



AlphaPAT
MI 2142
Instruction manual
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Mark on your equipment certifies that this equipment meets the requirements of the EU
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1 General description

AlphaPAT MI 2142 is a portable test instrument intended for all measurements performed when testing the electrical safety of portable electrical equipment. The following tests can be performed/done:

- ❑ earth bond resistance,
- ❑ insulation resistance,
- ❑ substitute leakage current,
- ❑ leakage current,
- ❑ touch leakage current,
- ❑ functional test,
- ❑ IEC cord polarity test, and
- ❑ TRMS current measurement.

Wide graphic matrix display with backlight offers easy to read results, indications, measurement parameters, and messages. Operation is simple and clear – operator does not need any special training (except reading this user manual) to operate the instrument.

Built-in flash memory for storing test results is an important feature of the AlphaPAT MI 2142 instrument. Professional PC software enables simple transfer of test results and other measurement parameters in both directions between the test instrument and PC. Two RS232C communication ports also allow communication with barcode reader, printer, and RFID reader/writer.

The instrument is equipped with all accessories necessary for comfortable performance of tests. It is kept in a soft carrying bag together with all accessories.

1.1 Warnings

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

- ❑ If the test equipment is used in manner not specified in this user manual the protection provided by the equipment may be impaired!
- ❑ Read this user manual carefully, otherwise use of the instrument may be dangerous for the operator, for the instrument or for the equipment under test!
- ❑ Use only earthed mains outlets to supply the instrument!
- ❑ Do not use the instrument and accessories if any damage is noticed!
- ❑ In case a fuse has blown follow the instructions in this user manual to replace it!
- ❑ Service intervention or calibration procedure is allowed to be carried out only by a competent authorized person!
- ❑ Use only standard or optional test cables supplied by your distributor!
- ❑ In some countries the leakage and touch leakage current measurements shall be executed for normal connection of tested equipment and also for the connection with changed L and N. It is advised to prepare appropriate test set-up for the test with the changed lines. Consider local regulations.
- ❑ **High voltages and currents are generated during some tests or measurements. Never touch the appliance being tested or the test terminals, whilst a test or measurement is in progress!**

1.2 Warning markings on connector panel

Refer to chapter **2.2 Connector panels!**

1.3 Standards applied

The AlphaPAT MI 2142 instrument has been manufactured and tested in accordance with the following standards:

Safety:

- ❑ EN61010-1

Electromagnetic compatibility (emission and immunity):

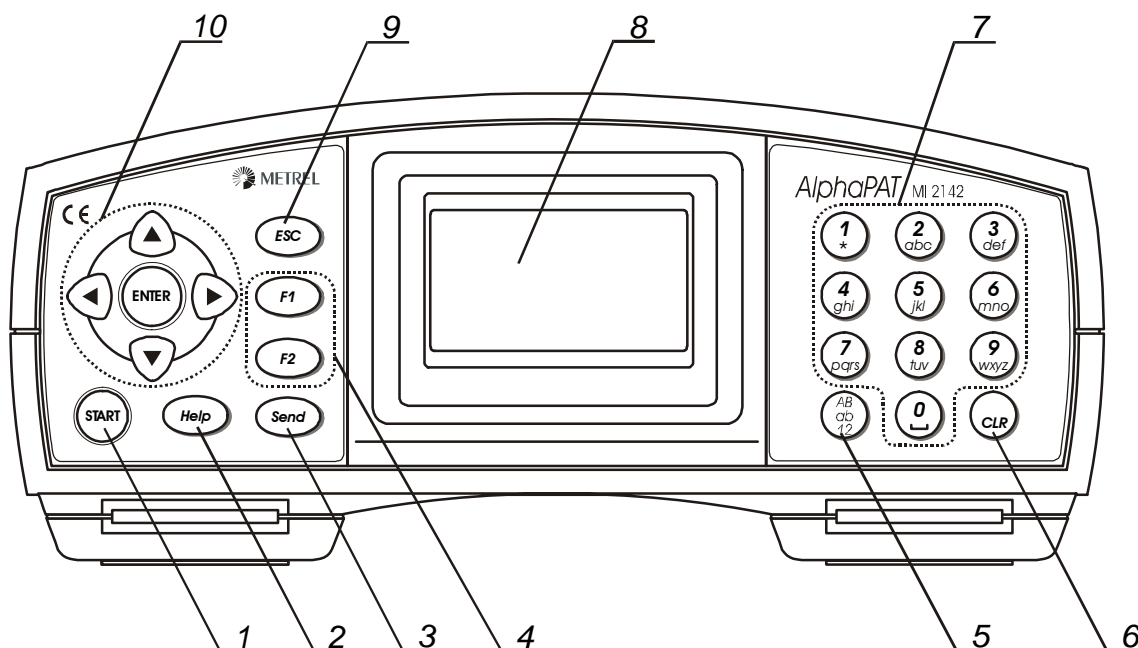
- ❑ IEC 61326

Measurements in accordance with:

- ❑ British standard BS89
- ❑ German standards VDE 0701 and VDE 0702

2 Instrument description

2.1 Front panel

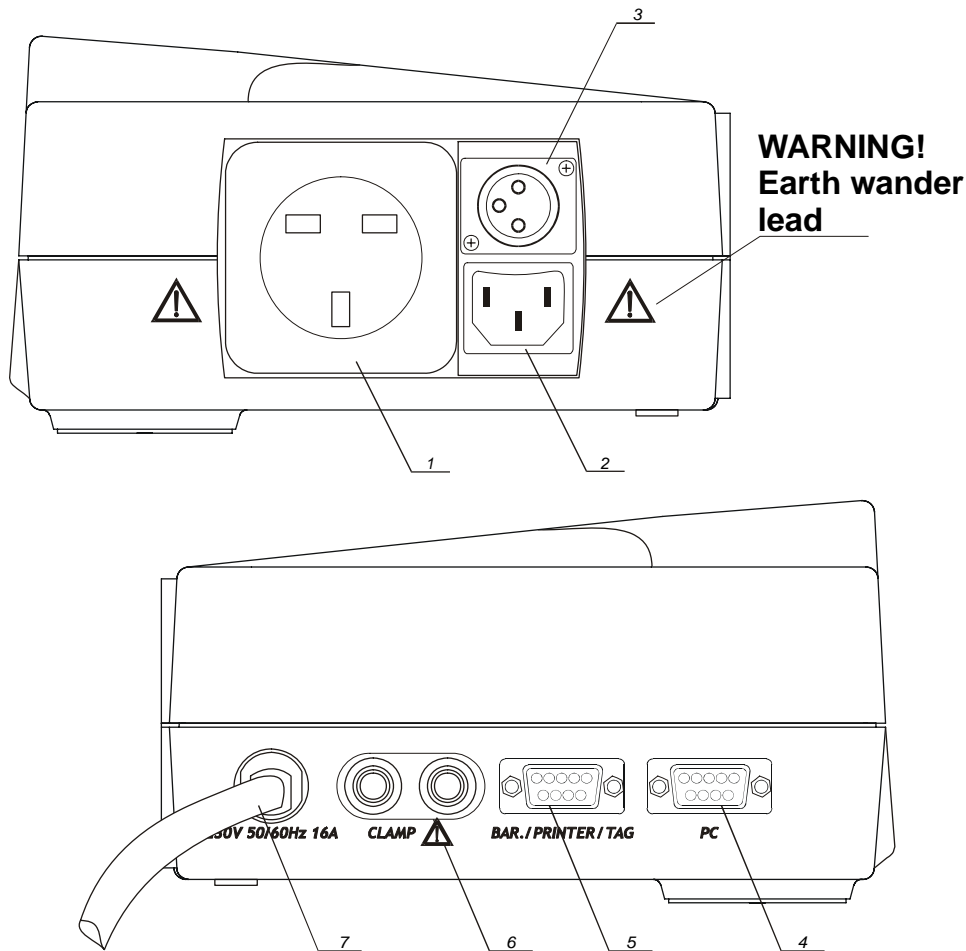


Front panel

Legend:

- 1..... START/STOP key
- 2..... HELP key
- 3..... SEND key
- 4..... Function keys F1 and F2
- 5..... Alpha-numeric selector key
Press the key to select the type of entry (large/small letters, numbers) via keypad.
- 6..... CLEAR key
- 7..... Alpha-numeric keypad
- 8..... 128 x 64 dots graphic matrix display with backlight
- 9..... ESCAPE key
- 10..... Cursor keys and ENTER key

2.2 Connector panels

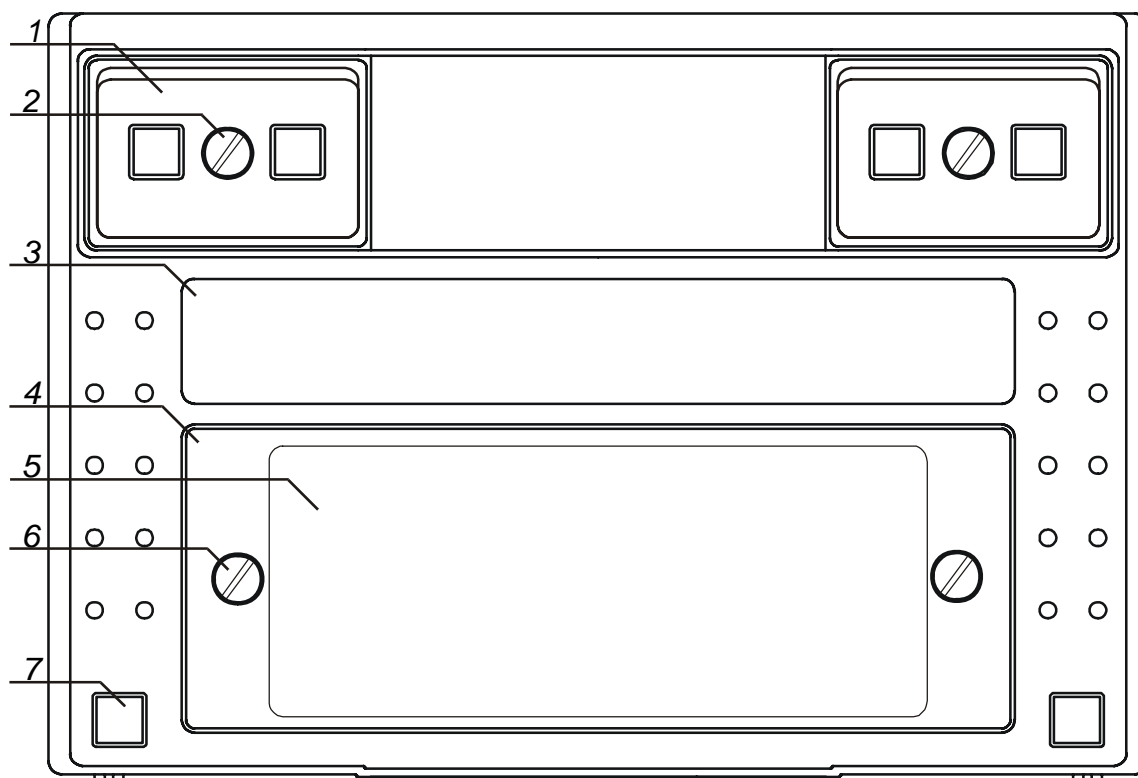


Connector panels

Legend:

- 1..... Test socket
Warning! Maximum output current is 16 A, test only appliances with maximum rated supply current not higher than 16 A!
- 2..... IEC lead connector
Warning! The connector input is only for test purposes; do not connect it to mains supply!
- 3..... Earth bond connector, also used as an input in some class II measurements:
 subleakage current, touch leakage current, and insulation resistance
Warning! When cord test being carried out the wander earth lead must not be connected to the instrument!
- 4..... PC connector
- 5..... Barcode reader/printer/RFID TAG connector
- 6..... Clamp current input
Warning! Do not connect any voltage source on this input. It is intended only for connection of current clamp with current output. Maximum input current is 30 mA!
- 7..... Mains supply cord

2.3 Bottom side



Bottom side

Legend:

- 1..... Plastic cover
A screw under the cover needs to be unscrewed when opening the instrument for service or calibration purposes.
- 2..... Screw
- 3..... Label with measurement data
- 4..... Fuse compartment cover
- 5..... Information label
- 6..... Fixing screw for fuse compartment cover
(see chapter **11.2 Fuses** for instructions on fuse replacement).
- 7..... Rubber foot

2.4 Safety pre-tests

The instrument makes pre-tests before a regular test of connected appliance to ensure safety and to prevent any damage. These safety pre-tests check for:

- any external voltage against earth on test socket and test probe,
- too high leakage current,
- too high touch leakage current,
- short circuit or too low resistance between L and N on appliance,
- correctly applied mains voltage to the test socket and
- if the 110V adapter is used.

If pre-test fails, an appropriate warning message will be displayed.







The warnings and measures that have to be taken are described in chapter 2.5

Meaning of symbols and messages on the instrument display.

2.5 Meaning of symbols and messages on the instrument display

<p>MAINS VOLTAGE IS NOT CORRECT OR PE NOT CONNECTED!</p> <p>Check mains voltage and PE connection!</p>	<p>Improper supply voltage warning. Determine and eliminate the problem before proceeding! Check for incorrect wiring on wall socket. Possible causes:</p> <ul style="list-style-type: none"> <input type="checkbox"/> no earth connection, <input type="checkbox"/> incorrect mains voltage.
<p>L and N are crossed.</p> <p>Press Start key to continue.</p>	<p>The instrument works normally also in the case when L and N are interchanged. Pay attention to wrong polarity of line and neutral wires on test socket.</p>
<p>L-N RESISTANCE TOO HIGH (>30kΩ)!</p> <p>Are you sure to proceed? YES NO</p>	<p>Too high resistance was measured in the fuse pre-test. Indication means that appliance has too low consumption or is:</p> <ul style="list-style-type: none"> <input type="checkbox"/> not connected, <input type="checkbox"/> switched off. <p>Select YES or NO with < or > key and press Enter key to confirm.</p>
<p>L-N RESISTANCE TOO LOW (<20.0Ω)!</p> <p>Are you sure to proceed? YES NO</p>	<p>It is very likely that too high current will flow after applying power to the tested appliance. If the too high current is only of short duration (caused by the short inrush current) the test can be performed, otherwise not.</p> <p>Select YES or NO with < or > key and press Enter key to confirm.</p>

<p>L-N SHORTED (<3.0Ω)!</p> <p>Are you sure to proceed? YES NO</p>	<p>It is very likely that fuses will blow after applying power to the tested appliance. If the too high current is only of short duration (caused by the short inrush current) the test can be performed otherwise it must be stopped.</p> <p>Check the appliance! Select YES or NO with ◀ or ▶ key and press Enter key to confirm.</p>
<p>LEAKAGE TOO HIGH (>20.0mA)!</p> <p>Are you sure to proceed? YES NO</p>	<p>Dangerous leakage current (higher than 3.5mA) will flow if the power is connected to the tested appliance. Proceed with testing only if all safety measures are taken.</p> <p>Check regularity of cord connections of tested appliance before continuing test. Select YES or NO with ◀ or ▶ key and press Enter key to confirm.</p>
<p>110V ADAPTER CONNECTED!</p> <p>No fuse test!</p>	<p>Indication that adapter for 110V appliance is connected into test socket.</p>
<p>110V ADAPTER CONNECTED!</p> <p>Measurement is prohibited!</p>	<p>110V appliance can not be tested with mains supply voltage of 230V.</p>
<p>TEST WAS SKIPPED FOR SAFETY!</p>	<p>Instrument detected unsafe condition and skipped the required test.</p>
<p>INSTRUMENT OVERHEATED!</p> <p>Measurement is aborted!</p>	<p>Temperature of internal components in the instrument reached top limit. Measurement is prohibited until temperature is lower than that limit.</p>

<p>VOLTAGE ON TEST SOCKET TOO HIGH!</p>	<p>DANGER! Voltage on test socket is higher than 20V (AC or DC) approximately!</p> <p>Disconnect the connections to the instrument immediately and determine the external voltage source!</p>
<p>VOLTAGE ON TEST PROBE TOO HIGH!</p>	<p>POSSIBLE DANGER! Voltage on test probe is higher than 15V (AC or DC) approximately!</p> <p>Disconnect the test probe from the appliance and determine the cause of error!</p>
<p>HARDWARE ERROR</p>	<p>In self-test and before test where mains voltage is applied the functionality of the instrument output relays is checked. In case of error the mains voltage is not applied to the test socket. In case of this warning return the instrument to the repair centre.</p>
<p>EB</p>	<p>The earth bond test probe must be used in this test.</p>
	<p>Remove the EB clip, especially if it is connected to any part that will begin to rotate or move when power is applied.</p>
	<p>Warning! High voltage is (will be) applied on the instrument output! (Insulation test voltage or mains voltage).</p>
	<p>The tested appliance should be switched on (to ensure that the complete circuit will be tested).</p>
<p>IEC</p>	<p>Connect the lead to be tested to the IEC plug!</p>
<p>PASS</p>	<p>Test passed.</p>
<p>FAIL</p>	<p>Test failed.</p>
	<p>Numeric entry</p>
	<p>Small character entry</p>
	<p>Caps entry</p>

3 Technical specifications

3.1 Earth bond resistance

Earth bond resistance readout

Range	Resolution	Accuracy
0.00 Ω ÷ 19.99 Ω	0.01 Ω	$\pm(5\%$ of reading + 3 digits)

Test currents..... 25 A, 10 A, 100 mA into 100 m Ω at mains voltage of 230 V AC

Open circuit voltage .. <6 V AC at mains voltage of 230 V AC

Pass levels 0.01 Ω ÷ 0.09 Ω , 0.10 Ω ÷ 0.90 Ω , 1.00 Ω ÷ 9.00 Ω

Test duration..... 2 s, 3 s, 5 s, 10 s, 30 s

Output..... test probe connector, test socket (PE)

Test method..... 4-wire measurement, floating to earth

3.2 Insulation resistance

Insulation resistance readout

Range	Resolution	Accuracy
0.000 M Ω ÷ 0.500 M Ω	0.001 M Ω	$\pm(10\%$ of reading + 5 digits)
0.501 M Ω ÷ 1.999 M Ω	0.001 M Ω	$\pm(5\%$ of reading + 3 digits)
2.00 M Ω ÷ 19.99 M Ω	0.01 M Ω	$\pm(5\%$ of reading + 3 digits)

Nominal voltages 250 V DC, 500 V DC (-0%, +10 %)

Measuring current..... min. 1 mA at 250 k Ω (250 V), 500 k Ω (500 V)

Short circuit current... <0.5 mA

Pass levels 0.50 M Ω , 1.00 M Ω , 2.00 M Ω , 4.00 M Ω , 7.00 M Ω , 10.00 M Ω

Test duration..... 2 s, 3 s, 5 s, 10 s, 30 s

Output..... test socket (Class I) / test socket, test probe connector (Class II)

Auto discharge after test.

3.3 Substitute leakage current

Substitute leakage current readout

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

Open circuit voltage .. <50 V AC at mains voltage of 230 V AC

Short circuit current... <40 mA

Pass levels 0.25 mA, 0.50 mA, 0.75 mA, 1.00 mA, 1.50 mA, 2.50 mA,
3.50 mA, 7.00 mA, 9.90 mA

Test duration..... 2 s, 3 s, 5 s, 10 s, 30 s

Output..... test socket (Class I) / test socket, test probe connector (Class II)

Displayed current is calculated to appliance mains supply voltage (230 V / 115 V).

3.4 Leakage current and apparent power

Differential leakage current readout

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

Pass levels 0.25 mA, 0.50 mA, 0.75 mA, 1.00 mA, 1.50 mA, 2.25 mA,
2.50 mA, 3.00 mA, 3.50 mA, 9.90 mA
Test duration..... 2 s, 3 s, 5 s, 10 s, 30 s, 60 s, 120 s, 180 s
Output..... test socket

Apparent power readout

Range	Resolution	Accuracy
0.00 kVA ÷ 3.7 kVA	0.01 kVA	±(10 % of reading + 3 digits)

Test duration..... 2 s, 3 s, 5 s, 10 s, 30 s, 60 s, 120 s, 180 s
Output..... test socket

3.5 Touch leakage current

Touch leakage current readout

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

Pass levels 0.25 mA, 0.50 mA, 1.00 mA
Test duration..... 2 s, 3 s, 5 s, 10 s, 30 s, 60 s, 120 s, 180 s
Output..... test socket, test probe connector
Probe human body model with resistance of 2 kΩ

3.6 Polarity test

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

3.7 TRMS current

True RMS current readout using 1000:1 current clamp

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

*) Consider accuracy of current transformer.

Pass levels 0.25 mA, 0.50 mA, 0.75mA, 1.00 mA, 1.50 mA, 2.25 mA,
2.50 mA, 3.00mA, 3.50 mA, 9.90 mA, none
Test duration..... 2 s, 3 s, 5 s, 10 s, 30 s, 60 s, 120 s, 180 s
Input..... current clamp terminals

3.8 General data

Rated supply voltage230 V AC (±10 %, 50 or 60 Hz)
Max. power consumption140 VA (without tested appliance)
Maximum appliance current.....16 A

Overvoltage category.....Cat II / 300 V
Protection classificationI
Pollution degree.....2

Display64*128 dots graphic matrix display with backlight

Dimensions (w*h*d)26.5 cm × 11 cm × 18.5 cm
Weight (without accessories).....3.5 kg

Memory.....1100 memory locations

RS232 interfaces 1200 bps ÷ 115200 bps, 1 start bit, 8 data bits,
1 stop bit

RS232 connectors9-pin subminiature type D, female

Reference conditions

Reference temperature range.....10 °C ÷ 30 °C

Reference humidity range.....40 % ÷ 70 % RH

Operation conditions

Working temperature range0 °C ÷ 40 °C

Maximum relative humidity95 % RH (0 °C ÷ 40 °C), non-condensing

Storage conditions

Temperature range	-10 °C ÷ +70 °C
Maximum relative humidity	90 % RH (-10 °C ÷ +40 °C)
	80 % RH (40 °C ÷ 60 °C)

Accuracies apply for 1 year in reference conditions. Temperature coefficient outside these limits is 0,2 % of measured value per °C, and 1 digit.

Fuses

Instrument protection	T1.25 A / 250 V, 5 × 22 mm
Test socket protection.....	2 x T16 A / 250 V, 6.3 × 32 mm

Protection pre-tests

- External voltage between L and PE or N and PE (DC and AC)
- External voltage on test clip (DC and AC)
- Excessive leakage between L and PE
- Short circuit or too low resistance between L and N

Connectivity (fuse) pre-test

- Appliance not switched on or too high resistance between L and N

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

4 Main menu and test modes

The AlphaPAT instrument uses user-friendly manipulation. By using only a few keys most of the actions can be done. Menu tree of the instrument is simple to understand and easy to operate.

Instrument enables testing of appliances in:

- single test mode, and
- autotest modes.

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

4.1 Help menus

The measurement help menus are available in single and autotest modes. Help menu contains schematic diagrams for illustration of proper connection of appliance under test to the AlphaPAT instrument.

4.1.1 How to enter help menu

After entering the selected measurement and before pressing START, press HELP key in order to view help menu.

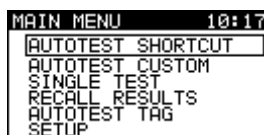


Examples of help menu

Press HELP key again to see the next page if available. Press HELP or ESC key to return to the last test/measurement menu.

4.2 Main menu

From the **Main menu** all instrument functions can be selected.



Main menu

Select the function you want to perform by using \blacktriangle and \blacktriangledown cursor keys and press ENTER key to confirm. To return to the **Main menu** press ESC key.

Note:

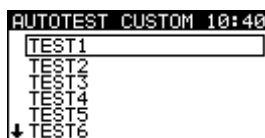
- Press ESC key one or more times to return to **Main menu** from any submenu or selected function.

4.2.1 Autotest shortcut menu

In this menu one of 120 pre-defined autotest sequences can be selected and performed. When the autotest sequence is completed measurement results can be stored into instrument flash memory or sent to the printer or PC for further processing.

4.2.2 Autotest custom menu

It might happen that none of the offered autotest shortcut sequences corresponds with test requirements. For this reason any autotest procedure can be set in the autotest custom menu. In this menu the autotest results can be stored into instrument flash memory or sent to the PC for further purposes (as well test reports can be printed out, etc.).

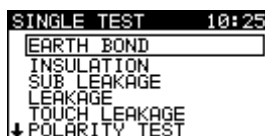


Autotest custom menu

See chapter **7 Autotest modes** for detailed description about these modes.

4.2.3 Single test menu

In single test menu individual tests can be performed. Note that measurement results performed in this mode cannot be stored.

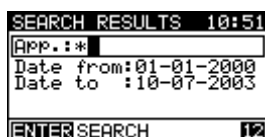


Single test menu

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

4.2.4 Recall results menu

Manipulation with stored results is allowed in this menu. Stored results can be recalled according to appliance name and date.

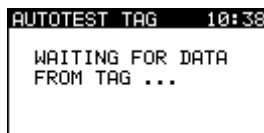


Recall results menu

See chapter **8 Saving and recalling autotest results** for detailed description about recalling results.

4.2.5 Autotest TAG menu

Autotest sequence and measurement results for tested appliance can be downloaded (uploaded) from (to) the RFID TAG.

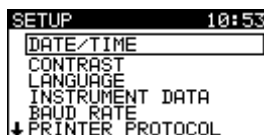


Autotest RFID TAG menu

See chapter **7.3 Autotest TAG menu** for detailed description about Autotest.

4.2.6 Setup menu

In this menu general instrument parameters can be set.



Setup menu

See chapter **10.1 Setup menu** for detailed description.

5 Single test mode

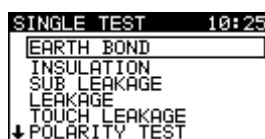
In single test mode individual tests can be performed. This is especially helpful when you suspect one or more faults in the tested appliance.

Note:

- ❑ The measurement results cannot be saved in this mode!

5.1 How to perform measurements in single test mode

Select **Single test** in **Main menu** by using ▲ and ▼ cursor keys and press ENTER key to confirm. The **Single test menu** is displayed.



Single test menu

By using ▲ and ▼ cursor keys select the measurement you want to perform and press ENTER key to confirm. To return to the **Single test menu** press ESC key.

Selected test measurement parameters are detailed in the lower left corner of the display. In general the following parameters can be set:

- ❑ output test voltage/current,
- ❑ pass level, and
- ❑ measurement duration.

Once the measurement parameters are set, the settings are kept until new changes are made or the instrument is reset to the default configuration.

Note:

- ❑ To keep new settings in case of power fail return to main menu before turning the power off.

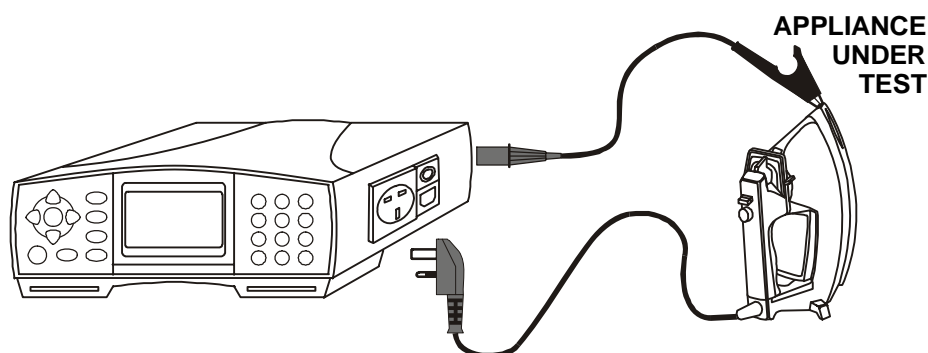
6 Measurements

6.1 Earth bond resistance

This test ensures that the connections between the protective conductor terminal in the mains plug of the appliance and each conductive part of the appliance housing are satisfactory and of sufficiently low resistance.

A high current is normally used to stress the connections under fault conditions. 100mA test current is used to prevent damage that may be caused by testing when using high currents. This is often necessary when sensitive electronics such as computers and other information technology equipment is tested.

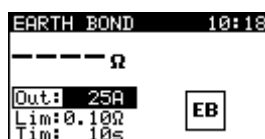
For class I appliances, a resistance is measured between the protective conductor of the test socket and test probe connection at the conductive parts of the appliance.



Measurement of earth bond resistance of class I appliance

6.1.1 How to perform single earth bond resistance measurement

Select **Earth bond** in **Single test menu** by using \blacktriangle and \blacktriangledown cursor keys and press ENTER key to confirm. **Earth bond menu** is displayed.



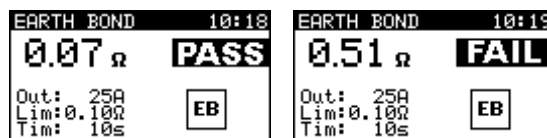
Earth bond menu

Measurement parameters are detailed in the lower left corner of the display. The following parameters can be adjusted:

- test current,
- high limit resistance value and
- measurement duration.

Use \blacktriangle and \blacktriangledown cursor keys to select the parameter you want to edit. Use \blacktriangleleft and \blacktriangleright cursor keys to adjust the selected parameter.

Press START key to perform measurement.



Examples of earth bond resistance measurement results

The measurement can be aborted by pressing START key at any time.

Actual result is shown on the display during measurement. After measurement time period has elapsed the last measured value is displayed, and PASS or FAIL indication appears on the display.

Press START key to repeat the test or press ESC key to return to the **Single test menu**.

Note:

- Consider any displayed warning before starting measurement!

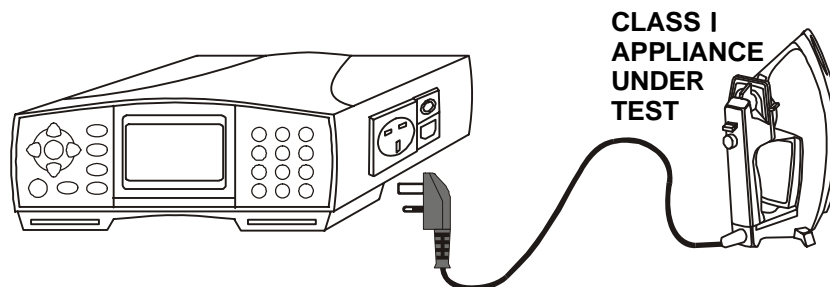
6.2 Insulation resistance

This test ensures that the resistances between mains terminals and protective conductor of the appliance mains supply plug or each metal part of the appliance housing are satisfactory and of sufficiently high value.

Test measurement parameters can be selected according to requirements.

6.2.1 Insulation resistance on class I appliances

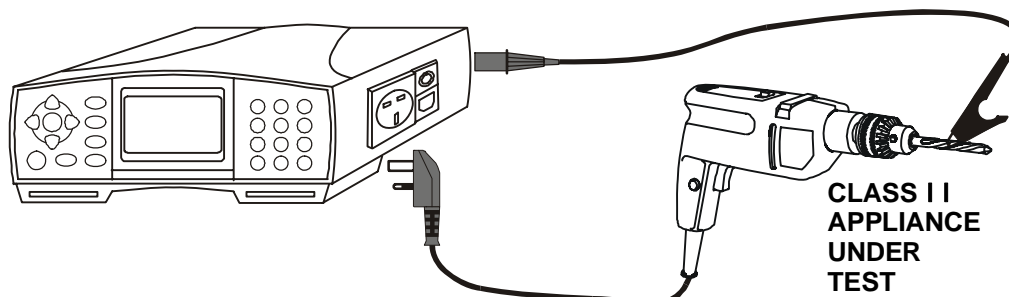
For class I appliances insulation resistance is measured between short-circuited mains terminals (L and N are shorted together in instrument) and protective conductor terminal of the appliance mains supply plug.



Measurement of insulation resistance of class I appliance

6.2.2 Insulation resistance on class II appliances

For class II appliances and non-earthed parts of safety class I appliances insulation resistance is measured between short-circuited mains terminals in the appliance mains plug and external conductive parts, which can be contacted with the test probe.



Measurement of insulation resistance of class II appliance

6.2.3 How to perform single insulation resistance measurement

Select **Insulation** in **Single test menu** by using \blacktriangle and \blacktriangledown cursor keys and press ENTER key to confirm. **Insulation menu** is displayed.



Insulation menu

Measurement parameters are detailed in the lower left corner of the display. The following parameters can be adjusted in this measurement:

- test voltage,
- low limit resistance value, and
- measurement duration.

Use \blacktriangle and \blacktriangledown cursor keys to select the parameter you want to edit. Use \blacktriangleleft and \blacktriangleright cursor keys to adjust the selected parameter.

Press START key to perform measurement.



Examples of insulation resistance measurement results

The measurement can be aborted by pressing START key at any time.

Actual result is shown on the display during measurement. After measurement time has elapsed the last measured value is displayed, and PASS or FAIL indication appears on the display.

Press START key to repeat the test or press ESC key to return to the **Single test menu**.

Notes:

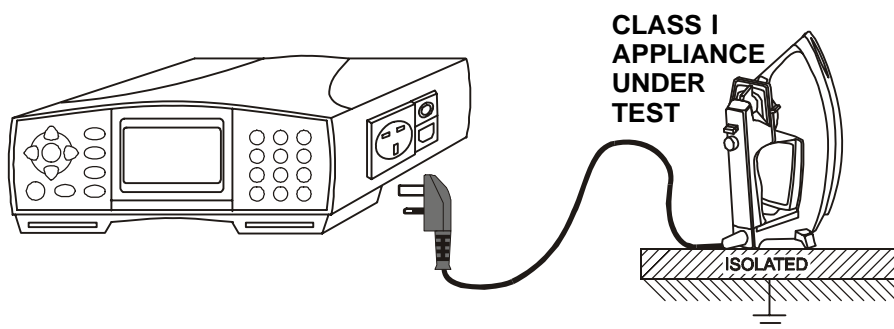
- ❑ The appliance under test should be de-energized before the measurement!
- ❑ Consider any warning on the display before starting the measurement!
- ❑ Do not touch the appliance under test during the measurement or before it is fully discharged! The message »Discharging...« is displayed while the voltage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

6.3 Substitute leakage current

This test determines the current that will leak through the appliance into ground if the test voltage is the nominal mains supply voltage for the appliance. The current flowing at test voltage of 40VAC is measured and scaled to the appliance mains supply voltage (110VAC or 230VAC).

6.3.1 Substitute leakage current on class I appliances

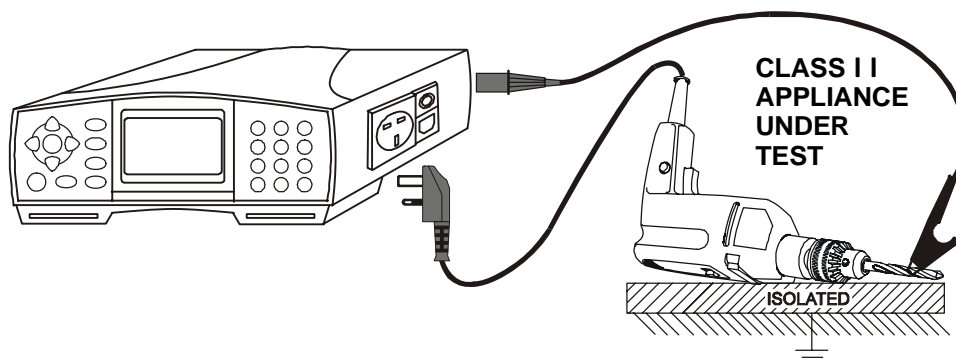
For class I appliances the nominal test voltage of 40VAC is applied between short-circuited mains terminals and protective conductor terminal of the appliance mains supply plug.



Measurement of substitute leakage current of class I appliance

6.3.2 Substitute leakage current on class II appliances

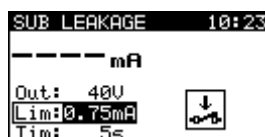
For class II appliances the test probe, which should be attached to the each exposed metal part of the appliance, is used. Ensure that the tested metal part is not in contact with ground.



Measurement of substitute leakage current of class II appliance

6.3.3 How to perform single substitute leakage current measurement

Select **Sub leakage** in **Single test menu** by using \blacktriangle and \blacktriangledown cursor keys and press ENTER key to confirm. **Sub leakage menu** is displayed.



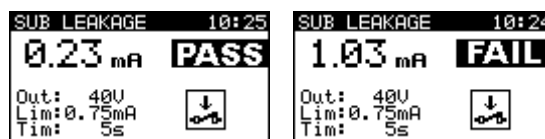
Sub leakage menu

Measurement parameters are detailed in the lower left corner of the display. The following parameters can be adjusted in this measurement:

- high limit leakage value and
- measurement duration.

Use \blacktriangle and \blacktriangledown cursor keys to select the parameter you want to edit. Use \blacktriangleleft and \blacktriangleright cursor keys to adjust the selected parameter.

Press START key to perform measurement.



Examples of substitute leakage current measurement results

The measurement can be aborted by pressing START key at any time.

Actual result is shown on the display during measurement. After measurement time has elapsed the last measured value is displayed, and PASS or FAIL indication appears on the display.

Press START key to repeat the test or press ESC key to return to the **Single test menu**.

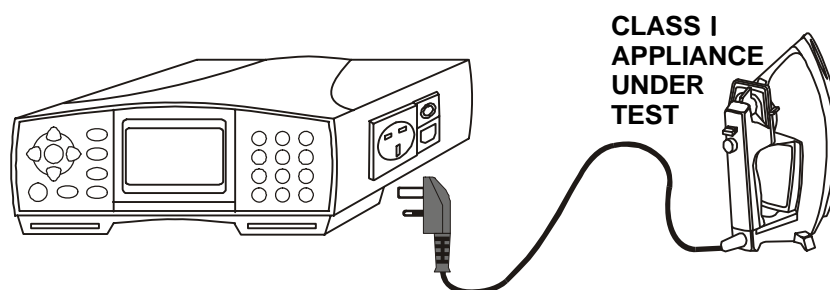
Notes:

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

6.4 Leakage current and power

The purpose of this test is to determine the sum of all leakages flowing from the live conductor to the earth. Because the differential method for determining leakage current is used the full and true appliance leakage current is always measured, although there can exist parallel current paths to ground.

Also the apparent power is measured. By checking the power an efficient functional test can be performed.



Measuring of leakage current and power

6.4.1 How to perform single leakage current measurement

Select **Leakage** in **Single test menu** by using \blacktriangle and \blacktriangledown cursor keys and press ENTER key to confirm. **Leakage menu** is displayed.



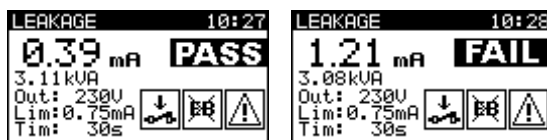
Leakage menu

Measurement parameters are detailed in the lower left corner of the display. The following parameters can be adjusted for this measurement:

- ❑ high limit leakage value, and
- ❑ measurement duration.

Use \blacktriangle and \blacktriangledown cursor keys to select the parameter you want to edit. Use \blacktriangleleft and \blacktriangleright cursor keys to adjust the selected parameter.

Press START key to perform measurement.



Examples of leakage current and apparent power measurement results

The measurement can be aborted by pressing START key at any time.

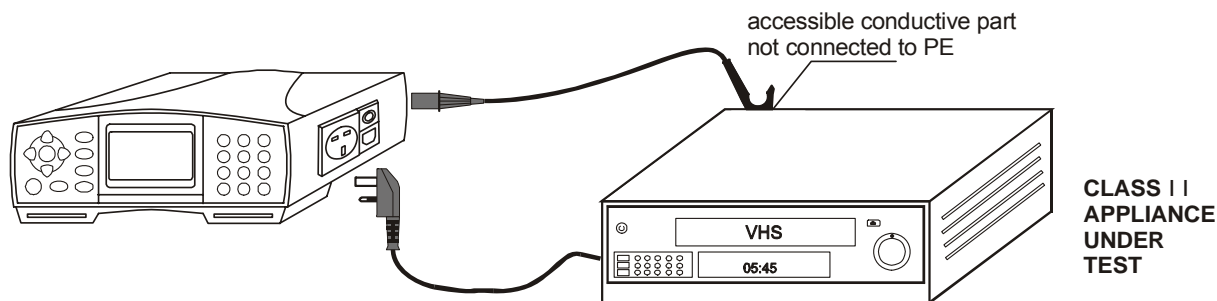
Actual result is shown on the display during measurement. After measurement time period has elapsed the last measured value is displayed, and PASS or FAIL indication appears on the display.

Notes:

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

6.5 Touch leakage current

This test determines the current that would flow if a person touches the appliance. Measurement is based on a human body model with resistance of $2k\Omega$. Both AC and DC components of touch leakage current are detected.



Measurement of touch leakage current

6.5.1 How to perform single touch leakage current measurement

Select **Touch leakage** in **Single test menu** by using \blacktriangle and \blacktriangledown cursor keys and press ENTER key to confirm. **Touch leakage menu** is displayed.



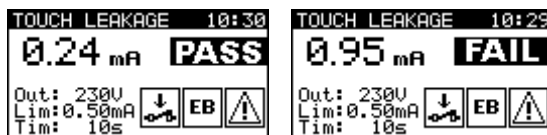
Touch leakage menu

Measurement parameters are detailed in the lower left corner of the display. The following parameters can be adjusted in this measurement:

- high limit leakage value and
- measurement duration.

Use ▲ and ▼ cursor keys to select the parameter you want to edit. Use ◀ and ▶ cursor keys to adjust the selected parameter.

Press START key to perform measurement.



Examples of touch leakage current measurement results

The measurement can be aborted by pressing START key at any time.

Actual result is shown on the display during measurement. After measurement time period has elapsed the last measured value is displayed, and PASS or FAIL indication appears on the display.

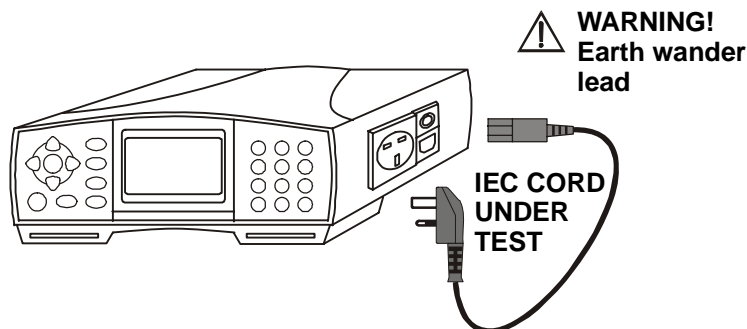
Press START key to repeat the test or press ESC key to return to the **Single test menu**.

Notes:

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

6.6 Polarity test

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



Polarity test of IEC cord

6.6.1 How to perform the measurement

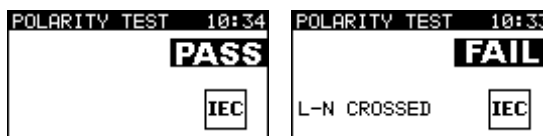
Select **Polarity test** in **Single test menu** by using \blacktriangle and \blacktriangledown cursor keys and press ENTER key to confirm. **Polarity test menu** is displayed.



Polarity test menu

Press START key to perform test.

After performing the test PASS or FAIL indication appears on the display. In case of FAIL result the detected fault is displayed.



Examples of polarity test results

Press START key to repeat the test or press ESC key to return to the **Single test menu**.

Note:

- ❑ Consider any displayed warning before starting test!

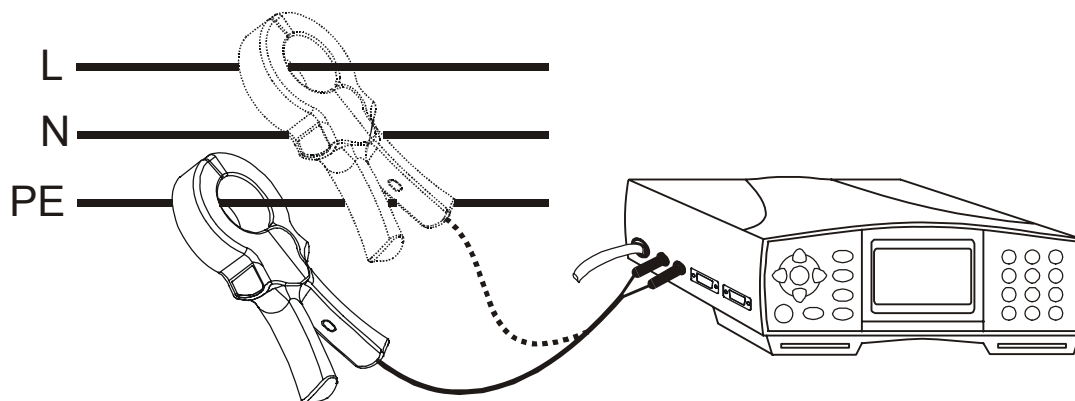
6.7 True RMS current measurement

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

- ❑ measuring leakage currents through PE conductor in permanently installed appliances,
- ❑ measuring load currents through L or N conductor in permanently installed appliances,
- ❑ measuring leakage currents through parallel current paths, etc.

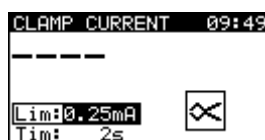
6.7.1 How to perform TRMS clamp current measurement

In order to measure TRMS current by using current clamp connect the clamp to the instrument CLAMP connector first.



Connecting current clamp to the AlphaPAT instrument

Select **Current clamp** in **Single test menu** by using \blacktriangle and \blacktriangledown cursor keys and press ENTER key to confirm. **Current clamp menu** is displayed.



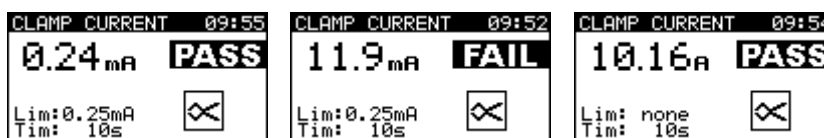
Current clamp menu

Measurement parameters are detailed in the lower left corner of the display. The following parameters can be adjusted in this measurement:

- high limit current value, and
- measurement duration.

Use \blacktriangle and \blacktriangledown cursor keys to select the parameter you want to edit. Use \blacktriangleleft and \blacktriangleright cursor keys to adjust the selected parameter.

Press START key to perform measurement.



Examples of TRMS current measurement results

The measurement can be aborted by pressing START key at any time.

Press START key to repeat the measurement or press ESC key to return to the **Single test menu**.

Notes:

- Consider any displayed warning before starting measurement!
- When measuring leakages neighbor magnetic fields and capacitive coupling (especially from the L and N conductors) can disturb the results. It is recommended that the clamp is as close as possible to the grounded surface and away from wires and other objects under voltage or carrying current.

7 Autotest modes

Autotest is the fastest and easiest way to test appliances. A pre-programmed autotest sequence runs all the tests needed for verifying the selected appliance. The complete autotest results can be stored together with appliance name and operator notes.

7.1 Autotest shortcut menu

In this autotest menu one of 120 pre-defined autotest procedures can be selected. Pre-programmed sequences cover almost all *in-service* tests, regardless of appliance type, safety class, supply cord length, fuse type, etc.

All limits and tests are in compliance with currently valid standards and regulations. In case of any changes, new firmware will be available at your distributor or from Metrel directly.

The complete list of autotest shortcut sequences can be found in Appendices A and B.

7.1.1 How to set the autotest shortcut sequence

Select **Autotest shortcut** in **Main menu** by using \blacktriangle and \blacktriangledown cursor keys, and press ENTER key to confirm. **Autotest shortcut menu** is displayed.

```

SHORTCUT      10:38
APP. : Port/H.HeId
Class: 1
Func.: Yes
Cord : short
Fuse : 3A (750VA)
Code : 001
  
```

Autotest shortcut menu

The autotest sequence can simply be selected by:

- setting few autotest parameters,
- setting the three digit autotest code, or
- using barcode reader.

7.1.2 How to set autotest parameters

Depending on appliance type the following parameters can be set:

- appliance safety class,
- enabling or disabling functional and PE test,
- appliance supply cord length,
- appliance fuse rating,
- extension lead cross-section area (c. s. a.),
- extension lead maximal current capability and power, and
- extension lead length.

Use \blacktriangle and \blacktriangledown cursor keys in **Autotest shortcut menu** to select the parameter you want to edit. Use \blacktriangleleft and \blacktriangleright cursor keys to adjust the selected parameter.

```

SHORTCUT      10:38
APP. : Heat/Cook
Class: 1
Func.: Yes
Cord : short
Fuse : 3A (750VA)
Code : 027

```

Autotest shortcut parameters adjustment

The complete list of autotest shortcut parameters can be found in Appendix A.

7.1.3 How to set or enter autotest shortcut code

Each pre-defined autotest procedure has its own three-digit code. Autotest shortcut codes can be found in Appendix B.

Select **Autotest shortcut code** parameter by using ▲ and ▼ cursor keys.

```

SHORTCUT      10:38
APP. : Heat/Cook
Class: 1
Func.: Yes
Cord : short
Fuse : 3A (750VA)
Code : 027

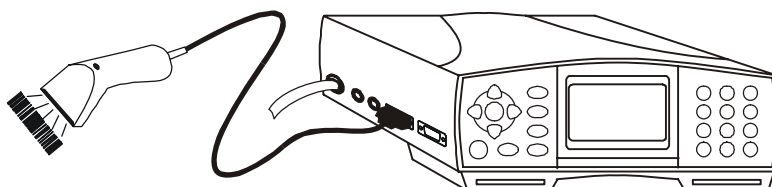
```

Autotest shortcut code adjustment

Use ◀ and ▶ cursor keys to increase/decrease code or enter three-digit code using alphanumeric keypad.

7.1.4 How to set autotest sequence by using barcode reader

Barcode reader can also be used to set three-digit code in **Autotest custom menu**. Connect barcode reader to DB-9 female BAR/PRINTER/TAG connector.



Connecting barcode reader to the AlphaPAT instrument

The code read from the barcode label will be adopted In **Autotest shortcut menu** when two short beeps are emitted.

```

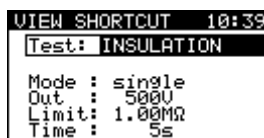
SHORTCUT      10:38
APP. : IT equip.
Class: 1
Cord : short
Code : 037

```

New code adopted

7.1.5 How to view autotest shortcut sequence measurement parameters

After pressing ENTER key in **Autotest shortcut menu** the measurement parameters of the selected autotest sequence are detailed.



Autotest shortcut view menu

By using ◀ and ▶ cursor keys the parameters of the selected measurement can be viewed.

The following measurement parameters can be viewed in all measurements:

- ❑ measurement mode,
- ❑ output test voltage or current (except in visual test),
- ❑ pass level (except visual test), and
- ❑ measurement duration (except in visual test).

In **disable** measurement mode the selected measurement is skipped.

In **single** measurement mode one measurement will be performed.

In **continuous** measurement mode up to five repetitive measurements can be performed.

Press ESC key to return to the **Autotest shortcut menu**.

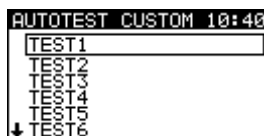
7.1.6 How to start autotest shortcut sequence

Pressing START key in Autotest shortcut menu starts the pre-defined autotest sequence. Refer to chapter **7.4 Performing autotest sequences** for more information.

7.2 Autotest custom menu

Autotest custom menu allows setting and editing user-defined autotest procedures. 20 autotest sequences with all measurements disabled are added to the list by default and can be set to user needs. They can be restored to default settings by selecting ORIGINAL SETTINGS in **Setup menu**. Up to 50 custom autotest sequences can be pre-programmed in this autotest mode.

Use ▲ and ▼ cursor keys in **Main menu** to select **Autotest custom** and press ENTER key to confirm. The **Autotest custom menu** is displayed.



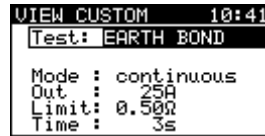
Autotest custom menu

Note:

- ❑ Up to 50 custom autotest sequences can be pre-programmed! If you want to save more than 50 autotests, the »Out of memory« message is displayed.

7.2.1 How to view and/or change an existing autotest custom sequence

By using \blacktriangle and \blacktriangledown cursor keys in **Autotest custom menu** select the autotest sequence you want to view and/or change and press ENTER key to confirm. **Autotest custom view menu** is displayed.



Autotest custom view menu

Depending on the measurement the following measurement parameters can be set here:

- measurement mode,
- output test voltage or current,
- pass level, and
- measurement duration.

In **disabled** mode the selected measurement will be skipped.

In **single** mode one measurement will be performed.

In **continuous** mode up to five repetitive measurements will be performed.

By using \blacktriangleleft and \blacktriangleright cursor keys select the measurement.

By using \blacktriangle and \blacktriangledown cursor keys measurement parameters can be selected. Use \blacktriangleleft and \blacktriangleright cursor keys to adjust the selected parameter.



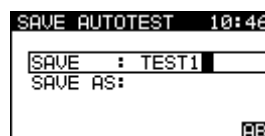
Adjusting measurement parameters

7.2.2 How to save the autotest custom sequence

In **Autotest save** menu the following actions can be taken:

- an existing autotest sequence can be saved or renamed, and
- new autotest sequence can be added to the list.

Press ENTER key in **Autotest custom** view menu to enter **Autotest save** menu.



Autotest custom save menu

The existing name of the selected custom procedure is shown in **Save** field. The custom autotest sequence can be saved under the same name or renamed.

By using \blacktriangle and \blacktriangledown cursor keys select **Save as** option in order to add a new autotest custom sequence to the list.

After autotest name is entered press ENTER key for confirmation.

Up to 8 alphanumeric characters can be entered in both **Save** and **Save as** fields.

7.2.3 How to delete an existing custom test sequence from the list

In **Autotest custom menu** select the test sequence you want to delete by using \blacktriangle and \blacktriangledown cursor keys. Press CLR key on alphanumeric keypad. Confirm delete by ENTER key. The selected autotest sequence will be deleted from the list.

Note:

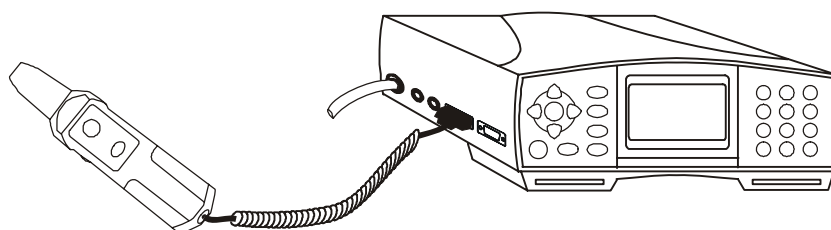
- If only one custom autotest is defined it cannot be deleted from the list!

7.2.4 How to start custom autotest sequence

In **Autotest custom menu** select the test sequence you want to execute by using \blacktriangle and \blacktriangledown cursor keys. By pressing START key the selected autotest sequence is started. Refer to chapter **7.4 Performing autotest sequence** for more information.

7.3 Autotest TAG menu

Autotest sequence and measurement results can be entered in the AlphaPAT instrument by using RFID TAGs together with RFID reader/writer. To use RFID system connect RFID reader/writer to DB-9 female BAR./PRINTER/TAG connector first.



Connecting RFID reader/writer to the AlphaPAT instrument

The following can be done with data stored in RFID TAGs:

- viewing autotest results,
- viewing autotest sequence,
- saving autotest sequence and results to instrument memory,
- storing autotest sequence and results back to the RFID TAG,
- pre-programming empty RFID TAGs.

To enter into **Autotest RFID TAG menu** use \blacktriangle and \blacktriangledown cursor keys to select **Autotest TAG** in **Main menu** and press ENTER key. The following menu is displayed:

```

AUTOTEST TAG 10:38
WAITING FOR DATA
FROM TAG ...

```

Autotest RFID TAG menu

The AlphaPAT instrument is now ready to accept the RFID TAG data. Once the data from RFID TAG have been successfully received, the following menu is displayed:

```

AUTOTEST TAG 09:45
F1 NEW READING
F2 VIEW AUTOTEST SET
ENTER VIEW RESULTS
START START AUTOTEST

```

Autotest TAG menu

The following actions can be performed now:

F1 new reading from RFID TAG
 F2 view autotest sequence
 ENTER view autotest results
 START start autotest sequence

If no results were stored in the RFID TAG, VIEW RESULTS option is not offered.

7.3.1 How to view autotest sequence from RFID TAG

In **Autotest TAG menu** press F2 key in order to view autotest sequence. The following menu is displayed:

```

VIEW AUTOTEST 10:41
Test: EARTH BOND
Mode : continuous
Out : 25A
Limit: 0.50A
Time : 3s

```

Autotest TAG view autotest sequence menu

By using < and > cursor keys the parameters of the selected measurement can be viewed.

Press ESC key to return to **Autotest TAG menu**.

7.3.2 How to view and/or save autotest results from TAG

Refer to chapter **8 Saving and recalling autotest results**.
 See *RFID reader/writer user manual* for more information.

7.3.3 How to send an autotest sequence/results to TAG

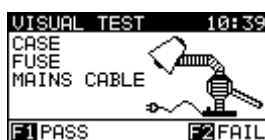
Refer to chapter **8 Saving and recalling autotest results**.
 See *RFID reader/writer user manual* for more information.

7.4 Performing autotest sequences

7.4.1 Visual inspection

During visual inspection damages of the following items should be identified:

- appliance case,
- appliance mains fuse, and
- appliance supply cable.



Visual test menu

In case any damage on the appliance is noticed press F2 key in order to identify the visual test as failed.

7.4.2 Earth bond resistance measurement

Note:

- Consider the displayed warnings before starting measurement!

In case of PASS result in single mode of earth bond resistance measurement, the autotest sequence will automatically proceed with the insulation resistance or substitute leakage current measurement, if at least one of them is enabled and polarity test is disabled in autotest sequence! Otherwise the following actions can be taken to continue or complete the autotest sequence:

- F1 key proceed to the next earth bond resistance measurement (in continuous measurement mode only)
- F2 key repeat the earth bond resistance measurement
- START key proceed to the next autotest sequence measurement
- ESC key end autotest sequence without saving autotest results

7.4.3 Insulation resistance measurement

Notes:

- Consider the displayed warnings before starting measurement!
- For class II appliances the test probe is used!

In case of PASS result in single measurement mode of insulation resistance measurement the autotest sequence will automatically proceed with the substitute leakage current measurement (if enabled, and polarity test is disabled) in autotest sequence! Otherwise the following actions can be taken to continue or complete the autotest sequence:

- F1 key proceed with the next insulation resistance measurement (in continuous measurement mode only)
- F2 key repeat the insulation resistance measurement
- START key proceed to the next autotest sequence measurement
- ESC key end autotest sequence without saving autotest results

7.4.4 Substitute leakage current measurement

Notes:

- Consider the warnings on the display before starting measurement!
- For class II appliances the test probe is used!

The autotest sequence stops when substitute leakage current measurement is performed. The following actions can be taken to continue or complete autotest sequence:

F1 key proceed to the next substitute leakage current measurement (in continuous measurement mode only)
 F2 key repeat the substitute leakage current measurement
 START key proceed to the next autotest sequence measurement
 ESC key end autotest sequence without saving autotest results

7.4.5 Leakage current and apparent power measurement

Notes:

- If any of the earth bond resistance, insulation resistance, or substitute leakage current measurements have failed in autotest sequence, the leakage current measurement is prohibited!
- Consider the displayed warnings before starting or proceeding with measurements!

The autotest sequence stops after the leakage current measurement is performed. The following actions can be taken to continue or complete autotest sequence:

F1 key proceed with the next leakage current measurement (in continuous measurement mode only)
 F2 key repeat the leakage current measurement
 START key proceed to the next autotest sequence measurement
 ESC key end autotest sequence without saving autotest results

7.4.6 Touch leakage current measurement

Notes:

- Consider the warnings on the display before starting measurement!
- If any of earth bond resistance, insulation resistance, substitute leakage current or leakage current measurements have failed or were skipped in selected autotest sequence, the touch leakage current measurement is prohibited!

The autotest sequence stops after performing touch leakage current measurement. The following actions can be taken to continue or complete autotest sequence:

F1 key proceed to the next touch leakage current measurement (in continuous measurement mode only)
 F2 key repeat the touch leakage current measurement
 START key proceed to the next autotest sequence measurement
 ESC key end autotest sequence without saving autotest results

8 Saving and recalling autotest results

After the autotest sequence is completed measurement results can be:

- ❑ saved to the flash memory of the instrument,
- ❑ sent to PC,
- ❑ stored to RFID TAG, or
- ❑ test report can be printed out to serial printer.

8.1 Autotest save results menu

When the autotest sequence is finished the *Autotest save results menu* is displayed.

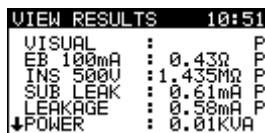


Autotest save results menu

Press ESC key to return to *Autotest menu*.

8.1.1 How to view autotest sequence results

By pressing F1 key in *Autotest save results menu*, *View results menu* will be displayed. The performed tests with results and PASS or FAIL status are displayed.



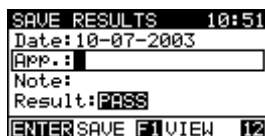
Autotest sequence results view menu

To return to *Save results menu* press ESC key.

8.1.2 How to save autotest sequence results

In *Autotest save results menu* the following data can be added to the autotest sequence results:

- ❑ appliance name, and
- ❑ notes.



Autotest save results menu

By using \blacktriangle and \blacktriangledown cursor keys select parameter you want to edit. In **Appliance name** field and **Note** field up to 10 alphanumeric characters can be entered. Appliance name can be read with a barcode reader.

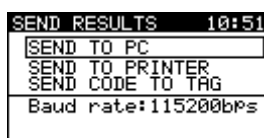
Press ENTER key to save the results to the flash memory of the instrument. After saving the results the instrument returns to **Autotest menu**.

Notes:

- The date is automatically attached to the saved results!
- The autotest results cannot be stored if the **Appliance name** field is empty.

8.1.3 How to download or send autotest sequence results

By pressing SEND key in **Autotest save results menu**, **Send results menu** is displayed.



Send results menu

By using \blacktriangle and \blacktriangledown cursor keys select the action you want to perform.

Press ENTER key to start the selected activity or press ESC key to return to **Autotest save results menu**.

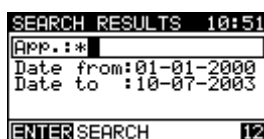
8.2 Recall results menu

In this menu the stored autotest measurement results can be:

- recalled from the memory,
- sent to PC,
- stored to RFID TAG,
- printed out, or
- deleted from the memory.

8.2.1 How to search for and recall saved autotest results

Select **Recall results** in **Main menu** by using \blacktriangle and \blacktriangledown cursor keys and press ENTER key to confirm. **Search results menu** is displayed.



Search results menu

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

- appliance name,
- date from, and
- date to.

By using \uparrow and \downarrow cursor keys select the filter you want to edit. Up to 10 alphanumeric characters can be entered in **Appliance name** field. Appliance name can be read with a barcode reader.

In order to search for all appropriate tests press ENTER key. **Recall results menu** is displayed if at least one stored autotest result was found.

```

RECALL RESULTS 10:51
APP.:APP2
Date:10-07-2003
Note:
Result:PASS
ENTERVIEW  F1DELETE
  
```

Recall results menu

Press ENTER key to view test results of the selected test.

```

VIEW RESULTS 10:51
VISUAL      : P
EB 100mA   : 0.43Ω P
INS 500V   : 1.435MΩ P
SUB LEAK   : 0.61mA P
LEAKAGE    : 0.38mA P
↓POWER     : 0.01kVA
  
```

View results menu

Press ESC key to return to **Recall results menu**.

8.2.2 How to delete saved autotest results

The following stored results can be deleted by pressing CLR key in **Recall results menu**:

- selected result,
- all found results, or
- all stored results.

```

DELETE RESULTS 10:41
SELECTED
ALL FOUND
ALL STORED
  
```

Delete results menu

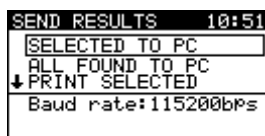
By using \uparrow and \downarrow cursor keys select the option and press ENTER key. Press ENTER key again for confirmation.

8.2.3 How to download or send stored autotest results

Selected or all found test results can be sent to:

- PC,
- printer, or
- RFID TAG.

By pressing SEND key in **Recall results menu**, **Send results menu** is displayed.



Send results menu

By using ▲ and ▼ cursor keys select the action you want to perform.

Press ENTER key to start the selected activity or press ESC key to return to **Recall results menu**.

9 Measuring 110 V appliances

9.1 110 V adapter

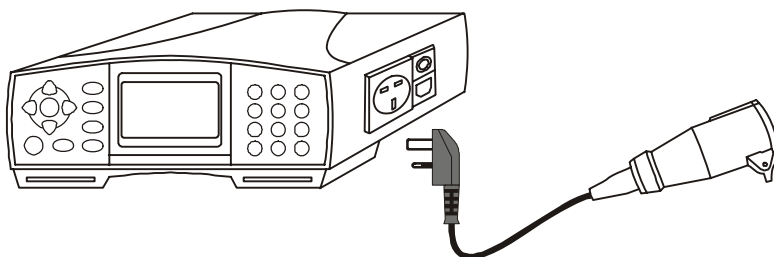
The AlphaPAT instrument allows measurements of 110 V appliances. When the 110 V adapter is used only the following measurements can be performed:

- ❑ earth bond resistance,
- ❑ insulation resistance,
- ❑ substitute leakage current, and
- ❑ TRMS current.

Other measurements are prohibited in order to prevent damage of the tested appliance if 230 V voltage is connected to it. The adapter is designed to prevent accidental connection of 230 V supply voltage to the tested appliance. In substitute leakage current measurement the displayed value is automatically calculated to 110 V when adapter is connected to the instrument.

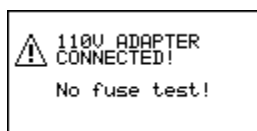
9.1.1 How to perform measurements by using 110 V adapter

In order to test 110 V appliance first connect 110 V adapter to the main test socket of the instrument.



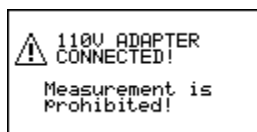
Connecting 110 V adapter to the instrument

If the 110 V adapter is connected to the test socket the following screen will be displayed after starting earth bond resistance, insulation resistance or substitute leakage current measurement:



110 V adapter warning screen 1

If you want to perform leakage current and power measurement, touch leakage current measurement or polarity test, the following screen appears on the display for a few seconds after the start:



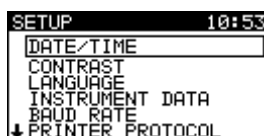
110V adapter warning screen 2

10 Other instrument operations

10.1 Setup menu

In **Setup menu** the general instrument parameters can be configured and saved.

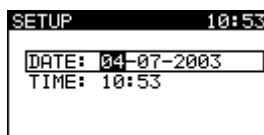
To enter **Setup menu** select **Setup** in **Main menu** using \blacktriangle and \blacktriangledown keys and press ENTER key to confirm. **Setup menu** is displayed.



Setup menu

10.1.1 Setting date and time

Select **Date/time** in **Setup menu** by \blacktriangle and \blacktriangledown cursor keys and press ENTER key to confirm. The following menu is displayed:



Date and time menu

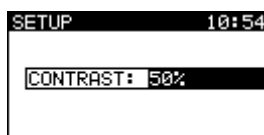
By using \blacktriangle and \blacktriangledown keys the date or time field can be selected. To set date and/or time use \blacktriangleleft and \blacktriangleright cursor keys.

Notes:

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

10.1.2 Display contrast adjustment

Select **Contrast** in **Setup menu** by using \blacktriangle and \blacktriangledown cursor keys and press ENTER key to confirm. The following menu is displayed.

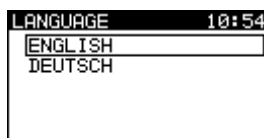


Contrast menu

Use \blacktriangle and \blacktriangledown cursor keys to adjust contrast. Press ENTER key to accept the setting or press ESC key to return to **Setup menu** without saving.

10.1.3 Language selection

Select **Language** in **Setup menu** by using ▲ and ▼ cursor keys and press ENTER. The following menu is displayed:



Language menu

By using ▲ and ▼ cursor keys select language you want to use.

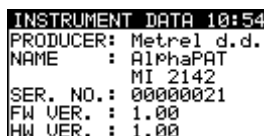
Press ENTER key to accept the new language or press ESC key to return to **Setup menu** without any change.

10.1.4 Viewing of instrument data

In this menu the following instrument data are shown:

- producer name,
- instrument name,
- serial number,
- firmware version, and
- hardware version.

Select **Instrument data** in **Setup menu** by using ▲ and ▼ cursor keys and press ENTER. **Instrument data** menu is displayed.



Instrument data menu

Note:

- Operator cannot change any instrument data!

10.1.5 Serial communication port settings

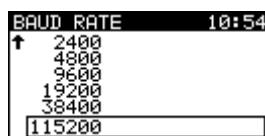
Two serial ports on the instrument are intended for communication with different equipment.

One is intended for communication with a personal computer, the other with identification devices (barcode readers and RFID readers/writers), and with printer.

Only baud rate can be changed for PC port.

To change baud rate for PC port select **Baud rate menu**.

By using \uparrow and \downarrow cursor keys in **Baud rate** menu to select baud rate you want to use and press ENTER key to confirm.



Baud rate setting

BAR/TAG/PRINTER serial port has a fixed baud rate (set to 9600 baud) but it is possible to select the printer data transfer protocol.

Select **Printer protocol** in **Setup menu** by using \uparrow and \downarrow cursor keys and press ENTER. The following menu is displayed.



Printer protocol menu

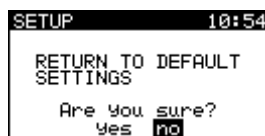
Software transfer control uses XON (CTRL-Q) and XOFF (CTRL-S) characters. Hardware control uses DTR line.

10.1.6 Reset instrument settings

In this menu the following parameters can be set to their initial values:

- all measurement parameters in single test mode,
- user defined tests are cleared,
- 20 autotest sequences with all measurements disabled are added,
- all menus are set to initial structure,
- PC baud rate is set to 115000bps, and
- printer protocol is set to hardware (DTR).

Select **Original settings** in **Setup menu** by using \uparrow and \downarrow cursor keys and press ENTER key to confirm. The following menu is displayed:



Original settings menu

Select YES to confirm or NO to quit without changes.

11 Maintenance

11.1 Periodic calibration

It is essential that all measurement instruments are regularly calibrated. We recommend an annual calibration.

11.2 Fuses

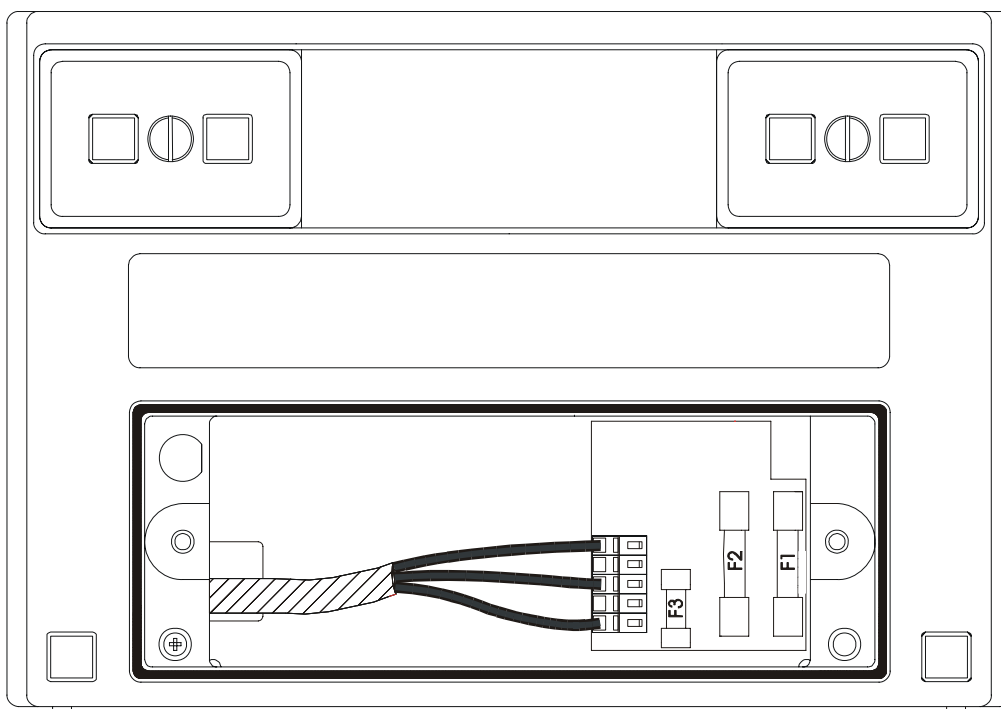
There are three fuses under fuse cover:

F1 = F2 = T16A / 250V: intended for protection of test socket.

Check the fuses F1 and F2 if malfunction of mains output voltage on test socket is noticed.

F3 = T1.6A / 250V, 20 x 5mm: instrument protection.

Check the fuse when the instrument does not respond after connection to mains supply.



Position of fuses

To change the fuse:

- ❑ Disconnect all test leads and the instrument mains cord before removing fuse cover!
- ❑ Unscrew screws on fuse cover (position 6 of bottom part) and remove cover.
- ❑ Replace blown fuse with the same type.
- ❑ Close fuse compartment and fix the fuse cover.
- ❑ Check the instrument.

11.3 Service

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

Unauthorized person is not allowed to open the AlphaPAT MI2142. There are no user replaceable components inside the instrument, except three fuses (refer to chapter **11.2 Fuses**).

11.4 Cleaning

Use soft patch slightly moistened with soap water or alcohol to clean the surface of AlphaPAT MI2142. Leave the instrument to dry totally before using it.

Notes:

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

12 Instrument set and accessories

Standard set

- ❑ Instrument AlphaPAT MI 2142
- ❑ Soft carrying case
- ❑ Test probe
- ❑ User manual
- ❑ Production verification data
- ❑ Conformity declaration

Optional accessories

- ❑ PC software package PATLink with RS232 cable
- ❑ Printer
- ❑ Barcode reader
- ❑ RFID reader/writer
- ❑ RFID TAG set
- ❑ 110V test adapter

Appendix A

Autotest shortcut parameters

APPLIANCE TYPE

- portable or handheld appliances
- IT (information technology) equipment (EN60950)
- heating and cooking appliances
- other appliances
- extension leads

Most electrical appliances belong to one of these above-mentioned types. The tests and limits differ slightly depending on the specific regulation.

In general the following tests must be performed during an *in service* test:

Class I equipment:

- visual check,
- earth bond resistance,
- insulation resistance, and
- functional test.

Class II equipment:

- visual check,
- insulation resistance, and
- functional test.

Notes:

- For portable and handheld appliances the leakage (or touch leakage) limits are stricter than for other types.
- For IT equipment the earth bond resistance measurement is performed with low current (100mA) in order to avoid any damage to earth connections for EMC (screening) purposes.
- For cooking and heating appliances the leakage limit is set higher because some leakage typically occurs in the heating elements. Therefore the substitute leakage current measurement is performed instead of insulation resistance measurement.
- Only three conductor extension leads are considered and they are tested as a class I appliance. When testing them, the functional test and the polarity test are performed.
- The IT equipment must conform to the EN60950 regulations. Otherwise the equipment may be damaged during the insulation resistance measurement!

APPLIANCE SAFETY CLASS

- SC I
- SC II

SUPPLY CORD

- Short
- Middle (or low c.s.a)
- Long

Notes:

- The earth bond limit depends significantly on the supply cord length and its PE wire cross-section.
- SHORT should be set for appliances with a cord not longer than 5m.
- MEDIUM can be used when the appliance supply cord is longer than 5m or the cord wire has a small cross-section.
- LONG can be used if the appliance has a very long supply cord (for instance vacuum cleaners).

APPLIANCE FUSE

- 3 A (750 VA)
- 6 A (1.5 kVA)
- 10 A (2.5 kVA)
- 13 A (3.2 kVA)

Notes:

- The earth bond test current depends on the set fuse rating of appliance. The current is always at least 1.5 times higher than the fuse rating.
- The power (in parenthesis) means the maximum power that can be delivered in combination with the set fuse. Some users are more familiar with the nominal power than the fuse rating.
- Substitute leakage and leakage current limits (in heating and cooking) are set according to the set power.

FUNCTIONAL TEST / PROTECTIVE EARTH TEST

- Yes
- No

Notes:

- A functional test should be performed at the end of the test sequence to ensure that the appliance works properly. This test can also be performed without the measuring instrument.
- However it is advisable to perform this test with the AlphaPAT instrument, since it performs more tests simultaneously: the functional check, the protective earth test, and load test.

Extension leads test only:

LENGTH

- <5 m
- 7.5 m
- 10 m
- 12 m
- 15 m
- 20 m
- 30 m
- 40 m
- 50 m

CROSS-SECTION AREA (c.s.a.)

- 0.5 mm²
- 0.75 mm²
- 1.0 mm²
- 1.25 mm²
- 1.5 mm²
- unknown

MAXIMUM CURRENT CAPABILITY, POWER (Imax / Power)

- 3 A / 750 VA
- 6 A / 1.5 kVA
- 10 A / 2.5 kVA
- 13 A / 3.2kVA
- 15 A / 3.75 kVA
- unknown

Notes:

- If the cross-section area is unknown the most conservative (as for 1.5mm²) limit is set.
- The Imax/Power specification is only informative. It provides the maximal current capability and power depending on the lead c.s.a.

Appendix B

Autotest shortcut codes

Type	Class	Fuse	Cord	Earth Limit	Bond Out	Insulation Limit	Out	S. Leakage Limit	Leakage Limit	T. Leakage Limit	Code
Portable or Handheld											
	I	3A	short	0.1Ω	10A	1MΩ	500V	-	0.75mA		001
	I	6A	short	0.1Ω	10A	1MΩ	500V	-	0.75mA		002
	I	10A	short	0.1Ω	25A	1MΩ	500V	-	0.75mA		003
	I	13A	short	0.1Ω	25A	1MΩ	500V	-	0.75mA		004
	I	3A	short	0.1Ω	10A	1MΩ	500V	-			005
	I	6A	short	0.1Ω	10A	1MΩ	500V	-			006
	I	10A	short	0.1Ω	25A	1MΩ	500V	-			007
	I	13A	short	0.1Ω	25A	1MΩ	500V	-			008
	I	3A	mid	0.3Ω	10A	1MΩ	500V	-	0.75mA		009
	I	6A	mid	0.3Ω	10A	1MΩ	500V	-	0.75mA		010
	I	10A	mid	0.3Ω	25A	1MΩ	500V	-	0.75mA		011
	I	13A	mid	0.3Ω	25A	1MΩ	500V	-	0.75mA		012
	I	3A	mid	0.3Ω	10A	1MΩ	500V	-			013
	I	6A	mid	0.3Ω	10A	1MΩ	500V	-			014
	I	10A	mid	0.3Ω	25A	1MΩ	500V	-			015
	I	13A	mid	0.3Ω	25A	1MΩ	500V	-			016
	I	3A	long	0.5Ω	10A	1MΩ	500V	-	0.75mA		017
	I	6A	long	0.5Ω	10A	1MΩ	500V	-	0.75mA		018
	I	10A	long	0.5Ω	25A	1MΩ	500V	-	0.75mA		019
	I	13A	long	0.5Ω	25A	1MΩ	500V	-	0.75mA		020
	I	3A	long	0.5Ω	10A	1MΩ	500V	-			021
	I	6A	long	0.5Ω	10A	1MΩ	500V	-			022
	I	10A	long	0.5Ω	25A	1MΩ	500V	-			023
	I	13A	long	0.5Ω	25A	1MΩ	500V	-			024
	II	-		-	-	2MΩ	500V	-	0.25mA		025
	II	-		-	-	2MΩ	500V	-			026

Type	Class	Fuse	Cord	Earth Limit	Bond Out	Insulation Limit	Out	S. Leakage Limit	Leakage Limit	T. Leakage Limit	Code
Heating and cooking											
	I	3A	-	0.1Ω	10A				0.75mA		027
	I	5A	-	0.1Ω	10A				0.75mA		028
	I	10A	-	0.1Ω	25A				1.00mA		029
	I	13A	-	0.1Ω	25A				1.50mA		030
	I	3A	-	0.1Ω	10A			0.75mA			031
	I	5A	-	0.1Ω	10A			0.75mA			032
	I	10A	-	0.1Ω	25A			1.00mA			033
	I	13A	-	0.1Ω	25A			1.5mA			034
	II					2MΩ	500V		0.25mA		035
	II					2MΩ	500V				036

Type	Class	Fuse	Cord	Earth Limit	Bond Out	Insulation Limit	Out	S. Leakage Limit	Leakage Limit	T. Leakage Limit	Code
IT equipment EN 60950											
	I		short	0.1Ω	0.1A	1MΩ	500V	3.5mA			037
	I		mid	0.3Ω	0.1A	1MΩ	500V	3.5mA			038
	I		long	0.5Ω	0.1A	1MΩ	500V	3.5mA			039
IT equipment EN 60950 250V											
	I		long	0.5Ω	0.1A	1MΩ	250V	3.5mA			040

Type	Class	Fuse	Cord	Earth Limit	Bond Out	Insulation Limit	Out	S. Leakage Limit	Leakage Limit	T. Leakage Limit	Code
OTHER											
	I	3A	short	0.1Ω	10A	1MΩ	500V	-	3.5mA		041
	I	6A	short	0.1Ω	10A	1MΩ	500V	-	3.5mA		042
	I	10A	short	0.1Ω	25A	1MΩ	500V	-	3.5mA		043
	I	13A	short	0.1Ω	25A	1MΩ	500V	-	3.5mA		043
	I	3A	short	0.1Ω	10A	1MΩ	500V	-			045
	I	6A	short	0.1Ω	10A	1MΩ	500V	-			046
	I	10A	short	0.1Ω	25A	1MΩ	500V	-			047
	I	13A	short	0.1Ω	25A	1MΩ	500V	-			048
	I	3A	mid	0.3Ω	10A	1MΩ	500V	-	3.5mA		049
	I	6A	mid	0.3Ω	10A	1MΩ	500V	-	3.5mA		050
	I	10A	mid	0.3Ω	25A	1MΩ	500V	-	3.5mA		051
	I	13A	mid	0.3Ω	25A	1MΩ	500V	-	3.5mA		052
	I	3A	mid	0.3Ω	10A	1MΩ	500V	-			053
	I	6A	mid	0.3Ω	10A	1MΩ	500V	-			054
	I	10A	mid	0.3Ω	25A	1MΩ	500V	-			055
	I	13A	mid	0.3Ω	25A	1MΩ	500V	-			056
	I	3A	long	0.5Ω	10A	1MΩ	500V	-	3.5mA		057
	I	6A	long	0.5Ω	10A	1MΩ	500V	-	3.5mA		058
	I	10A	long	0.5Ω	25A	1MΩ	500V	-	3.5mA		059
	I	13A	long	0.5Ω	25A	1MΩ	500V	-	3.5mA		060
	I	3A	long	0.5Ω	10A	1MΩ	500V	-			061
	I	6A	long	0.5Ω	10A	1MΩ	500V	-			062
	I	10A	long	0.5Ω	25A	1MΩ	500V	-			063
	I	13A	long	0.5Ω	25A	1MΩ	500V	-			064
	II	-		-	-	2MΩ	500V	-	0.25mA		065
	II	-		-	-	2MΩ	500V	-			066

	Length	Earth Bond		Insulation		Polarity	Code
		Limit	Out	Limit	Out		
IEC leads							
0.5 mm² / 3 A							
	<=5m	0.3Ω	10A	1MΩ	500V	✓	067
	7.5	0.4Ω	10A	1MΩ	500V	✓	068
	10	0.5Ω	10A	1MΩ	500V	✓	069
	12	0.6Ω	10A	1MΩ	500V	✓	070
	15	0.7Ω	10A	1MΩ	500V	✓	071
	20	0.9Ω	10A	1MΩ	500V	✓	072
	30	2.0Ω	10A	1MΩ	500V	✓	073
	40	2.0Ω	10A	1MΩ	500V	✓	074
	50	2.0Ω	10A	1MΩ	500V	✓	075
0.75 mm² / 6 A							
	<=5m	0.2Ω	10A	1MΩ	500V	✓	076
	7.5	0.3Ω	10A	1MΩ	500V	✓	077
	10	0.4Ω	10A	1MΩ	500V	✓	078
	12	0.4Ω	10A	1MΩ	500V	✓	079
	15	0.5Ω	10A	1MΩ	500V	✓	080
	20	0.6Ω	10A	1MΩ	500V	✓	081
	30	0.9Ω	10A	1MΩ	500V	✓	082
	40	1.0Ω	10A	1MΩ	500V	✓	083
	50	2.0Ω	10A	1MΩ	500V	✓	084
1 mm² / 10 A							
	<=5m	0.2Ω	25A	1MΩ	500V	✓	085
	7.5	0.2Ω	25A	1MΩ	500V	✓	086
	10	0.3Ω	25A	1MΩ	500V	✓	087
	12	0.3Ω	25A	1MΩ	500V	✓	088
	15	0.4Ω	25A	1MΩ	500V	✓	089
	20	0.5Ω	25A	1MΩ	500V	✓	090
	30	0.7Ω	25A	1MΩ	500V	✓	091
	40	0.9Ω	25A	1MΩ	500V	✓	092
	50	1.0Ω	25A	1MΩ	500V	✓	093
1.25 mm² / 13A							
	<=5m	0.2Ω	25A	1MΩ	500V	✓	094
	7.5	0.2Ω	25A	1MΩ	500V	✓	095
	10	0.3Ω	25A	1MΩ	500V	✓	096
	12	0.3Ω	25A	1MΩ	500V	✓	097
	15	0.3Ω	25A	1MΩ	500V	✓	098
	20	0.4Ω	25A	1MΩ	500V	✓	099
	30	0.6Ω	25A	1MΩ	500V	✓	100
	40	0.7Ω	25A	1MΩ	500V	✓	101
	50	0.9Ω	25A	1MΩ	500V	✓	102
1.5 mm² / 15 A							
	<=5 m	0.2Ω	25A	1MΩ	500V	✓	103
	7.5	0.2Ω	25A	1MΩ	500V	✓	104
	10	0.2Ω	25A	1MΩ	500V	✓	105
	12	0.3Ω	25A	1MΩ	500V	✓	106
	15	0.3Ω	25A	1MΩ	500V	✓	107
	20	0.4Ω	25A	1MΩ	500V	✓	108
	30	0.5Ω	25A	1MΩ	500V	✓	109
	40	0.6Ω	25A	1MΩ	500V	✓	110
	50	0.8Ω	25A	1MΩ	500V	✓	111
UNKNOWN							
	<=5m	0.2Ω	25A	1MΩ	500V	✓	112
	7.5	0.2Ω	25A	1MΩ	500V	✓	113
	10	0.2Ω	25A	1MΩ	500V	✓	114
	12	0.3Ω	25A	1MΩ	500V	✓	115
	15	0.3Ω	25A	1MΩ	500V	✓	116
	20	0.4Ω	25A	1MΩ	500V	✓	117
	30	0.5Ω	25A	1MΩ	500V	✓	118
	40	0.6Ω	25A	1MΩ	500V	✓	119
	50	0.8Ω	25A	1MΩ	500V	✓	120