EN Manual

BENDER
The Power in Electrical Safety©

UNIMET® 800ST/UNIMET® 810ST

Test system for electrical safety

Software version: from 3.1.9

UNIMET8xxST_D00008_01_M_XXEN/02.2016

Bender GmbH & Co. KG
P.O. Box 1161 • 35301 Gruenberg • Germany
Londorfer Straße 65 • 35305 Gruenberg • Germany
Tel.: +49 6401 807-0 • Fax: +49 6401 807-259
E-mail: info@bender.de • www.bender.de

Photos: Bender archives.

Table of Contents

1. How to get the most out of this manual

1.1 About this operating manual

This operating manual describes the test systems UNIMET® 800ST and UNIMET® 810ST with the software version indicated on the cover page. The functions and processes described may vary from those featured in other versions. It is designed for electrically skilled persons working in electrical engineering and electronics.

Please read this operating manual before using the devices. This documentation must be kept in an easily accessible location near to the device.

This manual has been compiled with great care. It may nevertheless contain errors and mistakes. The Bender Group cannot accept any liability for injury to persons or damage to property resulting from errors or mistakes in this manual.

Each of the registered trademarks which appears in this document remains the property of its owner.

For improved readability, the test systems UNIMET® 800ST and UNIMET® 810ST will also be referred to as "UNIMET®".

1.2 Technical support

As a Bender customer, you will receive technical support and assistance in the event of queries relating to equipment you have purchased. Please contact the Technical Sales Department or our Service Department:

Service hotline: 0700-BenderHelp (telephone and fax)
Carl-Benz-Straße 8 • 35305 Gruenberg • Germany
Tel: +49 6401 807-760 • Fax: +49 6401 807-629
E-mail: info@bender-service.com • www.bender.de

1.3 Explanation of symbols and notes

The following terms and symbols are used to denote hazards and instructions in Bender documentation:

*The signal word indicates that there is a **high** risk of danger, that **will** result in **death** or **serious injury** if not avoided.*

*This signal word indicates a **medium** risk of danger that **can** lead to **death** or **serious injury**, if not avoided.*

*This signal word indicates a **low-level** risk, that **can** result in **minor or moderate injury** or **damage to property**, if not avoided.*

This symbol denotes information intended to assist the user in making optimum use of the product.

2. Safety instructions

2.1 Delivery

Inspect the dispatch and equipment packaging for damage, and compare the contents of the package with the delivery documents. Devices damaged in transit must not be used. In the event of damage in transit, please contact Bender immediately.

Equipment may only be stored in areas where it is protected against dust, damp, spray water and dripping water and where the specified storage temperatures can be assured.

The selling company's "General conditions of sale and delivery" always apply.

2.2 Intended use

The test systems are exclusively intended for the area of use stipulated in the chapter "System description" on page 11.

Risk of destruction due to incorrect mains voltage
The UNIMET® 800ST or 810ST must always be connected to the supply voltage (AC 100…120 V, AC 220…240 V) indicated on the nameplate. Only these two voltage ranges are permissible. Voltages between these two voltage ranges are not permissible!
Failure to observe this requirement may damage the test system and any device under test connected to it.

Intended use also implies:

- Observance of all instructions in this operating manual and
- compliance with any test intervals.

Any other use than that described in this manual is regarded as improper. The Bender Group cannot accept any liability for damage resulting from such use.

2.3 Qualified personnel

Only appropriately qualified personnel may work with the Bender devices. Personnel who are familiar with the installation, commissioning and operation of the equipment and have undergone appropriate training are considered qualified. The personnel must have read this manual and understood all instructions relating to safety.

Bender would be happy to provide training in respect of the use of test equipment. Training for two people is included in the purchase price of the test system. You can find the current dates on our homepage http://www.bender.de -> Know-how-> Seminars.

2.4 General safety instructions

Bender devices are designed and built in accordance with the state of the art and accepted rules in respect of technical safety. However, the use of such devices may introduce risks to life and limb of the user or third parties and/or result in damage to Bender devices or other property.

- Use Bender devices only:
  - As intended
  - In perfect working order
  - In compliance with the relevant safety regulations and safety standards applicable at the location.
- Eliminate all faults immediately which may endanger safety.
- Do not make any unauthorised changes.
- Use only accessories (e.g. measuring cables, adapters, etc.) or replacement parts purchased from or recommended by the manufacturer of the devices. Failure to observe this requirement can result in fire, electric shock and injury.
- Reference signs must always be clearly legible. Replace damaged or illegible signs immediately.

2.5 Delivery conditions, warranty and liability

The conditions of sale and delivery set out by Bender apply.

For software products, the "Softwareklausel zur Überlassung von Standard-Software als Teil von Lieferungen, Ergänzung und Änderung der Allgemeinen Lieferbedingungen für Erzeugnisse und Leistungen der Elektroindustrie" (software clause in respect of the licensing of standard software as part of deliveries, modifications and changes to general delivery conditions for products and services in the electrical industry) set out by the ZVEI (Zentralverband Elektrotechnik- und Elektronikindustrie e.V., the German Electrical and Electronic Manufacturers' association) also applies.

Delivery and payment conditions along with a copy of the software clause can be obtained from Bender in printed or electronic format.

.

3. System description

3.1 Areas of application

The UNIMET® is used to test electrical safety. It has been designed for following areas of application:

- Testing medical electrical equipment in accordance with DIN EN 60601-1 (VDE 0750-1):2013-12 (optional software licence required for IEC 60601-1).
- Recurrent tests and testing prior to first use of medical electrical equipment or systems in accordance with DIN EN 62353 (VDE 0751-1).
- Testing electrical equipment for measurement, control and laboratory use in accordance with DIN EN 61010-1 (VDE 0411-1):2011-07 (optional software licence for IEC 61010-1 as well as test probe TP1010 required).
- Recurrent tests of hospital and care beds.
- Single-phase electrical equipment: "Prüfung nach Instandsetzung, Änderung elektrischer Geräte - Wiederholungsprüfung elektrischer Geräte" (Inspection after repair, modification of electrical appliances and periodic inspection on electrical appliances) acc. to DIN VDE 0701-0702; VDE 0701-0702:2008-06.
- In conjunction with a DS32A adapter, the electrical safety of three-phase devices with a current input of up to 32 A can be tested acc. to IEC 62353 (VDE 0751-1) and DIN VDE 0701-0702 . Tests are always carried out during operation using the differential measurement method.

UNIMET® has been designed solely for use with earthed systems. If the test system is used other than as intended, i.e. on an IT system, the measured values of any leakage currents will not be reproducible. The test result cannot be used.

3.2 Versions UNIMET® 800ST and UNIMET® 810ST

The difference between the hardware of the UNIMET® 810ST and its predecessor UNIMET® 800ST is an even more efficient PC module.

If the corresponding software licence has been purchased, the operating software enables additional tests according to IEC 60601-1 (med. electrical equipment) or DIN EN 61010-1 (electrical equipment for laboratory use).

The operating software indicated on the cover page can be used with the UNIMET® 810ST, but also with the existing UNIMET® 800ST. In this case, the following restrictions apply:

Art. no. of the UNIMET® 800ST	**Restrictions**
B 9602 8010 B 9602 8014, B 9602 8016 B 9602 8017, B 9602 8018	No restriction of the range of functions. Software licences for DIN EN 60601-1 and DIN EN 61010-1 can be installed.
B 9602 8000 B 9602 8004, B 9602 8006 B 9602 8007, B 9602 8008	Software licences for DIN EN 60601-1 and DIN EN 61010-1 **cannot** be installed.

3.3 Functional description

The test system supplies measurement results and evaluates them immediately in order to classify the test as "PASSED" or "FAILED". In addition to the electrical test steps, the test specification, which follows classification, contains a visual inspection and a functional test. The test specification is saved in the "Test specifications" folder. The test sequence can be completed automatically, semi-automatically or manually dependent upon the DUT.

The test results can be displayed on the screen, saved or printed out using an external printer. The test results can be stored as PDF file and saved to a USB drive (USB stick) for any subsequent printouts.

In the event of unexpected results, the DUT can be inspected in more detail by carrying out a single test. Tested devices can be saved under their device IDs in the "Device protocols" folder. The data memory provides space for up to 10000 data records. Device IDs may only appear more than once if they are assigned to different clients.

The date of the last test and the test interval are saved. If a device passes the test, the test date is updated by the set test interval. Filter and sort functions (query filter) make selecting test data easy.
Test specifications and device protocols can be transferred to a PC software program (e.g. UNIMET® 800ST Control Center) via the RS-232 interface or using a USB drive (USB stick). For recurrent tests, the data stored in the PC software are transferred back to the UNIMET®.
The RS-232 interface is also used for any subsequent updates of the internal operating software on the test system.

The "Test engineer catalogue" folder can be beneficial if more than one person is working with the test system. Test engineers already registered on the system are simply selected from this folder. There is no need to re-enter the name of the test engineer. The "Test engineer names", "Test specifications" and "Device protocols" folders share the same data memory. Accordingly, the number of test engineer names is limited only by the size of the available memory.

The large colour display is backlit. Graphics illustrate how to connect the DUT. Operation is quick and easy via the touchscreen. A standard keyboard (PS/2 or USB) can also be connected.

3.4 Standard-compliant tests

The UNIMET® carries out measurements and tests according to the following standards (see also chapter "8.1 Standards"):

- Medical electrical equipment -Part 1: General requirements for safety.
  Test in compliance with DIN EN 60601-1 (VDE 0750-1); optional software licence required for IEC 60601-1.
- Medical electrical equipment, recurrent tests in accordance with DIN EN 62353 (VDE 0751-1).
- Prüfung nach Instandsetzung, Änderung elektrischer Geräte - Wiederholungsprüfung elektrischer Geräte (Inspection after repair, modification of electrical appliances and periodic inspection on electrical appliances) acc. to DIN VDE 0701-0702; VDE 0701-0702:2008-06.
- Electrical equipment for measurement, control and laboratory use - Part 1: General requirements
  Test according to DIN EN 61010-1 (VDE 0411-1): optional software licence for IEC 61010-1 as well as test probe TP1010 required.

Depending on the national language selected for the user interface, the appropriate standard appears on the display and the device protocol. Example:
German: DIN EN 62353 (VDE 0751-1)
English or other languages: IEC 62353

The UNIMET® carries out the following measurements and tests:

Measurement	DIN EN 60601-1 (VDE 0750-1)	DIN EN 62353 (VDE 0751-1)	DIN VDE 0701-0702	DIN EN 61010-1 (VDE 0411-1)	Direct measurement method	Differential measurement method	r.m.s. (root mean square value)	AC	DC
PE resistance (permanently installed and transportable equipment)	X	X	X	X				X	
Insulation resistance (Class I and Class II)		X	X	X					X
Insulation resistance (applied part – PE)		X							X
Insulation resistance (applied part- LN)		X							X
Equipment leakage current - alternative method (Class I and Class II)		X	X				X		

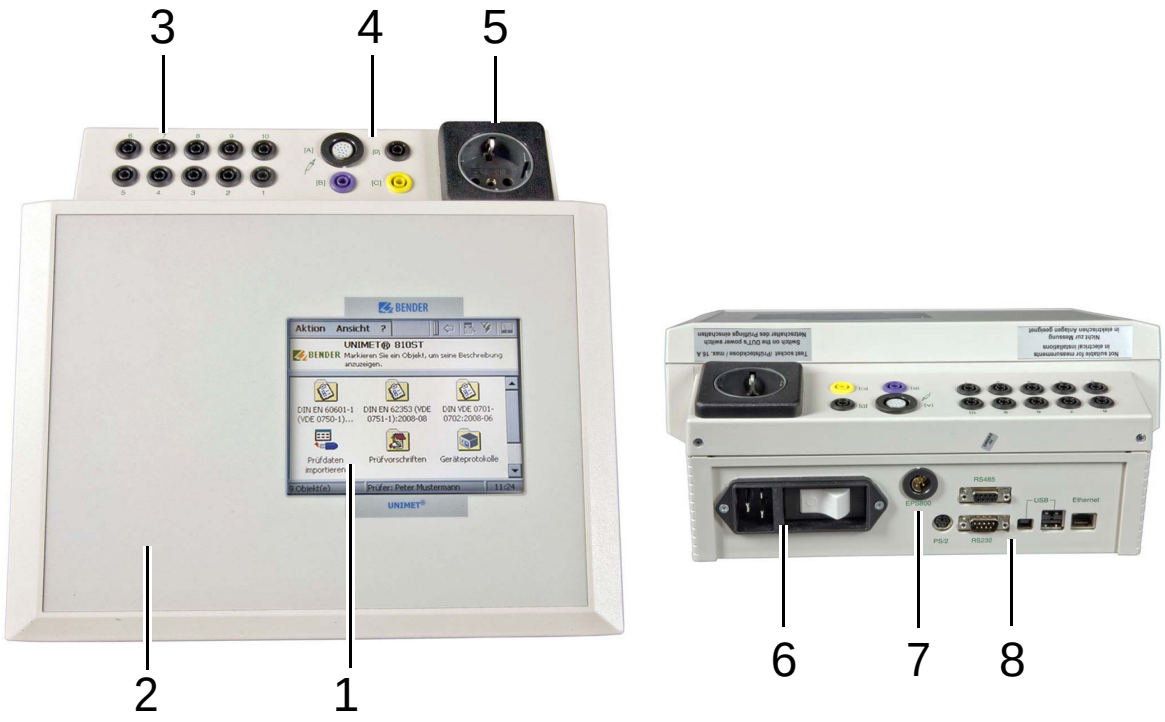
Measurement	DIN EN 60601-1 (VDE 0750-1)	DIN EN 62353 (VDE 0751-1)	DIN VDE 0701-0702	DIN EN 61010-1 (VDE 0411-1)	Direct measurement method	Differential measurement method	r.m.s. (root mean square value)	AC	DC
Applied part leakage current - alternative method		X					X		
Equipment leakage current (Class I and Class II)		X			X	X	X		
PE current			X		X	X	X		
Earth leakage current	X				X		X		
Touch current	X		X	X	X	X	X		
Touch voltage				X				X	X
Applied part leakage current	X							X	X
Patient auxiliary current	X							X	X
Total applied part leakage current	X							X	X
Applied part leakage current with mains voltage on applied part	X	X					X		
Mains voltage	X	X	X	X			X		
Current consumption	X	X	X	X			X		
Apparent power	X	X	X	X			X		
Supply cable test			X						

3.5 System components

The following accessories are supplied with the UNIMET® test system:

1	Carrying bag	For storage and transport of the test system and its accessories. Accessories are kept in the side pocket (1a) and the inside pocket (1b). There is a loop to hold the stylus pen (1c) supplied with the system for operating the touchscreen.
2	Test terminal (safety claw grip)	For connection to accessible parts of the DUT
3	Test probe, single-pole	For testing accessible parts of the DUT
4	Measuring lead, single-pole	For testing permanently installed equipment
5	VK701-7 Adapter for non-heating appliances	For testing device connecting cables
6	Interface cable (null modem cable)	Enables data to be exchanged between the test system and a PC (RS-232 interface)
7	Calibration certificate	Proof of the calibration work carried out in the factory
8	Technical manual and software tools on CD. **The CD is kept in the inside pocket (1b).**	- Manual of the test system - Software for saving test specifications and device protocols on a PC, software to transfer firmware updates to the UNIMET
	Power supply cord, detachable	For connection to the supply voltage (no picture)

3.6 Operating elements



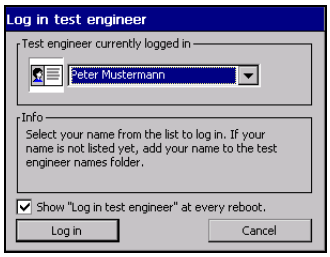
1	Touchscreen for operator control and indication. For this purpose, a stylus is included in the scope of supply.
2	Durable plastic enclosure, with pushbuttons for safe storage in the carrying bag.
3	10 sockets (1…10) for the connection of patient electrodes.
4	Measuring terminals - [B] (violet) for the connection of the single-pole test probe supplied with the product. - [A] for active test probe TP800 with pushbutton (option). - Socket [C] for equipotential bonding (e.g. connection for single-pole line extension with clip for the testing of permanently installed equipment). - Socket [D] for functional earth
5	Test socket: This is where the DUT's power supply cable is plugged in.
6	Connection to the supply voltage and power switch with thermo-magnetic circuit-breaker.
7	Connection for the external 25 A power source EPS800. **Note:** The connector will lock into position and is protected against being pulled out unintentionally. The plug can only be removed after pushing the movable grip back.
8	Interfaces: - PS/2 Connection for external keyboard - RS-485 Serial interface for Bender Service - RS-232 interface, 9-pin, electrically isolated, for connection to a PC - USB interface for connection to a printer, a USB stick, an external keyboard or a barcode scanner (2 x host) and a PC (1 x device, for Bender Service only) - Ethernet Network connection (optional)

4. Quick reference guide

CAUTION

The "Quick reference guide" chapter provides a brief overview of how the test system works. We strongly recommend that you read the entire manual in order to ensure that you can use all the functions of the test system.

Switching on the test system

Actions	Details	Page
1. Switch on the power switch		21
2. Select a test engineer		32
3. If you are switching the test system on for the first time: Connect and configure the accessories you need.	- Connect the printer - Connect an external keyboard - Connect barcode scanner - Calibrate test probe or measuring lead if necessary	22 23 23 36

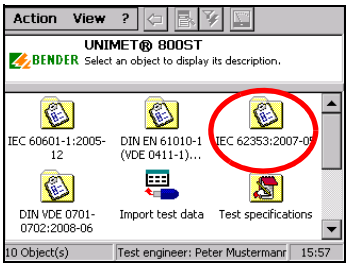
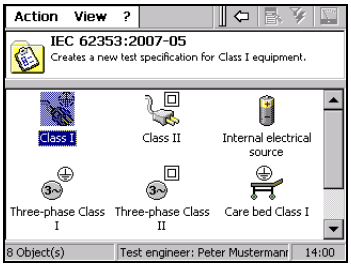
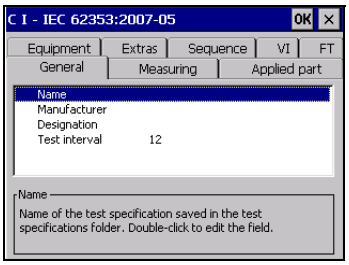
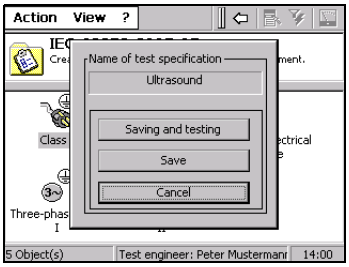
Selecting a test specification

There are three options, dependent upon the starting point:

Starting point	Actions	Page
The DUT is new: Start the classification by selecting the applicable test standard.	1. Select the applicable test standard. 2. Make the settings. 3. Click OK to save (and test)	18, 40
The DUT has previously been tested (recurrent test): The DUT is listed in the "Device protocol" folder under its "Device ID.	1. Open the "Device protocols" folder. 2. Select the "Device ID". 3. Start the test with .	62
You know the type of the DUT: The "Name" of the test specification" appears in the "Test specifications" folder.	1. Open the "Test specifications" folder. 2. Select the "Name" of the test specification. 3. Start the test with .	58

Classification of a new DUT

There is not yet a test specification available for the DUT. The required test steps are identified by means of classification.

Actions	Details	Page
1. Select the applicable test standard.		40
2. Select the applicable protection class.		40
3. Enter a name (type name) for the new test specification. Then open each tab in turn and make the settings. Click OK to complete the settings process.		40
4. Click "Saving and testing" to save the test specification and to start the test. Click "Save" to save the test specification without starting the test.		47

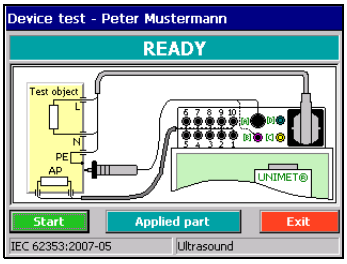
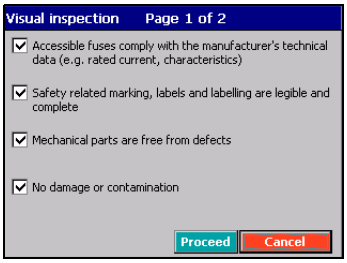
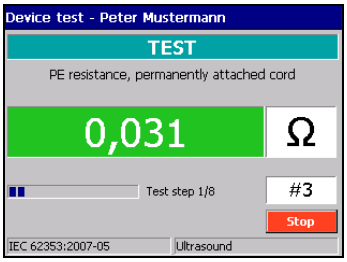
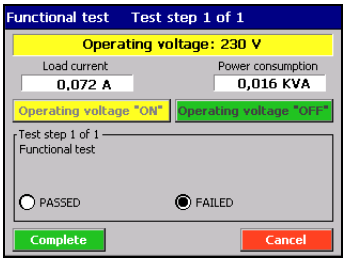
Performing the test

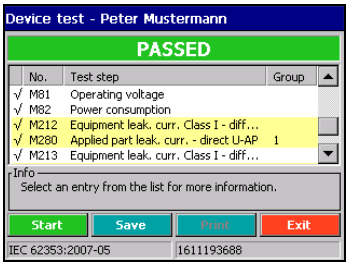
To start a test (initial test), proceed as follows:

- ► After classification, select "Saving and testing",
- ► Select an existing test specification in the "Test specifications" folder and then click on the "Measuring device" icon
- ► or call up "Start device test" from the context menu.

To start a recurrent test, proceed as follows:

- ► Select an existing device protocol in the "Device protocols" folder, then
  - – click on the "Measuring device" icon
  - – or call up "Start device test" from the context menu.

Actions	Details	Page
1. Connect the DUT, then click "Start".		48
2. Perform a visual inspection: - Check that the information displayed is applicable and check or uncheck the boxes as appropriate. - Click "Proceed" to carry out further visual inspections. - Click "Complete" to save and quit the visual inspection process.		51
3. Perform the electrical test steps: The test steps are carried out in sequence with - the DUT switched off - the DUT switched on - the DUT switched on and the phase reversed.		51
4. Perform a functional test: - answer the questions or enter measured values as appropriate. - Click "Proceed" to carry out further functional tests. - Click "Complete" to save and quit the functional test process.		54

Actions	Details	Page
5. Document the test result: - View, save or print the test results - Enter the device ID and additional information. Note: Test results can only be saved and printed if a device ID exists.		55

5. Operation and setting

5.1 Commissioning

WARNING

Before using devices that have been stored at low temperatures: Leave the devices to stand for 3 to 4 hours at room temperature before connecting the power supply. When the devices are moved from a cold to a warm environment, condensation will be evident on all parts. Putting damp devices into operation may damage electrical components and there is a danger of electric shock on contact.

CAUTION

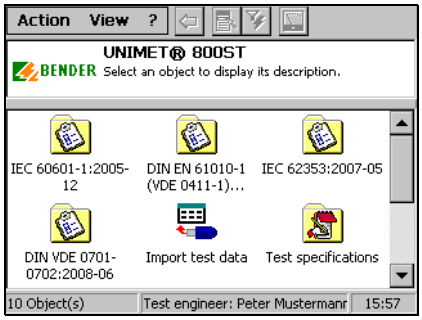
Risk of destruction due to incorrect mains voltage
The UNIMET® 800ST or 810ST must always be connected to the supply voltage (AC 100…120 V, AC 220…240 V) indicated on the nameplate. Only these two voltage ranges are permissible. Voltages between these two voltage ranges are not permissible!
Failure to observe this requirement may damage the test system and any device under test connected to it.

1. Place the UNIMET® on an even surface with the coloured edges of the bag facing up. Open the two covers (Velcro fasteners).
2. Connect the UNIMET® to the supply voltage using the power cable.
3. Switch the test system on using the power switch.

The test system requires approx. 20 seconds to start up and carry out self testing. The test system tests the mains voltage. If the test system detects an IT system (e.g. in an operating theatre) or an error, a message will appear.

During self testing, the software, firmware and hardware versions are displayed, along with the serial number.

If the mains voltage detected deviates from the set nominal voltage by more than 5 V, a message will appear accordingly. The UNIMET® converts the measured current values into nominal voltage (see also chapter "Nominal voltage" on page 36). Click "OK".
Start-up continues. The "Log in test engineer" window will now appear as appropriate for the configuration (see "Test engineer names" on page 32). The test system's main folder appears next:



5.1.1 The touchscreen

The device is controlled via the touchscreen. Please use the accompanying stylus (included in the scope of supply). There is a loop in the test system's carrying bag to hold the stylus.

CAUTION

Do not use a ballpoint pen, a pencil or other sharp objects to operate the touch screen. This may damage or destroy the touch screen.

5.1.2 Connecting a printer

PCL-compatible printers (PCL=Printer Common Language) can be connected to print out the test results. Virtually all laser printers and all HP Deskjet printers meet these specifications. Due to the large variety of printers, Bender is not able to create a list of compatible printers and keep it updated at all times.

Always observe the specifications of the printer manufacturer to obtain a seamless printout with the UNIMET®. Unfortunately, printing out with a multi-function device including fax, printer and scanner is not possible.

When connecting a printer for the first time, proceed as follows:

1. Connect the printer to one of the two USB interfaces of the test system.
2. Switch the printer on. The test system cannot detect the printer type until it has been switched on.
3. Configure the test system for the printer.
   - Starting from the main folder, double-click to select each of the following:
     > "System control" > "Windows system control" > "Printer".
     Hint: If you cannot see the "System control" icon in the main folder, scroll down the bar on the right-hand edge of the screen.
   - Select the connected printer from the list. You do not need to install any printer drivers. Select the paper size, print quality and colour.
   - Click "OK". The setting remains active until the next time the UNIMET® is switched off.
   - Select "Save settings" from the "Windows system control" menu to save your settings permanently.

If no suitable printer is available for direct connection to the UNIMET® you can "print" the data as a PDF file to a USB stick. Afterwards, the USB stick can be plugged into a PC to print out the data.

5.1.3 Print setup in PDF file

Test results can be saved as a PDF file. The PDF file is saved to a USB stick. For printing, the USB stick can be connected to a personal computer with printer connection.

When connecting a printer for the first time, proceed as follows:

1. Connect the USB stick to one of the two USB interfaces of the test system. The following settings can only be carried out with the USB stick connected.
2. Set up the test system for PDF printouts.

– Starting from the main folder, double-click to select each of the following:
> "System control" > "Windows system control" > "Printer".
Hint: If you cannot see the "System control" icon in the main folder, scroll down the bar on the right-hand edge of the screen.
– Select "Adobe PDF file" from the list.
– Click "OK". The setting remains active until the next time the UNIMET® is switched off.
– Select "Save settings" from the "Windows system control" menu to save your settings permanently.

5.1.4 Connecting an external keyboard

A standard keyboard (PS/2) can be connected to the "PS/2" socket.

► Switch the UNIMET® off to connect the keyboard. The UNIMET® will detect the keyboard the next time it is started up and it will be ready for immediate use.

A keyboard with a USB connection (see "Ordering information" on page 92) can be connected to one of the UNIMET® USB sockets during operation. It can be used immediately.

5.1.5 Connecting barcode scanner

The barcode scanner for the UNIMET® (with PS/2 connection; see "Ordering information" on page 92) can be connected to the "PS/2".
Note: The barcode scanner must be configured.
The UNIMET® will detect the barcode scanner the next time it is started up and it will be ready for immediate use.

5.1.6 Connecting USB stick

A USB stick can be plugged into one of the two USB sockets of the UNIMET® during operation. It can be used immediately. It should be formatted as FAT.

There is a large variety of USB sticks on the market.
If the UNIMET® is not able to detect a USB stick, try to connect another one with less storage capacity (≤2 GB).

5.1.7 TP1010 for tests according to DIN EN 61010-1 (VDE0411-1):2011-07

The international standard DIN EN 61010-1 (VDE0411-1):2011-07 specifies general safety requirements for electrical equipment for measurement, control and laboratory use.

To carry out test according to the standard DIN EN 61010-1, the UNIMET® 800ST always requires the test probe TP1010 (see "Ordering information" on page 92).

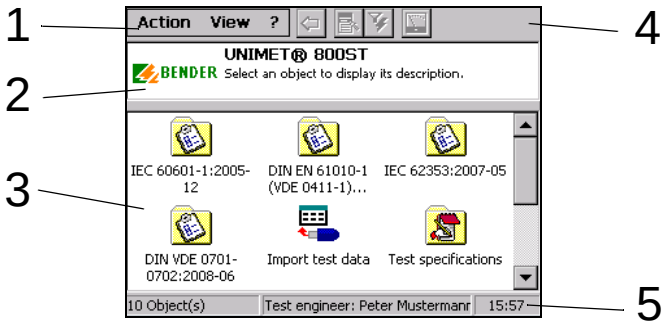
For further information, refer to the quick-start guide of the TP1010.

5.1.8 Other device settings

Other device settings are listed in chapter "5.5 Device settings". Some of the settings are used in generating reports to record test results. You should therefore check these settings before carrying out the first device test.

5.2 Principle of operation

The UNIMET® operating software runs on the WINDOWS® CE operating system. Accordingly, the user interface is one with which PC users will be familiar.



1	Menu bar	Used to log in test engineers, to select various screen configurations for icons, to select the language and for information about the test system's software and hardware.
2	Info window	If you click on an icon from within the main window, an info window will appear containing a brief description. Messages are also displayed in this window, e.g. if the UNIMET® is running on an IT system or in the event of hardware problems being detected.
3	Main window	It provides access to the various UNIMET® folders and functions.
4	Toolbar	Buttons for context menu, query filter or starting tests.
5	Status bar	Provides information about the number of objects in the main window, the test engineer logged on and the time of day.

5.2.1 Menu bar

5.2.1.1 The "Action" menu

Test engineers use the "Action" menu to log on. The name of the test engineer currently logged on is assigned to subsequent device tests.

1. Select "Action" -> "Log in test engineer" from the menu bar
2. Select your name from the list and click "Log in" to confirm your selection.

To edit or enter a new test engineer's name, select "Test engineer names" in the main folder.

5.2.1.2 The "View" menu

Various screen configurations and different languages can be selected from the "View" menu. The settings are saved and are retained even after the test system has been switched off.

Large icons	Very transparent if only a limited number of objects are to be displayed. This screen configuration is used predominantly in this operating manual.
List	Improves the overview in the event of a large number of objects (e.g. selection from a "Device protocols" folder containing a large number of entries).
Details	Same properties as List, but with more information (e.g. measurement numbers in a list of single tests).
Select All	Used to select all entries in the "Test specifications" and "Device protocols" folders.
Invert selection	Used to invert the selection of the highlighted entries in the "Test specifications" and "Device protocols" folders.
English, Deutsch, Italiano, Français	Select language of user interface.

5.2.1.3 The "?" menu

The menu "Software information" includes the serial number, firmware (operating software), hardware and all software components of the UNIMET®. Please have this information to hand if you need to contact us for assistance by telephone.

1. Select "?" > "Software information" from the menu bar.
2. To close this screen, click "OK".

5.2.2 Main window

When it starts up, the UNIMET® shows the main folder in the main window (see "Principle of operation" on page 24).

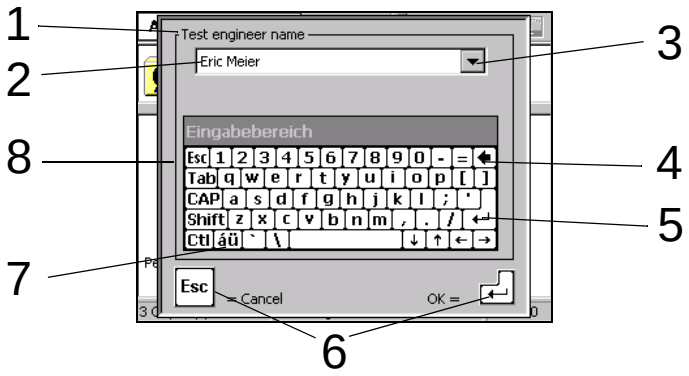
► Single-click on an icon to show a brief description in the info window.

► Double-click on the required icon to activate the associated function or open a sub-folder.

5.2.3 The software keyboard

5.2.3.1 Entries via the keyboard

A software keyboard for entering text and numbers appears on the UNIMET® display. You can make your entries by touching the required keys with the stylus (or via a hardware keyboard, if one is connected).



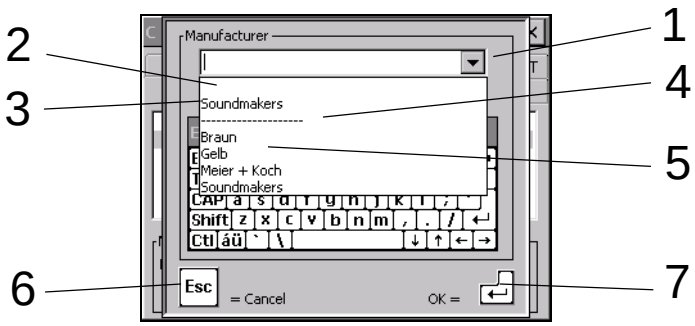
1	Text box title
2	Text box
3	List for text box. Existing entries can be selected from the list to accelerate entry and avoid errors.
4	Delete one character to the left of the cursor (Backspace).
5	Accept entry and close software keyboard (ENTER).
6	ESC and ENTER buttons, alternative option to 8 and 5.
7	Show/hide umlauts and special characters
8	Reject entry and close software keyboard without making changes (ESCAPE).

5.2.3.2 Selection from a list

A list of existing entries is available for each text box. To open this list, click on the triangle next to the text box. Advantages of selecting entries from a list:

- Faster entry
- Uniform notation

The following rules apply to all text boxes: Once a term has been entered, you will need to use the list every time you enter this term subsequently. This is to ensure that the same term is always written in an identical way. This is a basic requirement in order for term searches and selections to work (e.g. with the query filter; see also "How to use the query filter" on page 30).
Examples of application:
All device protocols for the manufacturer Soundmaker need to be selected for a test by the manufacturer's customer service department.
All device protocols for the client Dr. Koch need to be selected for a recurrent test inhouse.



1	Open list: click on the triangle
2	Current entry
3	Last entry
4	Delete list: Click on the line
5	Previous entries
6	Close software keyboard without making changes
7	Accept entry

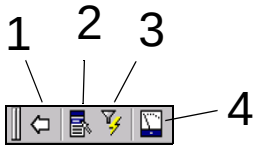
5.2.4 Saving settings or cancelling

Some windows feature OK and ☒ buttons at the top edge. Here:

OK	Accept settings and close window.
☒	Close window without making changes.

5.2.5 Toolbar

The toolbar provides rapid access to UNIMET® functions. The buttons can be active or inactive, depending on the available options. Inactive buttons are greyed out.



1	**Back**, closes the current folder. This icon will be active if, for example, you have double-clicked to switch to the "Test specifications" or "Device protocols" folder. Click it to return to the main folder.
2	The **context menu** will become active, for example, if you click on a test specification, a device protocol or a test engineer and there are several possible operator actions. Click on the icon (or press the corresponding button on the keyboard) to open the context menu listing the possible operator actions. Single-click on the required function; a help text will appear. Double-click to launch this function.
3	If a larger number of test specifications and device protocols are available, the **query filter** can be used to refine your search. Activate the filter to sort and filter test data.
4	**Measuring instrument** to quick-start a device test. The measuring instrument can be activated in the "Test specifications" or "Device protocol" folders, as well as for single tests, by clicking on an icon. Click on the measuring instrument to start the device test or a single test step.

5.2.5.1 How to use the context menu when only one entry is activated

Example:

1. Select a device ID under "Device protocols".
2. Click  (context menu) in the toolbar.
3. Select one of the following operator actions by double-clicking on it:

Start device test Device protocol - Properties Device protocol(s) - Print Device protocol(s) - Print overview Device protocol(s) - XML-Export (USB) Device protocol(s) - CSV--Export (USB) Device protocol(s) - Delete Exit

5.2.5.2 How to use the context menu if more than one entry is activated

If the "Device protocols" folder contains a large number of device IDs, you can select the "List" or "Details" screen configuration to improve transparency. This setting remains saved even after the test system is shut down.
To select specific device protocols for batch printing (print all), proceed as described below.

Example:

1. Select several device IDs under "Device protocols". To select multiple device IDs, proceed as follows:
   Draw a frame around the selected icons with the stylus pen or
   if you have a keyboard connected,
   - press and hold down the shift button and click the first and last IDs in a group of device IDs with the stylus pen.
   - press and hold down the shift button and select a group of device IDs using the arrow buttons up/down.
   - press and hold down the "Ctrl" button and click several individual device IDs with the stylus.

   Activated device IDs are displayed against a dark background.
2. Click  (context menu) in the toolbar.
3. Select one of the following operator actions by double-clicking on it:

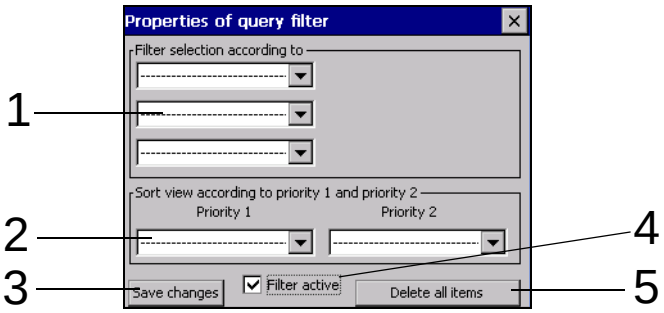
Device protocol(s) - Print
Device protocol(s) - Print overview
Device protocol(s) - XML-Export (USB)
Device protocol(s) - CSV-Export (USB)
Device protocol(s) - Delete
Exit

Another example application for the context menu appears in chapter "5.4.2.2 Logging in, changing or deleting test engineers".

5.2.5.3 How to use the query filter

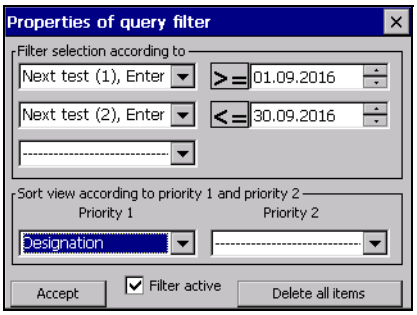
You can filter only, sort only or filter and sort at the same time.

1. Click  in the toolbar.
2. Select "Filter active" to modify the settings.



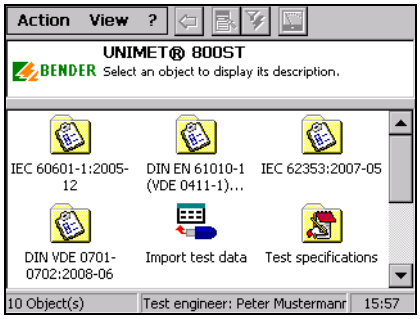
1	Filter selection by	Three filter conditions can be selected. Only entries meeting all conditions (AND operation) are displayed. - Fields tagged "Search for“ can be used for a full text search. - With the test data circulation you can select test data received or sent from a PC. - The test date can be narrowed using relational operators (e.g. <, >, =, …). - In other fields, one of the existing entries can be selected.
2	Sort view by	Two sort criteria can be specified. Data is sorted first by priority 1, then by priority 2.
3	Accept	Accept settings and exit function.
4	Filter active	Activate/deactivate filter. Settings can only be made if the filter is active. Changes made to settings are retained even if the filter is deactivated or the test system is shut down.
5	Delete all items	Delete all filter conditions and sort criteria.

Example:
Numerous device IDs are saved in the "Device protocols" folder. Only device protocols relating to devices due for testing in September 2016 need to be displayed. The device protocols are displayed sorted by designation. Make the following settings:



5.3 Main folder

The main folder is the top operating level. It provides access to the various UNIMET® folders and functions.



Function	Description	Page
DIN EN 60601-1 (VDE 0750-1) DIN EN 61010-1 (VDE 0411-1) DIN EN 62353 (VDE 0751-1) DIN VDE 0701-0702	Classification in accordance with the relevant standard. Answer the questions that appear on the screen. The test system will identify the required test steps and limit values to be complied with. You can save this test specification under a name in the "Test specifications" folder.	40
Import test data	Imports test specifications and device protocols from a USB drive. The test specifications associated with the device protocols are imported automatically.	57
Test specifications	The "Test specifications" folder contains saved test specifications and their creation dates.	58
Device protocols	The "Device protocols" folder contains saved device protocols. Test results, measured values and the date of the next test are saved under each device ID.	62
Single test	Test steps can be called up in the form of single tests and repeated as often as required.	64
Test engineer names	Select test engineer, enter new test engineer, delete test engineer	32
System control	Display, date, time of day and printer settings. The Windows® settings are grouped in a folder.	34

Double-click on the relevant icon to activate the required function.

5.4 Test engineer names

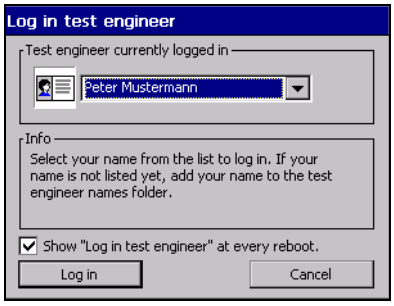
The names of the test engineers are stored in the "Test engineer names" folder. The test engineer whose name appears in the device protocol is also logged in here. You should therefore set the test engineer's name before carrying out the first test.

The "Test engineer names" folder is particularly useful if more than one person is working with the test system. Test engineer names already registered on the system can be selected easily. There is no need to re-enter the name of the test engineer. The "Test engineer names", "Test specifications" and "Device protocols" folders share the same data memory. Accordingly, the number of test engineer names is limited only by the size of the available memory. A name of a test engineer cannot be longer than twenty characters.

5.4.1 Log in test engineer

The name of the test engineer currently logged in is assigned to all subsequent device protocols. The test engineer's name is printed on the device protocols.

1. Select "Action" -> "Log in test engineer" from the menu bar
2. Select your name from the list and click "Log in" to confirm your selection.



If more than one person is working with the test system, there is a risk that users will forget to select the name of the new test engineer. To avoid this, check the ☒ "Log in test engineer" box on every restart. The "Log in test engineer" window will then appear every time the test system is powered up.

5.4.2 Test engineer names administration

The "Test engineer names" folder features the following functions:

- Create new
- Log in
- Change
- Delete

How to access the "Test engineer names" folder:

► In the main folder, double-click to open the "Test engineer names" folder.
Hint: If you cannot see the "Test engineer names" icon in the main folder, scroll down the bar on the right-hand edge of the screen.

5.4.2.1 Other options for "Log in test engineer"

1. Double-click the required test engineer name (e.g. "Peter Mustermann").
2. or click on "Test engineer names" > click on "  " in the toolbar > double-click on "Log in".
3. or, in the menu "Action", select -> "Log in test engineer".

5.4.2.2 Logging in, changing or deleting test engineers

Use the "Context menu" on the toolbar to edit the name of an existing test engineer. Proceed as follows:

1. Click the name of the test engineer.
2. Click  (context menu) in the toolbar
3. Double-click on the required action

Log in	Logs the test engineer in.
Change	You can use the keyboard to edit the name of the test engineer. ESC = Name of the test engineer remains unchanged. ↵ = save the test engineer name you have changed
Delete	The selected name is deleted.
Exit	The name of the test engineer remains unchanged. The "context menu" function is exited.

5.4.2.3 Creating a new test engineer

1. Double-click "Create new".
2. Enter the name using the stylus and the software keyboard (or external keyboard).
3. Confirm entry with "OK".
4. Choose whether new test engineer is logged in (yes/no).

5.5 Device settings

The "System control" folder is used to configure your test system. How to access the "System control" folder:

► In the main folder, double-click to open the "System control" folder.
Hint: If you cannot see the "System control" icon in the main folder, pull the scroll bar on the right-hand edge of the screen down.

5.5.1 Windows system control

The UNIMET® uses the Windows® CE operating system. How to access the "System control" folder:

► In the "System control" folder, open the "Windows system control" folder.

The system settings can be changed as follows:

You have to execute the function "Safe changes" to be secure that all the settings in the "Windows system control" folder are stored permanently.

5.5.1.1 Saving settings

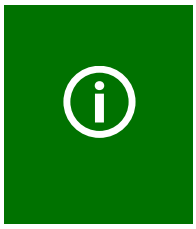
► Select > "System control" > "Windows system control" > "Save settings".

"Save settings" can be used to save various Windows settings, so that they are retained for use the next time the system is powered up (e.g. display settings, regional settings, printers, keyboard layout etc.).

5.5.1.2 Display

► Select > "System control" > "Windows system control" > "Display".

Make the settings for the background, the appearance of the windows and the characteristics of the display lighting here.



UNIMET® helps saving energy
The menu item "Display" > "Lighting" is set in a way that the display light is turned off after 10 minutes of no-load operation. After touching the display, the light is immediately turned on again.
This function also increases the service life of the display and must therefore not be deactivated.

5.5.1.3 Printer

► Select > "System control" > "Windows system control" > "Printer".

The procedure for setting up an external printer is described in the chapter entitled "Connecting a printer" on page 22. Also refer to "Print setup in PDF file" on page 22.

5.5.1.4 Date/time

► Select > "System control" > "Windows system control" > "Date/Time".

This window is used to set the date, time of day and time zone, as well as automatic changeovers to and from summer/winter time.

You can move this window to reveal all standard functions it supports (e.g. the "OK" button). To do this, click on the blue title bar and drag the window in the required direction.

5.5.1.5 Regional settings

► Select > "System control" > Windows system control" > "Country settings".

Regional settings such as numbers, currencies, time of day and date.

5.5.1.6 Stylus

► Select > "System control" > Windows system control" > "Stylus".

In the "Stylus" window you can personalise the double-click action of the stylus. Double-click the grid. This will teach the UNIMET® the rate at which you will perform the double-click action in the future.
Select "Calibration" to calibrate the touchscreen for the stylus pen.

5.5.1.7 Input panel

► Select > "System control" > "Windows system control" > "Input panel".

If data needs to be entered, a software keyboard will appear on the test system's touchscreen. The appearance of the software keyboard can be modified in the "Input panel" window.

5.5.1.8 Keyboard

► Select > "System control" > "Windows system control" > "Keyboard".

The settings in this window only apply to an external hardware keyboard connected to a USB interface or a PS/2 port. You can activate character repetition here, as well as changing the delay and repetition rate.

5.5.1.9 Keyboard layout

► Select > "System control" > "Windows system control" > "Keyboard layout".

The settings in this window only apply to an external hardware keyboard connected to a USB interface or a PS/2 port. Here you can configure the test system in line with a keyboard in German or American format.
If this function is not displayed, you can find the setting option under "Regional settings".

5.5.1.10 Volume & sound

► Select > "System control" > "Windows system control" > "Volume & sound".

You can set the volume in this window and assign events to specific sound responses.

Other functions in the "System control" folder:

- ► In the main folder, double-click to open the "System control" folder. **Hint:** If you cannot see the "System control" icon in the main folder, scroll down the bar on the right-hand edge of the screen.

5.5.2 Zero balance PE resistance (test probe/measuring lead)

Zero balance has to be performed for the UNIMET® test probe. As with an ohmmeter, this ensures that the ohmic resistance of the test probe will not affect the PE conductor test result. You should repeat this calibration procedure every time you connect a different test probe or measuring lead to the test system. Also carry out a zero balance before testing with the VK701 adapter or the external power source EPS800 (measurements #0101, #0102, #0103).

1. Select > "System control" > "Windows system control" > "Zero balance PE resistance".
2. Select the number of the PE conductor test (e.g. #0003 to test a device with a power cable). A zero balance procedure can be saved for each measurement path.
3. Connect the test probe as illustrated in the diagram on the screen.
4. Press "Test" to test your test probe.
5. Press "Adjust" to calibrate your test probe.

Information about general device calibration appears in the chapter entitled "Calibration" on page 67.

5.5.3 Nominal voltage

UNIMET® can be used for the voltage ranges AC 100…120 V or AC 220…240 V. In order to always obtain comparable measured values even if the mains voltage is fluctuating, various standards require measured values to be converted to nominal system voltage or even to 106 or 110 % of the nominal system voltage. It is for this reason that you should set the nominal system voltage. The factory setting is 230 V. The required conversion of the measured values is performed automatically by the UNIMET®.

1. Select > "System control" > "Nominal voltage".
2. Select the corresponding nominal voltage.
3. Confirm the nominal voltage with "Accept".

5.5.4 Database

The UNIMET® uses a shared database for the "Test specifications", "Device protocols" and "Test engineer names" folders. Deleting test data creates gaps which remain unfilled. Therefore, you should compress the database regularly in order to make this space available for use. The UNIMET® takes approximately one minute to compress 1000 data records.

1. Select > "System control" > "Database".
2. Click "Compress test database…"

5.5.5 Backup (USB)

Can be used to back up the operating software and the UNIMET® test database to a USB stick. We recommend making regular backup copies. You should back up your data in particular before updating the UNIMET® operating software.
Therefore, connect a USB stick to the USB port on the UNIMET®. The data will take up approximately 20 MB of memory space.

How to back up UNIMET- data on a USB stick

1. Select > "System control" > "Backup".
2. Click "Start backup".

To copy the data saved on the USB stick back to the UNIMET®, proceed as follows:

1. Switch the UNIMET® off.
2. Connect the USB stick.
3. Switch the UNIMET® on.
4. In the window, specify whether the UNIMET® operating software and/or the test database (test specifications and device protocols) should be copied back.

Start	Starts data recovery.
Cancel	Cancels recovery. - UNIMET® starts up. **No** data is copied from the USB stick to the UNIMET®.

5.5.6 Remote control RS-232

The UNIMET® can be connected to a PC via the RS-232 interface.
The baud rate and data bits are set in this window. The baud rate indicates the data transmission rate in bits per second.

The baud rate and data bits on the test system and the PC (or in the PC software) must always be set to the same value! In case of different settings, data transmission cannot be carried out.

1. Select > "System control" > "Remote control RS-232".
2. Select the corresponding interface parameter
3. Confirm the new interface parameter with "Accept".

5.5.7 Diagnostic

You need a test box TB3 for this function. Running a test with the TB3 test box will show whether the test system needs to be returned to the factory for calibration. Testing with the TB3 test box is no substitute for the recommended regular calibration procedure.

The TB3 simulates a standardised DUT. The UNIMET® runs a test sequence and evaluates the result as "PASSED" or "FAILED". A description of how to connect and use the test box appears on the TB3's instruction leaflet.

1. Select > "System control" > "Diagnostic".
2. Connect the TB3 test box as illustrated in the diagram on the screen.
3. Select "Properties" > "Options",
   - Select the corresponding test box (diagnostic routine): TB3-230 V or TB3-120 V.
     The TBPAT test box is intended for use by Bender Service only.
   - Select the "Number of tests".
     This function enables the test sequence to be run more than once. The evaluation of the test results is shown in the test protocol. If the test has been run more than once, UNIMET® will provide statistical interpretations of the measurements taken in the test protocol (standard deviation, min./max. values, stability value (CP)).
   - Confirm your selection by pressing "OK".
4. Click "Start". The test system performs an automatic test with the connected test box.
5. On completion of the test, the test system will display the results of the diagnostic.
   Click "Print" to print the test result on a connected printer or to create a PDF file.
6. Terminate the indication of the test result by clicking ☒ or "OK".

6. Testing and measuring

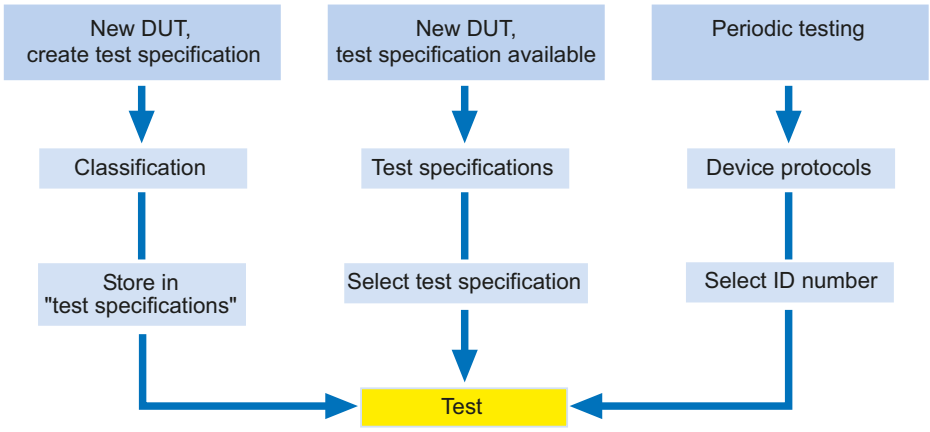
6.1 Test concept

The integrated "Test specifications" and "Device protocols" folders provide the basis for time-efficient and cost-effective testing with the UNIMET®.

Classification
The UNIMET® allows tests to be carried out in accordance with the standards DIN EN 60601-1 (VDE 0750-1), DIN EN 62353 (VDE 0751-1), DIN VDE 0701-0702 (VDE 0701-0702) und EN 61010-1 (VDE 0411-1). For test specifications of DUTs not saved in the "Test specifications" folder so far, the required test steps and their limit values have to be determined in dialogue between the test engineer and the UNIMET®. This classification is then saved as a test specification named accordingly in the "Test specifications" folder, where it is available for all subsequent DUTs of the same type.

The "Test specifications" folder
Test specifications which have already been classified are saved in this folder named accordingly (e.g. AFX infusion pump). When a new device for which a test specification does exist is tested for the first time, only the test specification needs to be selected. The device test can be started directly. Once the device has passed the test, the device protocol is saved in the "Device Protocols" folder under the device ID. This saves an enormous amount of time where new acquisitions are concerned. A further advantage is: All devices with the same test specification are tested under identical conditions.

The "Device protocols" folder
The "Device protocols" folder contains saved device protocols. Test results, measured values and the date of the next test are saved under each device ID. In the case of recurrent tests, only the device ID needs to be selected. Connect the DUT – test – done. This saves an enormous amount of time. A DUT is always tested in the same way with its associated test specification.



Single test
Test steps can be called up in the form of single tests and repeated as often as required. If, for example, a limit value is not complied with during a device test, the test step concerned can be examined in more detail using a single test.

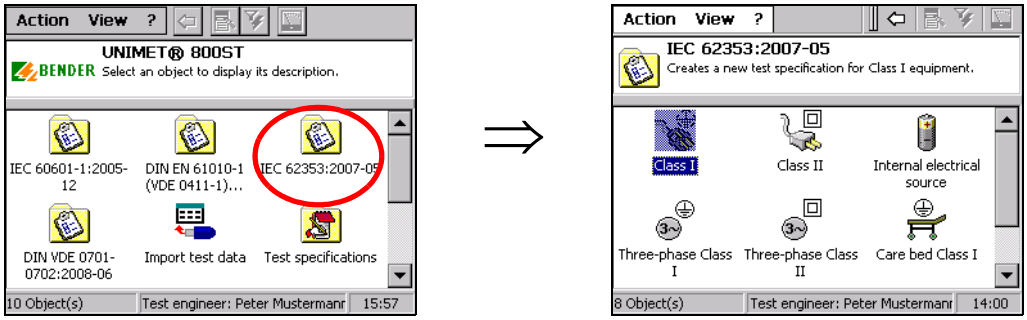
6.2 Classification

► Select the applicable test standard from the main folder. Answer the questions that appear on the screen.

The test system will identify the required test steps, their sequence and the limit values to be complied with. Classification produces the test specification, which is saved to the "Test specifications" folder.

Example:
Classification of medical electrical equipment (e.g. ultrasound device) according to IEC 62353:2007-05
This is a Class I device with two patient connections.

In the main folder, select "IEC 62353:2007-05“ and then "Class I".



The remainder of the classification procedure is carried out on tabs. The UNIMET® marks completed tabs with the "√" symbol. Modify the settings on every tab to reflect the properties of the DUT. Then click OK to accept your entries. To cancel classification, click X.

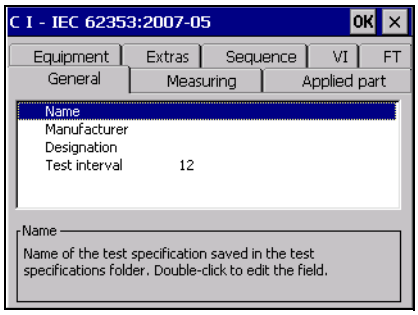
6.2.1 General

The following rules apply to all text boxes: Once a term has been entered, you will need to use the list every time you enter this term subsequently. This is to ensure that the same term is always written in an identical way. This is a basic requirement in order for term searches and selections to work (e.g. with the query filter; see also "How to use the query filter" on page 30).

You must always enter a name. If you do not, you will not be able to save the classification. Example: Ultrasound.

The manufacturer and designation describe the DUT in more detail. You must decide whether you want to enter this information immediately or edit it at a later date. You also need to specify a test interval for recurrent tests. Once a device has passed the test, the UNIMET® will calculate the date of the next device test.

- ► When clicking on an entry, a short description appears in the info field at the bottom.
- ► Double-click on an entry to open the software keyboard and edit that entry (entries can also be edited using an external keyboard).



6.2.2 Method of measurement

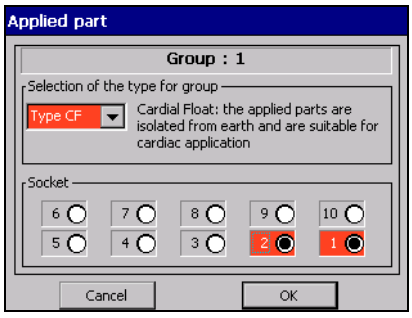
The test standards enable you to choose between three different methods of measurement to ascertain the leakage currents.

- ► When clicking on an entry, a short description appears in the info field at the bottom.
- ► Double-click on an entry to select this method of measurement. The current method of measurement is identified by the "√" symbol. Example: Direct measurement method.

6.2.3 Applied part

Our example device has patient connections.

1. You therefore need to select" [X] Test with applied part".
2. In the next window, create one or several groups of applied parts (e.g. type "BF" and type "CF"). For each group, select "Create new".
3. In the next window, select the type of applied part (see the medical device's nameplate). Example: CF type.
4. Next, select the patient socket on the test system to which this applied part is to be connected. Patient sockets can be selected at will. The patient sockets are colour-coded as appropriate for the type of applied part (B = green, BF = yellow, CF = red).



Cancel	Close window without making changes.
OK	Accept settings and close the "Group 1" window. A second group can be created. If you do not wish to create any more groups, continue the classification process by clicking on the next tab.

6.2.4 Equipment type

The "Equipment type" tab only appears when it is required for classification of the DUT.

- ► When clicking on an entry, a short description appears in the lower info field ("ME system" means "medical electrical system").
- ► Double-click on an entry to select this equipment type. The current equipment type is identified by the "√" symbol. Example: Standard equipment.

6.2.5 Extras

The "Extras" tab combines a variety of settings.

- ► Click on an entry to show an explanatory comment in the info field at the bottom of the tab.
- ► Double-click on an entry to activate that function. Activated entries are identified by the "√" symbol.

Depending on the selected test standard, the following settings are available.

All accessible conductive parts are connected to PE	This function can be used if you know that all metal accessible parts of the enclosure are connected to PE. During device testing, the test probe then only has to be brought into contact with one metal point on the enclosure. If not all metal parts of the enclosure are connected to PE, deactivate this function. During device testing, an additional equipment leakage current test resp. touch current test (Class II) is carried out. The semi-automatic test sequence is classified automatically. During device testing, proceed as follows: During PE conductor testing, use the test probe to scan all parts of the enclosure connected to PE. During equipment leakage current testing or touch current testing (Class II), test all parts not connected to PE.
Warm-up and cool-down period	Once they have been switched on, an increasing number of DUTs need to complete a self-test and warm-up period, followed by a cool-down period prior to shutting down. Examples include computers, processor-controlled devices and laser equipment. For these devices, the UNIMET® may only start the measurements once the DUT has warmed up or "booted up". Otherwise, there is a risk that the parts of the device to be tested will only have switched on partially or not at all, and therefore will not be tested. Once the measurements are complete, the UNIMET® may only turn off the DUT once it has shut down or cooled down. Otherwise, on laser equipment, there is the risk of overheating or, on a computer, of sectors of the hard disk becoming unusable.
Display warning notice	If this function is activated, a warning notice will appear prior to the DUT connected to the mains voltage. Only once the message has been confirmed will the mains voltage be connected. This prevents hazardous devices such as grinders starting up unexpectedly.
Carry out insulation resistance test step (**not** applicable for tests acc. to DIN EN 60601-1)	During insulation measurement, a voltage of 500 V is applied between the active conductors and earth. Insulation testing may damage sensitive devices. Only activate insulation measurement if permitted by the manufacturer's instructions provided with the DUT.
Permit measurement with phase reversed (only applicable for tests acc. to DIN EN 60601-1)	Permanently installed equipment with neutral conductor not protected by a fuse cannot be tested with phase reversed.

25-A power source EPS800 connected (only for tests in acc. with DIN EN 60601-1)	Activate this option for carrying out a standard-compliant test of the protective earth resistance with 25 A. The external power source EPS800 is required for these tests.
ME equipment/system with signal input or output parts (only for tests in acc. with DIN EN 60601-1)	Detecting leakage currents from medical electrical equipment or systems whose signal input and output is connected to an external voltage.
Functional earth is also connected (for tests acc. to DIN EN 60601-1 only)	The functional earth of the medical electrical equipment resp. the system is connected to FE connection of the test device.
DUT can be disconnected from the system (only for tests acc. to DIN VDE 0701-0702)	If the DUT cannot be disconnected from the system, deactivate this option (limited equipment test).

6.2.6 Test sequence

The test sequence can be carried out automatically, semi-automatically or manually for each DUT.

- ► Click on an entry to show an explanatory comment in the info field at the bottom of the tab.
- ► Double-click on an entry to activate that function. Activated entries are identified by the "√" symbol. Example: Automatic.

Automatic test sequence	During automatic testing, the test probe or test terminal comes into contact with one point of the DUT. The electrical test steps are carried out one after the other.
Semi-automatic test sequence	During semi-automatic testing, the test steps for which the test probe is needed are only started on request. This means that a test step can be repeated in order to check various accessible conductive parts of the DUT. To start the current test step, click "Measure" or press the active test probe (option) firmly onto the DUT. The UNIMET® will save the *worst* value measured. To proceed to the next test step, click the "Proceed" button or press the button on the handle of the active test probe (option). Test steps for which the test step is not required are performed one after the other during the next automatic test sequence.
Manual test sequence	During the manual test sequence, every test step is carried out continuously. This makes it possible to contact several accessible parts one after another with the test probe. The UNIMET® will save the worst value measured. To proceed to the next test step, click the "Proceed" button or press the button on the handle of the active test probe (option).

If an error is detected during automatic testing, the test step concerned can be repeated. The UNIMET® will switch to manual mode for this test step.

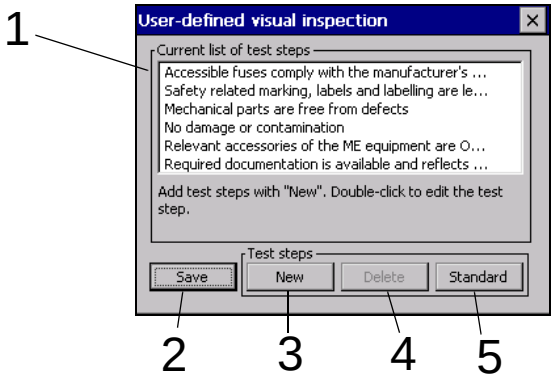
6.2.7 Visual inspection

The device test also includes a visual inspection. The UNIMET® can save and document the test steps involved in this visual inspection.

- ► Click on an entry to show an explanatory comment in the info field at the bottom of the tab.
- ► Double-click on an entry to activate that function. Activated entries are identified by the "√" symbol. Example: Standard visual inspection.

Short visual inspection	During the device test, it is only possible to activate or deactivate the "Visual inspection" option.
Standard visual inspection	The device is tested against the criteria from the relevant standard.
User-defined visual inspection	You can create your own test steps for the visual inspection process. Use the criteria from the relevant standard as a starting point. Text can be modified, deleted or added.

To create a user-defined visual inspection, proceed as follows:



1	Current test steps in the visual inspection process. The first test step is selected (single-click). Double-click to edit the test step.
2	Saves the current test steps in the visual inspection process.
3	A new test step is added below the existing test steps. The software keyboard opens automatically for this purpose.
4	Deletes the selected test step.
5	The default test steps associated with the relevant standard are activated. Any user-defined test steps are deleted.

6.2.8 Functional test

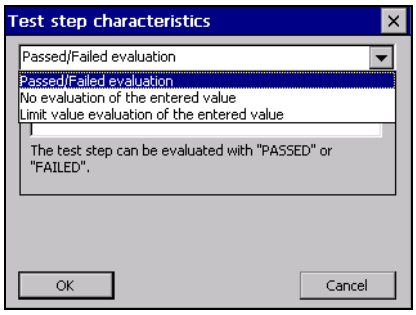
A device test also includes a functional test. The UNIMET® can save and document the test steps involved in this functional inspection.

- ► Click on an entry to show an explanatory comment in the info field at the bottom of the tab.
- ► Double-click on an entry to activate that function. Activated entries are identified by the "√" symbol. Example: Standard functional test.

Do not perform a functional test	Select this option if a functional test is not required.
Standard functional test	DUT is put into operation via the test socket of the UNIMET®. It is evaluated as "PASSED" or "FAILED".
User-defined functional test	You can create your own test steps for the functional test process.

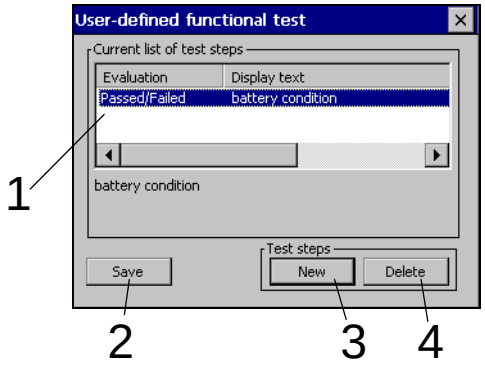
To create a user-defined functional test, proceed as follows:

1. Click on "New" to create a new test step. Then configure the test step.



PASSED/ FAILED evaluation	It is evaluated as "PASSED" or "FAILED". Text for display on the screen can be entered.
No evaluation after entering the measured value	The measured value entered is documented. The test step does not affect the evaluation of the test result ("PASSED"/"FAILED").
Limit value evaluation after entering the measured value	The test step is evaluated against the limit values. The text displayed on the screen should include the setpoint and the unit.

2. Enter a text to be displayed on the screen for this test step. Then click "OK".



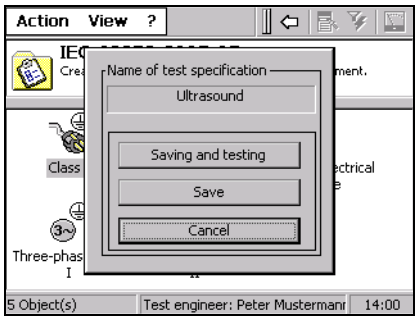
1	Current test steps in the functional test process. The first test step is selected (single-click). Double-click to edit the test step.
2	Saves the current test steps in the functional test process.
3	A new test step is added below the existing test steps. Configure the test step and enter the associated text to be displayed on the screen.
4	Deletes the selected test step.

Further examples of user-defined functional tests

Selected property	Display text/ minimum and maximum limit value	Description
No evaluation after entering the measured value	Operating hours	The hours of operation are simply documented. The test result remains unaffected.
Limit value evaluation after entering the measured value	Delivery accuracy at 10 ml/h Minimum limit value: 9.70 Maximum limit value: 10.30	If the measured value entered for the delivery rate is below the minimum limit value or exceeds the maximum limit value, the DUT will be evaluated as "Failed".

6.2.9 Exiting classification

Once all settings have been made, click OK to accept your entries.



Classification is complete. Now you have the following options:

Saving and testing	The classification is saved under its name to the "Test specifications" folder. Afterwards, the device test will be started.
Save	The classification is saved under its name in the "Test specifications" folder.
Cancel	The classification is not saved.

6.3 Device test

WARNING

Faulty DUTs may present dangerous touch currents on conductive parts during the device test.
The UNIMET® will terminate test steps during which the leakage current is detected by means of "Direct measurement method" as soon as a measured value of > 20 mA is reached.

WARNING

The test system must not be used for measurements in electrical installations. It is exclusively intended for devices and systems listed under "System description" on page 11.

CAUTION

During testing of the insulation resistance with DC 500 V, a direct touch current of up to 2.5 mA may be conducted on faulty DUTs or in the event of direct contact with the test probe. DIN EN 61010 permits a direct touch current of up to 15 mA.

CAUTION

During testing of the equipment leakage current -alternative method- with AC 250 V on faulty DUTs or in the event of direct contact with the test probe there is the risk of an electric shock. The test current is limited to 3.5 mA.

CAUTION

The leakage current flowing during the test of a faulty DUT can cause the residual current protective device (RCD) to operate.

CAUTION

When leakage currents are measured during a test, the DUT must be set up in an insulated state. This ensures that no leakage currents can flow via accidental earth connections. Accessible conductive parts of the DUT and the measuring leads may be live. and therefore must not be touched.

Information on the electromagnetic compatibility (EMC):
The lengths of the connected interface cable must not exceed 30 m.
If the device is connected to a DUT, electromagnetic emissions may occur exceeding the levels specified by the standards.
If asymmetrical surge voltages occur on the power supply line, the test may be aborted. Electrostatic discharges at the interfaces may require that the system is to be restarted.

CAUTION

Risk of overheating due to high load currents

If DUTs with high current consumption (> 8 A) are supplied by the UNIMET® for several minutes, the UNIMET® will prevent overheating by aborting the test. A message will appear.

Therefore, please regard the following when DUTs with high current consumption are concerned, (> 8 A):

- Take the UNIMET® out of the carrying bag.

- The DUT must not be supplied from the UNIMET® test socket for more than 15 minutes.

UNIMET® in specific national versions for Switzerland, Great Britain and the USA are only designed for a current consumption of maximum 10 or 13 A (see ordering information).

To start an initial test:

1. After classification, select "Saving and testing".
2. Select an existing test specification in the "Test specifications" folder, then
   - click the "Measuring device" icon
   - or call up "Start device test" from the context menu.

To start a recurrent test:

► Select an existing device protocol in the "Device protocols" folder, then
   - click the "Measuring device" icon
   - or call up "Start device test" from the context menu.

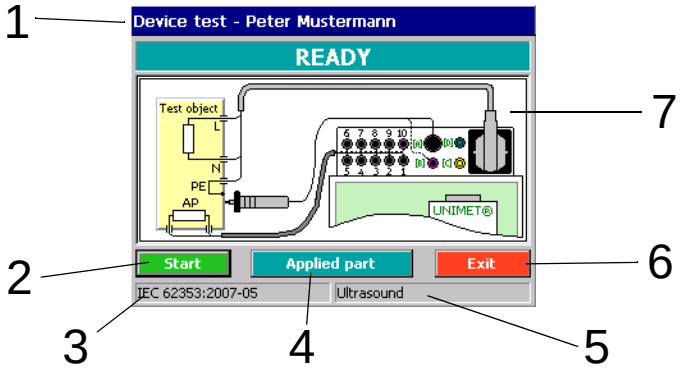
The device test is carried out in the following order:

1. Visual inspection
2. Electrical test
3. Functional test

6.3.1 Connecting the DUT

The UNIMET® will now display the wiring diagram matching the classification. This diagram will show you where to make the connection for the test probe and all other connections to the DUT.

In the wiring diagram, the test probe is connected to socket [A]. We are using the TP800 active test probe (option).
The single-pole test probe supplied with the UNIMET® is connected to socket [B].



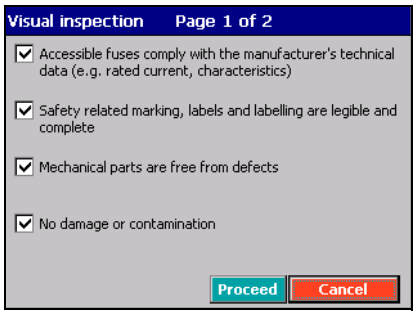
1	Test engineer logged on
2	Start device test
3	Test standard
4	Only if there is an applied part: Additional information about the applied part.
5	Test specification or device ID
6	Cancel device test
7	Wiring diagram

Proceed as follows:

1. Connect the DUT to the UNIMET®.
2. Then click the "Start" button.

6.3.2 Carrying out the visual inspection

Carry out the visual inspection following the test steps listed. All visual inspections are set as passed ☑ by default. If this is not applicable for one of the test steps, click ☑. The box is unchecked ☐ and as a result the test step and the entire device test are saved as "FAILED".
If there are too many test steps to be displayed on a single page, a button labelled "Proceed" or "Back" will appear on the screen. Click this button to move between pages.



Click "Proceed" to proceed with the electrical part of the device test.

6.3.3 Carrying out the electrical test steps

The UNIMET® now starts the electrical part of the device test. The electrical test steps are carried out in the following order:

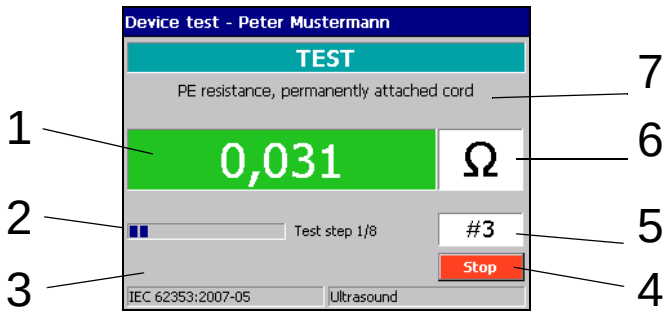
1. All test steps during which the DUT is not in operation (e.g. PE resistance test, insulation resistance test and equipment leakage current test -alternative measurement).
2. Test steps with the DUT in operation with a given phase angle (e.g. touch current test, differential current test and applied part leakage current test).
3. Test steps as 2, but with phase reversed.
4. DIN EN 60601-1 only: Test steps interrupted by system conductor (single fault condition; SFC).
5. DIN EN 60601-1 only: Test steps as 4, but with phase reversed

This ensures that the DUT is not started up and shut down too often.

The UNIMET® monitors compliance with the limit values throughout the device test.

If a limit value is violated during a test step, the test engineer can decide whether to abort the device test or continue to its completion.

Test steps illustrated using the example of PE conductor testing



1	Measured value. The background colour is - green if the limit value is complied with - red if the limit value is not complied with - black if there is no limit value
2	Progress bar and test step counter
3	Space for "Next" button (Only for manual and semi-automatic test sequences, or if the limit value was not observed and the device test was not aborted).
4	Aborts the device test.
5	Number of the test step. Bender device test steps are numbered consecutively. Also refer to chapter "8.3 Test steps".
6	Measured value unit
7	Name of the current test step

6.3.3.1 PE conductor test

On Class I equipment, the resistance of the PE conductor is tested.

- ► In the event of the limit value not being complied with, the measured value will be displayed first, followed by a warning message. At this point, you can choose between the following options:
  - – Accept measured value (Yes). Proceed with device test.
  - – Not accept the measured value (No). Test step is repeated.
  - – Cancel device test by clicking "Stop".
- ► If the test step is repeated, the UNIMET® switches automatically into the manual test sequence for this test step. This test step will then be repeated until the test engineer starts the next test step with "Next".

During the PE conductor test, the low-resistance continuity of the PE conductor is tested with a high current (max. 8 A). This produces heat energy. If the PE conductor test is repeated frequently and without breaks during manual or semi-automatic test sequences or in the context of single tests, the UNIMET® will prevent overheating by aborting the test step. A message will appear. PE conductor testing can continue once a short cool-down period has elapsed.

- ► In accordance with the classification, further tests during which the DUT is not in operation (e.g. PE conductor test, insulation resistance test and equipment leakage current -alternative measurement) are carried out after the PE conductor test.

6.3.3.2 Switching on the DUT

If the "Display warning notice" message was activated on the "Extras" tab during the classification process, a warning notice will appear before the DUT is connected to the mains voltage.

► Click "Next" to proceed with the device test. The DUT is connected to the power supply.

Warm-up period

If the "Warm-up and cool-down period" was activated on the "Extras" tab during the classification process, the UNIMET® will wait for the device to ramp up or reach readiness for operation. Once the DUT is connected to the mains supply, the message "Warm-up phase" appears.

► Click "Next" to proceed with the device test.

Power consumption

The UNIMET® ST measures the power consumed by the DUT.

Please note that only DUTs with a power consumption of up to 16 A may be supplied with power via the UNIMET® test socket. UNIMET® in specific national versions for Switzerland, Great Britain and the USA are only designed for a current consumption of maximum 10 or 13 A (see ordering information). If DUTs with too high power consumption are connected, the thermomagnetic circuit-breaker installed in the power switch of the UNIMET® will trip. After disconnecting the DUT, the test system can be switched on after a few seconds.

At a load current of less than 0.005 A, the UNIMET® will prompt you to confirm that the DUT is actually switched on.

► This is the latest point at which you can switch the DUT on. Then click "Proceed".

Cool-down period

If the "Warm-up and cool-down period" function was activated on the "Extras" tab during the classification process, once the last test step to be carried out with this phase relation has been completed, the UNIMET® will wait for the DUT to ramp down.

► Click "Next" to proceed with the device test.

The UNIMET® then repeats the tests with the phase reversed. Here too, it will comply with any settings made in relation to warm-up and cool-down period.

6.3.4 Carrying out the functional test

The functional test follows the electrical part of the device test.

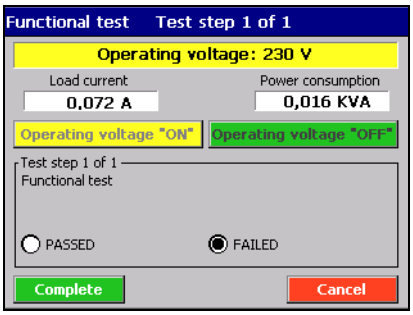
WARNING

Only DUTs which have successfully passed the electrical tests may be tested for correct functioning.
DUTs can suddenly start while starting the functional test (example: jigsaw). This can lead to damage and injuries.

► *Switch the DUT off before starting the functional test. First, select "Operating voltage ON". Then switch the DUT on again.*

Standard functional test

1. Click "Operating voltage ON". Turn the DUT on.
2. Test the function of the DUT.
3. Click "Operating voltage OFF". Turn the DUT off.
4. Evaluate the test step using "PASSED" or "FAILED".



Operating voltage "ON"	DUT is put into operation* via the test socket of the UNIMET®. Please note the manufacturer's instructions when doing this. Three-phase DUTs and DUTs with power consumption levels higher than 16 A (resp.10 or13 A, see ordering information) cannot be supplied with power via the test socket. Connect these DUTs directly to the designated mains voltage.
Operating voltage "OFF"	The DUT is switched off*.
Proceed	Proceed to the next test step.
PASSED	The DUT has passed the test step.
FAILED	The DUT has failed the test step. The entire device test is saved as "FAILED".
Complete	Results are accepted. The functional test concludes.
Cancel	The functional test is aborted. The entire device test is evaluated as "FAILED".

* *The operating voltage can be switched on or off at any time.*

User-defined functional tests

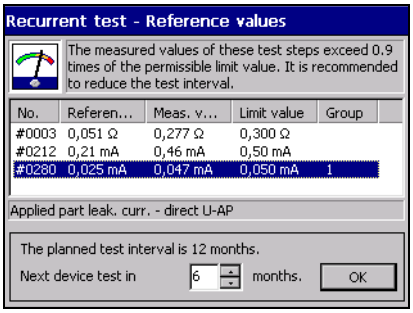
If in the classification "User-defined functional tests" is selected. the set test steps appear (refer also to "To create a user-defined functional test, proceed as follows:" on page 45).

► Evaluate the test steps using "PASSED" or "FAILED". If necessary, enter the requested measured value.

6.3.5 Evaluating and documenting the test result

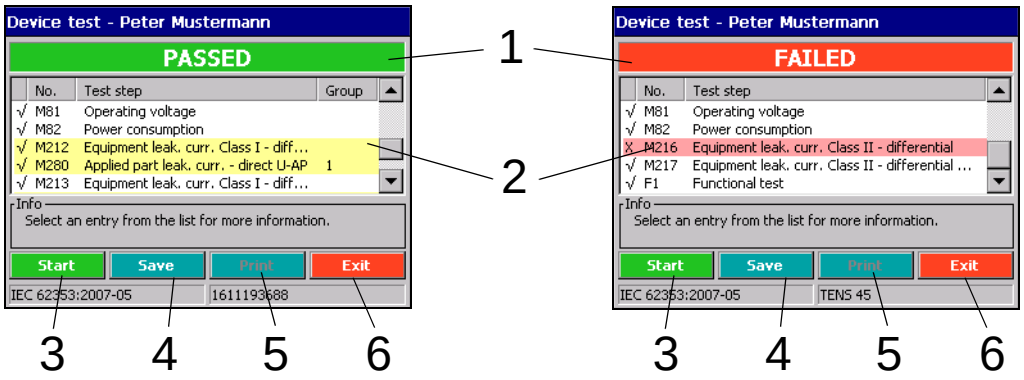
Shortening the test interval

If the test is a recurrent test, the UNIMET® will display a list of all test steps whose measured value reach or exceed 90 % of the limit value. The reference values for these test steps are also displayed. You need to decide whether to shorten the test interval.



Documenting the test result

Once the functional test has been completed and the test interval has been amended (if necessary), the result of the device test is displayed.



1	Overall result of the device test. The background colour is: - green, if the device has passed the test, - red, if the device has failed the test.
2	Test steps completed. The background colour is: - red, if the device has failed the test step, - yellow if the measured values for the test step reach or exceed 90% of the limit value.
3	Starts the device test again. The existing device test is overwritten.
4	Saves the device test to the "Device protocols" folder. The values initially saved for this device ID (reference values) are always retained. All subsequent device tests are overwritten by the more recent device test in each case.
5	Prints the device protocol on a connected printer or creates a PDF file. "Print" will be activated not until the device test has been saved.
6	Quits the device test. If the device protocol has not been saved, a warning will appear.

- ► Click on a test step to show details. The evaluation of the test step, the measured value and the limit value are shown.
- ► The device ID is required for saving to the "Device protocols" folder. Other data such as serial number, client, room, department, test costs, and a comment can also be entered. Enter at least the device ID and click "Save device protocol". Click "Cancel" to exit the device test. If a device passes the test, the test date is updated by the set test interval.

The following rules apply to all text boxes: Once a term has been entered, you will need to use the list every time you enter this term subsequently. This is to ensure that the same term is always written in an identical way. This is a basic requirement in order for term searches and selections to work (e.g. with the query filter; see also "How to use the query filter" on page 30).

6.3.5.1 Client administration

The UNIMET® supports administration of test data for different clients specifically for service applications. Every time you enter the name of the client, it must be in the same format.

If the same device ID has been inadvertently assigned to two different clients, UNIMET® is able to detect that these are two different DUTs. The device protocols for both DUTs are saved and administered.

Selecting a clients' device

1. In the main folder, double-click to open the "Device protocols" folder.
   Hint: If you cannot see the "Device protocols" icon in the main folder, scroll down the bar on the right-hand edge of the screen.
2. Click  in the toolbar.
3. Select "Filter active".
4. Select filter selection by "client" and then select the required client name.
5. Sort the devices, e.g. by "Device ID".
6. Click "Accept".

The client's device can now be edited (see "Editing, printing, exporting and deleting a device protocol" on page 62f).

6.4 Importing test data

Imports test specifications and device protocols previously exported to a USB drive (USB stick) back to the UNIMET®.

1. Connect a USB stick on which test data has been saved to one of the two USB sockets on the UNIMET®.
2. In the main folder, select "Import test data".
3. Make a selection to indicate whether you are importing "Test specifications" or "Device protocols".
4. Click "Create preview". A list of the imported data appears. Select which data should to be imported:
   - "All" selects all entries in the preview.
   - "Invert" inverts the selection of entries.
   - Clicking on an entry selects this entry.
   - If you have a keyboard, you can select several entries at a time by clicking on entries from the list while pressing and holding the [CTRL] button. Alternatively, you can also select a group of device IDs using the arrow buttons up/down while pressing and holding the shift button.
5. "Import selected test data" imports the selected test data.
   When device protocols are imported, the associated test specifications are always imported with them. A progress bar appears on the screen. The process can be aborted.
6. Click "Finish" to exit the "Import test data" function.

6.5 The "Test specifications" folder

All test specifications are saved by name in the "Test specification" folder. Test specifications contain all test steps drafted and limit values calculated. Using the same test specification to test more than one DUT offers the following advantages:

- Saves time: Classification only has to be carried out once.
- Assures quality: All devices with the same test specification are tested under identical conditions.

The content of the "Test specifications" folder can be transferred to an administration program installed on a PC. Likewise, data records selected in the administration program can be transferred to the "Test specifications" folder. These functions are described in the PC software guide.

6.5.1 How to access the "Test specifications" folder

1. Click "Test specification" in the main folder.
2. Select the relevant test specification.

If the "Test specifications" folder contains a large number of names, you can select the "List" or "Details" screen configuration to improve transparency. This setting remains saved even after the test system is shut down.
You can also improve transparency by using the query filter. An empty "Test specifications" folder indicates that none of the entries meets the conditions set in the query filter. Deactivate the query filter or select different settings for it.

6.5.2 How to start a device test from the "Test specifications" folder

► Click on the required test specification and proceed as follows:
  – Click  in the toolbar,
  – or on  (Context menu) in the toolbar,
  then double-click "Start device test".

If a device has been tested and saved previously, you will need to start the recurrent testing from the "Device protocols" folder.

6.5.3 Editing, printing, exporting and deleting a test specification

The settings saved in a test specification are valid for all device protocols created with this test specification. Changes to the test specification are applied to all associated device protocols with immediate effect.
When deleting a test specification, please remember that you are also deleting all device protocols created with it from the "Device protocols" folder.

Use the "Context Menu" on the toolbar to edit the name of an existing test specification. Proceed as follows:

1. Click on the name.
2. Click  (Context menu) in the toolbar
3. Select required action
4. Select one of the following operator actions by double-clicking on it:

Start device test
Test specification - Properties
Test specification - Test step editor
Test specification(s) - Print
Test specification(s) - Print overview
Test specification(s) - XML-Export (USB)
Test specification(s) - Delete
Exit

You can also **modify** a test specification by double-clicking on the name. Please bear in mind the restrictions listed below.

Start device test	Starts the device test. Once the device test is complete, save the test result to the "Device protocols" folder.
Test specification - Properties	Shows the settings for this test specification. **If you need to make fundamental changes affecting test steps, you will need to repeat the classification process.** Here, you can only change the functions listed below: **Tab** — **Function** General — - Name (only if not yet transferred to PC) - Manufacturer - Designation - Test interval Extras — - Show warning notice - Warm-up and cool-down period Test sequence — - Automatic - Semi-automatic - Manual
Test specification- Test step editor	Limit values for test steps can be modified and test steps can be added or deleted in the Test step editor (see page 60 for more detailed information)
Test specification(s) - Print	Prints the selected test steps (all details of the test step) on a connected printer or creates a PDF file.
Test specification(s) - Print overview	Prints an overview of the selected test specifications on a connected printer or creates a PDF file.
Test specification(s) - XML-Export (USB)	Exports the selected test specification to a USB drive (USB stick). A progress bar appears on the screen. The process can be aborted. The exported data can be imported again.
Test specification(s) - Delete	Deletes the selected test specifications along with the associated device protocols. A progress bar appears on the screen. The process can be aborted.
Exit	The "context menu" function is exited.

6.5.3.1 Test step editor

The test step editor supports the following functions for existing test specifications:

- Change limit values for test steps
- Add test steps
- Delete test steps

The test system will only permit modifications for test specifications for which no device protocols have been saved and which have not yet been exported or imported. This prevents divergent settings being made for the same test specification.

WARNING

Running the modified test sequence can put test personnel (electric shock) and the DUT (damage beyond repair) at risk. You should therefore first run a test sequence without the DUT and check whether all tests are completed as required. Only at this point should you connect the DUT. During testing, do not touch any conductive metal parts of the DUT or test leads.

Proceed as follows:

1. Open the "Test specifications" folder.
2. Click on the required test specification.
3. Click  (Context menu) in the toolbar and select "Test specification - Test step editor".

► The settings on the **"General", "Extras", and "Test sequence" tabs** are made in the same way as during the original classification process:

► The **"Applied part" tab** is used to add, edit and delete groups (application groups).

- **Deleting a group:** Single-click on the group to be deleted, then click "Delete".
- **Editing a group:** Double-click on one of the groups in the list to start editing it. Example: Change group "Type B" to "Type BF".
- **Creating a new group:** Click "Create new". Select the type of the new group and the associated sockets.
  Example: "Type CF" with patient socket 3…6.

You also need to enter the test steps associated with this group. A group for which no test steps have been entered will be deleted when the test specification is saved.
A safer and quicker procedure is to make as many settings as possible during the classification process and just make minor adjustments with the test step editor.

► **Visual inspections** can be added or deleted. Test steps for the functional test can be added or deleted.

► The primary task of the test system is the electrical test. Test steps can be edited, deleted and added via the **"Test steps" tab**.

– **Deleting test steps:** If, for example, you have doubts about running the insulation resistance test, click on this test step, followed by the "Delete" button. The test step is deleted with immediate effect.

– **Editing test steps:** Start the edit process of the limit value by double-clicking on the required test step. Enter a new limit value using an external keyboard or via the numbers and arrow buttons on the screen. Click OK to accept your entries. To abort the function, click X.

– **Filter selection by standards:** Click "Standards". The currently selected filter will be indicated. Example: Only test steps included in DIN EN 62353 will be indicated.
Click ▼ to display the list of available standards. Click on the respective standard or "Display all electrical test steps". Then click the "OK" button.

– **Adding test steps:** Click "Add". A list of available test steps appears. The available test steps depend on the settings of the "Standards" button.
Click on the required test step. Then click on the "Limit value" text box. Enter a new limit value using an external keyboard or via the numbers and arrow buttons on the screen. Confirm the new limit value by clicking the OK button, located between the arrow buttons.

Click OK at the top of the screen to accept your entries for this test step. To abort the function, click X.

You must always enter an applicable limit value when creating new test steps. If you do not, the default limit values, which are too strict, will lead to the DUT failing the test.

– **Adding test steps for the applied part:** Test steps have to be created for the new group created under "Applied part". Go to the "Test Steps" tab and click "Add".
Under "Test Steps" add a test step (e.g. applied part leakage current) for the new group (i.e. this applied part). Enter the associated limit value.
Click OK at the top of the screen. The "Assign group" window appears. Select the corresponding group then click "OK".
Click OK to accept your entries. To abort the function, click X.

For each group, a new test step has to be added and the group then needs to be assigned.

– **Saving test specifications:** Once you have made all the settings for this test specification, click OK.
The test system will now check the new settings. The test steps are sorted into an appropriate order for the test sequence. Groups of applied parts with no associated test steps are deleted. The test specification is then saved with the new settings.
Modified test specifications are marked with the suffix "MOD." before the test standard.
Example: MOD. DIN EN 60601-1…

6.6 The "Device protocols" folder

All tested devices are saved in the "Device protocols" folder with their device ID and the test results obtained. The reference values are also saved. In the event of recurrent tests, the devices are simply called up in the "Device protocols" folder and tested again.

The content of the "Test specifications" folder can be transferred to an administration program installed on a PC. Likewise, data records selected in the administration program can be transferred to the "Device protocols" folder. These functions are described in the PC software guide.

6.6.1 How to access the "Device protocols" folder"

1. Click "Device protocols" in the main folder.
2. Select the device ID of the DUT.

If the "Device protocols" folder contains a large number of device IDs, you can select the "List" or "Details" screen configuration to improve transparency. This setting remains saved even after the test system is shut down.
You can also improve transparency by using the query filter. An empty "Device protocols" folder indicates that none of the entries meets the conditions set in the query filter. Deactivate the query filter or select different settings for it.

6.6.2 How to start a device test from the "Device protocols" folder

► Click the required device ID and proceed as follows:
  – Click  in the toolbar,
  – or on  (Context menu) in the toolbar,
  then double-click "Start device test".

6.6.3 Editing, printing, exporting and deleting a device protocol

Use the "Context Menu" on the toolbar to edit a device protocol saved under a device ID. Proceed as follows:

1. Click on the device ID.
2. Click  (Context menu) in the toolbar
3. Select one of the following operator actions by double-clicking on it:

Start device test
Device protocol - Properties
Device protocol(s) - Print
Device protocol(s) - Print overview
Device protocol(s) - XML-Export (USB)
Device protocol(s) - CSV-Export (USB)
Device protocol(s) - Delete
Exit

You can also **modify** a device protocol by double-clicking on the device ID. Please bear in mind the restrictions listed below.

Start device test	Starts the device test. Once the device test is complete, save the test result to the "Device protocols" folder. This will overwrite the old device protocol.
Device protocol properties	Shows the device properties and reference values. If you need to make fundamental changes which could have an effect on the test steps, you will need to repeat the classification process. Here, you can only change the functions listed below: **Tab** — **Function** Master data — - >>Serial No. - Manufacturer - Designation - Client - Location - Street - Building - Department - Room - Test costs - Comment - Date of next test
Device protocol(s)-Print	Prints the selected device protocols (all details of the device protocol) on a connected printer or creates a PDF file.
Device protocol(s)-Print overview	Prints an overview of the selected device protocols on a connected printer or creates a PDF file.
Device protocol(s)-XML-Export (USB)	Exports the selected device protocols to a USB drive (backup copy on USB stick). A progress bar appears on the screen. The process can be aborted. The exported data can be imported again.
Device protocol(s)-CSV-Export (USB)	Exports the selected device protocols to a USB drive (USB stick) as an Excel file. A progress bar appears on the screen. The process can be aborted. The exported data **cannot** be imported again. They can only be used as Excel files.
Device protocol(s)-Delete	Deletes the selected device protocols. A progress bar appears on the screen. The process can be aborted.
Exit	The "context menu" function is exited.

6.7 Single test

Test steps can be called up in the form of single tests and repeated as often as required. If, for example, a limit value is not complied with during a device test, the test step concerned can be examined in more detail using a single test.

6.7.1 How to access the "Single test" folder

► Click "Single tests" in the main folder.
Hint: Since there are a large number of single tests, you can select under "View" the "List" or "Details" screen configuration to improve transparency.

For safety reasons, the device aborts each single test after two minutes.

6.7.2 How to start a single test

1. Select test step:
   – Select the required test step then click in the toolbar,
   – or double-click on the required test step.
2. The wiring diagram of the test step is displayed. Click "Start" to start the test step.
3. Click "Finish" or "Stop" to cancel the test step.

6.7.3 Using the query filter

UNIMET® provides many test steps. The query filter allows the respective test step to be selected quickly.

1. Activate the query filter .
2. Select the required test standard (e.g. DIN VDE 0701-0702)
3. Select "Filter active".
4. Click "Accept".

Only test steps from the selected test standard are displayed.

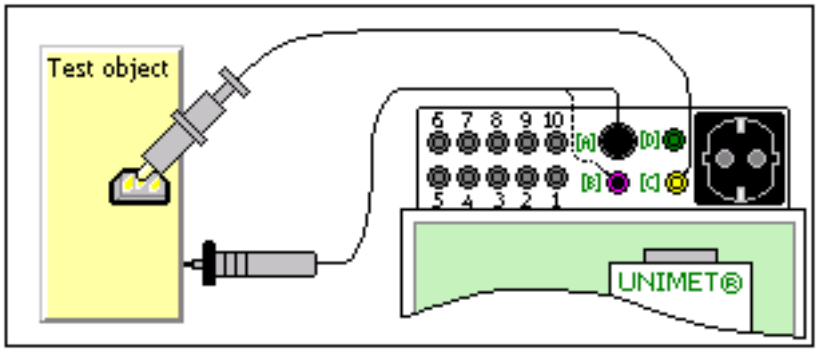
6.7.4 Protective earth resistance measurement

During the PE conductor test, the low-resistance continuity of the PE conductor is tested with a high current (max. 8 A). This produces heat energy.
If the PE conductor test is repeated frequently and without breaks during manual or semi-automatic test sequences or in the context of single tests, the UNIMET® will prevent overheating by aborting the test step. A message will appear. PE conductor testing can continue once a short cool-down period has elapsed.

6.7.4.1 Differentiating between the types of protective earth resistance measurement

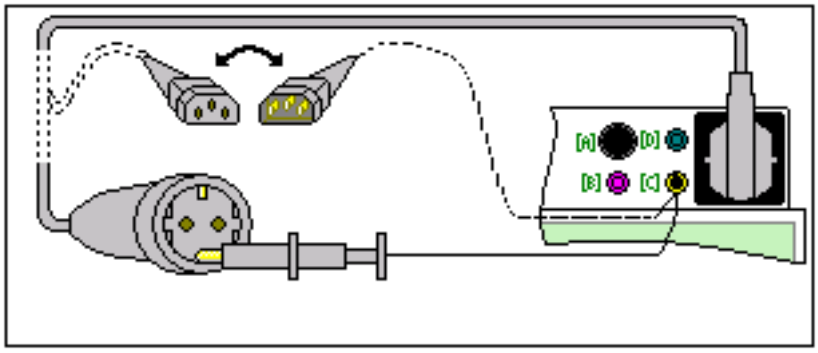
Risk of incorrect measured values if zero balance has not been carried out
A zero balance of the UNIMET® has to be performed for the test probe or the measuring lead. This ensures that the ohmic resistance of the test probe and/or the measuring lead will not affect the PE conductor test result. You should repeat this calibration procedure every time you connect a different test probe or measuring lead to the test system.
A zero balance procedure can be saved for each measurement path of the PE conductor testing (see chapter "5.5.2 ").

Measurement #0001: PE resistance, enclosure PE
A DUT has a detachable power supply cord. If only the DUT is to be tested for low-resistance continuity of the PE conductor without the cable, connect as follows:



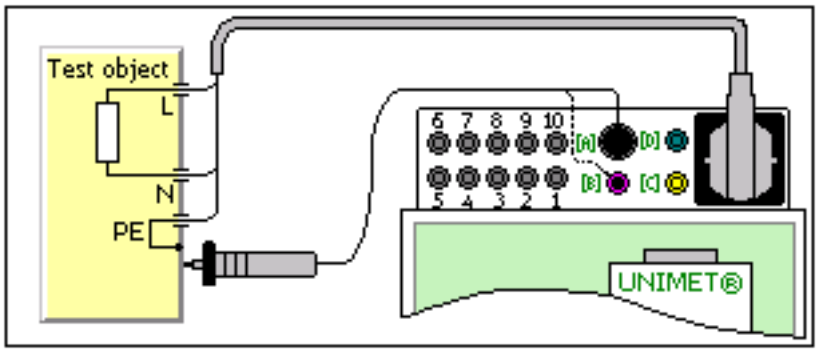
- ► Plug measuring lead (if applicable, with test terminal) into socket "C". Contact PE connector with DUT.
- ► Plug the passive test probe into socket "B" or rather the active test probe into socket "A". Test accessible metallic enclosure parts of the DUT.

Measurement #0002: PE resistance, cord
A DUT has a detachable power supply cord. If only the cable is to be tested for low-resistance continuity of the PE conductor, connect as follows:



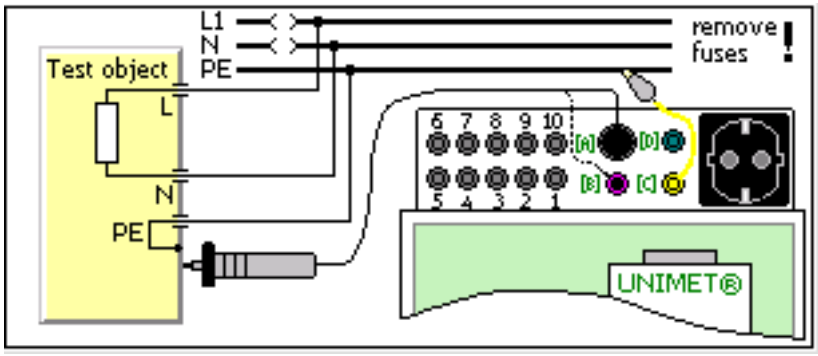
- ► Plug the detachable power supply cord into the test socket of the UNIMET®.
- ► Plug adapters or measuring lead with test terminal into socket "C".

Measurement #0003: PE resistance, permanently attached cord
A DUT has a permanently attached power supply cord. Connection is also carried out this way if a DUT with detachable power supply cord is to be tested with the cable:



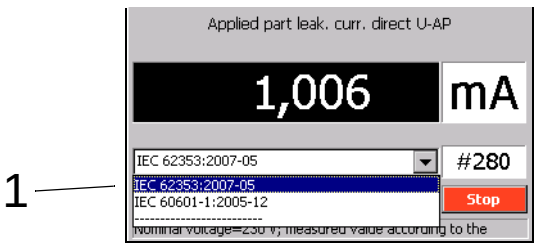
- ► Plug the power supply cable into the test socket of the UNIMET®.
- ► Plug the passive test probe into socket "B" or the active test probe into socket "A". Test accessible metallic enclosure parts of the DUT.

Measurement #0004: PE resistance, permanently installed equipment
A permanently installed DUT should be tested for low-resistance continuity of the PE conductor. Make the connection as follows:



- ► Disconnect DUT from power supply DUT (switch off fuses).
- ► Plug measuring lead (if applicable, with test terminal) into socket "C". Contact PE connector of the power supply of the DUT.
- ► Plug the passive test probe into socket "B" or rather the active test probe into socket "A". Test accessible metallic enclosure parts of the DUT.

Displaying single tests in accordance with the relevant standards
Some test steps are evaluated differently depending on the applicable standard (e.g. extrapolation to 110 % of the nominal system voltage). Therefore, you need to select the applicable test standard.
(1) If you do not want the measured value to be extrapolated, select the entry "----------".



7. Maintenance and calibration

7.1 Calibration

Like any other test instrument, the UNIMET® requires a regular measured values check. The calibration interval is 36 months. The test system can only be calibrated and adjusted by Bender or centre approved by Bender.

7.2 Changing the battery

The clock of the UNIMET® is powered by a battery with a service life of approximately three years. The test system battery can only be changed by Bender or a centre approved by Bender.

The battery is replaced by Bender as part of the calibration procedure.

7.3 Maintenance

Other than the work carried out as part of periodic calibration, the test system requires no further maintenance.

7.4 Cleaning and care

CAUTION

Risk of damage due to incorrect cleaning
Solvents or chemicals may destroy the surface of the test system (e.g. the display).

► *The test device must only be cleaned with a slightly damp cloth.*

7.5 Device error

The UNIMET® monitors its device functions continuously. If an error message appears, you should proceed as follows:

1. Make a note of the error message.
2. Shut down the UNIMET® and remove the mains plug.
3. Make a note of what happened prior to the fault: operator inputs, type of DUT, ambient conditions etc.
4. Keep the device serial number to hand.
5. Call our Technical Service department and describe the type of error.

8. Data

8.1 Standards

8.1.1 Application standards

The UNIMET® carries out measurements and tests according to the following standards:

- DIN EN 60601-1 (VDE 0750-1):2013-12
  Medical electrical equipment - Part 1: General requirements for basic safety and essential performance (IEC 60601-1:2005); German version: EN 60601-1:2006
- DIN EN 62353 (VDE 0751-1):2008-08
  "Medical electrical equipment - Recurrent test and test after repair of medical electrical equipment (IEC 62353:2007); German version: EN 62353:2008"
- DIN VDE 0701-0702 (VDE 0701-0702):2008-06
  „Prüfung nach Instandsetzung, Änderung elektrischer Geräte - Wiederholungsprüfung elektrischer Geräte - Allgemeine Anforderungen für die elektrische Sicherheit“ (Inspection after repair, modification of electrical appliances - Periodic inspection on electrical appliances - General requirements for electrical safety)
- DIN EN 61010-1 (VDE 0411-1):2011-07
  "Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements (IEC 61010-1:2010 + Cor.:2011); German version EN 61010-1:2010"

8.1.2 Design standards

The requirements of the following standards were taken into account for the design of the UNIMET®:

- DIN VDE 0404-1 (VDE 0404-1):2002-05
  "Testing and measuring equipment for checking the electrical safety of electric devices - Part 1: General requirements"
- DIN VDE 0404-2 (VDE 0404-2):2002-05
  "Testing and measuring equipment for checking the electrical safety of electric devices - Part 2: Prüfeinrichtungen für Prüfungen nach Instandsetzung, Änderung oder für Wiederholungsprüfungen" (Testing and measuring equipment for checking the electric safety of electric devices - Part 2: Testing equipment for tests after repair, change or in case of repeat tests)
- DIN VDE 0404-3 (VDE 0404-3):2005-04
  "Testing and measuring equipment for checking the electrical safety of electric devices - Part 3: Prüfeinrichtungen für Wiederholungsprüfungen und Prüfungen vor der Inbetriebnahme von medizinischen elektrischen Geräten oder Systemen" (Testing and measuring equipment for testing the electrical safety of electrical devices - Part 3: Equipment for periodical tests prior to commissioning medical electrical devices or systems)
- DIN EN 61010-1 (VDE 0411-1):2011-07
  "Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements (IEC 61010-1:2010 + Cor.:2011); German version EN 61010-1:2010"

8.2 Terms and abbreviations

8.2.1 Terms used

The terms used have been taken primarily from the standards in accordance with which the UNIMET® runs its tests.

Terms	Description
Detachable power supply cord	Flexible cord intended to be connected to electrical equipment by means of a suitable appliance coupler for mains supply purposes.
ME equipment	Medical electrical equipment provided with not more than one connection to a particular supply mains and intended by its manufacturer to be used: a) in diagnosis, treatment or monitoring of a patient; and has an applied part or transfers energy to or from the patient or detects such energy transfer to or from the patient; or b) compensation or alleviation of disease, injury or disability
Applied part	Part of ME equipment that in normal use necessarily comes into physical contact with the patient for ME equipment or an ME system to perform its function…
F-type isolated (floating) applied part	Applied part in which the patient connections are isolated from other parts of the ME equipment to such a degree that no current higher than the allowable applied part leakage current flows if an unattended voltage originating from an external source is connected to the patient, and thereby applied between the patient connection and earth.
Type B applied part 	Applied part complying with the specified requirements of DIN EN 60601-1 to provide protection against electric shock, particularly regarding allowable patient leakage current and patient auxiliary leakage current.
Type BF applied part 	Type F applied part complying with the specified requirements of DIN EN 60601-1 to provide a higher degree of protection against electric shock than that provided by Type B applied parts.
Type CF applied part 	Type F applied part complying with the specified requirements of DIN EN 60601-1 to provide a higher degree of protection against electric shock than that provided by Type BF applied parts.
Accessible part	Part of electrical equipment other than applied part that can be touched by means of the standard test finger (acc. to DIN EN 60601-1)
Direct cardiac application	Use of applied part that can come in direct contact with the patient's heart.
Electrically skilled person	Person with relevant education and experience to enable him or her to perceive risks and to avoid hazards which electricity can create.
Permanently installed	Adjective meaning electrically connected to the supply mains by means of a permanent connection that can only be detached by the use of a tool.
Class I equipment 	Adjective referring to electrical equipment in which protection against electric shock does not rely on basic insulation only, but which includes an additional safety precaution in that means are provided for accessible parts of metal or internal parts of metal to be protectively earthed.
Class II equipment 	Adjective referring to electrical equipment in which protection against electric shock does not rely on basic insulation only, but which additional safety precautions such as double insulation or reinforced insulation are provided.

Terms	Description
NEP	Accessible metal parts not protectively earthed (non earthed parts)
Internally powered	Adjective referring to electrical equipment that is able to operate from an internal electrical power source.
Measuring device (MD)	Measuring device. A measuring device must apply an impedance of a specific value to the source of the leakage current. For alternating current, the measuring device must have a specific frequency characteristic. The standard applicable to the DUT will provide detailed information.
Mains Part (MP)	Mains Part. Electrical circuit that is intended to be connected to the supply mains.

8.2.2 Abbreviations used

Abbreviation	Meaning
3Ph	Three-phase current
AC	Alternating current
AG2	Rooms of application group 2
AP	Applied part
AP-LN	Between the applied part and the system conductors
AP->PE	Applied part connected to PE
AP+FE->PE	Applied part and functional earth connected to PE
DC	Direct current
DIN	German Standardisation Institute
DUT	Device under test
FE	Functional earth
GDI	Graphic Device Interface
ISO	Insulation resistance
MD	Measuring device (IEC 60601)
MDD	Medical Device Directive (European Directive)
ME	Medical electrical equipment
MP	Mains part
MPG	Medical Products Law (German law on medical products)
NC	Normal condition
NEP	Accessible metal parts not protectively earthed
PA	Equipotential bonding
PCL	Printer Common Language
PE	Protective earth conductor
PE-O	PE conductor interrupted
Ph-r	Phase reversed

Abbreviation	Meaning
R-PE	Protective earth conductor resistance
SC-O	System conductor interrupted
SFC	Single fault condition
CI	Protection class I
CII	Protection class II
TRMS	True-root-mean-square value
U-AP	Mains voltage on applied part
U-IO	Mains voltage on signal input/output part
UL	Underwriters Laboratories
VBG4	Accident prevention regulations for electrical plant and operating equipment (German)
VDE	Association of German Electrical Engineers

8.3 Test steps

A classified test sequence with the UNIMET® comprises a number of individual test steps.

Test step	Description
108	PE resistance, VK701
121	Insulation resistance cord VK701 L1->PE
122	Insulation resistance cord VK701 L2->PE
123	Insulation resistance cord VK701 L3->PE
124	Insulation resistance cord VK701 N->PE
125	Insulation resistance cord VK701 L1 L2 L3 N->PE
151	Continuity VK701 L1
152	Continuity VK701 L2
153	Continuity VK701 L3
154	Continuity VK701 N
155	Conductors not reversed VK701 L1->L2
156	Conductors not reversed VK701 L1->L3
157	Conductors not reversed VK701 L1->N
158	Conductors not reversed VK701 L2->L3
159	Conductors not reversed VK701 L2->N
160	Conductors not reversed VK701 L3->N
1	PE resistance, enclosure PE
2	PE resistance, cord
3	PE resistance, permanently attached cord
4	PE resistance, permanently installed equipment
101	PE resistance enclosure PE conductor (25A EPS800)
102	PE resistance cord (25A EPS800)
103	PE resistance, permanently attached cord (25 A EPS800)
104	PE resistance, permanently installed equipment (25A EPS800)
5	Insulation resistance enclosure
6	Insulation resistance PE conductor
53	Insulation resistance applied part PE conductor
54	Insulation resistance applied part enclosure
120	Insulation resistance cord L1+L2->PE
206	Insulation resistance AP-LN

Test step	Description
44	Equipment leak. curr. Class I, alternative
46	Equipment leak. curr. Class II, alternative AP enclosure
109	Equipment leak. curr. Class I, alternative
110	Equipment leak. curr. Class II, alternative
43	Applied part leak. current Class I, alternative NEP
45	Applied part leak. current Class I, alternative
47	Applied part leak. current Class II, alternative
80	Load current
81	Operating voltage
82	Power consumption
7	Earth leak. curr. NC
8	Earth leak. curr. NC Ph-r
9	Earth leak. curr. NC AP->PE
10	Earth leak. curr. NC AP->PE Ph-r
11	Earth leak. curr. NC FE->PE
12	Earth leak. curr. NC FE->PE Ph-r
13	Earth leak. curr. NC AP+FE->PE
14	Earth leak. curr. NC AP+FE->PE Ph-r
15	Earth leak. curr. SFC SC-O
16	Earth leak. curr. SFC SC-O Ph-r
17	Earth leak. curr. SFC SC-O AP->PE
18	Earth leak. curr. SFC SC-O AP->PE Ph-r
19	Earth leak. curr. SFC SC-O FE->PE
20	Earth leak. curr. SFC SC-O FE->PE Ph-r
21	Earth leak. curr. SFC SC-O AP+FE->PE
22	Earth leak. curr. SFC SC-O AP+FE->PE Ph-r
210	Equipment leak. curr. Class I - direct
211	Equipment leak. curr. Class I - direct Ph-r
212	Equipment leak. curr. Class I - differential
213	Equipment leak. curr. Class I - differential Ph-r
214	Equipment leak. curr. Class II - direct
215	Equipment leak. curr. Class II - direct Ph-r
216	Equipment leak. curr. Class II - differential

Test step	Description
217	Equipment leak. curr. Class II - differential Ph-r
111	PE current - direct
112	PE current - Direct Ph-r
113	PE current - differential
114	PE current - differential Ph-r
76	PE current 3Ph - Differential
77	Touch current 3Ph - differential
78	Equipment leak. curr. Class I 3Ph - differential
79	Equipment leak. curr. Class II 3Ph - differential
92	Touch current NC AC
93	Touch current NC AC Ph-r
94	Touch current SFC AC PE-O
95	Touch current SFC AC PE-O Ph-r
96	Touch current NC DC
97	Touch current NC DC Ph-r
98	Touch current SFC DC PE-O
99	Touch current SFC DC PE-O Ph-r
115	Touch current - direct
116	Touch current - direct Ph-r
117	Touch current - differential
118	Touch current - differential Ph-r
132	Touch current NC AC
133	Touch current NC AC Ph-r
134	Touch current SFC AC PE-O
135	Touch current SFC AC PE-O Ph-r
136	Touch current NC DC
137	Touch current NC DC Ph-r
138	Touch current SFC DC PE-O
139	Touch current SFC DC PE-O Ph-r
310	Touch current NC
311	Touch current NC Ph-r
312	Touch current NC AP->PE
313	Touch current NC AP->PE Ph-r

Test step	Description
314	Touch current NC FE->PE
315	Touch current NC FE->PE Ph-r
316	Touch current NC AP+FE->PE
317	Touch current NC AP+FE->PE Ph-r
334	Touch current NC U-IO
335	Touch current NC U-IO Ph-r
336	Touch current NC U-IO AP->PE
337	Touch current NC U-IO AP->PE Ph-r
338	Touch current NC U-IO FE->PE
339	Touch current NC U-IO FE->PE Ph-r
340	Touch current NC U-IO AP+FE->PE
341	Touch current NC U-IO AP+FE->PE Ph-r
358	Touch current NC Ph-r U-IO
359	Touch current NC Ph-r U-IO Ph-r
360	Touch current NC Ph-r U-IO AP->PE
361	Touch current NC Ph-r U-IO AP->PE Ph-r
362	Touch current NC Ph-r U-IO FE->PE
363	Touch current NC Ph-r U-IO FE->PE Ph-r
364	Touch current NC Ph-r U-IO AP+FE->PE
365	Touch current NC Ph-r U-IO AP+FE->PE Ph-r
382	Touch current int. power source NC
383	Touch current int. power source NC U-IO
318	Touch current SFC SC-O
319	Touch current SFC SC-O Ph-r
320	Touch current SFC SC-O AP->PE
321	Touch current SFC SC-O AP->PE Ph-r
322	Touch current SFC SC-O FE->PE
323	Touch current SFC SC-O FE->PE Ph-r
324	Touch current SFC SC-O AP+FE->PE
325	Touch current SFC SC-O AP+FE->PE Ph-r
326	Touch current SFC PE-O
327	Touch current SFC PE-O Ph-r
328	Touch current SFC PE-O AP->PE

Test step	Description
329	Touch current SFC PE-O AP->PE Ph-r
330	Touch current SFC PE-O FE->PE
331	Touch current SFC PE-O FE->PE Ph-r
332	Touch current SFC PE-O AP+FE->PE
333	Touch current SFC PE-O AP+FE->PE Ph-r
342	Touch current SFC U-IO SC-O
343	Touch current SFC U-IO SC-O Ph-r
344	Touch current SFC U-IO SC-O AP->PE
345	Touch current SFC U-IO SC-O AP->PE Ph-r
346	Touch current SFC U-IO SC-O FE->PE
347	Touch current SFC U-IO SC-O FE->PE Ph-r
348	Touch current SFC U-IO SC-O AP+FE->PE
349	Touch current SFC U-IO SC-O AP+FE->PE Ph-r
350	Touch current SFC U-IO PE-O
351	Touch current SFC U-IO PE-O Ph-r
352	Touch current SFC U-IO PE-O AP->PE
353	Touch current SFC U-IO PE-O AP->PE Ph-r
354	Touch current SFC U-IO PE-O FE->PE
355	Touch current SFC U-IO PE-O FE->PE Ph-r
356	Touch current SFC U-IO PE-O AP+FE->PE
357	Touch current SFC U-IO PE-O AP+FE->PE Ph-r
366	Touch current SFC Ph-r U-IO SC-O
367	Touch current SFC Ph-r U-IO SC-O Ph-r
368	Touch current SFC Ph-r U-IO SC-O AP->PE
369	Touch current SFC Ph-r U-IO SC-O AP->PE Ph-r
370	Touch current SFC Ph-r U-IO SC-O FE->PE
371	Touch current SFC Ph-r U-IO SC-O FE->PE Ph-r
372	Touch current SFC Ph-r U-IO SC-O AP+FE->PE
373	Touch current SFC Ph-r U-IO SC-O AP+FE->PE Ph-r
374	Touch current SFC Ph-r U-IO PE-O
375	Touch current SFC Ph-r U-IO PE-O Ph-r
376	Touch current SFC Ph-r U-IO PE-O AP->PE
377	Touch current SFC Ph-r U-IO PE-O AP->PE Ph-r

Test step	Description
378	Touch current SFC Ph-r U-IO PE-O FE->PE
379	Touch current SFC Ph-r U-IO PE-O FE->PE Ph-r
380	Touch current SFC Ph-r U-IO PE-O AP+FE->PE
381	Touch current SFC Ph-r U-IO PE-O AP+FE->PE Ph-r
205	Applied part leak. curr. int. power source - direct
280	Applied part leak. curr. U-AP
281	Applied part leak. curr. U-AP Ph-r
286	Applied part leak. curr. DC
289	Applied part leak. curr. DC Ph-r
292	Applied part leak. curr. AC
295	Applied part leak. curr. AC Ph-r
300	Applied part leak. curr. Class I U-AP NEP
302	Applied part leak. curr.Class I U-AP NEP Ph-r
304	Applied part leak. curr. Class II U-AP
306	Applied part leak. curr. Class II U-AP Ph-r
400	Applied part leak. curr. NC DC
401	Applied part leak. curr. NC AC
402	Applied part leak. curr. NC DC Ph-r
403	Applied part leak. curr. NC AC Ph-r
404	Applied part leak. curr. NC DC FE->PE
405	Applied part leak. curr. NC AC FE->PE
406	Applied part leak. curr. NC DC FE->PE Ph-r
407	Applied part leak. curr. NC AC FE->PE Ph-r
424	Applied part leak. curr. NC DC NEP
425	Applied part leak. curr. NC AC NEP
426	Applied part leak. curr. NC DC NEP Ph-r
427	Applied part leak. curr. NC AC NEP Ph-r
428	Applied part leak. curr. NC DC NEP FE->PE
429	Applied part leak. curr. NC AC NEP FE->PE
430	Applied part leak. curr. NC DC NEP FE->PE Ph-r
431	Applied part leak. curr. NC AC NEP FE->PE Ph-r
448	Applied part leak. curr. NC DC U-IO
449	Applied part leak. curr. NC AC U-IO

Test step	Description
450	Applied part leak. curr. NC DC U-IO Ph-r
451	Applied part leak. curr. NC AC U-IO Ph-r
452	Applied part leak. curr. NC DC U-IO FE->PE
453	Applied part leak. curr. NC AC U-IO FE->PE
454	Applied part leak. curr. NC DC U-IO FE->PE Ph-r
455	Applied part leak. curr. NC AC U-IO FE->PE Ph-r
472	Applied part leak. curr. NC DC Ph-r U-IO
473	Applied part leak. curr. NC AC Ph-r U-IO
474	Applied part leak. curr. NC DC Ph-r U-IO Ph-r
475	Applied part leak. curr. NC AC Ph-r U-IO Ph-r
476	Applied part leak. curr. NC DC Ph-r U-IO FE->PE
477	Applied part leak. curr. NC AC Ph-r U-IO FE->PE
478	Applied part leak. curr. NC DC Ph-r U-IO FE->PE Ph-r
479	Applied part leak. curr. NC AC Ph-r U-IO FE->PE Ph-r
496	Applied part leak. curr. NC DC U-IO NEP
497	Applied part leak. curr. NC AC U-IO NEP
498	Applied part leak. curr. NC DC U-IO NEP Ph-r
499	Applied part leak. curr. NC AC U-IO NEP Ph-r
500	Applied part leak. curr. NC DC U-IO NEP FE->PE
501	Applied part leak. curr. NC AC U-IO NEP FE->PE
502	Applied part leak. curr. NC DC U-IO NEP FE->PE Ph-r
503	Applied part leak. curr. NC AC U-IO NEP FE->PE Ph-r
520	Applied part leak. curr. NC DC Ph-r U-IO NEP
521	Applied part leak. curr. NC AC Ph-r U-IO NEP
522	Applied part leak. curr. NC DC Ph-r U-IO NEP Ph-r
523	Applied part leak. curr. NC AC Ph-r U-IO NEP Ph-r
524	Applied part leak. curr. NC DC Ph-r U-IO NEP FE->PE
525	Applied part leak. curr. NC AC Ph-r U-IO NEP FE->PE
526	Applied part leak. curr. NC DC Ph-r U-IO NEP FE->PE Ph-r
527	Applied part leak. curr. NC AC Ph-r U-IO NEP FE->PE Ph-r
544	Applied part leak. curr. int. power source NC DC
545	Applied part leak. curr. int. power source NC AC
546	Applied part leak. curr. int. power source NC DC U-IO

Test step	Description
547	Applied part leak. curr. int. power source NC AC U-IO
408	Applied part leak. curr. SFC DC SC-O
409	Applied part leak. curr. SFC AC SC-O
410	Applied part leak. curr. SFC DC SC-O Ph-r
411	Applied part leak. curr. SFC AC SC-O Ph-r
412	Applied part leak. curr. SFC DC SC-O FE->PE
413	Applied part leak. curr. SFC AC SC-O FE->PE
414	Applied part leak. curr. SFC DC SC-O FE->PE Ph-r
415	Applied part leak. curr. SFC AC SC-O FE->PE Ph-r
416	Applied part leak. curr. SFC DC PE-O
417	Applied part leak. curr. SFC AC PE-O
418	Applied part leak. curr. SFC DC PE-O Ph-r
419	Applied part leak. curr. SFC AC PE-O Ph-r
420	Applied part leak. curr. SFC DC PE-O FE->PE
421	Applied part leak. curr. SFC AC PE-O FE->PE
422	Applied part leak. curr. SFC DC PE-O FE->PE Ph-r
423	Applied part leak. curr. SFC AC PE-O FE->PE Ph-r
432	Applied part leak. curr. SFC DC NEP SC-O
433	Applied part leak. curr. SFC AC NEP SC-O
434	Applied part leak. curr. SFC DC NEP SC-O Ph-r
435	Applied part leak. curr. SFC AC NEP SC-O Ph-r
436	Applied part leak. curr. SFC DC NEP SC-O FE->PE
437	Applied part leak. curr. SFC AC NEP SC-O FE->PE
438	Applied part leak. curr. SFC DC NEP SC-O FE->PE Ph-r
439	Applied part leak. curr. SFC AC NEP SC-O FE->PE Ph-r
440	Applied part leak. curr. SFC DC NEP PE-O
441	Applied part leak. curr. SFC AC NEP PE-O
442	Applied part leak. curr. SFC DC NEP PE-O Ph-r
443	Applied part leak. curr. SFC AC NEP PE-O Ph-r
444	Applied part leak. curr. SFC DC NEP PE-O FE->PE
445	Applied part leak. curr. SFC AC NEP PE-O FE->PE
446	Applied part leak. curr. SFC DC NEP PE-O FE->PE Ph-r
447	Applied part leak. curr. SFC AC NEP PE-O FE->PE Ph-r

Test step	Description
456	Applied part leak. curr. SFC DC U-IO SC-O
457	Applied part leak. curr. SFC AC U-IO SC-O
458	Applied part leak. curr. SFC DC U-IO SC-O Ph-r
459	Applied part leak. curr. SFC AC U-IO SC-O Ph-r
460	Applied part leak. curr. SFC DC U-IO SC-O FE->PE
461	Applied part leak. curr. SFC AC U-IO SC-O FE->PE
462	Applied part leak. curr. SFC DC U-IO SC-O FE->PE Ph-r
463	Applied part leak. curr. SFC AC U-IO SC-O FE->PE Ph-r
464	Applied part leak. curr. SFC DC U-IO PE-O
465	Applied part leak. curr. SFC AC U-IO PE-O
466	Applied part leak. curr. SFC DC U-IO PE-O Ph-r
467	Applied part leak. curr. SFC AC U-IO PE-O Ph-r
468	Applied part leak. curr. SFC DC U-IO PE-O FE->PE
469	Applied part leak. curr. SFC AC U-IO PE-O FE->PE
470	Applied part leak. curr. SFC DC U-IO PE-O FE->PE Ph-r
471	Applied part leak. curr. SFC AC U-IO PE-O FE->PE Ph-r
480	Applied part leak. curr. SFC DC Ph-r U-IO SC-O
481	Applied part leak. curr. SFC AC Ph-r U-IO SC-O
482	Applied part leak. curr. SFC DC Ph-r U-IO SC-O Ph-r
483	Applied part leak. curr. SFC AC Ph-r U-IO SC-O Ph-r
484	Applied part leak. curr. SFC DC Ph-r U-IO SC-O FE->PE
485	Applied part leak. curr. SFC AC Ph-r U-IO SC-O FE->PE
486	Applied part leak. curr. SFC DC Ph-r U-IO SC-O FE->PE Ph-r
487	Applied part leak. curr. SFC AC Ph-r U-IO SC-O FE->PE Ph-r
488	Applied part leak. curr. SFC DC Ph-r U-IO PE-O
489	Applied part leak. curr. SFC AC Ph-r U-IO PE-O
490	Applied part leak. curr. SFC DC Ph-r U-IO PE-O Ph-r
491	Applied part leak. curr. SFC AC Ph-r U-IO PE-O Ph-r
492	Applied part leak. curr. SFC DC Ph-r U-IO PE-O FE->PE
493	Applied part leak. curr. SFC AC Ph-r U-IO PE-O FE->PE
494	Applied part leak. curr. SFC DC Ph-r U-IO PE-O FE->PE Ph-r
495	Applied part leak. curr. SFC AC Ph-r U-IO PE-O FE->PE Ph-r
504	Applied part leak. curr. SFC DC U-IO NEP SC-O

Test step	Description
505	Applied part leak. curr. SFC AC U-IO NEP SC-O
506	Applied part leak. curr. SFC DC U-IO NEP SC-O Ph-r
507	Applied part leak. curr. SFC AC U-IO NEP SC-O Ph-r
508	Applied part leak. curr. SFC DC U-IO NEP SC-O FE->PE
509	Applied part leak. curr. SFC AC U-IO NEP SC-O FE->PE
510	Applied part leak. curr. SFC DC U-IO NEP SC-O FE->PE Ph-r
511	Applied part leak. curr. SFC AC U-IO NEP SC-O FE->PE Ph-r
512	Applied part leak. curr. SFC DC U-IO NEP PE-O
513	Applied part leak. curr. SFC AC U-IO NEP PE-O
514	Applied part leak. curr. SFC DC U-IO NEP PE-O Ph-r
515	Applied part leak. curr. SFC AC U-IO NEP PE-O Ph-r
516	Applied part leak. curr. SFC DC U-IO NEP PE-O FE->PE
517	Applied part leak. curr. SFC AC U-IO NEP PE-O FE->PE
518	Applied part leak. curr. SFC DC U-IO NEP PE-O FE->PE Ph-r
519	Applied part leak. curr. SFC AC U-IO NEP PE-O FE->PE Ph-r
528	Applied part leak. curr. SFC DC Ph-r U-IO NEP SC-O
529	Applied part leak. curr. SFC AC Ph-r U-IO NEP SC-O
530	Applied part leak. curr. SFC DC Ph-r U-IO NEP SC-O Ph-r
531	Applied part leak. curr. SFC AC Ph-r U-IO NEP SC-O Ph-r
532	Applied part leak. curr. SFC DC Ph-r U-IO NEP SC-O FE->PE
533	Applied part leak. curr. SFC AC Ph-r U-IO NEP SC-O FE->PE
534	Applied part leak. curr. SFC DC Ph-r U-IO NEP SC-O FE->PE Ph-r
535	Applied part leak. curr. SFC AC Ph-r U-IO NEP SC-O FE->PE Ph-r
536	Applied part leak. curr. SFC DC Ph-r U-IO NEP PE-O
537	Applied part leak. curr. SFC AC Ph-r U-IO NEP PE-O
538	Applied part leak. curr. SFC DC Ph-r U-IO NEP PE-O Ph-r
539	Applied part leak. curr. SFC AC Ph-r U-IO NEP PE-O Ph-r
540	Applied part leak. curr. SFC DC Ph-r U-IO NEP PE-O FE->PE
541	Applied part leak. curr. SFC AC Ph-r U-IO NEP PE-O FE->PE
542	Applied part leak. curr. SFC DC Ph-r U-IO NEP PE-O FE->PE Ph-r
543	Applied part leak. curr. SFC AC Ph-r U-IO NEP PE-O FE->PE Ph-r
550	Applied part leak. curr. SFC U-AP
551	Applied part leak. curr. SFC U-AP Ph-r

Test step	Description
552	Applied part leak. curr. SFC U-AP FE->PE
553	Applied part leak. curr. SFC U-AP FE->PE Ph-r
554	Applied part leak. curr. SFC Ph-r U-AP
555	Applied part leak. curr. SFC Ph-r U-AP Ph-r
556	Applied part leak. curr. SFC Ph-r U-AP FE->PE
557	Applied part leak. curr. SFC Ph-r U-AP FE->PE Ph-r
558	Applied part leak. curr. SFC U-AP NEP
559	Applied part leak. curr. SFC U-AP NEP Ph-r
560	Applied part leak. curr. SFC U-AP NEP FE->PE
561	Applied part leak. curr. SFC U-AP NEP FE->PE Ph-r
562	Applied part leak. curr. SFC Ph-r U-AP NEP
563	Applied part leak. curr. SFC Ph-r U-AP NEP Ph-r
564	Applied part leak. curr. SFC Ph-r U-AP NEP FE->PE
565	Applied part leak. curr. SFC Ph-r U-AP NEP FE->PE Ph-r
566	Applied part leak. curr. int. power source SFC U-AP
570	Applied part leak. curr. SFC U-NEP
571	Applied part leak. curr. SFC U-NEP Ph-r
572	Applied part leak. curr. SFC U-NEP FE->PE
573	Applied part leak. curr. SFC U-NEP FE->PE Ph-r
574	Applied part leak. curr. SFC Ph-r U-NEP
575	Applied part leak. curr. SFC Ph-r U-NEP Ph-r
576	Applied part leak. curr. SFC Ph-r U-NEP FE->PE
577	Applied part leak. curr. SFC Ph-r U-NEP FE->PE Ph-r
578	Applied part leak. curr. int. power source SFC U-NEP
600	Σ Applied part leak. curr. NC DC
601	Σ Applied part leak. curr. NC AC
602	Σ Applied part leak. curr. NC DC Ph-r
603	Σ Applied part leak. curr. NC AC Ph-r
604	Σ Applied part leak. curr. NC DC FE->PE
605	Σ Applied part leak. curr. NC AC FE->PE
606	Σ Applied part leak. curr. NC DC FE->PE Ph-r
607	Σ Applied part leak. curr. NC AC FE->PE Ph-r
624	Σ Applied part leak. curr. NC DC NEP

Test step	Description
625	Σ Applied part leak. curr. NC AC NEP
626	Σ Applied part leak. curr. NC DC NEP Ph-r
627	Σ Applied part leak. curr. NC AC NEP Ph-r
628	Σ Applied part leak. curr. NC DC NEP FE->PE
629	Σ Applied part leak. curr. NC AC NEP FE->PE
630	Σ Applied part leak. curr. NC DC NEP FE->PE Ph-r
631	Σ Applied part leak. curr. NC AC NEP FE->PE Ph-r
648	Σ Applied part leak. curr. NC DC U-IO
649	Σ Applied part leak. curr. NC AC U-IO
650	Σ Applied part leak. curr. NC DC U-IO Ph-r
651	Σ Applied part leak. curr. NC AC U-IO Ph-r
652	Σ Applied part leak. curr. NC DC U-IO FE->PE
653	Σ Applied part leak. curr. NC AC U-IO FE->PE
654	Σ Applied part leak. curr. NC DC U-IO FE->PE Ph-r
655	Σ Applied part leak. curr. NC AC U-IO FE->PE Ph-r
672	Σ Applied part leak. curr. NC DC Ph-r U-IO
673	Σ Applied part leak. curr. NC AC Ph-r U-IO
674	Σ Applied part leak. curr. NC DC Ph-r U-IO Ph-r
675	Σ Applied part leak. curr. NC AC Ph-r U-IO Ph-r
676	Σ Applied part leak. curr. NC DC Ph-r U-IO FE->PE
677	Σ Applied part leak. curr. NC AC Ph-r U-IO FE->PE
678	Σ Applied part leak. curr. NC DC Ph-r U-IO FE->PE Ph-r
679	Σ Applied part leak. curr. NC AC Ph-r U-IO FE->PE Ph-r
696	Σ Applied part leak. curr. NC DC U-IO NEP
697	Σ Applied part leak. curr. NC AC U-IO NEP
698	Σ Applied part leak. curr. NC DC U-IO NEP Ph-r
699	Σ Applied part leak. curr. NC AC U-IO NEP Ph-r
700	Σ Applied part leak. curr. NC DC U-IO NEP FE->PE
701	Σ Applied part leak. curr. NC AC U-IO NEP FE->PE
702	Σ Applied part leak. curr. NC DC U-IO NEP FE->PE Ph-r
703	Σ Applied part leak. curr. NC AC U-IO NEP FE->PE Ph-r
720	Σ Applied part leak. curr. NC DC Ph-r U-IO NEP
721	Σ Applied part leak. curr. NC AC Ph-r U-IO NEP

Test step	Description
722	Σ Applied part leak. curr. NC DC Ph-r U-IO NEP Ph-r
723	Σ Applied part leak. curr. NC AC Ph-r U-IO NEP Ph-r
724	Σ Applied part leak. curr. NC DC Ph-r U-IO NEP FE->PE
725	Σ Applied part leak. curr. NC AC Ph-r U-IO NEP FE->PE
726	Σ Applied part leak. curr. NC DC Ph-r U-IO NEP FE->PE Ph-r
727	Σ Applied part leak. curr. NC AC Ph-r U-IO NEP FE->PE Ph-r
744	Σ Applied part leak. curr. int. power source NC DC
745	Σ Applied part leak. curr. int. power source NC AC
746	Σ Applied part leak. curr. int. power source NC DC U-IO
747	Σ Applied part leak. curr. int. power source NC AC U-IO
608	Σ Applied part leak. curr. SFC DC SC-O
609	Σ Applied part leak. curr. SFC AC SC-O
610	Σ Applied part leak. curr. SFC DC SC-O Ph-r
611	Σ Applied part leak. curr. SFC AC SC-O Ph-r
612	Σ Applied part leak. curr. SFC DC SC-O FE->PE
613	Σ Applied part leak. curr. SFC AC SC-O FE->PE
614	Σ Applied part leak. curr. SFC DC SC-O FE->PE Ph-r
615	Σ Applied part leak. curr. SFC AC SC-O FE->PE Ph-r
616	Σ Applied part leak. curr. SFC DC PE-O
617	Σ Applied part leak. curr. SFC AC PE-O
618	Σ Applied part leak. curr. SFC DC PE-O Ph-r
619	Σ Applied part leak. curr. SFC AC PE-O Ph-r
620	Σ Applied part leak. curr. SFC DC PE-O FE->PE
621	Σ Applied part leak. curr. SFC AC PE-O FE->PE
622	Σ Applied part leak. curr. SFC DC PE-O FE->PE Ph-r
623	Σ Applied part leak. curr. SFC AC PE-O FE->PE Ph-r
632	Σ Applied part leak. curr. SFC DC NEP SC-O
633	Σ Applied part leak. curr. SFC AC NEP SC-O
634	Σ Applied part leak. curr. SFC DC NEP SC-O Ph-r
635	Σ Applied part leak. curr. SFC AC NEP SC-O Ph-r
636	Σ Applied part leak. curr. SFC DC NEP SC-O FE->PE
637	Σ Applied part leak. curr. SFC AC NEP SC-O FE->PE
638	Σ Applied part leak. curr. SFC DC NEP SC-O FE->PE Ph-r

Test step	Description
639	Σ Applied part leak. curr. SFC AC NEP SC-O FE->PE Ph-r
640	Σ Applied part leak. curr. SFC DC NEP PE-O
641	Σ Applied part leak. curr. SFC AC NEP PE-O
642	Σ Applied part leak. curr. SFC DC NEP PE-O Ph-r
643	Σ Applied part leak. curr. SFC AC NEP PE-O Ph-r
644	Σ Applied part leak. curr. SFC DC NEP PE-O FE->PE
645	Σ Applied part leak. curr. SFC AC NEP PE-O FE->PE
646	Σ Applied part leak. curr. SFC DC NEP PE-O FE->PE Ph-r
647	Σ Applied part leak. curr. SFC AC NEP PE-O FE->PE Ph-r
656	Σ Applied part leak. curr. SFC DC U-IO SC-O
657	Σ Applied part leak. curr. SFC AC U-IO SC-O
658	Σ Applied part leak. curr. SFC DC U-IO SC-O Ph-r
659	Σ Applied part leak. curr. SFC AC U-IO SC-O Ph-r
660	Σ Applied part leak. curr. SFC DC U-IO SC-O FE->PE
661	Σ Applied part leak. curr. SFC AC U-IO SC-O FE->PE
662	Σ Applied part leak. curr. SFC DC U-IO SC-O FE->PE Ph-r
663	Σ Applied part leak. curr. SFC AC U-IO SC-O FE->PE Ph-r
664	Σ Applied part leak. curr. SFC DC U-IO PE-O
665	Σ Applied part leak. curr. SFC AC U-IO PE-O
666	Σ Applied part leak. curr. SFC DC U-IO PE-O Ph-r
667	Σ Applied part leak. curr. SFC AC U-IO PE-O Ph-r
668	Σ Applied part leak. curr. SFC DC U-IO PE-O FE->PE
669	Σ Applied part leak. curr. SFC AC U-IO PE-O FE->PE
670	Σ Applied part leak. curr. SFC DC U-IO PE-O FE->PE Ph-r
671	Σ Applied part leak. curr. SFC AC U-IO PE-O FE->PE Ph-r
680	Σ Applied part leak. curr. SFC DC Ph-r U-IO SC-O
681	Σ Applied part leak. curr. SFC AC Ph-r U-IO SC-O
682	Σ Applied part leak. curr. SFC DC Ph-r U-IO SC-O Ph-r
683	Σ Applied part leak. curr. SFC AC Ph-r U-IO SC-O Ph-r
684	Σ Applied part leak. curr. SFC DC Ph-r U-IO SC-O FE->PE
685	Σ Applied part leak. curr. SFC AC Ph-r U-IO SC-O FE->PE
686	Σ Applied part leak. curr. SFC DC Ph-r U-IO SC-O FE->PE Ph-r
687	Σ Applied part leak. curr. SFC AC Ph-r U-IO SC-O FE->PE Ph-r

Test step	Description
688	Σ Applied part leak. curr. SFC DC Ph-r U-IO PE-O
689	Σ Applied part leak. curr. SFC AC Ph-r U-IO PE-O
690	Σ Applied part leak. curr. SFC DC Ph-r U-IO PE-O Ph-r
691	Σ Applied part leak. curr. SFC AC Ph-r U-IO PE-O Ph-r
692	Σ Applied part leak. curr. SFC DC Ph-r U-IO PE-O FE->PE
693	Σ Applied part leak. curr. SFC AC Ph-r U-IO PE-O FE->PE
694	Σ Applied part leak. curr. SFC DC Ph-r U-IO PE-O FE->PE Ph-r
695	Σ Applied part leak. curr. SFC AC Ph-r U-IO PE-O FE->PE Ph-r
704	Σ Applied part leak. curr. SFC DC U-IO NEP SC-O
705	Σ Applied part leak. curr. SFC AC U-IO NEP SC-O
706	Σ Applied part leak. curr. SFC DC U-IO NEP SC-O Ph-r
707	Σ Applied part leak. curr. SFC AC U-IO NEP SC-O Ph-r
708	Σ Applied part leak. curr. SFC DC U-IO NEP SC-O FE->PE
709	Σ Applied part leak. curr. SFC AC U-IO NEP SC-O FE->PE
710	Σ Applied part leak. curr. SFC DC U-IO NEP SC-O FE->PE Ph-r
711	Σ Applied part leak. curr. SFC AC U-IO NEP SC-O FE->PE Ph-r
712	Σ Applied part leak. curr. SFC DC U-IO NEP PE-O
713	Σ Applied part leak. curr. SFC AC U-IO NEP PE-O
714	Σ Applied part leak. curr. SFC DC U-IO NEP PE-O Ph-r
715	Σ Applied part leak. curr. SFC AC U-IO NEP PE-O Ph-r
716	Σ Applied part leak. curr. SFC DC U-IO NEP PE-O FE->PE
717	Σ Applied part leak. curr. SFC AC U-IO NEP PE-O FE->PE
718	Σ Applied part leak. curr. SFC DC U-IO NEP PE-O FE->PE Ph-r
719	Σ Applied part leak. curr. SFC AC U-IO NEP PE-O FE->PE Ph-r
728	Σ Applied part leak. curr. SFC DC Ph-r U-IO NEP SC-O
729	Σ Applied part leak. curr. SFC AC Ph-r U-IO NEP SC-O
730	Σ Applied part leak. curr. SFC DC Ph-r U-IO NEP SC-O Ph-r
731	Σ Applied part leak. curr. SFC AC Ph-r U-IO NEP SC-O Ph-r
732	Σ Applied part leak. curr. SFC DC Ph-r U-IO NEP SC-O FE->PE
733	Σ Applied part leak. curr. SFC AC Ph-r U-IO NEP SC-O FE->PE
734	Σ Applied part leak. curr. SFC DC Ph-r U-IO NEP SC-O FE->PE Ph-r
735	Σ Applied part leak. curr. SFC AC Ph-r U-IO NEP SC-O FE->PE Ph-r
736	Σ Applied part leak. curr. SFC DC Ph-r U-IO NEP PE-O

Test step	Description
737	Σ Applied part leak. curr. SFC AC Ph-r U-IO NEP PE-O
738	Σ Applied part leak. curr. SFC DC Ph-r U-IO NEP PE-O Ph-r
739	Σ Applied part leak. curr. SFC AC Ph-r U-IO NEP PE-O Ph-r
740	Σ Applied part leak. curr. SFC DC Ph-r U-IO NEP PE-O FE->PE
741	Σ Applied part leak. curr. SFC AC Ph-r U-IO NEP PE-O FE->PE
742	Σ Applied part leak. curr. SFC DC Ph-r U-IO NEP PE-O FE->PE Ph-r
743	Σ Applied part leak. curr. SFC AC Ph-r U-IO NEP PE-O FE->PE Ph-r
750	Σ Applied part leak. curr. SFC U-AP
751	Σ Applied part leak. curr. SFC U-AP Ph-r
752	Σ Applied part leak. curr. SFC U-AP FE->PE
753	Σ Applied part leak. curr. SFC U-AP FE->PE Ph-r
754	Σ Applied part leak. curr. SFC Ph-r U-AP
755	Σ Applied part leak. curr. SFC Ph-r U-AP Ph-r
756	Σ Applied part leak. curr. SFC Ph-r U-AP FE->PE
757	Σ Applied part leak. curr. SFC Ph-r U-AP FE->PE Ph-r
758	Σ Applied part leak. curr. SFC U-AP NEP
759	Σ Applied part leak. curr. SFC U-AP NEP Ph-r
760	Σ Applied part leak. curr. SFC U-AP NEP FE->PE
761	Σ Applied part leak. curr. SFC U-AP NEP FE->PE Ph-r
762	Σ Applied part leak. curr. SFC Ph-r U-AP NEP
763	Σ Applied part leak. curr. SFC Ph-r U-AP NEP Ph-r
764	Σ Applied part leak. curr. SFC Ph-r U-AP NEP FE->PE
765	Σ Applied part leak. curr. SFC Ph-r U-AP NEP FE->PE Ph-r
766	Σ Applied part leak. curr. int. power source SFC U-AP
770	Σ Applied part leak. curr. SFC U-NEP
771	Σ Applied part leak. curr. SFC U-NEP Ph-r
772	Σ Applied part leak. curr. SFC U-NEP FE->PE
773	Σ Applied part leak. curr. SFC U-NEP FE->PE Ph-r
774	Σ Applied part leak. curr. SFC Ph-r U-NEP
775	Σ Applied part leak. curr. SFC Ph-r U-NEP Ph-r
776	Σ Applied part leak. curr. SFC Ph-r U-NEP FE->PE
777	Σ Applied part leak. curr. SFC Ph-r U-NEP FE->PE Ph-r
778	Σ Applied part leak. curr. int. power source SFC U-NEP

Test step	Description
250	Patient auxiliary current NC DC
251	Patient auxiliary current NC AC
252	Patient auxiliary current NC DC Ph-r
253	Patient auxiliary current NC AC Ph-r
254	Patient auxiliary current NC DC FE->PE
255	Patient auxiliary current NC AC FE->PE
256	Patient auxiliary current NC DC FE->PE Ph-r
257	Patient auxiliary current NC AC FE->PE Ph-r
274	Patient auxiliary current int. power source NC DC
275	Patient auxiliary current int. power source NC AC
258	Patient auxiliary current SFC DC SC-O
259	Patient auxiliary current SFC AC SC-O
260	Patient auxiliary current SFC DC SC-O Ph-r
261	Patient auxiliary current SFC AC SC-O Ph-r
262	Patient auxiliary current SFC DC SC-O FE->PE
263	Patient auxiliary current SFC AC SC-O FE->PE
264	Patient auxiliary current SFC DC SC-O FE->PE Ph-r
265	Patient auxiliary current SFC AC SC-O FE->PE Ph-r
266	Patient auxiliary current SFC DC PE-O
267	Patient auxiliary current SFC AC PE-O
268	Patient auxiliary current SFC DC PE-O Ph-r
269	Patient auxiliary current SFC AC PE-O Ph-r
270	Patient auxiliary current SFC DC PE-O FE->PE
271	Patient auxiliary current SFC AC PE-O FE->PE
272	Patient auxiliary current SFC DC PE-O FE->PE Ph-r
273	Patient auxiliary current SFC AC PE-O FE->PE Ph-r

8.4 Technical data

Nominal voltage range ..... AC 100 . . . 120 V/± 10 %, AC 220 . . . 240 V/± 10 %
Frequency range ..... 48 . . . 62 Hz
Power consumption ..... max. 100 VA
Maximum output current ..... see ordering information
Protection class II

Testing of PE resistance

Measuring range ..... 0.001 . . . 29.999 Ω
Measuring current ..... max. AC 8 A
Measuring voltage ..... max. AC 8 V
Intrinsic uncertainty ..... 0.001 . . . 1.000 Ω: ± 2.5 % v. M. ± 5 digits
..... 1.001 . . . 29.999 Ω: ± 5 % v. M. ± 5 digits
Operating uncertainty ..... 0.001 . . . 1.000 Ω: ± 5 % v. M. ± 10 digits
..... 1.001 . . . 29.999 Ω: ± 7.5 % v. M. ± 10 digits

Insulation resistance

Measuring range ..... 0.01 . . . 199.99 MΩ
Measuring voltage ..... max. DC 550 V
Measuring current ..... max. 2.5 mA
Intrinsic uncertainty ..... 0.01 . . . 99.99 MΩ: ± 5 % v. M. ± 2 digits
..... 100.00 . . . 199.99 MΩ: ± 10 % v. M. ± 2 digits
Operating uncertainty ..... 0.01 . . . 99.99 MΩ: ± 7.5 % v. M. ± 4 digits
..... 100.00 . . . 199.99 MΩ: ± 10 % v. M. ± 4 digits

Equipment leakage current - alternative method

Measuring range ..... 0.001 . . . 19.999 mA
Measuring voltage ..... max. AC 250 V
Measuring current ..... max. 3 mA
Intrinsic uncertainty ..... ± 5 % v. M. ± 5 digits
Operating uncertainty ..... ± 7.5 % v. M. ± 10 digits

Leakage current, differential measuring method

Measuring range ..... 0.02 . . . 19.99 mA
Intrinsic uncertainty ..... ± 5 % v. M. ± 2 digits
Operating uncertainty ..... ± 7.5 % v. M. ± 4 digits
Frequency response ..... 40 . . . 100 kHz ± 3 dB

Leakage current, direct measurement

Measuring range ..... 0.001 . . . 19.999 mA
Intrinsic uncertainty ..... ± 5 % v. M. ± 2 digits
Operating uncertainty ..... ± 7.5 % v. M. ± 4 digits
Frequency response ..... up to 100 kHz ± 3 dB

Voltage measurement

Measuring range ..... AC 90 . . . 264 V
Frequency range ..... 48 . . . 62 Hz
Intrinsic uncertainty ..... ± 2.5 % v. M. ± 3 digits

Load current measurement

Measuring range ..... 0.005 . . . 16 A
Frequency range ..... 48 . . . 62 Hz
Intrinsic uncertainty ..... ± 2.5 % v. M. ± 3 digits

Apparent power

Measuring range ..... 5 . . . 3600 VA
Frequency range ..... 48 . . . 62 Hz
Intrinsic uncertainty ..... ± 5 % v. M. ± 3 digits

General data

EMC ..... IEC 61326-1
Ambient temperature ..... 0 . . . +40 °C
Storage temperature ..... -10 . . . +70 °C
Relative humidity (up to 31 °C) ..... max. 80%
Relative humidity (>31 . . . 40 °C) ..... decreasing linearly, max. 50%
..... Condensation must be avoided
Height above sea level ..... max. 2000 m
Degree of protection, enclosure: IP40, connections: IP20
..... acc. to DIN VDE 0470 Part 1/EN 60529
Dimensions (without bag) ..... approx. 300x277x126 mm (W x D x H)
Weight (without accessories or bag) ..... approx. 3.5 kg
Calibration interval ..... 36 months

of MV = of measured value

8.5 Ordering information

Type	Description	Art. no.
UNIMET® 810ST (DE/DE)	Test system for medical electrical equipment and general electrical equipment; Nominal voltage ranges AC 100…120 V and AC 220…240 V, maximum output current 16 A, PE test current approx. 8 A, Plug/socket: Schuko (German)	B 9602 8020
UNIMET® 810ST (GB/GB)	Test system for medical electrical equipment and general electrical equipment; Nominal voltage ranges AC 100…120 V and AC 220…240 V, maximum output current 13 A, PE test current approx. 8 A, Plug/socket: GB/GB	B 9602 8024
UNIMET® 810ST (CH/CH)	Test system for medical electrical equipment and general electrical equipment; Nominal voltage ranges AC 100…120 V and AC 220…240 V, maximum output current 10 A, PE test current approx. 8 A, Plug/socket: CH/CH	B 9602 8026
UNIMET® 810ST (B/B)	Test system for medical electrical equipment and general electrical equipment; Nominal voltage ranges AC 100…120 V and AC 220…240 V, maximum output current 13 A, PE test current approx. 8 A, Plug/socket: B/B	B 9602 8027
UNIMET® 810ST (US/US)	Test system for medical electrical equipment and general electrical equipment; Nominal voltage ranges AC 100…120 V and AC 220…240 V, maximum output current 13 A, PE test current approx. 8 A, Plug/socket: US/US	B 9602 8028
UNIMET® 800ST Software licence	Software licence IEC 60601-1 for UNIMET® 810ST and for UNIMET® 800ST from art. no. B 9602 8010 (see chapter "3.2 ").	B 9602 8200
UNIMET® 810ST Software licence	Software licence IEC 61010-1 for UNIMET® 810ST and for UNIMET® 800ST from art. no. B 9602 8010 (see chapter "3.2 "). For use of this licence, the test probe TP1010 is required.	B 9602 8201
EPS800 (D)	External power source 25 A for protective earth resistance measurements in accordance with IEC 60601-1 (only in conjunction with UNIMET® 800ST, art. no. B 9602 8010 and UNIMET® 810ST), Plug: D	B 9602 8050

EPS800 (GB)	External power source 25 A for protective earth resistance measurements in accordance with IEC 60601-1 (only in conjunction with UNIMET® 800ST, art. no. B 9602 8014 and UNIMET® 810ST), Plug: GB	B 9602 8054
EPS800 (CH)	External power source 25 A for protective earth resistance measurements in accordance with IEC 60601-1 (only in conjunction with UNIMET® 800ST, art no. B 9602 8016 and UNIMET® 810ST), Plug: CH	B 9602 8056
EPS800 (B)	External power source 25 A for protective earth resistance measurements in accordance with IEC 60601-1 (only in conjunction with UNIMET® 800ST, art. no. B 9602 8017 and UNIMET® 810ST), Plug: B	B 9602 8057
EPS800 (US)	External power source 25 A for protective earth resistance measurements in accordance with IEC 60601-1 (only in conjunction with UNIMET® 800ST, art. no. B 9602 8018 and UNIMET® 810ST), Plug: US	B 9602 8058
VK701-1	Adapter Schuko/non-heating devices	B 9602 0048
VK701-2	Adapter CEE 5-pole 16 A	B 9602 0049
VK701-3	Adapter screw-type connection/plug-in connector	B 9602 0050
VK701-4	Adapter 5-pole CEE 32 A	B 9602 0051
VK701-5	Adapter 5-pole CEE 63 A	B 9602 0052
VK701-6	Adapter Schuko (German)	B 9602 0067
VK701-7	Adapter for non-heating appliances	B 9602 0066
VK701-8	Adapter kit 16 A for DS32A	B 9602 0066
RS-232/RS-232 interface cable	Cable for connecting the test system with a PC, 9-pole, female-female (null modem cable)	B 9601 2012
USB2.0-RS232 converter	Converter cable USB/RS-232 for UNIMET®	B 9602 0086
TP800	Test probe active (with switch)	B 9602 0080
Test probe	Measuring lead, 3 m, with black test probe	B 928 748
Cable 150 cm	Measuring lead, 150 cm, 4 mm connector	B 928 703
Test terminal	Test terminal black	B 928 741
Stylus pen	Touchscreen pen	B 928 749
Barcode scanner PS/2	for UNIMET® 800ST and UNIMET® 810ST (PS/2 connection)	B 9602 0082
Barcode scanner USB	for UNIMET® 800ST and UNIMET® 810ST (USB connection)	B 9602 0092
Scanner bag UNIMET®	for barcode scanner	B 9602 0102
Flex keyboard	for UNIMET® 800ST and UNIMET® 810ST (USB connection)	B 9602 0093

PK3	Test kit, various adapters for connecting medical electrical equipment to test systems	B 9602 0004
TP16	Cable drum with 16 m measuring lead	B 9602 0054
TB3	Test box for testing test systems	B 9602 0025
PAT Box	For measuring of up to 10 patient connections with UNIMET® 1100/800/400ST according to IEC 62353	B 9602 0096
DS32A	Three-phase adapter for testing medical electrical three-phase devices during operation (acc. to DIN EN 62353, DIN VDE 0751-1, DIN VDE 0701-0702)	B 9602 0098
TP1010	For measurement of equipment for laboratory use with UNIMET® 800ST and UNIMET® 1100ST or 1000ST acc. to IEC 1010-1; EN 61010-1	B 9602 0060

Other models and software are available on request.

INDEX

R

S

T

U

V

W

Z

BENDER
The Power in Electrical Safety©

Bender GmbH & Co. KG
P.O. Box 1161 • 35301 Gruenberg • Germany
Londorfer Straße 65 • 35305 Gruenberg • Germany
Tel.: +49 6401 807-0 • Fax: +49 6401 807-259
E-mail: info@bender.de • www.bender.de

Fotos: Bender Archiv und bendersystembau Archiv.

BENDER Group