

Included**1 Test system**

- 1 mains power cable
(at the **test system**: via 16 A inlet plug
– mains side: country-specific)
- 1 probe cable with test probe
- 1 plug-on alligator clip
- 1 Compact flash card type II
- 1 Short-form Operating Instructions
- 1 PS3 CD ROM
Contents:
 - PS3 PC software enabled for 20 objects
 - Operating instructions in the available languages
D: ba_d_secustar.pdf, GB: ba_gb_secustar.pdf (in preparation)

Software Revision Level

These operating instructions describe software revision level of the test system as of 1.9.11

**Attention!**

SECUSTAR FM+ and **SECULIFE SB** may not be operated with a software version older than 1.9.6.

See section 4.10.7 for instructions on how to query the software revision level.

Accessories (sensors, plug inserts, adapters, consumable materials)

The accessories available for your **test system** are checked for compliance with currently valid safety regulations at regular intervals, and are amended as required for new applications. Currently up-to-date accessories which are suitable for your **test system** are listed at the following web address along with photo, order num-

ber, description and, depending upon the scope of the respective accessory, data sheet and operating instructions:
www.gossenmetrawatt.de (→ Products → Electrical Testing → Testing of Electr. Appliances)

Product Support

Technical Queries
(use, operation, software registration)
If required please contact:

GMC-I Messtechnik GmbH

Product Support Hotline

Phone: +49 911 8602-0

Fax: +49 911 8602-709

E-mail: support@gossenmetrawatt.com

Software Enabling for PS3

GMC-I Messtechnik GmbH

Front Office

Phone: +49 911 8602-111

Fax: +49 911 8602-777

E-mail: info@gossenmetrawatt.com

Recalibration Service

We **calibrate** and **recalibrate** all instruments supplied by GMC-I Service GmbH, as well as other manufacturers, at our service center, for example after one year within the framework of your test equipment monitoring program, as well as prior to use etc. (see address on page 3).

Repair and Replacement Parts Service Calibration Center* and Rental Instrument Service

If required please contact:

GMC-I Service GmbH
Service Center
Thomas-Mann-Str. 20
90471 Nürnberg, Germany
Phone: +49 911 817718-0
Fax: +49 911 817718-253
e-mail: service@gossenmetrawatt.com
www.gmci-service.com

This address is only valid in Germany. Please contact our representatives or subsidiaries for service in other countries.

DAkKS Calibration laboratory for measured electrical quantities,
D-K-15080-01-01, accredited in accordance with
DIN EN ISO/IEC 17025:2008

Accredited quantities: direct voltage, direct current value, direct current resistance, alternating voltage, alternating current value, AC active power, AC apparent power, DC power, capacitance, frequency and temperature

Competent Partner

GMC-I Messtechnik GmbH is certified in accordance with DIN EN ISO 9001:2008. Our DAkKS calibration lab is accredited by the Deutscher Kalibrierdienst (German Calibration Service) in accordance with DIN EN ISO/IEC 17025 under registration number D-K-15080-01-01.

We offer a complete range of expertise in the field of metrology: from **test reports** and **factory calibration certificates**, right on up to **DAkKS calibration certificates**.

Our spectrum of offerings is rounded out with free test equipment management. Our service department includes an **on-site DAkKS calibration bench**. If errors are discovered during calibration, our specialized personnel are capable of completing repairs using original replacement parts. As a full service calibration lab, we can calibrate instruments from other manufacturers as well.

Table of Contents

Contents	Page	Contents	Page
1 Applications	6	4.11.1 Update – Updating System Software	32
1.1 Table: Types of DUTs – Tests – Regulations	7	4.11.2 Data Exchange with Update, Backup, Restore and DB Init Operations	35
1.2 Table of Leakage Currents, Measuring Methods and Designations	8	4.11.3 Backup – Database Backup	35
2 Safety Features and Precautions	10	4.11.4 Auto-Backup – Automatic Database Backup	36
3 Operating Overview – Connections	12	4.11.5 Restore – Restoring the Database	36
4 Initial Start-Up	16	4.11.6 DB Init – Database Initialization (admin only)	37
4.1 Connection to the Mains (90 to 264 V, 45 to 65 Hz)	16	4.11.7 DB-Stat – Database Statistics	37
4.1.1 Automatic Recognition of Mains Connection Errors	16	4.11.8 Sound – Switching Key Sound On and Off	38
4.2 Battery Operation	18	4.11.9 Tests – Carrying Deadlines Forward	38
4.3 Switching the Test System On	19	4.11.10 Object Hierarchy – Hierarchy Administration (Admin only)	38
4.4 Login	19	4.11.11 Accessories	39
4.5 Standby – Switching the Test System Off	20	5 Manually Triggered Measurements – Individual Measurements	40
4.6 Loading Test Sequences and Test Step Specifications	21	5.1 General Procedure	40
4.7 General Information Regarding Data Backups	22	5.2 Overview	41
4.8 Icons in the Main Menu Footers	22	6 Automatic Test – Individual Test Sequences	72
4.9 Configuring Device Parameters – Setup Menu	23	6.1 Index Card System	72
4.10 Overview of Setup Parameters and Functions	24	6.2 Prerequisites for the Test Sequence	72
4.10.1 User Administration	25	6.3 Preparing and Executing Test Sequences	75
4.10.2 Roles – Assigning Authority	26	6.3.1 “Deadlines” Index Card	75
4.10.3 Configuring the Display	26	6.3.2 “Objects” Index Card	76
4.10.4 Printer	27	6.3.3 “Sequences” Index Card	77
4.10.5 User Interface Language	27	6.3.4 “Test” Index Card	77
4.10.6 Setting Date and Time	27	6.3.5 Loading DUT Data by Entering the ID Number	79
4.10.7 System Information	27	6.3.6 Evaluation of Measured Values for Individual Test Steps	80
4.10.8 Energy Options	27	7 Data Administration and Data Exchange	82
4.11 Establishing a LAN Connection to the test system	28	7.1 Tabular Overview of Database Functions	83
		7.2 General Processing of Catalog Entries	84

Contents	Page	Contents	Page		
7.3	DUT Administration	85	10.1	Test Sequences	132
7.3.1	Catalog of Designations – Device Categories	86	10.2	Testing Devices in Accordance with DIN VDE 0701-0702 ..	133
7.3.2	Catalog of Object Types – Device Types	88	10.2.1	Overview of Primary Test Sequences per DIN VDE 0701-0702	135
7.3.3	Catalog of DUTs	90	10.2.2	Test sequences in detail (DIN VDE 0701-0702)	136
7.3.4	Catalog of manufacturers	92	10.3	Testing Devices in Accordance with IEC 62353 / DIN EN 62353 (VDE 0751-1)	138
7.4	Test Sequence Administration	94	10.3.1	Test Sequences in Detail	139
7.4.1	Catalog of Standards	94	10.4	Tests with Accessories	143
7.4.2	Catalog of Test Step Specifications	96	10.4.1	Illuminance Measurement	143
7.4.3	Catalog of Sequences	103	10.5	Classification of Devices Under Test	145
7.5	Test Results Administration	106	10.5.1	Safety Classes	145
7.5.1	Catalog of Tests	106	10.5.2	Application Parts (electrical medical devices)	145
7.5.2	Catalog of Deadlines	107	10.6	Abbreviations	146
7.5.3	Catalog of Intervals	109	10.7	Bibliography	148
7.6	Customer and Location Administration	111	10.8	Internet Addresses for Additional Information	149
7.6.1	Catalog of Persons, Companies and Departments	112	10.9	Test Intervals (recommended)	150
7.6.2	Catalog of Locations	114	10.10	List of Compatible Printers	151
7.6.3	Catalog of Departments	116	11	Maintenance and Calibration	152
7.6.4	Catalog of Location Designation	117	11.1	Housing Maintenance	152
7.7	Data Exchange Between the test system and vFM / PS3	118	11.2	Battery Pack Maintenance	152
7.7.1	Preparing for Data Exchange (vFM / PS3 only)	119	11.3	Replacing the Fuses	152
7.7.2	Creating the Vers.def File (vFM / PS3)	120	11.4	Recalibration	153
7.7.3	Synchronizing the Hierarchies	121	11.5	Return and Environmentally Sound Disposal	153
7.7.4	Data Import from vFM / PS3	121	11.6	Displays – Error Messages	154
7.7.5	Data Export to vFM / PS3	122	12	Index	156
7.7.6	Data Export to XML	123			
7.7.7	Data Import from XML	124			
8	Technical Data	126			
9	Data Interfaces	131			
10	Appendix	132			

1 Applications

The **test system** has been developed for user-controlled execution of approvals, routine tests and periodic testing in accordance with legally specified directives (e.g. **BGV A3** – previously BGV A2 and VBG4 –, **GUV A2**, **MPG**, **BetrSichV**, **Brandschutz** etc.). Individual work steps are combined by the user into complete work sequences to this end. Test sequences created in this way are then executed in a user-controlled fashion. Test sequences, including all required measurements in accordance with the following standards, have been predefined:

DIN VDE 0701- 0702

In addition to this, the modular **test system** allows for the integration of testing tasks through the connection of sensors, e.g. for the measurement of ambient temperature, relative humidity and light.

In addition to test data archiving and administration within the instrument, data exchange with **PS3** software programs is also possible. Furthermore, your data can be backed up as an XML file, which can be processed with an appropriate editor.

All of the values for electrical equipment required for approval reports or device logbooks (e.g. per ZVEH) can be measured with the **test system**.

Test data can be printed in standard test report forms by means of an interconnected printer. The user can also create and print out reports in **PS3**.

Use for Intended Purpose

- The **test system** can be used as a benchtop instrument which must be isolated and set up on a solid base while measurements are being performed. It can also be hung around the neck with a carrying strap for use as a portable device.
- Only those measurements which are described in the following chapters may be performed with the **test system**.
- The **test system**, including the measuring probe, may only be used within the specified measuring category (see section 2 on page 10 as well as the table below explaining their meaning).
- Overload limits may not be exceeded. See technical data on page 126 for overload values and overload limits.
- Measurements may only be performed under the specified ambient conditions. See page 128 regarding operating temperature range and relative humidity.
- The **test system** may only be used in accordance with the specified protection type (see page 129).

Measuring Categories and their Meaning per IEC 61 010-1

CAT	Definition
I	Measurements in electrical circuits which are not directly connected to the mains: <i>(e.g. electrical systems in motor vehicles and aircraft, batteries etc.</i>
II	Measurements in electrical circuits which are electrically connected to the low-voltage mains: <i>with plugs, e.g. at home, in the office or laboratory etc.</i>
III	Measurements in building installations: <i>stationary consumers, distributor terminals, devices connected permanently to the distributor</i>
IV	Measurements at power sources for low-voltage installations: <i>meters, mains terminals, primary overvoltage protection devices</i>

1.1 Table: Types of DUTs – Tests – Regulations

	Tests after initial start-up and modifications	Tests after repairs and periodic testing
DUTs to be tested in accordance with following regulations	IEC 62353 :2007 DIN EN 62353 :2008 (VDE 0751-1)	DIN VDE 0701- 0702 :2008
Laboratory devices		•
Measuring and control equipment		•
Voltage generating devices		•
Electrical tools		•
Electrical heaters		•
Devices with electric motors		•
Light fixtures		•
Consumer, information and communication technology devices		•
Cable reels, extension and device connector cables		•
Data processing equipment and office machines		
Electrical medical devices, application parts	•	

**Attention!**

The **test system** may not be used for measurements within electrical systems!

1.2 Table of Leakage Currents, Measuring Methods and Designations

Individual Measurements per Regulation	DIN VDE 0701-0702	IEC 62353 DIN EN 62353 (VDE 0751-1)	The following is measured:
protective earth leakage current	•		
Direct measuring method	•		Current in protective conductor, mains power on
Differential current measuring	•		Difference between current in L and N, mains power on
Alternative measurement	•		Probe to N+L
Equipment leakage current		•	
Direct measuring method		•	Current in protective conductor + current in probe, mains power on
Differential current measuring		•	Difference between current in L and N + current in the probe, mains power on
Alternative measurement		•	Probe connected to the protective conductor, to N+L
Touch current	•		
Direct measuring method	•		Current in the probe, mains power on
Differential current measuring	•		Difference between current in L and N, PE interrupted, mains power on
Alternative measurement	•		Probe to N+L
Leakage current from applied part		•	
Direct measuring method		•	Current in the probe, mains power on
Differential current measuring		•	Probe to N+L+PE
Alternative measurement		•	
earth leakage current		•	Current in protective conductor, mains power on
patient leakage current		•	Current in the probe, mains power on

Key

- stipulated test

PE = potential earth electrode $\hat{=}$ mains protective conductor

2 Safety Features and Precautions

This instrument fulfills the requirements of applicable European and national EC directives. This is confirmed by means of the CE mark. A corresponding declaration of conformity can be requested from GMC-I Messtechnik GmbH.

The **test system** test system has been manufactured and tested in accordance with the following safety regulations:

IEC 61 010-1 / DIN EN 61010-1 / VDE 0411-1, DIN VDE 0404
IEC 61577 / EN 61577 / VDE 0413-2, -4

When used for its intended purpose, the safety of the user, the **test system** and the device under test (electrical equipment or electrical medical device) is assured.

Read the operating instructions carefully and completely before placing your test system into service. Follow all instructions contained therein. Make sure that the operating instructions are available to all users of the instrument.

Tests may only be performed by a qualified electrician, or under the supervision and direction of a qualified electrician. The user must be instructed by a qualified electrician in the execution and evaluation of tests.



Note

Manufacturers and importers of electrical medical devices must provide documentation for the performance of maintenance by trained personnel.

Observe the following safety precautions:

- The instrument may only be connected to electrical supply systems with 230 V/240 V which conform to the valid safety regulations (e.g. IEC 60364, VDE 0100) and are protected with a fuse or circuit breaker with a maximum rating of 16 A.

- **Measurements within electrical systems are prohibited.**
 - Be prepared for the occurrence of unexpected voltages at devices under test (for example, capacitors may be dangerously charged).
 - Make certain that the measurement cables are in flawless condition, e.g. no damage to insulation, no cracks in cables or plugs etc.
 - **Insulation resistance measurement** (equivalent leakage current) Testing is conducted with up to 500 V. Current limiting is utilized ($I < 10$ mA), but if the terminals (L and N) are touched, electrical shock may occur which could result in consequential accidents.
 - **Measuring leakage current** It is absolutely essential to assure that the device under test is operated with line voltage during performance of leakage current measurements. Exposed conductive parts may conduct dangerous contact voltage during testing, and may not under any circumstances be touched (mains power is disconnected if leakage current exceeds approx. 10 mA).
 - **Function test**
-



Attention!

The function test may only be performed after the DUT has successfully passed the safety test!. For reasons of safety, the device under test must be switched off before the function test is started. This precaution prevents inadvertent start-up of a device under test which may represent a hazard during operation, e.g. a circular saw or a disc grinder.

Ending the Function Test: After completion of the function test, devices under test must be turned off with their own switch – especially devices with relatively high inductivity.

- **Consumers with high inrush current (> 16 A) – function test** (e.g. fluorescent tubes, halogen lamps, headlights etc.) Observe the following instructions in order to prevent excessive contact loads.



Attention!

The **test system** is protected with two 16 A FF fuses. In order to avoid blowing the fuses, we recommend the use of a Z850 D adapter for testing with sequence I, making current > 16 A (Z850 B required for connection to 32 A systems).

The measuring and test system may not be used:

- If it demonstrates visible damage
- With damaged connector cables, measuring cables or patient ports
- If it no longer functions properly

In such cases, the instrument must be removed from operation and secured against unintentional use.

Opening of Equipment / Repair

The equipment may be opened only by authorized service personnel to ensure the safe and correct operation of the equipment and to keep the warranty valid.

Even original spare parts may be installed only by authorized service personnel.

In case the equipment was opened by unauthorized personnel, no warranty regarding personal safety, measurement accuracy, conformity with applicable safety measures or any consequential damage is granted by the manufacturer.

Any warranty claims will be forfeited when the warranty seal has been damaged or removed.

Meanings of Symbols on the Instrument

300 V CAT II Maximum permissible voltage and measuring category between connections 1 through 4, the test socket and ground System with maximum 16 A nominal current



Warning regarding dangerous electrical voltage



Warning concerning a point of danger (attention: observe documentation!)



The device may not be disposed of with the trash. Further information regarding the WEEE mark can be accessed on the Internet at www.gossenmetrawatt.com by entering the search term WEEE.



Any warranty claims will be forfeited when the warranty seal has been damaged or removed.

Data Security

Save your data to the inserted compact flash card or to a PC on a regular basis in order to prevent any loss of data (see section 4.11.3).

We assume no liability for data loss.

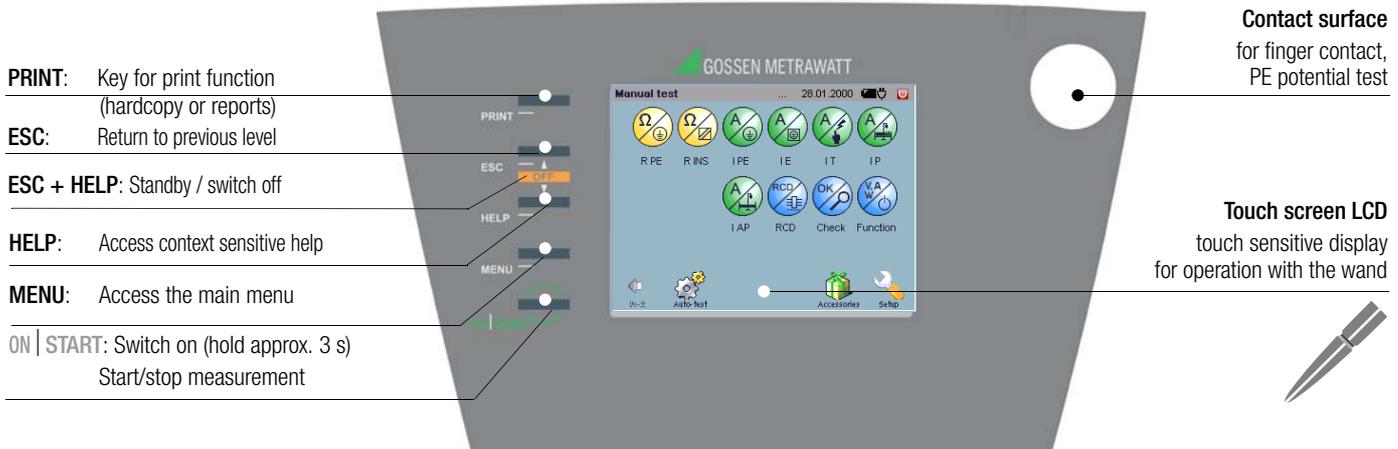
We recommend the following PC program for data processing and data administration: **vFM/PS3** (transmission of measurement data to a PC, documentation, administration, report generating and deadline follow-up).

Condensed instructions for PS3 software for maintenance and equipment management are provided on the CD ROM.

They include important instructions regarding the following topics:

- PS3 demo with additional instructions
- Special features for reading in measured values from a data file

3 Operating Overview – Connections



PRINT: Key for print function (hardcopy or reports)

ESC: Return to previous level

ESC + HELP: Standby / switch off

HELP: Access context sensitive help

MENU: Access the main menu

ON | START: Switch on (hold approx. 3 s)
Start/stop measurement

Contact surface
for finger contact,
PE potential test

Touch screen LCD
touch sensitive display
for operation with the wand

PRINT

- Read out a screenshot to a connected printer *
- Save a screenshot to device memory
- Read-out a report to a connected printer*

* only HP printers with PCL are currently supported (black-and-white)

– Refresh the display when a USB sensor is connected (see page 67)

ESC

- Return to previous level
- Refresh the display when a USB sensor is connected (see page 67)

HELP

Access the following functions:

- Help texts for each menu window
- Connection example for manual measurement

MENU

- Access the main menu for the manual test procedure

ON | START

ON: Switch the test system on (hold for approx. 3 s)

START: – Start an individual test (manual test)
– Start a test sequence (automatic test)



Note

The background color of the display has been changed as of software version 1.9.6. However, if you use a device with an old TFT display, the background color remains green even after upgrading to version 1.9.6.

Contact surface

For checking potential, i.e. this contact surface must be touched in order to determine whether or not the protective conductor is charged with dangerous contact voltage (see page 66).

ESC+HELP

Simultaneous activation of these two keys:
- Standby: The Prüfsystem is switched to standby. Background illumination is switched off in the standby mode. The Prüfsystem is reactivated by pressing the ON | START key, or by contacting the touch screen. The Prüfsystem is shut down completely after two hours in the standby mode.
- Switch off: Switches the Prüfsystem off. The Prüfsystem is shut down and the database is reorganized (page 20).

If the test system cannot be switched off with the ESC+HELP key combination or with icon [U], it can be shut down in an emergency by pressing and holding the Start key for roughly 5 seconds.



Attention!

The database may be destroyed by pressing and holding the Start key!

Main Menu – Manual Test

Selection via the menu key

Main Menu – Manual Test interface with annotations: Test person, Date and time, Charge level, Mains power, Switch off, Individual measurements, USB accessories, Setup Settings, Back button, Auto-test, Administration, Accessories.

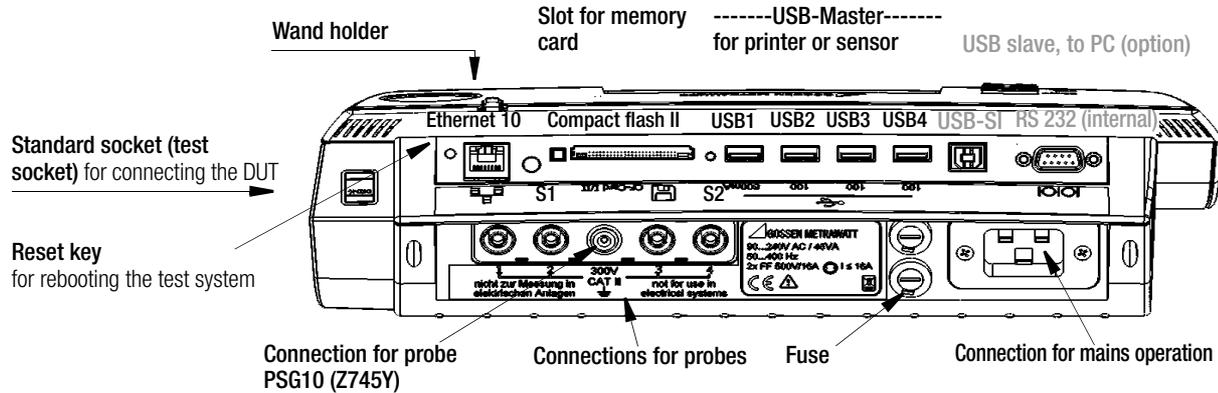


Attention!

Use the included stylus in order to select a pictograph. Other objects may damage the touch screen's sensitive surface.

In the event that not all of the test steps or other displays can be shown at the same time, a scroll bar appears automatically at the right-hand edge of the screen which can be tapped in order to scroll through the display.

Connections



Connection	Application
Top connections	
Standard socket	Test socket with safety class detection
Ethernet 10	Network connection, 10 MBit
CF slot	For inserting compact flash II memory cards
USB1	USB master, e.g. for keyboard, printer, barcode scanner or 500 mA sensor
USB2 USB3 USB4	USB master, e.g. for keyboard, printer, or sensor, 100 mA
USB-SI	USB slave, to PC (in preparation)
RS232	Interface, for service only

Connection	Application
Bottom connections	
Sockets 1 and 2	Test probe connection (max. 300 V CAT II)
Sockets 3 and 4	Current sensor connection, 1 mV/mA (max. 300 V CAT II)
Inlet socket	Supply power connection (90 to 240 V, 50 to 400 Hz)

Reset key In the event that the system no longer reacts, briefly press the recessed button with the stylus (at the back of the **Prüfsystem** to the left of the Ethernet port).

4 Initial Start-Up

4.1 Connection to the Mains (90 to 264 V, 45 to 65 Hz)

- ⇒ Connect the **test system** to the mains with the mains plug as shown in the figure. The mains plug symbol  appears in the header.

Charging the Battery Pack

- ⇒ Initial start-up: Make sure that the battery pack is properly inserted and connected (see section 4.2 regarding installation of the battery pack).

If a battery pack has been installed, it is recharged automatically  as soon as a specified threshold value is fallen short of.

The charging process is indicated by the alternating charge level at the battery symbol. After this display appears, the **test system** should remain connected to the mains for a charging time of at least 3 hours. **Initial charging time:** at least 5 hours.

The duration of the charging process is extended correspondingly in the event of mixed operation, i.e. simultaneous charging and measuring. Practically no charging at all takes place in the event of continuous changing from one mains connection to the next with a dwell time of less than 4 minutes per measuring point. We recommend charging the battery pack overnight without interruption. This applies in particular to initial start-up.

You can start fast charging any time with the  key (see “Setup Menu” in section 4.10.8). Even after the batteries have been fully charged, the device need not be disconnected from mains power (overcharge protection).

Note

If no battery pack has been installed, the charging symbol appears at the display after start-up and login.

4.1.1 Automatic Recognition of Mains Connection Errors

The test system automatically recognizes mains connection errors if the conditions in the following table have been fulfilled. The user is informed of the type of error, and all measuring functions are disabled in the event of danger.

Each time the system is reconnected to the mains, the following messages appear after the first test has been started:

- ⇒ Simultaneously touch the contact surface and tap the “OK” button.
 - ⇒ PE connection test:
 - If PE is detected, measurement is continued.
 - If no PE is detected, the following message appears: “Connect PE”, for which three options exist:
 - Cancel:* Abort the test.
 - OK:* Repeated attempt to detect PE.
Testing is not continued until PE has been detected.
 - No:* Testing is continued regardless of whether or not PE is detected.
-



Attention!

In the event of mains connection errors in accordance with either of the first two cases in the following table, immediately disconnect the **test system** from the mains and arrange to have the error eliminated!



Note

Voltage at the electrical system’s protective conductor (PE) may result in distorted measurement values during testing for the absence of voltage, or during leakage voltage measurements.

Type of Mains Connection Error	Message	Condition	Measurements
Voltage from PE to finger contact	Text at LCD panel	Touch the contact surface $U > 25 \text{ V}$	Disabled
Protective conductor PE and phase conductor L reversed and/or neutral conductor N interrupted	Text at LCD panel	Voltage at PE $> 65 \text{ V}$	Impossible (no supply power)
Contact voltage from PE to neutral conductor N or phase conductor L	Text at LCD panel	$U > 25 \text{ V}$	Disabled, but disabling can be deactivated (e.g. IT network)
Line voltage too low	Text at LCD panel	$U_{L-N} < 90 \text{ V}$	Possible under certain circumstances

4.2 Battery Operation

Installing the Battery Pack



Attention!

If a DUT is connected to the test socket, disconnect it first. Do not disconnect the **test system** from the mains while changing the battery pack, if you want to prevent the loss of current configuration data.

Opening the Battery Compartment Lid

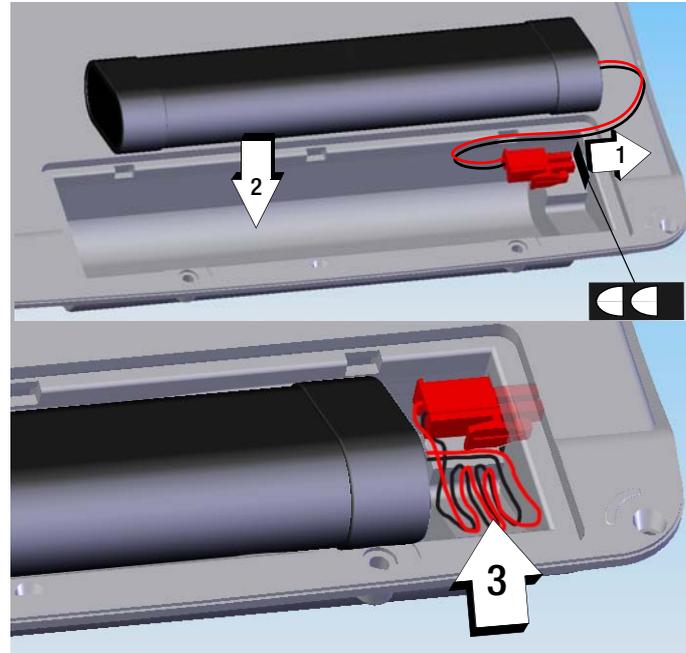
Loosen the two captive slotted screws with the help of a coin. Remove the battery compartment lid.

Connect and insert the battery pack (see figure).

1. Connect the battery pack by inserting its plug until the latch snaps into place. (In order to disconnect the plug, simultaneously press the latch towards the plug and pull the plug out.)
2. Insert the battery pack. Make sure that neither the connector cable nor any portion thereof is located underneath the battery pack.
3. Stow the connector cable in the empty space to the right of the inserted battery pack.

Closing the Battery Compartment Lid

Set the battery compartment lid back into place and retighten the two screws.



If a fully charged battery pack has been installed and the **test system** is not connected to the mains, the battery symbol  appears at the display after start-up and login, and the number of dark bars indicates the battery charge level. After installing the battery pack, the device is automatically supplied with power from the batteries.

See also energy options in section 4.10.8 on page 27.

Rechargeable battery (charging process)

In contrast to conventional, commercially available storage battery-operated instruments, an inserted battery set is not recharged until it falls below a fixed threshold.

This is due to the fact that the SECUSTAR FM+/SECULIFE SB may not be permanently recharged while being changed between different types of mains connections. This would corrupt the rechargeable battery set within a short period of time.

The charging concept with the above-mentioned fixed threshold, however, ensures that the battery is only recharged if it is almost entirely depleted.

When the SECUSTAR FM+/SECULIFE SB is supplied with mains power for more than 2 hours without interruption (in on or off state), the battery charging process is launched automatically, independent of the battery charging condition. A battery which is supplied overnight with mains power, is therefore always fully charged.

Of course, it is also possible to start the fast charging process via the express charge button in the setup menu at any time (see section 4.10.8).

4.3 Switching the Test System On

Prerequisite for switching the test system on:

- The test system is connect to the mains with the mains cable (see section 4.1).

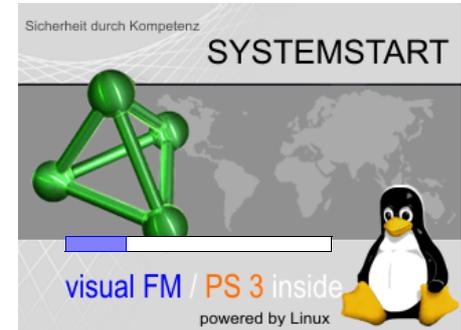
or

- A charged battery pack is installed (see section 4.2).
- ⇒ Press and hold the **ON | START** key for approximately 3 seconds . The initial window appears.

Initial Window

The initial window shown at the right appears in the event of:

- Reset
- Battery change
- Test system has been switched off for more than 2 hours.



Note

The touch screen must be calibrated from time to time before the login menu appears (see section 4.10.3 on page 26).

4.4 Login

Login As Default User

“...” appears next to User name.

- ⇒ Ignore the password prompt. Tap the Login key

Login With Password (user status)

- ⇒ Select a test person from the list which appears after clicking the drop-down arrow.



Initial Start-Up – Setup

- ⇨ Enter the appropriate password using the keyboard which appears at the display. The password is acknowledged by tapping OK, and is displayed as a series of asterisks. This point can be skipped if the test person name is not password protected.
- ⇨ Tap the Login key.

Note

It is also possible to create test persons who do not require a password.

Login With Password (administrator status)

- ⇨ Select the test person name “Admin” from the list.
- ⇨ Enter the password “admin” in the case of initial start-up or if you have not yet changed the password.

Refer to section 4.10.1 regarding test person name administration.

Service Menu

By tapping the **tetrahedron in the login menu** (password: **SecuService**), the view is switched to the service menu. The user can execute a comprehensive check of database structure and content in this service menu, reset the database and copy it to the CF card / USB stick.

After Login

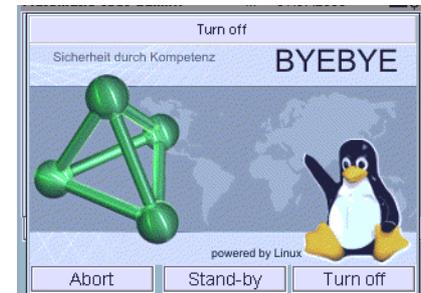
The last main menu to be accessed appears. “. . .” or the selected test person name appears in all menu headers.

During use, you can tap the user name in the header in order to log out, making it possible to change from one test person to another.



4.5 Standby – Switching the Test System Off

- ⇨ Access the shutdown menu by simultaneously pressing the **ESC** and **HELP** keys.



Standby Mode

The system should be switched to the standby mode during breaks in order to deactivate the energy intensive background illumination and extend the service life of the rechargeable batteries.

⇨ Press the **Standby** key.

The test system is switched to the standby mode.

The test system is shut down completely after two hours in the standby mode.

The test system is reactivated by pressing the **ON | START** key, or by tapping the touch screen.

Switching the System Off

The **test system** is shut down, and the database is reorganized and backed up to the CF card / USB stick, if the auto-backup function is activated.

If the **auto-backup** function is deactivated, a message appears when the **test system** is shut down.

If the **test system** cannot be switched off with the **ESC+HELP** key combination, it can be shut down in an emergency **test system** by pressing and holding the **Start** key for roughly 5 seconds.



Attention!

The database may be destroyed in this case!

If the **test system** is not switched off normally, but rather by means of a reset, by pressing and holding the **Start** key, due to power failure etc., extensive database checking is executed the next time the instrument is switched on.

4.6 Loading Test Sequences and Test Step Specifications

As of software version 1.9.3, fixed sequences and test step specifications are no longer stored to the **test system**, and are instead included on a CF card as XML files. The inspector is thus able to load only those sequences to the **test system** which he actually needs.

The test sequences can also be write protected, so that they're not deleted if the option "**delete all test sequences**" is selected in **SETUP**  **DB Statistics**.



Attention!

If DB-Init is executed in the SETUP menu, write protection is not functional!

Loading a test sequence:

- ⇨ Open the Administration menu. 
- ⇨ Select the Im-/Export index card.
- ⇨ Touch the Import icon.
- ⇨ Select Files in XML Format on CF Card.
- ⇨ Selected the appropriate XML file.

The XML file is loaded and the corresponding test sequences are immediately available in the test system.

See also section 7.7.7 to this end.

If you attempt to import a sequence whose name has already been used in the **test system**, testing is executed in order to determine whether or not the sequences have the same content. If so, the deadlines and the tests are imported without any further security prompts. If the test sequences are not identical, the user is asked whether or not the sequence (including tests and deadlines) in the database at the **test system** should be overwritten.

4.7 General Information Regarding Data Backups

There are a total of three ways to back up data:

- The backup function (see section 4.11.3)
- Data export to XML (see section 7.7.6)
- Data export to the L&H format (see section 7.7.6)

The backup function creates a stored image of all database entries and measurement results. This function has the disadvantage of a version-dependent backup, i.e. the data can only be restored to the same version of the **test system** from which they were backed up. Backups which have been created before software updates are thus no longer usable..

All data are saved when export to an XML file is executed. The XML file can also be read after updating the **test system**, and can be imported in a trouble-free fashion. For this reason, you should always export your data to an XML file before installing an update.

In the event of data export to the L&H format, the data bases in PS3 and in the **test system** are reconciled. In this case, only data (catalog / data) which are important for the PS3 database are exported. This type of data export cannot be used as a substitute for a backup, or for data export to an XML file.



Note

“Data export to XML” is preferable to the “backup function” for assuring secure, long-term data archiving.



Attention!

If the backup is interrupted due to a reset or by switching the instrument off, the database may be destroyed.

CF Card (data safety)

To ensure data safety, the CF card must always remain in the instrument, and the auto-backup function must be activated. This is the only way of saving backup copies of the database during the power-down process.

4.8 Icons in the Main Menu Footers

Icon	Designation	Meaning	Description
	Setup	Menu setup, system settings	See section 4.9
	Accessories	Accessory programs, e.g. pocket calculator	See section 4.11.11
	Man Test	Menu for individual tests and manual test	See section 5
	Auto-Test	Menu for automated test sequences	See section 6
	Administration	Menu for administration of DUTs, customers etc.	See section 7
	Back Button	Go back one menu level	–

4.9 Configuring Device Parameters – Setup Menu



Setup



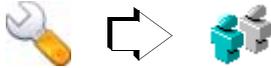
All of the settings which are required for operation and of the **test system** and the user interface can be entered in the setup menu.

4.10 Overview of Setup Parameters and Functions

Sym- bol	Designation	Change to Sub- menu	Sym- bol	Designation	Meaning	Description
	User				Administer test persons, only after login as admin	page 25
	Roles				Assign authority, only after login as admin	page 26
	Display			Calibrate	Calibrate the touch screen	page 26
	Display			Brightness/contrast	Adjust brightness and contrast	page 25
	Printer			Search printer	Search printer	page 27
	Language			English	Select a user interface language	page 27
	Date/time				Set date and time	page 27
	System information				List of software module versions	page 27
	Update				Update system software	page 32
	Sound				Key sound, activate/deactivate	page 38
	Energy options				– Enter a standby time – Quick charge the batteries	page 27
	Network				Setup a LAN connection to the test system	page 28

Sym- bol	Designation	Change to Sub- menu	Sym- bol	Designation	Meaning	Description
	Database			Backup	Database backup	page 35
	Database			Restore	Restore database	page 36
	Database			DB Init	Initialize the database	page 37
	Database			Auto-backup	Automatic database backup	page 36
	Database			DB Statistics	Database statistics	page 37
	Tests				Define conditions for carrying forward	page 38
	Object hierarchy				Administrate object hierarchies	page 38

4.10.1 User Administration



Various user names (test person name, ID and password) can be changed, deleted and entered here. An alphanumeric keyboard is automatically displayed when any of the entry fields is tapped.

Users, i.e. test persons, can only be administered after logging in as the administrator (admin status), i.e. with the user name “Admin”. The only exception is changing one’s own password which is also possible as a non-administrator after logging in as a user (user status).

Entering a New User (admin status)

At least the name must be entered to this end. An ID can also be entered if required. If the user name is to be password protected, a password must also be entered.

In order to acknowledge a new password, it must be entered a second time and acknowledged by tapping OK.

The new user is not added to the **test system** until his data has been saved.

Changing User Data (admin status)

Names, IDs and passwords can be changed with this function.

The new password must be typed in in order to change an existing password, for example because the user has forgotten it . In order to acknowledge the new password, it must be entered a second time and acknowledged by tapping OK.



Attention!

If you change the administrator password, be sure to make a note of the new password! Administrator access is not possible without the currently valid password.

If the administrator password needs to be reset, the test system must be sent to our service department (see address on page 3).

Changed user data is not updated to the **test system** until it has been saved.

Changing Your Own Password (user status)

The old password must first be entered correctly before it can be changed. The new password can then be typed in. In order to acknowledge the new password, it must be entered a second time and acknowledged by tapping OK.

The changed password is not updated to the **test system** until it has been saved.

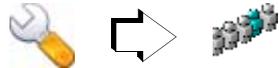
Deleting Users (admin status)

In order to delete users and their data, activate the checkbox to the left of the respective user and tap the delete symbol.

Note

Users which have been added to the CF card are updated to the test system during import.

4.10.2 Roles – Assigning Authority

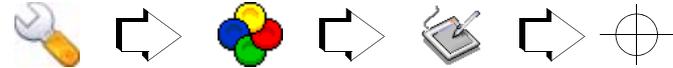


The user with administrator authority (admin status) is able to assign authority allowing users to enter new designations and manufacturers in the “Roles” setup menu. This authority is not assigned to individual persons (i.e. test person names), but rather to a group, for example standard users.

If the respective user of a given group (user status) does not have this authority, he is only able to select designations and manufacturers from a list.

4.10.3 Configuring the Display

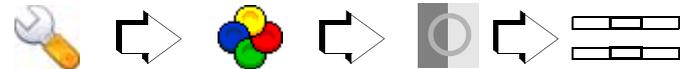
Calibrating the Touch Screen



Recalibration of the touch screen becomes necessary when, for example, the symbols have to be tapped at the side instead of in the middle in order to activate the various functions and menus. The calibration menu appears automatically after a reset, after the batteries have been replaced and if the system has been switched off for a period of longer than 2 hours.

Three crosshairs, one at the top left and one at the bottom right, must be tapped with the wand, one after the other, in order to calibrate the touch screen. The procedure is then concluded by tapping OK.

Adjusting Brightness and Contrast



Brightness (0 ... 4 ... 7) and contrast (0 ... 100 ... 1xx) are adjusted either with sliders or numerically. New values are only activated if acknowledged by tapping the OK button within a given period of time which is specified by means of a count-down timer (7 to 0 seconds).

Note

From device variant **SECUSTAR FM+** onwards, it is no longer possible to adjust the contrast.

4.10.4 Printer



Here you can search for the printer to be connected to the USB port.

Report



A logo can be loaded into the Secustar which will then be printed on the test report.

The logo must meet the following requirements:

- png format
- RGB colors or palette colors
- maximum file size: 400 kB
- at least 100 x 100 pixels
- maximum dimensions: 2,400 pixels wide and 900 pixels high

4.10.5 User Interface Language

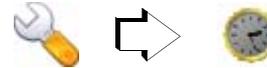


Selection can be made here amongst various languages for the user interface. English, German, French and Dutch user interfaces are currently available.

The layout of the internal softkey keyboard, or an external keyboard which has been connected to the USB port, is automatically adapted to the selected user interface language.

Note: When using a barcode scanner, the modified character coding must be adjusted.

4.10.6 Setting Date and Time



Date and time can be entered here. The respective data are saved automatically after they have been entered:

Date (DD.MM.YYYY)

Time (hh:mm:ss)

You can switch back and forth between the display of date and time by tapping the respective entry in the header. The date

4.10.7 System Information



The versions of the various software modules are listed here.

4.10.8 Energy Options



Standby Time in Minutes

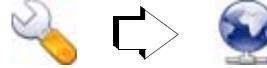
A time is specified here in minutes after which the test system is shut down automatically, if none of the keys or the touch screen have been activated during this time.



Quick Charging the Batteries

Charging of the battery pack can be started at any time with this function.

4.11 Establishing a LAN Connection to the test system



IP Address
Net Mask

Application

The **test system** is capable of communicating with any PC (Windows, Linux or Mac), assuming both are connected to a LAN, or if the two devices are directly connected with a LAN cable:

- For remote controlling tests (full functionality)
- For reading out test results
- For generating hard copies



Attention!

Remote control of the **test system** should always be coordinated with the user, who is in contact with the **test system** at the same time, for example in order to exclude the possibility of contact hazards

Connecting the test system to the LAN

**Attention!**

Consult with the responsible LAN administrator before connecting the **test system** to your company LAN.

**Note**

As an alternative to connecting the system to the respective company LAN, the **test system** can be directly connected to your PC with a crossover cable, or a standard LAN cable and a hub.

- ⇒ Connect the **test system** to the LAN.

If the system has been correctly connected to an active LAN by means of a LAN cable, die grüne LED oberhalb des LAN-Steckers am Prüfsystem. Die gelbe LED blinkt im Takt des Datenflusses.

Assigning an IP Address

**Attention!**

Consult with your LAN administrator before assigning an IP address.

- LAN with DHCP server:
(DHCP: dynamic host control protocol)
Prerequisite: The **test system** must be connected to the LAN before it is switched on.
The IP address and the subnet mask are assigned by the DHCP server, and are entered automatically to the **test system**.
Note: There is no assurance that the same IP address will be assigned each time.
- LAN without DHCP server:
A fixed IP address and subnet mask are set up automatically by the **test system**:
IP address: 169.254.191.151
Net mask: 255.255.255.0
Note: After rebooting on a LAN with DHCP server, the previous permanently assigned IP address is overwritten.
- Direct connection to the PC via LAN cable and hub, or via crossover cable:
A fixed IP address and subnet mask are set up automatically by the **test system**:
IP address: 169.254.191.151
Net mask: 255.255.255.0
Note: After rebooting on a LAN with DHCP server, the previous permanently assigned IP address is overwritten.

Initial Start-Up – Setup

Manual selection and entry of the IP address at the test system in the event of communication problems between test system and the PC and in the case of direct connection to the PC without connection to the company LAN

Normally you can skip this section and proceed with querying the automatically selected IP address on page 31.

- ⇨ Check the IP address at your PC:
Enter the “ipconfig” command to the DOS window to this end (Programs > Accessories > Command Prompt).

```
cmd C:\WINDOWS\System32\cmd.exe
C:\Dokumente und Einstellungen\weho>ipconfig
Windows-IP-Konfiguration

Ethernetadapter LAN-Verbindung:

    Verbindungsspezifisches DNS-Suffix:
    IP-Adresse (Autokonfig.) . . . . . : 169.254.191.139
    Subnetzmaske . . . . . : 255.255.0.0
    Standardgateway . . . . . :
```

The subnet mask indicates which digits of the IP address have to be transferred without any changes, for example the subnet decimal number 255 corresponds to hexadecimal FF, or 1111 1111 as a binary number.

Places which are occupied by a 1 must be transferred unchanged, and places which are occupied by a 0 can be freely selected.

For the example described above, this means that the IP address for the **test system** can be set to 169.254.xxx.xxx.

Normally, a number is selected which only differs from the PC's IP address by one or a few final digits, for example 169.254.191.141.

- ⇨ Enter the selected IP address to the uppermost entry field at the **test system**.
- ⇨ Enter the sequence of numbers for the PC's subnet mask to the net mask field.



Note

The manually selected IP address is overwritten after restarting.

Querying the IP Address at the **test system** and **Activating the Web Server**



Network

- Activate the web server by tapping the globe.



Web server / file enabling
activated



Web server / file enabling
deactivated

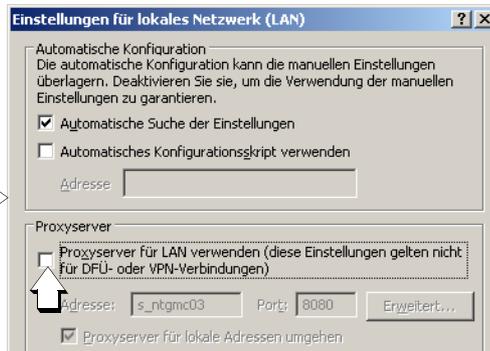
Logging the test system on at the PC

- Prerequisite: Deactivate the proxy server at your web browser (no check mark):

Tools > Internet Options > Connections > Settings ... > Proxy ...



e. g.
Internet Explorer
or
Firefox

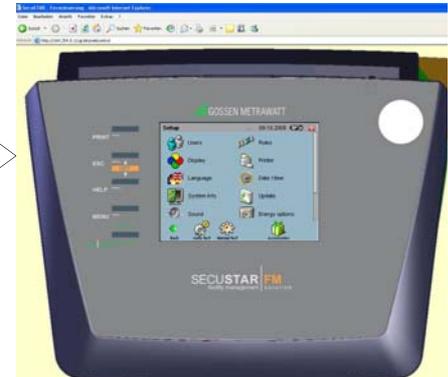


- Enter the IP address displayed at the **test system** to your web browser, for example:
http://169.254.191.141, and acknowledge with the ENTER key.

The **test system** is displayed at the PC monitor screen with the current menu image. You can now control the test system from the PC. Just click the test system keys and symbols which appear at the user interface to this end.



e. g.
Internet Explorer
or
Firefox



You can also display the current menu image only by entering, for example, http://169.254.9.50/cgi-bin/ sshot to the web browser. The browser must be continuously refreshed in order to retain the current menu image at the monitor screen.

The **test system** cannot be controlled here.

Parameter, “File Enabling” (Samba server function)

This parameter makes it possible to access an inserted CF card via the LAN. In this way, for example, a catalog file can be read out from the CD card via the LAN. The file can then be read in, for example to PS3, with the “Import data from tester” function.

Example regarding assignment of a drive for the CF card in a current Windows XP version:

- At the **test system**: file enabling: activate
- At the PC:
Windows Explorer > Tools > Connect Network Drive
> Drive: V
> Directory: \\169.xxx.xxx.xxx\cf
(IP address which has been assigned to the **test system**)

The following access data are predefined:

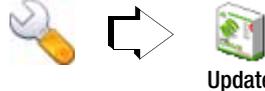
- > User name: samba
- > Password: samba

Logging Off of the LAN

If the LAN connection is no longer required, the web server should be deactivated. Otherwise it continuously transmits data and unnecessarily expends system resources.

Don't forget to reactivate the proxy server at your Internet Explorer!

4.11.1 Update – Updating System Software



Continuous further development of the **test system** in response to customer requirements results in expansion and improvement of the **test system software** at regular intervals.

It is advisable to purchase a service contract, assuring that you'll receive system software updates at regular intervals. Please contact our product support department to this end (see page 2).



Attention!

SECUSTAR FM+ and **SECULIFE SB** may not be operated with a software version older than 1.9.6.

The following update prerequisites must be observed:

- You must be logged in as administrator!
- The **test system** must be connected to the mains and a fully charged battery set must be inserted for performing an update.
- A CF card with adequate capacity must be inserted.
- After inserting the CF card, a waiting period of 10 to 15 seconds is required for recognition and loading by the system. Data on the CF card cannot be accessed until this process has been completed. If an attempt is made to access the card prematurely, the following message appears: “CompactFlash – can't read card”.

**Attention!
Data Loss**

Execute an XML export before each update.
It is often no longer possible to read in older database versions (filename.bak) after an update.

Database Backup during an Update

The database in the **test system** is overwritten during updating. The contents of the database are reset to the contents which existed upon shipment from the factory. Any other data are lost.

An externally secured backup which was created before an update can no longer be read in after the update.

During the update process, a safety query prompts you to perform a data export. We urgently recommend responding to the prompt by tapping “Yes”.

Data are then saved in XML format, and the following file is created on the inserted CF card:

preUpdateYYYY-MM-DD.xml

where YYYY = year, MM = month and DD = day.

If another XML file by the same name is already stored to the card, it is overwritten.

As opposed to a backup file, an exported XML file can be read in after the update regardless of which version it was created with.

The new file can then be re-imported after the update.

**Attention!**

Save the update file from your PC to the root directory on a compact flash card. The file cannot otherwise be processed by the **test system**. If you received the update as a ZIP file, it must first be unzipped.

Update Sequence

- Register in the **test system** as „admin“.
- Insert the CF card into the slot at the back of the **test system**. If the CF card is of the correct type, namely type II, and if the system is able to access the card, the yellow LED at the right-hand side of the slot lights up.
- Change to the **Setup** menu and tap the **Update** symbol.
- You are prompted to perform a data export. We urgently recommend you to follow this request.
- After completing the data export, you will receive a message informing you that the XML file has been successfully created.
- The **test system** checks as to whether the update file is compatible with the hardware.
The update starts automatically if the software is compatible. If not, the update is interrupted and you will receive an error message to this end.

Automatic Update Sequence

- 1 Update preparation: advancing blue bar
- 2 Operating system is rebooted: initial screen with an advancing blue bar – pause for approx. 30 seconds
- 3 The update is loaded (approx. 7 min.): two advancing blue bars
- 4 Operating system is rebooted: initial screen with an advancing blue bar
- 5 Calibration prompt
- 6 Login window appears
- 7 The software update has been completed and the CF card can be removed after pressing the button at the left-hand side of the slot.

Beachten Sie Folgendes bei einem Update von Version 1.8.2 auf Version 1.8.3 oder höher (nur SECUSTAR FM):

As of version 1.8.2, the **test system** has several hierarchies. For this reason, you'll need an LHTIF.exe file (version \geq 1.05.0013) or PS3 as of version 9.10.0113 in order to exchange data with PS3. All of the necessary files can be downloaded from our website at <http://www.gossenmetrawatt.com/deutsch/produkte/secustar-up.htm>.

It's important to sort data into the correct hierarchies when updating.

If you're working with PS3 (lower than version 9.10.0.113) or LHTIF.exe (version \geq 1.05.0013) and **test system** firmware version 1.8.2, and if data are included in the **test system** in the HK11 hierarchy, they must be transferred to hierarchy HK4.

Proceed as follows to this end:

- ↪ Back your data up to an XML file.
- ↪ Open the XML file in an editor.
- ↪ Replace all occurrences of **hierarchy-ref="11"** in the text with **hierarchy-ref="4"**.
- ↪ Save the XML file.
- ↪ Run DB Init at the test system.
- ↪ Import the modified XML file.

4.11.2 Data Exchange with Update, Backup, Restore and DB Init Operations



Selecting Files and Directories – Test System Explorer

After clicking the icons for **Backup**, **Restore** or **Update**, the root level of the compact flash card is displayed as a default feature.

“/cf” appears to the right of **Directory**. If directories are available here, they're identified under **Filename** with brackets and under **Type** with Dir. You can switch to a directory by clicking it, after which “/cf/directory_name” appears. After tapping the “.” soft-keys, the display is returned to the root level.

The otherwise common scroll bar for displaying further data is replaced here with **Continue** and **Back** keys.

4.11.3 Backup – Database Backup



Save your measurement data and database entries to a PC at regular intervals in order to prevent any possible data loss.

The generation of only a single backup has the following disadvantage: If a faulty or incomplete database is generated during the backup process, this is the only existing version which can be used for restoring data. The more backups are created over a long period of time, the less critical this danger becomes (see section 4.11.4).

The active database in **test system** RAM can be temporarily saved to a compact flash card to this end using the predefined file name (secustar.db.bak), and the backup file can be saved to a PC later. In order to save data to the compact flash card, it must first be inserted. Data backup is not possible if a card has not been inserted.



Attention!

Any data included on the CF card from previous backups are overwritten. Such data are irretrievably lost in this case! A prompt must first be answered by tapping “Yes” or “No”. We assume no liability for data loss.



Attention!

The generated backup files are restricted in their usability for the respective software version of the **test system**. If the test instrument is updated to another software version, there is no guarantee that the backup files generated with the previous software version can be restored with the „Restore“ command! Execute the data export function before installing an update for this reason, in order to save all data in a version independent fashion as an XML file (see section 7.7.5).

4.11.4 Auto-Backup – Automatic Database Backup



If the “Auto-Backup” function has been activated in setup, data are saved to a CF card before the **test system** is shut down.

The following prerequisites must be fulfilled:

- A CF card with adequate capacity must be inserted.
- Backup must be acknowledged by tapping “OK”.

Sequence

Before the backup is started, you are once again prompted to acknowledge by tapping “OK”. If a CF card with adequate memory capacity is inserted, the following file is created in the “SecuStar-Autobackup” directory on the CF card:

“autobackup_YYYY-MM-DD-XXX.db.bak”

where YYYY = year, MM = month and DD = day.

XXX = consecutive number beginning with 000.

Example

If this directory already contains a backup file with the file name “autobackup_2006-06-26-007.db.bak”, the next file will be named “autobackup_2006-06-26-008.db.bak”, assuming that the second backup was also created on the 26th of June, 2006.

Multiple Backup Files

The generation of only a single backup has the following disadvantage: If a faulty or incomplete database is generated during the backup process, this is the only existing version which can be used for restoring data. The more backups are created over a long period of time, the less critical this danger becomes. The number of backup versions (default setting = 5 backups) can be selected in the setup menu to this end.

Each time the selected maximum number of backup files is exceeded, the oldest backup file is overwritten.

No backup is created in the following cases:

- The auto-backup function is deactivated in the setup menu.
- No CF card has been inserted (an error message appears).
- Memory capacity is insufficient (an error message appears).
Remedy: Insert another CF card or reduce the number of backup versions.
- The backup function is skipped by tapping “Ignore”.

4.11.5 Restore – Restoring the Database



Restoring an existing database is advisable under the following conditions:

- You are using several test systems and want them all to have the same database.
- After data loss has occurred

When restoring the database with the restore function, extensive checking of the database structure is executed. If the database is defective, it cannot be restored.

If you have saved the backup file under another name to a PC: Note that the backup file used for restoring data must have file name “secustar.db.bak”.

Attention!

If you respond to the prompt by tapping “Yes”, the database backup file (secustar.db.bak or preUpdateYYYY-MM-DD.xml) is restored to the **test system** from the inserted compact flash card. The current database is overwritten and its data are irretrievably lost.

If no compact flash card has been inserted, data cannot be restored.

Note

Data originating from an older version of the **test system** cannot be restored. Execute the export function before, and the import function after updating for this reason. (see section 7.7.7).

4.11.6 DB Init – Database Initialization (admin only)



Attention!

If you respond to the prompt by tapping “Yes”, the database is returned to its default state (as shipped from the factory), and all data are irretrievably lost except for the test person and the information as to which hierarchies were active.

4.11.7 DB-Stat – Database Statistics



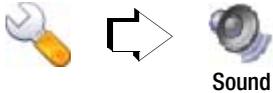
All database entries are recorded statistically here, and are listed according to category.

An “occupancy bar graph” is also displayed, which indicates how well the **test system** can be operated (= number of data records). As of 5000 data records, the **test system** becomes slower. The catalogs can be selectively deleted as well.

Attention!

If the security prompt is acknowledged with yes, the corresponding entries are deleted and the data are irretrievably lost.

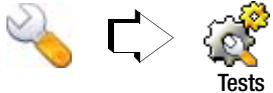
4.11.8 Sound – Switching Key Sound On and Off



If this function is activated, each key stroke (for the softkeys as well) is acknowledged with an acoustic signal. Tap the following symbol repeatedly in order to activate and deactivate this function:



4.11.9 Tests – Carrying Deadlines Forward



Here you can replace the default name of a test without deadline, i.e. “spontaneous test”, with a user specified text. The text is entered to the “Activity” field.

You can specify whether or not, and if so how a deadline will be carried forward with the automatic carry forward function (not automatic, after successfully passing a test or after every test). If the automatic carry forward function is activated, a new deadline is set after a test is saved to memory.

The user can also select which deadline will be displayed for a DUT, if it's selected in the **Automatic Test** menu.

4.11.10 Object Hierarchy – Hierarchy Administration (Admin only)



Here you're provided with an overview of the object hierarchies within the system, their designations and their identification. Object hierarchies are used to further demarcate devices under test. For example, objects can be entered which must fulfill various test criteria for different applications. If you possess administrator authority, you can activate and deactivate object hierarchies. A “red light” means that the respective hierarchy is not activated. A “green light” means that the respective hierarchy is activated. In order to deactivate a hierarchy, tap the corresponding “green light” with the wand. In order to activate a hierarchy, tap the corresponding “red light” with the wand.

Designation	ID	Ac...	Enabled
Standard	0	●	●
Equipment	4	●	●
Medical engineering	10	●	●
Building services	11	●	●
EDP	13	●	●
Company fire pr...	46	●	●

If more than one hierarchy is active, the user has to specify to which hierarchy newly created devices under test, object types and object categories will be assigned to. The following

hierarchies are currently available: standard, systems, medical technology, building services, EDP and facility fire prevention.

Hierarchy names can be changed as desired.



Attention!

Be sure to observe any security prompts which are displayed during activation and deactivation.

4.11.11 Accessories

Pocket Calculator

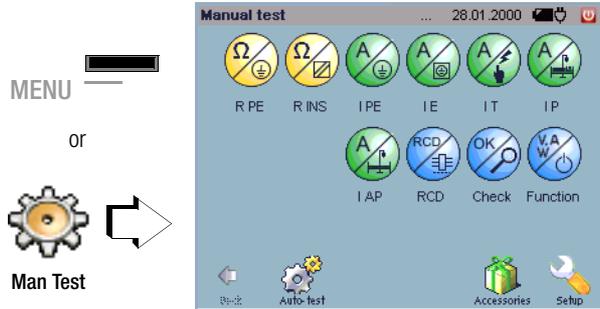


Apart from addition, subtraction, multiplication and division in the right-hand column, various special functions can be selected in the header by repeatedly tapping the “2nd” button.

2nd	C	()
Meaning	Clear entry	Left parenthesis	Right parenthesis
2nd	<-	±	^
Meaning	Clear individual digits beginning at right	Change plus or minus sign	Exponent (e.g. $2^3=2 \times 2 \times 2=8$)



5 Manually Triggered Measurements – Individual Measurements



Individual tests are executed at the “Manual Test” menu level. Tests can be executed here in a targeted fashion while repairing defective devices under test.

Other applications are started in the accessories or setup menu. You should double check all parameters before starting the respective measurement with the **ON | START** key. Adjustable parameters are highlighted by means of raised buttons. Before starting the actual measurement, it is also advisable to conduct a visual inspection, as well as a connection test with the help of the test function.

5.1 General Procedure

Select the “Manual Test” main menu .

- Select the measuring function.
- Double check the selected parameter settings. Readjust them if necessary.
- Select the desired type of measurement: *type of DUT, type of connection.*
- Connect the DUT in accordance with the wiring diagrams provided by the help function (**HELP** button) and the above selected type of connection.

Depending upon the type of connection selected for the DUT, use of probes, adapters or a clip-on ammeter may be required.

- Start the test with the **ON | START** key.

The following symbol appears for the duration of the measurement:



After measurement has been completed – after the selected measuring time has elapsed, or if (long-term) measurement is aborted by pressing the **ON | START** key – the following symbol appears:



Measurement data can be read from the display or printed out.

- The display is returned to the main menu by pressing the **ESC** or the **MENU** key.



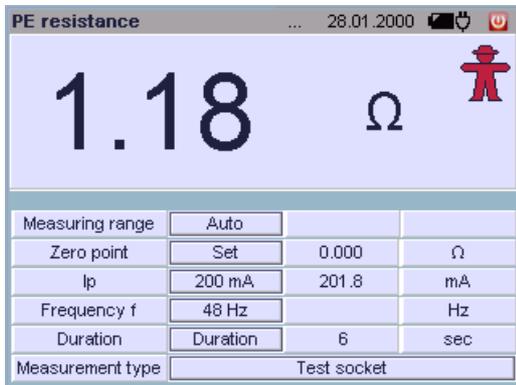
5.2 Overview

Symbol	Abbr.	Measurement / Test	Terminals		Visual inspection	Description	
		Manual test	Test socket	Socket 1-2 3-4			
Resistance measurements							
	PE Resistance	Permanent connection	●		●	page 42	
		Permanent connection + earth electrode		●			Probe 1-2
		Extension cable	●				
	Insulation Resistance	SC1 with mains plug	●		●	page 46	
		SC2 with mains plug	●	●			Probe 1-2
		Permanent connection	●				
	Extension cable	●					
Current measurements							
	PE leakage Current	Direct measuring method	●		●	page 49	
		Differential current measuring method	●				
		Alternative measurement	●				
		Differential current measuring method with current clamp		●			Probe 3-4
	Equipment Leakage Current	Direct measuring method	●		●	page 52	
		Differential current measuring method	●	●			Probe 1-2
		Alternative measurement	●				
	Touch Current	Direct measuring method	●		●	page 56	
		Differential current measuring method	●				
		Alternative Measurement	●	●			Probe 1-2
		Direct measurement with permanent connection	●				
	Patient Leakage Current	Direct measuring method	●	●	●	page 60	

Symbol	Abbr.	Measurement / Test	Terminals		Visual inspection	Description
		Manual test	Test socket	Socket 1-2 3-4		
	IAP	Applied Parts leakage Current	●	●	●	page 62
Functions Tests						
	RCD Test	RCD time to trip		Netzanschluss		page 64
		PRCD time to trip	●	●	●	Probe 1-2
	Function	Voltage / load current Active/app. power P/A Power factor PF Energy E	●			page 68
Connection test						
	Test	PE connection test ^{1) 2)} Short-Circuit Test On Test Safety class check PE potential test ¹⁾ Probe test	●		●	page 66
				Touch contact surface		
				●	●	Probe 1-2
Measurement with sensors (option) USB1 ...USB4						
	Humi	Temperature Humidity (with Z751B)			●	page 70
	Light	Illuminance (with Z751C)			●	page 71

- 1) test system mains connection
- 2) Special case, IT network: results in system message
- 3) Special case, IT network: results in error messages

ts = test socket
SC1/2 = safety class I/II



Application

Continuity and resistance of the protective conductor must be measured.

Definition

Protective conductor resistance is the resistance of the connection of a safety class I device (SC1) between any exposed conductive parts and the protective contact at the mains plug or the mains side end of the permanent connection.

Protective conductor resistance is the sum of the following resistances:

- Connector cable or device connector cable resistance
- Contact resistance of the plug and terminal connections
- Resistance of the extension cable

Measuring Method

Resistance is measured:

- Between each exposed *conductive part of the housing* (probe contact) and the earthing contacts at the mains and the device plug (if a removable mains connector cable is used), or the protective conductor terminal for permanently installed devices.
- Between the earthing contacts at the mains plug and the earthing contacts at the device plug for *device connector cables*
- Between the earthing contacts at the mains plug and the earthing contacts at the coupling socket for *extension cables*

Parameters

The following parameters must be set before measurement:

- Measuring range: mΩ, Ω or auto (automatic switching amongst the ranges).
- Zero point: see “Combined Test – Differential Protective Conductor Resistance” on page 45.
- I_p (protective conductor test current): 50, 100, 150, 200 or 250 mA
- Frequency: 48 Hz, 58 Hz, 108 Hz, 148 Hz, or 198 Hz
- Measurement duration: 5 s, 10 s, 15 s, 30 s or continuous
- Measurement type:
 - Test socket (connection of SC1 devices)
 - Permanent connection
 - Permanent connection
 - Extension cable (via test socket and probe)

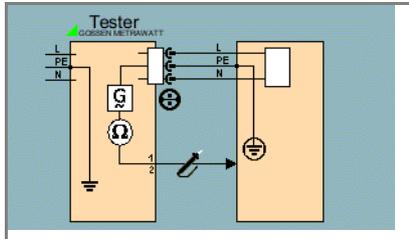
In order to select the correct type of connection:

Select the measurement type and check the associated wiring diagram after accessing it with the help function.

Test Socket

DUT mains plug connected to the test socket

Probe connected to sockets 1 and 2

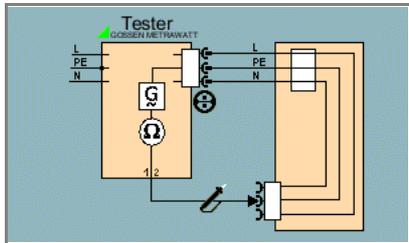


Extension Cable

Extension cable plug connected to the test socket

Probe connected to sockets 1 and 2

Probe connected to protective conductor contact of the extension cable socket coupling



Sequence – DUT Connected to Test Socket

- Select the test: R PE softkey.
- Connect the DUT to the **test socket**.
- Select measuring range, protective conductor test current, frequency and measurement duration.
- Select **test socket** or **extension cable*** as the type of connection via measurement type.
- Start the test: Press the **ON | START** key.
- After each reconnection to the mains, and as soon as the first test is started, a mains connection test is executed (see section 4.1.1).
- Contact one of the conductive parts of the housing which is connected to the protective conductor with the probe.

During measurement, the **connector cable** must only be moved to the extent it is accessible during repair, modification or testing. If a change in resistance occurs during the manual test step of the continuity test, it must be assumed that the protective conductor is damaged, or that one of the connector contacts is no longer in flawless condition.

- Measured values are displayed.
- End the test: Press the **ON | START** key.
- Read the measured value and compare it with the table of allowable limit values.

* Special Case, Connection of Extension Cables

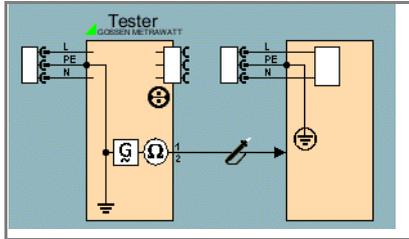
The extension cable plug is inserted into the test socket, and the probe is connected to the protective conductor contact in the coupling socket.



Permanent Connection

Permanently installed DUT

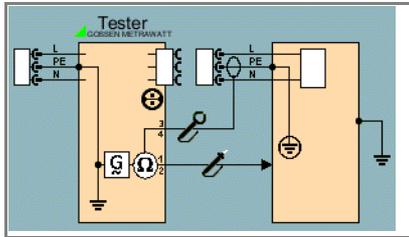
Probe connected to sockets 1 and 2



Permanent Connection and Ground

Probe connected to sockets 1 and 2

Clip-on ammeter connected to sockets 3 and 4



Sequence – Permanently Installed DUT

- Select the test: R PE softkey.
- Connect the DUT to the **mains outlet**.
- Select measuring range and measurement duration.
- Select **permanent connection*** as the type of connection via measurement type.



Attention!

Deactivate the electrical system which supplies power to the device under test before connecting the test system (via the probe)!

- Contact one of the conductive parts of the housing which is connected to the protective conductor with the probe.
- Start the test: Press the **ON | START** key.
- All measured values are displayed.
- End the test: Press the **ON | START** key.
- Read the measured value and compare it with the table of allowable limit values.

* **Special Case 'Permanent Connection and Ground'**



Combined Test – Differential Protective Conductor Resistance

Zero balancing is also possible for protective conductor measurement. With zero balancing, all subsequent measurements are adjusted with an offset such that 0 Ω is displayed for a selected reference point which is connected to the protective conductor.

When test points are contacted with the probe which are electrically connected to this reference point, differential resistance ΔR_{PE} between the reference point and the contacted test point is displayed.

Zero balancing is started by activating the “Set” key, and is ended pressing the **ON | START** key.

The zero point is set until it’s cleared, or until the measurement is exited.

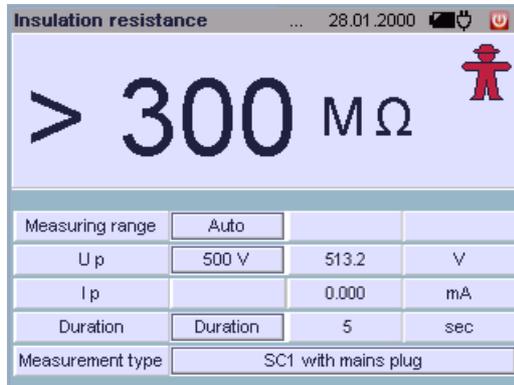
Maximum Allowable Limit Values for Protective Conductor Resistance for Connector Cables with Lengths of up to 5 m

Test Standard	Test current	Open-Circuit Voltage	R _{PE} Housing – Device Plug	R _{PE} Housing – Mains Plug
VDE 0701-0702	> 200 mA ⁻⁻⁻	4 V < U _L < 24 V		0.3 Ω ¹⁾
				+ 0.1 Ω ³⁾ for each additional 7.5 m
IEC 62353 (VDE 0751-1)			0.2 Ω	0.3 Ω

¹⁾ This value may not exceed 1 Ω for permanently connected data processing systems (DIN VDE 0701, part 240).

²⁾ Permanently connected cable

³⁾ Max. 1 Ω



Application

Insulation resistance must be measured for:

Safety class I	between L + N and PE
Safety class II	between L + N and user accessible conductive parts

In order to assure that all insulation which is exposed to line voltage is tested during this measurement, make sure that switches, temperature regulators etc. are closed.

Definition

Insulation resistance is active resistance between the electrical circuits of the device and its exposed conductive parts.

Measuring Method

Safety Class I (SC1)

Insulation resistance is measured between short-circuited mains terminals and the protective conductor.

Safety Class II (SC2)

Insulation resistance is measured between short-circuited mains terminals and external conductive parts which can be contacted with the probe.

Parameters

The following parameters must be set before measurement:

- Measuring range: 300 MΩ, 30 MΩ, 3 MΩ, 300 kΩ or auto (automatic switching amongst the ranges)
- U_T (test voltage): 500 V, 400 V, 300 V, 200 V or 100 V
- Measurement duration: 5 s, 10 s, 15 s, 30 s or continuous
- Measurement type:
 - SC1 with mains plug
 - SC2 with mains plug
 - Permanent connection
 - Extension cable

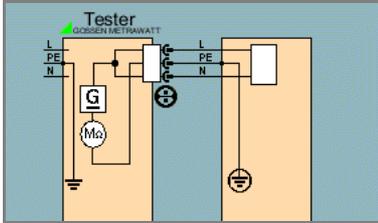
In order to select the correct type of connection:

Select the measurement type and check the associated wiring diagram after accessing it with the help function.



SC1 with Mains Plug

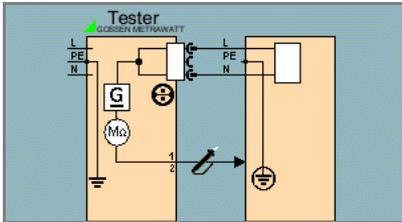
DUT mains plug connected to the test socket



SC2 with Mains Plug

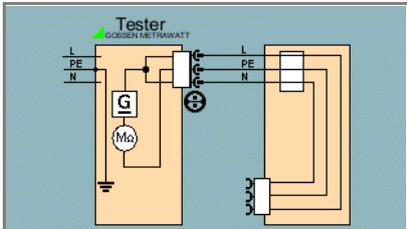
DUT mains plug connected to the test socket

Probe connected to sockets 1 and 2



Extension Cable

Extension cable plug connected to the test socket



Connection of Permanently Installed Safety Class I Devices



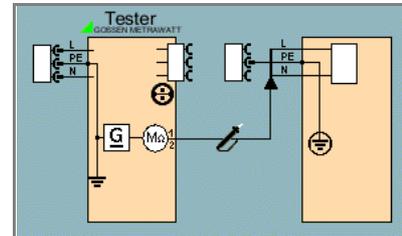
Attention!

Deactivate the electrical system which supplies power to the device under test before connecting the test system!

- Remove the mains fuses from the device under test and disconnect the neutral conductor N inside the device under test.
- Connect the probe to phase conductor L at the device under test in order to measure insulation resistance.

Permanent Connection

Probe connected to sockets 1 and 2





Sequence

Safety class I devices: The protective conductor test must already have been passed as a prerequisite for the insulation resistance test.

- Select the test: R ISO softkey.
- Connect the DUT to the test socket, or connect the probe.
- Select measuring range, test voltage U_t and measurement duration.
- Select the type of connection via measurement type.

Note

All switches at the device under test must be set to the on position during measurement of insulation resistance, including temperature controlled switches and temperature regulators as well. Measurement must be performed in all program stages for devices equipped with program controllers.

- Start the test: Press the **ON | START** key.
- After each reconnection to the mains, and as soon as the first test is started, a mains connection test is executed (see section 4.1.1).

Attention!

Testing is conducted with up to 500 V. Current limiting is utilized ($I < 10$ mA), but if the terminals (L and N) are touched, electrical shock may occur which could result in consequential accidents.

Note

Open-circuit voltage is always greater than nominal voltage.

- Special case, SC2 connection: Contact exposed conductive parts with the probe during measurement.
- All measured values are displayed.
- End the test: Press the **ON | START** key.
- Read the measured value and compare it with the table of allowable limit values.

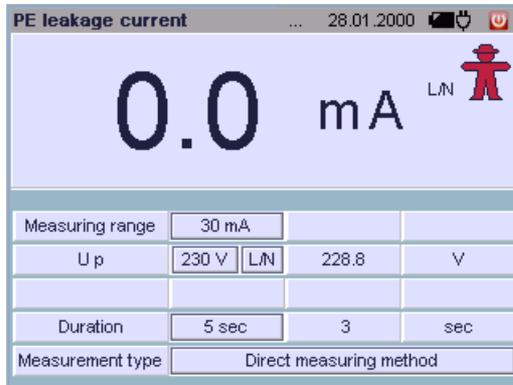
Minimum Allowable Limit Values for Insulation Resistance

Test Standard	Test voltage	R _{ISO}			
		SC I	SC II	SC III	Heaters
VDE 0701-0702 :2008	500 V	1 MΩ	2 MΩ	0.25 MΩ	0.3 MΩ
		2 MΩ	7 MΩ		
70 MΩ		70 MΩ			
IEC 62353 (VDE 0751-1)					

Notes Concerning Test Standard 0701-0702

If the measured value is less than 0.3 MΩ for safety class I devices which include a heating element, leakage current must be measured as described on page 52, and this test must be passed. The same applies to mains powered safety class II electronic devices if the required value of 2 MΩ is not complied with. In the case of safety class II devices, all exposed conductive parts must be contacted with the probe, and insulation resistance must be measured.

Batteries must be disconnected from their terminals during testing of battery powered devices.



Application

Measurement of protective conductor current may be performed in the case of safety class I devices for which it cannot be assured that all components exposed to line voltage are tested by means of insulation resistance measurement, or if insulation resistance measurement cannot be performed for other reasons.

Definition of Differential Current

Sum of instantaneous current values which flow via the L and N conductors at the device mains connection. Differential current is practically identical to fault current in the event of an error. Fault current: Current which is caused by an insulation defect, and which flows via the defective point.

Definition of Equivalent Measurement

Equivalent leakage current is current which flows through active conductors of the device which are connected to each other (L/N) to the protective conductor (SC1), or to exposed, conductive parts (SC2).

Definition of Protective Conductor Current (direct measurement)

Current which flows through the protective conductor with housings which are isolated from ground.

Differential Current Measuring Method

The device under test is operated with mains power. The sum of the momentary values of all currents which flow through all active conductors (L/N) at the mains side of the device connection is measured. The measurements must be performed with mains plug polarity in both directions.

Equivalent Measurement Method

A high-impedance power supply is connected between the short-circuited mains terminals and all exposed metal parts of the housing (which are connected to one another). Current which flows over the insulation at the device under test is measured.

Protective Conductor Current Measuring Method (direct measurement)

The device under test is operated with mains power. Current which flows through the PE conductor to earth at the mains side of the device connection is measured.



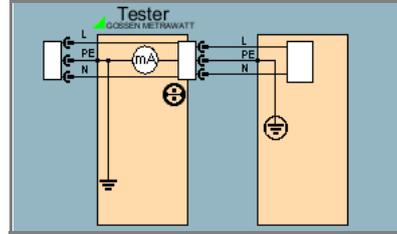
Parameters

- Measuring range: 300 μ A, 3 mA, 30 mA or auto (automatic switching amongst the ranges)
- Test voltage U_t: 110 V ... 240 V, selection of test voltage polarity: N/L or L/N
- Test frequency f_t: 400, 200, 60 or 50 Hz
- Measurement duration: 5 s, 10 s, 15 s, 30 s or continuous
- Measurement type:
 - Direct measuring method (via test socket),
 - Differential current measuring method
 - Equivalent leakage current measuring method,
 - Differential current measuring method (via current sensor at sockets 3 and 4)

In order to select the correct type of connection:
Select the measurement type and check the associated wiring diagram after accessing it with the help function.

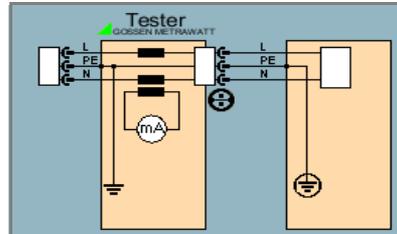
Direct measuring method

DUT mains plug connected to the test socket

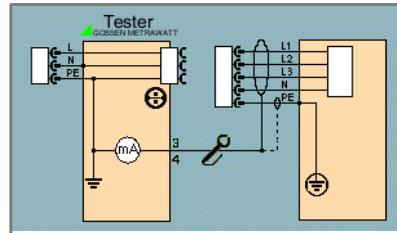


Differential current measuring method:

DUT mains plug connected to the test socket



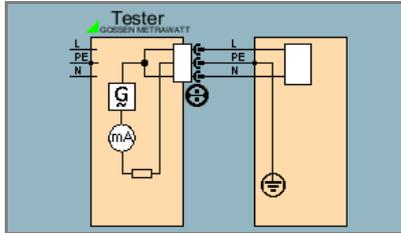
Differential Current measuring method + current clamp:
sensor at sockets 3 and 4





Alternative measurement:

DUT mains plug connected to the test socket



Sequence

- Select the test: I PE softkey.
- Connect the DUT to the test socket, or connect a clip-on ammeter.
- Select measuring range, test voltage U_t with polarity, and measurement duration.
- Select type of connection and type of current via measurement type.
- Start the test: Press the **ON | START** key.
- After each reconnection to the mains, and as soon as the first test is started, a mains connection test is executed (see section 4.1.1).
- Measured values are displayed.
- End the test: Press the **ON | START** key.
- Read the measured value and compare it with the table of allowable limit values.

Maximum Allowable Limit Values for Leakage Current in mA

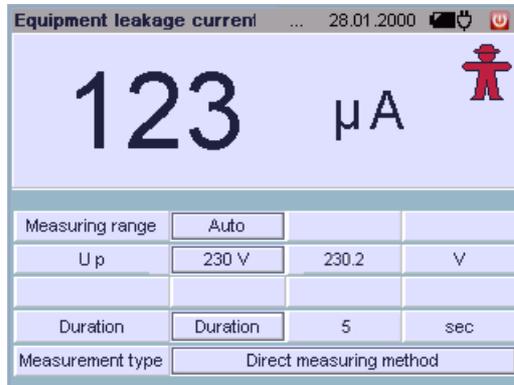
Test Standard	Prot. conductor current		Diff. current
	NC	SFC	
VDE 0701-0702	3,5 mA / 1 mA/kW *		3,5 mA / 1 mA/kW *
IEC 62353 (VDE 0751-1)			

* For devices with heating power of greater than 3.5 kW

Key

NC normal condition

SFC single fault condition



Application

Measurement of device leakage current is required for: Electrical medical devices in accordance with IEC 62353 (VDE 0751-1).

Definition

Devices leakage current is the sum of all leakage current from the housing, exposed conductive parts and application parts to PE (protective earth).

Parameters

- Measuring range: 300 μA, 3 mA, 30 mA or auto (automatic switching amongst the ranges)
- Test voltage U_t: 110 V ... 240 V
- Test frequency f_t: 400 Hz, 200 Hz, 60 Hz or 50 Hz
- Measurement duration: 5 s, 10 s, 15 s, 30 s or continuous
- Measurement type:
 - Direct measuring method ¹⁾
 - Differential current measuring method ¹⁾
 - Equivalent leakage current measuring method

In order to select the correct type of connection: Select the measurement type and check the associated wiring diagram after accessing it with the help function.

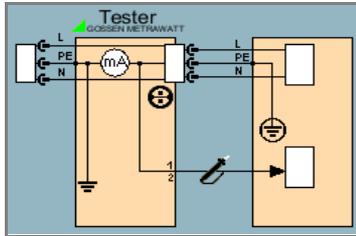
- ¹⁾ Measurement must be performed with mains polarity in both directions. The largest value is documented.



Direct Measuring Method

DUT mains plug connected to the test socket

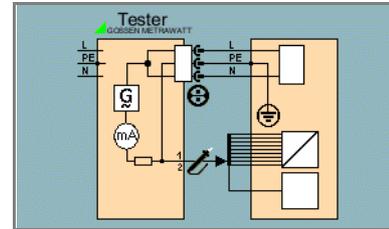
Probe to sockets 1 and 2



Equivalent Leakage Current Measuring Method

DUT mains plug connected to the test socket

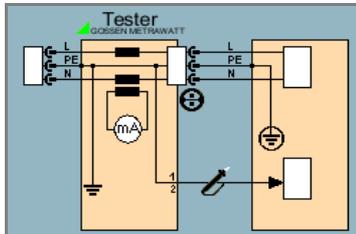
Probe to sockets 1 and 2



Differential Current Measuring Method

DUT mains plug connected to the test socket

Probe to sockets 1 and 2





Sequence

- Select the test: I EL softkey.
- Connect the DUT to the test socket, or connect the probe.
- Select measuring range, test voltage U_t , test frequency f_t and measurement duration.
- Select type of connection and type of current via measurement type.
- Start the test: Press the **ON | START** key.
- After each reconnection to the mains, and as soon as the first test is started, a mains connection test is executed (see section 4.1.1).
- Measured values are displayed.
- End the test: Press the **ON | START** key.
- Read the measured value and compare it with the table of allowable limit values.

Maximum Allowable Limit Values for Equipment Leakage Current in mA

Test Standard	I _{EL}	I _{EDL}	
VDE 0701-0702	SC I: 3.5 / 1 mA/kW ¹⁾		
	SC II: 0.5		
VDE 0751: 2008		SC II	0.2 ²⁾
		SC I (PE or parts connected to PE)	1
		Permanently connected devices with PE	10
		Portable x-ray devices with additional PE	5
		Portable x-ray devices without additional PE	2
		Devices with mineral insulation	5

I_{EL} Equivalent leakage current

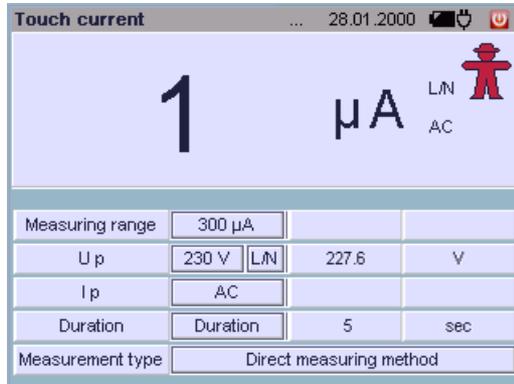
I_{EHL} Equivalent housing leakage current

PE Protective conductor

¹⁾ For devices with heating power of greater than 3.5 kW

²⁾ This limit value is not taken into consideration in the IEC 62353 (VDE 0751-1) standard.





Application

This test may be performed for safety class II devices with exposed conductive parts where reservations exist regarding the measurement of insulation resistance, or if not possible to interrupt device operation.

The above mentioned conditions apply as well to measurements at exposed conductive parts on safety class I devices which are not connected to the protective conductor.

Definition

Current which flows from housing parts which are not connected to the protective conductor via an external conductive connection to earth or another part of the housing. Flow of current via the protective conductor is excluded in this case.

The following designations are also common: housing leakage current, probe current.

Measuring Method

The device under test is operated with mains power. Current which flows to the protective conductor via exposed conductive parts is measured. The measurements must be performed with mains plug polarity in both directions. The AC or the DC component of the current is measured.

Parameters

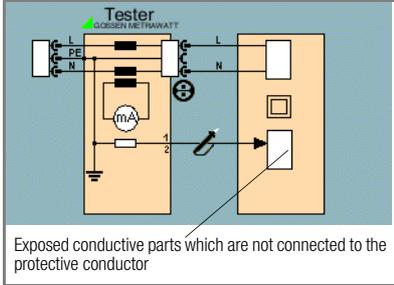
- Measuring range: 300 μA, 3 mA, 30 mA or auto (automatic switching amongst the ranges)
- Test voltage U_t: 110 V ... 240 V,
- Selection of test voltage polarity: N/L or L/N
- Test current type: Eff (AC+DC), DC or AC
- Measurement duration: 5 s, 10 s, 15 s, 30 s or continuous
- Measurement type:
 - Direct measuring method
 - Differential current measuring method
 - Equivalent leakage current measuring method
 - Direct measurement with permanent connection



Differential Current Method

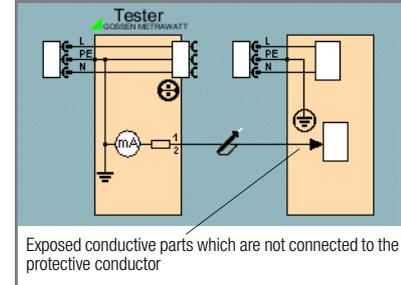
DUT mains plug connected to the test socket

Probe to sockets 1 and 2



Direct Measuring Method, Permanent Connection

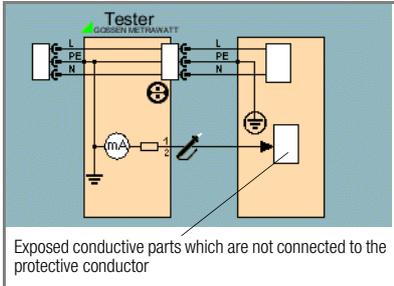
Probe to sockets 1 and 2



Direct Measuring Method:

DUT mains plug connected to the test socket

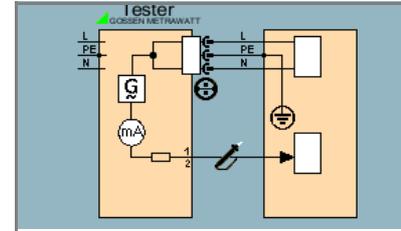
Probe to sockets 1 and 2



Equivalent Leakage Current Measuring Method

Connection to test socket

Probe to sockets 1 and 2





Measuring Contact Current (absence of voltage)

Make sure that the contacted parts are not grounded.

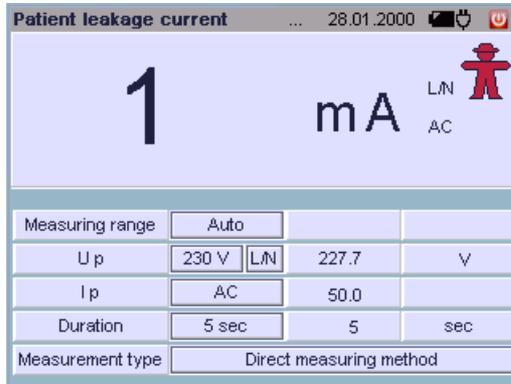
Sequence

- ⇨ Select the test: I C softkey.
- ⇨ Connect the DUT to the test socket, or connect the probe.
- ⇨ Select measuring range, test voltage U_t with polarity, test current type and measurement duration.
- ⇨ Select type of connection and type of current via measurement type.
- ⇨ Start the test: Press the **ON | START** key.
- ⇨ After each reconnection to the mains, and as soon as the first test is started, a mains connection test is executed (see section 4.1.1).
- ⇨ Measured values are displayed.
- ⇨ End the test: Press the **ON | START** key.
- ⇨ Read the measured value and compare it with the table of allowable limit values.

Maximum Allowable Limit Values for Touch Current in mA

Test Standard	I _c	
	NC	SFC
VDE 0701-0702	0.5	
IEC 62353 (VDE 0751-1)		





Definition

Patient leakage current is the current which flows to ground or PE from the patient ports at the energized device via the patient. This current can also be caused by inadvertent interference voltage at the patient, and may flow to ground via the patient and an isolated type F floating application part. Useful patient current is excepted in both cases.

The AC and the DC component of the current is measured.

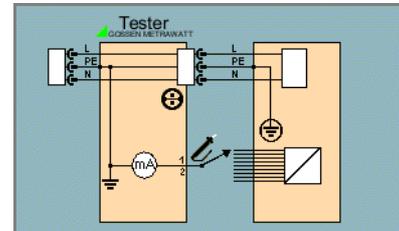
Parameters

- Measuring range: 300 μ A, 3 mA, 30 mA or auto (automatic switching amongst the ranges)
- Test voltage U_t: 110 V ... 240 V, selection of test voltage polarity: N/L or L/N
- Test current type: AC+DC TRMS, DC or AC
- Measurement duration: 5 s, 10 s, 15 s, 30 s or continuous
- Measurement type: patient leakage current (via test socket and probe)

Direct Measuring Method

DUT mains plug connected to the test socket

Probe connected to sockets 1 and 2



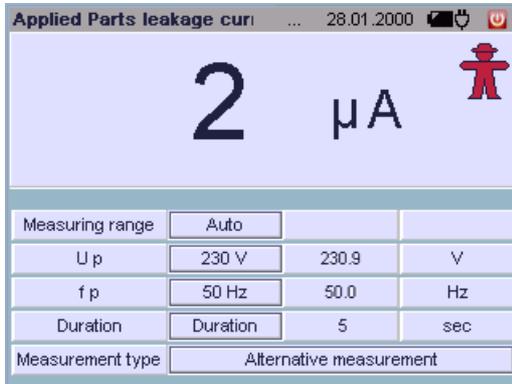


Sequence

- Select the test: I P(L) softkey.
- Connect the DUT to the test socket and connect the probe.
- Select measuring range, test voltage U_t with polarity, test current type and measurement duration.
- Start the test: Press the **ON | START** key.
- After each reconnection to the mains, and as soon as the first test is started, a mains connection test is executed (see section 4.1.1).
- Contact all of the application parts, one after the other, with the probe.
- Measured values are displayed.
- End the test: Press the **ON | START** key.
- Read the measured value and compare it with the table of allowable limit values.

Maximum Allowable Limit Values for Leakage Current in mA

Test Standard		I _{PL}					
		Type B		Type BF		Type CF	
		NC	SFC	NC	SFC	NC	SFC
IEC 62353 (VDE 0751-1)	Direct current	0.01		0.01		0.01	
	Alternating current	0.1		0.1	5	0.01	0.05
EN 60601	Direct current	0.01	0.05	0.01	0.05	0.01	0.05
	Alternating current	0.1	0.5	0.1	0.5	0.01	0.05



Definition

Equivalent patient leakage current is current which flows through the conductors of the device, which are connected to each other (L/N/PE), to the patient ports.

Prerequisite

A high-impedance power supply is connected between one patient port at a time and the exposed metallic parts of the housing (which are connected to each other). The mains terminals are short-circuited and are connected to the same point on the housing.

Measurement

The current which flows over the insulation of the device under test is measured separately for each application part.

Measurement is always performed using an AC source with current limiting. Differing mains voltages are taken into consideration.

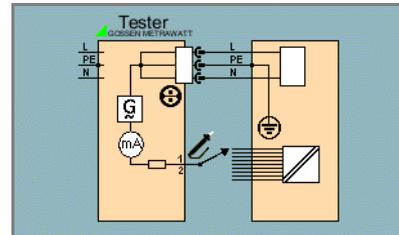
Parameters

- Measuring range: 30 mA, 3 m A, 300 μA or auto (automatic switching amongst the ranges)
- Test voltage U_t: 110 V ... 240 V
- Test frequency f_t: 400 Hz, 200 Hz, 60 Hz or 50 Hz
- Measurement duration: 5 s, 10 s, 15 s, 30 s or continuous
- Measurement type: equivalent patient leakage current (ts) (via test socket and probe)

Equivalent Leakage Current Measuring Method

DUT mains plug connected to the test socket

Probe connected to sockets 1 and 2



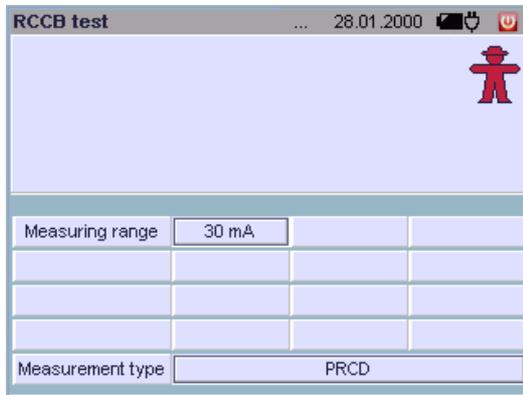


Sequence

- ⇨ Select the test: I EPA softkey.
- ⇨ Connect the DUT to the test socket, or connect the probe.
- ⇨ Select measuring range, test voltage U_t , test frequency f_t and measurement duration.
- ⇨ Start the test: Press the **ON | START** key.
- ⇨ After each reconnection to the mains, and as soon as the first test is started, a mains connection test is executed (see section 4.1.1).
- ⇨ Contact all of the application parts, one after the other, with the probe.
- ⇨ Measured values are displayed.
- ⇨ End the test: Press the **ON | START** key.
- ⇨ Read the measured value and compare it with the table of allowable limit values.

Maximum Allowable Limit Values for Leakage Current in mA

Test Standard		I _{EPA}	
		Type BF	Type CF
		SFC	SFC
IEC 62353 (VDE 0751-1)	Alternating current	5	0.05



Definition

According to DIN VDE 0100, part 610:2004, substantiation must be provided that RCCBs are tripped at nominal residual current within 400 ms (1000 ms for selective RCCBs).

RCD: Residual current device

PRCD: Portable residual current device (only those whose protective conductor is not deactivated)

RCD Measurement

The **test system** is connected to the RCD under test by connecting its mains cable to mains supply power.

In order to test RCD time to trip, the battery in the **test system** must be charged adequately enough to span the duration during which mains power is unavailable after the RCD has been tripped.

PRCD Measurement

The PRCD under test is plugged into the test socket at the **test system**. The **test system** must be connected to the mains so that line voltage can be switched to the PRCD during the test. The phase must be contacted with the probe in order to trip the PRCD.

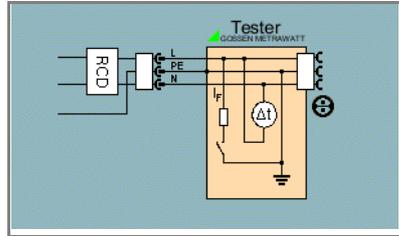
Parameters

- Measuring range: 30 mA
- Measurement type: RCD or PRCD



RCD Measurement Sequence

- Select the test: RCD Test softkey.
- Connect the **test system** to a mains outlet within the appropriate RCD circuit: .
- Select the measurement type with the RCD softkey.



Attention!

The RCD is tripped during measurement. In order to prevent **loss of data** from data processing systems, back up your data first, and **switch off all power consumers**.

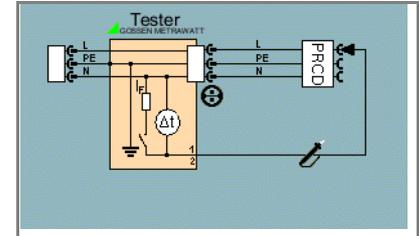
If **inductive power consumers** are also switched off during RCD tripping tests, voltage peaks may occur within the respective circuit when tripping takes place. The fuses in the **test system** may blow as a result.

- Start the test: Press the **ON | START** key.
- After each reconnection to the mains, and as soon as the first test is started, a mains connection test is executed (see section 4.1.1).
- Time to trip is displayed after tripping the RCD.

If the RCCB is not tripped, we recommend an additional earth resistance test with the **PROFITEST | ONE** test instrument.

PRCD Measurement Sequence

- Select the test: RCD Test softkey.
- Plug the PRCD into the test socket at the **test system**, connect the probe to sockets 1 and 2 and contact phase L at the PRCD with the probe tip (always the bottom terminal).



- Select the measurement type with the PRCD softkey.
- Start the test: Press the **ON | START** key.

Execute the following steps when prompted to do so:

- After each reconnection to the mains, and as soon as the first test is started, a mains connection test is executed (see section 4.1.1).
- If the probe test has revealed that no probe was connected: Connect the probe as described above.
- Switch on or activate the PRCD within 5 seconds (e.g. reset button on PRCD), so that the PRCD can be activated when energized with line voltage.
- The test is automatically ended and time to trip is displayed after the PRCD is tripped.

If the PRCD was not switched on, or if N was contacted instead of L at the PRCD with the probe, an error message is displayed and “Error” appears at the display.



Connection of the DUT is tested by means of the following three individual tests. **OK** is displayed each time a test is passed, and **Error** appears each time a test is failed.



PE Connection Test (mains connection test for the test system)

Testing to determine whether or not the protective conductor is connected.

$R_{PE} < 15 \text{ k}\Omega \rightarrow$ connection OK
 $R_{PE} > 15 \text{ k}\Omega \rightarrow$ not connected



PE Potential Test (mains connection test for the test system)

Testing to determine whether or not the protective conductor is charged with dangerous contact voltage. Touch the contact surface to this end.

$U < 15 \text{ V}\sim^* \rightarrow$ connection OK
 $U > 15 \text{ V}\sim^* \rightarrow$ warning

* Assuming earth resistance of 1 M Ω



Short-Circuit Test – Test for short-circuiting at the device under test

- 1 Test for short-circuiting of N and L
- 2 Test for short-circuiting of N or L to the protective conductor

$R < 0.5 \text{ }\Omega \rightarrow$ short-circuit
 $R > 5 \text{ }\Omega \rightarrow$ no short-circuit



On Test – Test to determine whether the device under test is switched on or off

The on test is executed by measuring the input impedance of the device under test at the test socket:

$R < 250 \text{ k}\Omega \rightarrow$ DUT switched on \rightarrow message: **ON**
 $R > 300 \text{ k}\Omega \rightarrow$ DUT switched off \rightarrow message: **OFF**



Probe Test (probe connection test)

Testing is conducted to determine whether or not the test probe is plugged into sockets 1 and 2, i.e.

whether or not a (low impedance) connection exists between the two connector plugs.

Probe plugged in → message: **OK**

Probe not plugged in → message: **Error**



Safety Class Test

– DUT safety class detection

This test determines whether or not a safety class I device (earthing contact plug) is plugged into the test socket. Resistance between the protective conductor terminal at the mains plug and the protective conductor contact at the test socket is measured to this end:

$R < 0.5 \Omega$: protective conductor exists → **SC1**

$R > 5 \Omega$: no protective conductor → **SC2**

Note: SC2 also appears at the display if no DUT is connected, or if the protective conductor at the plug is only contacted at one side.

Sequence

- ⇨ Select the test: Test softkey.
- ⇨ Select the type of test: Measurement type softkey.
- ⇨ Connect the DUT to the test socket, or connect the probe.
- ⇨ Start the test: **ON | START** key.

Testing is ended automatically.



Function test		
Voltage U LN	228.1	V
Load current I L	0.50	A
Active power P	58	W
Apparent power S	114	VA
Power faktor PF	0.51	
Energy E	0.38	Wh
Frequency f	50.0	Hz

The device under test can be subjected to a function test with line voltage via the integrated test socket.

The function test includes the following measurements:

- Voltage U-LN between the L and N conductors
- Load current I_L
- Active power P
- Apparent power S (calculated)
- Power factor PF ($\cos \varphi$ calculated, display > 10 W)
- Electrical energy E
- Frequency f (line frequency)

Power factor is calculated from active power and apparent power. Power factor corresponds to $\cos \varphi$ for sinusoidal quantities (line voltage and load current).

Prerequisites

- The function test may only be performed after the DUT has successfully passed the safety test, i.e. after all safety measurements have been executed and passed.
- The device under test must be connected to the test socket. *If no DUT has been connected, momentary line voltage and line frequency are measured if the test system is connected to the mains.*
- No short-circuits may exist at the DUT.



Attention! Starting the Function Test

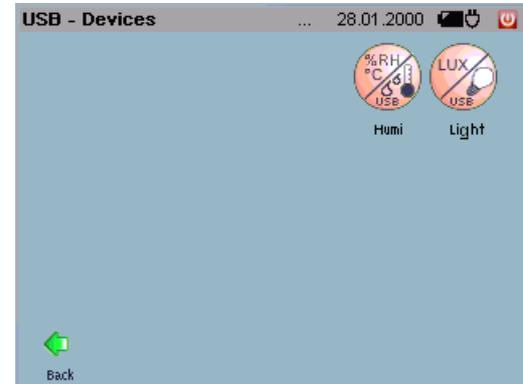
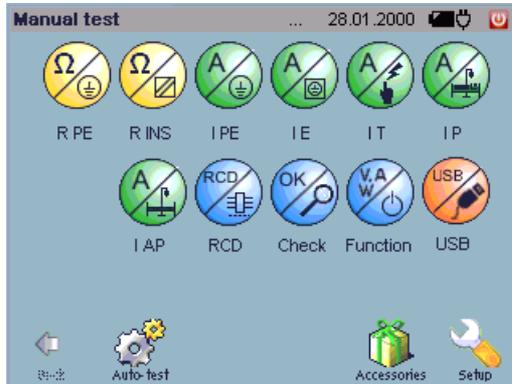
For reasons of safety, the device under test must be switched off before the function test is started. This precaution prevents inadvertent start-up of a device under test which may represent a hazard during operation, e.g. a circular saw or a disc grinder.

Ending the Function Test

After completion of the function test, devices under test must be turned off with their own switch – especially devices with relatively high inductivity.

Sequence

- Select the test: Function softkey.
- Connect the DUT to the test socket.
- Start the test: Press the **ON | START** key.
- All measured values are displayed.
- End the test: Press the **ON | START** key.



Connection

Up to four USB sensors can be connected simultaneously. USB sensors with high current consumption ratings should be connected to the socket labeled 500 mA.

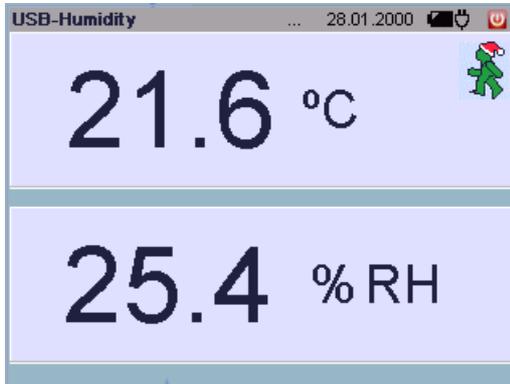
Note: Current consumed by sensors which are connected to the USB ports must be taken into consideration. If possible, disconnect sensors from the USB ports when they are not actually in use.

Activating the USB Devices Menu

Press the ESC or the MENU key in order to allow for the selection of USB sensors in the main menu. The “USB directory” icon is displayed (see screenshot above).

After selecting the USB directory, the softkeys for all connected USB sensors are displayed (see screenshot above).

The softkeys for the sensors which are included in the USB devices directory are activated in the same way as the softkeys for the individual measurements in the main menu.

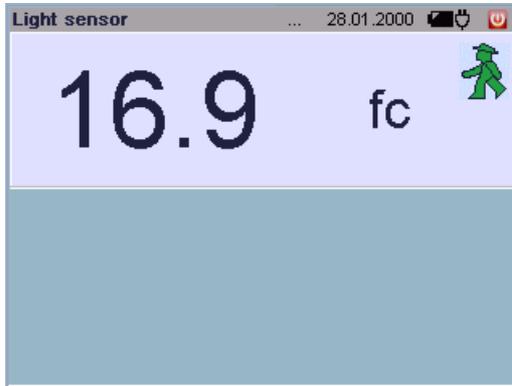


Sequence

- Connect the temperature/humidity sensor to one of the USB ports.
- Activate the USB directory from the manual test:
MENU or **ESC** key.
The USB directory is additionally displayed.
- Select the USB directory.
- Activate the temperature and humidity test: Humi softkey.
- Start the test: **ON** | **START** key.
- End the test: **ON** | **START** key.
ESC key: Return to the Humi softkey.
MENU key: Return to the main menu level.



Application



The sensor is suitable for precisely ascertaining **illuminance** in the units of measure lux and footcandles. With an adapter which is available as an accessory, the MAVOLUX 5032 B USB can also be used to measure **luminance** in cd per square meter or footlamberts.

The light sensitive receiver is color corrected, i.e. its spectral sensitivity is matched to that of the human eye $V(\lambda)$ in accordance with DIN 5032, part 7, class B.

The correction filters are integrated into the measuring probe. All important types of light can thus be measured very accurately, without having to take correction factors into consideration.

In order to assure that even obliquely incident light is correctly evaluated, the measuring instrument includes integrated cosine correction.

Even minimal light can be measured, e.g. for emergency lighting systems.

Notes Regarding Correct Measurement

Make sure that the light receiving surface is fully and uniformly illuminated (e.g. no shadows from hands or body). Hold the measuring probe parallel to the surface to be evaluated if you want to measure illumination of the respective surface (e.g. workstation illumination).

Please note that:

- Artificial light sources do not reach full power until after a lengthy run-up time. If at all possible, switch them on 15 minutes before measurement is performed for this reason.
- Light output from light sources depends upon line voltage. Check line voltage.

Further notes regarding illuminance measurement are included in the appendix on page 143.

Sequence

- ⇨ Connect the MAVOLUX 5032 B USB sensor to the USB port at the **test system** with the included USB cable.
- ⇨ Start the test: Press the **ON | START** key.
- ⇨ All measured values are displayed.
- ⇨ End the test: Press the **ON | START** key.

6 Automatic Test – Individual Test Sequences



6.1 Index Card System

Automated test sequences are run automatically after tapping the **ON | START** button in the “Automatic Test” menu.

Various options are provided for the selection of test sequences via the “Test”, “Sequences”, “Objects” and “Deadlines” index cards.

- Enter the ID number in the “Test” index card.
- Select a sequence form the “Sequences” index card.
- Select an object from the “Objects” index card.
- Select a deadline from the “Deadlines” index card.

You can change from one index card to the other by tapping the appropriate tabs. The tab of the respectively selected index card appears bright blue.

“Test” Index Card

After an ID number has been entered, all relevant test data for the respective device under test is displayed.

“Sequences” Index Card

Test sequences which are available for a given object type are listed in the “Sequences” index card. After a test sequence has been selected, the “Test” index card is activated automatically.

“Objects” Index Card

All DUTs belonging to a given customer are listed in the “Objects” index card according to location. After a device under test has been selected, the “Test” index card is activated automatically.

“Deadlines” Index Card

All existing deadlines are listed here (section 7.5.2). When a deadline is selected, the **Test** index card is activated automatically and the test data are displayed. The test can be started by tapping the **ON | START** button.

6.2 Prerequisites for the Test Sequence

- **Deadline administration:** If required, deadlines can be specified here for periodic testing (see page 109).
- **Object administration:** The effected device under test must be previously defined with an ID number along with its attributes and test sequences (see page 94).

- **Customer administration:** The customer whose object is to be tested, as well as the respective locations, must be previously entered (see page 111).
- **Sequences:** Test sequences in accordance with regulations or standards must be previously defined here by specifying test steps (see page 94).

Overview of Test Sequence Symbols

Symbol	Meaning
	“Deadlines” tab: test is due today
	“Deadlines” tab: test is past due
	Filter function active – preselection of customer / location / object type
	Editing option – edit / save device under test
	Test is active – test steps are being processed
	Test step: measurement is being performed
	Test step: measurement / visual inspection passed
	Test step: measurement / visual inspection not passed
	Save test results
	Display test results

Scrolling through the Monitor Display – Searching for Entries

If more list entries are included than can be displayed at the screen, tap the arrow to access hidden entries.

You can also search for entries in the column on the basis of which the list is ordered. The column which is being searched is indicated in the header of the touch keyboard which opens as soon as you tap onto the binoculars.

	To top of page		Top = bottom of page
	Scroll back 10 pages		Less than 10 pages remain
	Scroll back 1 page		No more pages
3	The number of pages to be scrolled forward or back is entered by directly selecting the desired page.		
	Alphanumeric search (binoculars icon) (entry with correct decimal place beginning at left)		
	Scroll forward 1 page		No more pages
	Scroll forward 10 pages		Less than 10 pages remain
	To bottom of page		Bottom = top of page

Editing Function

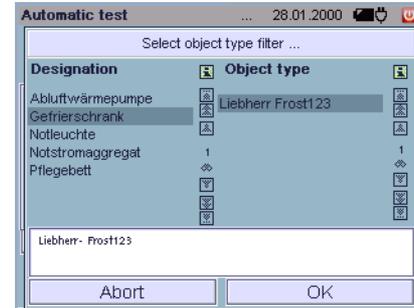
The **editing** icon  appears at the end of each object line. The editing mode can be entered for the respective device under test by tapping this icon. In this way, DUT data can be edited and saved shortly before testing without having to switch to the administration menu. See section 7.3.3.

Filter Function

The **filter** icon  in the object type, customer or location field means:

You have preselected an object type, customer or a location. Only those objects are listed in the „Objects“ index card which comply with the respective criteria.

- Select the object type, customer or location field with gray background in order to set a filter.
- First mark the desired designation, followed by the object type and customer, and then the location.
- Acknowledge your entry with “OK”.
- The selected entry can be unselected by tapping it once again.

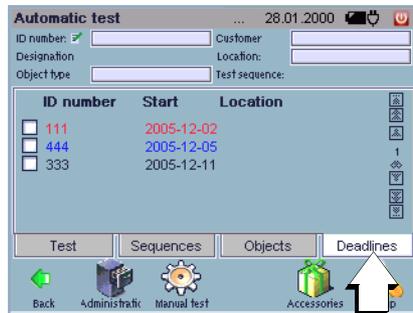


Cancelling Object Type, Customer and Location Selection – Display All Test Objects

If you want to undo the pre-selection for the displayed object type, customer or location, select once again in the filter selection the „Designation“ and „Object type „, or „Customer“ and „Location“ field which is already framed with a bar so that the bar disappears, and acknowledge by tapping the OK button.

6.3 Preparing and Executing Test Sequences

6.3.1 “Deadlines” Index Card



Filter:
enter preselection

Red: test past due

Blue: test due today

Black: deadline in the future

All of the deadlines entered with the deadline administration function (section 7.5.2) are listed here provided no pre-selection has been made for object type, customer or location (“filter function”, see page 74.)

If a scheduled object has been selected, and if it has only one test sequence, the “Test” index card is then automatically activated. The test can be started.

Currently Due Deadline

DUTs whose test deadlines are the same as the day on which the **test system** has been switched on appear in blue.

Past Due Deadline

DUTs whose test deadlines are past due appear in red.

Future Deadline

DUTs whose test deadlines are in the future appear in black.

Test Sequence

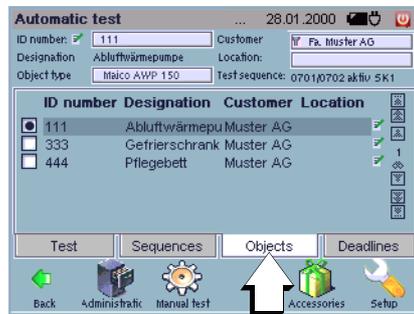
After execution of the scheduled tests and storage of the test results to memory, these tests no longer appear in the deadlines list. Deadlines entered to the **test system** are not carried forward.



Note

Deadline administration, by means of which deadlines are carried forward, is only possible at a PC with PS3.

6.3.2 “Objects” Index Card



-  **Filter:**
enter preselection
-  **Editor:**
edit object data

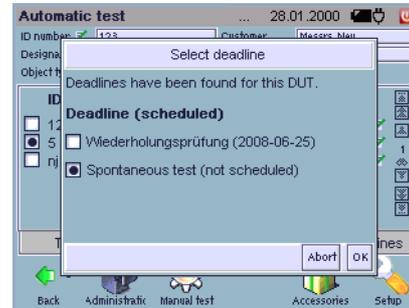
All of the DUTs entered with the object administration function (section 7.3) are listed here, provided no pre-selection has been made for object type, customer or location, and no scheduled tests have been selected in the “Deadlines” index card (“filter function”, see page 74).

You can selected a device under test from the list or by entering its ID number. The pertinent data for the object including designation, object type, customer and location are displayed automatically. If a deadline is associated with the object which should not be executed on the specified date, a selection must be made:

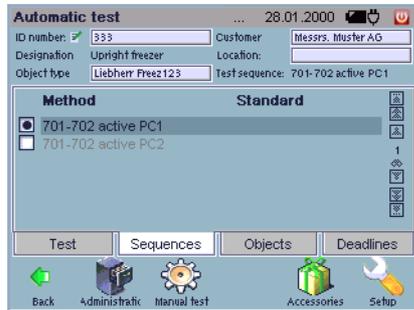
- **New activity:** The following test is deemed executed on the future deadline and no longer appears in the deadlines list after execution and storage of test results.

The “New activity” designation can be changed – Shown in the next screenshot as “Periodic Test”. See section 4.11.9

- **Spontaneous test:** The following test is not deemed executed on the future deadline and thus still appears in the deadlines list.



6.3.3 “Sequences” Index Card



All of the test sequences entered with the test sequence administration function (section 7.4) are listed here, as long as no pre-selection has been entered for a customer, a location or an object in the “Objects” index card (see page 76).

If you select a device under test, only those sequences are displayed which have been assigned to the DUT. Any desired test sequence can be started by pressing and holding the **ON | START** key.

6.3.4 “Test” Index Card



Selection

The desired device under test can be loaded by entering the ID number or by scanning. Preset filters are disabled in this case, and are overwritten by the data associated with the entered device under test.

Test Sequence

Start the test with the **ON | START** key.

Checking is first executed in order to determine whether a scheduled test or a spontaneous test will be conducted.

If a spontaneous test is conducted, this is documented later in the test results under activity.

Depending upon the sequence, the corresponding tests are executed (e.g. special test, short-circuit, potential at protective conductor etc.). All test steps of the sequence are successively executed.

An hourglass appears in the “Test” index card.

As long as the test is being executed, the **testing ...** icon  is

Automatic Test – Individual Test Sequences

displayed to the right of the respective test step.

After testing has been completed, each test step is flagged either **passed** ✓ or **not passed** ✗.

As soon as any one of the test steps is not passed, the entire test is deemed not passed and **not passed** ✗ appears in the index card to the right of “Test”.

For this reason, the option of aborting the test is offered as soon as one step is failed.

If all of the test steps are passed, **passed** ✓ appears in the index card to the right of “Test”.

Saving the Test Results

If you want to document all of the tests, it is advisable to save test results after completion of each test by tapping the **save** icon .

Apart from the main measured value, other available measured values are saved to memory as well. These measured values are time-synchronized.

Displaying Test Results

After the test has been completed, the **documentation** icon  appears. General test data (“Test” index card) and the associated measurement and test results of the individual measurements (“Test Steps” index card) are displayed by tapping the **documentation** icon .

Printing Test Results

- Displayed data can be read out to a connected USB printer by tapping the **Print** button .
- If the **PRINT** key is activated, the user can select whether the test report for the current measurement will be printed out via a connected USB printer, or read out as a screen print.

Test Report Print-Out

A test report with a form sheet template can be printed out for each measurement. If a second page is required when printing out a report, reference to the first page is included. Otherwise, the signatures on the last page are not legally binding for the previous pages. The date of the test and the DUT’s ID number appear at the upper left in the print-out. It is also possible to print a logo on the test report provided you have loaded one into the Secustar via the setup menu (see page 27)

A function for printing the report to the CF card is offered additionally in the print menu. A directory with the name “reports” is added to the CF card in this case. This directory contains subdirectories which are named according to the test hierarchy. The individual reports are saved to these hierarchy directories. The filename has the following structure:

[ID_no.]_[date_time]_[no._of_pages].png

When the display is returned to the auto-start menu, the **documentation** icon  is no longer displayed. However, it is possible to review test results once again, to enter additional comments and to save and print out the modifications under “Tests” in the administration function (see section 7.5).

6.3.5 Loading DUT Data by Entering the ID Number

All of the data for a given device under test (designation, object type, customer and location), as well as the associated test sequence, are saved with reference to an **ID number** (see page 94). If a nonexistent ID number is entered to the test index card, a prompt appears for the entry of a new object. The display is switched to the administration view to this end. There are different ways to enter the ID number :

- Manually (tap the entry field: the softkeys for the alphanumeric keypad are displayed)
- With an external USB keyboard
- With a USB barcode scanner
- With a transponder
- With another USB entry device

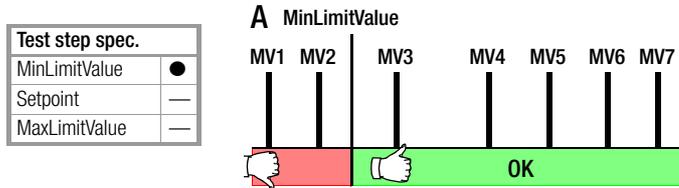


Note

If entry is made with a USB keyboard, USB barcode scanner, transponder etc., the ID number field does not have to be selected. The password is confirmed by pressing the return key.

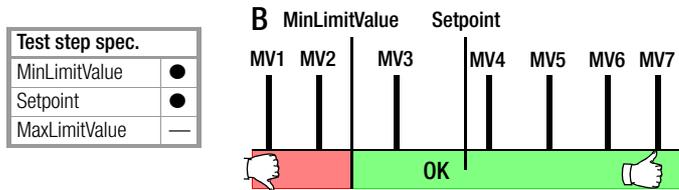
6.3.6 Evaluation of Measured Values for Individual Test Steps

The evaluation of the test steps is based upon limit values which have been stipulated in the respective test step specifications (see section 7.4.2). This includes the specification of a lower and/or an upper limit value and of the setpoint, if applicable. The respectively poorest results with reference to the specified limit value or the setpoint are displayed and saved.



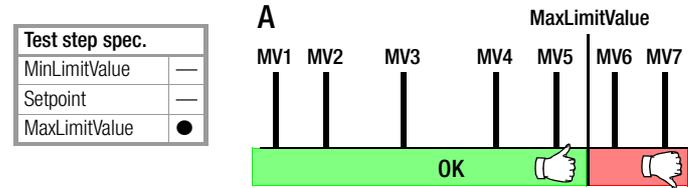
Test OK/passed: The measured value with the smallest difference relative to the MinLimitValue is displayed and saved, in this case MV3.

Test not passed: The measured value with the largest difference relative to the MinLimitValue is displayed and saved, in this case MV1.



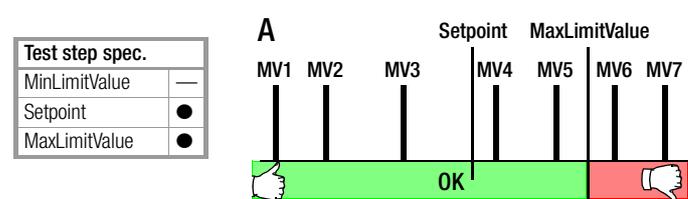
Test OK/passed: The measured value with the largest difference relative to the setpoint is displayed and saved, in this case MV7.

Test not passed: The measured value with the largest difference relative to the MinLimitValue is displayed and saved, in this case MV1.



Test OK/passed: The measured value with the smallest difference relative to the MaxLimitValue is displayed and saved, in this case MV5.

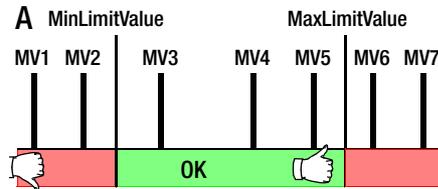
Test not passed: The measured value with the largest difference relative to the MaxLimitValue is displayed and saved, in this case MV7.



Test OK/passed: The measured value with the largest difference relative to the setpoint is displayed and saved, in this case MV1.

Test not passed: The measured value with the largest difference relative to the MaxLimitValue is displayed and saved, in this case MV7.

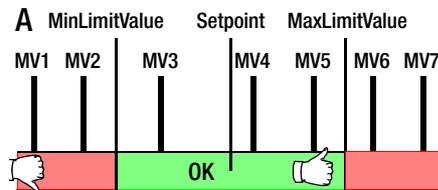
Test step spec.	
MinLimitValue	●
Setpoint	—
MaxLimitValue	●



Test OK/passed: The measured value with the smallest difference relative to the Min or MaxLimitValue is displayed and saved, in this case MV5.

Test not passed: The measured value with the largest difference relative to the Min or MaxLimitValue is displayed and saved, in this case MV1.

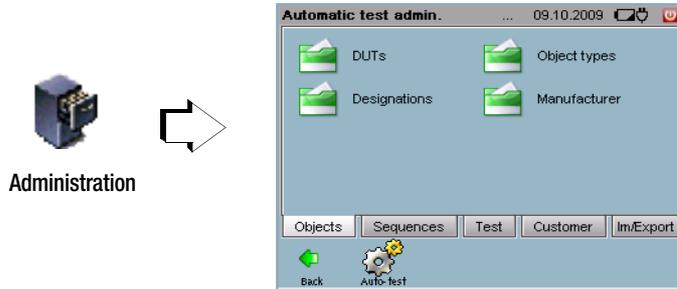
Test step spec.	
MinLimitValue	●
Setpoint	●
MaxLimitValue	●



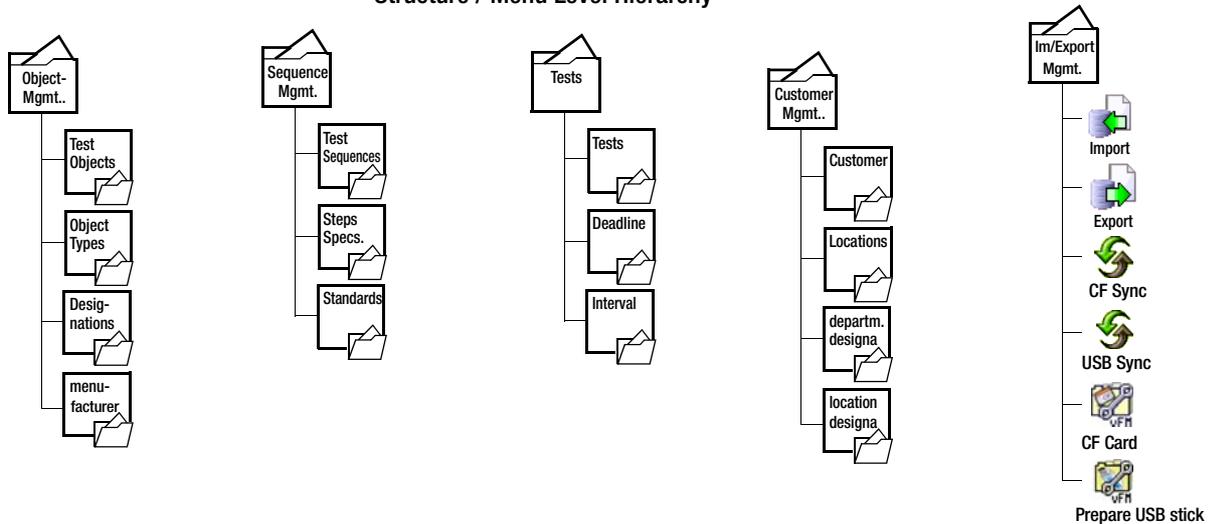
Test OK/passed: The measured value with the largest difference relative to the setpoint is displayed and saved, in this case MV5.

Test not passed: The measured value with the largest difference relative to the Min or MaxLimitValue is displayed and saved, in this case MV1.

7 Data Administration and Data Exchange



Structure / Menu Level Hierarchy



7.1 Tabular Overview of Database Functions

Administration Menus, Automatic Test	Referencing – Links Between Catalog Entries	Description on Page
Object administration		
Catalog of designations		section 7.3
Catalog of object types		section 7.3.1
Catalog of DUTs *		section 7.3.2
Catalog of manufacturers		section 7.3.3
		section 7.3.4
Sequence administration		
Catalog of standards		section 7.4
Catalog of test step specifications		section 7.4.1
Catalog of test sequences*		section 7.4.2
		section 7.4.3
		section 7.4.4
		section 7.4.5
Tests (results administration)		
Catalog of tests		section 7.5
Catalog of deadlines		section 7.5.1
Catalog of intervals		section 7.5.2
		section 7.5.3
Customer administration		
Catalog of customers		section 7.6
Catalog of locations		section 7.6.1
Catalog of departments		section 7.6.2
Catalog of location designations		section 7.6.3
		section 7.6.4
Data exchange functions		
 Prepare CF Card/ USB stick for vFM / PS3		section 7.7.1
 CF Sync/USB Sync, synchronization of the hierarchies		section 7.7.3
 Data import from vFM / PS3		section 7.7.4

Administration Menus, Automatic Test	Referencing – Links Between Catalog Entries	Description on Page
 Data export to vFM / PS3		section 7.7.5
 Data export to XML		section 7.7.6
 Data import from XML		section 7.7.7

* This catalog entry is a prerequisite for the automatic test.

Overview of Administration Symbols

Symbol	Meaning
	Create a new catalog entry
	Go back one level
	Save a new or an edited catalog entry
	Delete a catalog entry
	Catalog entry, test step specification – default setting cannot be deleted
	Catalog entry (hand symbol), test step specification – test steps can be assigned individually
	Selection from a catalog, as long as at least one catalog entry is specified
	Display test results
	Print test results

7.2 General Processing of Catalog Entries

Creating Catalog Entries

Tap the **New** symbol  in order to create a new catalog entry. All fields highlighted in red in the submenu are mandatory fields and must contain a valid value. After entering all of the data, tap the **Save** icon  in order to add the new entry to the catalog. If the menu is exited without pressing save, all new entries are ignored. Existing test sequences can be used as templates when entering new test sequences (see section 7.4.3).

Note

Avoid the use of special characters and blanks at the beginnings and ends of entries. This may lead to problems with vFM / PS3 or other databases.

Editing Catalog Entries

Tap the line in which the respective catalog entry appears (do not activate the respective checkbox), in order to edit a catalog entry (entry of the hand symbol type).

Deleting Catalog Entries

In order to delete an existing catalog entry, first select the desired entry by activating the respective checkbox. Then tap the **Delete** symbol .

With some menu items you have the option of selecting and deleting all catalog elements of a specific type. However, only those catalog elements are marked which are actually visible at the display.

If all of the elements from a given catalog need to be deleted, use the DB Statistics menu item (see section 4.11.7). Already referenced DUTs cannot be deleted.

Selecting a Catalog Entry

- One or several entries can be marked with an X.
- Only one entry can be selected from a catalog.

Assigning Catalog Elements to a Hierarchy

Some data records must be assigned to an object hierarchy. If more than one object hierarchy has been activated, it must be selected manually.

The following object hierarchies are available in the default state:

- Systems (HK4)
- Medical technology(HK10)
- Building services (HK11)
- EDP (HK13)
- Facility fire prevention (HK 46)

The administrator can activate and deactivate hierarchies, see section 4.11.10. As from firmware version 1.9.3 the administrator is allowed to change the designation of the hierarchies.

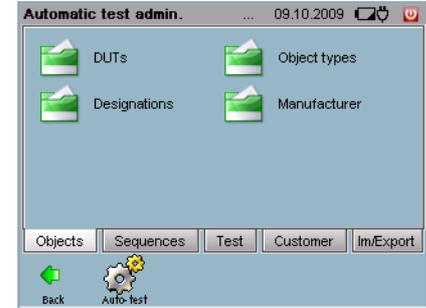
- If the info symbol is active, a short piece of information on the selected object is shown at the bottom of the display.

Scrolling through the Monitor Display – Searching for Entries

If more catalog entries are included than can be displayed at the screen, tap the arrows to access hidden entries.

	To top of page		Top = bottom of page
	Scroll back 10 pages		Less than 10 pages remain
	Scroll back 1 page		No more pages
3	Number of pages to be scrolled forward or back is entered by directly selecting the desired page.		
	Alphanumeric search (binoculars icon) (entry with correct decimal place beginning at left)		
	Scroll forward 1 page		No more pages
	Scroll forward 10 pages		Less than 10 pages remain
	To bottom of page		Bottom = top of page

7.3 DUT Administration



Devices under test are entered and assigned to customers and locations, and the test sequences with which the DUTs must be tested are set up with the object administration function.

General Procedure for Entering New DUTs

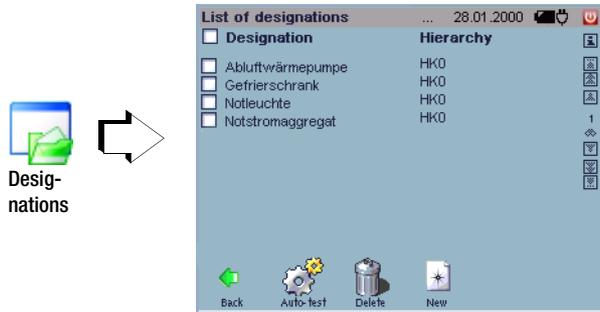
We recommend sticking to the following order:

1. Enter test steps → section 7.4.2
2. Create the sequence → section 7.4.3
3. Enter customers → section 7.6.1 and locations → section 7.6.2 *
4. Enter the object → section 7.3.3
5. Enter the deadline → section 7.5 on page 106 *

* Customers, deadlines and locations can also be created while entering an object.

7.3.1 Catalog of Designations – Device Categories

Designations for commonly tested object types can be entered and saved with this function, which you can access via a drop-down list when entering individual DUTs.



Designations from this catalog can be used when entering object types.

The designations are arranged alphabetically.

Entering a New Designation



When a new data record is entered, an object hierarchy must first be selected if more than one has been activated.

Enter the designation using the softkey keyboard after selecting the entry field.

The new designation is added to the catalog by tapping **Save** ✓.

We recommend saving newly entered designations at regular intervals with the help of the **Backup** function  in the **Setup**  menu (see section 4.11.3), or via the data export  function as an XML file which is independent of a version, see section 7.7.6.

Editing a Designation

Designations can be selected for editing from a catalog of previously entered designations by selecting the respective line. The edited designation is used for all existing objects.

Deleting Designations

In order to delete existing designations, they must first be marked in the catalog by activating the respective checkbox. Referenced designations, i.e. designations which are already being used for DUTs, cannot be deleted.



Short-form Operating Instructions

Creating a (device) Designation

- ⇨ Create a new designation: 
- ⇨ Select object category
- ⇨ Enter a brief designation for the device



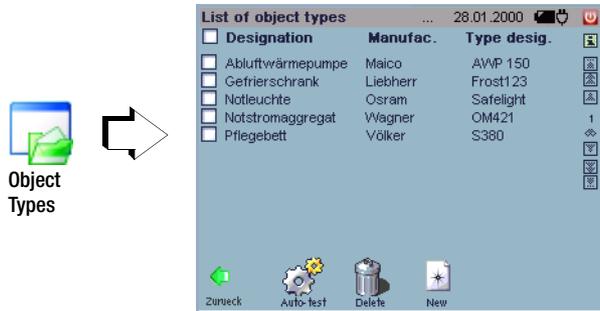
Note

Entry of a new designation or editing of an exiting designation can be exited at any time by pressing the  key. Entries are ignored.

-
- ⇨ Add the new designation to the catalog by tapping **Save**  .

7.3.2 Catalog of Object Types – Device Types

This catalog saves you the trouble of repeatedly entering identical object and device types which only vary with regard to their respective manufacturers or type designations.



Object types from this catalog can be used when entering DUTs and test sequences.

Designation

Device designation regardless of manufacturer, device category (see section 7.3.1)

Manufacturer

Name of the manufacturer

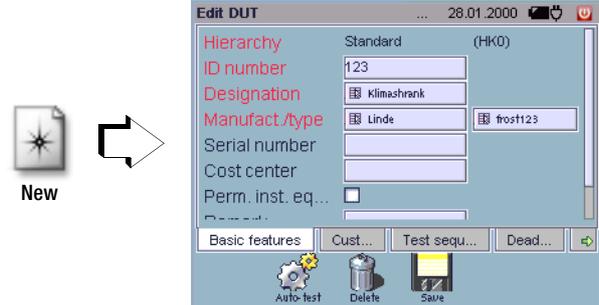
Type des. Manufacturer-specific type designation within a device category

Note

Type designations must be entered unambiguously. For example, type S1000 can only come from manufacturer A or B. Identical type designations cannot be used for different manufacturers because this makes data exchange with vFM / PS3 impossible.

New designations which are entered here are not added to the accessible catalog of designations unless the object type is subsequently saved.

Entering a New Object Type



When a new data record is entered, an object hierarchy must first be selected if more than one has been activated (see also section 4.11.10)

Various device types can be entered here which may be listed under the same category, but which come from different manufacturers and thus have different type designations. When entering designations, previously entered categories and designations are displayed for possible selection. Manufacturer and type must be entered directly with the keyboard. The new object type can only be created after all of the fields in the "Basic Attributes" index card have been filled in.

- ⇨ The new object type is added to the catalog by tapping **Save** .

We recommend saving newly entered object types at regular intervals with the help of the **Backup** function  in the **Setup**  menu (see section 4.11.3), or via the data export  function as an XML file which is independent of a version, see section 7.7.6.

Editing an Object Type

Object types can be selected for editing from a catalog of previously entered object types by selecting the respective line.

Deleting an Object Type

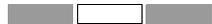
In order to delete existing object types, they must first be marked in the catalog by activating the respective checkbox. Already referenced object types cannot be deleted.



Short-form Operating Instructions

Entering an Object Type

- ⇨ Enter a new object type: 
- ⇨ Select object type



Basic Attributes Index Card

- ⇨ **Designation** Select

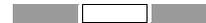
A catalog of all designations is displayed.

- ⇨ Select an appropriate designation or enter a new one.
- ⇨ **Manufacturer** Select

The same procedure is used here as is also the case for entering designations.

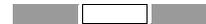
- ⇨ **Type** Enter the type designation

All other parameters listed in this index card are optional entries.



Extended Attributes Index Card

- ⇨ **Voltage** . . . Enter technical data
- ⇨ **Current** . . . Enter technical data
- ⇨ **Power** . . . Enter technical data
- ⇨ **xx mark** Mark available certifications
- ⇨ **Permanently installed equipment** Mark if this is the case
- ⇨ **Permanent connection** Mark if this is the case



Test Sequences Index Card

- ⇨ Select **Add test sequence**.

A catalog of all test sequences is displayed.

- ⇨ Mark the desired test sequence.
- ⇨ All selected test sequences are added to the new test sequence by tapping OK.



Note

If a device under test is created from an object type to which a test sequence has been assigned, the test sequence is automatically assigned to the device under test.



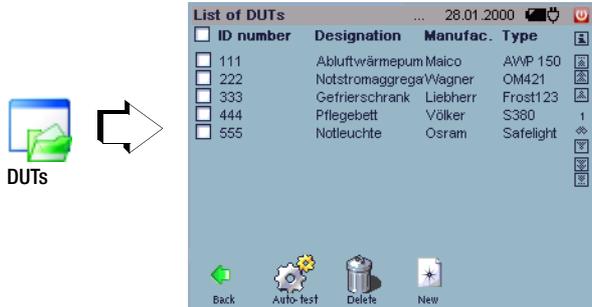
Note

Entry of a new object type or editing of an existing object type can be exited at any time by pressing the ESC key (when not in the keyboard entry mode) or  (in the keyboard entry mode). Entries are ignored. At this point, no new test sequences can be created.

- ⇨ Add the new object type to the catalog by tapping **Save** .

7.3.3 Catalog of DUTs

In order to be able to execute an automated test sequence, a device under test must be entered under its ID number along with its data, and the associated test sequence must be entered in the catalog of DUTs.



DUTs from this catalog can be used when entering deadlines for periodic testing (deadline administration).

ID Unique number:
 – May only be used once
 – No blanks or special characters at the beginning or end of the number

Designation Designation from the catalog of designations (see section 7.3.1)

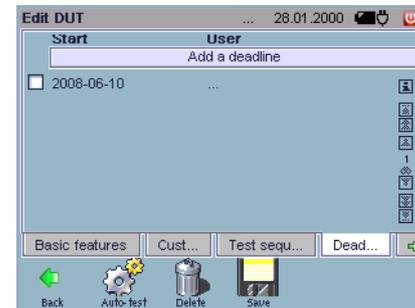
Manufacturer The manufacturer's name (see section 7.3.2)

Type Manufacturer-specific type designation within a device category from the catalog of object types (see section 7.3.2)

Entering a New DUT



New



When a new data record is entered, an object hierarchy must first be selected if more than one has been activated (see also section 4.11.10).

Basic attributes such as **ID no.**, **designation**, **manufacturer** and **object type** (type) should always be entered for the identification of a device under test; an error message will otherwise appear. Make sure that the ID number has not already been assigned to another object. The catalog symbol at the beginning of the entry field

makes reference to a database, from which previously entered attributes can be taken. It is advisable to enter at least one suitable **test sequence**, so that the DUT can be tested with the automatic test function.

We recommend saving newly entered DUTs at regular intervals with the help of the **Backup** function  in the **Setup**  menu (see section 4.11.3) or via the data export  function as an XML file which is independent of a version, see section 7.7.6.

Editing a Device Under Test

DUTs can be selected for editing from a catalog of previously entered DUTs by selecting the respective line.

Deleting a Device Under Test

In order to delete existing DUTs, they must first be marked in the catalog by activating the respective checkbox.



Attention!

If referenced DUTs are deleted, all associated tests and deadlines are deleted as well.



Short-form Operating Instructions

Entering a Device Under Test

- ⇨ Enter a new DUT: 
- ⇨ Select an object hierarchy.

Basic Attributes Index Card

- ⇨ **ID no.** Enter
- ⇨ **Designation** Select

A catalog of all designations is displayed.

- ⇨  Select an appropriate designation or enter a new one.



Note

New designations which are entered here are not added to the accessible catalog of designations unless the object type is subsequently saved.

- ⇨ **Manufacturer/type**Select

A catalog is displayed which contains all manufacturers with assigned types next to each other.

- ⇨  Select the suitable name or enter a new one.

The same procedure is used here as is also the case for entering designations.

All other parameters listed in this index card are optional entries.

Customer Index Card

- ⇨ **Customer:** Select the company, the department or the person from a catalog to whom this DUT should be assigned.
- ⇨ **Location:** Select the property, building, floor or room from a catalog or create a new one to which this DUT should be assigned.

Test Sequences Index Card

- ⇨ Select **Add test sequence**.
- ⇨ Select assignment to object type or device under test. A catalog of all test sequences is displayed.
- ⇨ Mark the desired test sequence.
- ⇨ All selected test sequences are added to the new test sequence by tapping OK.

Note

If the test sequence is assigned to the object type only, and not to the device under test, the test sequence appears with a faded, pale font color.

Entry of a new device under test or editing of an existing device under test can be exited at any time by pressing the ESC key. Entries are deleted.

At this point, no new test sequences can be created.

- ⇨ Add the new object type to the catalog by tapping **Save** .

Deadlines index card

Catalog of deadlines is displayed.

- ⇨ Add a deadline (see section 7.5.2)

Test index card

Displays the catalog of tests for the DUT.

7.3.4 Catalog of manufacturers

Manufacturers for commonly tested object types can be entered and saved with this function, which you can access via a drop-down list when entering individual DUTs.



This catalog can be accessed when entering an object type.

The manufacturers are arranged alphabetically.

Entering a new manufacturer



Manufacturers

Enter the manufacturer directly using the softkey keyboard. The new manufacturer is entered to the catalog by pressing **Save** ✓.

We recommend saving newly entered manufacturers at regular intervals with the help of the **Backup** function  in the **Setup** menu  (see section 4.11.3), or with the data export function  as a version-independent XML file (see section 7.7.6).

Editing Manufacturers

A manufacturer can be selected from the catalog for editing by marking the appropriate line.

Deleting Manufacturers

In order to delete existing manufacturers, they must first be marked in the catalog by activating the respective checkbox. Referenced manufacturers, i.e. manufacturers which are already being used for DUTs, cannot be deleted.



Short-form Operating Instructions

Entering a Manufacturer

- Enter a new manufacturer: 
- **Entry field:** Enter manufacturer.

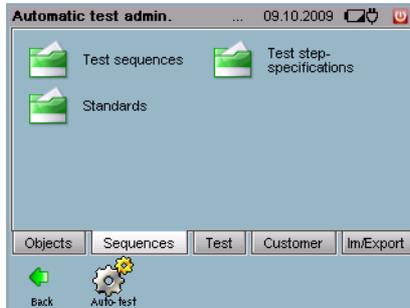


Note

Entry of a new designation or editing of an existing designation can be exited at any time by pressing the ESC key (when not in the keyboard entry mode) or  (in the keyboard entry mode). Entries are ignored.

- Add the new designation to the catalog by pressing **Save** ✓.

7.4 Test Sequence Administration



Test sequences are defined as test regulations in accordance with which DUTs are tested. The various test sequences are based upon the applicable standards, and consist of several test steps.

The entry of standards, the subsequent creation of test step specifications and the combination of test steps into test sequences are described in the following sections.

7.4.1 Catalog of Standards

This convenient function saves you the trouble or repeatedly entering the designations of the various standards, regulations and directives.

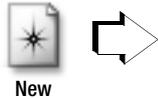


The designations for standards included in this catalog can be used when test sequences are created.

Designation Exact designation of the standard, regulation or directive

Description Brief description of the standard, regulation or directive

Entering a New Standard



You can create a standard, i.e. its designation, upon which your tests are based. The designations included in this catalog can be used when a test sequence in accordance with a given standard is created.

We recommend saving newly entered standards at regular intervals with the help of the **Backup** function  in the **Setup**  menu (see section 4.11.3) or via the data export  function as an XML file which is independent of a version, see section 7.7.6.

Editing a Standard

Designations can be selected for editing from a catalog of previously entered standards by selecting the respective line.

Deleting a Standard

In order to delete existing standards, they must first be marked in the catalog by activating the respective checkbox. Referenced standards, i.e. standards which are already being used for test sequences, cannot be deleted.

Short-form Operating Instructions

Entering a New Standard

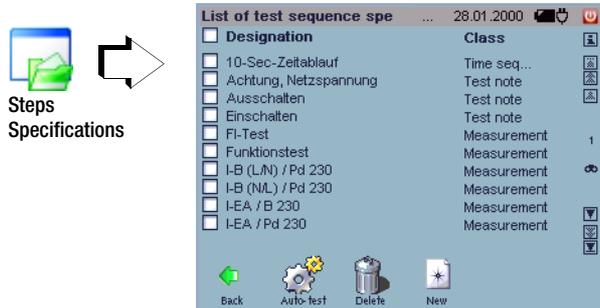
- Enter a new standard: .
- **Designation:** Brief designation for the standard
- **Description:** A comment can be entered if required.

Note

Entry of a new standard or editing of an existing standard can be exited at any time by pressing the ESC key. Entries are ignored.

- Add the new standard to the catalog by tapping **Save** .

7.4.2 Catalog of Test Step Specifications



A test sequence is made up of several test steps. The test step specifications included in this catalog can be used when test sequences are created. A test step can be a measurement, a visual inspection, a test instruction, an external measurement or a time sequence.

Designation Name or abbreviation for the individual test.
This designation appears in the automatic sequence under test step.

Class Measurement or multiple measurement, time sequence, external measurement, visual inspection or test instruction

Entering a New Test Step Specification

The following selections must be made, one after the other, when entering new test step specifications:

- Class (type of test step):
measurement / visual inspection / test instruction / external measurement / time sequence

- If measurement or multiple measurement is selected: measuring function (type of measuring instrument)

The **designation** of the selected measuring function is automatically supplemented with a consecutive number.

The designation of a test step specification, no matter whether it refers to a measurement, multiple measurement, visual inspection, test instruction, time sequence or external measurement, can always be altered at your discretion.

The designations “visual inspection” or “test instruction” can be supplemented or replaced with an alphanumeric term when they are first entered.

During initial entry of test step specifications of the “visual inspection” class, the order of the visual inspection queries can be changed as desired in the measurement templates index card with the scroll keys at the right, as long as at least two visual inspection queries have been selected. Beyond this, any previously entered visual inspection query can be individually deleted using the waste basket symbol at the right.

We recommend saving newly entered test step specifications at regular intervals with the help of the **Backup** function  in the **Setup**  menu (see section 4.11.3) or via the data export  function as an XML file which is independent of a version, see section 7.7.6.

Editing a Test Step Specification

Test step specifications can be selected for editing from a catalog of previously entered test step specifications by selecting the respective line. Test step specifications of the  type cannot be edited. Designations of previously entered test steps can no longer be edited.

If the parameters of a given test step specification are edited, this has **no influence on the parameters of a test step which has already been integrated into a test sequence**. If the edited parameters are to be used in all previously integrated (referenced) test steps of the same type, the effected test step must first be deleted from each respective test sequence, and the edited test step specification must then be added to the test sequences.

Deleting a Test Step Specification

In order to delete existing test step specifications, they must first be marked in the catalog by activating the respective checkbox.

Test Step Specification – Measurement

A suitable measurement can be selected from a catalog of measuring functions, and can be supplemented with limit values and other parameters.



Short-form Operating Instructions

Entering a Measurement

- ⇒ Enter a new test step: .
- ⇒ Select a measurement
- ⇒ Select a measuring function

 
General Index Card

- ⇒ **Designation:** Brief designation for the measurement
- Class** Measurement (pre-selection)
- Measuring function** Test step (pre-selection)
- Measuring instrument** **test system** (default setting)
- ⇒ **Description:** A comment can be entered if required.

Continued on next page

 
Evaluation Index Card

The limit values must be entered here which result in failure of the test in the event that they are exceeded (MaxLimitValue) or fallen short of (MinLimitValue). A setpoint can be entered here as well. See also section 6.3.6, "Evaluation of Measured Values for Individual Test Steps".

- ⇒ **Main measured value** Determines the main measured value; the limit values which are entered refer to this measured value.

Automatic Test – Administration

U/M	Unit of measure for limit value, setpoint or tolerance
↗ Test condition	in preparation
↗ MinLimitValue	See following table for sample entry
↗ MaxLimitValue	See following table for sample entry
↗ Setpoint	Target value
↗ Tolerance	in preparation

Examples

Test Step	Abbr.	MinLimit-Value	Setpoint	MaxLimit-Value	Cross Reference
Protective conductor meas.	R PE	—	0 Ω	0.3 Ω	page 45
Insulation resistance meas.	R ISO	1 MΩ	10,000 MΩ	—	page 48
Leakage current	I PE	—	0 mA	3.5 mA	page 51
Equivalent leakage current	I EL	—	0 mA	3.5 mA	page 54
Contact current	I B	—	0 mA	0.5 mA	page 58
Patient leakage current	I PL				page 61
Eq. patient leakage current	I EPL				page 63

Note

Select a limit value which either complies with or is stricter than the legally binding regulations.

Parameter Index Card

The parameters for the measuring function must be entered here. Various parameters are displayed, depending upon the measuring function. Refer to section 5, “Manually Triggered Measurements – Individual Measurements” for further information.

Switch off Display / hide message

Switch on Display / hide message

Meas. type e.g. safety class type,
Type of Connection: test socket or permanent connection

After meas.¹⁾ Automatic / force test socket off

Polarity L-N or N-L

Up / Ip Test voltage in V / test current in A

fp Test frequency in Hz for I EL

Zero point²⁾ Reference point (offset) for R-PE measurement

Duration Test duration in seconds

¹⁾ If these messages are deactivated, attention is drawn to the fact (during deactivation) that the device may not be switched on via the relays as of a nominal current of greater than 10 A.

²⁾ Automatic: It's determined whether or not line voltage can remain switched on after measurement. If so, line voltage remains switched on. This feature can also be deactivated: “force test socket off”. In addition to this, each measurement which requires line voltage can then be configured such that the inspector is prompted by means of messages to switch the device on and off after voltage is applied to the test socket, and before voltage is disconnected from the test socket. This protects the relay included in the **test system**.

²⁾ An offset can be entered for the R-PE measurement in the automatic test, so that 0 ? is displayed for a selected reference point which is connected to the protective conductor. This is necessary in order to compensate for any offset which is caused by the use of an adapter (e.g. the AT13/32), or the offset caused by installation in the event of a permanently connected DUT.

Note

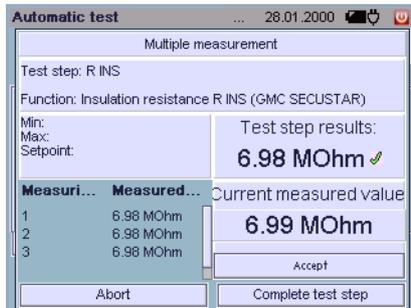
Entry of a new measurement can be exited at any time by pressing the ESC key. Entries are ignored.

↗ Add the new measurement to the catalog by tapping **Save** .

Test Step Specification – Multiple Measurement

Several measuring points can be acquired from a single DUT with these measurements.

Measurement is started as a continuous measurement. Three buttons can be used during the measurement, namely “Accept”, “End Test Step” and “Abort”. The current measured value is accepted as the test result with the “Accept” button. However, measurement continues so that an additional measured value can be accepted by pressing the “Accept” button once again. Measurement can be ended with the “End Test Step” button, after which the next test is started. The sequence can be stopped with the “Abort” button. The measured values for the individual measuring points are listed in a special window, one after the other. The results of the test step are determined on the basis of these values and are always based on the worst of all measured values.



Test Step Specification – Visual Inspection

A visual inspection prompts the test person to visually assess the device under test. One or a number of test questions can be answered with “OK” or “Not OK”.



Short-form Operating Instructions

Entering a Visual Inspection

- Enter a new test step: 
- Select visual inspection

General Index Card

- **Designation:** Enter a designation for identification/archiving
- Class** Visual inspection (pre-selection)
- **Description:** A comment can be entered if required

Visual Inspection Questions Index Card

- Select and edit **new visual inspection / test instruction**
- Select **add further questions** if required
- Select and edit **new visual inspection question**
- Change the order of the questions with the ▲ ▼ keys if required
- Individual questions can be deleted with the  symbol

Parameter Index Card

- Select whether or not voltage is applied to the test socket during visual inspection.

Select whether or not voltage will be switched off after visual inspection (if selected above).



Note

Entry of a new visual inspection can be exited at any time by pressing the ESC key. Entries are ignored.

- Add the new visual inspection to the catalog by tapping **Save**



Test Step Specification – Test Instruction

Test instructions appear as a text display before the next respective test step. These texts may include instructions for executing the next test step, or a warning.



Short-form Operating Instructions

Entering a Test Instruction

- Enter a new test step:
- Select test instruction.
- **Designation:** Enter a designation for identification/archiving
- **Class** Measurement (pre-selection)
- **Test instruction:** Enter the desired text.
- **Description:** A comment can be entered if required.



Note

Entry of a new test instruction can be exited at any time by pressing the ESC key. Entries are ignored.

- Add the new test instruction to the catalog by tapping **Save**

Test Step Specification – External Measurement

Measurement results from an external test instrument can be entered for this test step. Whether or not the DUT has passed the test or not is determined with additional entries for Min-Max limit values and setpoint.

External measurements and visual inspections can be configured such that voltage to the test socket is switched on during execution.



Short-form Operating Instructions

Setting Up an External Measurement

- ↪ Enter a new test step:
- ↪ Select external measurement



General Index Card

- ↪ **Designation:** Enter for purpose of identification/archiving appears as a headline in other windows for improved clarity and cross-reference.
- ↪ **Class:** External measurement
- ↪ **Description:** Enter comment if required

Evaluation Index Card

The limit values must be entered here which result in failure of the test in the event that they are exceeded (MaxLimitValue) or fallen short of (MinLimitValue). A setpoint can be entered here as well. See also section 6.3.6, "Evaluation of Measured Values for Individual Test Steps".

- ↪ **Unit:** Enter unit of measure
Unit Unit of measure for limit value setpoint or tol.
- ↪ **Test condition:** In progress
- ↪ **Min Limit Value** See entry examples in table on page 98
- ↪ **Max Limit Value** See entry examples in table on page 98
- ↪ **Setpoint:** Target value
- ↪ **Tolerance:** In progress



- Note**
Select a limit value which either complies with or is stricter than the legally binding regulations.

Parameter Index Card

- ⇒ Select whether or not voltage is applied to the test socket during visual inspection.
- ⇒ Select whether or not voltage will be switched off after visual inspection (if selected above).
- ⇒ Add new external measurement to the catalog with **Save** .



Test Step Specification – Time Lapse

A time lapse helps you to allow a given amount of time to elapse between two test steps. Measurement cannot be performed until this time period has elapsed.



Short-form Operating Instructions

Setting Up a Time Lapse

- ⇒ Enter a new test step: 
- ⇒ Select time lapse 
- ⇒ **Designation:** Enter for purpose of identification/archiving
Class Time lapse
- ⇒ **Message:** Enter comment if required
- ⇒ **Sound:** Activate/deactivate acoustic signal for the duration of the time lapse
- ⇒ **Duration:** Duration of the time lapse

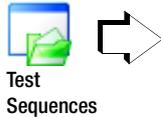


Note

Entry of a new test instruction can be exited at any time by pressing the ESC key. Entries are deleted.

- ⇒ Add new time lapse to the catalog with **Save** .

7.4.3 Catalog of Sequences



List of test sequences		...	28.01.2000		
<input type="checkbox"/> Designation	Standard				
<input type="checkbox"/> 0701-0702 IT PC I	DIN VDE 0701-0702				
<input type="checkbox"/> 0701-0702 IT PC I+II	DIN VDE 0701-0702				
<input type="checkbox"/> 0701-0702 IT PC II	DIN VDE 0701-0702				
<input type="checkbox"/> 0701-0702 active PC I	DIN VDE 0701-0702				
<input type="checkbox"/> 0701-0702 active PC I+II	DIN VDE 0701-0702				
<input type="checkbox"/> 0701-0702 active PC II	DIN VDE 0701-0702				
<input type="checkbox"/> 0701-0702 passive PC I	DIN VDE 0701-0702				
<input type="checkbox"/> 0701-0702 passive PC I+II	DIN VDE 0701-0702				
<input type="checkbox"/> 0701-0702 passive PC II	DIN VDE 0701-0702				
<input type="checkbox"/> Multiple socket outlet	DIN VDE 0701-0702				

Back Auto-test Delete New

As of software version 1.9.3, fixed sequences and test step specifications are no longer stored to the **test system**, and are instead included on a CF card (see section 4.6).

The sequences can be write protected, so that they are not deleted if the option “delete all test sequences” is selected in SETUP (red padlock).

The padlock icon must be selected in order to activate or deactivate write protection. The test sequences included in this catalog can be used when DUTs or deadlines for periodic testing (deadline administration) are entered.

Designation The name of the test (sequence) consists of three parts:
standard – passive, active or EDP component – safety class.
This designation appears for the automatic sequence in the test sequences index card under process.

Standard Designation of the standard or regulation (see section 7.4.1)

Creating a New Test Sequence

All of the necessary test steps must first be entered before a new test sequence can be created. We recommend entering all required test steps before creating the test sequence in order to avoid repeated switching back and forth between the menus (test steps cannot be entered from the test sequence administration function). Go to the catalog of test step specifications to this end (see section 7.4.2).



Edit test sequence		...	28.01.2000		
Standard					
Designation	New test sequence 1				
Description					
Form					

Basic data Test steps Object types

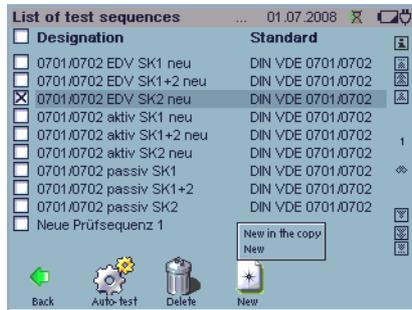
Back Auto-test Delete Save

When creating new test sequences, the order of the test steps included in the test sequence can be changed as desired with the scroll keys at the right-hand side of the test steps index card, as long as at least two test steps have been selected.

Individual test steps can be saved as new test step specifications with the key.

We recommend saving newly entered test sequences at regular intervals with the help of the **Backup** function in the **Setup** menu (see section 4.11.3) or via the data export function as an XML file which is independent of a version, see section 7.7.6.

Creating New Test Sequences „in the copy“



After marking a test sequence and activating the “New” button , the sub-points “New as Copy” and “New” appear. You can use an existing test sequence as a template with the help of the “New as Copy” function, edit it and save it as a new test sequence.

Editing a Test Sequence

Test sequences and their respective test steps can be selected for editing from a catalog of previously entered test sequences by selecting the respective line. If the parameters of a test step are changed, all test sequences of the same type are effected as well. All objects which have already been assigned to a device under test are thus affected by the modification. However, the corresponding test step specification remains unchanged (see also “Editing a Test Step Specification” in section 7.4.2).

Deleting a Test Sequence

In order to delete existing test sequences, they must first be marked in the catalog by activating the respective checkbox.



Short-form Operating Instructions

Creating a Test Sequence

- Create a new test sequence: .

Test Sequence, “New as Copy”

- Select the desired test sequence and activate the “New” button .
- The sub-points “New” and “New as Copy” appear above the “New” button.
- Select “New as Copy”.
- Edit the designation and the test step as required.

Basic Data Index Card

- **Standard:** Enter the name of the standard or regulation
- **Designation:** Enter a designation for identification/archiving
- **Description:** A comment can be entered if required.
- **Form:** Reserved

Test Steps Index Card

- Select **add test step**.

A catalog of all test step specifications is displayed.

- Mark the desired test steps.
- All selected test steps are added to the new test sequence by tapping OK.

**Note**

The test step specifications are added in the order in which they are clicked.

- ⇨ Change the order of the test steps with the ▲ ▼ keys if required.
- ⇨ Individual test steps can be saved as a new test specification with the  button.
- ⇨ Individual test steps can be deleted with the  symbol.

**Object Types Index Card**

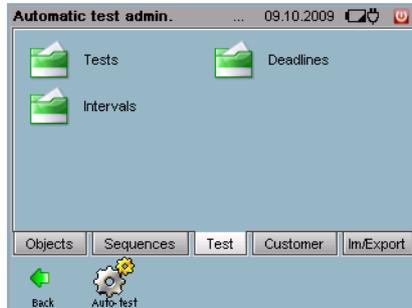
- ⇨ Object types can be assigned to a test sequence if required.
All devices under test which correspond to this object type are then automatically tested with the respective test sequence.

**Note**

Creation of a new test sequence can be exited at any time by pressing the ESC key. Entries are ignored.

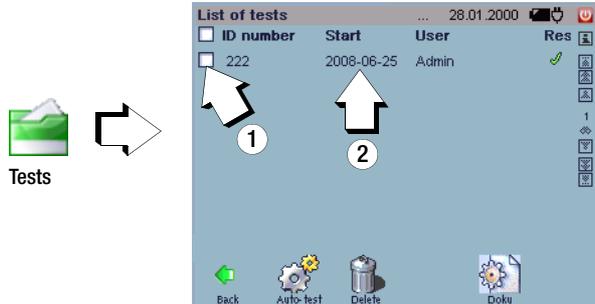
- ⇨ Add the new test sequence to the catalog by tapping **Save** .

7.5 Test Results Administration



All information associated with already executed tests can be queried using the menus in the test index card, and deadlines and intervals can be administrated and created.

7.5.1 Catalog of Tests

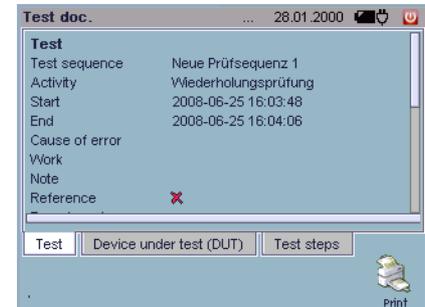


① Displaying and Printing Test Results

A test can be selected from a catalog of previously executed tests by activating the respective checkbox.

General test data ("Test" index card) and the associated measurement and test results of the individual measurements ("Test Steps" index card) are displayed by tapping the **documentation** icon . Displayed data can be read out to a connected USB printer by tapping the **Print** button .

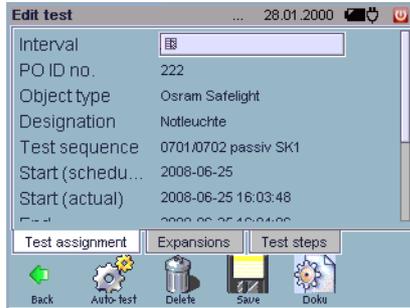
It's also possible to print several tests at once by selecting several tests from the list and pressing the **Print** button. If you press the **Print** button without selected any tests, all of the tests included in the catalog are printed.



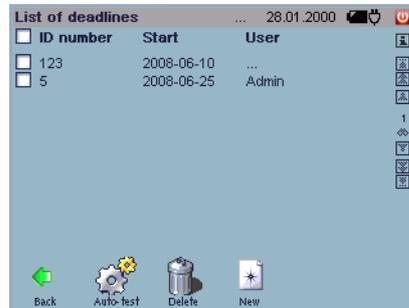
② Processing Tests and Adding Comments

A test can be selected for further processing from a catalog of previously executed tests by selecting the respective line (not by activating the respective checkbox).

The test can be reset here, after which a new deadline is created for the test.



7.5.2 Catalog of Deadlines



Deadlines, e.g. for periodic testing in accordance with BGV A3, can be administered in a catalog with this function.

If the **Deadlines** index card is subsequently selected in **Automatic test** , DUTs which currently require testing are displayed in blue. After completion of the respective test, the display is cleared or a new deadline is displayed if carrying forward of deadlines is active.

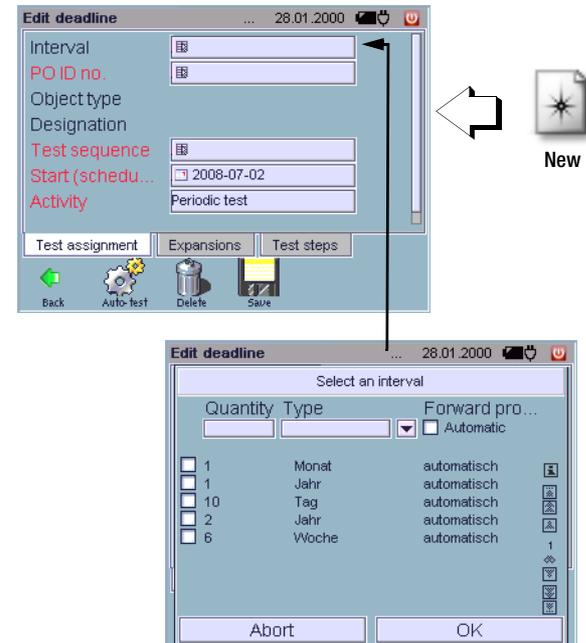
Editing Deadlines

An interval or a new starting point can be selected for editing from a catalog of previously entered deadlines by selecting the respective line.

Deleting a Deadline

In order to delete existing deadlines, they must first be marked in the catalog by activating the respective checkbox.

Entering a New Test or Calibration Deadline, Editing Existing Deadlines



Automatic Test – Administration

If the selected DUT has only one assigned test sequence, this sequence is started automatically. The test sequence can nevertheless be changed. The assigned test steps can be reviewed in the test steps index card.

The inspector is assigned in the advanced index card.

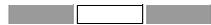
We recommend saving newly entered deadlines at regular intervals with the help of the **Backup** function  in the **Setup** menu (see section 4.11.3) or via the data export  function as an XML file which is independent of a version, see section 7.7.6.



Short-form Operating Instructions

Entering a Deadline

⇒ Enter a new deadline: .



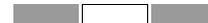
Test Assignment Index Card

- ⇒ **Interval** Voluntary additional entry as a supplement to the **Start** parameter
- ⇒ **DUT ID no.** Select the ID number of a device under test from a catalog.

The associated object type and the designation are displayed.

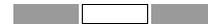
- ⇒ **Test sequence** Upon selecting “assigned to the DUT”, only those test sequences are displayed which were assigned when the device under test was entered.
 Select a test sequence (if “show all” is selected, test sequences which were not originally assigned to the DUT can also be selected).

- ⇒ **Start** Enter a date (the date must be in the future).
- ⇒ **Activity** A comment can be entered here.



Advanced Index Card

Comments regarding the test can be entered here according to deadline.



Test Steps Index Card

This display is purely informational. The test steps included in the selected test sequence are displayed here.



Note

Entry of a new deadline can be exited at any time by pressing the ESC key (when not in the keyboard entry mode) or  (in the keyboard entry mode). Entries are ignored.

- ⇒ Add the new deadline to the catalog by tapping **Save** .

7.5.3 Catalog of Intervals



Intervals



Quantity	Type	Forward proje...
<input type="checkbox"/> 1	Month	Automatic
<input type="checkbox"/> 1	Year	Automatic
<input type="checkbox"/> 10	Day	Automatic
<input type="checkbox"/> 2	Year	Automatic
<input type="checkbox"/> 6	Week	Automatic

At the bottom of the screenshot are icons for Back, Auto-test, Delete, and New.

All predefined intervals are displayed in the “Intervals” menu. An interval generates the deadline of the next test in the case of automatic carry forward function.

Size and

Type

Indicates the length of the interval

Carrying

Forward

Indicates whether or not a new deadline will be set based on the specified interval after saving the test. In the setup menu under item „Tests“, it must be specified as to whether and, if so, on which conditions automatic carrying forward is to be performed.

Entering a New Interval



New



Interval new

Quantity

Type

Forward projec... Automatic

At the bottom of the screenshot are icons for Back, Auto-test, and Save.

You can enter intervals here which remind you to execute measurements at predetermined times. The size and the type of interval must be entered to this end. Depending on the type of automatic carry forward function that has been activated, a new deadline is set after the test is saved to memory.

We recommend saving newly entered intervals at regularly with the help of the **Backup** function  in the **Setup**  menu (see section 4.11.3) or via the data export  function as an XML file which is independent of a version, see section 7.7.6.

Changing Intervals

The listed intervals can be changed with respect to “size”, “type” or “carrying forward” by clicking the respective cell.

Deleting Intervals

In order to delete existing designations, they must first be marked in the catalog by activating the respective checkboxes.



Short-form Operating Instructions

Creating an Interval

Create a new interval: 

- ⇒ **Size** Duration of the interval
- ⇒ **Type** Select day, week, month or year
- ⇒ **Carry forward** Activated: A new deadline is set automatically after the test is saved.

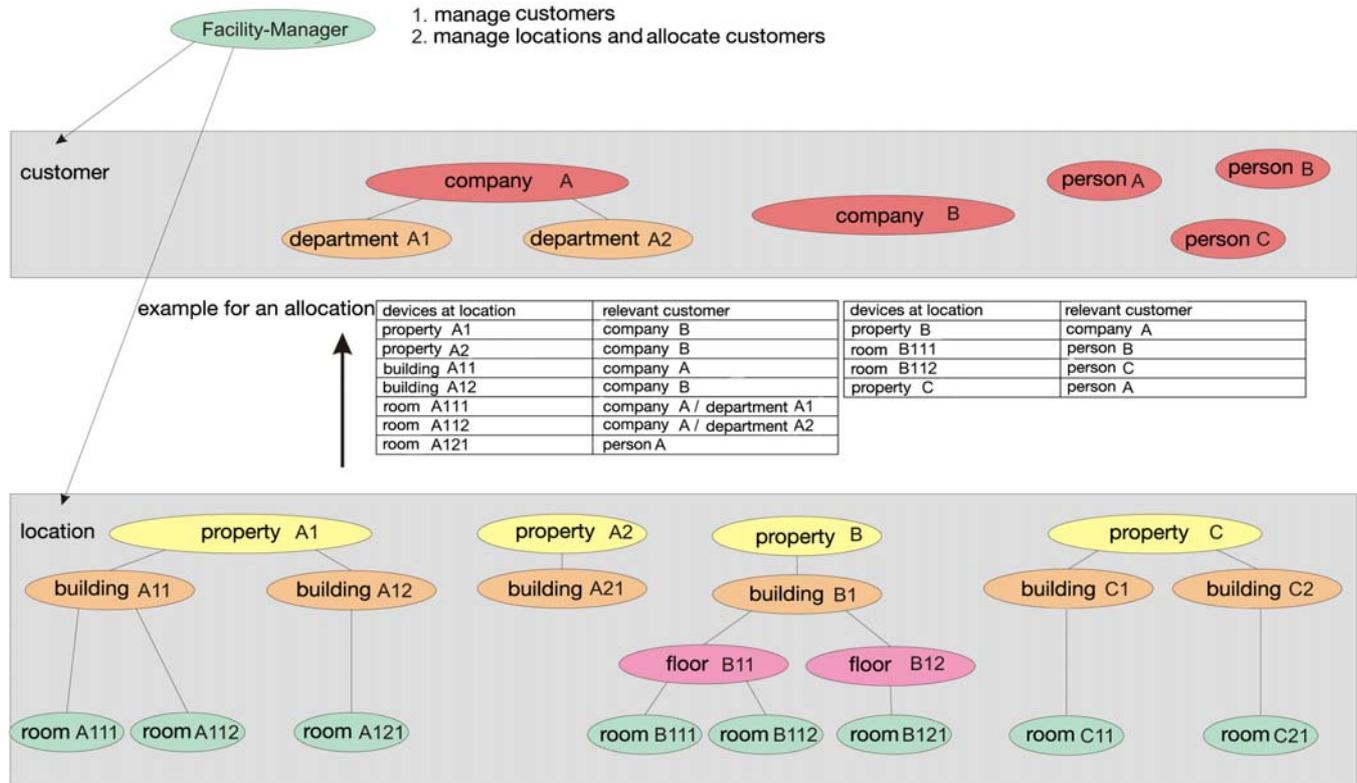


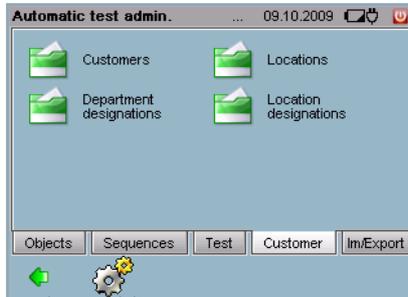
Note

Entry of a new interval or editing of an existing interval can be exited at any time by pressing the **ESC** key. Entries are ignored.

- ⇒ Add the new interval to the catalog with **Save** .

7.6 Customer and Location Administration





Customers and locations for devices under test are entered with the customer administration function.

7.6.1 Catalog of Persons, Companies and Departments



Customer



Companies, departments and/or persons can be listed for improved clarity by activating the appropriate checkbox. More than one checkbox can be activated if desired. If either none or all of the checkboxes are activated, all of the categories are displayed. Catalog entries can be supplemented and deleted as well.

Creating a New Customer Entry



New



When a data record is entered, a customer type must first be selected:

- Company
- Department
- Person

Entry fields for basic data, address and contact data then appear. A department can only be assigned to a previously entered company.

We recommend saving newly entered customers at regular intervals with the help of the **Backup** function  in the **Setup**  menu, see section 4.11.3 or via the data export  function as an XML file which is independent of a version, see section 7.7.6.

Editing a Customer Entry

Persons, companies and departments can be selected for editing from a catalog of previously entered customers by selecting the respective line. If the name of the company is changed, all of the company's departments are changed accordingly automatically.

Deleting a Customer Entry

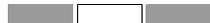
In order to delete existing personal, company and department entries, they must first be marked in the catalog by activating the respective checkbox.



Short-form Operating Instructions

Entering a Customer

- ⇨ Enter a new customer: 
- ⇨ Select a customer type (company, department or person) and acknowledge with OK



Basic Attributes Index Card

Various entry parameters appear depending upon the selected type of customer.

Company

- ⇨ **Designation** This entry appears in the catalog of customers as “Co. *Entry*”
 - ⇨ **ID no.** Entry of numbers and/or letters
- All other parameters listed in this index card are optional entries.

Department

- ⇨ Select the company to which the department belongs and acknowledge with OK.
 - ⇨ **Designation** This entry appears in the catalog of customers as “Dept. *Entry*, Company”
 - ⇨ **ID no.** Entry of numbers and/or letters
- All other parameters listed in this index card are optional entries.

Person

- ⇨ **Name** This entry appears in the catalog of customers as “Pers. *Entry*”
 - ⇨ **ID no.** Entry of numbers and/or letters
- All other parameters listed in this index card are optional entries.



Note

Entry of a new customer can be exited at any time by pressing the ESC key (when not in the keyboard entry mode) or  (in the keyboard entry mode). Entries are ignored.

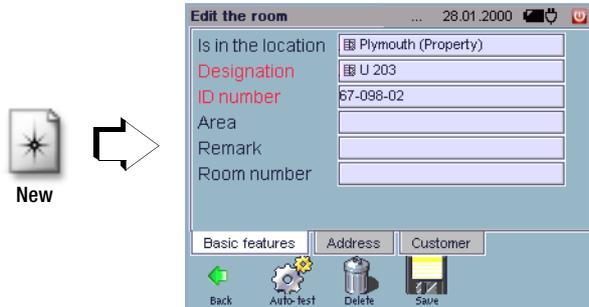
- ⇨ Add the new customer to the catalog by tapping **Save** .

7.6.2 Catalog of Locations



Individual locations included in this catalog can be supplemented or deleted. The hierarchy levels can be opened up by pressing the “+” symbol.

Entering a New Location



When a data record is entered, a location type must first be selected:

- Room
- Floor
- Building
- Property

Observe the hierarchy as depicted on page 111. Enter the location type with the highest hierarchical level first, and then proceed in descending order to building (floor if required) and finally room. While entering a new location, you can access the alphabetically arranged location designations.

The ID number should be selected such that the hierarchy in the catalog is reflected (see above example, “Catalog of Locations”). We recommend saving newly entered locations at regular intervals with the help of the **Backup** function  in the **Setup**  menu (see section 4.11.3) or via the data export  function as an XML file which is independent of a version, see section 7.7.6.

Editing a Location

Designations can be selected for editing from a catalog of previously entered locations by selecting the respective line.

Deleting a Location

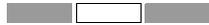
In order to delete existing locations, they must first be marked in the catalog by activating the respective checkbox. Locations for which references already exist cannot be deleted.



Short-form Operating Instructions

Entering a Location

- Enter a new location .
- Select the location type (property, building, floor or room) and acknowledge with OK.



Basic Attributes Index Card

Various entry parameters appear depending upon the selected type of location.

Property

- **Designation** This entry appears in the catalog of locations as “Property *Entry*”
- **ID no.** Entry of numbers and/or letters

All other parameters listed in this index card are optional entries.

Building

- **Included in location** A superordinate location type must be selected from a catalog.
- **ID no.** Entry of numbers and/or letters
- **Designation** This entry appears in the catalog of locations as “Building *Entry*”

All other parameters listed in this index card are optional entries.

Floor

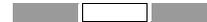
- **Included in location** A superordinate location type must be selected from a catalog.
- **ID no.** Entry of numbers and/or letters
- **Designation** This entry appears in the catalog of locations as “No Building, Floor *Entry*”

All other parameters listed in this index card are optional entries.

Room

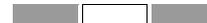
- **Included in location** A superordinate location type must be selected from a catalog.
- **ID no.** Entry of numbers and/or letters
- **Room** The entry for the room number appears in the catalog of locations as “No Building, Room *Entry*”

All other parameters listed in this index card are optional entries.



Address Index Card

An associated address (usually the address of the property or building which is at the higher level in the hierarchy) can be entered or selected here.



Customer Index Card

A customer can be selected from an existing catalog and assigned here. If no customer is selected, the customer associated with the assigned location (address) appears with a faded, pale font color. Customers cannot be entered here.

- Add the new location to the catalog by tapping **Save** .

7.6.3 Catalog of Departments

Departmental designations can be entered and edited here.



The departments are arranged alphabetically.

This catalog can be accessed while entering a new customer of the “department” type.

Entering a new department



Enter the department name here using the softkey keyboard.

- Add the new department to the catalog by tapping **Save** ✓.

We recommend saving newly entered locations at regular intervals with the help of the **Backup** function  in the **Setup**  menu (see section 4.11.3) or via the data export  function as an XML file which is independent of a version, see section 7.7.6.

Changing Departments

A department can be selected from the catalog for editing by marking the appropriate line.

Deleting Departments

In order to delete existing departments, they must first be marked in the catalog by activating the respective checkbox. Referenced departments, i.e. departments which are already being used for DUTs, cannot be deleted.

Short-form Operating Instructions

Entering a Department

- Enter a new department: 
- **Entry field:** Enter department

Note

Entry of a new designation or editing of an existing designation can be exited at any time by pressing the ESC key (when not in the keyboard entry mode) or  (in the keyboard entry mode). Entries are ignored.

- Add the new designation to the catalog by tapping **Save** ✓.

7.6.4 Catalog of Location Designation



A location designation can be entered here, to which one of the four location designations can then be assigned, namely “Property”, “Building”, “Floor” or “Room”.

Entering a New Location Designation



When a data record is entered, a location type must first be selected:

- Room
- Floor
- Building
- Property

Then enter the location designation directly using the softkey keyboard.

- Add the new location designation to the catalog by tapping **Save** ✓.

We recommend saving newly entered locations at regular intervals with the help of the **Backup** function  in the **Setup**  menu (see section 4.11.3) or via the data export  function as an XML file which is independent of a version, see section 7.7.6.

Changing Location Designations

A designation can be selected from the catalog for editing by marking the appropriate line.

Changing Location Designations

In order to delete existing location designations, they must first be marked in the catalog by activating the respective checkboxes. Location designations for which references already exist cannot be deleted.



Short-form Operating Instructions

Entering Location Designations

- ⇒ Enter a new location designation: 
 - ⇒ **Entry field:** Enter location designation
-



Note

Entry of a new designation or editing of an existing designation can be exited at any time by pressing the ESC key (when not in the keyboard entry mode) or  (in the keyboard entry mode). Entries are ignored.

- ⇒ Add the new designation to the catalog by tapping **Save** .

7.7 Data Exchange Between the test system and vFM / PS3

Data from the database in the **test system** can be exchanged with other databases, in particular with vFM / PS3, by means of export and import files.

Data exchange is carried out by means of special files, which must be included on the storage medium used for data exchange in a specified structure:

Example based on Compact Flash

Root:

cmd.def	Determines which catalogs will be exchanged.
Secustar.def	Determines which data fields will be exchanged.
Vers.def	Determines which hierarchies are enabled in vFM / PS3.



Note

Your compact flash card has already been prepared for exchanging data with vFM / PS3, and the above mentioned files are thus located in the root directory.

Data exchange is carried out in two stages:1. Exchange of **catalog data** „Catalog“

(Catalog data are all one-time only entries for an object.)

Data transfer from the following catalogs is possible with vFM / PS3 (examples in parentheses):

- Objects (ID number, designation, serial number, comment, cost center)
- Work directives (designation, work steps)
- Object types (manufacturer, type)
- Object designations
- Customers (ID, name, address)
- Building (location)
- Rooms (ID, name)
- Addresses

**Attention!**

Objects, object types and object designations, as well as their deadlines, can only be imported or exported from or to activated hierarchies. If the hierarchies have not been activated, the above mentioned data are discarded.

2. Exchange of **portable data**

Portable data include all types of tests (measurement results for the above listed objects) and deadlines.

7.7.1 Preparing for Data Exchange (vFM / PS3 only)

**Prepare
CF Card****Prepare
USB Memory Stick**

Data is exchanged between vFM / PS3 and the **test system** via the CF card / USB stick. Configuration files are required to this end, which are accessed by the test system and vFM / PS3 from the CF card or the USB stick. The configuration files control the scope of data exchange.

⇒ Select **Prepare CF Card** or **USB Stick**.

The cmd.def and secustar.def files are created on your CF card or USB stick.

Prerequisites

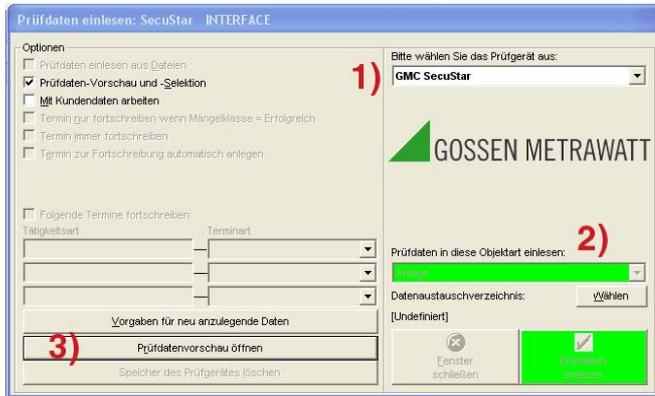
- A formatted type II CF card or USB stick is inserted.
- The yellow LED next to the slot is lit up.

**Attention!**

Existing configuration files with the same names are overwritten during the preparation procedure.

7.7.2 Creating the Vers.def File (vFM / PS3)

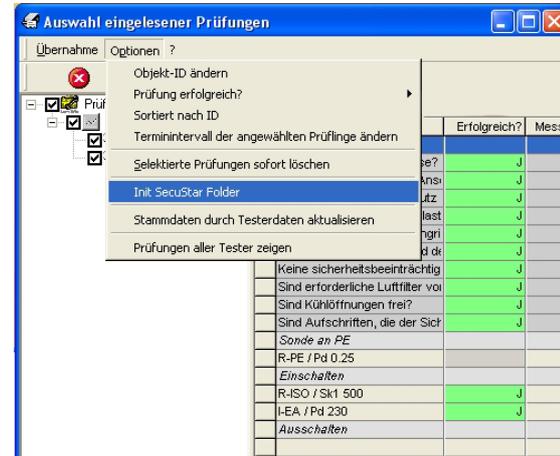
Start vFM / PS3 at your PC and select **Data Import** and then **DUTs** from the **Extras** menu.



Select:

1. **SecuStar** as the test instrument
2. The corresponding directory in your USB stick or CF card
3. And then open the **test data preview**.

The following window appears:



You can now generate the Vers.def file by selecting **Init SecuStar Folder** in the **Options** menu.

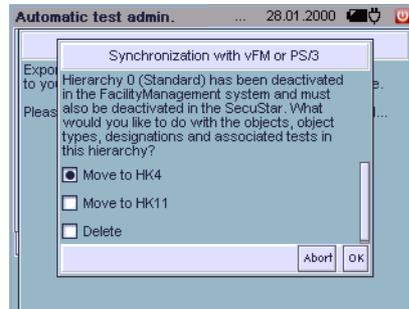
A Vers.def file then appears in the selected directory on your CF card or USB stick, and the hierarchies can be synchronized.

7.7.3 Synchronizing the Hierarchies



CF-Sync USB-Sync

Synchronizing
the CF card or
the USB stick



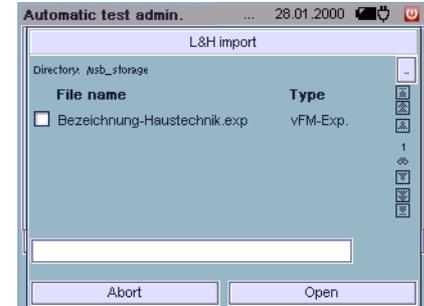
Due to the fact that the same hierarchies exist in vFM / PS3 as in the **test system**, they must be reconciled before the first data transmission takes place.

If the files (catalog/data) are exported or imported, the “Vers.def” file is required. It must be specified in this file which hierarchies are supported by the vFM / PS3 program.

This file must therefore always be generated by vFM / PS3 before the first import/export (see section 7.7.2).

Before import or export, the **test system** first checks to determine whether or not the object structures are identical. If differences exist, the user has to decide how to proceed (e.g. delete the objects in non-supported, but existing object types ...). You can only continue when both object structures are identical. Before this reconciliation, there is only one help hierarchy in the **test system**, namely HK0. All objects are entered to this hierarchy. During the first data reconciliation with vFM / PS3 for which a “Vers.def” file is created, the user can select to which hierarchy the **test system** exports the objects.

7.7.4 Data Import from vFM / PS3



Data records are selected here for import from vFM / PS3 at the PC to the test system via the CF card / USB stick. Select the file in L&H Format function to this end. The respective file name ends with the .exp extension.

If you want to select the file manually, you can choose to transmit only the catalog data required for the DUTs, or only portable data. Otherwise, the test instrument loads both types of data, one after the other.

Prerequisites

- The CF card / USB stick has been formatted (see section 7.7.1).
- The CF / USB stick card is inserted.
- The yellow LED next to the slot is lit up.

The name of the import file cannot be changed.

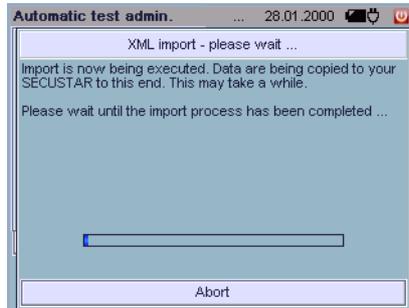
Explorer Functions for Data Import and Export

The display can be returned to the root directory with the “.” soft-key at the upper right after selecting a subdirectory (this is always displayed in brackets).

You can scroll within the directory with the “Forward” and “Back” keys.

Import can be interrupted at any time with the “Interrupt” button.

This also applies to the L&H import and, as of version 1.9.10, also to the xml and L&H export.



7.7.5 Data Export to vFM / PS3



Data records are selected here for export to vFM / PS3 at the PC. Select the file in L&H Format function to this end. The respective file name ends with the .imp extension.



Attention!

The name of the export file can be freely selected and several files can be generated simultaneously in the **test system**. vFM / PS3 always expects the same files, namely **catalog.imp** or **data.imp**.

Prerequisites

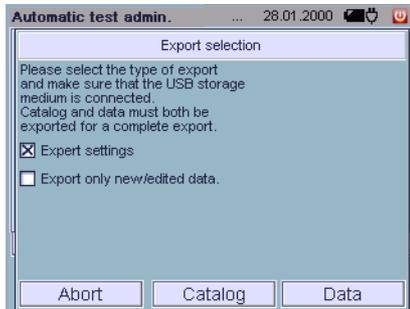
- The CF card / USB stick has been formatted (see section 7.7.1).
- The CF / USB stick card is inserted.
- The yellow LED next to the slot is lit up.

In order to obtain a full export, two types of exports must be executed one after the other:

1) Catalog export: Catalog.imp, 2) Data export: Data.imp

The name and the extension of the export file should not be changed. However, the name can be supplemented, for example: Data2.imp.

If data are exported in vFM / PS3 format, the following submenu appears:



If the expert setting is selected, you can select the directory path to which the catalog.imp and data.imp files will be exported.

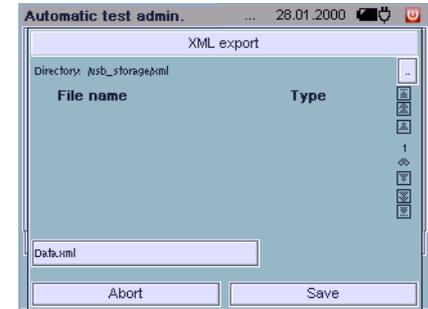
If this setting is deactivated, the file is saved to the root directory and you have the option of exporting both files at the same time with the “All” button.

The “Export new/edited files only” setting make it possible for you to export these file only, instead of all catalog data and portable data.

Note

The “Export new/edited files only” setting assumes that all data have been previously exported at least once.

7.7.6 Data Export to XML



The “Data export” and “Data import” submenus in the administration function allow for data exchange between the **test system** and PC applications via the CF card.

All data entered to, and values measured with the **test system** can be read out.

The XML format saves all data from the **test system** and is suitable for use as a backup, because it’s version independent.

Note

The file generated during XML export (filename.xml) is device-specific, and is not practically exchangeable with XML from Microsoft Office Applications.

Prerequisites

- The CF card / USB stick has adequate available memory space.
- The CF card / USB stick is inserted.
- The yellow LED next to the slot is lit up.

7.7.7 Data Import from XML



Lists or catalogs (e.g. designations) from various PC applications can be made available to the **test system** for test sequences using the import function.

Prerequisites

- The CF card / USB stick has adequate available memory space.
- The CF card / USB stick is inserted.
- The yellow LED next to the slot is lit up.



Attention!

We assume no liability for impermissibly adjusted parameters which are transferred to the **test system** via the import function, and which may result in malfunctioning.



Note

The secuxml.xsd schema file can be downloaded at www.gossenmetrawatt.com/software/secustar/schema/0.4/secuxml.xsd.

8 Technical Data

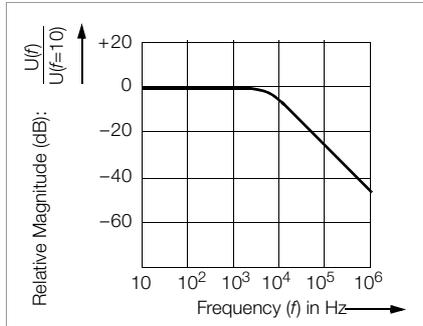
Function	Measured Quantity	Measuring Range / Nominal Range of Use	Resolution	Additional Information	Open-Circuit Voltage U_0	Additional Information	Short-circuit current I_K	Int. Resistance R_I	Ref. Resistance R_{REF}	Measuring Uncertainty *	Intrinsic Uncertainty *	Overload Capacity		
												Value	Time	
DIN VDE 0701-0702 / IEC 62353 (VDE 0751 -1) Tests	PE resistance R PE	man: 1 ... 999 mΩ man: 0.01 ... 9.99 Ω auto: 0.01 ... 30.00 Ω 0.01 ... 3.30 Ω 0.1 ... 10.0 Ω	1 mΩ 10 mΩ 10 mΩ 10 mΩ 100 mΩ	Electronic fuse + fuse link	4.0 ... 4.5 V AC TRMS	Where $I_{sl} = 200$ mA~	220 ... 270 mA AC TRMS	—	—	< ±10% rdg. within a range of 0.1 ... 10 Ω where $I_P = 200$ mA	±(2.5% rdg. + 10 mΩ) within a range of 0.1 ... 10 Ω where $I_P = 200$ mA	264 V AC/DC	Cont.	
	Insulation resistance R ISO	10 ... 300 kΩ 0.01 ... 3.0 MΩ 0.1 ... 30.0 MΩ 1 ... 300 MΩ	10 kΩ 10 kΩ 100 kΩ 1 MΩ	Test voltage: 100/200/300/400/500 V DC	$U_N < U < 1.2 U_N$	Nominal current > 1 mA where $R_{ISO} = 500$ kΩ	2 mA	—	—	0.01 ... 100 MΩ: < ±10% rdg. > 100 MΩ < ±20% rdg. where $U_P = 500$ V each	0.1 ... 30 MΩ: ±(2.5% rdg. + 1 d) > 30 MΩ ±(5% rdg. + 1 d) where $U_P = 500$ V each	264 V AC/DC	Cont.	
	Equivalent leakage current I AP	10 ... 300 μA~ 0.01 ... 3.00 mA~ 0.1 ... 30.0 mA~	10 μA 10 μA 100 μA	Test voltage: 110, 220, 230, 240 V AC	110 ... 240 V~ -15 / +10%	Freq. 50, 60, 200, 400 Hz	< 1.5 mA	> 150 kΩ	1 kΩ ±10Ω	20 μA ... 15 mA AC: < ±10% rdg. > 15.0 mA AC: < ±15% rdg.	20 μA ... 15 mA AC: ±(5% rdg. + 1 d) > 15.0 mA AC: ±(10% rdg. + 1 d)	264 V AC/DC	Cont.	
	Direct method IT	10 ... 300 μA≅ 0.01 ... 3.00 mA at 0.1 ... 30.00 mA at	10 μA 10 μA	Probe current monitoring: Probe shutdown: $I_C > 10$ mA~ (5 ms) Residual current monitoring Mains shutdown: $I_D > 10$ mA~ (25 ms)					1 kΩ ±10 Ω	—	0.02 ... 10 mA at: < ±10% rdg.	20 ... 300 μA at: ±(5% rdg. + 1 d) > 300 μA at: ±(2.5% rdg. + 1 d)	264 V AC/DC	Cont.
	Direct method IP	10 ... 300 μA≅ 0.01 ... 3.00 mA at	10 μA 10 μA	Probe current monitoring: Probe shutdown: $I_C > 10$ mA~ (5 ms) Residual current monitoring Mains shutdown: $I_D > 10$ mA~ (25 ms)					1 kΩ ±10 Ω	—	0.01 ... 3 mA at: < ±10% rdg.	10 ... 300 μA at: ±(7.5% rdg. + 1 d) 0.30 ... 3.00 mA at ±(2.5% rdg. + 1 d)	264 V AC/DC	Cont.
	Residual current I PE between L and N	10 ... 300 μA~ 0.01 ... 3.00 mA~ 0.1 ... 30.0 mA	10 μA 10 μA 100 μA	= Protective conductor current, direct Residual current monitoring Mains shutdown: > 20 mA~ (25 ms)							0.5 ... 20.0 mA: < ±10% rdg.	20 ... 300 μA: ±(5% rdg. + 1 d) > 300 μA: ±(2.5% rdg. + 1 d)	264 V AC/DC	Cont.
	PE leakage current Direct I PE between L and N	10 ... 300 μA≅ 0.01 ... 3.00 mA at 0.1 ... 30.0 mA at	10 μA 10 μA 100 μA	= Protective conductor current, direct Residual current monitoring Mains shutdown: > 20 mA~ (25 ms)							0.5 ... 20.0 mA: < ±10% rdg.	20 ... 300 μA: ±(5% rdg. + 1 d) > 300 μA: ±(2.5% rdg. + 1 d)	264 V AC/DC	Cont.
	Prot. conductor current I PE with current sensor	0.0 ... 100.0 mA	100 μA	Via current sensor as optional accessory (sockets 3 and 4) with a transformation ratio of 1 mV / 1 mA <i>In preparation</i>							Depends upon current sensor characteristics			

Function	Measured Quantity	Measuring Range / Nominal Range of Use	Resolution	Additional Information	Open-Circuit Voltage U_0	Additional Information	Short-circuit current I_K	Int. Resistance R_I	Ref. Resistance R_{REF}	Measuring Uncertainty *	Intrinsic Uncertainty *	Overload Capacity Value	Overload Capacity Time
RCD test	Time to trip	0 ... 400 ms	±5 ms	Test current: 30 mA	At nominal voltage of 230 / 240 V and 50 / 60 Hz, only during battery operation with mains connected								
PRCD:	Time to trip	0 ... 400 ms	±2 ms	Test current: 30 mA	At nominal voltage of 230 / 240 V and 50 / 60 Hz,								
Function test (not during battery operation)	Line voltage (RMS) U_{LN}	90 ... 264 V AC (45 ... 440 Hz)	0.1 V							±5.0% rdg.	±(2.5% rdg. + 1 d)	264 V AC	Cont.
	Load Current (RMS) I_L	0.02 ... 16.00 A AC (45 ... 440 Hz)	10 mA	Shutdown by mains relay at: $I_V > 16\text{ A}$ ~ where $t > 0.5\text{ s}$ Shutdown by mains relay at: $I_V > 4\text{ A}$ ~ where internal temperature $> 70^\circ\text{C}$						±5.0% rdg.	±(2.5% rdg. + 1 d)	4 A	Cont.
	Active power P	10 ... 4000 W	1 W	Measured value P and calculated value S are compared, and the smaller of the two is displayed. Shutdown at internal temperature $> 70^\circ\text{C}$				$f < 100\text{ Hz}$ ±7.5% rdg.	$P > 10\text{ W}$, PF > 0.5 $f < 100\text{ Hz}$ ±(5% rdg. + 10 d)	< 1000 W	Cont.		
								$f \geq 100\text{ Hz}$ ±10% rdg.	$P > 10\text{ W}$, PF > 0.5 $f \geq 100\text{ Hz}$ ±(7.5% rdg. + 10 d)	< 4000 W	Int.		
	Apparent power S	10 ... 4000 W	1 VA	Calculated vale $U_{L-N} \cdot I_V$ [OL display for ULN or I L overload] Shutdown at internal temperature $> 70^\circ\text{C}$				$f < 100\text{ Hz}$ ±7.5% rdg.	$P > 10\text{ W}$ $f < 100\text{ Hz}$ ±(5% rdg. + 10 d)	< 1000 W	Cont.		
								$f \geq 100\text{ Hz}$ ±10% rdg.	$P > 10\text{ W}$ $f \geq 100\text{ Hz}$ ±(7.5% rdg. + 10 d)	< 4000 W	Int.		
Power factor PF with sinusoidal waveshape: $\cos \varphi$	0.00 ... 1.00 inductive	0.01	Calculated value P / S, display as of $P > 10\text{ W}$				$f < 100\text{ Hz}$ ±7.5% rdg.	$P > 10\text{ W}$, PF > 0.5 $f < 100\text{ Hz}$ ±(5% rdg. + 10 d)	—	—			
							$f \geq 100\text{ Hz}$ ±10% rdg.	$P > 10\text{ W}$, PF > 0.5 $f \geq 100\text{ Hz}$ ±(7.5% rdg. + 10 d)	—	—			
On-time t (E = P · t)	00:00:00 ... > 99:00:00 s	1 s	On-time, line voltage to test socket, for calculating energy						—	—	—	—	

* The data are only valid for the values displayed at the test instrument.
Data which are transmitted via the USB interface may deviate.

Measuring Leakage Current

Frequency response is taken into consideration in accordance with the diagram to the right when leakage current is measured.



Reference Conditions

Line voltage	230 V ± 0.2 %
Line frequency	50 Hz ± 0.1 %
Waveshape	Sine (deviation between effective and rectified value < 0.5%)
Battery supply power	9.2 ... 12.5 V
Ambient temperature	+23 °C ± 2 K
Relative humidity	40 ... 60%
Load Resistance	Linear

Influencing Quantities and Influence Error

Influencing Quantity / Sphere of Influence	Desig. per DIN VDE 0404	Influence Error ± ... % of the measured values
Test instrument position	E1	2.5 at I PE (diff)
Test instrument supply voltage	E2	1
Ambient temperature (0 °C ... +40 ° C)	E3	1
DUT current consumption	E4	2.5
Low frequency magnetic fields	E5	3.0 at I PE (diff)
DUT impedance	I6	2.5
Conductance leakage capacity during insulation measurement	E7	0.5
Waveshape of the measured test current	E8	2.5 at I PA 1 Other measuring ranges

Ambient Conditions

Operating temp.	0 ° C ... +4 ° C
Accuracy Range	0 ° C ... +4 ° C
Storage temp. range	-20 ° C ... +60 ° C
Relative humidity	Max. 75 %, no condensation allowed
Elevation	Max. 2000 m
Deployment	Indoors, except within specified ambient conditions

Power Supply

Broad range variable power pack

Line voltage 90 ... 264 V
 Line frequency 45 Hz ... 65 Hz
 Power consumption
 Internal consumption < 40 VA
 Permissible DUT power consumption ≤ 4000 VA
 Permissible DUT power consumption, cont. operation ≤ 1000 VA
 Permissible DUT current consumption, cont. operation ≤ 4 A~
 Switching capacity ≤ 16 A, AC1

Battery Operation

Battery pack NiMH, 9.6 V / 3.2 Ah
 Charging time Approx. 3 hours in discharged state
 Working range 9.2 ... 11 V
 Service life Operation: > 4 hours, 450 measuring cycles

Standby function: approx. 24 hrs.

Retention of configuration data during storage: approx. 4 months (assuming the battery has been fully charged)

Battery Test If a voltage level of 9.2 V is fallen short of, the battery symbol blinks red and an intermittent acoustic signal is generated.

Electrical Safety

Fuses 2 x FF (UR) 500 V/16 A AC;
 6,3 mm x 32 mm;
 (Article number 3-578-215-01)
 50 kA breaking capacity at 500 V AC

Safety class Isolation from mains per SC II
 Nominal voltage 230 V
 Test voltage 2.2 kV AC or 3.3 kV DC
 Measuring category 300 V CAT II
 Fouling factor 2
 Safety Shutdown With following differential current at DUT during:
 – Function test 10 mA~ / < 25 ms
 – Contact current measurement 10 mA~ / < 25 ms
 – Residual current measurement 20 mA~ / < 25 ms
 – Prot. con. current meas. 20 mA~ / < 25 ms
 With following probe current during:
 – Contact current measurement 10 mA~ / < 5 ms
 – Prot. conductor resistance meas. 300 mA~ / < 1 ms

Mechanical Design

Dimensions (W x D x H) 325 x 250 x 90 mm
 Weight Approx. 2.4 kg with battery pack
 Protection Housing: IP 40
 Connections: IP 20
 Per DIN VDE 0470, part 1 / EN 60529

Table Excerpt Regarding Significance of IP Codes

IP XY (1 st char. X)	Protection against penetration of solid particles	IP XY (2 nd char. Y)	Protection against penetration by water
0	Not protected	0	Not protected
1	≥ 50.0 mm dia.	1	Vertical dripping

IP XY (1 st char. X)	Protection against penetration of solid particles	IP XY (2 nd char. Y)	Protection against penetration by water
2	≥ 12.5 mm dia.	2	Dripping (15° inclination)
3	≥ 2.5 mm dia.	3	Spray water
4	≥ 1.0 mm dia.	4	Splashing water

Operating System and Firmware

The software used in the **test system** test system is a variant of the GNU system which is based upon the Linux kernel. The corresponding source code was developed by third parties and is subject to the GNU license (GPL: general public license), the LGPL (lesser general public license) or other open source license stipulations.

General information regarding GNU/Linux systems is available at www.gnu.org.

A CD ROM with the source code can be requested form our service department.

9 Data Interfaces

USB master

Output voltage	5 V DC \pm 10%
Short-circuit current	Socket 1: 0.5 A, sockets 2 through 4: 0.1 A
USB Port	4-pin type A, USB 1.1 compatible with USB 2.0
Connector pin assignments	1: VCC, 2: D-, 3: D+, 4: GND

USB slave

In preparation

Slot for CF card

Compact flash card type II

Ethernet LAN

10 MBit/s

RS 232

Interface for factory settings entered by the manufacturer only

10 Appendix

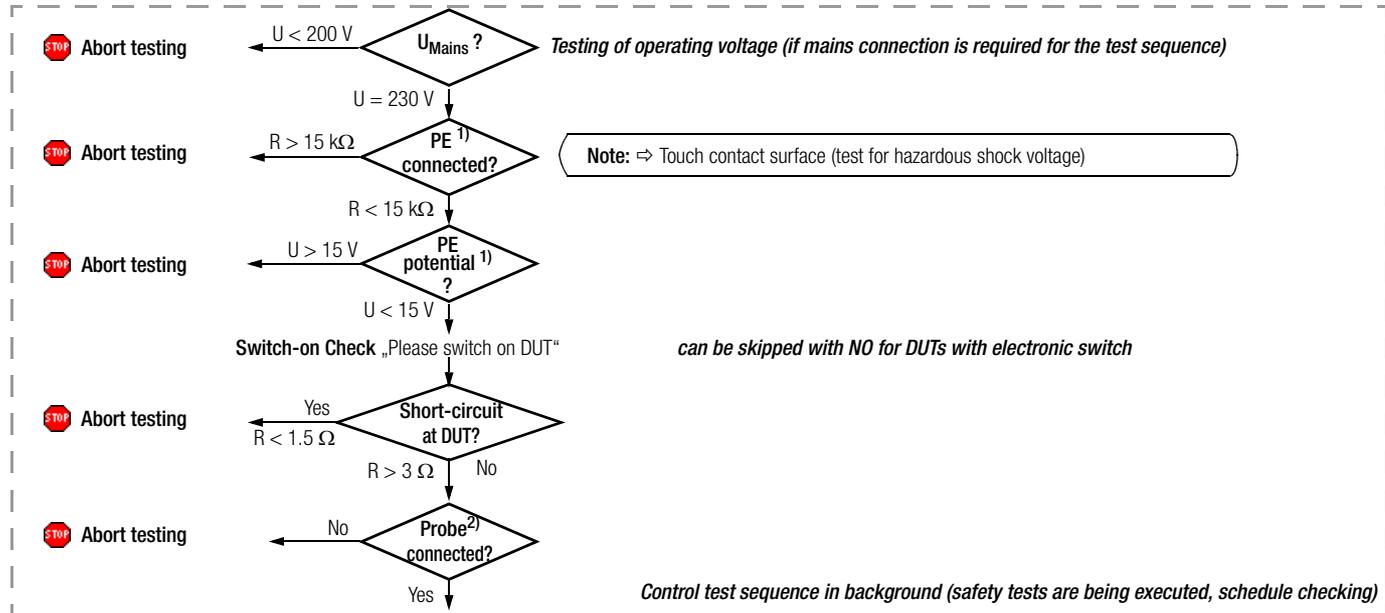
10.1 Test Sequences

The following flowchart is representative of all test sequences. The control test sequence is started automatically in the background, during the course of which all preliminary tests are executed which are required for a safe test sequence.

The number and type of test steps varies in the visible part of the test sequence depending upon which standard has been selected.

How the various test steps included in the test sequences can be accessed and modified is described in section 7.4.3 (factory default setting; read only). The test sequences are described in detail in section 7.4.3.

Flow Chart



Start of visible part of the test sequences

¹⁾ Check whenever the **test system** is connected to mains power.

²⁾ Check if test steps are included in the sequence for which the probe is required.

10.2 Testing Devices in Accordance with DIN VDE 0701-0702

In accordance with DIN VDE 0701-0702 regulations, repaired or modified electrical devices must provide users with the same degree of safety against the dangers of electrical energy as is also the case for new devices. The following tests must be executed in the order specified below to this end:

1. Visual inspection
2. Protective conductor resistance
3. Insulation characteristics:
 - if technically reasonable, i.e. if the DUT does not include any electrically actuated, all-pole switches:
 - Insulation resistance followed by protective conductor or equivalent leakage current
 - Otherwise: leakage current during operation (protective conductor current and contact current)
 - Safety extra-low voltage (only at point of connection of safety extra-low voltage generated in the DUT)
4. Function test
5. Labeling inspection
6. Documentation

Visual inspection is performed before metrological testing is executed, and includes the following points:

- Damage to the connector cables
- Damage to the insulation
- Correct selection and use of cables and plugs
- Condition of the mains plug, the connector terminals and wires
- Defective cable bending guard
- Defective connector cable stress relief
- Condition of mounts, cable retainers, the fuse holder which is accessible to the user etc.
- Damage to the housing and the safety covers
- Signs of overloading, as well as improper use or operation
- Signs of impermissible tampering or modifications
- Contamination, corrosion or aging which impermissibly impairs safety
- Contamination or clogging of openings required for cooling
- Condition of air filters
- Leak-proof containers for water, air or other media, condition of pressure relief valves
- Operability of switches, controllers, adjusting devices etc.
- Legibility of all labels and symbols with safety functions, as well as rated values
- and position indicators
- Good legibility of labeling required for safety (e. g. warning symbols, protection class, characteristic fuse data, switch positions for disconnectors).

The following measurements can be performed in accordance with the above mentioned standard:

- **Protective conductor measurement R PE** (*permanent connection or with plug*)
Part 1: test current: ± 200 mA DC
- **Insulation measurement R ISO**
(*not required if there is any danger of damaging voltage-sensitive components in data processing equipment*)
- **Protective conductor current measurement**
with the following measuring methods:
 - Direct measurement
 - Alternative measurement (Equivalent leakage current)
 - Differential current measuring method current

The test is required for all safety class I devices under test:

 - For which insulation resistance cannot be measured and
 - At which all exposed conductive parts are connected to the protective conductor
 - If mains plugs without fixed polarity are used, they must be tested in both positions.
- **Touch current measurement**
with the following measuring methods:
 - Direct measurement
 - Alternative measurement (Equivalent leakage current)
 - Differential current measuring method current

Testing is required for all devices under test:

 - For which insulation resistance cannot be measured and
 - Which include exposed conductive parts which are **not** connected to the protective conductor.
 - If mains plugs without fixed polarity are used, they must be tested in both positions.

Testing safety class I and II **data processing equipment and office machines** as individual devices and in combination with one another.

The following measurements can be performed in accordance with the above mentioned standard:

- Protective conductor measurement R PE (*permanent connection or with plug*)
Test current: DC ± 200 mA
- Housing leakage current I T
- According to DIN VDE 0701-0702, the device protective conductor must be tested after maintenance, repair or modification of data processing equipment and office machines, and exposed, conductive parts must be tested for the absence of voltage. This applies to:
 - Safety class I devices for all exposed, conductive parts which are accessible to the user, and which are not connected to the protective conductor
 - Safety class II devices (totally insulated devices) for all exposed, conductive parts which are accessible to the user, with the mains plug poled in both directions.

10.2.1 Overview of Primary Test Sequences per DIN VDE 0701-0702

- Passive: e.g. lamps, cable reels, extension and device connector cables
- Active: e.g. electrical heaters and motorized devices, devices with controllers
- EDP: Data processing equipment and office machinery

Individual Abbr.	Tests per Test Seq. Test / Measurement	DIN VDE 0701-0702				
		SC 1	SC 2	Passive	Active	EDP
SC	Safety class test	●	●			
EK	On test	●	●			
	Visual inspection	●	●	●	●	●
R-PE	PE resistance	●		●	●	●
R-ISO (LN-PE)	Insulation resistance	●		●	●	
R-ISO (LN-housing)	Insulation resistance		●	●	●	
I-EA	Equivalent leakage current ¹⁾	●		●		
I-EA	Equivalent contact current		●	●		
I-PE (L-N) (N-L)	Differential current ²⁾	●			●	●
I-T (-N) I-T (N-L)	Touch current ³⁾		●		●	●

¹⁾ In addition to insulation resistance measurement, as a measuring method for protective conductor current measurement:

all exposed conductive parts are connected to the protective conductor.

²⁾ Special case, IT network: If the PE terminal is not detected, the user is asked whether or not measurement should be executed in the IT network. Testing is continued if the user responds in the affirmative.

³⁾ In addition to insulation resistance measurement: exposed conductive parts are **not** connected to the protective conductor



Note

Active leakage current measurements IPE differential current and IPE direct protective conductor current result in erroneous measurements in IT networks.

A function test can be executed immediately after passing each VDE test. Click the Function softkey in the “Manual Test” main menu to this end.

10.2.2 Test sequences in detail (DIN VDE 0701-0702)

(test sequences and descriptions are included on the CF card: [0701-0702KaDrFeSt.xml](#) / [test_sequences-0701-0702_2008.pdf](#))

0701-0702 EDV SK I	0701-0702 EDV SK I + II	0701-0702 EDV SK II	0701-0702 aktiv SK I
Visual inspection	Visual inspection	Visual inspection	Visual inspection
Contact exposed conductive parts of the DUT which are connected to the protective conductor (PE) with the probe (socket 1/2).	Contact exposed conductive parts of the DUT which are connected to the protective conductor (PE) with the probe (socket 1/2).		Contact exposed conductive parts of the DUT which are connected to the protective conductor (PE) with the probe (socket 1/2).
R-PE / Pd 0,25 / GW 0,3 Ω	R-PE / Pd 0,25 / GW 0,3 Ω		R-PE / Pd 0,25 / GW 0,3 Ω
			R-ISO / SK1 500 / GW 1MΩ
Switch the device under test off.	Switch the device under test off.	Switch the device under test off.	Switch the device under test off.
Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.
I-PE (L/N) / Diff 230 / GW 3,5 mA	I-PE (L/N) / Diff 230 / GW 3,5 mA		I-PE (L/N) / Diff 230 / GW 3,5 mA
	Contact exposed conductive parts of the DUT which are not connected to the protective conductor (PE) with the probe (socket 1/2).	Contact exposed conductive parts of the DUT which are not connected to the protective conductor (PE) with the probe (socket 1/2).	
	I-B (L/N) / Direkt 230 / GW 0,5 mA	I-B (L/N) / Direkt 230 / GW 0,5 mA	
Attention! Mains voltage will be applied to the DUT..	Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.
I-PE (N/L) / Diff 230 / GW 3,5 mA	I-PE (N/L) / Diff 230 / GW 3,5 mA		I-PE (N/L) / Diff 230 / GW 3,5 mA
	Contact exposed conductive parts of the DUT which are not connected to the protective conductor (PE) with the probe (socket 1/2).		
	I-B (N/L) / Direkt 230 / GW 0,5 mA	I-B (N/L) / Direkt 230 / GW 0,5 mA	

0701-0702 aktiv SK I + II	0701-0702 aktiv SK II	0701-0702 passiv SK I	0701-0702 passiv SK I + II	0701-0702 passiv SK II
Visual inspection	Visual inspection	Visual inspection	Visual inspection	Visual inspection
Contact exposed conductive parts of the DUT which are connected to the protective conductor (PE) with the probe (socket 1/2).		Contact exposed conductive parts of the DUT which are connected to the protective conductor (PE) with the probe (socket 1/2).	Contact exposed conductive parts of the DUT which are connected to the protective conductor (PE) with the probe (socket 1/2).	
R-PE / Pd 0,25 / GW 0,3 Ω		R-PE / Pd 0,25 / GW 0,3 Ω	R-PE / Pd 0,25 / GW 0,3 Ω	
R-ISO / SK1 500 / GW 1MΩ		R-ISO / SK1 500 / GW 1 MΩ	R-ISO / SK1 500 / GW 1 MΩ	
Contact exposed conductive parts of the DUT which are not connected to the protective conductor (PE) with the probe (socket 1/2).	Contact exposed conductive parts of the DUT which are not connected to the protective conductor (PE) with the probe (socket 1/2).			
R-ISO / SK2 500 / GW 2 MΩ	R-ISO / SK2 500 / GW 2 MΩ			
Switch the device under test off.	Switch the device under test off.			
Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.			
I-PE (L/N) / Diff 230 / GW 3,5 mA		I-PE / Ersatz 230 / GW 3,5 mA	I-PE / Ersatz 230 / GW 3,5 mA	
Contact exposed conductive parts of the DUT which are not connected to the protective conductor (PE) with the probe (socket 1/2).			Contact exposed conductive parts of the DUT which are not connected to the protective conductor (PE) with the probe (socket 1/2).	Contact exposed conductive parts of the DUT which are not connected to the protective conductor (PE) with the probe (socket 1/2)..
I-B (L/N) / Direkt 230 / GW 0,5 mA	I-B (L/N) / Direkt 230 / GW 0,5 mA		R-ISO / SK2 500 / GW 2 MΩ	R-ISO / SK2 500 / GW 2 MΩ
Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.			
I-PE (N/L) / Diff 230 / GW 3,5 mA				
Contact exposed conductive parts of the DUT which are not connected to the protective conductor (PE) with the probe (socket 1/2).				
I-B (N/L) / Direkt 230 / GW 0,5 mA	I-B (N/L) / Direkt 230 / GW 0,5 mA		I-B / Ersatz230 / GW 0,5 mA	I-B / Ersatz230 / GW 0,5 mA
		Switch the device under test off.	Switch the device under test off.	Switch the device under test off.

10.3 Testing Devices in Accordance with IEC 62353 / DIN EN 62353 (VDE 0751-1)

Visual inspection is performed before metrological testing is executed. Testing must be conducted in order to determine whether or not:

- Externally accessible fuses comply with the values specified by the manufacturer (nominal current value, blowing characteristics)
- Labeling required on the device/system is legible and complete
- The mechanical condition of the device allows for continued safe use
- Safety impairing damage or contamination can be detected
- The accessories and/or disposables used with the device/system will also be evaluated (e.g. mains cable, patient cables, tubing)
- The required documentation is available and complete

The following measurements can be performed in accordance with the above mentioned standard:

- Protective conductor measurement R PE, test current: 200 mA DC
- Insulation measurement (*optional*) R ISO (insulation resistance LN to protective conductor)
- Equipment leakage current with the following measuring methods:
 - Direct measuring method
 - Alternative measurement (Equivalent device leakage current)
 - Differential current measuring method
- Patient leakage current or equivalent patient leakage current (patient leakage current is not possible in the event of the SFC: "mains at application part")

10.3.1 Test Sequences in Detail

(test sequences and descriptions are included on the CF card: [751NeueNorm.xml / test_sequences-0751_1_2008.pdf](#))

Medical devices with type CF application parts

0751 SKI CF	0751 SK II CF	0751 SKI + II CF
Visual inspection	Visual inspection	Visual inspection
Contact exposed conductive parts of the DUT which are connected to the protective conductor (PE) with the probe (socket 1/2).	Bitte kontaktieren Sie die Sonde (Buchse 1/2) mit berührbaren leitfähigen Teilen des Prüflings.	Contact exposed conductive parts of the DUT which are connected to the protective conductor (PE) with the probe (socket 1/2).
R-PE / Pd 0,25 / GW 0,3 Ω		R-PE / Pd 0,25 / GW 0,3 Ω
Contact the probe (socket 1/2) with all exposed conductive parts and the application parts of the DUT		Contact the probe (socket 1/2) with all exposed conductive parts and the application parts of the DUT.
Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT,	Attention! Mains voltage will be applied to the DUT.
I-GA (L/N) / Diff 230 / GW 0,5 mA		I-GA (L/N) / Diff 230 / GW 0,5 mA
		Contact exposed conductive parts of the DUT which are not connected to the protective conductor (PE) with the probe (socket 1/2).
	I-B (L/N) / Direkt 230 / GW 0,1 mA	I-B (L/N) / Direkt 230 / GW 0,1 mA
		Contact the probe (socket 1/2) with all exposed conductive parts and the application parts of the DUT.
Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.
I-GA (N/L) / Diff 230 / GW 0,5 mA		I-GA (N/L) / Diff 230 / GW 0,5 mA
		Contact exposed conductive parts of the DUT which are not connected to the protective conductor (PE) with the probe (socket 1/2).
	I-B (N/L) / Direkt 230 / GW 0,1 mA	I-B (N/L) / Direkt 230 / GW 0,1 mA
Contact the type B application parts at the DUT with the probe (socket 1/2).	Contact the type B application parts at the DUT with the probe (socket 1/2).	Contact the type B application parts at the DUT with the probe (socket 1/2).
Switch the device under test on.	Switch the device under test on.	Switch the device under test on.
I-EPA / CF 230 / GW 0,05mA	I-EPA / CF 230 / GW 0,05mA	I-EPA / CF 230 / GW 0,05mA

Medical devices with type B application parts

0751 SKI B	0751 SK II B	0751 SKI + II B
Visual inspection	Visual inspection	Visual inspection
Contact exposed conductive parts of the DUT which are connected to the protective conductor (PE) with the probe (socket 1/2).	Contact exposed conductive parts of the DUT with the probe (socket 1/2).	Contact exposed conductive parts of the DUT which are connected to the protective conductor (PE) with the probe (socket 1/2).
R-PE / Pd 0,25 / GW 0,3 Ω		R-PE / Pd 0,25 / GW 0,3 Ω
		Contact the probe (socket 1/2) with all exposed conductive parts and the application parts of the DUT.
Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.
Contact type B application parts at the DUT with the probe (socket 1/2).		I-GA (L/N) / Diff 230 / GW 0,5 mA
		Contact exposed conductive parts of the DUT which are not connected to the protective conductor (PE) with the probe (socket 1/2).
I-GA (L/N) / Diff 230 / GW 0,5 mA	I-B (L/N) / Direkt 230 / GW 0,1 mA	I-B (L/N) / Direkt 230 / GW 0,1 mA
	Contact exposed conductive parts of the DUT with the probe (socket 1/2).	Contact the type B application parts at the DUT with the probe (socket 1/2).
I-PA(L/N) Direkt /230 / GW 0,1 mA	I-PA(L/N) Direkt /230 / GW 0,1 mA	I-PA(L/N) Direkt /230 / GW 0,1 mA
	Contact exposed conductive parts of the DUT with the probe (socket 1/2).	Contact the probe (socket 1/2) with all exposed conductive parts and the application parts of the DUT.
Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.
I-GA (N/L) / Diff 230 / GW 0,5 mA		I-GA (N/L) / Diff 230 / GW 0,5 mA
		Contact exposed conductive parts of the DUT which are not connected to the protective conductor (PE) with the probe (socket 1/2).
I-B (N/L) / Direkt 230 / GW 0,1 mA	I-B (N/L) / Direkt 230 / GW 0,1 mA	I-B (N/L) / Direkt 230 / GW 0,1 mA
	Contact the type B application parts at the DUT with the probe (socket 1/2).	Contact the type B application parts at the DUT with the probe (socket 1/2).
	I-PA(N/L) Direkt /230 / GW 0,1 mA	I-PA(N/L) Direkt /230 / GW 0,1 mA

Medical devices with type BF application parts

0751 SKI BF	0751 SK II BF	0751 SK II BF mit ISO	0751 SKI + II BF
Visual inspection	Visual inspection	Visual inspection	Visual inspection
Contact exposed conductive parts of the DUT which are connected to the protective conductor (PE) with the probe (socket 1/2).	Contact the probe (socket 1/2) with all exposed conductive parts and the application parts of the DUT.		Contact exposed conductive parts of the DUT which are connected to the protective conductor (PE) with the probe (socket 1/2).
R-PE / Pd 0,25 / GW 0,3 Ω		R-ISO / Sk1 500 / GW 1 MΩ	R-PE / Pd 0,25 / GW 0,3 Ω
Contact the probe (socket 1/2) with all exposed conductive parts and the application parts of the DUT.		Contact exposed conductive parts of the DUT with the probe (socket 1/2).	Contact the probe (socket 1/2) with all exposed conductive parts and the application parts of the DUT.
Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.
I-GA (L/N) / Diff 230 / GW 0,5 mA			I-GA (L/N) / Diff 230 / GW 0,5 mA
			Contact exposed conductive parts of the DUT which are not connected to the protective conductor (PE) with the probe (socket 1/2).
	I-B (L/N) / Direkt 230 / GW 0,5 mA	I-B (L/N) / Direkt 230 / GW 0,1 mA	I-B (L/N) / Direkt 230 / GW 0,1 mA
			Contact the probe (socket 1/2) with all exposed conductive parts and the application parts of the DUT.
Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.
I-GA (N/L) / Diff 230 / GW 0,5 mA			I-GA (N/L) / Diff 230 / GW 0,5 mA
			Contact exposed conductive parts of the DUT which are not connected to the protective conductor (PE) with the probe (socket 1/2).
	I-B (N/L) / Direkt 230 / GW 0,5 mA	I-B (N/L) / Direkt 230 / GW 0,5 mA	I-B (N/L) / Direkt 230 / GW 0,1 mA
Contact the type B application parts at the DUT with the probe (socket 1/2).	Contact the type B application parts at the DUT with the probe (socket 1/2).	Contact the type B application parts at the DUT with the probe (socket 1/2).	Contact the type B application parts at the DUT with the probe (socket 1/2).
Switch the device under test on.	Switch the device under test on.	Switch the device under test on.	Switch the device under test on.
I-EPA / CF 230 / GW 5,0 mA	I-EPA / CF 230 / GW 5,0 mA	I-EPA / CF 230 / GW 5,0 mA	I-EPA / CF 230 / GW 5,0 mA

Medical devices without application parts

0751SK I	0751 SK II
Visual inspection	Visual inspection
Contact exposed conductive parts of the DUT which are connected to the protective conductor (PE) with the probe (socket 1/2).	
R-PE / Pd 0,25 / GW 0,3 Ω	
Switch the device under test on.	Switch the device under test on.
	Contact exposed conductive parts of the DUT with the probe (socket 1/2).
Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.
I-GA (L/N) / Diff 230 / GW 0,5 mA	I-B (L/N) / Direkt 230 / GW 0,1 mA
Attention! Mains voltage will be applied to the DUT.	Attention! Mains voltage will be applied to the DUT.
I-GA (N/L) / Diff 230 / GW 0,5 mA	I-B (N/L) / Direkt 230 / GW 0,1 mA

10.4 Tests with Accessories

10.4.1 Illuminance Measurement

For lighting and illumination technicians

Illuminance measurements are required for planning, installation, testing and monitoring of lighting systems, as well as for defining illumination conditions for hygienic, physiological, psychological and/or safety reasons.

Areas of application, terminology, tasks, requirements and practical guidelines are set forth to a great extent in the DIN standards.

Definitions:

Universal illumination

Uniform illumination of a room which provides for nearly identical visibility in all areas within the room.

Workstation oriented universal illumination

Universal illumination with fixed allocation of lamps to specific workstations (refer to DIN V ENV 26385 for a definition of the workstation).

Single workstation illumination

Illumination of individual workstations in addition to universal illumination.

Practical Examples of Illuminance Measurements

- Planning and installation of illumination systems and monitoring of such with regard to ageing, contamination and viability.
- Daylight in interior rooms (DIN 5034)
- Testing of emergency lighting (in accordance with paragraph 7 of the German Workshop Directive, illuminance must have a value of at least 1 lux).

- Traffic illumination with street lights for vehicles and traffic facilities (DIN 5044)
- Evaluation of headlights (DIN 5037)
- Gymnastics and play (DIN 18032, part 1)
- Sport facility illumination (DIN 67526-1)
- Illumination of construction sites, railroad yards, airport aprons and other outdoor areas
- Floodlighting for buildings, towers and smokestacks
- Illumination of greenhouses and plants

Illumination with artificial light (DIN 5035)

This standard applies to the artificial illumination of interior rooms; it applies analogously to the artificial illumination of outdoor areas, in so far as they are used for the same purpose as the corresponding interior rooms. In cooperation with all interested groups, the standards committee has made every attempt to devise the minimum requirements such that they are justifiable from an illumination technology standpoint on the one hand, and that they do not represent any unreasonable requirements for the user on the other hand. In combination with ASR 7/3, the standard bindingly specifies the recognized technical rules by means of whose application the stipulations set forth in paragraph 7, section 3 of the German Workshop Directive (ArbStättVO) dated March 1975 are complied with.

Basic Light Technology Theory

Illuminance indicates with how much intensity an area is illuminated. The unit of measure for illuminance is the lux (abbreviated lx). The lux is defined as follows: a light source with a luminous intensity of 1 candela (abbreviated cd) at a distance of 1 meter has an illuminance value of 1 lux. The candela represents luminous intensity in a specific direction from the source of radiation which emits monochromatic radiation with a frequency of 540×10^{12} Hz, and whose radiant intensity in the direction in question is equal to watts divided by steradian (1/683).

The footcandle is another unit of measure for illuminance, and is especially common in England and the USA. The footcandle is equal to illuminance resulting from a light source with a luminous intensity of 1 candela at a distance of one foot.

The following relationships exist between the lux and the footcandle:

$$\begin{aligned} 1 \text{ footcandle} &= 10.76 \text{ lux} \\ 1 \text{ lux} &= 0.0929 \text{ footcandles} \end{aligned}$$

Correct measurement necessitates an evaluation of the emitted light on the basis of eye sensitivity in accordance with internationally standardized spectral sensitivity $V(\lambda)$ of the light-adapted eye. This curve represents the mean value which has been ascertained with a large number of test persons.

The utilized silicon photo cell has been adapted so closely to the spectral sensitivity of the human eye by means of correction filters, that it can be assigned to accuracy class B in accordance with DIN 5032, part 7, for the MAVOLUX 5032 B *USB*.

Further details are included in DIN 5032.

10.5 Classification of Devices Under Test

10.5.1 Safety Classes

Devices assigned to all of the following safety classes are equipped with basic insulation, and provide for protection against electrical shock by means of various additional precautions as well.

Safety Class I Devices

Exposed, conductive parts are connected to the protective conductor so that they are not charged with voltage if the basic insulation should fail.

Safety Class II Devices

These devices are equipped with double insulation or reinforced insulation.

Safety Class III Devices

These devices are powered with safety extra-low voltage (SELV). Beyond this, no voltages are generated which exceed SELV. These devices may not be connected to the mains.

Note: Only visual inspection can be performed with the test system.

10.5.2 Application Parts (electrical medical devices)

Type B Application Parts (body)

Devices of this type are suitable for both internal and external patient applications, except for use in direct proximity to the heart. These devices provide for adequate protection against shock, especially as regards:

- Reliable leakage current
- Reliable protective conductor connection if utilized

The following safety classes are permissible: I or II

Type BF Application Parts (body float)

Same as type B, but with type F insulated application parts.

Type CF Application Parts (cardiac float)

Devices of this type are suitable for use directly at the heart. The application part may not be grounded. The following safety classes are permissible: I or II

10.6 Abbreviations

B, BF, CF	Classifications for application parts (chapter 10.5.2)	I P	Patient leakage current
BetrSichV	German occupational safety law	I AP	Applied Parts leakage current
BGV	German trade association regulation	IT system	The IT system has no direct contact between active conductors and grounded parts: bodies within the electrical system are grounded.
BildscharbV	German regulation regarding work at monitor screens	I L	Load current (during function test)
CF card	Compact flash memory card	Ip	Protective conductor test current during R PE measurement, otherwise selection of AC or DC test current
DIN	German Institute for Standardization	L	Phase conductor
$\Delta R PE$	Differential protective conductor resistance, see page 45	PF	Power factor (during function test)
E	Electrical energy (during function test)	MedGV	German medical device ordinance
ElektroG	German law for electrical and electronic equipment: regulates distribution, return and environmental disposal of electrical/electronic equipment	MPG	German medical product law
EN	European standard	MSELV	Medical safety extra-low voltage
f	Line frequency (during function test)	N	Neutral conductor
fp	Test frequency	P	Active power (during function test)
GUV	Accident insurance required by German law	Pd	Test socket
GUV-I	(GUV information)	PE	Ground potential, protective conductor
GUV-R	GUV rules	R INS	Insulation resistance
GUV-V	GUV regulations	RoHS	Directive regarding the restriction of use of hazardous materials in electrical and electronic equipment
I T	Touch current	R PE	Protective conductor resistance
I PE	Protective leakage current, Protective conductor current	S	Apparent power (during function test)
I EA	Equivalent leakage current equivalent device leakage current, equivalent contact current, equivalent leakage current	SELV	Safety extra-low voltage
I E	Equipment leakage current	U _{REF}	Reference voltage to which all leakage voltages make reference (as a rule nominal line voltage)
		U ISO	Test voltage for insulation measurement
		U LN	Line voltage (during function test)

Up	Test voltage (with and without polarity selection)
VDE	Association of German electrical engineers
WEEE	WEEE 2002/96/EC: directive regarding waste electrical and electronic equipment)
ZS	Loop resistance
ZVEH	General Association of German Electricians

10.7 Bibliography

Statutory Source Documents			
German occupational safety law (BetrSichV) Regulations issued by the accident insurance carriers			
Title	Information Rule / Regulation	Publisher	Issue / Order no.
German occupational safety law (BetrSichV)	BetrSichV		
Electrical systems and equipment	BGV A3	BGETF / trade association for electrical, textiles, precision engineering	Legal commentary, 9th issue, 2003
Electrical systems and equipment	GUV-V A2	German assoc. of accident insurance carriers	Order no. GUV-V A2

VDE Standards			
German Standard	Title	Date of Issue	Publisher
DIN VDE 0100-410	Protection against electric shock	2007-06	Beuth-Verlag GmbH
DIN VDE 0100-530	Erection of low-voltage installations Part 530: Selection and erection of electrical equipment - Switchgear and controlgear	2005-06	Beuth-Verlag GmbH
DIN VDE 0100-600	Erection of low-voltage installations Part 6: tests	2008-06	Beuth-Verlag GmbH
Series of standards DIN EN 61557	Devices for testing, measuring or monitoring protective measures	2006/8	Beuth-Verlag GmbH
DIN VDE 0105-100	Operation of electrical installations, part 100: General requirements	2005-06	Beuth-Verlag GmbH

Further literature in German			
Title	Author	Publisher	Issue / Order no.
Wiederholungsprüfungen nach DIN VDE 105	Bödeker, K.; Kindermann, R.; Matz, F.; Uhlig, H.-P	Hüthig & Pflaum www.vde-verlag.de	Issue 2007 VDE Reference No. 310589
Messpraxis Schutzmaßnahmen	Dieter Feulner (Hrsg.), Bödeker, K. Kindermann, R. u. a.	Richard Pflaum Verlag www.pflaum.de	Revised edition 2005 ISBN 3-7905-0924-8
Prüfungen vor Inbetriebnahme von Niederspannungsanlagen	Kammler, M. Nienhaus, H. Vogt, D.	VDE Verlag GmbH www.vde-verlag.de	VDE publication series Volume 63 2 nd edition (2004)
Schnelleinstieg in die neue DIN VDE 0100-410: Schutz gegen elektr. Schlag	Hörmann, W. Nienhaus, H. Schröder, B.	VDE Verlag GmbH www.vde-verlag.de	VDE publication series Volume 140 3 rd edition (2007)
Erstprüfung elektrischer Gebäudeinstallation	Bödeker, W. Kindermann, R.	Huss Medien Verlag Technik, Berlin	Elektropraktiker-Bibliothek
Fehlerstrom-Schutzschalter; Auswahl, Einsatz, Prüfung	Bödeker, W. Kindermann, R.	Huss Medien Verlag Technik, Berlin	Elektropraktiker-Bibliothek
VDE-Prüfung nach BGVA3 und BetrSichV	Henning, W., Rosenberg, W.	Beuth-Verlag GmbH www.beuth.de	VDE publication series Volume 43 Issue 2006
Merkbuch für den Elektrofachmann	GMC-I Messtechnik GmbH		Order No. 3-337-038-01
Prüfdokumentation 7000 für Erst- und Wiederholungsprüfungen elektrischer Anlagen		Richard Pflaum Verlag, München www.pflaum.de	

Fachwissen Elektroinstallation (für die Berufsschule)	Hübscher, Jagla, Klaue, Wickert	Westermann Schulbuchverlag GmbH www.westermann.de	ISBN 978-3-14-221630-0 2 nd edition 2007
Prüfungsfragen Praxis Elektrotechnik	Arbeitskreis Bastian	Europa-Lehrmittel www.europa-lehrmittel.de	ISBN-13 978-3-8085-3167-9 7 th edition 2007
Prüfung elektrische Geräte in der betrieblichen Praxis nach DIN VDE 0701-0702 DIN EN 62353 (VDE 0751-1)	Bödeker, Feulner Kammerhoff, Kindermann, Matz	VDE Verlag GmbH www.vde-verlag.de	ISBN 978-3-8007-3207-4 6 th edition 2010
Messpraxis Schutzmaßnahmen	Feulner D.	Richard Pflaum Verlag www.pflaum.de	ISBN-10 3-7905-0924-8
Prüfung elektrischer Geräte	Bödker K., Bödker F.	Hüthig & Pflaum www.vde-verlag.de	ISBN-13 978-3-8101-0253-9 1 st edition 2008
Normen in der Medizintechnik	Gärtner A.	TÜV Media GmbH www.tuev-media.de	ISBN-13 978-3-8249-1165-3 1 st edition 2009

10.8 Internet Addresses for Additional Information

Internet Address	
www.dguv.de	GUV information, rules and regulations from Bundesverband der Unfallkassen (<i>Federal German Accident Insurance Association</i>)
www.beuth.de	VDE regulations, DIN standards, VDI directives from Beuth-Verlag GmbH
www.bgetf.de	BG information, rules and regulations from gewerbliche Berufsgenossenschaften (<i>Social Insurances against Occupational Accidents</i>) e.g. BGFE (Berufsgenossenschaft der Feinmechanik und Elektrotechnik - <i>Social Insurance of Precision Mechanics and Electrical Engineering</i>)
www.baua.de	Bundesanstalt für Arbeitsschutz und Arbeitsmedizin (<i>Federal Institute for Industrial Safety and Occupational Medicine</i>) Laws and Regulations

10.9 Test Intervals (recommended)

Table 1B from GUV-V A2

Recommended values for test intervals in various work surroundings for normal operating and ambient conditions. The evaluation of operating and ambient conditions is the responsibility of the respective electrician, and may lead to varying test intervals in individual cases.

Test Interval	Portable Electrical Equipment
6 Months	Bathrooms
	• Liquid jet sprayers • water vacuum devices (vacuum-scrubbers) • extension and device connector cables • submersible vacuum devices • centrifuges • etc.
	Slaughterhouses
	• Stunning tongs • electrical saws • electrical knives • etc.
12 Months	Kitchens for canteen meals
	• Slicing machines • coffee machines • hot plates • toasters • mixers • heated trolleys / hot servers • extension and device connector cables • handheld electrical devices • etc. • exceptions: other kitchens = 12 months
	Fire departments / technical assistance organizations (for equipment used for practice and actual operations)
	• Handheld electrical devices • portable lamps • floodlights • transfer pumps • extension and device connector cables • etc.
12 Months	Contract cleaners
	• Vacuum cleaners • floor polishers and cleaners • carpet cleaners • extension and device connector cables • etc.
	Laboratories
	• Rotary evaporators • portable analyzers • heaters • measuring instruments • mains powered lab devices • table lamps • mixers • extension and device connector cables • etc.

12 Months	School classrooms
	Electrical media equipment: • Slide, movie and overhead projectors • video devices • etc. • extension and device connector cables • etc.
	Electrical equipment for textile design: • Irons • sewing machines • extension and device connector cables • etc.
	Electrical equipment for home economics: • Toasters • hand mixers • hot plates • extension and device connector cables • etc.
	Electrical equipment for technical training: • Soldering irons • jig saws • handheld drills • orbital sanders • portable woodworking tools • extension and device connector cables • etc.
	Electrical equipment for instruction in the natural sciences: • Hot plates • electrolysis devices • power packs • signal generators • oscilloscopes • extension and device connector cables • etc.
	Electrical workshop equipment for trade schools: • See devices listed under workshops • etc.
	Laundries
	• Irons • portable ironing machines • sewing machines • extension and device connector cables • etc.
	Workshops / construction sites
• Portable lamps and construction site lamps • handheld drills • angle grinders • belt and orbital sanders • handheld circular saws • keyhole saws • welding equipment • soldering irons • ventilation equipment • liquid jet sprayers • portable bench saws • portable surface planing machines • sawdust exhausters • mixers • percussion drills • hedge shears • chippers • lawn mowers • extension and device connector cables • etc.	
24 Months	Offices
	• Word and data processing equipment • dictating machines • overhead projectors • table lamps • receipt stamping machines • posting machines • fans • extension and device connector cables • portable copiers • etc.
	Nursing wards and nursing homes
• Hair dryers • curling tongs • infrared lamps • electric shavers • bottle warmers • heaters • handheld electrical devices • table lamps • floor lamps • extension and device connector cables • radios • etc.	

10.10 List of Compatible Printers

The **SECUSTAR FM+** or **SECULIFE SB test system** is capable of controlling printers featuring the HP printer language „PCL“ (Printer Command Language) in the appropriate version and which are equipped with a USB port.

This covers a broad range of HP ink jet and laser printers, provided they support PCL3 and/or PCL5 (no „Host-Based Printing“ or „Host-based PCL“; printers which only support „PCL3GUI“ or strictly require „PCL3 HPA“, are partly not supported either).

Models supported acc. to printer specifications:	Printers which are not supported:
HP DeskJet 970Cxi (getestet)	HP DeskJet 3930
HP DeskJet 5440	HP DeskJet 3940
HP DeskJet 5940	HP DeskJet 3845
HP DeskJet 6540	HP LaserJet 1020 Series
HP DeskJet 6840 Series	HP LaserJet 1022 Series
HP Business Inkjet 1000	HP LaserJet 1160 Series
HP Business Inkjet 1200 Series	HP Color LaserJet 2600 Series
HP Business Inkjet 2300 Series	HP Color LaserJet 3600 Series
HP DeskJet 450 Series	HP LaserJet P1005
HP DeskJet 460 Series (getestet)	HP LaserJet P1006
HP LaserJet 1320 Series (getestet)	HP LaserJet P1505
LaserJet 2420 Series	HP LaserJet P2014
LaserJet 2430 Series	HP Deskjet D2530 (CB673A)
LaserJet 4250 Series	HP Deskjet D2560 (CB671B)
LaserJet 4350 Series	HP Deskjet D2560 (CB671A)
HP Color LaserJet 2550 Series	HP Deskjet D2566 (CB675A)
HP Color LaserJet 3000 Series	HP Officejet Pro K5400N (C9282A)
HP Color LaserJet 3800 Series	HP Officejet Pro K5400dn (C8185A)
HP Color LaserJet 4700 Series	HP Officejet Pro K5400dtn (C9277A)

Models supported acc. to printer specifications:	Printers which are not supported:
HP Color LaserJet 4730 Series	
HP LaserJet P1505N	
HP LaserJet P2015	
HP Photosmart D5300 (Q8361B)	
HP Photosmart D7400 (CC247B)	
HP Photosmart D7200 (CC975B)	
HP Deskjet 6940 (C8970B)	
HP Officejet H470	
HP OfficeJet Pro K550	
HP OfficeJet 100 mobile (tested)	

The above list has been compiled on the basis of the manufacturer's specifications. No guarantee is given that these printers are actually compatible with the **test system**.

The **test system** controls all printers with B&W commands, which means that the print-outs are only produced in black and white or grey scale values.

11 Maintenance and Calibration

11.1 Housing Maintenance

No special maintenance is required for the housing. Keep outside surfaces clean. Use a slightly dampened cloth for cleaning. Avoid the use of cleansers, abrasives or solvents.

11.2 Battery Pack Maintenance

Depleted rechargeable batteries require at least 3 hours recharging time. If the batteries have been excessively depleted, the test system cannot be switched on. Leave the test system connected to the mains with the power cable for approximately 30 minutes before switching on.

Battery Pack Storage

1 year at -20 to +35° C
3 months at -20 to +45° C
1 month at -20 to +55° C

Refer to section 4.2 on page 18 regarding battery pack replacement.



Attention!

The instrument may not be operated if the battery compartment lid has not been properly installed and secured!

Battery Pack Disposal

Dispose of old rechargeable batteries properly, i.e. at a designated collection point.

11.3 Replacing the Fuses

All fuses are accessible from the outside.

If a fuse should blow, eliminate the cause of overload before placing the instrument back into service!



Attention!

Disconnect the instrument from the measuring circuit before removing the fuse!



Attention!

Use specified fuses only!

If fuses with other blowing characteristics, other current ratings or other breaking capacities are used, the operator is placed in danger, and protective diodes, resistors and other components may be damaged.

The use of repaired fuses or short-circuiting the fuse holder is prohibited.

11.4 Recalibration

The respective measuring task and the stress to which your measuring instrument is subjected affect the ageing of the components and may result in deviations from the guaranteed accuracy.

If high measuring accuracy is required and the instrument is frequently used in field applications, combined with transport stress and great temperature fluctuations, we recommend a relatively short calibration interval of 1 year. If your measuring instrument is mainly used in the laboratory and indoors without being exposed to any major climatic or mechanical stress, a calibration interval of 2-3 years is usually sufficient.

During recalibration* in an accredited calibration laboratory (DIN EN ISO/IEC 17025) the deviations of your instrument in relation to traceable standards are measured and documented. The deviations determined in the process are used for correction of the readings during subsequent application.

We are pleased to perform DAkkS or factory calibrations for you in our calibration laboratory. Please visit our website at www.gossenmetrawatt.com (→ Services → DAkkS Calibration Center or → FAQs → Calibration questions and answers).

By having your measuring instrument calibrated regularly, you fulfill the requirements of a quality management system per DIN EN ISO 9001.

Standards DIN VDE 0701-0702 and IEC 63353 (VDE 0751) stipulate that only measuring instruments which are regularly tested and calibrated may be used for testing.

* Verification of specifications or adjustment services are not part of the calibration. For products from our factory, however, any necessary adjustment is frequently performed and the observance of the relevant specification is confirmed.

11.5 Return and Environmentally Sound Disposal

The **instrument** is a category 9 product (monitoring and control instrument) in accordance with ElektroG (German Electrical and Electronic Device Law). This device is not subject to the RoHS directive.

We identify our electrical and electronic devices (as of August 2005) in accordance with WEEE 2002/96/EG and ElektroG with the symbol shown to the right per DIN EN 50419.

These devices may not be disposed of with the trash. Please contact our service department regarding the return of old devices (see page 3).

If you use **batteries** or **rechargeable batteries** in your instrument or accessories which no longer function properly, they must be duly disposed of in compliance with the applicable national regulations.

Batteries or rechargeable batteries may contain harmful substances or heavy metal such as lead (Pb), cadmium (Cd) or mercury (Hg).

The symbol shown to the right indicates that batteries or rechargeable batteries may not be disposed of with the trash, but must be delivered to collection points specially provided for this purpose.



11.6 Displays – Error Messages

Displays and Error Messages	Meaning / Cause	Remedy
LCD does not light up	Mains power cable not plugged in	Plug in the power cable (see page 16).
	Batteries are excessively discharged	Leave test system connected to the mains with the power cable for approx. 30 min.
	ON START was not pressed	Press and hold the ON START key for at least 3 seconds (see page 19).
LCD no longer reacts when touch screen is activated		Press the reset key (see page 14).
Probe test Connect probe 1/2.	The probe must be connected in order to contact the housing which is connected to the protective conductor.	Connect the probe to sockets 1 and 2 (see page 14).
Switch the device under test on.	The DUT connected to the test socket must be switched on for insulation testing.	Switch the device under test on.
Caution: Execute all safety measurements before starting the function test.	Safety precaution	Do not start the function test until after the protective conductor resistance measurement for safety class 1, the insulation resistance measurement and the leakage current measurements have been executed and passed by the device under test.
Error (PE potential test)	Mains connection error: voltage at the protective conductor (PE) when the contact surface is touched with the finger.	
Error (PE connection test)	The test system's mains power cable is defective.	Inspect the mains power cable.
	Mains connection error: no PE contact.	Check PE contact at mains power supply.
Error (probe test)	The probe is not connected.	Connect the probe to sockets 1 and 2 (see page 14).
Error (short-circuit test)	Short-circuit at the test socket	There is a short-circuit in the device under test or in the DUT connector cable.
OFF (on test)	The device under test is not switched on.	Switch the device under test on.

Displays and Error Messages	Meaning / Cause	Remedy
Data Security		
Error message during creation of the auto-backup file (filename.bak)	The CF card is not inserted. The CF card does not have enough memory capacity.	Insert the CF card into the device. Reduce the backup versions. Skip the auto-backup function by clicking "Ignore".
Error message during automatic creation the backup file (filename.xml) before an update	The CF card is not inserted. The CF card does not have enough memory capacity.	Insert a CF card with adequate memory capacity into the device. Execute a manual XML export in order to receive an exact error message (see section 7.7.6).
Error message during creation of an update	The battery pack has not been inserted and connected. The battery pack is not adequately charged.	Charge the battery pack, insert it and connect it.
Compact flash card cannot be read	You accessed the card to early.	After inserting the CF card, wait for 10 to 15 seconds until the system has detected and loaded the card.
The test system slows down.	Too many data records at the test system	Use an external PS3 / visual FM database to manage your data, and load only those data required for the test to the test system .

12 Index

A

Abbreviations	146
Accessories	2
Adjusting Brightness	26
Adjusting Contrast	26
Administration	
Customers	111
DUTs	85
Test Sequences	94
Tests	106
After Login	20
Aministration	
Tests	106
Applied Parts Leakage Current	41, 62
Limit Values	63

B

Battery	129
Battery Pack	
Charge During Mains Operation	16
Disposal	152
Installation	18
Storage	152

C

Catalog	
Assign Catalog Elements to a Hierarchy	84
Deleting Catalog Entries	84
Departments	116
Designations	86
DUTs	90
Locations	114
Object Types	88
Persons, Companies and Departments	112
Selecting a catalog entry	84
Standards	94
Test Sequences	103
Test Step Specifications	96
Classification of DUTs	
According to Application Parts	145
According to Safety Class	145
Configuration Files from visual FM	119
Configuring Device Parameters	23
Connection Tests	66
Connections	14
Contact Surface	12
Customer	
Create Entry	112
Overview	111
D	
Data Exchange	82
Synchronisation of Hierarchies	121
visual / PS3 and Test System	118
Data Export and Catalog	122

Data Import from visual FM	121
Data Interface	131
Data Security	
Safety Warning	11
Database	
Backup	35
Initialization	37
Restore	36
Statistics	37
Deadline	
Enter	107
Department	
Enter	116
Designations	86
Device Leakage Current	41
Differential Current	49, 135
DIN VDE 0701-0702	133
DUT	
Enter	90
E	
Editing Function	74
Energy Options	27
Equipment Leakage Current	41, 52
Limit Values	54
Equivalent Contact Current	135
Equivalent Leakage Current	135
Error Messages	154
Establishing a LAN Connection	28
Evaluation	80

F			
FI Test (RCD/PRCD)	64	Light	41
File Enabling	32	Limit Value	
Firmware	130	Lower (enter Min Limit Value)	101
Frequency Response	128	Lower (enter MinLimitValue)	98
Function	41	Setpoint (enter)	98, 101
Function Test	68	Upper (enter MaxLimitValue)	98
Fuses		Upper (enter Miox Limit Value)	101
Replacing the Fuses	152	Location	
Technical Data	129	Enter	114
H		Location Designation	117
Hierarchy	38	Enter	117
Synchronisation	121	Login	19
Humidity	41, 70	M	
I		Mains Connection Errors	16
ID Number	79	Maintenance	
IEC 62353 / DIN EN 62353 (VDE 0751-1)	138	Battery Pack	152
Illuminance	71, 143	Housing	152
Illuminance Measurements		Manufacturer	92
Practical Examples	143	Create	93
Individual Measurements	40	Measuring Categories and their Meaning	6
General Procedure	40	N	
Initial Window	19	New Designation	
Initially Measured Values	133	Enter	86
Insulation Resistance	41, 46, 135	O	
Limit Values	48	Object Type	
Interval		Enter	88
Enter	109	Object Types	
Intervals	109	Enter	88
L		On Test	66, 135
Leakage Current	128	Operating System	130
		Overview	
		Database Functions	83
		Individual Measurements	41
		Individual Tests per Test Sequence	135
		Setup Parameters	24
		P	
		Patient Leakage Current	41, 60
		Limit Values	61
		PE Leakage Current	41
		PE Resistance	41, 42, 135
		Limit Values	45
		Periodic testing	7
		Pocket Calculator	39
		Power Supply	129
		Printer	27
		Protective Conductor Current	41
		Product Support	2
		Protective Conductor Resistance	41, 135
		Prüfabläufe im Detai	136
		R	
		RCD Test	41
		Recalibration Service	3
		Repair and Replacement Parts Service	3
		Reset Key	14
		Roles	26
		S	
		Safety Class Check	135
		Safety Class Detection	66
		Safety Precautions	10
		Samba Server	32
		Scope of Delivery	2

Index

Setting Date and Time	27	Touch Current	41, 56
Standard		Limit Values	58
Enter	95	U	
Standby Mode	20	Update – Updating System Software	32
Switching the System Off	21	Use for Intended Purpose	6
Symbols		User Interface Language	27
Administration	83	V	
On the Device	11	visual FM/PS3	11
Test Sequence	73	Visual Inspection	135
System Information	27	Z	
T		Zero Balancing	45
Temperature	70		
Test Intervals	150		
Test or Calibration Deadline	107		
Test Sequence			
Create	103		
Index Card System	72		
New in the Copy	104		
Preparation and Execution	75		
Prerequisites	72		
Test Step Specification			
Enter	96		
External Measurement	101		
Measurement	97		
Multiple Measurement	99		
Test Instruction	100		
Time Lapse	102		
Visual Inspection	99		
Tests	38		
Tests after repairs	7		

Edited in Germany • Subject to change without notice • A pdf version is available on the internet

 **GOSSEN METRAWATT**
GMC-I Messtechnik GmbH
Südwestpark 15
90449 Nürnberg • Germany

Phone +49 911 8602-111
Fax +49 911 8602-777
E-Mail info@gossenmetrawatt.com
www.gossenmetrawatt.com