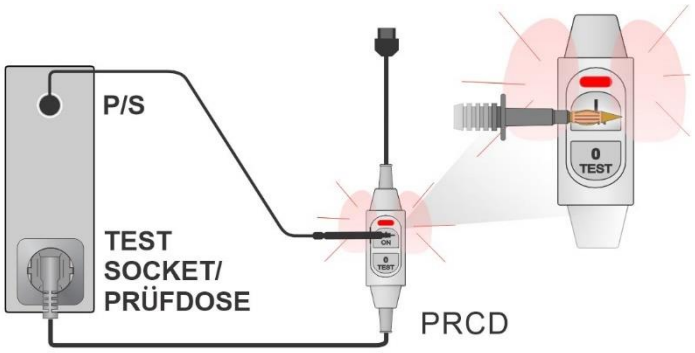
Test results / sub-results

Result	Indication of the test [Pass, Fail]

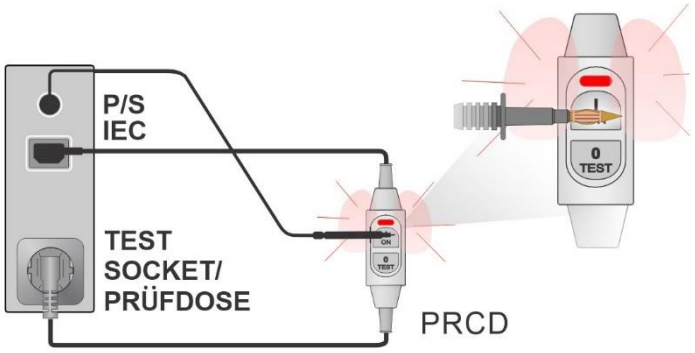
Test parameters / limits

Test mode	Test: [manual, auto]
Type of PRCD	Design: [2 pole, 3 pole, K/Di (varistor), S (3 pole), S+]

Test circuits



Test = manual



Test = auto

Notes
• A safe but high voltage is applied to the test lead during the test. Do not touch the exposed tip at the end of the test lead. Risk of not dangerous but unpleasant electric shock! • The test is intended for PRCDs with built in detection for high voltage on PE.

6.4.19 Polarity

Test results / sub-results

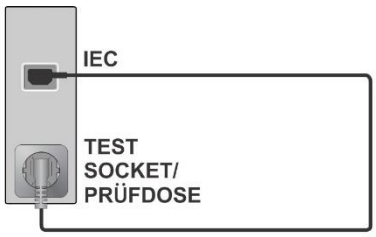
Result	Indication of the test [Pass, Description of the fault]

Test parameters / limits

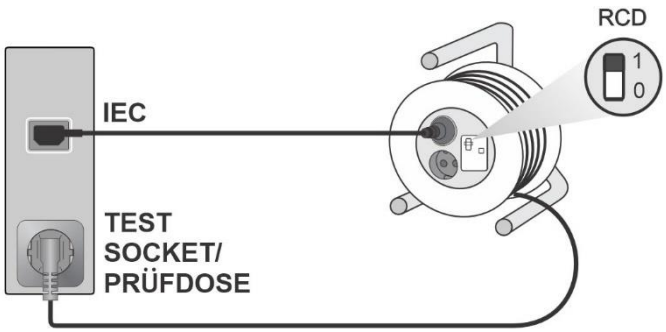
Test mode	Mode: [normal, active]
Test status	Status [On, Off] (disable test status within Auto Sequence® for K/Di PRCD)
L and N cross	Cross of phase and neutral wire LN cross: [not allowed, allowed[1]]

[1] Not applicable in AUS/NZ and UK versions.

Test circuits



Mode = normal



Mode = active

Note

- Active polarity test is intended for testing cords equipped with (P)RCD or mains operated switches.

6.4.20 Clamp current

Test results / sub-results

I	Current

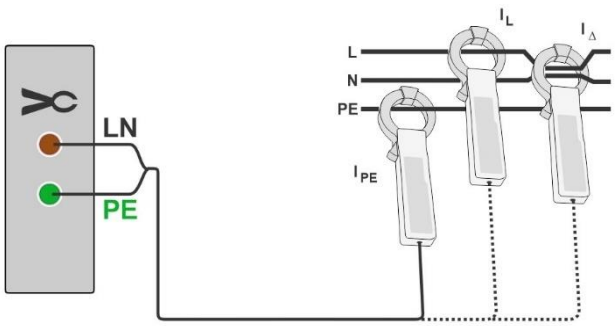
Test parameters

Indication of the type of current measured	Test: [Differential leakage, PE leakage, Current]
Duration	Duration: [Off, 2 s ...180 s]
Current clamp model	Ch1 clamp type: [A1472]

Test limits

High Limit (I, Idiff, Ipe)	Limit(I, Idiff, Ipe): [Off, Custom, 0.25 mA ... 15.0 mA]

Test circuit



Note

- The frequency range of this measurement is limited. This measurement function cannot be used for measuring leakage currents of appliances that are able to generate leakage currents with frequencies above 10 kHz or above the specified frequency range of the clamp.

6.4.21 SELV/PELV Voltage

Test results / sub-results

U (+ mains, condition, result)	Voltage Mains [nor, rev][1] Result [TRMS, AC, DC]

[1)] not shown separately in Result view = Standard

Test parameters

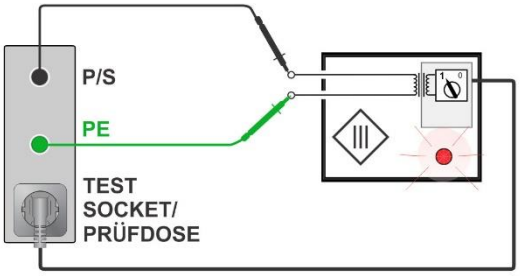
Duration	Duration: [Off, 2 s ... 180 s]
Mains	[On, Off] On: Mains voltage is applied to the mains test socket. Off: No mains voltage on mains test socket.
Mains polarity	[All, Normal, Reversed] Normal: Phase voltage is applied to the right output of the mains test socket. Reversed: Phase voltage is applied to the left output of the mains test socket. All: Tests at both mains polarities will be carried out.
Delay	Delay between the two steps, if Mains polarity = All,

	[0.2 s ... 5 s]
Condition	[NC, SFC-N, SFC-PE] NC: normal condition SFC-N: single fault, N open SFC-PE: single fault, PE open

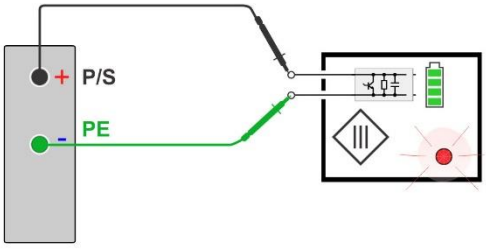
Test limits

H Limit (U NC, TRMS)	Limit (U NC, TRMS): [Off, Custom, 50 V, 60 V]
H Limit (U NC, AC)	Limit (U NC, AC): [Off, Custom, 30 V, 50 V]
H Limit (U NC, DC)	Limit (U NC, DC): [Off, Custom, 60 V, 120 V]
H Limit (U sfN, TRMS)	Limit (U sfN, TRMS): [Off, Custom, 50 V, 60 V]
H Limit (U sfN, AC)	Limit (U sfN, AC): [Off, Custom, 30 V, 50 V]
H Limit (U sfN, DC)	Limit (U sfN, DC): [Off, Custom, 60 V, 120 V]
H Limit (U sfPE, TRMS)	Limit (U sfPE, TRMS): [Off, Custom, 50 V, 60 V]
H Limit (U sfPE, AC)	Limit (U sfPE, AC): [Off, Custom, 30 V, 50 V]
H Limit (U sfPE, DC)	Limit (U sfPE, DC): [Off, Custom, 60 V, 120 V]

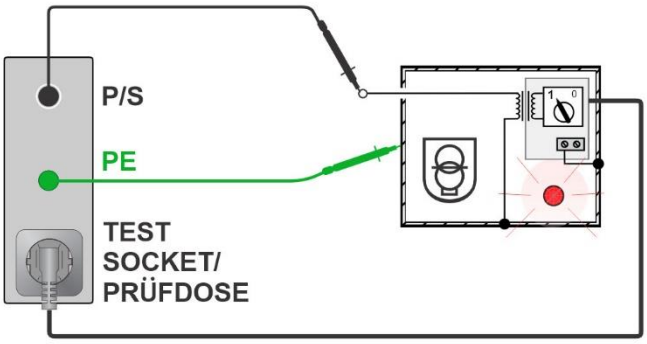
Test circuit



AC



DC



SELV / PELV

Notes

- Single Fault Condition Adapter (A 1789) should be used, to simulate single fault condition connections.
- Voltmeter is floating against PE.

6.4.22 EVSE Diagnostic Test (A 1632)

Test results / sub-results

CP+	Maximal value of CP (control pilot) signal
CP-	Minimal value of CP (control pilot) signal
Duty C.	Duty cycle of CP (control pilot) signal
Freq	Frequency of CP (control pilot) signal
Ievse	Charging current available by charging cable / EVSE
U1N	Voltage UL1-N on the output of charging cable / EVSE
U2N	Voltage UL2-N on the output of charging cable / EVSE
U3N	Voltage UL3-N on the output of charging cable / EVSE
Field	1.2.3 – correct connection – CW rotation sequence 3.2.1 – invalid connection – CCW rotation sequence
toff	Disconnection time of charging cable / EVSE
State	System state

Test parameters

Test	[EV simulator, Monitor, Errors] EV simulator: Simulation of electrical vehicle. Monitor: Monitoring of EVSE - EV interconnection and signalling. Errors: Simulation of CP errors.
Toff	Simulated CP errors [C->E1, C->E2, C->E3, D->E1, D->E2, D->E3]
Simulator CP	CP (control pilot) state setting [nc, A, B, C, D]
Simulator PP	PP (proximity pilot) state setting [nc, 13 A, 20 A, 32 A, 63 A, 80 A]
Duration	Duration [Off, 2 s ... 180 s]
Control	Analyser control [Manual (A 1632), Remote (Bluetooth)]

Test circuits

Notes

- Refer to *A 1632 eMobility Analyser Instruction manual* for more information.
- Refer to application note *Guide to OmegaPAT/GT XA* for more information.
- Follow instructions in Metrel Auto Sequences® for charging cables.

6.4.23 EV-RCD

Test results / sub-results

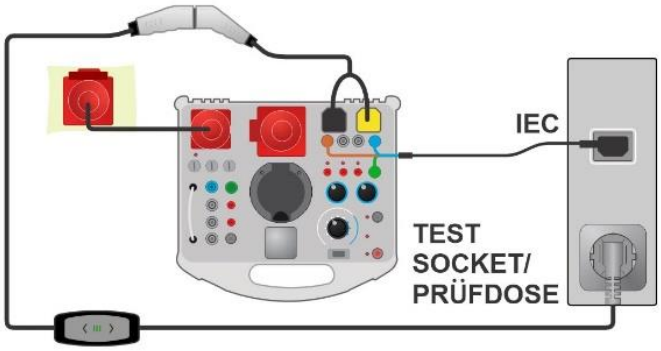
t ΔN	trip out time
t IΔN (+)	trip-out time at (+) positive polarity
t IΔN (-)	trip-out time at (-) negative polarity
I **ΔN**	trip-out current
I **IΔN (+)**	trip-out current at (+) positive polarity
I **IΔN** (-)	trip-out current at (-) negative polarity

Test parameters

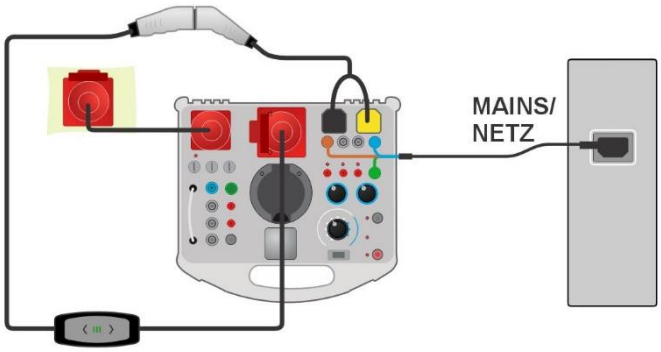
Test	[t-trip, I-trip] t-trip: trip out time I-trip: trip out current
Test method	[Internal, External] Internal: Charging cable is plugged into mains test socket External: Charging cable is plugged into A 1632 adapter
Test current	Shape of test current [a.c., Pulse d.c.(A), Smooth d.c.] a.c: sinusoidal Pulse d.c. (A): pulsed DC current (half wave) Smooth d.c: smooth DC
IΔN	Nominal test current [10 mA, 15 mA, 30 mA], [6 mA]
x IΔN	Multiplication factor [0.5, 1, 2, 5], [0.5, 1, 10]
Phase	Starting polarity of test current [+, -, (+,-)]

Design	In-cable control and protection device [IC-CPD]
EV-RCD standard	Test standard [IEC 62752]

Test circuit



Test method = internal



Test method = external

Notes

- Refer to *A 1632 eMobility Analyser Instruction manual* for more information.
- Refer to *A 1532XA eMobility Adapter Instruction manual* for more information.
- Refer to *A 1832 eMobility Adapter Instruction manual* for more information.
- Refer to application note *Guide to OmegaPAT/GT XA* for more information.
- Follow instructions in Metrel Auto Sequences® for charging cables.

6.4.24 PE conductor (EV RCD)

Test results / sub-results

R ..... Resistance

Test parameters

Type of EV RCD	Design [IC CPD]
Duration	Duration [Off, 2 s ... 180 s]

Test current	I test [standard, low] Standard: I test = 0.2 A Low: Itest = < 3 mA

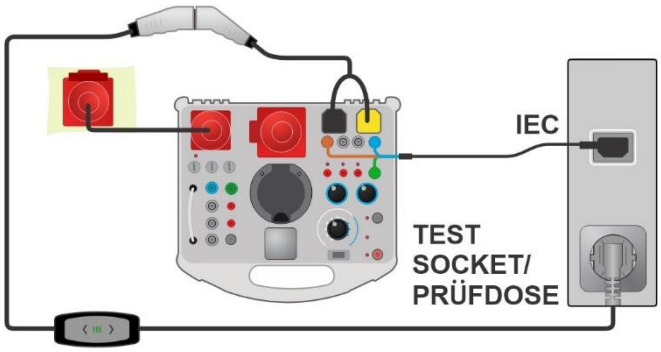
Test limits

H Limit (R)	H Limit (R): [Off, Custom, 0.01 Ω ... 9 Ω]

Additional options

Calibrate	Calibrate – Compensation of IEC plug cable resistance. Refer to chapter *Compensation of IEC plug adapter resistance*.
Limit Calculator	Lim. Calculator - PE_conductor(EV RCD) resistance H_Limit(R) calculator. Refer to chapter *Limit calculator*.

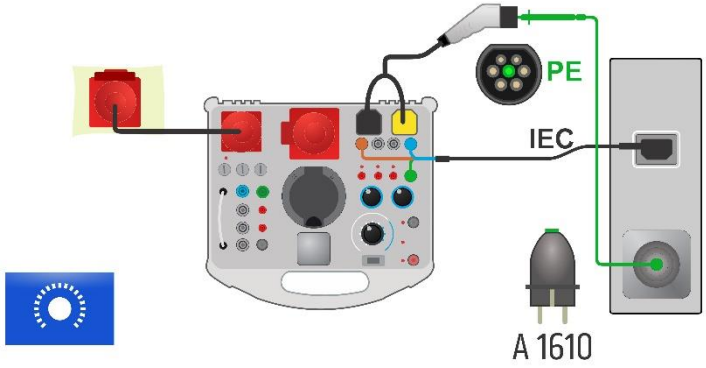
Test circuit



6.4.24.1 Compensation of IEC plug adapter resistance

Resistance of IEC plug adapter can be compensated in PE conductor (EV RCD) test function:

Connection for compensating the resistance of IEC plug adapter



Compensation of IEC plug adapter resistance procedure
Select PE conductor (EV RCD) single test and its parameters.
Connect test instrument and A 1632 eMobility Analyser according to figure above.

Connect test lead between test instrument socket PE (using A 1610 Continuity test adapter) and PE pin of A 1634 plug, connected to A 1632 eMobility Analyser.
Calibrate: Compensate IEC plug adapter resistance
Symbol CAL is displayed if the compensation was carried out successfully.

6.4.25 Enhanced TRMS test

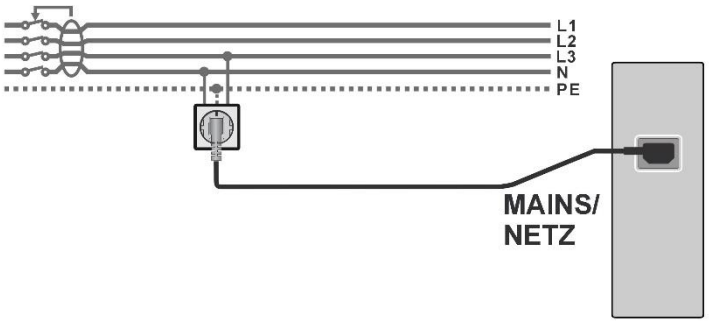
Test results / sub-results

Uln	Voltage line - neutral
Unpe	Voltage neutral - PE
Ulpe	Voltage line - PE
Socket fault	Description of the fault
Rl	Loop resistance

Test limits

Limit R	Limit (Rl): [2000 Ω]

Test circuit



Note

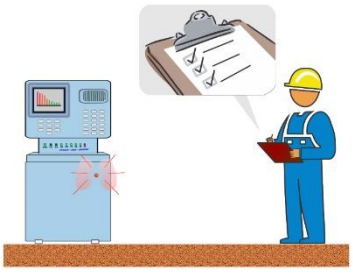
- This function is intended as a check of voltages and loop resistance at mains sockets. Some (but not all) errors are detected and are indicated on the display.

6.4.26 Functional test

Test results / sub-results

Pass, Fail, Checked

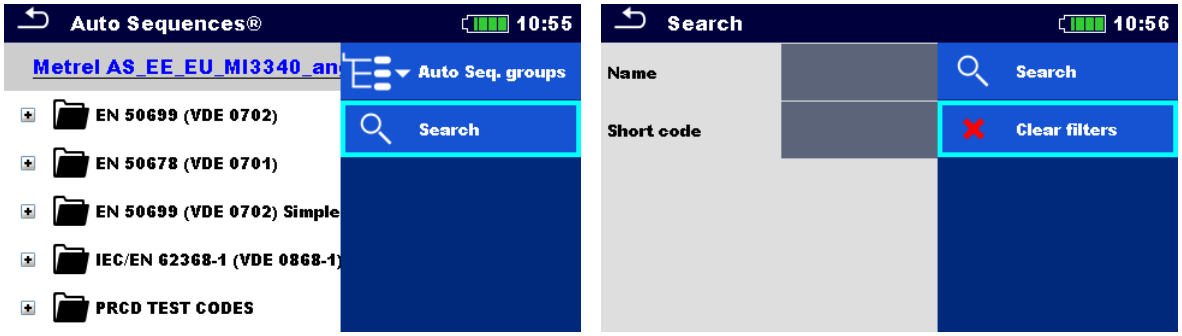
Test circuit



7 Auto Sequences®

Auto Sequences® are pre-programmed sequences of measurements. The Auto Sequences can be pre-programmed on PC with the Metrel ES Manager software and uploaded to the instrument. On the instrument parameters and limits of individual single test in the Auto Sequence can be changed / set.

7.1 Selection and searching of Auto Sequences

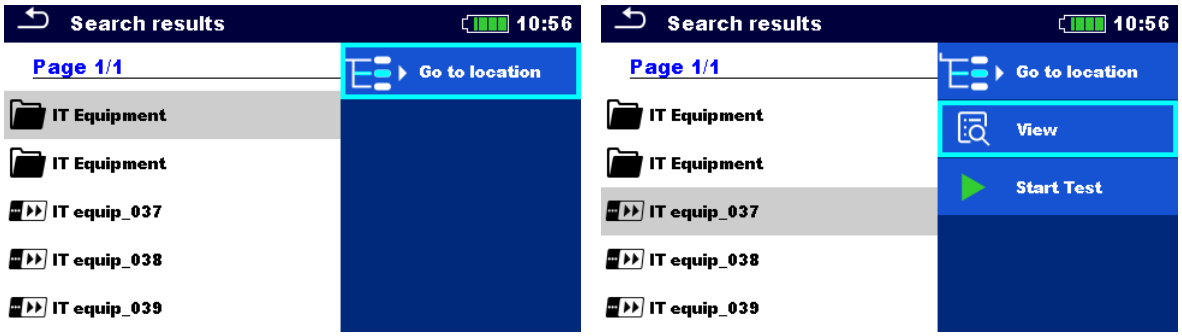


Selecting an Auto Sequence list in Auto Sequence groups menu

Go to Auto Sequence® groups menu	Header line (Auto Sequence list), Auto Seq. groups

Searching of Auto Sequences

Search for Auto Sequence	Header line (Auto Sequence list), Search, set filters (Name or Short code)
Clear filters	Clear filters



Operations on found Auto Sequences

Page x/y, Next Page, Previous Page	To jump Page Up/Down
Go to location	Go to location in Auto Sequences® menu

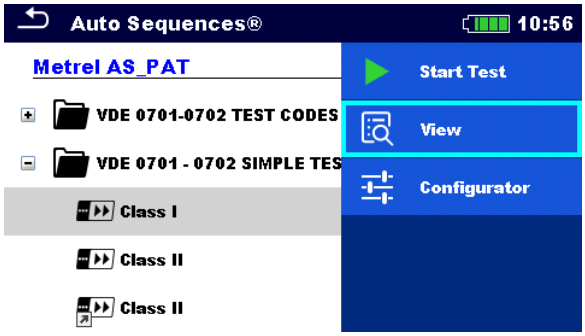
Start Test	Start Auto Sequence
View	View Auto Sequence

7.1.1 Organization of Auto Sequences® in Auto Sequences® menu

The Auto Sequence® menu can be organized in a structural manner with folders, sub-folders and Auto Sequences. Auto Sequence in the structure can be the original Auto Sequence or a shortcut to the original Auto Sequence.

Originals and shortcuts
Auto Sequences marked as shortcuts and the original Auto Sequences are coupled. Changing of parameters or limits in any of the coupled Auto Sequences will influence on the original Auto Sequence and all its shortcuts.

Class II	The original Auto Sequence®.
Class II	A shortcut to the original Auto Sequence®.



Start Test	Start of Auto Sequence.
View	Detailed view of Auto Sequence.
Configurator	Enter Auto Sequence Configurator, see chapter *Auto Sequence® Configurator.*

7.2 Auto Sequence

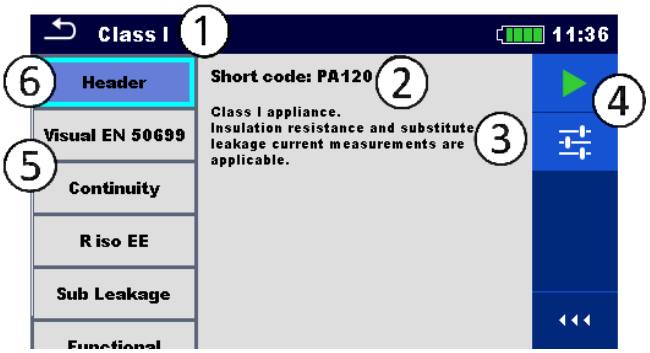
Carrying out Auto Sequences step by step

Before starting, the Auto Sequence view menu is shown, (unless it was started directly from the Main Auto Sequences® menu). Before the test, parameters and limits of individual measurements can be edited.

During the execution phase of an Auto Sequence, pre-programmed single tests are carried out. The sequence of single tests is controlled by pre-programmed flow commands.

After the test sequence is finished the Auto Sequence result menu is shown. Details of individual tests can be viewed and the results can be saved to Memory organizer.

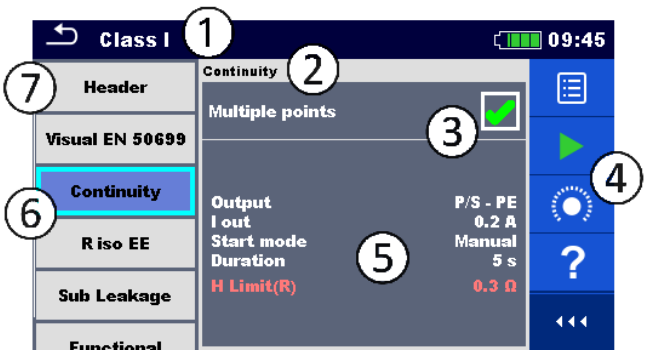
7.2.1 Auto Sequence® view menu



Header is selected

1	Auto Sequence name
2	Short code
3	Description
4	Options
5	Single tests
6	Header

Start Test	Start of Auto Sequence
Configurator	Enter Auto Sequence configurator, see chapter *Auto Sequence® Configurator.*



Single test is selected

1	Auto Sequence name

2	Name of selected single test
3	Multiple points selected
4	Options
5	Parameters / limits of selected single test
6	Single tests
7	Header

Parameters	View/edit parameters
Start Test	Start of Auto Sequence®
Help	View help screens

Additional option:

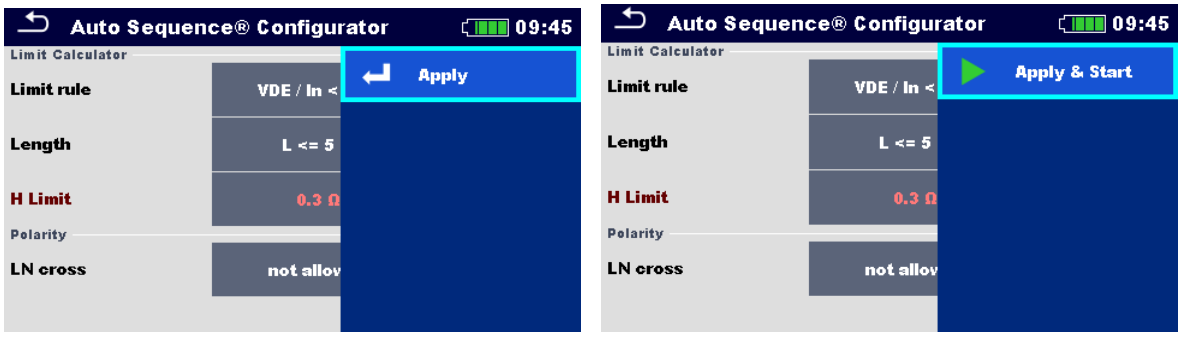
Calibrate	Compensation of test leads resistance

Enable multiple points testing: set Multiple points, see *Managing multiple points*.

7.2.2 Auto Sequence® Configurator

The Configurator options is offered only when single tests within selected Auto Sequence have configurable limits / parameters that are likely to be changed. For example, if testing prolongation cables the length need to be set for each individual cable.
The settings can be changed before the Auto Sequence is executed. New settings will be considered for the actual Auto Sequence only.

See *Single test measurements* for details of parameters and limits.



Apply & Start	Start Auto Sequence from Configurator menu
Apply	Confirm limits and parameters settings and return to view menu

7.2.3 Indication of Loops

The attached 'x3' at the end of single test name indicates that a loop of single tests is programmed. This means that the marked single test will be carried out as many times as the number behind the 'x' indicates. It is possible to exit the loop before, at the end of each individual measurement.

7.2.4 Managing multiple points

If the device under test has more than one test point for an individual single test and the selected Auto Sequence predicts only one test point (one single test) it is possible to change the Auto Sequence appropriately. Single tests with enabled Multiple points ticker will be executed in a continuous loop. It is possible to exit the loop anytime at the end of each individual measurement.

The Multiple points setting is valid only for the actual Auto Sequence. If the user often tests appliances with more than one test points it is recommended to program a special Auto Sequence with pre-programmed loops.

Hint
Enable multiple points is typically used: • if testing earthing connections and the DUT has more than one earthed conductive parts. • if testing touch leakage and the DUT has more than one non-earthed conductive parts.

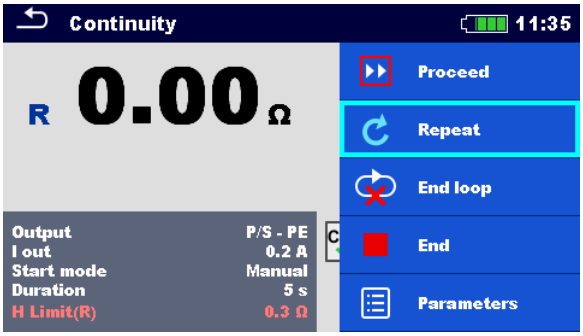
7.2.5 Step by step execution of Auto Sequences

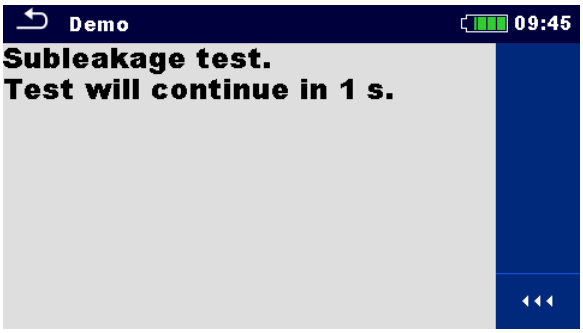
While the Auto Sequence is running, it is controlled by pre-programmed flow commands.

Examples of actions controlled by flow commands
Pauses during the Auto Sequence (texts, warnings, pictures)

Buzzer Pass / Fail sound after the tests
Pre-set data off appliances
Expert mode for Inspections
Skip non-safety notifications

For the actual list and description of flow commands see *Metrel ES Manager software help file*.



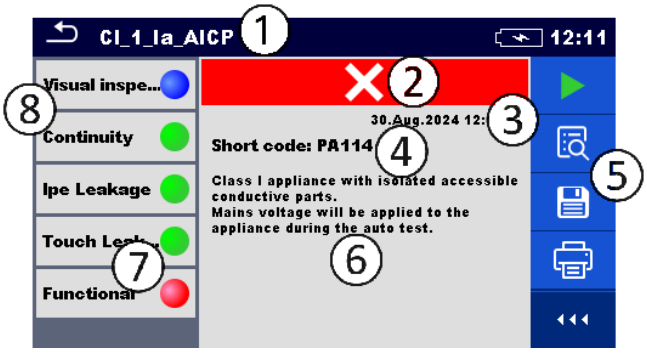


The offered options in the control panel depend on the selected single test, its result and the programmed test flow.

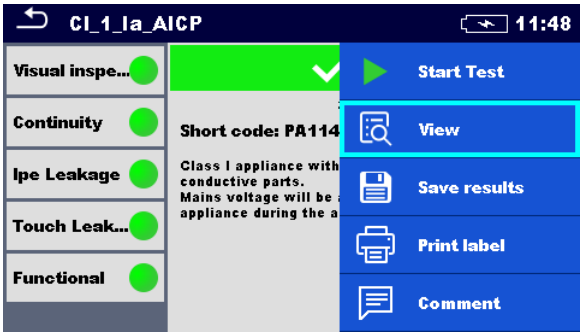
Proceed	Proceeds to the next step in the test sequence.
Repeat	Repeat the measurement.
End loop	Exit the loop of single tests and proceeds to the next step.
End	End the Auto Sequence® and go to result screen.
Parameters	View parameters/limits of single test.
Comment	Add comment

7.2.6 Auto Sequence result screen

After the Auto Sequence is finished the result screen is displayed. At the left side of the display the single tests and their statuses in the Auto Sequence are shown. In the middle of the display the header of the Auto Sequence with Short code and description of the Auto Sequence is displayed. At the top the overall Auto Sequence result status is displayed. For more information see chapter *Measurement statuses*.



1	Auto Sequence name
2	Overall status
3	Test date and time
4	Short code
5	Options
6	Description
7	Status of single test
8	Single tests



Start Test	Start a new Auto Sequence
View	View results of individual measurements.
Comment	Add comment to Auto Sequence
Print label Print & Save	Print label (available only if printing device is set). For details, see chapter *Printing labels*.
Tap on Single test	Viewing details of individual single tests, add comment on individual single test
Save results	Save the Auto Sequence results
A new Auto Sequence was selected and started from a Structure object in the structure tree	The Auto Sequence result will be saved under the selected Structure object

A new Auto Sequence was started from the Auto Sequence main menu	Saving under the last selected Structure object will be offered by default. The user can select another Structure object or create a new Structure object. By pressing Save in Memory organizer menu the Auto Sequence result is saved under selected location.
An empty measurement was selected in structure tree and started	The result(s) will be added to the Auto Sequence. The Auto Sequence will change its overall status from 'empty' to 'finished'.
An already carried out Auto Sequence was selected in structure tree, viewed and then restarted	A new Auto Sequence result will be saved under the selected Structure object.

7.2.7 Printing labels

Note

- 'Print label' options are available only if writing device in Devices settings menu is set. If no writing device is set, then 'Print label' options are hidden.

	Print label.
	Print label and Save Auto Sequence results simultaneously. Option is available if Devices parameter Auto save is set to On print, see *Devices*.

8 Maintenance

Unauthorized persons are not allowed to open the AlphaEE XA instrument. There are no user replaceable components inside the instrument, except the battery and fuses under back cover.

8.1 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.

8.2 Fuses

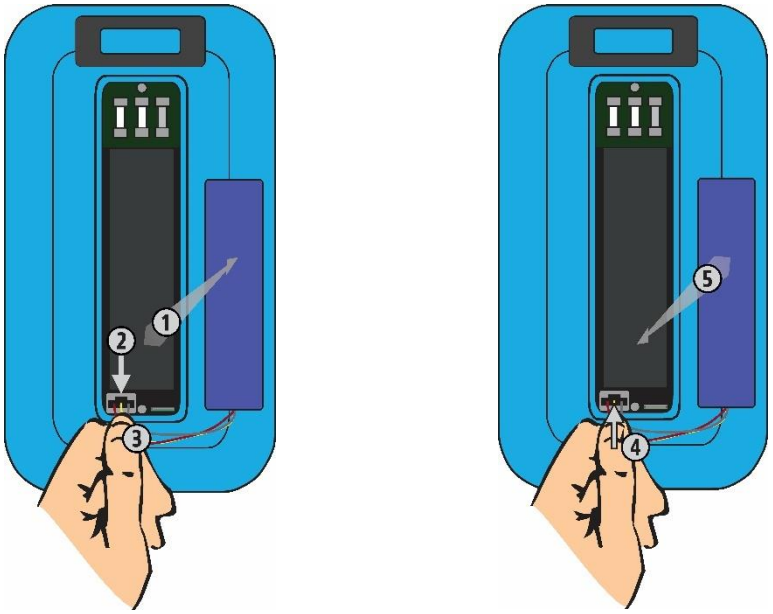
There are three fuses in the battery / fuse compartment:
F1, F2: T 16 A / 250 V / (20 × 5) mm / 1500 A: intended for general instrument protection.
F3: M 0.315 A / 250 V / (20 × 5) mm / 35 A: intended for protection of Continuity test circuit

For position of fuses see figure in chapter *Battery / fuse compartment*.

WARNINGS

- Switch off the instrument and disconnect all test accessories and mains cord before replacing the fuses.
- Replace blown fuses with the same type as defined in this document.

8.3 Battery pack insertion / replacement



Battery pack disconnection procedure

Unscrew and remove the battery / fuse compartment cover.
Remove the battery pack from battery compartment ①.
Press to unlock the connector ② and pull the wires ③ to disconnect the battery pack from the instrument.

Battery pack insertion procedure

Connect the new battery pack to the instrument ④.
Insert the battery pack into battery compartment ⑤.
Close and screw the battery / fuse compartment cover.

WARNINGS

- Switch off the instrument and disconnect all test accessories and mains cord before replacing the battery.
- Pay special attention when inserting the battery pack into the battery compartment and when closing the battery / fuse compartment cover to avoid pinched wires.

8.4 **Service**

For repairs under or out of warranty please contact your distributor for further information. Unauthorized person is not allowed to open the instrument. There are no user replaceable parts inside the instrument.

8.5 **Cleaning**

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

WARNINGS

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

9 Communications

The instrument can communicate with the Metrel ES Manager PC software. There are two communication interfaces available on the instrument: USB and Bluetooth. Instrument can also communicate to various external devices (Android devices, scanners, printers, ...).

9.1 USB communication with PC

The instrument automatically selects the communication mode according to detected interface. USB interface has priority.

How to establish an USB link:.

- USB communication: connect a PC USB port to the instrument USB connector using the USB interface cable.
- Switch on the PC and the instrument.
- Run the Metrel ES Manager software.
- Select communication port (COM port for USB communication is identified as "Measurement Instrument USB VCom Port").
- The instrument is prepared to communicate with the PC.

9.2 Bluetooth communication with printers and scanners

The instrument can communicate with supported Bluetooth printers and scanners. Contact Metrel or your distributor which external devices and functionalities are supported. See chapter *Devices* for details how to set the external Bluetooth device.

10 Technical specifications

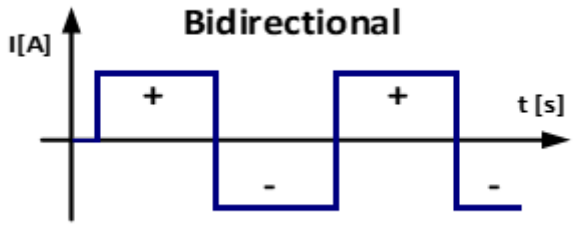
10.1 **Continuity**

Continuity

	Range	Resolution	Accuracy
R	0.00 Ω ... 19.99 Ω	0.01 Ω	±(2 % of reading + 2 D)
	20.0 Ω ... 99.9 Ω	0.1 Ω	±3 % of reading
	100.0 Ω ... 199.9 Ω	0.1 Ω	±5 % of reading
	200 Ω ... 1999 Ω	1 Ω	±5 % of reading

Operating range (acc. to EN 61557-4)..... 0.08 Ω ... 1999 Ω
Test current..... ±0.2 A d.c.
Test polarity..... bidirectional, continuous
Current source..... > 0.2 A d.c. at R < 2 Ω
Open circuit voltage..... 4 V r.m.s. ... 6 V r.m.s.

Current waveform shape



10.2 **Insulation Resistance (Riso, Riso-S)**

Insulation resistance, Insulation resistance –S (50 V, 100 V)

	Range	Resolution	Accuracy
Riso Riso-S	0.00 MΩ ... 19.99 MΩ	0.01 MΩ	±(3 % of reading + 2 D)

Insulation resistance, Insulation resistance –S (250 V, 500 V)

	Range	Resolution	Accuracy
Riso Riso-S	0.00 MΩ ... 19.99 MΩ	0.01 MΩ	±(3 % of reading + 2 D)
	20.0 MΩ ... 99.9 MΩ	0.1 MΩ	±5 % of reading
	100.0 MΩ ... 199.9 MΩ	0.1 MΩ	±10 % of reading

Output voltage

	Range	Resolution	Accuracy
Um	0 V ... 600 V	1 V	±(3 % of reading + 2 D)

Operating range (acc. to EN 61557-2).....0.08 MΩ ... 19.9 MΩ at Un: 50 V, 100 V
Operating range (acc. to EN 61557-2).....0.08 MΩ ... 199.9 MΩ at Un: 250 V, 500 V
Nominal voltages Un.....50 V, 100 V, 250 V, 500 V (- 0 %, + 10 %)
Short circuit current.....max. 2.0 mA

10.3 Sub-Leakage current (Isub, Isub-S)

Substitute leakage current, Substitute leakage current - S

	Range	Resolution	Accuracy
Isub Isub-S	0.00 mA ... 1.99 mA	0.01 mA	±(3 % of reading + 3 D)
	2.00 mA ... 19.99 mA	0.01 mA	±5 % of reading

Operating range (acc. to EN 61557-16) .....0.02 mA ... 19.99 mA
Open circuit voltage.....230 V a.c., 110 V a.c.
Short circuit current.....< 2 mA
Current calculated to mains supply voltage (110 V or 230 V) is displayed.

10.4 Cont+Ins+Sub

Refer to technical specification for Continuity (R), Insulation Resistance (Riso) and Sub-Leakage current (Isub).

10.5 Differential Leakage current

Differential leakage current

	Range	Resolution	Accuracy
Idiff	0.00 mA ... 1.99 mA	0.01 mA	±(3 % of reading + 3 D)
	2.00 mA ... 19.99 mA	0.01 mA	±5 % of reading

Power (active)

	Range	Resolution	Accuracy
P	0.00 W ... 19.99 W	0.01 W	±(5 % of reading + 5 D)
	20.0 W ... 199.9 W	0.1 W	±5 % of reading
	200 W ... 1999 W	1 W	
	2.00 kW ... 3.70 kW	10 W	

Operating range (acc. to EN 61557-16) ..... 0.01 mA ... 19.99 mA
Influence of load current ..... ≤ 0.03 mA/A

Differential leakage current (with A 1830)

	Range	Resolution	Accuracy
Idiff	0.10 mA ... 1.99 mA	0.01 mA	±(5 % of reading + 20 D)
	2.00 mA ... 19.99 mA	0.01 mA	±5 % of reading

Operating range (acc. to EN 61557-16) ..... 0.10 mA ... 19.99 mA
Influence of load current ..... ≤ 0.03 mA/A

10.6 PE Leakage current

PE leakage current

	Range	Resolution	Accuracy
Ipe	0.000 mA ... 1.999 mA	1 µA	±(3 % of reading + 3 D)
	2.00 mA ... 19.99 mA	0.01 mA	±5 % of reading

Power (active)

	Range	Resolution	Accuracy
P	0.00 W ... 19.99 W	0.01 W	±(5 % of reading + 5 D)
	20.0 W ... 199.9 W	0.1 W	±5 % of reading
	200 W ... 1999 W	1 W	
	2.00 kW ... 3.70 kW	10 W	

Operating range (acc. to EN 61557-16) ..... 0.010 mA ... 19.99 mA

10.7 Touch leakage current

Touch leakage current

	Range	Resolution	Accuracy
Itou	0.000 mA ... 1.999 mA	1 µA	±(3 % of reading + 3 D)
	2.00 mA ... 19.99 mA	0.01 mA	±5 % of reading

Power (active)

	Range	Resolution	Accuracy
P	0.00 W ... 19.99 W	0.01 W	±(5 % of reading + 5 D)
	20.0 W ... 199.9 W	0.1 W	±5 % of reading
	200 W ... 1999 W	1 W	
	2.00 kW ... 3.70 kW	10 W	

Operating range (acc. to EN 61557-16) ..... 0.010 mA ... 19.99 mA

10.8 Point to point leakage

Point to point leakage current

	Range	Resolution	Accuracy
Ileak	0.000 mA ... 1.999 mA	1 µA	±(3 % of reading + 3 D)
	2.00 mA ... 19.99 mA	0.01 mA	±5 % of reading

Operating range (acc. to EN 61557-16) ..... 0.010 mA ... 19.99 mA

10.9 Ipe+Ifloating input (Ipe+Ifi)

PE leakage current

	Range	Resolution	Accuracy
Ipe	0.000 mA ... 1.999 mA	1 µA	±(3 % of reading + 3 D)
	2.00 mA ... 19.99 mA	0.01 mA	±5 % of reading

Operating range (acc. to EN 61557-16) ..... 0.010 mA ... 19.99 mA

Differential leakage current

	Range	Resolution	Accuracy
Idiff	0.00 mA ... 1.99 mA	0.01 mA	±(3 % of reading + 3 D)
	2.00 mA ... 19.99 mA	0.01 mA	±5 % of reading

Operating range (acc. to EN 61557-16) ..... 0.01 mA ... 19.99 mA
Influence of load current ..... ≤ 0.03 mA/A

Ifi

	Range	Resolution	Accuracy
Ifi	0.000 mA ... 1.999 mA	1 µA	±(3 % of reading + 5 D)
	2.00 mA ... 19.99 mA	0.01 mA	± 5 % of reading

Operating range (acc. to EN 61557-16) ..... 0.020 mA ... 19.99 mA
Output voltage ..... ≤250 Va.c max, ≤2 mA
Technical specification is valid for Uinp_max ≤250 Va.c.. For values Uinp_max >250 Va.c., result is calculated.

Ipe+Ifi / Idiff+Ifi

	Range	Resolution	Accuracy
Ipe+Ifi Idiff+Ifi	0.000 mA ... 1.999 mA	1 µA	Calculated values
	2.00 mA ... 19.99 mA	0.01 mA	

10.10 **Itouch+Ifloating input (Itou+Ifi)**

Touch leakage current

	Range	Resolution	Accuracy
Itou	0.000 mA ... 1.999 mA	1 µA	±(3 % of reading + 3 D)
	2.00 mA ... 19.99 mA	0.01 mA	±(5 % of reading)

Operating range (acc. to EN 61557-16) ..... 0.010 mA ... 19.99 mA

Ifi

	Range	Resolution	Accuracy
Ifi	0.000 mA ... 1.999 mA	1 µA	±(3 % of reading + 5 D)
	2.00 mA ... 19.99 mA	0.01 mA	± 5 % of reading

Operating range (acc. to EN 61557-16) ..... 0.020 mA ... 19.99 mA
Output voltage ..... ≤250 Va.c. max, ≤2 mA
Technical specification is valid for Uinp_max ≤250 Va.c.. For values Uinp_max >250 Va.c., result is calculated.

Itouch+Ifi

	Range	Resolution	Accuracy
Itou+Ifi	0.000 mA ... 1.999 mA	1 µA	Calculated values
	2.00 mA ... 19.99 mA	0.01 mA	

10.11 **Power**

Power (active)

	Range	Resolution	Accuracy
P	0.00 W ... 19.99 W	0.01 W	±(5 % of reading + 5 D)
	20.0 W ... 199.9 W	0.1 W	±5 % of reading
	200 W ... 1999 W	1 W	
	2.00 kW ... 3.70 kW	10 W	

Power (apparent)

	Range	Resolution	Accuracy
S	0.00 VA ... 19.99 VA	0.01 VA	±(5 % of reading + 10 D)
	20.0 VA ... 199.9 VA	0.1 VA	±5 % of reading
	200 VA ... 1999 VA	1 VA	
	2.00 kVA ... 3.70 kVA	10 VA	

Power (reactive)

	Range	Resolution	Accuracy
Q	±(0.00 var ... 19.99 var)	0.01 var	±(5 % of reading + 10 D)
	±(20.0 var ... 199.9 var)	0.1 var	±5 % of reading
	±(200 var ... 1999 var)	1 var	
	±(2.00 kvar ... 3.70 kvar)	10 var	

Power factor

	Range	Resolution	Accuracy
PF	0.00i ... 1.00i 0.00c ... 1.00c	0.01	±(5 % of reading + 5 D)

Total Harmonic Distortion (voltage)

	Range	Resolution	Accuracy
THDU	0.0 % ... 99.9 %	0.1 %	±(5 % of reading + 5 D)

Total Harmonic Distortion (current)

	Range	Resolution	Accuracy
THDI	0 mA ... 999 mA	1 mA	±(5 % of reading + 5 D)
	1.00 A ... 16.00 A	10 mA	±5 % of reading

Cosine **Φ**

	Range	Resolution	Accuracy
Cos Φ	0.00i ... 1.00i 0.00c ... 1.00c	0.01	±(5 % of reading + 5 D)

Current

	Range	Resolution	Accuracy
I	0 mA ... 999 mA	1 mA	±(3 % of reading + 5 D)
	1.00 A ... 16.00 A	10 mA	±3 % of reading

Voltage

	Range	Resolution	Accuracy
U	0.0 V ... 199.9 V	0.1 V	±(3 % of reading + 10 D)
	200 V ... 264 V	1 V	±3 % of reading

Accuracy is valid within 0.5c ≤ PF ≤ 0.8i

10.12 **Leak's & Power**

Touch leakage current

	Range	Resolution	Accuracy
Itou	0.000 mA ... 1.999 mA	1 µA	±(3 % of reading + 3 D)
	2.00 mA ... 19.99 mA	0.01 mA	±5 % of reading

Operating range (acc. to EN 61557-16) ..... 0.010 mA ... 19.99 mA

Differential leakage current

	Range	Resolution	Accuracy
Idiff	0.00 mA ... 1.99 mA	0.01 mA	±(3 % of reading + 3 D)
	2.00 mA ... 19.99 mA	0.01 mA	±5 % of reading

Operating range (acc. to EN 61557-16) ..... 0.01 mA ... 19.99 mA
Influence of load current ..... ≤ 0.03 mA/A

Power (active)

	Range	Resolution	Accuracy
P	0.00 W ... 19.99 W	0.01 W	±(5 % of reading + 5 D)
	20.0 W ... 199.9 W	0.1 W	±5 % of reading
	200 W ... 1999 W	1 W	
	2.00 kW ... 3.70 kW	10 W	

Power (apparent)

	Range	Resolution	Accuracy
S	0.00 VA ... 19.99 VA	0.01 VA	±(5 % of reading + 10 D)
	20.0 VA ... 199.9 VA	0.1 VA	±5 % of reading
	200 VA ... 1999 VA	1 VA	
	2.00 kVA ... 3.70 kVA	10 VA	

Power (reactive)

	Range	Resolution	Accuracy
Q	±(0.00 var ... 19.99 var)	0.01 var	±(5 % of reading + 10 D)
	±(20.0 var ... 199.9 var)	0.1 var	±5 % of reading
	±(200 var ... 1999 var)	1 var	
	±(2.00 kvar ... 3.70 kvar)	10 var	

Power factor

	Range	Resolution	Accuracy
PF	0.00i ... 1.00i 0.00c ... 1.00c	0.01	±(5 % of reading + 5 D)

Total Harmonic Distortion (voltage)

	Range	Resolution	Accuracy
THDU	0.0 % ... 99.9 %	0.1 %	±(5 % of reading + 5 D)

Total Harmonic Distortion (current)

	Range	Resolution	Accuracy
THDI	0 mA ... 999 mA	1 mA	±(5 % of reading + 5 D)
	1.00 A ... 16.00 A	10 mA	±5 % of reading

Cosine **Φ**

	Range	Resolution	Accuracy
Cos Φ	0.00i ... 1.00i 0.00c ... 1.00c	0.01	±(5 % of reading + 5 D)

Current

	Range	Resolution	Accuracy
I	0 mA ... 999 mA	1 mA	±(3 % of reading + 5 D)
	1.00 A ... 16.00 A	10 mA	±3 % of reading

Voltage

	Range	Resolution	Accuracy
U	0.0 V ... 199.9 V	0.1 V	±(3 % of reading + 10 D)
	200 V ... 264 V	1 V	±3 % of reading

10.13 **Polarity**

Test voltage (normal) ..... < 230 V a.c.
Maximal current ..... < 2 mA
Test voltage (active) ..... mains voltage
Power consumption of tested device
during the active test ..... < 25 VA
Results ..... Pass, PE open, L open, N open, LN cross, LN short, LPE short, NPE short, LPE FAULT, NPE FAULT, Multiple fault

10.14 **PRCD test**

Trip-out time

	Range	Resolution	Accuracy
tΔN	0 ms ... 300 ms (999 ms*) (½×$I_{\Delta N}$)	1 ms	± 3 ms
	0 ms ... 300 ms (40 ms*) ($I_{\Delta N}$)	1 ms	± 3 ms
	0 ms ... 40 ms (5×$I_{\Delta N}$)	1 ms	± 3 ms

*According to standard AS/NZS 3017

Trip-out current

	Range	Resolution	Accuracy
IΔ	0.2× $I_{\Delta N}$ ... 2.2× $I_{\Delta N}$	0.05× $I_{\Delta N}$	±0.1× $I_{\Delta N}$

Test current type:..... sine-wave (AC), pulsed (A, F), smooth DC (B, B+)
Test currents (IΔN): ..... 10 mA, 15 mA, 30 mA
Test current size (PRCD standard is AS/NZS 3017)..... ± 5%
Test current size (general).....-0/+10%

10.15 **RCD test**

Trip-out time

	Range	Resolution	Accuracy
tΔN	0 ms ... 300 ms (999 ms*) (½×$I_{\Delta N}$)	1 ms	± 3 ms
	0 ms ... 300 ms (40 ms*) ($I_{\Delta N}$)	1 ms	± 3 ms
	0 ms ... 40 ms (5×$I_{\Delta N}$)	1 ms	± 3 ms

*According to standard AS/NZS 3017

Trip-out current

	Range	Resolution	Accuracy
IΔ	0.2× $I_{\Delta N}$ ... 2.2× $I_{\Delta N}$	0.05× $I_{\Delta N}$	±0.1× $I_{\Delta N}$

Contact voltage

	Range	Resolution	Accuracy
Uc	0.0 V ... 19.9 V	0.1 V	(-0 % / +15 %) of reading ± 20 D
	20.0 V ... 99.9 V	0.1 V	(-0 % / +15 %) of reading

Test current type:..... sine-wave (AC), pulsed (A,F), smooth DC (B,B+)
Test currents (IΔN): ..... 10 mA, 15 mA, 30 mA
Test current size (RCD standard is AS/NZS 3017)..... ± 5%
Test current size (EN 61008/EN 61009).....-0/+10%

10.16 **PE conductor (PRCD)**

PE conductor (Type = 2 pole, 3 pole, S(3 pole), S+)

	Range	Resolution	Accuracy
R	0.00 Ω ... 19.99 Ω	0.01 Ω	±(2 % of reading + 2 D)

Current source ..... > 0.2 A d.c. at R < 2 Ω
Operating range (acc. to EN 61557-4)..... 0.08 Ω ... 19.99 Ω
Upper range is limited by polarity pretest.

10.17 **Open conductor (PRCD)**

Test principle:
Mains voltage is applied to the mains test socket. Disconnection of the L, N and PE connections is performed inside the instrument. There is a 'PASS' if the PRCD trips.

10.18 **PRCD PE probe test**

Test principle:
Mains voltage is applied to the mains test socket. A safe voltage sufficiently high to activate the protection circuit in the PRCD is applied to the P/S terminal.

Test voltage (active)..... ≤ 250 V a.c.
Maximal current ..... < 2 mA

10.19 **EV RCD test**

Trip-out time

Result	Test current		Range	Resolution	Accuracy
$t_{\Delta N}$	a.c. pulse d.c. (A)	½× $I_{\Delta N}$	0.0 ms ... 300.0 ms	0.1 ms	± 3 ms
		$I_{\Delta N}$	0.0 ms ... 300.0 ms	0.1 ms	± 3 ms
		2× $I_{\Delta N}$	0.0 ms ... 150.0 ms	0.1 ms	± 3 ms
		5× $I_{\Delta N}$	0.0 ms ... 40.0 ms	0.1 ms	± 3 ms
	smooth d.c.	½× $I_{\Delta N}$	0.0 ms ... 999.9 ms 1.00 s ... 9.99 s	0.1 ms 0.01 s	± 3 ms ± 30 ms
		$I_{\Delta N}$	0.0 ms ... 999.9 ms 1.00 s ... 9.99 s	0.1 ms 0.01 s	± 3 ms ± 30 ms
		10× $I_{\Delta N}$	0.0 ms ... 300.0 ms	0.1 ms	± 3 ms

Trip-out current

Result	Test current	Range	Resolution	Accuracy
I_Δ	a.c.	0.2× $I_{\Delta N}$ ... 1.1× $I_{\Delta N}$	0.05× $I_{\Delta N}$	±0.1× $I_{\Delta N}$
	pulse d.c. (A)	0.2× $I_{\Delta N}$ ... 1.5× $I_{\Delta N}$	0.05× $I_{\Delta N}$	±0.1× $I_{\Delta N}$
	smooth d.c.	1.5 mA ... 6.0 mA	0.05× $I_{\Delta N}$	±0.1× $I_{\Delta N}$

Test current type: ..... sine-wave (a.c.), pulsed d.c. (A), smooth d.c.
Test currents (IΔN): ..... 6 mA (smooth d.c.), 10 mA, 15 mA, 30 mA
Test current size:.....-0/+10%

10.20 **PE conductor (EV RCD)**

PE conductor (I test = Standard)

	Range	Resolution	Accuracy
R	0.00 Ω ... 19.99 Ω	0.01 Ω	±(2 % of reading + 2 D)

Current source ..... > 0.2 A d.c. at R < 2 Ω
Operating range (acc. to EN 61557-4)..... 0.08 Ω ... 19.99 Ω
Upper range is limited by polarity pretest.

PE conductor (I test = Low)

	Range	Resolution	Accuracy
R	0.0 Ω ... 19.9 Ω	0.1 Ω	±(5 % of reading + 5 D)

Current source ..... < 3 mA at R < 2 Ω
Upper range is limited by polarity pretest.

10.21 **SELV/PELV Voltage**

Voltage (U trms, Uac)

	Range	Resolution	Accuracy
U trms Uac	0.0 V ... 199.9 V	0.1 V	±(2 % of reading + 10 D)
	200 V ... 264 V	1 V	±2 % of reading

Voltage (Udc)

	Range	Resolution	Accuracy
Udc	±(0.0 V ... 199.9 V)	0.1 V	±(2 % of reading + 10 D)
	±(200 V ... 264 V)	1 V	±2 % of reading

Result type..... True r.m.s. (TRMS), AC, DC

Input resistance ..... input P/S 200 kΩ to earth,
input PE 200 kΩ to earth

Nominal frequency range ..... 0 Hz (DC), 15 Hz ... 500 Hz
Bandwidth..... 1 kHz

10.22 **EVSE Diagnostic test (A 1632)**

This test is performed in combination with an external test adapter / instrument. For technical specification refer to *A 1632 eMobility Analyser Instruction manual*.

10.23 **Enhanced TRMS test**

Voltage

	Range	Resolution	Accuracy
Uln, Unpe, Ulpe	103 V ... 253 V	1 V	±(3 % of reading + 3 D)

R loop

	Range	Resolution	Accuracy*
Rl	0.0 kΩ ... 9.9 kΩ	0.1 kΩ	±(5 % of reading + 5 D)

*Specified accuracy is valid in circuits with Rline < 20 Ω.

Detects..... active neutral reversal, PE fault

10.24 **Clamp current**

True RMS current using current clamp A 1472

	Range	Resolution	Accuracy
I Idiff Ipe	0.10 mA ... 9.99 mA	0.01 mA	±(5 % of reading + 10 D)
	10.0 mA ... 99.9 mA	0.1 mA	±(5 % of reading + 5 D)
	100 mA ... 999 mA	1 mA	±(5 % of reading + 5 D)
	1.00 A ... 9.99 A	0.01 A	±(5 % of reading + 5 D)
	10.0 A ... 24.9 A	0.1 A	±(5 % of reading + 5 D)

Nominal frequency range ..... 50 Hz ... 200 Hz

10.25 **General data**

Mains supply

Supply voltage, frequency	115 V* / 230 V a.c., 50 Hz / 60 Hz
Supply voltage tolerance	±10 %
Max. power consumption	30 VA (without load on test socket)
Max. load	10 A continuous, 16 A short duration, 1.5 kW motor
Mains supply overvoltage category	CAT II / 300V
Altitude	≤ 2000 m

*except UK, AUS/NZ see *Appendix B – Profile Notes*.

Measuring categories

Instrument:	Cat II / 300 V
Test socket:	Cat II / 300 V
Plug test cable:	Cat II / 300 V
Altitude	≤ 2000 m

Protection classifications

Power supply	Class I (mains supply), Class II (battery supply)
Pollution degree	2
Degree of protection	IP 40 IP 20 (mains test socket)
Case	Shock proof plastic / portable
Operation	Indoor use

Display

Display	Colour TFT display, 4.3 inch, 480 x 272 pixels
Touch screen	Capacitive

Communication

Memory	depends on microSD card size
USB 2.0	Standard USB Type B
Bluetooth	Class 1

EMC

Emission	Class B (Group 1)
Immunity	Industrial environment

Reference conditions
- Reference temperature range:.....15 °C ... 35 °C
- Reference humidity range: .....35 % ... 65 % RH

Operation conditions
- Working temperature range: ..... 0 °C ... +40 °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)

Fuses
- F1, F2 .....T 16 A / 250 V, 20 mm × 5 mm / 1500 A
- F3 .....M 0.315 A / 250 V, 20 mm × 5 mm / 35 A

General
- Dimensions (w×h×d):.....15 cm × 8 cm × 28 cm
- Weight .....1.7 kg

Accuracies apply for 1 year in reference conditions. Temperature coefficient outside these limits is 0.2 % of measured value per °C plus 1 digit, otherwise noted.

Appendix A – Structure objects in AlphaEE XA

Structure elements used in Memory Organizer are instrument's Profile dependent.

Symbol	Default name	Description
	Node	Node
	Project	Project
	Location	Location
	Client	Client
	Appliance	Appliance (basic description)
	Appliance FD	Appliance (full description)
	Element	Universal element

Appendix B – Profile Notes

The instrument can work with multiple Profiles. This appendix describes important specific functionalities for each Profile.

B.1 **Profile CBAB**

110 V equipment can be fully tested, except if testing in IT or CT supply system; see *Appendix F – Testing in IT and CT supply systems* for limitations.

Instrument works on 110 V and 230 V mains.

B.2 **Profile CBAC (UK)**

Testing of 110 V equipment is partly supported. With dedicated adapters Continutiy, Insulation and Sub-leakage tests can be carried out. Note that Sub-leakage test results are calculated to 230 V. For more information about adapters and their limitations, contact Metrel or distributors.

Instrument works on 230 V mains.

B.3 **Profile CBAD (AUS/NZ)**

Testing of 110 V equipment is partly supported. With dedicated adapters Continutiy, Insulation and Sub-leakage tests can be carried out. Note that Sub-leakage test results are calculated to 230 V. For more information about adapters and their limitations, contact Metrel or distributors.

Instrument works on 230 V mains.

Appendix C – Print labels and read NFC tags

The instrument supports different label printers, label size forms, two tag formats (PAT and Generic) and NFC reader devices.
Please check with Metrel or distributor which printers, NFC reading devices and labels are supported in your instrument profile.

C.1 **PAT tag format**

In the tables below, the content printed on the selected label is shown.

PAT format

Size [W × H]	*Label type*	*Field*	*Data 1st label*	*Data 2nd label*
50 mm × 25.5 mm	Classic	Barcode	Test code, Appliance ID	Appliance ID
		Text	Test code, Appliance ID, Test or retest date, Status, User	Appliance ID,Test or retest date, Status, User
	QR	QR	Test code, Appliance ID, Appliance name, Test date, Retest period, Location, User, Status, Measurement results	Appliance ID, Appliance name, Test date, Retest period, Location, User, Status
		Text	Test code, Appliance ID, Appliance name, Test or retest date, Status, User	Appliance ID, Appliance name, Test or retest date, Status, User
	Simple	Text	Appliance ID, Appliance name, Status, Test or retest date, User	/

Size [W × H]	*Label type*	*Field*	*Data 1st label*	*Data 2nd label*
43 mm × 99 mm	Classic	Barcode	Test code, Appliance ID	Appliance ID
		Text	Test code, Appliance ID, Test and retest date, Status, User	Appliance ID,Test and retest date, Status, User
	QR	QR	Test code, Appliance ID, Appliance name, Test date, Retest period, Location, User, Status, Measurement results	Appliance ID, Appliance name, Test date, Retest period, Location, User, Status
		Text	Test code, Appliance ID, Appliance name, Test and retest date, Status, User	Appliance ID, Appliance name, Test and retest date, Status, User

Size [W × H]	*Label type*	*Field*	*Data 1st label*	*Data 2nd label*
100 mm × 50 mm	Classic	Barcode	Test code, Appliance ID	Appliance ID
		Text	Test code, Appliance ID, Test and retest date, Status, User	Appliance ID, Test and retest date, Status, User
	QR	QR	Test code, Appliance ID, Appliance name, Test date, Retest period, Location, User, Status, Measurement results	Appliance ID, Appliance name, Test date, Retest period, Location, User, Status
		Text	Test code, Appliance ID, Appliance name, Test and retest date, Status, User	Appliance ID, Appliance name, Test and retest date, Status, User

Notes

- 2nd label is intended to mark supply cords.
- If Auto Sequence® was modified, its test code will be marked with an asterisk (*).

C.2 **Generic tag format**

In the table below, the content printed on the selected label is shown.

Generic format

Size [W × H]	*Label type*	*Field*	*Data*
50 mm × 25.5 mm	QR	Text	Parent object name, Test code, Object ID, Test or retest date, Status, User
		QR	Parent object name, Test code, Object ID, Test date, Retest period, Auto Sequence® status, Object status, User.

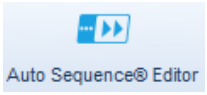
Note

- If Auto Sequence® was modified, its test code will be marked with an asterisk (*).

Appendix D – Programming of Auto Sequences on Metrel ES Manager

The Auto Sequence® editor is a part of the Metrel ES Manager software. In Auto Sequence® editor Auto Sequence® can be pre-programmed and organized in groups, before uploaded to the instrument.

D.1 **Auto Sequence® Editor workspace**

To enter Auto Sequence® Editor's workspace, select 

in Home Tab of Metrel ES Manager PC SW. Auto Sequence® Editor workspace is divided in four main areas. On the left side ❶,structure of selected group of Auto Sequence® is displayed. In the middle part of the workspace❷, the elements of the selected Auto Sequence® are shown. On the right side, list of available Single tests ❸ and list of Flow commands ❹ are shown.
Single test area contains three tabs, Measurements, Inspections and Custom Inspections tab. Custom Inspections and their tasks are programmed by user.

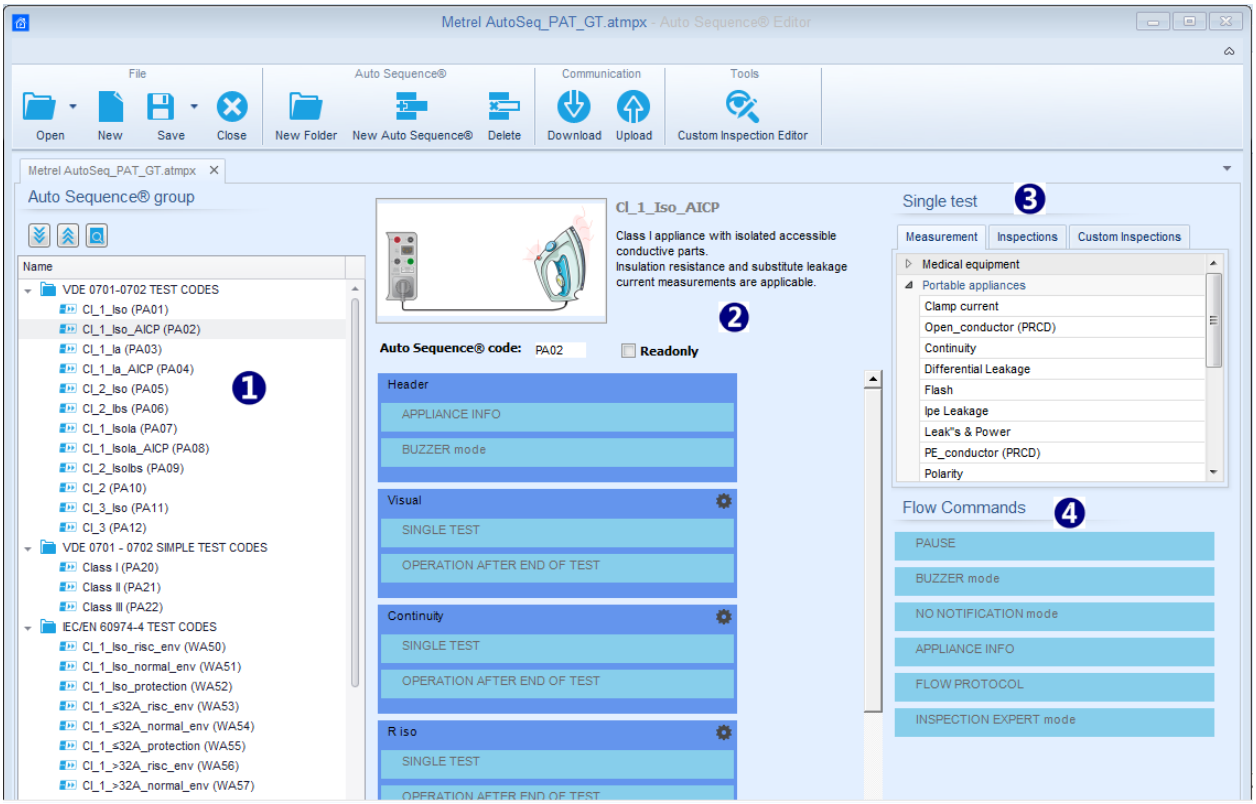


Figure D.1: Auto Sequence® Editor workspace

An Auto Sequence® ❷ begins with Name, Description and Image, followed by the first step (Header), one or more measuring steps and ends with the last step (Result). By inserting

appropriate Single tests (measurements, inspections and custom inspections) ❸ and Flow commands ❹ and setting their parameters, arbitrary Auto Sequences® can be created.

Figure D.2: Example of an Auto Sequence® header

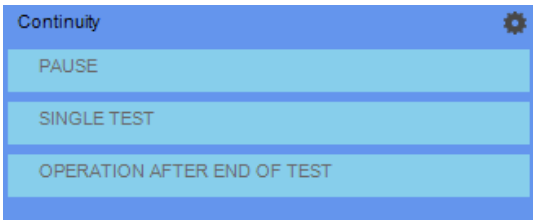


Figure D.3: Example of a measurement step

Figure D.4: Example of an Auto Sequence® result

D.2 Managing groups of Auto Sequences®

The Auto Sequences® can be divided into different user defined groups of Auto Sequences®. Each group of Auto Sequences® is stored in a file. More files can be opened simultaneously in Auto Sequence® editor.
Within Group of Auto Sequences®, tree structure can be organized, with folders / subfolders containing Auto Sequences®. The three structure of currently active Group of Auto Sequences® is displayed on the left side of the Auto Sequence® editor workspace, see *Figure D.5*.

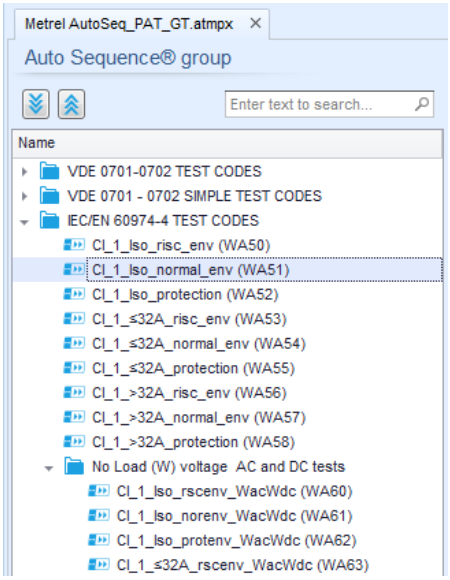


Figure D.5: Group of Auto Sequences® tree organization

Operation options on Group of Auto Sequences® are available from menu bar at the top of Auto Sequence® Editor workspace.

File operation options:

	Opens a file (Group of Auto Sequences®).
	Creates a new file (Group of Auto Sequences®).
	Saves / Saves as the opened Group of Auto Sequences® to a file.
	Closes the file (Group of Auto Sequences®).

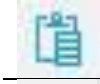
Group of Auto Sequences® view options:

	Expand all folders / subfolders / Auto Sequences®.
	Collapse all folders / subfolders / Auto Sequences®.
	Search by name within Auto Sequence® group. See *Appendix D.2.2 - Search within selected Auto Sequence® group* for details.

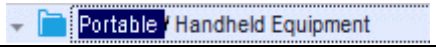
Group of Auto Sequences® operation options (also available by right clicking on Folder or Auto Sequence®):

	Adds a new folder / subfolder to the group
	Adds a new Auto Sequence® to the group.
	Deletes: - the selected Auto Sequence® - the selected folder with all subfolders and Auto Sequences®

Right click on the selected Auto Sequence® or Folder opens menu with additional possibilities:

	Auto Sequence®: Edit Name, Description and Image (*see Figure D.6*). Folder: Edit folder name
	Auto Sequence®: Copy to clipboard Folder: Copy to clipboard including subfolders and Auto Sequences®
	Auto Sequence®: Paste it to selected location Folder: Paste it to selected location
	Auto Sequence®: Creates shortcut to selected Auto Sequence®

Double click on the object name allows it name edit:

DOUBLE CLICK	Auto Sequence® name: Edit Auto Sequence® name  Folder name: Edit folder name 

Drag and drop of the selected Auto Sequence® or Folder / Subfolder moves it to a new location:

DRAG & DROP	"Drag and drop" functionality is equivalent to "cut" and "paste" in a single move. move to folder insert

D.2.1 Auto Sequence® Name, Description and Image editing

When EDIT function is selected on Auto Sequence®, menu for editing presented on *Figure D.6* appear on the screen. Editing options are:
Name: Edit or change the name of Auto Sequence®.
Description: Any text for additional description of Auto Sequence® can be entered.
Image: Image presenting Auto sequence® measuring arrangement can be entered or deleted.

	Enters menu for browsing to Image location.
	Deletes the Image from Auto Sequence®.

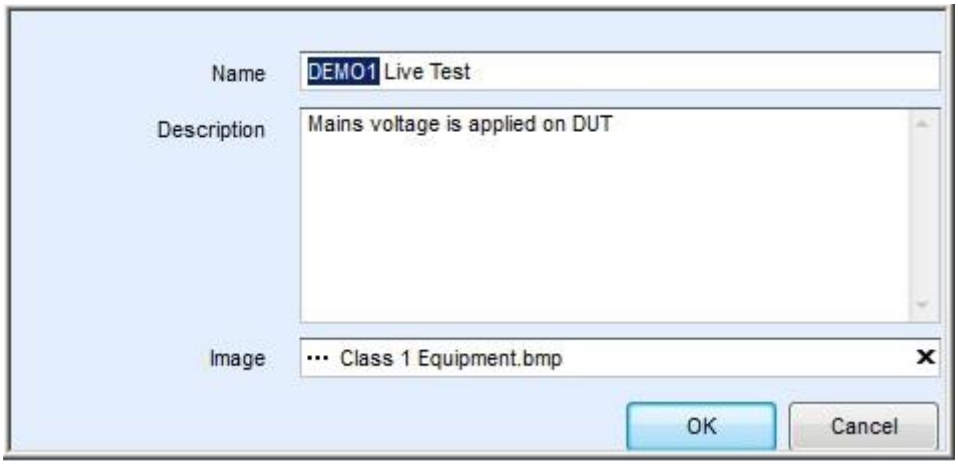


Figure D.6: Editing the Auto Sequence® Name, Description and Image

D.2.2 Search within selected Auto Sequence® group

By entering the text into search box and click on the search icon, found results are highlighted with yellow background and first found result (Folder or Auto Sequence®) is focused. Click on the Search icon again focus next search result. Search functionality is implemented in Folders, Subfolders and Auto Sequences® of selected Auto Sequence® Group.

Search text can be cleared by selecting the Clear button.

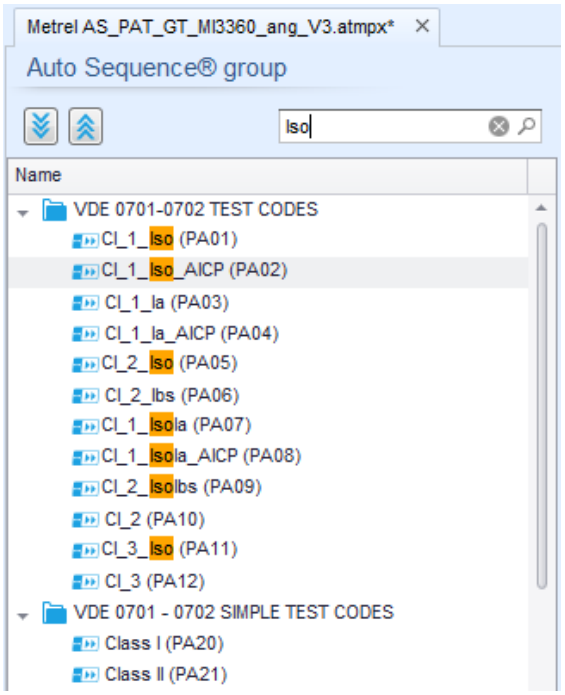


Figure D.7: Example of Search result within Auto Sequence® group

D.3 **Elements of an Auto Sequence®**

D.3.1 Auto Sequence® steps

Auto Sequence® code
A code can be added to custom made Auto Sequences®.

Instructed person use
This checkbox must be checked, to allow the use of the Auto Sequence® by instructed persons. See chapter *User Accounts* and *Appendix G – User permissions* for more information.

Header
The Header step is empty by default.
Flow commands can be added to the Header step.

Measurement step

The Measurement step contains a Single test and the Operation after end of test flow command by default. Other Flow commands can also be added to the Measurement step.

Result
The Result step contains the Result screen flow command by default. Other Flow commands can also be added to the Result step.

D.3.2 Single tests

Single tests are the same as in Metrel ES Manager Measurement menu.
Limits and parameters of the measurements can be set. Results and sub-results can't be set.

D.3.3 Flow commands

Flow commands are used to control the flow of measurements. Refer to *Appendix D.5 - Description of flow commands* for more information.

D.3.4 Number of measurement steps

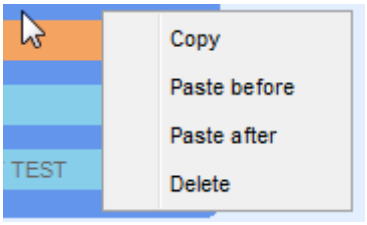
Often the same measurement step has to be performed on multiple points on the device under test. It is possible to set how many times a Measurement step will be repeated. All carried out individual Single test results are stored in the Auto Sequence® result as if they were programmed as independent measuring steps.

D.4 **Creating / modifying an Auto Sequence®**

If creating a new Auto Sequence® from scratch, the first step (Header) and the last step (Result) are offered by default. Measurement steps are inserted by the user.

OptionsAdding a measurement step	By double clicking on a Single test a new measurement step will appear as the last of measurement steps. It can also be dragged and dropped on the appropriate position in the Auto Sequence®.
Adding flow commands	Selected flow command can be dragged from the list of Flow commands and dropped on the appropriate place in any Auto Sequence® step.
Changing position of flow command within measurement step	By a click on an element and use of keys.
Viewing / changing parameters of flow commands or single tests.	By a double click on the element.
Setting number of measurement step repetitions	By setting a number in the  field.

Right click on the selected measurement step / flow command:



Copy – Paste before
A measurement step / flow command can be copied and pasted above selected location on the same or on another Auto Sequence®.

Copy – Paste after
A measurement step / flow command can be copied and pasted under selected location on the same or on another Auto Sequence®.

Delete
Deletes the selected measurement step / flow command.

D.5 **Description of flow commands**

Double click on inserted Flow Command opens menu window, where text or picture can be entered, external commands can be activated and parameters can be set.
Flow commands Operation after end of test and Results screen are entered by default, others are user selectable from Flow Commands menu.

D.5.1 Pause

A Pause command with text message or picture can be inserted anywhere in the measuring steps. Warning icon can be set alone or added to text message. Arbitrary text message can be entered in prepared field Text of menu window.

Parameters

Pause type	Show text and/or warning (check to show warning icon) Show picture (browse for image path)
Duration	Number in seconds, infinite (no entry)

D.5.2 Buzzer mode

Passed or failed measurement is indicated with beeps.

- Pass – double beep after the test
- Fail – long beep after the test

Beep happens right after single test measurement.

Parameters

State	On – enables Buzzer mode Off – disables Buzzer mode

D.5.3 No notifications mode

Instrument skips pre-test warnings (see chapter for more information).

Parameters

State	On – enables No notifications mode Off – disables No notifications mode

D.5.4 Appliance info

Instrument enables to automatically select the appliance type and add the Appliance ID, Appliance name and Retest period to the Auto Sequence®.

Parameters

Repeat Setting	Repeat:	The same Appliance ID will be offered each time if the same Auto Sequence® is carried out successively in a loop.
	Increment:	A four digit number will be added to the Appliance ID and incremented each time if the same Auto Sequence® is carried out successively in a loop.
Appliance type	Selects the type of the appliance (Appliance, Appliance_FD)	
Default Appliance ID	Enter default Appliance ID	
Appliance name	Enter Appliance name. Options: ☑ Editable – allows Appliance name to be modified while running Auto Sequence®. Menu with a list of Appliance names and possibility to enter custom Appliance name is offered within the test. ☐ Not editable – Default Appliance name is used. Appliance name cannot be modified while running Auto Sequence®.	
Retest period	Retest period in months. Options: ☑ Editable – allows Retest period to be modified while running Auto Sequence®. Numeric keypad for entering custom Retest period is offered within the test. ☐ Not editable – Default Retest period is used. Retest period cannot be modified while running Auto Sequence®.	

Note

- This flow command is active only if Auto Sequence® is started from the Auto Sequence® Main menu.

D.5.5 Inspection Expert mode

If Inspection Expert mode flow command is set, the Visual inspection screen and Functional inspection screen within Auto Sequence® are displayed for 1 second and an overall PASS is

automatically applied at the end of test. In between, the automatic procedure can be stopped and statuses can be applied manually.
Inspection Expert mode is disabled by default.

Parameters

State	On – enables automatic settings of tickers in Visual and Functional tests. Off – disables automatic settings of tickers in Visual and Functional tests.

D.5.6 Operation after end of test

This flow command controls the proceeding of the Auto Sequence® in regard to the measurement results.

Parameters

Operation after end of test – pass – fail – no status	The operation can be individually set for the case the measurement passed, failed or ended without a status.	
	Manual:	The test sequence stops and waits for appropriate command (RUN key, external command...) to proceed.
	Auto:	The test sequence automatically proceeds.

D.5.7 Result screen

This flow commands control the proceeding after the Auto Sequence® has ended.

Parameters

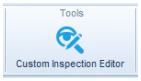
☑ Auto Save	Auto Sequence® results are stored in the momentary workspace. A new Node with the date and time will be created. Under the Node Auto Sequence® results or (if Appliance info flow command is set) a new appliance and Auto Sequence® results will be stored. Up to 100 Auto Sequence® results or appliances can be automatically stored under the same node. If more results / appliances are available, they are split to multiple nodes. Local Save Flow setting is disabled by default.
☑ Auto Print	Auto Sequence® results are automatically printed. Print label menu will not be displayed. All printer and tag settings from Devices menu applies.

Note
• This flow command is active only if Auto Sequence® is started from the Auto Sequence® Main menu (not from the Memory organizer).

D.6 **Custom Inspections programming**

Arbitrary set of tasks dedicated to specific user defined Inspections can be programmed with application of Custom Inspection Editor Tool, accessible from Auto Sequence® Editor workspace. Custom Inspections are stored in dedicated file *.indf with user defined name. For application of Custom Inspections as a single test within Auto Sequence® group, appropriate file containing specific Custom Inspection should be opened first.

D.6.1 Creating and editing Custom Inspections

Custom Inspection Editor workspace is entered by selecting 

icon from Auto Sequences® main menu. It is divided in two main areas, as presented on *Figure D.8*:

1. Custom Inspection Name and Scope of inspection (Visual or Functional)
2. Name of Custom Inspection Item tasks and Type of Item Pass / Fail checkbox marking

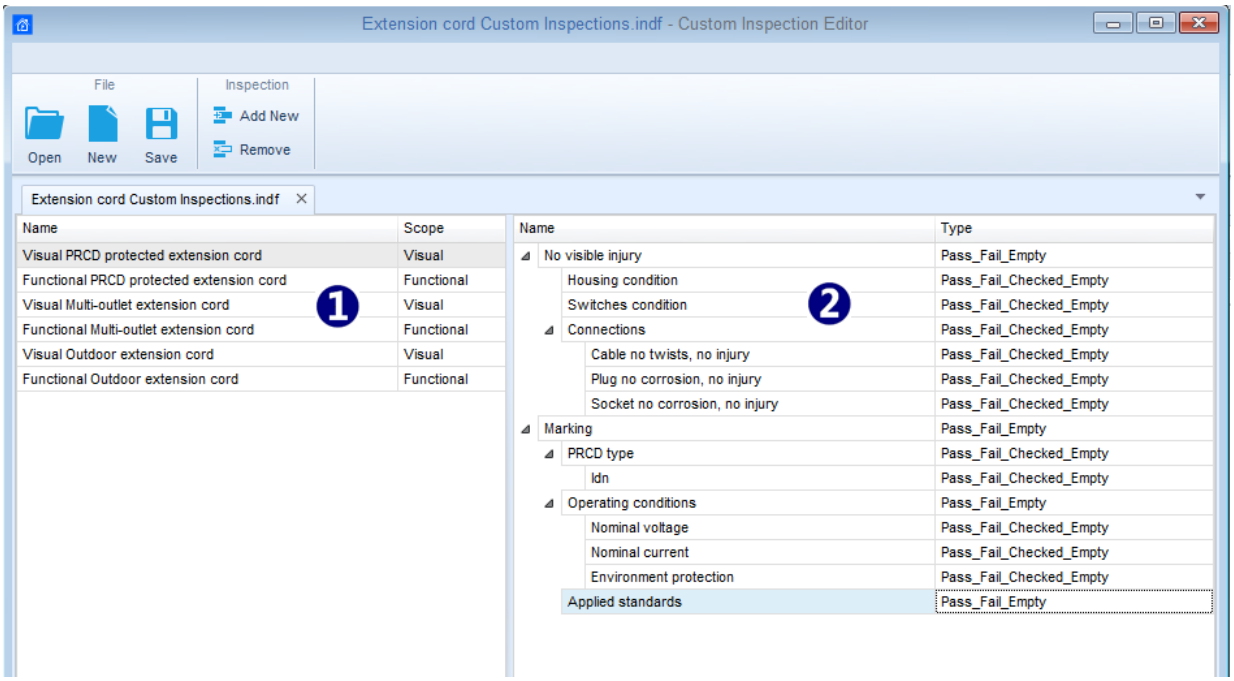
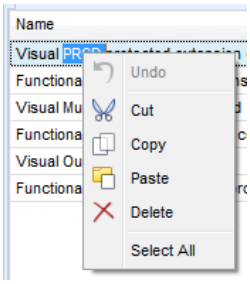
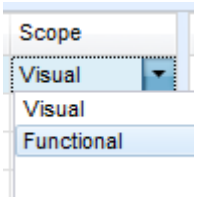


Figure D.8: Custom Inspection Editor workspace

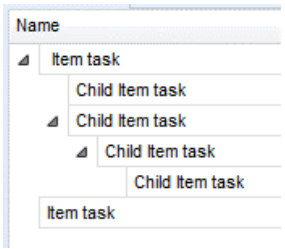
Custom Inspection Editor Main menu options:

	Opens existing Custom Inspection Data file. By selecting, menu for browsing to location of *.indf file containing one or more Custom Inspections data appear on the screen. Selected file is opened in dedicated tab marked with file name.
	Creates a new Custom Inspection Data file. New tab with empty workspace is opened. Default name of the new tab is *Inspection Data File*; it could be renamed during Save procedure.
	Saves / Saves as Custom Inspection Data file opened on active tab. Menu for browsing to the folder location and editing of file name is opened. Browse to the location, confirm overwriting, if file already exists or edit file name to save it as a new Custom Inspection Data file.
	Add New Custom Inspection. New inspection with default name *Custom Inspection* and default scope *Visual* appear on the editor workspace. It contains one Item task with default name *Custom Inspection* and default Type *Pass_Fail_Checked_Empty*. Default Name and Type can be edited – changed.
	Remove selected custom inspection. To select inspection, click to the inspection Name field. To remove it, select icon from editor main menu. Before removal, user is asked to confirm deletion.

Edit Name and Scope of Inspection

	Inspection Name edit: Click to the Inspection Name field to start editing it. Drag cursor, with left mouse button pressed, to select letters and words. Position cursor and double-click to select word of the name. Actions could be performed with keyboard also. Press right mouse button to activate Edit menu and select appropriate action as presented on the left figure. Menu is case sensitive; options currently not available are greyed out.
	Inspection Scope edit: Click to Inspection Scope field to open selection menu presented on left figure. Options: Visual is intended for observation of test object Functional allows functional test of observed object

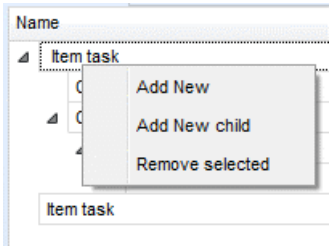
Edit Item task structure of Inspection



Item tasks of the selected Inspection are listed in Name column on the right side of Editor workspace.

Each Item task can have Child Item tasks, Child Item can have its own Child Item tasks and so on.

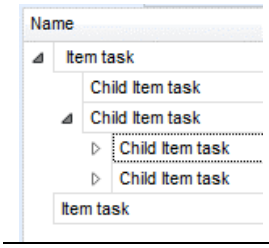
Arbitrary tree structure of Item tasks and subtasks can be built as presented on left figure.



ADD New Item task procedure:

Position cursor above Item task Name and apply right mouse click to select Item task and open menu with options:
Add New: new Item task is added on the top tree level
Add New Child: new child Item task is added under selected Item
Remove selected: delete selected Item task with all subtasks

Default Name of New Item task is *Custom Inspection,* default Type *Pass_Fail_Checked_Empty* and both can be edited – changed.

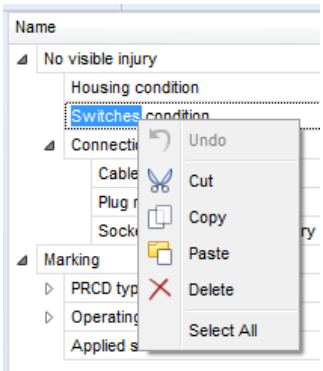


Item tasks containing Child Item tasks are marked with triangle in front of their Name.

Click on triangle mark:

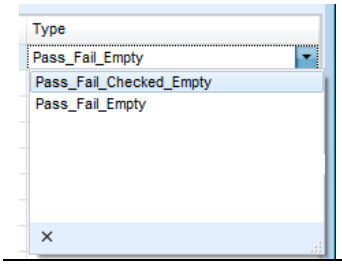
- collapse Item task tree structure
- expands Item task tree structure

Edit Name and Type of Item task



Edit Name of Item task:

Click to the Item task Name field to start editing it.
Drag cursor, with left mouse button pressed, to select letters and words. Position cursor and double-click to select word of the name. Actions could be performed with keyboard also.
Press right mouse button to activate Edit menu and select appropriate action as presented on the left figure. Menu is case sensitive; options currently not available are greyed out.



Edit Type of Item task:

Click to Item Type field to open selection menu presented on left figure. Selectable checkbox status assignment options are:

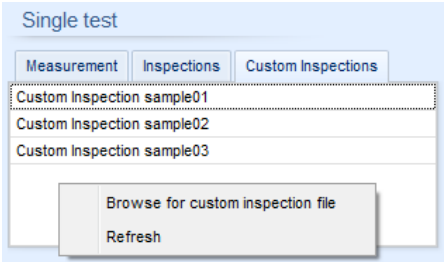
Pass_Fail_Checked_Empty: Pass, Fail, Checked, Empty (default)

Pass_Fail_Empty: Pass, Fail selection, Empty (default) value

D.6.2 Applying Custom Inspections

Custom inspections can be applied in Auto Sequences®. Direct assignment of Custom inspection to the Metrel ES manager structure objects is not possible. After custom created Inspection Data file is opened, available inspections are listed in Custom Inspections tab of Single test area of Auto Sequence® Editor, see *Appendix D.1 - Auto Sequence® Editor workspace* for details.
Custom Inspection is added to Auto sequence as a Single test, see *Appendix D.4 - Creating / modifying an Auto Sequence®* for details.

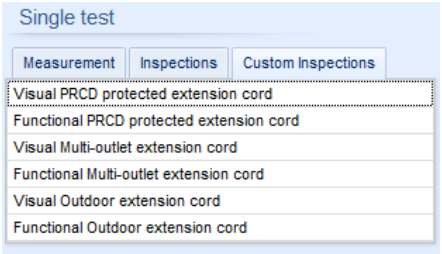
Opening / changing Inspection Data File



Position cursor within Custom inspections List area and apply mouse right click to open Option menu:

Refresh: Refresh content of already opened Inspection Data file.

Browse for custom Inspection file:
Menu for browsing to folder location of new Inspection Data file is opened.



After confirmation of selection, new Inspection Data file is opened and list of available Custom Inspections is changed.

Note

- If Metrel ES Manager Work scope is changed, opened Inspection Data file remains active and available Custom Inspections remains the same.

Appendix E – Remote operation

Different possibilities of remote operation of the instrument are supported.

E.1 **Black Box protocol**

The Black Box protocol is used for controlling the instrument with Terminal program / application. Communication via: USB is possible. The Black Box protocol is a system of rules that allows a PC as a master to start communication by sending the request command to the instrument, which answers and acts according to the protocol.
For more information contact Metrel or distributor.

E.2 **SDK**

SDK is a powerful interface for data communication with Metrel test instruments. The SDK itself is a set of subroutine definitions, protocols, and tools for building application software. It is intended for those who want to develop software using .NET platform and need to interface with Metrel instruments. The Metrel Instrument Communication SDK bundles client libraries for accessing Metrel instruments and provides a unified programming interface using C# programming language. The SDK includes a set of API calls which makes communication with Metrel instruments simple for the user.
For more information contact Metrel or distributor.

Appendix F – Testing in IT and CT supply systems

When testing appliances in IT or CT supply system, some test functions in the instrument are omitted due to safety reasons. Following is a list of applicable test functions.

	Supply system	
Test function	CT	IT
Continuity	✓	✓
Insulation resistance (Riso, Riso-S)	✓	✓
Sub-leakage	✓	✓
Differential Leakage	✓	✓
Ipe Leakage	✓	✓
Touch Leakage	✓	✓
Power	✓	✓
Leak's & Power	✓	✓
PRCD test	none	none
PE conductor (PRCD)	none	none
RCD test	✓	✓
Open conductor (PRCD)	none	none
PRCD PE probe test	none	none
Polarity - Normal	✓	✓
Polarity - Active	none	none
Clamp current	✓	✓
Itou+Ifi	✓	✓
Ipe+Ifi	✓	✓
SELV/PELV Voltage	✓	✓
EVSE Diagnostic Test (A 1632)	✓	✓
EV-RCD (Test method – external)	✓	✓
EV-RCD (Test method – internal)	none	none
PE conductor (EV RCD)	none	none
Cont+Ins+Sub	✓	✓
Functional test	✓	✓
Enhanced TRMS test	none	none
Point to Point Leakage	✓	✓

Appendix G – User permissions

Note
• Appendix G describe permissions for all AlphaEE XA instruments. If measurement / function setting is not supported by the instrument the information is irrelevant.

G.1 **Standard**

User can use all functions of the instrument, without limitations.

G.2 **Instructed**

Works with the instrument is restricted according to description below.

Auto Sequences®

Auto Sequence®can be used:

- if the 'Instructed person use' checkbox is checked. This checkbox can be set in *Metrel ES Manager*, in *Auto Sequence® editor*.

In general, changing of measuring parameters and limits on included single tests are not possible. Exceptions are:

Measurement	Parameters
All	Duration
All	Comment 1
All	Comment 2
RCD, PRCD, EV-RCD, PE conductor(PRCD)	IΔN
RCD, PRCD, PE_conductor(PRCD)	RCD type
PRCD, PRCD PE probe, Open_conductor(PRCD), PE_conductor(PRCD)	Design
Itou+Ifi, Ipe+Ifi measurements	Uinp max
Differential leakage, Touch leakage, Ipe leakage	Adapter

Meaurements	Limits
Leaks&Power	H limit, L limit
Power	H limit, L limit
Continuity, PE_conductor(PRCD), PE_conductor(EV RCD), Cont+Ins+Sub	H limit(R)[1]

1) *Configurable with Auto Sequence® configurator (Limit calculator)*

Single tests

Single tests cannot be carried out.

METREL d.o.o.
Ljubljanska cesta 77
SI-1354 Horjul
Slovenia
Phone: +386 (0)1 75 58 200
Fax: +386 (0)1 75 49 226
Email: info@metrel.si