GOSSEN METRAWATT

Operating Instructions

SECULIFE ST PRO / SECULIFE ST PRIME

Test Instruments for Testing the Electrical Safety of Medical Devices



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1 Safety Regulations



Read and follow these instructions carefully and completely in order to ensure safe and proper use.

The instructions must be made available to all persons who use the device.

Keep for future reference.

1.1 General

- Observe this documentation, in particular all included safety information, in order to protect yourself and others from injury, and to prevent damage to the test instrument.
- Tests/measurements may only be performed by a qualified electrician, or under the supervision and direction of a qualified electrician in the commercial sector. The user must be instructed by a qualified electrician concerning performance and evaluation of tests and/or measurements.
- Observe and comply with all safety regulations that apply to your work environment.
- Wear suitable and appropriate personal protective equipment (PPE) whenever working with the device.
- Be aware that PPE may be required for the DUT and wear it if necessary.
- The functioning of active medical devices (e.g., pacemakers, defibrillators) and passive medical devices may be affected by voltages, currents, and electromagnetic fields generated by the device, thereby impairing the health of their users. Implement corresponding protective measures in consultation with the manufacturer of the medical device and your physician. If any potential risk cannot be ruled out, do not use the device.

1.2 Accessories

- Use only the specified accessories (included in the scope of delivery or listed as options) with the device.
- Carefully and completely read and follow the product documentation for optional accessories. Retain these documents for future reference.

1.3 Handling

- Use the device only if it is in perfect condition.

  Inspect the device before use. Pay particular attention to damage, interrupted insulation, or kinked cables.

  Damaged components must be replaced immediately.
- Use only accessories and cables that are in perfect condition.

  Inspect accessories and all cables before use. Pay particular attention to damage, interrupted insulation, or kinked cables.
- Avoid plugging in or unplugging accessories (e.g., probes) while measurements are in progress.
- If the device or its accessories do not function flawlessly, permanently remove the device/accessories from operation and secure them against being restarted inadvertently.
- If the device or accessories are damaged during use (e.g., if they are dropped), permanently remove the device/accessories from operation and secure them against being restarted inadvertently.
- If signs of interior damage to the device or accessories (e.g., loose parts in the housing) are apparent, permanently shut down the device/accessories and secure them against being restarted inadvertently.

1.4 Tests/Measurements

- The test instrument and the accessories may only be used for the tests/measurements described in the documentation for the test instrument.
- The test instrument may only be connected to TN, TT, or IT electrical systems with a maximum of 264 V (nominal voltage) which comply with applicable safety regulations (e.g., IEC 60346, VDE 0100) and are protected with a fuse or circuit breaker with a maximum rating of 16 A.
- Ensure compliant functionality of this test instrument within the scope of operational equipment testing through the use of a suitable calibrator.
- SECULIFE ST PRIME: In particular, the detectability of a potential insulation defect with each measurement type must be checked regularly as part of the high-voltage testing provided in the instrument. This can be done with the aid of suitable calibrators. We recommend the use of the ISO-Kalibrator 1 (M662A).
- The test instrument is equipped with fuses. The test instrument may only be used as long as the fuses are in good working order. Defective fuses must be replaced.
- Do not perform any measurements in electrical systems with the test instrument. It has been neither designed nor approved for this purpose.

1.5 Operating Conditions

- Do not use the device and accessories after long periods of storage under unfavorable conditions (e.g., humidity, dust, temperature).
- Do not use the device and accessories after extraordinary stressing due to transport.
- Only use the device and accessories within the limits of the specified technical data and conditions (ambient conditions, IP protection code, measurement category, etc.).

1.6 Fuses

- The fuses may only be replaced when the test instrument is voltage-free, i.e., it must be disconnected from mains supply power and must not be connected to a measuring circuit.
  The fuse type must comply with the specifications in the technical data or the labeling on the test instrument.

1.7 Emissions

Test instruments with feature M01:

- The device is equipped with a Bluetooth® module. Determine whether or not use of the implemented frequency band of 2400 MHz to 2483.5 MHz is permissible in your country.

1.8 Measurement Cables and Establishing Contact

- Plugging in the measurement cables must not necessitate any undue force.
- Never touch conductive ends (e.g., of test probes).
- Fully unroll all measurement cables before starting a test/measurement. Never perform a test/measurement with the measurement cable rolled up.
- Avoid short circuits due to incorrectly connected measurement cables.
- Conduct a probe check after completing each test.
- The test instrument must be operated within the same electrical system as the DUT.
- Unexpected voltages may occur at DUTs (for example, capacitors can be dangerously charged). Take appropriate precautions.
- In particular during high-voltage testing, be aware that dangerous residual voltage may be present at the HV test pistol and/or the DUT. Do not touch the DUT for any reason during high-voltage testing.

1.9 Data Security

- The device is equipped with a data memory on which personal and/or sensitive data can be stored. Observe and comply with the applicable national data protection regulations. Use the corresponding functions provided by the instrument (such as access protection), as well as other appropriate measures to prevent unauthorized access to the data.
- Protect the device against unauthorized tampering. Use the functions provided by the device (e.g., key lock / sealing / lock) as well as other appropriate measures (e.g., restricting physical access to the device).

1.10 Documentation

- Test reports must be checked for correctness and signed by the inspector.

2 Application

Please read this important information!

2.1 Intended Use/Use for Intended Purpose

The SECULIFE ST PRO and the SECULIFE ST PRIME are test instruments for testing the electrical protective measures of electrical devices, medical electrical equipment, and arc welding equipment.

All test instruments include measuring and test functions for checking the effectiveness of the protective measures required in accordance with the respective test standards for the particular field of technology. Single measurements and test sequences can be performed.

Test sequences (semi-automatic test procedures) can be used in an integrated, i.e., preconfigured form, or defined individually by the user.

The integrated test sequences consist of a preconfigured series of individual tests with subsequent documentation, as stipulated in the respective standard. They can thus be used to perform standards-compliant tests repeatedly and efficiently. Their progress is interrupted by safety-related stoppages, as well as associated warnings and instructions. As a result, the level of protection provided to the user is greater than demanded by standard IEC / 61557-16 / DIN EN 61557-16 / VDE 0413-16 with regard to "automatic test sequences."

The integrated test sequences can be used to comply with the following standards:

- EN 50699 / VDE 0702 Periodic testing for electrical devices
- EN 50678 / VDE 0701 General procedure for verifying the effectiveness of the protective measures of electrical equipment after repair
- IEC 62353 / EN 62353 / VDE 0751-1 Medical electrical equipment – Recurrent test and test after repair of medical electrical equipment
- IEC 61010-1 / EN 61010-1 / VDE 0411-1 Safety requirements for electrical equipment for measurement, control and laboratory use[1] [2]
- IEC 60335 / EN 60335-1 / VDE 0700-1 Safety of electrical equipment for household use and other similar applications[1] [2]
- IEC 60601-1 / VDE 0750-1 Medical electrical equipment - Part 1: General requirements for safety and essential performance[1]
- VDE 0701-0702 (withdrawn) / ÖVE E 8701 / SNR 462638 Inspection after repair, modification of electrical appliances – Periodic testing of electrical devices
- IEC 60974-4 / EN 60974-4 / VDE 0544-4 Arc welding equipment – Part 4: Periodic inspection and testing
- NEN 3140 Operation of Electrical Installations – Low Voltage
- IEC 62368 / EN 62368 / VDE 0868-1 Audio/video, information and communication technology equipment[1]
- IEC 62911 / EN 62911 / VDE 0868-911 Audio, video and information technology equipment – Routine electrical safety testing in production[1]

NOTE

The integrated, preconfigured test sequences do not include all of the tests stipulated by the product standard which are required for type testing! They are restricted to the tests which are required as a rule after repair or during maintenance work and for occupational health and safety measures, as well as for quality assurance in production.

[1] With feature F01/F02 the test procedure also includes high-voltage test steps

[2] Only with feature KA03 or subsequently enabled with Z853V

NOTE

Availability of the individual integrated test sequences depends on the test instrument type (SECUTEST ST... or SECULIFE ST...), the selected features (order features), and the enabled extensions (activations).
Refer to your order/your test instrument and the data sheet for details.

Suitable, database-driven test software is available, namely IZYTRONIQ. This software facilitates test organization and the management of test data from a broad range of test instruments. It also provides extended functions such as remote control in connection with the respective test instrument – support for extended functions depends on the test instrument and its order features or enabled extensions (activations). The software itself is included with test equipment sets, or can be purchased separately.

The test instrument housing is compact, impact resistant and includes an integrated rubber protector for mobile use, e.g., in factories, on construction sites and in industrial environments.

The SECULIFE ST ... front panels and housings of the test instruments also have antimicrobial properties, which make it possible to use them in hygienically sensitive areas.

The safety of the user and the device is only guaranteed with intended use.

DUTs	Repair	Reason for Testing Periodic Testing (occupational safety, DGUV)	Routine Testing in Production
Electric devices (as a rule with mains power cable) including extension cords and multiple outlet strips	EN 50678 / VDE 0701 VDE 0701-0702 (withdrawn) / ÖVE E 8701 / SNR 462638 NEN 3140	EN 50699 / VDE 0702 VDE 0701-0702 (withdrawn) / ÖVE E 8701 / SNR 462638 NEN 3140	
IT equipment	Not defined To a given extent: IEC 62368 / EN 62368 / VDE 0868-1 IEC 62911 / EN 62911 / VDE 0868-911 VDE 0701-0702 (withdrawn) / ÖVE E 8701 / SNR 462638	EN 50699 / VDE 0702 VDE 0701-0702 (withdrawn) / ÖVE E 8701 / SNR 462638 NEN 3140	IEC 62911 / EN 62911 / VDE 0868-911
Medical electrical equipment	IEC 62353 / EN 62353 / VDE 0751-1	IEC 62353 / EN 62353 / VDE 0751-1	IEC 62353 / EN 62353 / VDE 0751-1 To a given extent: IEC 60601-1 / EN 60601-1 / VDE 0750-1
Arc welding equipment	IEC 60974-4 / EN 60974-4 / VDE 0544-4	IEC 60974-4 / EN 60974-4 / VDE 0544-4	

Table 1: Standards according to device and reason for testing

	EN 50678 / VDE 0 701 EN 50699 / VDE 0 702 VDE 0701-0702 (withdrawn)/ ÖVE E 8701 / SNR 462638	IEC 60974-4 / EN 60974-4 / VD E 0544-4	IEC 62353 / EN 62353 / VDE 0 751-1	IEC 60601-1 / EN 60601-1 / VD E 0750-1	IEC 62368 / EN 62368 / VDE 0 868-1 IEC 62911 / EN 62911 / VDE 0 868-911
Single Measurements					
Protective conductor resistance	×	×	×	×	×
Insulation resistance	×	×	×	×	×
Protective conductor current	×	×	×	×	×
Earth leakage current				×	
Primary leakage current		×			
Device leakage current			×		
Touch current	×	×	×	×	×
Current from welding circuit		×			
Patient leakage current				×	
Leakage current from the applied part			×		
Measuring Method					
Alternative (equivalent [device] leakage current)	×		×		
Differential current	×	×	×		
Direct	×	×	×	×	×

Table 2: Standard Designations for Available Tests

2.2 Use for Other Than Intended Purpose

Using the device for any purposes other than those described in these operating instructions or the quick start guide of the device is considered misuse. Use for other than the intended purpose may lead to unpredictable damage!

2.3 Liability and Guarantee

The liability and warranty provided by Gossen Metrawatt GmbH are governed by the applicable contractual and mandatory statutory provisions.

2.4 Opening the Instrument / Repairs

The device may only be opened by authorized, qualified personnel in order to ensure flawless, safe operation and to assure that the guarantee is not rendered null and void. Even original replacement parts may only be installed by authorized, qualified personnel.

Unauthorized modification of the device is prohibited.

If it can be ascertained that the device has been opened by unauthorized personnel, no guarantee claims can be honored by the manufacturer with regard to personal safety, measuring accuracy, compliance with applicable protective measures, or any consequential damages.

If the guarantee seal is damaged or removed, all guarantee claims are rendered null and void.

3 Documentation

3.1 Information Concerning These Instructions

Read these instructions carefully and attentively. They contain all the information for safe use of this device. Follow them to protect yourself and others from injury and to avoid damage to the device.

The latest version of these instructions is available on our website:

https://www.gossenmetrawatt.de/en/service-support/download-center/

3.2 Scope

This guide applies to the following instruments:

- SECULIFE ST PRO
- SECULIFE ST PRIME

3.2.1 Firmware Version

This documentation describes instruments with software version 4.0.0.

You can view your instrument's firmware version in the test instrument. Documentation for other firmware versions is available on request.

Refer to the operating instructions with regard to updates.

3.3 Description of Instrument Variants

This documentation describes the instruments specified within the scope and their variants.

As a result, features and functions may be described which do not apply to your instrument. In addition, the illustrations may differ from your device.

3.4 Errors and Suggestions for Improvement

These instructions have been prepared with the utmost care to ensure accuracy and completeness. Unfortunately, however, errors can never be avoided completely. Continuous improvement is part of our quality goal, so we always appreciate your comments and suggestions.

3.5 Gender Equality

For better readability, only the masculine form is used in these instructions in a grammatically neutral sense. The feminine and non-binary forms are of course always implied as well.

3.6 Copyright

This document is protected by copyright. Content modifications, reproduction, duplication, processing, or translation in any form (including excerpts) are only permissible after obtaining prior written permission from Gossen Metrawatt GmbH. This applies in particular to storage and processing in electronic systems, provided they do not exclusively serve legitimate internal purposes.

3.7 Identification of Warnings

Instructions for your safety and for the protection of the device and its environment are provided as warnings and notes at certain points in these instructions.

They are laid out as shown below and are graded in terms of the severity of the respective hazard. They also describe the nature and cause of the hazard, the consequences of non-observance, and steps to take to prevent hazards.



DANGER

Death or serious injury is almost certain.



WARNING

Death or serious injury is possible.



CAUTION

Minor or moderate injury is possible.

ATTENTION

Damage to the product or the environment is possible.



NOTE

Important information.



TIP

Useful additional information or application tip.

3.8 Identifiers

The following identifiers are used in this documentation:

Hardware controls	Keys and other controls
Software buttons	Buttons, menus
■ List	Bullet lists
– List	

▶ **Procedure: Beginning of a procedural instruction**

✓ Prerequisite: A condition, etc., that must be fulfilled before a given action can be taken.

1. Step 1: Steps that must be completed in the specified order.
2. Step 2
   ↳ Interim result: Interim result of the steps
3. Step 3

↳ Result: Result of steps

Table 1:	Description of the content of a table
Figure 1:	Description of the content of a figure
Footnote[1]	Footnote

3.9 Symbols in the Documentation

The following symbols are used in this documentation:

Symbol	Meaning
	Read and follow to the product documentation.
	General warning symbol.
	Warning regarding electrical voltage.

Table 3: Symbols in this documentation

3.10 Definition of Terms

Term	Definition
Test instrument	The instrument specified in the scope of these instructions.
Device under test (DUT)	Electrical device, medical electrical equipment, or electric welding equipment to be tested (DUT – device under test).
Test object	Electronic representation of a specific DUT in the internal test instrument database (unequivocal allocation to a real DUT by means of an ID)
Test sequence	Series of semi-automatic tests or test steps.
Integrated test sequence	A test sequence (see above) that is available upon delivery or once activated in the instrument. Cannot be changed (test parameters are configurable).
User-defined test sequence	A test sequence (see above) which is created individually by the user.

Table 4: Definition of Terms

4 Getting Started

This section provides an overview of the initial steps for working with the instrument.

1. Read and follow the product documentation. In particular, observe all safety information in the documentation, on the instrument and on the packaging.
   - ⇨ **"Safety Regulations "** 🗋 **7**
   - ⇨ **"Application"** 🗋 **10**
   - ⇨ **"Documentation"** 🗋 **14**
2. Familiarize yourself with the instrument.
   - ⇨ **"Instrument"** 🗋 **19**
3. Start up the instrument.
   - Initial Startup
4. Familiarize yourself with instrument operation.
   - ⇨ **"Operation"** 🗋 **47**
5. Prepare the test instrument for use.
   - ⇨ **"Test Instrument Settings"** 🗋 **57**
   - ⇨ **"Inspector Management"** 🗋 **74**
6. Perform measurements.
   - ⇨ **"Connecting the DUT"** 🗋 **93**
   - ⇨ **"Important Basic Information on Tests and Measurements"** 🗋 **103**
   - ⇨ **"Single Measurements"** 🗋 **108**
   - ⇨ **"Test Sequences (Automatic Test Procedures)"** 🗋 **203**
7. Generate a report if required.
   - ⇨ **"Reports"** 🗋 **261**
8. Transfer measurement data to the IZYTRONIQ software if required.
   - ⇨ **"Alternative: Transfer measurement data to the PC (IZYTRONIQ – push-print)"** 🗋 **115**

Further topics of interest:

- Troubleshooting: Warnings, error messages, and notes
- Maintenance
- Repair
- Contact, support, and service

5 Device

5.1 Scope of Delivery

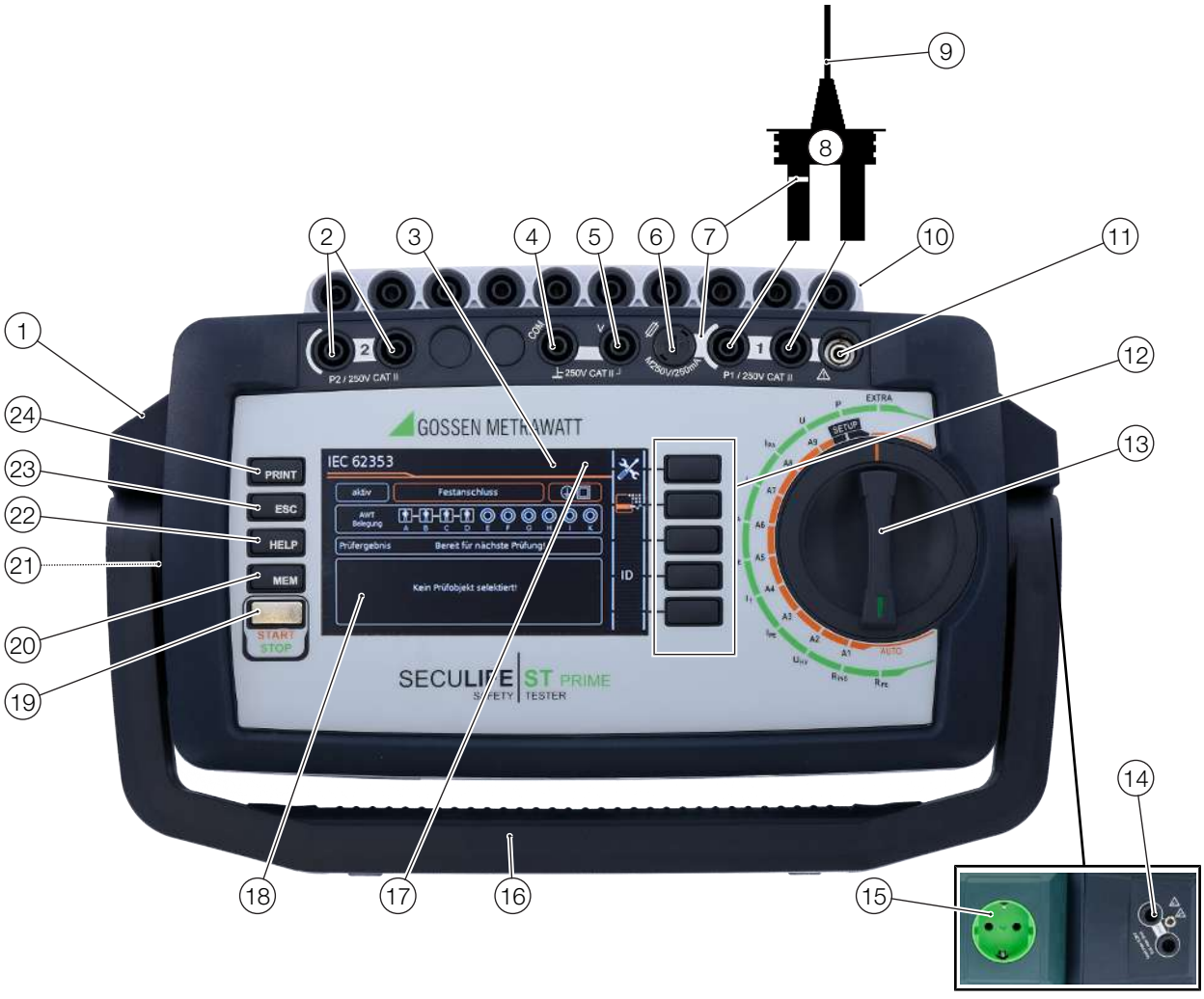
The scope of delivery varies depending on which test instrument variant has been ordered, and is country-specific.

Information concerning the scope of delivery can be found in your order and in the data sheet, in which all order information is listed.

Please check the scope of delivery for completeness and intactness.

5.2 Device Overview

5.2.1 Front



1	2 USB masters		For keyboard
			For scanner
			For printer
			For USB flash drive
			For USB BLE communication adapter Z705A

	1 USB slave	For PC	
2	2 connector sockets for test probe (P2, for 2-pole measurement)[1)]		
3	Cross-functional icons show the status of special functions or detected connections to accessories (USB).		
	Display of special icons:		Measurement at IT system active
			OFFSET for RPE active
			Active connection to the Test Report Receiver app
4	Voltage measuring inputs [1]		
5	Voltage measuring inputs [1]		
6	Fuse compartment (fuse link for probe input P1)		
7	White/silver color-coded, fused high-current path		
8	1 connector socket for test probe (P1)		
9	Reinforcing sleeve:	Black: max. 16 A	
		Green: max. 25 A	
10	Applied part sockets AP A ... K		
11	Supply power connection for SECUTEST CLIP (Z745H) [2]		
12	Softkeys with functions that vary depending upon the menu level		
13	Rotary function selector switch	Orange rotary switch level Test sequences A1 ... A9 (Test sequences according to standard or user-defined test procedure)	
		Green rotary switch level Single measurements	
14	HV test pistol connector socket (SECULIFE ST PRIME with feature F02)		
15	Test socket (country-specific) for connecting DUTs Attention! Depending on the measuring task, the test socket may be charged with line voltage		
16	Carrying handle and tilt stand		
17	Mains to test socket. SFC: Normal cond.		
	Mains to test socket. SFC: N interrup.		
	High voltage is present (with feature F01/F02)		
18	LCD panel		
19	**START STOP**	Start/stop ■ Single measurement ■ Test sequence Finger contact	
20	**MEM** function key	Database	
21	Socket for mains power via inlet plug (country-specific)		
22	**HELP** function key	Context-sensitive help	

23	**ESC** function key	Go back
24	**PRINT** function key	Print via USB

[1] Only test instruments with feature H01

[2] See also operating instructions for the device

5.2.2 Symbols on the Instrument and the Included Accessories

Symbol	Meaning
	Warning concerning a source of danger (Attention, follow the documentation!)
	If the guarantee seal is damaged or removed, all guarantee claims are rendered null and void.
250 V CAT II	Maximum permissible voltage and measurement category between connections P1 (test probe), the test socket and ground
	European conformity marking
	The instrument must not be disposed of with household trash. Follow the section “Disposal and Environmental Protection”.
	Warning regarding dangerous electrical voltage

Table 5: Symbols on the Instrument and the Included Accessories

5.3 Product Features

The instrument supports the following features:

	Features	SECULIFE ST PRO	SECULIFE ST PRIME
Touchscreen/keyboard	E01	×	×
High-voltage testing, LN–PE/P1	F01		×
High-voltage testing, LN–PE/P1 and P1–PHV	F02		o
10 A RPE test current	G01	×	o
25 A RPE test current	G02	o	×
2nd test probe (connector socket for 2nd test probe)	H01	×	o
Voltage measuring input [1]	I01	×	×
Integrated test sequences for EN 50678 / VDE 0701, EN 50699 / VDE 0702, IEC 62368 / EN 62368 / VDE 868-1, IEC 62911 / EN 62911/ VDE 868-911	KE	×	×
Additional test procedure for IEC 60601	KA01	×	×

	Features	SECULIFE ST PRO	SECULIFE ST PRIME
Additional test procedures IEC 60601 / IEC 61010 / IEC 60335	KA03	o	o
SECUTEST DB+	KB01	×	×
SECUTEST DB COMFORT	KD01	×	×
Bluetooth®	M01	o	×
Antimicrobial housing	-	×	×
Key: × = included o = optional			

[1] For voltage measurement or for connecting a current clamp sensor or an AT3 adapter, and for temperature measurement via RTD

Table 6: Product Features

5.4 Included Features

Single measurements and test sequences can be executed with the test instruments.

Single Measurements

Switch Position	Measuring Functions Test Current/Voltage		Measurement type Connection type
Single measurements (rotary switch level: green)			
Measurements at voltage-free DUTs			
R_{PE}	R_{PE}	Protective conductor resistance	PE(TS) - P1 active: PE(TS) - P1 PE(mains) - P1 [1] PE(mains) - P1 clamp [1 2] P1 - P2 [3]
	I_P	Test current: 200 mA Test current: 10 A [4] (feature G01) Test current: 25 A [4] (feature G02)	
R_{INS}	R_{ISO}	Insulation resistance	LN(TS) - PE(TS) LN(TS) - P1 P1 - P2 [3] PE(mains) - P1 PE(TS) - P1 LN(TS) - P1//PE(TS) LN(TS) - AP PE(mains) - AP PE(TS) - AP P1//PE(TS) - AP P2 - AP [3]
	U_{SIO}	Test voltage	
U_{HV} [5]		High-voltage testing	LN(TS) - P1 LN(TS) - P1//PE(TS) PHV - P1 [6]
	U_{min}	Determined minimum voltage value during the set test time	
	U_{Gen}	Test voltage	

Switch Position	Measuring Functions Test Current/Voltage		Measurement type Connection type
Single measurements (rotary switch level: green)			
Measurements at DUTs with line voltage			
I_{PE}	I_{PE} ≃	Protective conductor current, TRMS value	Direct Differential Alternative AT3 adapter [2] Clamp [2]
	I_{PE} ∿	AC component	
	I_{PE} =	DC component	
	U_{LPE}	Voltage L-PE from the mains power	
	U_{Gen}	Test voltage (alternative method)	
I_T	I_B ≃	Touch current, TRMS value	Direct P1 Differential P1 Alternative P1 Perm. conn. P1 Alternative P1–P2
	I_B ∿	AC component	
	I_B =	DC component	
	U_{LPE}	Voltage L-PE from the mains power	
	U_{Gen}	Test voltage (alternative method)	
I_E	I_G ≃	Device leakage current, TRMS value	Direct Differential Alternative AT3 adapter [2] Clamp [2]
	I_G ∿	AC component	
	I_G =	DC component	
	U_{LPE}	Voltage L-PE from the mains power	
	U_{Gen}	Test voltage (alternative method)	
I_A	I_A ≃	Leakage current from the applied part, TRMS value	Direct P1 Direct AP Alternative P1 Alternative AP Perm. conn. P1 Perm. conn. AP AP–P2 [7]
	U_{LPE}	Voltage L-PE from the mains power	
	U_{Gen}	Test voltage	
I_P	I_P ≃	Patient leakage current, TRMS value	Direct P1 Direct AP Perm. conn. P1 Perm. conn. AP
	I_P ∿	AC component	
	I_P =	DC component	
	U_{LPE}	Voltage L-PE from the mains power	
I_{PA}	I_P ≃	Patient auxiliary current, TRMS value	Direct AP Perm. conn. AP
	I_P ∿	AC component	
	I_P =	DC component	
	U_{LPE}	Line voltage	
U	U ≃	Measuring voltage, TRMS value	PE - P1 PE - P1 (with mains*) V – COM V – COM (with mains*) * Polarity setting
	U ∿	Alternating voltage component	
	U =	Direct voltage component	

Switch Position	Measuring Functions Test Current/Voltage		Measurement type Connection type
Single measurements (rotary switch level: green)			
P	**Function test at the test socket**		Polarity setting
	I	Current between L and N	
	U	Voltage between L and N	
	f	Frequency	
	P	Active power	
	S	Apparent power	
	PF	Power factor	
Special measuring functions			
EL1 [8]	Function test for extension cords Continuity, short-circuit, polarity (wire reversal [9])		EL1 adapter AT3-IIIE adapter VL2E adapter
EXTRA	Reserved for expansion within the framework of software updates		
	°C temperature measurement [2] with Pt100/Pt1000		V – COM
	ICL current clamp measurement with current clamp sensor		V – COM
	Relay continuity check [5]		N(TS) L(TS) PHV [6]
	t_{PRCD}	t_A Time to trip for 10/30 mA PRCD	
		U_{LN} Line voltage at the test socket	

1 Connection type not available with feature G02

2 Voltage measurement inputs with test instruments with feature I01 only

3 Connector socket for 2nd test probe for 2-pole measurement only with test instrument with feature H01

4 10 A/25 A RPE measurements are only possible with line voltages of 115 V/230 V and line frequencies of 50 Hz/60 Hz.

5 Only ST PRIME ... version.

6 Only with feature F02

7 For ME equipment (medical electrical equipment) with own supply

8 For version ... ST PRIME under the EXTRA rotary switch position.

9 No checking for reversed wires when the EL1 adapter is used.

Integrated Test Sequences

NOTE

Availability of the individual integrated test sequences depends on the test instrument type, the selected features (order features), and the enabled extensions (activations). Refer to your order/your test instrument and the data sheet for details.

The test instrument is equipped with preconfigured, integrated test sequences which are selected via the switch positions at the orange rotary switch level.

The integrated test sequences are freely assignable, i.e., they can be individually assigned to the rotary switch positions because there are more integrated test sequences than rotary switch positions. The test instrument is preconfigured upon delivery.

Which integrated test sequences are assigned to the rotary switch positions on your test instrument upon delivery depends on several factors: Test instrument type, selected features, and enabled extensions.

Due to the great variety of possible combinations, a list of all delivery statuses would go beyond the scope of this documentation.

For instance, the delivery status of a standard test instrument is listed below as an example.

Integrated test sequences **Switch Positions at Orange Rotary Switch Level**					
Rotary Switch Position	**Standard/Test Sequence**	**Measurement type**	**Connection**	**Type**	**Protection Class**
A1	VDE 0750-1 2nd edition	Active	Auto	BF/CF	I
A2	VDE 0750-1 3rd edition	Active	Auto	BF/CF	I
A3	VDE 0750-1 3rd edition TPL	Active	Auto	BF/CF	I
A4	VDE 0750-1 3rd edition TPL	Active	Auto	-	I
A5	IEC 62353	Passive	Test socket	BF	I
A6	IEC 62353	Passive	Test socket	BF/CF	II
A7	IEC 62353	Passive	Test socket	BF	II
A8	IEC 62353	Active	Auto	BF	I
A9	IEC 62353	Active	Auto	BF/CF	II
Auto = automatic detection TPL = total patient leakage current					

Table 7: Default settings, SECULIFE ST PRO (version for Germany)

NOTE

The automatic detection of the measurement type simply provides a starting point regarding which DUTs must be checked actively. If the automatic measurement type detection suggests a passive test to you, verify whether the DUT is actually suitable for a passive test. If in doubt, check with the active measurement type to rule out that some switched parts of the device are not erroneously included in the measurement.

5.5 Relevant Standards

The instrument has been manufactured and tested in accordance with the following safety regulations:

EN 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements
DIN EN 62353 DIN VDE 0751-1	Medical electrical devices – Recurrent test and test after repair of electrical medical devices
EN 60529	Test instruments and test procedures – Degrees of protection provided by enclosures (IP code)
EN 61326-1	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements
EN 61326-2	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-2: Particular requirements – Test configurations, operational conditions and performance criteria for sensitive test and measurement equipment for EMC unprotected applications
EN 61557-16	Electrical safety in low voltage distribution systems up to 1000 V AC and 1500 V DC – Equipment for testing, measuring or monitoring of protective measures– Part 16: Devices for testing the effectiveness of protective measures of electrical devices and/or electrical medical devices

5.6 Technical Data

Reference Ranges	Line voltage:	230 V AC ±0.2%	
	Line frequency:	50 Hz ±2 Hz	
	Waveform:	Sinusoidal (deviation between RMS and rectified values < 0.5%)	
	Ambient temperature:	+23 °C ±2 K	
	Relative humidity:	40 ... 60%	
	Load resistance:	Linear	
Nominal Ranges of Use	Nominal line voltage:	90 V ... 264 V A	
	Nominal line frequency:	50 Hz ... 400 Hz	
	Line voltage waveform:	Sinusoidal	
	Temperature:	0 °C ... +40 °C	
Power Supply	Supply network:	TN, TT, or IT	
	Line voltage:	90 V ... 264 V AC	
	Line frequency:	50 Hz ... 400 Hz	
	Power consumption:	200 mA DUT: 10 A DUT: 25 A DUT:	 approx. 32 VA approx. 105 VA approx. 280 VA
	Mains to test socket (e.g., for function test):	Continuous max. 3600 VA, power is conducted through the instrument only, switching capacity ≤ 16 A, ohmic load; the AT3-IIS32 (Z745X) adapter (for example) can be used for current > 16 A AC	

Ambient Conditions	Operating temperatures:	+0 ... +40 °C
	Storage temperatures:	-20 ... +60 °C
	Relative humidity:	Max. 75%, no condensation allowed
	Elevation:	Max. 2000 m
	Place of use:	Indoors; outdoors: only within specified ambient conditions
		In order to avoid deviation due to excessive temperature fluctuation, e.g., after outdoor transport at low temperature and subsequent operation in a warm indoor environment, it is advisable to wait until the test instrument has acclimatized before starting any measurements. If the test instrument is colder than the ambient air, condensation may occur at high humidity, i.e., condensate may accumulate on components. This could result in the occurrence of parasitic capacitances and resistances which affect the measuring circuit and measuring accuracy.
Electrical Safety	Measurement category:	Designed for 300 V CAT II (reduced to 250 V CAT II through the use of fuses for increased user safety. The user-friendly fuses are replaceable, and replacements are easily obtainable.)
	Pollution degree:	2
	Protection class:	I in accordance with EN 61140
	Nominal voltage:	230 V
	Test voltage:	2.3 kV AC 50 Hz or 3.3 kV DC (mains circuit/test socket to mains PE terminal, USB, finger contact, test probe(s), test socket, AP sockets)
	Safety shutdown:	At DUT differential current of > 10 mA, shutdown time < 500 ms, can also be switched to > 30 mA with probe current (electronic fuse) during: Leakage current measurement > 30 mA~/< 500 ms[1] Protective conductor resistance measurement: > 250 mA~/< 1 ms in case of continuous current I > 16.5 A
	Fuse links:	Mains fuses: 2 × 500 V/16 A T Probe fuse: M 250 V/250 mA 10 A RPE test current (feature G01 only): 1 × T 500 V/16 A Applied parts: 2 × M 250 V/250 mA
Electromagnetic Compatibility (EMC)	Interference emission:	EN 55011 class A EN 55032 class A EN IEC 61000-3-2 EN IEC 61000-3-3
	Interference immunity:	DIN EN 61326-1 DIN EN 61326-2-2

Mechanical Design	Protection:	Housing: IP 40 (protection against penetration of solid foreign bodies: ≥ 1.0 mm ∅; protection against the ingress of water: not protected) Test socket: IP 20 (protection against penetration of solid foreign bodies: ≥ 12.0 mm ∅; protection against the ingress of water: not protected) Applied part: IP20 (protection against penetration of solid foreign bodies: ≥ 12 mm ∅; protection against the ingress of water: not protected) in accordance with DIN EN 60529 / IEC 60529 Housing with antimicrobial properties in accordance with JIS standard Z 2801	
	Housing (W × H × D):	approx. 295 mm ×145 mm × 150 mm SECULIFE ST PRIME: approx. 295 mm × 145 mm × 240 mm	
	Height with handle:	170 mm	
	Weight:	Feature G00/G01:	approx. 2.5 kg
		Feature G02:	approx. 4.0 kg
		(depending on test instrument version) SECULIFE ST PRIME:	approx. 6.0 kg
	Display:	4.3" multi-display (9.7 × 5.5 cm) with backlighting, 480 × 272 pixels with 24-bit color depth (true color)	
Data Interfaces	Bluetooth® 2.1 + EDR (test instruments with feature M01 only):	Frequency range:	2400 ... 2483.5 MHz
		Transmission intensity:	Max. 2.5 mW (class II)
		Connecting a Bluetooth® keyboard. Only Bluetooth® keyboards that support Bluetooth® Classic mode (3.0) are compatible. Keyboards that can only connect to Bluetooth® Low Energy hosts (as of Bluetooth 4.x) are not supported (including Bluetooth® Low Energy (LE)).	
	USB:	USB slave for PC connection/remote control[2] 2 × USB master, for data entry devices[3] with HID boot interface, for USB flash drive for data backup, for USB flash drive for saving reports as HTML files for USB thermal report printer (Z721S) and label printer Z721D/E	
Database	Number of data records:	50,000 (1 data record = 1 DUT or location node or customer or single measurement)	

1 Firmware version 3.2.0 and lower: 12 mA

2 Remote control only with extension: “Remote Control via PC (IZYTRONIQ)” (included as standard feature with SECUTEST ST PRO, SECUTEST ST PRIME, and SECULIFE ST BASE(25), and available with SECUTEST DB+ (Z853R or feature KB01).

3 See section “Connecting and Configuring External Devices” for compatible devices.

Influencing Quantities and Influence Error

Abbreviation	Influencing Quantity	R_{PE}	R_{ISO}	I_{PE}, I_B, I_G, I_A Leakage currents Alternative measurement	I_{PE}, I_B, I_G, I_A, I_P, I_{PH} Leakage currents Direct measurement	I_{PE}, I_B, I_GLeakage currents Differential current measurement
A	Intrinsic Uncertainty °	±(10% rdg. + 10 d) >10 d	±(2.5% rdg. +2 d) >10 d ≥ 20 Mμ: ±(5% rdg. + 4 d)	±(2% rdg. +2 d) >10 d > 15 mA: ±(5% rdg. + 4 d)	±(2.5% rdg. +2 d) > 10 d	±(2.5% rdg. +2 d) > 10 d
E1	Reference position ±90	0%	0%	0%	0%	0%
E2	Supply voltage	2.5%	2.5%	2.5%	2.5%	2.5%
E3	Temperature 0°C ... +40°C	2.5%	2.5%	2.5%	2.5%	2.5%
E9	Mains harmonics				1%	1%
E11	Low frequency magnetic fields	2.5%	2.5%	2.5%	2.5%	2.5%
E12	Load current					2.5%
E13	Touch current, common-mode voltage					
E15	Repetition accuracy					

Table 8: Influencing Quantities and Influence Error

5.7 Characteristic Values

Conducting tests

Measured Quantity	Display Range [1] / Nominal Operating Range	Resolution	Nominal voltage U_N	Open-circuit voltage U_0	Nominal Current $_{IN}$	Short-circuit current I_{SC}	Internal resistance R_I	Reference Resistor R_{REF}	Operational Measurement Uncertainty [2]	Self-Uncertainty [2]	Overload Capacity	
											Value	Time
Protective conductor resistance R_{PE}	1 MΩ ... 999 MΩ	1 mΩ	--	< 6 V AC or DC	-	>200 mA AC / DC > 10 A AC [3] >25 A AC [4]	-	-	±(15% rdg. + 10 D) > 10 D > 10,0 Ω: ±(10% rdg.+ 10 d)	±(10% rdg.+ 10 d) > 10 d	264 V 250 mA	continuous
	1.00 Ω ... 9.99 Ω	10 mΩ									16 A [5]	
	10.0 Ω ... 27.0 Ω	100 mΩ									>42 AA C [4]	15 s

Measured Quantity	Display Range [1] / Nominal Operating Range	Resolution	Nominal voltage U_N	Open-circuit voltage U_0	Nominal Current $_{IN}$	Short-circuit current I_{SC}	Internal resistance R_i	Reference Resistor R_{REF}	Operational Measurement Uncertainty [2]	Self-Uncertainty [2]	Overload Capacity	
											Value	Time
Insulation resistance [6] R_{INS}	10 kΩ ... 999 kΩ	1 kΩ	50 ... 500 V DC	1.0× U_N... 1.5× U_N	> 1 mA	< 2 mA	-	-	±(5 % rdg.+ 4 d) > 10 d ≥20 MΩ: ±(10% rdg.+ 8 d)	±(2,5 % rdg.+2 d) > 10 ≥20 MΩ: ± (5% rdg. +4 d)	264 V	continuous
	1.00 MΩ ... 9.99 MΩ	10 kΩ										
	10.0 MΩ ... 99.9 MΩ	100 kΩ										
	100 MΩ ... 300 MΩ	1 MΩ										
Leakage Currents Alternative Measurement [7] I I_T, I_E, I_A	0 µA ... 99 µA	1 µA	-	50 ... 250 V~ – 20/ +10 %	-	< 1,5 m A	>150 kΩ	1 kΩ ±10 Ω	(5 % rdg. + 4 d) > 10 d > 15 mA: ±(10% rdg.+ 8 d)	±(2 % rdg.+2 d) > 10 d > 15 mA ±(5% rdg.+ 4 d)	264 V	continuous
	100 µA ... 999 µA	1 µA										
	1.00 mA ... 9.99 mA	10 µA										
	10.0 mA ... 30.0 mA	100 µA										
Direct Measurement of Leakage Currents [8] I_{PE}, I_T, I_E, I_A, I_P, I_{PH}	Only I_P, I_{PA}: 0.0 µA ... 99.9 µA	100 nA	-	-	-	-	1 kΩ ±10 Ω	1 kΩ	(5% rdg. + 4 d) > 10 d	±(|2.5% rdg. +2 d)> 10 d	264 V	continuous
	0 µA ... 99 µA	1 µA										
	100 µA ... 999 µA	1 µA										
	1.00 mA ... 9.99 mA	10 µA										
	10.0 mA ... 30.0 mA	100 µA										
Leakage Currents —Differential Current Measurement [9 10] I_{PE}, I_T, I_E	0 µA ... 99 µA	1 µA	-	-	-	-	-	-	(5% rdg. + 4 d) > 10 d	±(|2.5% rdg. +2 d)> 10 d	264 A	continuous
	100 µA ... 999 µA	1 µA										
	1.00 mA ... 9.99 mA	10 µA										
	10.0 mA ... 30.0 mA	100 µA										

rdg. = reading (measured value)

d = digit(s)

1 Under certain circumstances, the display range may be changed only if the value has fallen below the hysteresis range.

2 ">10D" means that the specified value only applies as of a display of > 10 digits (the same applies whenever ">XXD" is specified).

3 Measurement types IPE_clamp and IE_clamp.

[4] Only with feature G02.

[5] Only with feature G01.

[6] The upper range limit depends on the selected test voltage.

[7] Known as equivalent leakage current or equivalent patient leakage current from previous standards.

[8] Protective conductor current, touch current, device leakage current, patient leakage current

[9] Protective conductor current, touch current, device leakage current

[10] In the case of DUTs with high power consumption, direct measurement is necessary for measuring touch currents in medical devices.

Table 9: Characteristic Values Conducting tests

Function Test at the Test Socket

Measured Quantity	Display Range[1] / Nominal Range of Use	Resolution	Nominal Voltage U_N	Open-Circuit Voltage U_0	Nominal Current I_N	Short-Circuit Current I_K	Internal Resistance R_I	Reference Resistance R_{REF}	Measuring Uncertainty[2]	Intrinsic Uncertainty[2]	Overload Capacity	
											Value	Time
Line voltage U_{L-N}[3]	90.0 V~ ... 264.0 V~	0.1 V	-	-	-	-	-	-	-	±(2% rdg.+2 d)	264 V 16 A 20 A	Continuous Continuous <10 min
Load current I_V	0 A_{RMS} ... 20.00 A_{RMS}	10 mA	-	-	-	-	-	-	-	±(2% rdg.+2 d)		
Active power P	0 W ... 999 W	1 W	-	-	-	-	-	-	-	±(5% rdg.+10 d) 1.00 kW > 20 d		
	1.00 kW > 20 d ... 4.50 kW	10 W										
Apparent power S	0 VA ... 999 VA	1 VA	Calculated value $U_{L-N} \times I_V$							±(5% rdg.+10 d) 1.00 kVA > 20 d		
	1.00 kVA > 20 d ... 4.50 kVA	10 VA										
Power factor LF with sinusoidal waveform: cosφ	0.00 ... 1.00	0.01	Calculated value, P / S, display > 10 W							±(10% rdg.+5 d)		
Line frequency f	0 Hz ... 420.0 Hz	0.1 Hz	-	-	-	-	-	-	-	±(2% rdg.+2 d)		

rdg. = reading (measured value)

d = digit(s)

[1] Under certain circumstances, the display range may be changed only if the value has fallen below the hysteresis range.

[2] ">10D" means that the specified value only applies as of a display of > 10 digits (the same applies whenever ">XXD" is specified).

[3] Voltage at the test socket may be lower than measured line voltage due to components which limit inrush current.

Table 10: Characteristic Values Function Test at the Test Socket

t_{PRCD}

Measured Quantity	Display Range[1]/ Nominal Range of Use	Resolution	Nominal Voltage U_N	Open-Circuit Voltage U_0	Nominal Current I_N	Short-Circuit Current I_K	Internal Resistance R_i	Reference Resistance R_{REF}	Measuring Uncertainty[2]	Intrinsic Uncertainty[2]	Overload Capacity	
											Value	Time
Time to trip	0.1 ms ... 999.0 ms	0.1 ms	-	-	30 mA ±2%	-	-	-	±5 ms	-	264 V	Continuous
rdg. = reading (measured value) d = digit(s)												

1 Under certain circumstances, the display range may be changed only if the value has fallen below the hysteresis range.

2 ">10D" means that the specified value only applies as of a display of > 10 digits (the same applies whenever ">XXD" is specified).

Table 11: Characteristic Values t_{PRCD}

Voltage Measurement

Measured Quantity	Display Range[1]/ Nominal Range of Use	Resolution	Nominal Voltage U_N	Open-Circuit Voltage U_0	Nominal Current I_N	Short-Circuit Current I_K	Internal Resistance R_i	Reference Resistance R_{REF}	Measuring Uncertainty[2]	Intrinsic Uncertainty[2]	Overload Capacity	
											Value	Time
Probe voltage (probe P1 to PE) DC, AC and DC/AC	0.0 V ... 99.9 V 100 V ... 264 V	100 mV 1 V	-	-	-	-	3 MΩ	-	-	±(2% rdg.+2 d)	264 V	Continuous
Measuring voltage Continuous (V–COM sockets[3]) DC, AC and DC/AC	0.0 V ... 99.9 V 100 V ... 300 V						1 MΩ			±(2% rdg.+2 d) > 45 Hz ... 65 Hz ±(2% rdg.+5 d) > 65 Hz ... 10 kHz ±(5% rdg.+5 d) > 10 kHz ... 20 kHz	300 V	
rdg. = reading (measured value) d = digit(s)												

1 Under certain circumstances, the display range may be changed only if the value has fallen below the hysteresis range.

2 ">10D" means that the specified value only applies as of a display of > 10 digits (the same applies whenever ">XXD" is specified).

3 Only with feature I01.

Table 12: Characteristic Values Voltage Measurement

I_{Abl}

Measured Quantity	Display Range [1] / Nominal Range of Use	Resolution	Nominal Voltage U_N	Open-Circuit Voltage U_0	Nominal Current I_N	Short-Circuit Current I_K	Internal Resistance R_I	Reference Resistance R_{REF}	Measuring Uncertainty [2]	Intrinsic Uncertainty [2]	Overload Capacity	
											Value	Time
Leakage current via AT3-IIIE adapter Z745S [3] [4]AC	0.00 mA ... 0.99 mA	0.01 mA	–	-	-	-	-	-	-	±(2% rdg.+2 d) > 10 d without adapter	253 V	Continuous
	1.0 mA ... 9.9 mA	0.1 mA										
	10 mA ... 20 mA	1 mA										
rdg. = reading (measured value) d = digit(s)												

1 Under certain circumstances, the display range may be changed only if the value has fallen below the hysteresis range.

2 ">10D" means that the specified value only applies as of a display of > 10 digits (the same applies whenever ">XXD" is specified).

3 Only with feature I01.

4 Measurement types IPE_AT3 adapter and IG_AT3 adapter.

Table 13: Characteristic Values I_{Abl}

Temp

Measured Quantity	Display Range [1] / Nominal Range of Use	Resolution	Nominal Voltage U_N	Open-Circuit Voltage U_0	Nominal Current I_N	Short-Circuit Current I_K	Internal Resistance R_I	Reference Resistance R_{REF}	Measuring Uncertainty [2]	Intrinsic Uncertainty [2]	Overload Capacity	
											Value	Time
Temperature with Pt100 sensor	– 200.0 °C ... +850.0 °C	0.1 °C	-	< 20 V		1.1 mA	-	-	-	±(2% rdg.+1 °C)	10 V	Continuous
Temperature with Pt1000 sensor	– 150.0 °C ... +850.0 °C											
rdg. = reading (measured value) d = digit(s)												

1 Under certain circumstances, the display range may be changed only if the value has fallen below the hysteresis range.

2 ">10D" means that the specified value only applies as of a display of > 10 digits (the same applies whenever ">XXD" is specified).

Table 14: Characteristic Values Temp

I_{clamp}

Measured Quantity	Display Range[1] / Nominal Range of Use	Resolution	Nominal Voltage U_N	Open-Circuit Voltage U_0	Nominal Current I_N	Short-Circuit Current I_K	Internal Resistance R_I	Reference Resistance R_{REF}	Measuring Uncertainty[2]	Intrinsic Uncertainty[2]	Overload Capacity	
											Value	Time
Current via current clamp sensor [1 mV: 1 mA] (V-COM sockets[3] [4]) AC	1 mA ... 99 mA	1 mA (1 mV)	-	-	-	-	-	-	-	±(2% rdg.+2 d) > 10 d 20 Hz ... 20 kHz without clamp	253 V	Continuous
	0.1 A ... 0.99 A	0.01 A (10 mV)										
	1.0 A ... 9.9 A	0.1 A (100 mV)										
	10 A ... 300 A	1 A (1 V)										
Current via current clamp sensor [10 mV: 1 mA] (V-COM sockets[3] [4]) AC	0.1 mA ... 9.9 mA	0.1 mA (1 mV)	-	-	-	-	-	-	-			
	10 mA ... 99 mA	1 mA (10 mV)										
	0.10 A ... 0.99 A	0.01 A (100 mV)										
	1.0 A ... 30.0 A	0.1 A (1 V)										
Current via current clamp sensor [100 mV: 1 mA] (V-COM sockets[3] [4]) AC	0.01 mA ... 0.99 mA	0.01 mA (1 mV)	-	-	-	-	-	-	-			
	1.0 mA ... 9.9 mA	0.1 mA (10 mV)										
	10 mA ... 99 mA	1 mA (100 mV)										
	0.10 A ... 3.00 A	0.01 A (1 V)										
Current via current clamp sensor [1000 mV: 1 mA] (V-COM sockets[3] [4]) AC	1 µA ... 99 µA	1 µA (1 mV)	-	-	-	-	-	-	-			
	0.10 mA ... 0.99 mA	0.01 mA (10 mV)										
	1.0 mA ... 9.9 mA	0.1 mA (100 mV)										
	10 mA ... 300 mA	1 mA (1 V)										
rdg. = reading (measured value) d = digit(s)												

1 Under certain circumstances, the display range may be changed only if the value has fallen below the hysteresis range.

2 ">10D" means that the specified value only applies as of a display of > 10 digits (the same applies whenever ">XXD" is specified).

3 Only with feature I01.

4 Measurement types IPE_clamp and IE_clamp.

Table 15: Characteristic Values I_{clamp}

Testing Times, Automatic Procedure

Testing times ("measurement duration ..." parameter) can be set separately for each rotary switch position during configuration of the sequence parameters. Testing times are neither tested nor calibrated.

Leakage current measurement

With all leakage current measurements (I_{PE}, I_T, I_E, I_A, I_P, I_{PH}) (direct, differential, alternative), the frequency response is taken into account.

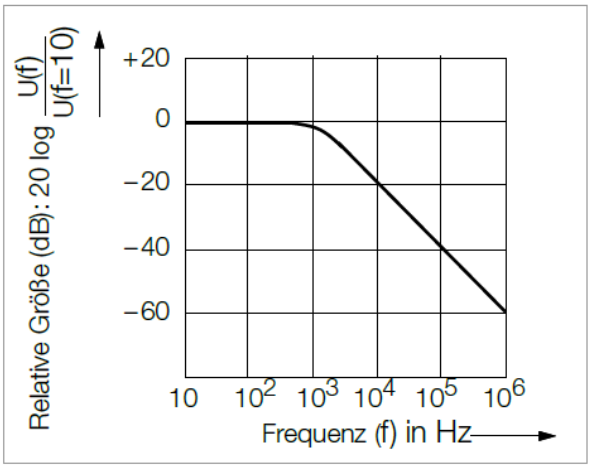


Fig. 1: Frequency response

Emergency Shutdown During Leakage Current Measurement

As of 10 mA of differential current (can also be set to 30 mA), automatic shutdown ensues within 500 ms. This shutdown does not take place during leakage current measurement with clamp meter or adapter.

SECUTEST ST PRIME with Integrated High-Voltage Testing

- High-voltage testing is available as a single test via the rotary switch position $\mathbf{U_{HV}}$
- Test L/N - PE (protection category I) and L/N to handheld probe (protection category II) are possible
- Test voltages depend on country variant/test socket ⇨ **"Maximum adjustable test voltage"** 🗋 **36**
- Also with feature F02: optional high-voltage connection for high-voltage test pistol
  - This connection enables in conjunction with the optional high-voltage test pistol (Z746H), for example, the verification of the resistance to high voltages on electrical components with two handheld probes
  - In conjunction with the high-voltage pistol Z746H, the test voltage can be ramped up/down from the pistol
- High-voltage testing (F01/F02) in conjunction with SECUTEST DB+ (feature KB01)
  - Also enables the remote control of the test instrument including high-voltage testing[1] via PC data interface for integration[2] in customer-specific test systems
  - User-defined test sequences, including high-voltage test steps, can be created in IZYTRONIQ and imported into the test instrument.
- Integrated test procedures augmented with test steps for the high-voltage testing for protection category I and protection category II DUTs Integrated Test Sequences

[1] Remote control of the high-voltage testing using “IZYTRONIQ” software is not supported.

[2] Documentation of the remote control commands is available upon request.

High-voltage source

DC test voltage	U_{Gen} adjustable in 50 V steps	0.50 ... 6.00 kV[1]
Open-circuit voltage	U_0	(U_{Gen} × 1.011) + 60 V
Accuracy of open-circuit voltage		±(2.5% U_0 + 5 digits) (resolution: 0.01 kV)
DC nominal current	In accordance with DIN VDE 0104	< 3 mA
Short-circuit current	Discharging current based on 6 × 2.7 nF	> 5 A at 5 kV
Interference Voltage Withstand		None

[1] See following table – Adjustable rise time and test time

Table 16: High-voltage source

Maximum adjustable test voltage (U_{Gen}) as a function of the measurement type and test socket

Test socket [country]	Measurement type	Limit value
B00 [Germany]	LN(TS) – PE(TS)||P1	max. 3.00 kV[1]
	LN(TS) - P1	max. 6.00 kV
B01 [Great Britain]	LN(TS) – PE(TS)||P1	max. 3.00 kV[1]
	LN(TS) - P1	max. 6.00 kV
B03 [France, Czech Republic, Poland]	LN(TS) – PE(TS)||P1	max. 3.00 kV[1]
	LN(TS) - P1	max. 6.00 kV
B04 [China]	LN(TS) – PE(TS)||P1	max. 3.00 kV[1]
	LN(TS) - P1	max. 6.00 kV
B05 [USA]	LN(TS) – PE(TS)||P1	max. 3.00 kV[1]
	LN(TS) - P1	max. 4.00 kV
B06 [Australia]	LN(TS) – PE(TS)||P1	max. 3.00 kV[1]
	LN(TS) - P1	max. 6.00 kV
B07 [Denmark]	LN(TS) – PE(TS)||P1	max. 3.00 kV[1]
	LN(TS) - P1	max. 6.00 kV
B09 [Switzerland, with connector socket and detection of protection category]	LN(TS) – PE(TS)||P1	max. 3.00 kV[1]
	LN(TS) - P1	max. 6.00 kV
B00 - B09 With feature F02, optional high-voltage connection (for HV test pistol Z746H)	PHV - P1	max. 6.00 kV

[1] As from firmware 3.6.1; previously 2.25 kV

Table 17: Maximum adjustable test voltage (U_{Gen}) as a function of the measurement type and test socket

Voltage Measurement

Measuring range	Display Range	Resolution	Accuracy
0 ... U_{0max}DC	0.00 ... 9.99 kV	0.01 kV	±(2.5% rdg. + 5 digits)

Table 18: Voltage Measurement

Lower Supply Limit for High-Voltage Testing

In order to be able to conduct high-voltage testing, the load must always be greater than the respective characteristic curve (see following diagrams).

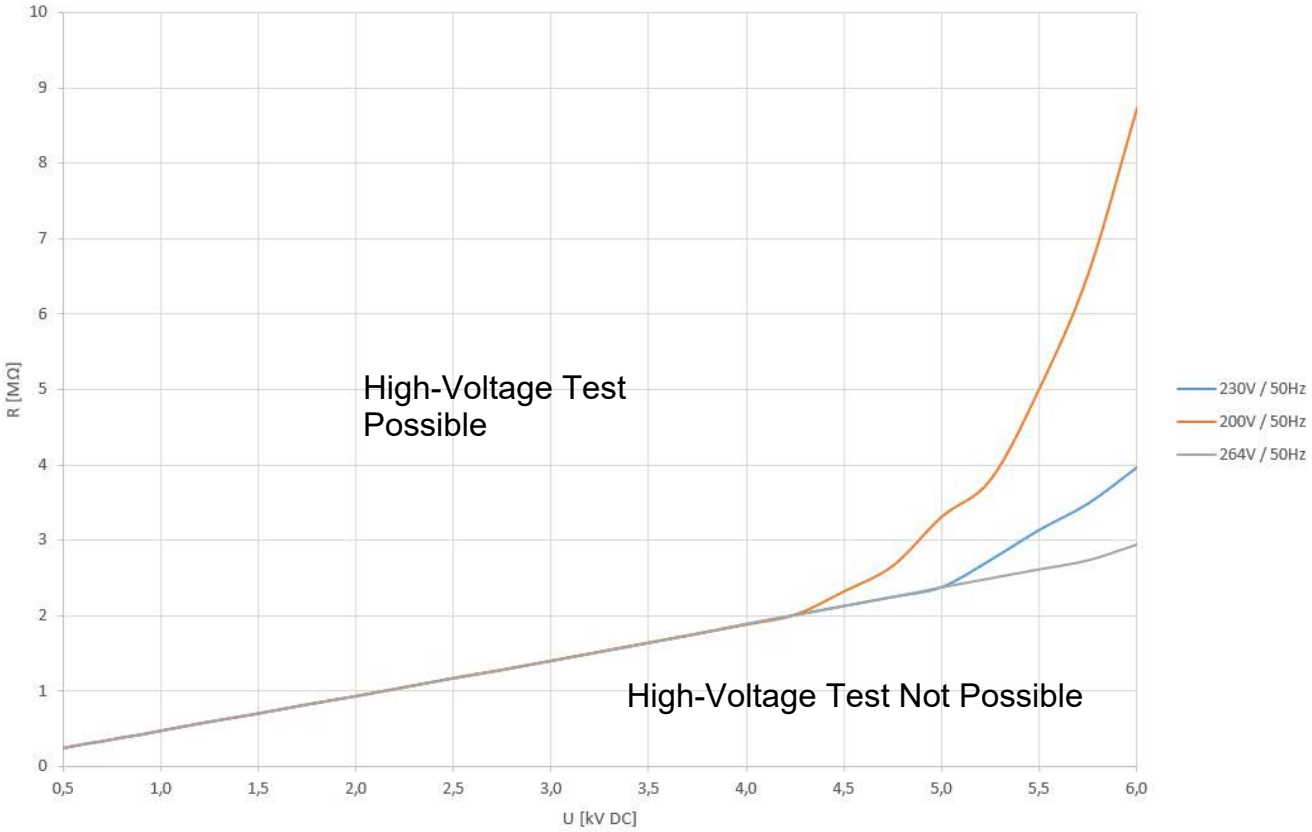


Fig. 2: Typical Maximum Load for the HV Source as a Function of Supply Voltage at 50 Hz

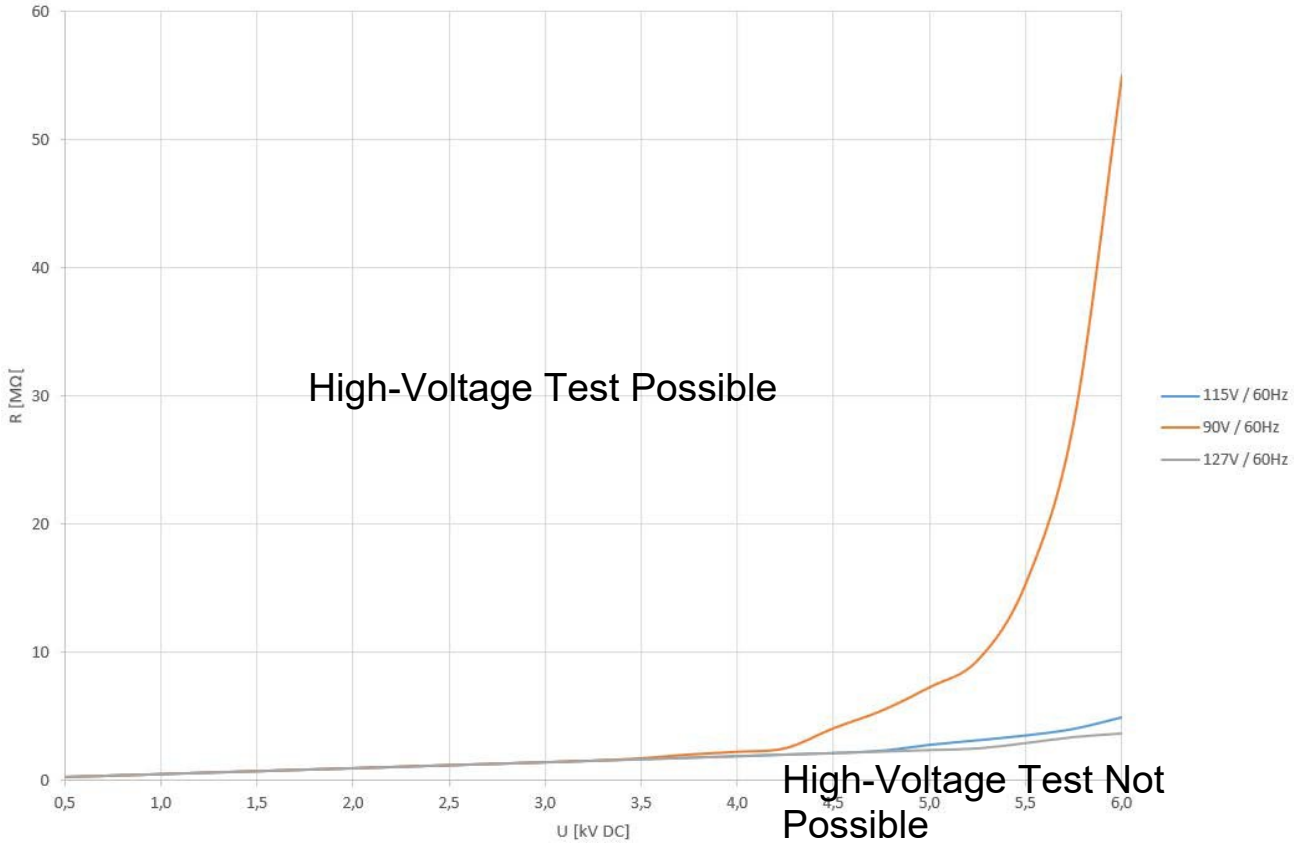


Fig. 3: Typical Maximum Load for the HV Source as a Function of Supply Voltage at 60 Hz

6 Initial Startup

Initial startup of the test instrument is conducted by connecting it to the power supply. The following sections describe operation, as well as how to select various basic settings.

6.1 Connecting the Test Instrument to the Mains

DANGER



Electric Shock!

Incorrectly connected power supply cables or connecting the instrument while energized may result in injury due to electrical voltage.

— If connection is not possible via an earthing contact outlet: Shut down mains power first.
— Then connect the cables from the coupling socket to the mains terminals using pick-off clips and finally activate the electrical circuit.

✓ The nominal mains values and nominal ranges of use correspond to the specifications in the technical data.

1. Connect the mains cable to the inlet plug on the test instrument.
2. Connect the mains plug to the mains power. The rotary switch position is not relevant here.

TIP



If a mains outlet (earthing contact outlet) is not available, or if only a 3-phase outlet is available, the adapter socket can be used to connect the phase conductor, the neutral conductor, and the protective conductor. The adapter socket has three permanently attached cables and is included with the KS13 cable set.

Measurements in IT Systems

In ungrounded supply systems, it is technically not possible to record leakage or fault currents. To prevent these measurements, certain parameters must be enabled.

The **IT Mains** setting can be activated in the **SETUP** switch position (Setup 1/3) in the **All Measurements** submenu: with "**Meas. at IT Mains**" set to Yes: active leakage current measurements (or all measurements with reference to PE at the mains connection side) are disabled. Test sequences which include measurements of this sort are also disabled.

6.2 Selection of Test Standards

Test sequences in accordance with standards (also referred to as measurement or test sequences) are preconfigured and integrated into the test instrument. They consist of a series of single tests followed by documentation, as prescribed by the respective standard. They can be used to repeatedly and efficiently execute standard-compliant tests.

The integrated test sequences are identical in content but have different national designations depending on the respective country (DIN, VDE, ÖNORM, SNR, etc.). Furthermore, there are variants for each integrated test sequence, e.g., for testing PRCDs.

During commissioning, you must first select a national standard designation for each integrated test sequence in the test instrument. Selecting the standard designation is mandatory.

NOTE

The standard designation cannot be changed retroactively. Stored measurements retain the standard designation and it is used in the test report.

Select the standard designation carefully during initial startup.

As soon as the standard designation has been changed, the new designation is used in all future tests.

The standard designation is used in the integrated test sequences, such as in the following operations:

- Displaying on the test instrument
- Saving results in the test instrument
- Exporting results, e.g., to the IZYTRONIQ testing software
- Including in reports (burden of proof)

To improve clarity, you can deactivate standards that are not needed.

The built-in test sequences are executed in rotary orange rotary switch positions **A1** through **A9**. Each rotary switch position is factory-set with a built-in test sequence, but this can be changed. Therefore, if necessary, you can assign a different built-in test sequence to a rotary switch position or leave the preselected built-in test sequences as is.

Overview of Integrated Standards

SETUP > Automatic measurem.	
EN 50678 >	Based on EN 50678 VDE 0701 OVE EN 50678 SN EN 60678
EN 50699 >	Based on EN 50699 VDE 0702 OVE EN 50699 SN EN 50699
IEC 62353 >	Based on EN 62353 IEC 62353 VDE 0751-1
IEC 60974-4 >	Based on EN 60974-4 IEC 60974-4 VDE 0544-4
NEN 3140 >	Based on NEN 3140
IEC 62368 >	Based on EN 62368 IEC 62368 VDE 0868-1
IEC 62911 >	Based on EN 62911 IEC 62911 VDE 0868-911

IEC 60335 >	Based on EN 60335-1 IEC 60335-1 VDE 0700-1
IEC 61010 >	Based on EN 61010-1 IEC 61010-1 VDE 0411-1
VDE 0701-0702 >	Based on OVE E 8701 SNR 462638 VDE 0701-0702
IEC 60601-1 2nd edition >	Based on EN 60601-1 2nd edition IEC 60601-1 2nd edition VDE 0750-1 2nd edition
IEC 60601-1 3rd edition >	Based on EN 60601-1 3rd edition IEC 60601-1 3rd edition VDE 0750-1 3rd edition
IEC 60601-1 3rd edition TPLC >	Based on EN 60601-1 3rd edition TPLC IEC 60601-1 3rd edition TPLC VDE 0750-1 3rd edition TPLC

Table 19: Overview of integrated standards

6.2.1 Selecting the Standard Designation and Deactivating Standards

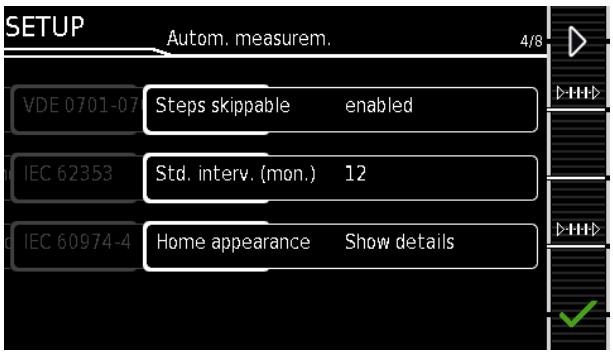
NOTE

Availability of the individual integrated test sequences depends on the test instrument type (SECUTEST ST... or SECULIFE ST...), the selected features (order features), and the enabled extensions (activations).
Refer to your order/your test instrument and the data sheet for details.

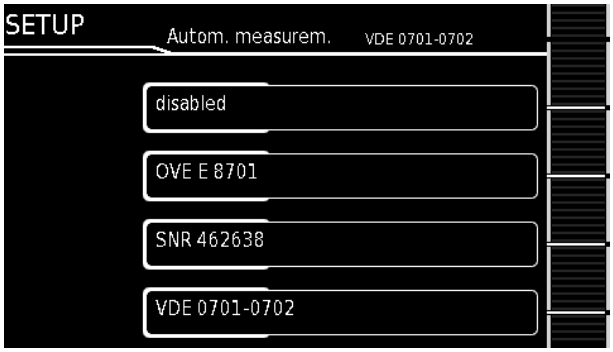
1. Go to the **SETUP 1/3 > Automatic measurem.** submenu.
   ↳ All standards for which a test sequence is integrated are displayed.



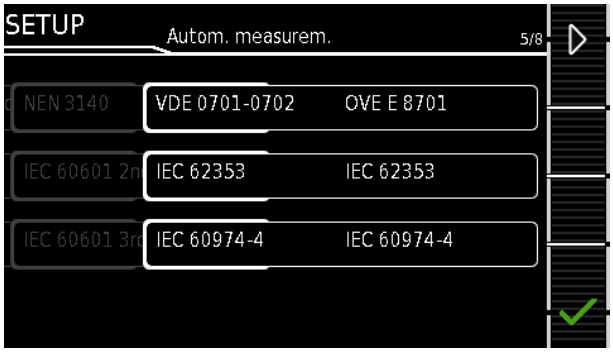
2. Scroll through the menu pages until the respective standards appear.



3. Use the softkey to select the first standard.
   ↳ All possible national standard designations are displayed.



4. Use the corresponding softkey to select the desired national standard designation.
5. To deactivate the standard, select the entry **off**.
   ↳ The menu returns to the standard displays in **Automatic measurem.**.
6. Repeat the previous steps for all standards.
7. When all settings have been configured, confirm your selection with **OK** (green checkmark).



↳ The settings are saved. The selected standard designation is used in the test instrument.

6.3 Automatic Detection of Mains Connection Errors

DANGER



Electric Shock! Risk of Consequential Accidents!

Voltage from the protective conductor is also applied to the test socket's exposed protective contacts and can cause life-threatening injury if touched.

If, while testing protective conductor potential, you determine that the mains protective conductor is conducting voltage (in accordance with the first two cases shown in the table above), no measurements may be performed with the test instrument at this mains connection.

— Immediately disconnect the test instrument from the mains connection.

— Arrange for rectification of the fault at the mains outlet/installation.

WARNING



Electric Shock! Risk of Consequential Accidents!

Voltage at the electrical system's protective conductor PE may result in distorted measured values during testing for the absence of voltage or during leakage voltage measurements. For example, DUTs can falsely pass the test and pose a safety risk when used.

— Make sure that the mains connection is correct. If necessary, change the mains outlet.

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.

NOTE



Finger contact

During this test for correct mains connection, a voltage measurement is performed between the finger contact and PE at the test instrument's mains connection, and its reference potential is acquired via the user's body resistance to the conductive start key. In order to obtain reliable measurement results, this resistance value must be less than 1 MΩ. If the user is wearing insulating shoes or gloves, or is standing on an insulating floor covering, erroneous measurements and display of the "Interference voltage at mains connection PE" message may result. Try to reduce resistance in this case, for example by touching ground potential with the other hand (e.g., a radiator, but not an insulating wall, etc.).

The device 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.

Type of Mains Connection Error	Message	Condition	Measurements
Voltage at protective conductor PE to finger contact (**START/STOP** key)	Display	Press the **START/STOP** key: U > 25 V key →PE: < 1 MΩ[1)]	All measurements disabled
Protective conductor PE and phase conductor L reversed and/or neutral conductor N interrupted		Voltage at PE > 100 V	Not possible (no supply power)

Type of Mains Connection Error	Message	Condition	Measurements
Line voltage < 180 V / < 90 V (depending on mains)		U_{L-N} < 180 V U_{L-N} < 90 V	Possible under certain circumstances [2]
Test for IT/TN system	Display	Connection N →PE > 20 kΩ	Possible under certain circumstances

Table 20: Mains Connection Errors

[1] If the location impedance of the inspector is very high, the following error message may appear: “Interference voltage at mains connection PE”

[2] 10 A/25 A R_{PE} measurements are only possible with line voltages of 115 V/230 V and line frequencies of 50 Hz/60 Hz.

6.4 Connecting the P1 or P2 test probe

CAUTION

Risk of Puncture When Using Test Probes with Coil Cable (SK2W)!

Tensioning at the coil cable may cause the test tip to snap back resulting in possible injury.

— Grasp the test probe firmly, for example if it has been inserted into a jack socket.

NOTE

Test current: 25 A

For test currents of 25 A with R_{PE} measurements, a test probe with a green strain relief sleeve must be used. Only these are suitable for this test current.

Measurements with 25 A may only be performed with test probes with a maximum probe cable of 5 m. With longer probe cables, the 25 A will not flow.

The inspector must take this into account with regards to any normative requirements.

1. Insert the double plug of test probe P1 or P2 into sockets 1 or 2 so that the side of the plug with the white ring is aligned with the silver-colored circle segment printed on the housing.

The white ring marks the connection of the high-current conductor. In the case of connection 1 for test probe P1, this is protected via the neighboring fuse.

TIP

Difficultly in Contacting Exposed Conductive Parts when Using the Standard Probe with Test Tip

In order to assure good contact, surface coatings must be removed from DUTs with special tools at a suitable location.

The tip of test probe P1 is not suitable for scratching away paint, because this may impair its coating and/or mechanical strength. Brush probe Z745G may be more suitable than the test probe in certain individual cases.

▶ **Checking the Probe**

1. Check probe P1 after each test – checking probe P1 also checks whether the probe fuse is still OK when the probe is plugged in.

NOTE

Tests that use the P1 probe may lead to erroneously good or overly low measured values when insulation resistance values or touch currents are evaluated.

If a probe check fails after a test, make sure that the test of the previously tested DUT is repeated after the probe fuse has been replaced.

6.5 International Use

Under the conditions described below, the test instrument can also be used internationally.

Power Supply

The test instrument is equipped with a broad range input and is thus suitable for nearly all AC networks anywhere in the world.

Depending on selected order features the plug on the power supply cable is country-specific. This cable can be removed and replaced with another suitable power cable with different national specifications. Ask your electrical components dealer for a suitable power supply cable.

The test instrument can also be connected to the power supply by means of a travel adapter. Observe the following in this regard:

- The travel adapter's protective earth conductor must demonstrate faultless continuity.
- The travel adapter must provide the necessary current carrying capacity (16 A or fusing of the upstream installation).
- The test instrument (irrespective of the travel adapter) is only suitable for active measurements of DUTs with nominal current of up to 16 A.

For active tests on DUTs with current exceeding 16 A or high starting current, use a suitable test adapter with its own residual current transformer and contactor (e.g., AT32-DI).

Test socket

The test instrument's test socket is also country-specific and depends on the selected order feature.

For international use, universal adapters are available as an accessory for the test socket Germany (only compatible with test instrument with feature B00), which are suitable for DUTs with various country-specific plugs (see data sheet feature B11).
The universal adapters simply adapt the plug connection - the DUT is still operated with the mains power used to supply the test instrument!

NOTE

Use of universal adapters in conjunction with high-voltage testing (with feature F01/F02 only)

These universal adapters are also suitable for conducting high-voltage testing on a DUT connected to the universal adapter. Unapproved adapters may distort their test result.

Make sure that the phase conductor is correctly positioned when connecting the universal adapter: in the **normal polarity** setting, the phase conductor is fed to the contact of the active conductors in the test socket, which faces the carrying handle.

Voltage and frequency have to be set for the different mains voltages of the DUTs. Enter the appropriate value under:

SETUP 1/3 > All Measurements 1/2 > Ref. Voltage L-PE and

SETUP 1/3 > All Measurements 1/2 > Test Freq. Alt.

These two values influence your work with the test instrument as follows:

When the **Alternative** measurement type is used for leakage current measurements involving touch current, protective earth current and device leakage current, as well as for all measurement types associated with the measuring function for leakage current from the applied part, the following occurs:

- The level of the generated test voltage is controlled (current limiting) on the basis of the selected reference voltage value.
- The frequency of the generated test voltage is controlled according to the value selected in SETUP.

For all types of leakage current measurement, the displayed leakage current value is converted using the selected reference voltage value in order to compensate for any deviations of the actual mains voltage from nominal conditions.

7 Operation

NOTE



The connections of the device must not be loaded with more than 30 V_{DC} 30 mA.
If these values are exceeded, a fuse will trip. The fuse will reset after a delay as soon as the overload has been removed.

7.1 Basic Operation of the Test Instrument

The test instrument is operated using the keys and the rotary switch on the test instrument.

Softkeys

The softkeys are assigned to different functions depending on the operating level.

Function Keys

Function keys have a permanently assigned function:

PRINT	Print via USB
ESC	Go back
MEM	Database
HELP	Help images
START STOP	Start/stop ■ Single measurement ■ Test sequence Finger contact

In some situations, for example when using the softkey keyboard, an alternative function appears at the display.

Display

Depending on the selected menu, the following appears at the display panel:

- Setup for test instrument settings
- The selected measuring function or standard
- Measured values with abbreviations and units of measure
- Setting parameters such as type of connection and measurement type
- Icons for softkey operation
- Wiring diagrams
- Notes regarding the test sequence
- Error messages

Display for measurements

Green progress bars appear in the header for single measurements, and orange progress bars appear for test sequences.

If the upper range limit is exceeded, the upper limit value is displayed and is preceded by the “>” (greater than) symbol, which indicates measured value overrun. Falling short of the lower range limit is indicated by the “<” (less than) symbol, e.g., for RINS.

Display for connected devices: Devices connected to the two USB master ports such as keyboard, barcode/RFID reader, printer, or USB flash drive appear as icons in the display header.

For reasons of clarity, only one icon is displayed when several devices of the same type are connected.

A small number also appears in the icon indicating the number of these devices.

Version with touchscreen

Depending on the selected order features, your test instrument may be equipped with a touchscreen.

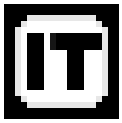
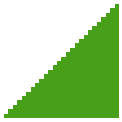
ATTENTION

Scratching the display!

Operating the touchscreen with hard or pointed objects, such as a test probe or a ballpoint pen, may damage the display.

— Operate the display with your fingers only.

7.1.1 Icons for Softkey Operation

Icon	Designation	Meaning
	**Set Parameters**	Set Parameters
	**IT**	
	**OK**	Accept changed parameters, acknowledge memory location
	**Resume test**	Acknowledges messages during tests/measurements or resumes the test sequence
	**Abort**	Abort measurement
	**Set measurement type**	Direct selection key for selecting the measurement type
	**SEL**	Calls up a selection list of parameters
	**Polarity normal**	Currently selected polarity: “normal” (green field) Pressing the key switches to “reversed” polarity
	**Polarity reversed**	Currently selected polarity: “reversed” (green field) Pressing the key switches to “normal” polarity
I_P	**Set test current**	Direct selection key for selecting test current for protective conductor measurement

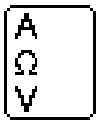
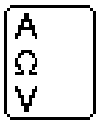
Icon	Designation	Meaning
U+ U–	**Change voltage value**	Direct selection key for gradually changing the voltage ■ In 10 V steps with the insulation measurement ■ In 50 V steps with the high-voltage testing (UHV switch position)
	**Start evaluation**	Start evaluation – record measured value. Each time this softkey is pressed, an additional measured value is saved and the number is increased by one.
	**ID**	The ID number to which the measurement(s) will be stored can be entered here.
	**Save**	Valid measured values have been obtained for a measurement. This measurement can be saved.
	**Save as**	Save measurement data as (with display of directory path/test object ID or new entry of a test object ID other than the preselected one)
	**Push-Print**	Send measurement data to the PC, e.g., for saving to IZYTRONIQ report generating software (push-print function) (see online help for IZYTRONIQ)
	**Display measured values**	Display measured values from performed measurements
	**Show details**	Show details from the measurement results list
	**Hide details**	Hide details from the measurement results list
	**Search**	Searches for compatible Bluetooth® devices

Table 21: Icons for user guidance

Icon	Designation	Meaning
	**Inspector**	Inspector
	**Inspector with password protection**	Inspector with password protection

Icon	Designation	Meaning
	**Test planner**	Test planner
	**Password-protected test planner**	Password-protected test planner
	**ETP**	ETP
	**Password-protected ETP**	Password-protected ETP

Table 22: Icons for inspector list

Icon	Designation	Meaning
	**Change display**	Change display to menu selection
	**NEW**	Add object
	**DEL**	Delete selected object or selected measurement
	**EDIT**	Edit object (ID, designation, comment ...)
	**MOVE**	Move object (with SECUTEST DB COMFORT only (Z853S or feature KD01))
	**Display measured values**	When a measurement is selected: Display measured values
	**Show details**	Show details from the measurement results list
	**Hide details**	Hide details from the measurement results list

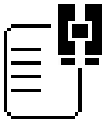
Icon	Designation	Meaning
	**Search All**	Search in the ID, designation, or UDI fields > enter the entire ID or designation (complete word)
	**Search ID**	Search by ID: > enter complete ID number of a test object
	**Show structure designation**	Show the structure designation
	**Hide structure designation**	Hide the structure designation
	**Standard instrument**	Standard instrument
	**ME equipment**	Medical test object
	**QEDIT**	Quick Edit
	**Save**	Save

Table 23: Icons for database

7.2 Entering Text and Numbers

A softkey keyboard is displayed for entering text, numbers, and characters (e.g., for entering an offset, a test object ID number, type designations, comments, etc.), which is operated by means of the softkeys. In the case of test instruments with touchscreen (feature E01), entry is via the touchscreen keyboard.

Alternatively, entries can also be made via a connected USB keyboard or Bluetooth® keyboard (with feature M01 only).

▶ **Entry via the softkey keyboard**

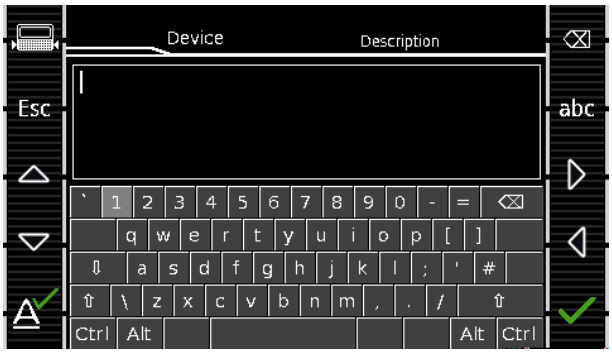
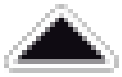
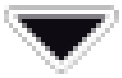


Fig. 4: Softkey keyboard

Icon	Designation	Function
	**Switch**	Switch between keypad and display panel
Esc	**Esc**	Exit entry mode without applying
	**Up**	Scroll up
	**Down**	Scroll down
	**Paste**	Accept character at cursor position in display panel
	**Delete**	Delete character to the left of the cursor
abc	**abc**	Switch between upper-/lowercase and symbols
	**Right**	Scroll right
	**Left**	Scroll left
	**OK**	Accept entry

▶ **Entry via touchscreen keyboard (feature E01)**

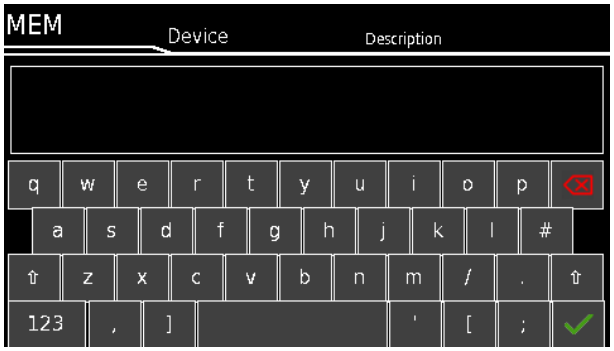


Fig. 5: Touchscreen keyboard

Action/icon	Designation	
Press the shift key once	**Uppercase**	Switches to uppercase for the following character
Pressing the shift key for a longer period of time	**All in uppercase**	Switches to all uppercase
Press the display panel at a certain point in the text that has already been entered	**Cursor**	Positions the cursor
	**Delete**	Delete character to the left of the cursor (also via the assigned softkey)
	**OK**	Accept entry (also via the assigned softkey)

▶ **Example: Name DUT**

1. Switch the keyboard to uppercase, lowercase, or special characters with the **abc** key (Abc, ABC, Symb).
2. Select the desired alphanumeric character or a line break with the scroll keys **Left** / **Right** / **Up** / **Down**. The selection cursor can be accelerated by pressing and holding the respective scroll key.
3. Press the **Insert** key to copy the respective symbol into the display panel.
4. Repeat steps 1 through 3 until the complete designation appears in the display panel.
5. To subsequently change designations in the display panel, press the **Toggle** key.
   ↳ The bottom keyboard is hidden. The cursor position can then be changed in order to delete individual characters.
6. Press the green checkmark **OK** to copy the value to the display panel.

7.3 Entry via an External Bluetooth or USB Keyboard

Instead of using the (touchscreen) keyboard, you can enter characters directly with a USB or Bluetooth® keyboard connected to the test instrument (only with feature M01).

NOTE

To operate an external USB keyboard with the test instrument, the "Keyboard Layout" settings in the Setup menu must match the connected keyboard exactly.

Key Functions (without DB Comfort option)

ESC	ESC
 (**Enter**)	Softkey ✓ (Executed if present in the view)

Table 24: Key functions (without DB Comfort option)

Additional Key Functions, DB Comfort Option

If feature KD01 (subject to a fee) has been enabled, the following additional entries can be made using an external keyboard:

Print	PRINT
ESC	ESC
Scroll key △▽◁▷	Scroll softkeys
Image ▽	▸ Scroll softkey
Image △	▸ Scroll backward is executed if the Scroll softkey is present in the view
F1	HELP
F2	MEM
F5	Softkey 1
F6	Softkey 2
F7	Softkey 3
F8	Softkey 4
F9	Softkey 5
F3	Search for DUT ID in the database (only in MEM database management, on the main level of Auto measurement screens, and on green measurement screens)
F4	Search for "Text" in the database (only in MEM database management, on the main level of Auto measurement screens, and on green measurement screens)

Additional key functions within MEM database management:

Scroll key	Navigation within the tree
Pos1	Jump to database root node
End	Jump to end of tree
TAB	Switch between location tree/customer tree
Enter	Create a new object

Delete	Delete an object
(**Enter**)	Edit object for editable objects; test list view for measurements
+ **Enter**	Move an object in the tree (press the **Shift** and **Enter** keys simultaneously)

If multiple objects are found during a search:

	Scroll through the found items (right or left scroll keys)

Table 25: Additional key functions within MEM database management

Additional key functions in the test list view (when the test report is displayed on the screen):

	Scroll (up and down scroll keys)
	Switch to the detail view or back to list of tests steps (right and left scroll keys)
TAB	Select the filter type for test steps (condensed/failed test steps only/all)
(**Enter**)	Exit the test list view

Table 26: Additional key functions in the test list view

Context-sensitive operation on the start screen for automatic sequences (switches A1–A9)

⇥ (TAB)	Move the focus between the sequence shortcut and the classification parameter buttons (focus marked by a (bold) border)
Shift + TAB	Move the focus between the sequence shortcut and the classification parameter buttons (focus marked by a (bold) border)
(**Enter**)	The button with focus is executed.

Table 27: Context-sensitive operation on the start screen for automatic sequences (switches A1–A9)

7.4 Help Functions (HELP key)

Depending on the rotary selector switch position and the selected measurement type, appropriate wiring diagrams are displayed.

▶ **Calling up the help function**

1. Press the **HELP** key.

↳ The help function is called up.

▶ **Closing the help function**

1. Press the **ESC** key.

↳ The help function is closed.

8 Test Instrument Settings

After the initial startup, you must first set the basic system parameters for language, keyboard layout, date and time as well as the display brightness.

Then you will need to decide which standard designations will be used for the integrated, preconfigured test sequences and, if necessary, change the assignment of test sequences to rotary switch positions.

NOTE

The standard designation cannot be changed retroactively. Stored measurements retain the standard designation and it is used in the test report.

Select the standard designation carefully during initial startup.

As soon as the standard designation has been changed, the new designation is used in all future tests.

8.1 “SETUP” Menu

Select the operating parameters in the **SETUP** menu.

▶ **Navigate in the SETUP menu**

1. Turn the rotary switch to the **SETUP** position.
   ↳ The **SETUP** menu with the operating parameters opens. A maximum of 4 operating parameters are shown on the display.
2. Press the softkey next to the **Right** icon to scroll to other pages in the menu.
3. Press the softkeys next to the icons to select an operating parameter or to trigger a function.

Icon	Designation	Function
	**Up**	Move cursor up Increase value
	**Down**	Move cursor down Decrease value
	**Right**	Move cursor right Scroll to the next page
	**Left**	Move cursor left
	**OK**	Accept entry Return to the next higher menu level

Table 28: Icons/softkeys for navigating in the **SETUP** menu

Operating parameters in the SETUP menu



Fig. 6: "Setup 1/3" page

Operating parameter	Function
All measurements	Parameter for single measurements and test sequences
Autom. measurements	Set test sequence parameters: incl. measurement sequences (standard)
Database	Clear database or display statistics **Save** only appears if a USB flash drive is plugged in
System	Set date/time, language, brightness, etc.

Table 29: Setup 1/3

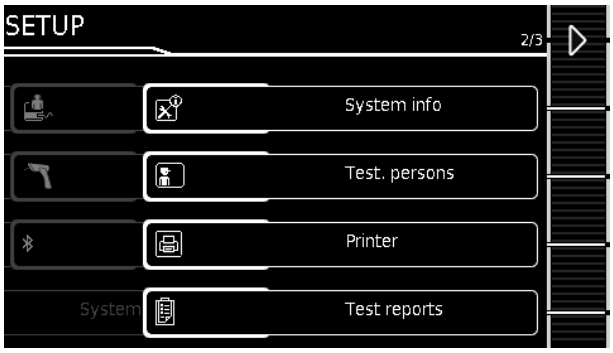


Fig. 7: "Setup 2/3" page

Operating parameter	Function
System information	Query software/hardware version, serial no., calibration dates, memory occupancy, user manual (QR code with link to current operating instructions on the web)
Inspector	Enter, edit, or protect inspector with password, assign roles
Printer	"Select and Set up a Printer" submenu
Test Reports	Layout of test reports, e.g., with logo, location, signature, details

Table 30: Setup 2/3

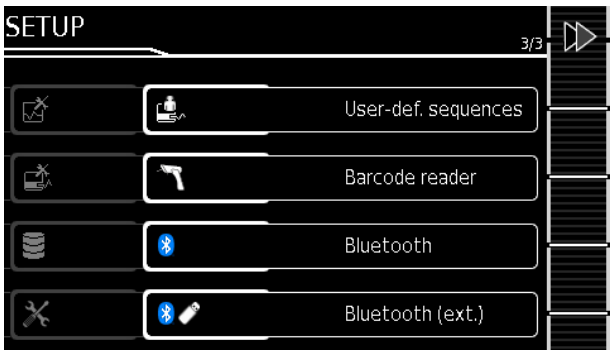


Fig. 8: "Setup 3/3" page

Operating parameter	Function
Own Sequences	Only with database expansion or feature KB01: manage and import own sequences
Barcode scanner	Select and configure barcode scanner by scanning the displayed barcode
Printer	"Select and Set up a Printer" submenu
Bluetooth	Menu for operating the Bluetooth® interface, with feature M01 only
Bluetooth (external)	Menus for operating the USB BLE communication adapter (Z705A) for transferring measurement data to an Apple iPad with at least iOS 17.5 on which the "Test Report Receiver" app is installed.

Table 31: Setup 3/3

8.1.1 "System" submenu

The **System** submenu allows you to set the language, keyboard layout, time, date, and brightness.

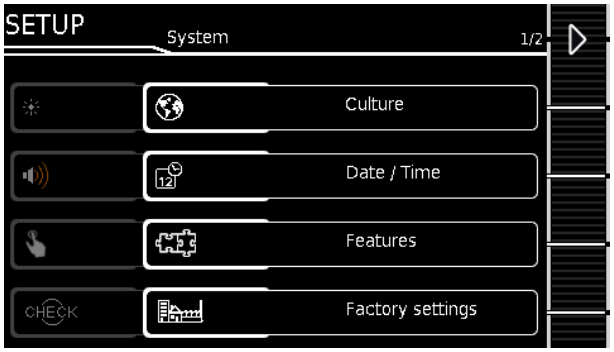


Fig. 9: "Setup 1/3 > System 1/2" page

Operating parameter	Function
Culture	Setting menu for language and keyboard layout
Date/Time	Setting menu for date and time
Extensions	Enable extensions (enabling functions/feature)
Default Settings	Reset to default settings Note: All settings in the setup are deleted! Resetting to default settings also deletes the list of inspectors, the database content and company logo.

Table 32: Setup 1/3 > System 1/2

Culture: Setting menu for language and keyboard layout

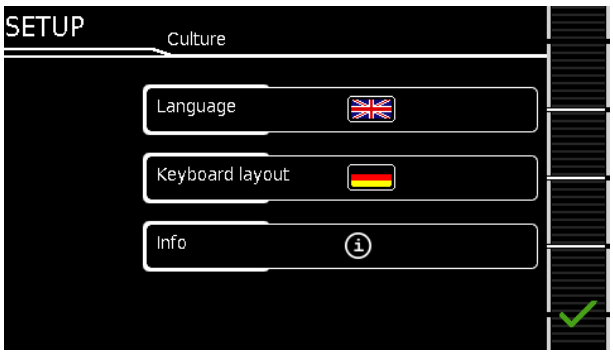


Fig. 10: "Setup 1/3 > System 1/2 > Culture" page

Operating parameter	Function
Language	Select user interface language including date format and decimal separator
Keyboard Layout	Country-specific keyboard layout for USB or touchscreen keyboard
Info	Info: date format and decimal separator

Table 33: Setup 1/3 > System 1/2 > Culture

NOTE

If you subsequently change the **keyboard layout** setting and you are already using a barcode scanner, you must set the barcode scanner to the new keyboard layout using **Setup 3/3 > Barcode Scanner > Type Z751A**. The barcode scanner must also be accordingly configured. Please refer to the device documentation for further information.

Date/Time: Setting menu for date and time



Fig. 11: "Setup 1/3 > System 1/2 > Date/Time" page

Icon	Function
Left	Move cursor left
Right	Move cursor right
Up	Increase value
Down	Decrease value
OK	Acknowledge change

Table 34: Setup 1/3 > System 1/2 > Date/Time

System 2/2: Menu Selection for Brightness, Volume, Touch, and Self-Test

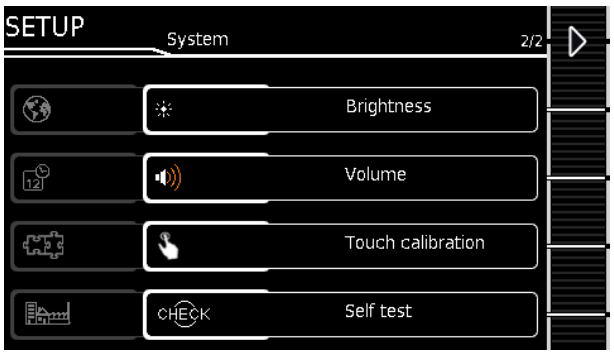


Fig. 12: "Setup 1/3 > System 2/2" page

Operating parameter	Function
Brightness	Menu for setting LCD brightness
Volume	Volume setting menu
Calibr. touch	Calibrate touchscreen keyboard With feature E01 only
Self-test	Self-test for display and buzzer

Table 35: Setup 1/3 > System 2/2

8.2 Configuration of Test Standards/Integrated Test Sequences After Update or Extension (Enabling Function)

The initial configuration of the test standards/integrated test sequences should be performed during the initial startup. After an update or an extension (enabling function), reconfiguration is necessary in the following cases:

- When updating the firmware from Version 3.2.0 or lower to firmware Version 3.3.0 or higher. The update changes rotary switch position assignments **A1** through **A9** and how the standards are shown at the test instrument, in the test data and in the test reports.
- With a subsequent extension and enabling for additional test sequences.

▶ **Reconfigure test standards and integrated test sequences after an update or extension (enabling function)**

1. Install the firmware update or extension.
2. Select the standard designations.
3. Disable standards that you do not need.
4. Reconfigure the rotary switch positions.

↳ The test instrument is now reconfigured and once again ready for use.

8.3 Configuring the Rotary Switch Positions

The integrated test sequences can be individually assigned to the rotary switch positions.

We recommend assigning frequently used test sequences to the rotary switch positions **A1** through **A8** and reserving rotary switch position **A9** for special procedures for which parameters often need to be adjusted.

▶ **Configuring rotary switch positions**

1. Select an orange rotary switch position **A1** through **A9**).
   ↳ The start page for the respective integrated test sequence set at the factory is displayed.
2. Press the **SEL** key to select the classification parameters.
   ↳ The **Classification Parameters 1/2** page is displayed.
   The standard which is currently assigned to the respective rotary switch position is displayed under **Standard/Test Procedure**.

3. Select **Standard/Test Procedure**.
   ↳ The **Standard/Test Procedure** page opens. All standards available on the test instrument are displayed here according to the selected setting.
4. Select the desired standard.
   ↳ The menu is returned to the **Classification Parameters 1/2** page.
5. Acknowledge the setting with **OK**.
   ↳ The settings are saved.
6. Repeat the above described procedure for each of the respective rotary switch positions.

8.4 "Bluetooth" Submenu (with feature M01 only)

The Bluetooth® interface facilitates various functions at the test instrument:

- Data transmission (test structure and measurement data) to IZYTRONIQ test software
- Transfer of results to the IZYTRONIQ test software (push-print function)

NOTE

Data Security

For security reasons, we recommend disabling the Bluetooth® interface unless it is needed. The "not visible" setting cannot be used as a substitute for shutting down the Bluetooth® interface, because invisible Bluetooth® devices can nevertheless be found using the appropriate means. Furthermore, device pairings which will no longer be required for a lengthy period of time should be deleted.

NOTE

Risk of mix-up when using multiple test instruments

The test instrument's device name is set to "SECUTEST" by default. If you access one PC with several test instruments, their names should differ or be added individually, e.g., SECUTEST1, SECUTEST2, etc.

Use the **Bluetooth** submenu to enter the settings for the Bluetooth® interface.

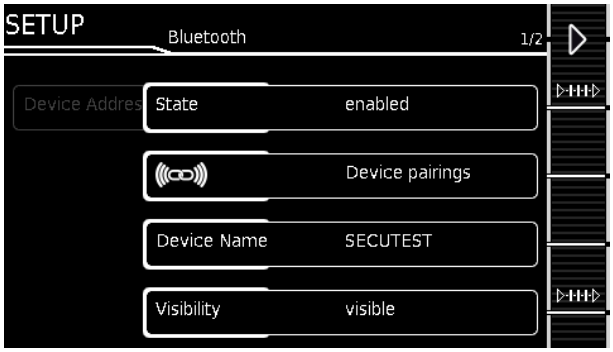


Fig. 13: "Setup 3/3 > Bluetooth 1/2" page

Operating parameter	Function
Status	Switch the Bluetooth® interface on or off
Device pairings	Search for/pair Bluetooth® devices, with status "ON": View/edit existing pairings
Device name	With status "ON": The name of the test instrument displayed above the interface can be changed here.

Operating parameter	Function
Visibility	With status “ON”: Specifies whether the test instrument can be found by other Bluetooth® devices.

Table 36: Setup 3/3 > Bluetooth 1/2

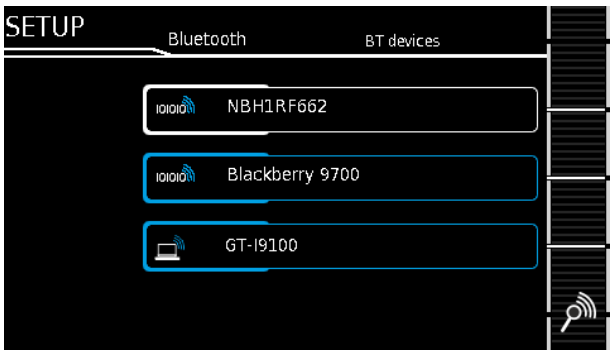


Fig. 14: “Setup 3/3 > Bluetooth 1/2 > Device Pairings” page

Operating parameter	Function
[Device name], white edge	Paired device found (white frame) > rename or delete
[Device name], blue edge and pairing PIN	Paired device found (blue frame) > rename or delete
[Device name], blue edge and device icon	Not yet paired device found (blue frame) > entry of the pairing PIN
Icon **Search**	Search for nearby Bluetooth® devices

Table 37: Setup 3/3 > Bluetooth 1/2 > Device Pairings

9 Add-ons (enabling functions / feature)

Add-ons can be purchased for test instruments. An add-on is a package of several helpful functions.[1]

For example, the SECUTEST DB COMFORT (Z853S) add-on includes, among other things, database extensions (medical database objects, moving objects, etc.), as well as functions such as AutoStore, Push/Print, and the “Continue/Cancel/Retry at limit violation” option.

The add-on must be purchased and then enabled on the test instrument. The test instrument show which enabling functions are available.

9.1 Viewing Available Add-Ons

The available add-ons depend on the test instrument’s firmware. Perform an update if necessary.

1. Set the rotary switch to the **SETUP** position.
2. Select **Setup 1/3 > System > Features> Feature status**.

↳ The available function extensions and their status (enabled/not installed) are displayed.

9.2 Purchasing Add-Ons

Please contact your dealer or the sales department at Gossen Metrawatt GmbH for information about available add-ons and how to purchase them.

When you purchase an expansion, you will receive a registration card. Then contact the sales department at Gossen Metrawatt GmbH. When your registration is complete, they will provide you with the activation key for the add-on.

9.3 Enabling an Add-On on the Test Instrument

NOTE

After you have installed additional test standards, you must reselect and reconfigure the standard designations and rotary switch assignments.⇨ **"Configuration of Test Standards/Integrated Test Sequences After Update or Extension (Enabling Function) "** 🗋 **61**

After receiving the activation key, you can enter it to the test instrument either via a USB flash drive or manually in order to enable the add-on.

▶ **Transfer an activation key via a USB flash drive**

You can transfer the activation key to the test instrument by copying it to a USB flash drive and connecting the device to the test instrument.

1. Copy the activation key to a USB flash drive.
2. Set the rotary switch to the **SETUP** position.
3. Select **Setup 1/3 > System > Features > Enable via USB**.
   ↳ A information window appears.
4. Connect the USB flash drive to the USB master port on the test instrument.
5. Press **OK**.
   ↳ The transfer of the activation key from the USB flash drive starts.

↳ The add-on is enabled.

[1] Some test instruments already include certain add-ons as order features included in the scope of delivery. Please check the order features of your test instrument.

▶ **Enter an activation key manually**

✓ The activation key is available.

1. Set the rotary switch to the **SETUP** position.
2. Select **Setup 1/3 > System > Features > Enter key manually**.
   ↳ The keyboard is displayed.
3. Use the keyboard to enter the activation key.

↳ The add-on is enabled.

10 Connecting and Configuring External Devices

The test instrument offers several functions for which a USB flash drive must be connected.

The test instrument also supports RFID readers/writers, as well as scanners and printers for one- and two-dimensional codes such as barcodes and QR codes.

Both are used to mark and identify tools and equipment.

This section describes how to connect and use these external devices.

10.1 USB Flash Drives

A USB flash drive must be connected directly to the test instrument for the following test instrument functions:

- Saving HTML reports to a USB flash drive
- Enabling add-ons

▶ **Prerequisites**

The connected USB flash drive must meet at least the following prerequisites in order to be used with your test instrument:

- File system: FAT32 (exFAT is not supported)
- Maximum current consumption: < 500 mA
- No encryption functions
- Recommended capacity: 32 GB or less

NOTE

For better compatibility with your USB flash drives, use firmware version 3.4.0 or higher on your test instrument.

NOTE

An LED display on the USB flash drive is helpful. It allows you to see if any write operation has already been completed.

▶ **List of Tested and Approved USB Flash Drives**

Designation	Manufacturer Part Number	Capacity	Interface
Philips Snow Edition 3.0 16GB	FM16FD75B/10	16 GB	USB 3.0
Toshiba TransMemory-MX U361 64GB	THN-U361K0640M4	64 GB	USB 3.0
Corsair Flash Voyager Vega USB 3.0 16 GB	CMFVV3-16GB	16 GB	USB 3.0
SanDisk Cruzer Force 32GB	SDCZ71-032G-B35	32 GB	USB 2.0
SanDisk Cruzer Glide 32GB	SDCZ60-032G-B35	32 GB	USB 2.0
SanDisk Cruzer Glide 64GB	SDCZ60-064G-B35	64 GB	USB 2.0
Transcend JetFlash 270M MLC 16GB	TS16GJF270M	16 GB	USB 3.0
Transcend JetFlash 710 Silver 32GB	TS32GJF710S	32 GB	USB 3.0

Table 38: List of tested and approved USB flash drives

Gossen Metrawatt GmbH does not guarantee operation with other devices.

▶ **Connect a USB flash drive**

1. Connect the USB flash drive to a USB master port on the test instrument.
   ↳ The **USB** icon appears in the header.

↳ The test instrument recognizes the USB flash drive.

10.2 USB Keyboard

To make it easier to enter text, numbers, and characters, you can connect an external keyboard to the test instrument via USB.

The keyboard must be equipped with a USB boot keyboard profile (human interface device class).

NOTE



To operate an external USB keyboard, the set keyboard layout must match the layout of the connected keyboard.

▶ **Connect a USB keyboard**

1. Connect the USB keyboard to a USB master port on the test instrument.
   ↳ The **USB keyboard** icon appears in the header.

↳ The test instrument recognizes the keyboard.

10.3 Bluetooth® Keyboard

As of firmware version 3.4.0 and later, SECULIFE supports Bluetooth® keyboards that are compatible with "Bluetooth® Classic (3.0)." Keyboards that only support the Bluetooth® LowEnergy HOG profile (HID over GATT, Bluetooth 4.x) are not compatible with SECULIFE's Bluetooth® wireless standard and cannot be paired with or used with ECULIFE.

The following keyboard models are recommended:

- Rapoo E6080
- Logitech K380
- Keychron K3

Gossen Metrawatt GmbH does not guarantee operation with other devices.

Pair only one keyboard at a time with SECULIFE.

▶ **Connect a Bluetooth® keyboard (with Logitech K380 as example)**

1. Turn the rotary switch on SECULIFE to the **SETUP** position.
2. Select **Bluetooth**.
3. Set **Status** to **On**.
4. Open **Device pairings**.
5. Check if any keyboards are already listed.
6. Delete any pairings you no longer need.
7. Switch on the Bluetooth® keyboard.
8. Press and hold the **1** (**F1**) key on the keyboard until the LED above the key flashes rapidly.
9. Press the softkey next to the **Search** icon on the device.
   ↳ The device searches for a new Bluetooth device.

10. When the progress bar in the header no longer shows any activity: Scroll through the list of devices found in the Bluetooth® environment until you reach the **Keyboard K380** entry, then press the corresponding softkey on SECULIFE.
11. On the keyboard, enter the characters '1234' one after another and press the **Return** key on the keyboard.
    ↳ The **New keyboard** icon appears in the header.

↳ The Bluetooth® keyboard is connected.

10.4 RFID

The RFID identification system is used to mark and identify tools and equipment. IDs stored in the RFID tag make it faster and more convenient to record DUTs, for example, during periodic testing.

You can connect an RFID reader/writer to the test instrument via USB.

The following devices have been tested for use with the test instrument:

- Z751E RFID reader/writer

Gossen Metrawatt GmbH does not guarantee operation with other devices.

▶ **Connect an RFID reader/writer**

1. Connect the RFID reader/writer to a USB master port on the test instrument.
   ↳ The **Printer** icon appears in the header.

↳ The test instrument recognizes the RFID reader/writer.

▶ **Scan an RFID code**

1. Hold the RFID reader/writer approximately 3 cm away from the center of the RFID tag.
   ↳ The SCAN LED on the test instrument flashes.
   ↳ The current content of the RFID tag (such as the ID code) is read.
   ↳ If the database view (MEM) is active on the test instrument, e.g., before or after a measurement: The cursor automatically jumps to the position of the DUT with the corresponding ID code.
   ↳ If the object was not found, e.g., because the DUT ID code has not yet been stored as a DUT in the database: A prompt appears asking if you want to create a new object.

NOTE

All other fields can be filled in using the QEDIT function (Quick Edit; only with SECUTEST DB COMFORT (Z853S or feature KD01)) after the DUT ID number has been created.

▶ **Write an RFID tag**

NOTE

False configuration of the RFID reader/writer

False configuration of the RFID reader/writer can result in RFID tags being written incorrectly.

— Configure the RFID reader/writer in accordance with its operating instructions.

1. Press the **MEM** function key.
   ↳ The database view opens.
2. Select the desired DUT using the scroll keys or enter a new DUT using its ID.
3. Briefly press the **PRINT** function key.
   ↳ A prompt appears asking you to move the scanner toward the RFID tag.

4. Hold the scanner approximately 3 cm away from the center of the RFID tag.
   ↳ The message “Successfully written” appears.

↳ The RFID tag for the new DUT has been written.

NOTE

If the DUT ID cannot be converted into an RFID tag, a warning message appears.

10.5 Barcodes / QR Codes

Codes can be used to encrypt DUT IDs. When the codes are scanned, the DUTs are recorded more quickly and conveniently during periodic testing, and the determined measured values are assigned to them. Frequently recurring designations, such as DUT types, can also be encrypted as codes so that they can be scanned in for use in comments as needed. The codes (labels) must be printed with a separate label printer.

You can connect a barcode scanner to the test instrument via USB.

The following devices have been tested for use with the test instrument:

- Z751A Barcode Scanner (scans one- and two-dimensional codes, e.g., barcodes and QR codes)

Gossen Metrawatt GmbH does not guarantee operation with other devices.

▶ **Connect a scanner**

1. Connect the scanner to a USB master port on the test instrument.
   ↳ The **Keyboard/Scanner** icon appears in the header.
   ↳ The test instrument recognizes the scanner.
2. To configure the scanner for initial commissioning, select the following parameter: **Setup 3/3 > Barcode reader > Type Z751A**.
3. Scan the barcode that appears.

▶ **Scan barcodes and QR codes**

✓ The menu for alphanumeric entry using the on-screen softkey keyboard is open.

1. Scan the desired value.
   ↳ The value is applied immediately.
   ↳ If the object was not found, e.g., because the DUT ID code has not yet been stored as a DUT in the database: A prompt appears asking if you want to create a new object.

NOTE

All other fields can be filled in using the QEDIT function (Quick Edit; only with SECUTEST DB COMFORT (Z853S or feature KD01)) after the DUT ID number has been created.

▶ **Print codes**

You can connect a label printer to the test instrument via USB and print codes.

The following devices have been tested for use with the test instrument:

- Barcode printer Z721E Code39, Code128, EAN13, Text, QR Code, Micro QR Code, DataMatrix, Aztec (tapes: 6 mm, 9 mm, 12 mm, 18 mm, 24 mm, 36 mm)
- Barcode printer Z721D (discontinued model)

Gossen Metrawatt GmbH does not guarantee operation with other devices.

▶ **Connect a label printer**

1. Connect the label printer to a USB master port on the test instrument.
   ↳ The **Printer** icon appears in the header.
2. To verify that the connected label printer is recognized by the test instrument, go to **Setup (2/3) > Printer > [Model name] > Printer info**.
   ↳ The test instrument recognizes the label printer.
3. To configure the encoding, go to **Setup (2/3) > Printer > [Model name] > Printer settings > ID labels**.
   ↳ The paper size is set automatically.
4. Press the **MEM** function key.
   ↳ The database view opens.
5. Use the scroll keys to select the desired DUT.
6. Press the **PRINT** function key.

↳ Depending on your selection, the ID is printed onto the label as a barcode. If the ID cannot be read out as a barcode or 2D code, a warning message appears.

NOTE

Code recognition

Please check if the printed codes are recognized by your scanner. Some codes (e.g., Aztec/DataMatrix) must first be activated on the scanner before use.

NOTE

Labels: Width and tapes

When using the label printer together with the test instrument, only TZ(e) tapes with widths of 6 mm, 9 mm, 12 mm, 18 mm, 24 mm and 36 mm are supported.

For printing 2D code labels (QR Code, MicroQR Code, DataMatrix, Aztec), tape cartridges with a width of at least 12 mm are recommended.

If a blank label is ejected when printing an ID as a 2D code with a 9 mm tape cartridge, replace the cartridge with a 12 mm cartridge (or wider) and restart the printing process.

NOTE

Text encoding

In “Text” print-out mode, output is limited to the CP1252 character set – characters that cannot be displayed are replaced by “_”.

10.6 Thermal Printer for Reports

You can connect a printer to the test instrument to print test reports.

The following devices have been tested for use with the test instrument:

- Thermal printer Z721S with report tapes (Z722S thermal paper as accessory)

Gossen Metrawatt GmbH does not guarantee operation with other devices.

▶ **Connect a printer**

1. Connect the printer to a USB master port on the test instrument.
   ↳ The **Printer** icon appears in the header.

↳ The test instrument recognizes the printer.

▶ **Customize a test report**

1. Go to **SETUP> Test reports 1/3 ... 3/3**.
2. Make the desired adjustments.
3. Optional: Upload a company logo from a USB flash drive.
   The following formats are supported: BMP, JPG, PNG or GIF, with a max. resolution of 800 x 800 pixels, Color depth: max. 24-bit.

▶ **Print a test report**

1. Press the **PRINT** function key.

↳ Printing begins.

10.6.1 “Printer" Submenu

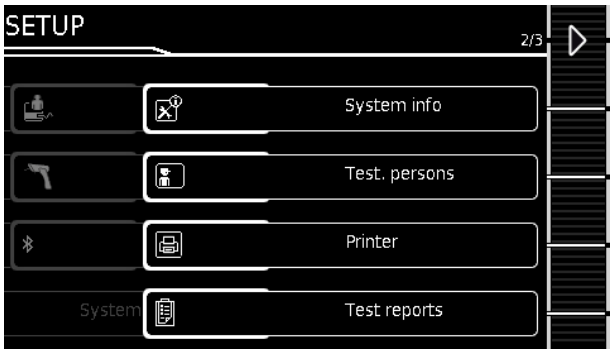


Fig. 15: "Setup 2/3” page

In the **Printer** submenu, you can select the connected printer and view information about it.

Selecting the Connected Printer

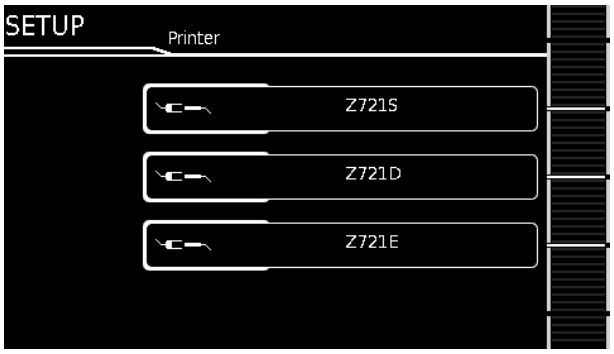


Fig. 16: "Setup 2/3 > Printer” page

Operating Parameter	Function
Z721S	Z721S printer: Printer info/printer settings
Z721D	Z721D printer (discontinued model): Printer info/printer settings
Z721E	Z721E printer (for test instrument firmware version 1.8.3 or higher): Barcode label printer printer info/printer settings

Table 39: Setup 2/3 > Printer

Retrieving Printer Information

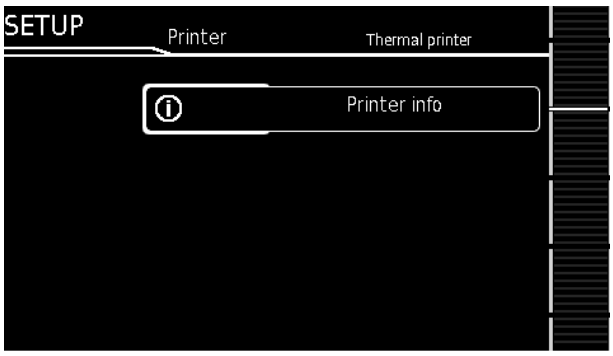


Fig. 17: "Setup 2/3 > Printer > [Model name]" page

Operating Parameter	Function
Printer info	Printer info: Name, status, type

Table 40: Setup 2/3 > Printer > [Model name]

10.6.2 "Test Reports" Submenu

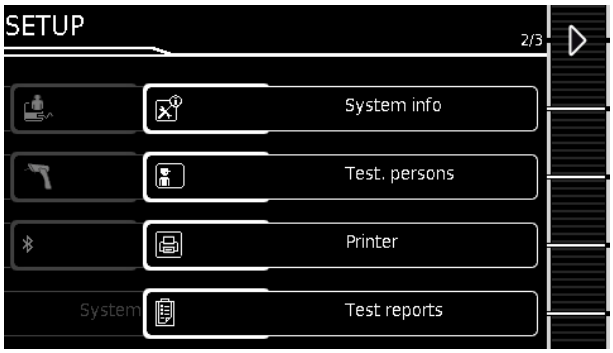


Fig. 18: Setup 2/3

In the **Test reports** submenu, you can customize the test report to meet your requirements.

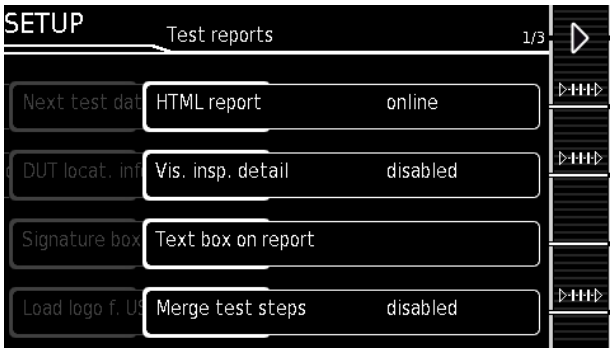


Fig. 19: "Setup > Test reports 1/3" page

Operating Parameter	Function
HTML report	Storage mode for digital HTML report on USB flash drive
Vis. insp. detail	Visual inspection details: show/hide
Text box on report	Display text box in report: Enter free text that appears in the report
Summarize test reports	Summarize test reports: on/off

Table 41: Setup > Test reports 1/3

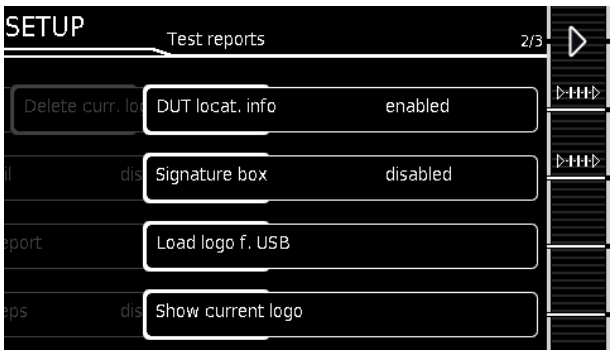


Fig. 20: "Setup > Test reports 2/3" page

Operating Parameter	Function
Next test date	Next scheduled date for the test: show/hide
DUT locat. info	Location information: show/hide
Customer info	Customer information: show/hide
Signature box	Signature box: show/hide

Table 42: Setup > Test reports 2/3



Fig. 21: "Setup > Test reports 3/3" page

Operating Parameter	Function
Load logo f. USB	Load a (company) logo from an inserted USB flash drive: Selection list is displayed
Show current logo	Load currently available logo
Delete current logo	Delete current logo

Table 43: Setup > Test reports 3/3

NOTE

Prerequisites for loading a logo

Format: BMP, JPG, PNG or GIF
Resolution: max. 800 x 800 pixels
Color depth: max. 24 bits

11 Inspector Management

The test instrument is equipped with an inspector management function. You can set up several inspectors and switch between them.

The “active” (currently used) inspector appears in completed tests as the “Inspector”: tests are saved under the inspector’s name and can thus be allocated unequivocally to the inspector.

Upon delivery (default settings) the inspector is set up in the test instrument as “not defined.”

NOTE

Test instrument settings are valid for all inspectors. Separate settings are not saved for the individual inspector.

11.1 “Testing Person” Submenu

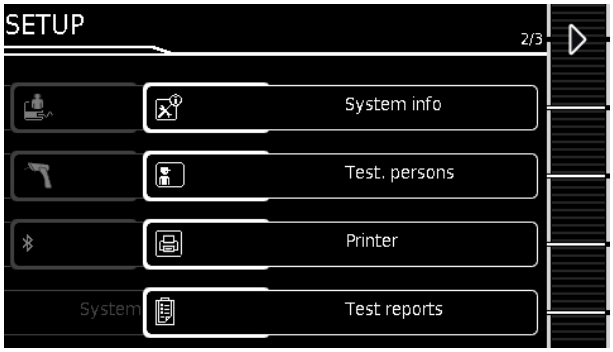


Fig. 22: "Setup 2/3” page

In the **Testing person** submenu you can create, edit, manage, or delete entries.

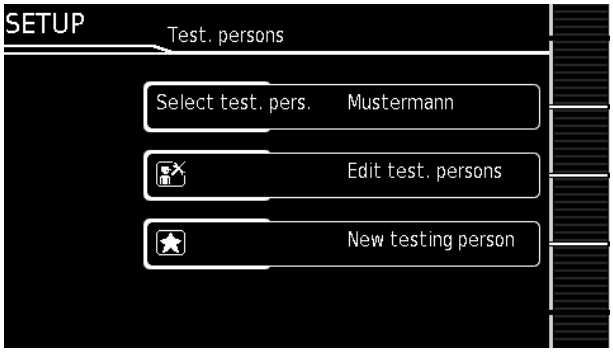


Fig. 23: "Setup 2/3 > Testing person” page

Operating Parameter	Function
Select test. Pers.	Display of active testing person (here, the factory setting for the testing person is “not defined”) and menu for selecting a testing person
Edit test. persons	Edit existing testing person
New testing person	Menu for creating a new testing person

Table 44: Setup 2/3 > Testing person

Edit test. persons

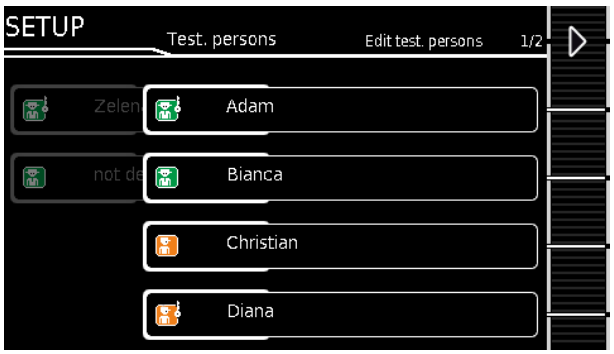


Fig. 24: "Setup 2/3 > Testing person > Edit test. persons" page

Operating Parameter	Function
[Name of testing person]	Select a testing person The selection makes the testing person an active testing person. The preceding symbols identify the role, permissions, and protection level of the created testing person.

Table 45: Setup 2/3 > Testing person > Edit test. persons



Fig. 25: "Setup 2/3 > Testing person > Edit test. persons" > [Name of testing person]" page

Operating Parameter	Function
Change password	Input menu for creating or changing the password of the testing person to be edited
Change name	Input menu for changing the name of the testing person to be edited
Change role "test planner"	Switch between "Test Planner" and "EIP" roles Available only with SECUTEST DB COMFORT (Z853S or feature KD01) and active only when the testing person is not selected
Delete testing person	Deletes the testing person to be edited (only after additional confirmation of deletion)

Table 46: Setup 2/3 > Testing person

11.2 Icons for Testing Person Management

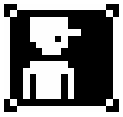
Icon	Description	Meaning
	not defined	Standard user
	Test planner	Test planner
	Password-protected test planner	Password-protected test planner
	EIP	EIP
	Password-protected EIP	Password-protected EIP

Table 47: Icons for testing person management

11.3 Creating a Testing Person

1. Go to **Setup 2/3 > Testing person > New testing person**.
2. Enter the data of the testing person. The data entry depends on the model and its features.
3. Press **OK**.

↳ The new testing person is created.



NOTE

Data Security

For security reasons, as soon as you have created individual testing persons and assigned passwords, you should delete the default user “not defined.”

11.4 Selecting (Activating) a Testing Person

1. Go to **Setup 2/3 > Testing person > Select testing person**.
   ↳ The list of the testing persons is displayed.
2. Press the **Up** or **Down** key to select the testing person. You may be required to enter a password.

↳ The testing person is selected and stored as the active testing person for tests.



NOTE

The active testing person remains selected when the test instrument is switched off, as well as in the event of a power failure.

No password prompt appears when the test instrument starts up.

NOTE



A testing person can only be deactivated by activating another testing person. There must always be an active testing person.

11.5 Editing a Testing Person

▶ **Give a testing person password protection**

You can assign a password to a testing person. This prevents users who do not know the password from signing on as the testing person and setting it as the active testing person.

1. Go to **Setup 2/3 > Testing person > Edit testing persons**.
   ↳ The list of testing persons is displayed.
2. Press the **Up** or **Down** key to select the testing person you want to edit from the list.
3. Press **OK**.
   ↳ The selection is confirmed.
4. Press **Set password** or **Change password**.
5. Enter the password. The data entry depends on the model and its features.
6. Press **OK**.

↳ The password has been added or changed.
The icon of the testing person is marked with an additional key symbol.

NOTE



If you do not know the password, you can confirm the password entry 3× by entering a false password. You will be asked if you want to delete the testing person.

Pressing **OK** permanently deletes the testing person.

Pressing **Cancel** cancels the deletion process.

▶ **Change a testing person name**

1. Go to **Setup 2/3 > Testing person > Edit testing persons**.
   ↳ The list of testing persons is displayed.
2. Press the **Up** or **Down** key to select the testing person you want to edit from the list.
3. Press **OK**.
   ↳ The selection is confirmed.
4. Press **Change name**.
5. Enter the changes. The data entry depends on the model and its features.
6. Press **OK**.

↳ The name of the testing person is changed.

11.6 Assigning User Permissions

On test instruments with SECUTEST DB COMFORT, you can assign testing persons various roles with various user permissions.

The following roles can be assigned to testing persons:

- Test planner = standard testing person
- EIP (electric instructed person) = testing person with limited functions

The following permissions are associated with these roles:

Permission	Role	
	Test planner	EIP
Change the “Test Planner/EIP” role (for all other testing persons)	×	–
Delete testing person (all other testing persons)	×	–
Select a testing person	×	×
Change testing person name (own name only)	×	×
Change password (own password only)	×	×
SETUP setting **Change all measurements**	×	–
SETUP setting **Change automatic measurem.**	×	–
Change classification parameters (rotary switch: sequences A1 to A9)	×	–
Change sequence parameters (rotary switch: sequences A1 to A9)	×	–

NOTE

Password protection for test planners

If you use multiple testing persons with different roles, we strongly recommend protecting the "Test Planner" role with a password. This ensures that unauthorized testing persons cannot make changes using advanced user permissions under someone else's name.

▶ **Add or change user permissions**

1. Go to **Setup 2/3 > Testing person > Edit testing persons**.
   ↳ The list of testing persons is displayed.
2. Press the **Up** or **Down** key to select the testing person you want to edit from the list.
3. Press **OK**.
   ↳ The selection is confirmed.
4. Press **Change role “test planner”** or **Change role "EIP”**.
   ↳ The role of the selected testing person changes from "Test Planner" to "EIP" or from "EIP" to "Test Planner."
5. Press **OK**.

↳ The selected role is confirmed.

NOTE

Protection against “lockout”

The active test planner can only change the roles of other testing persons – not their own role. This prevents a testing person with the last remaining role of a test planner from changing this role to the role of an EIP, which would deactivate the last extended user rights.

11.7 Deleting a Testing Person

1. Go to **Setup 2/3 > Testing person > Edit testing persons**.
   ↳ The list of testing persons is displayed.
2. Press the **Up** or **Down** key to select the testing person you want to delete from the list.
3. Press **OK**.
   ↳ The selection is confirmed.
4. Press **Delete testing person**.
   ↳ A confirmation prompt appears.
5. Press **OK**.

↳ The selected testing person is deleted.

NOTE



The currently active testing person cannot be deleted.

12 Internal Database

The internal database of the test instrument can include a complete test structure with data regarding customers, properties, buildings, floors, rooms, and test objects.

NOTE



Sensitive Data – Mandatory Data Protection!

Customer data are confidential and must be protected.

Observe and comply with the applicable national data protection regulations.

12.1 Test Structure Layout

A test structure is used to store the results of single measurements or test sequences executed on DUTs from different customers. Manual single measurements can be grouped together into a so-called “manual sequence”.

Structures can be created both on the test instrument and on a PC (IZYTRONIQ software) and then transferred accordingly. These instructions describe the creation process on the test instrument. The creation process on a PC using the IZYTRONIQ software is described in the program’s online help.

It is also possible to save structures to a USB flash drive and restore them from that device.

NOTE



The scope of functions provided by the database structure and the transfer options depend on the model and features.

Database elements are grayed out on test instruments on which the “extended database structure” (= estate, building, floor, room) from SECUTEST DB+ (Z853R or feature KB01) or SECUTEST DB COMFORT (Z853S or feature KD01) (medical electrical devices) is not enabled.

Objects

The test structure is a tree structure with elements known as objects.

The objects are marked with the parameters shown below. Certain fields are required. In the table below, the required fields are shown in bold. On the test instrument, the required fields are marked in red.

Parameter	Contents
Device	■ **ID** ■ Description ■ Location ■ Test interval [1] ■ Type ■ Manufacturer ■ Comment ■ Serial number ■ Protection class ■ Cost center [1] ■ Department [1]

Parameter	Contents
ME device [2] Medical electrical device	■ **ID** ■ Description ■ **Customer** ■ Test interval [1] ■ Type ■ Manufacturer ■ Comment ■ Serial number ■ Protection class ■ No. of AP Type B [2] ■ No. of AP Type BF [2] ■ No. of AP Type CF [2] ■ Cost center ■ Department ■ UDI [2] ■ Network connection [2]
Room [1]	■ ID ■ **Description**
Floor [1]	■ ID ■ **Description**
Building [1]	■ ID ■ **Description** ■ Street ■ ZIP code ■ City
Estate [1]	■ ID ■ **Description**
Customer	■ **ID** ■ **Description** ■ Street ■ ZIP code ■ City

[1] Only with SECUTEST DB+ database extension – Z853R or feature KB01)

[2] Only with SECUTEST DB COMFORT database extension (Z853S or feature KD01)

Table 48: Information on objects in the test structure

Up to 50,000 data records can be stored in the test instrument. The following applies: 1 data record = 1 DUT or location node or customer or single measured value.

NOTE

Results of measurements/tests can be stored under object types “Device” or “ME device”, which are also referred to as “DUT” in the following. In addition, measurements can be saved as a “manual sequence”.

NOTE

Data migration

If so-called “legacy data” has been transferred into the test instrument that does not comply with the hierarchy (e.g., due to a firmware update or using the “Restore database” function), customer objects are created automatically. The same applies to database objects “Room” and “Floor”, which must always be subordinate to a “Building”. In such cases, building objects are generated automatically if necessary.

Hierarchies

The following hierarchies must be complied with:

- A Room or Floor must always be subordinate to a Building.
- Devices or ME devices must always be subordinate to a Customer.

Database

Customer

Device

Manual sequence

- Measurement 1
- Measurement 2
- Measurement 3

Table 49: Test structure – hierarchy of object levels in SECUTEST ST BASE(10)

Database

Estate

Building

Floor

Room

Device

ME device [1]

Manual sequence

- Measurement 1
- Measurement 2
- Measurement 3

[1] Only with SECUTEST DB COMFORT database extension (Z853S or feature KD01)

Table 50: Database structure as location view for test instruments with SECUTEST DB+ (Z853R or feature KB01)

Database

Customer

Device

ME device [1]

Manual sequence

- Measurement 1
- Measurement 2
- Measurement 3

[1] Only with SECUTEST DB COMFORT database extension (Z853S or feature KD01)

Table 51: Database structure as customer view for test instruments with SECUTEST DB+ (Z853R or feature KB01)

12.2 "Database" Submenu



Fig. 26: "Setup 1/3" page

Menu Selection for Database Functions

In the **Database** submenu, you can store and manage complete test structures containing data on customers, estates, buildings, levels, rooms, and DUTs.



Fig. 27: "Setup 1/3 > Database 1/2" page

Operating Parameter	Function
Delete	Delete database content (but not its structure) Attention: Data is irretrievably deleted!
Statistics	Display database statistics
Backup	Only with inserted USB flash drive: Backup the database to a USB flash drive (formatted as FAT32)

Operating Parameter	Function
Restore	Only with inserted USB flash drive: Restore the database from a USB flash drive

Table 52: Setup 1/3 > Database 1/2



Fig. 28: "Setup 1/3 > Database 2/2" page

Operating Parameter	Function
Export.secu/[Filename]	Export the ".secu" database file Prerequisites: ■ SECUTEST DB+ (Z853R or feature KB01) ■ Database extension ■ Inserted USB flash drive ■ IZYTRONIQ-compatible ".secu" file
Import.secu/[Filename]	Import a database from a ".secu" file that was created specifically for the test instrument with IZYTRONIQ. Prerequisites: ■ SECUTEST DB+ (Z853R or feature KB01) ■ Database extension ■ Inserted USB flash drive ■ IZYTRONIQ-compatible ".secu" file
DUT creation	Limits which DUT types can be created on the device: ■ Only device ■ Device and ME device ■ Only ME device Configure this option to prevent accidentally creating ME devices (medical electrical devices) when you are working exclusively with non-medical devices. Regardless of this setting, all DUT types can always be imported into the device. Changing this setting does not alter the contents of the device's database: e.g., if you deactivate ME devices, they remain stored in the device database.

Table 53: Setup 1/3 > Database 2/2

Database Management Menu

The **MEM** function key allows you to open the database management. In database management, you can manage customers, devices, measurements, and objects.

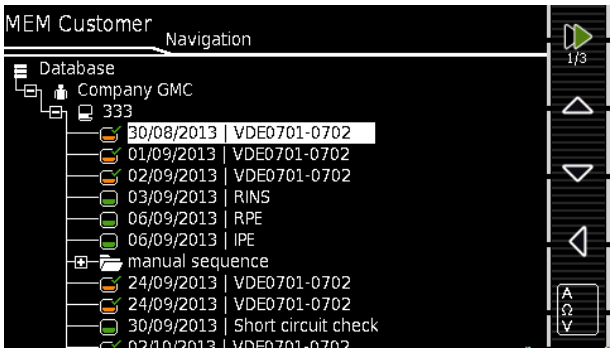


Fig. 29: "MEM 1/3, Navigation" page

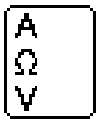
Icon	Description	Function
	Up	Selection of measurements
	Down	Selection of measurements
	Left	Go back (one level up in the hierarchy) or close open tree branches
	Measured values	Show measured values for a selected test ■ Orange icon: Test sequences according to standard ■ Green icon: Single measurement

Table 54: MEM 1/3, Navigation



Fig. 30: "MEM 2/3, Edit objects" page

Icon	Description	Function
	NEW	Create new (ME) device for the selected customer or clone current element
	DEL	Either “Delete selected customer, (ME) device or measurement” or “Delete selected object with all subordinate objects/measurements”

Icon	Description	Function
	EDIT	Edit device/customer
	MOVE	Move object

Table 55: MEM 2/3, Edit Objects

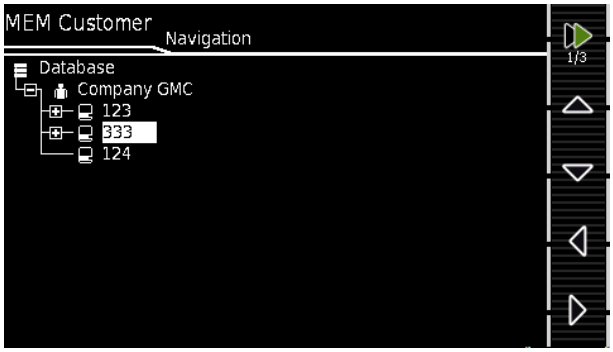


Fig. 31: "MEM 3/3, Search / Details view" page

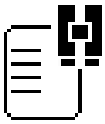
Icon	Description	Function
	Search ALL	Search by entering text
	Search ID	Search by entering IDs
	Hide Details	Hide the designation and ID of the selected device
	Show Details	Show the designation and ID of the selected device

Table 56: MEM 3/3, Search / Details View

12.3 Opening the Database

1. Press **MEM**.
   ↳ The database view opens.
2. To exit the database view, press **ESC**.

12.4 Creating a Test Structure (only with feature KB01 or option Z853R)

Press the MEM key. The database is displayed. The view in which the database opens depends on the last view selected (⇨ **"Switching Between 2 Tree Structure Views "** 🗋 **87**).

Three menu pages (1/3, 2/3 and 3/3) show you all the setting options for creating a tree structure.

As soon as you select an object, depending on the model and its features, you can enter data using the displayed keyboard (function keys and the softkeys or touchscreen keyboard), a connected USB keyboard or a barcode scanner.

▶ **Create a position where a new object will be added**

✓ The database view is open.

1. Press the softkeys next to the **Up** or **Down** icons to select the desired object.
2. Press the softkey next to the **Right** icon to switch to a sublevel or open a branch as needed.
   ↳ The position for the new object is selected.
3. To close the open branch or go to the next higher level, press the softkey next to the **Left** icon.

▶ **Create a new object**

✓ The position for the new object is selected.

1. Press the softkey next to the **Next page** icon to open the **MEM 2/3** menu page.
2. Press the softkey next to the **Add object** icon.
   ↳ The input screen for a new object opens.
   Depending on the position within the hierarchy, only the applicable object types will be suggested.
3. Fill in the input fields.
   Depending on the object type, use the keyboard to enter at least one ID number. If not all required fields marked in red are filled in, an error message will appear.
4. Press **OK**.

↳ The entry is applied.
The display returns to the parent level.

12.5 Switching Between 2 Tree Structure Views

This function is available only on SECUTEST ST PRO, SECUTEST ST PRIME, and SECULIFE ST BASE (25) or on test instruments with SECUTEST DB+ (Z853R or feature KB01).

✓ The database view is open.

1. Press **MEM**.
   ↳ The database view switches from the location view to the customer view.
2. Press **MEM** again.
   ↳ The database view switches back from the customer view to the location view.

12.6 Showing or Hiding Measured Values from Saved Tests

If measured values are available, you can choose to display or hide them.

✓ The database view is open.

1. Press the softkey next to the **Next page** icon to open the **MEM 1/3 Navigation** page.
2. Press the softkeys next to the **Up** or **Down** icons to select the ID number of the desired object.
3. Mark the desired test with the cursor, depending on whether single measurements or test sequences are involved:
   Single measurements: Date / Measuring function (7/17/2014 / RINS)
   Test sequence: Date / test standard (7/17/2014 / VDE ...)

4. Press the softkey next to the **Measured values** icon.
   ↳ The single measurements for the selected test sequence are listed.
5. Press the softkeys next to the **Up** or **Down** icons to select the desired single measurement.
6. Press the softkeys next to the **Show details** or **Hide details** icons to show or hide the corresponding measurement parameters.
7. To exit the measured values view, press **OK**.

12.7 Editing the Database

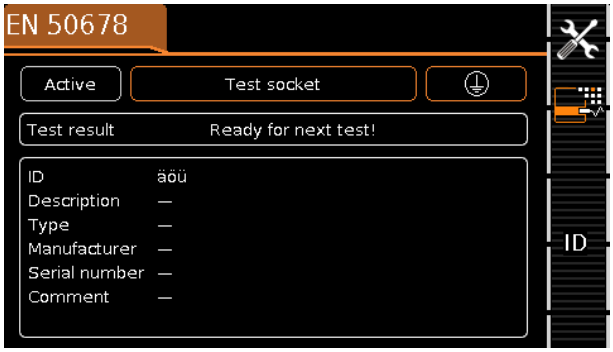
✓ The database view is open.

1. Press the softkey next to the **Next page** icon to open the **MEM 1/3 Navigation** page.
2. Press the softkeys next to the **Up** or **Down** icons to select the object you want to edit.
3. Press the softkey next to the **Next page** icon to open the **MEM 1/3 Edit objects** page.
4. Press the softkey next to the **EDIT** icon.
5. Select the parameter whose description you want to change.
   ↳ The keyboard input field opens automatically.
6. Make the desired changes.
7. Press **OK**.

↳ The change is saved.

▶ **Quick command: Edit object**

This function is available only with a touchscreen (feature E01) and SECUTEST DB COMFORT (Z853S or feature KD01).



1. Press and hold a point in the detail view field in the start screen of a test sequence until the progress bar starts to flash.
2. Release your finger.
   ↳ The “Edit” menu for the device/ME device opens automatically.
3. Make the desired changes.
4. Press **OK**.

↳ The change is saved.
The display returns to the start screen.

▶ Move object

This function is only available with SECUTEST DB COMFORT (Z853S or feature KD01).

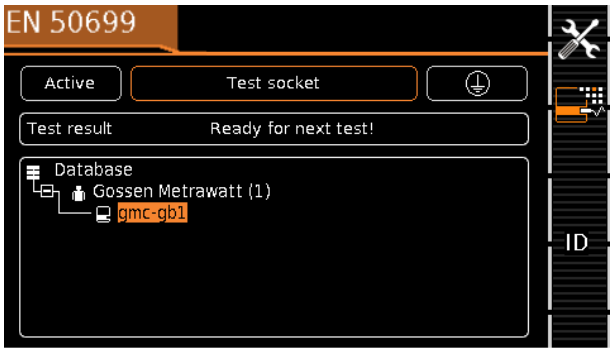
✓ The database view is open.

1. Press the softkey next to the **Next page** icon to open the **MEM 1/3 Navigation** page.
2. Press the softkeys next to the **Up** or **Down** icons to select the object (along with its subobjects) you want to move.
3. Press the softkey next to the **Next page** icon to open the **MEM 1/3 Edit objects** page.
4. Press the softkey next to the **MOVE** icon.
5. Press the softkeys next to the **Up** or **Down** to select the position to which you want to move the object.
6. Press **OK**.

↳ The object has been moved.

▶ Quick command: Move object

This function is available only with a touchscreen (feature E01) and SECUTEST DB COMFORT (Z853S or feature KD01).



1. Press and hold the object to be moved in the tree view in the start screen of a test sequence until the progress bar starts to flash.

NOTE

Depending on whether you use the “long press” in the customer tree or the location tree, you can “move” the device/ME device to a different customer or “move” it between locations.

2. Release your finger.

   ↳ The “Move” menu in the database view opens automatically.
3. Press the softkeys next to the **Up** or **Down** to select the position to which you want to move the object.
4. Press **OK**.

↳ The change is saved.

↳ The display returns the start screen.

12.8 Searching for Objects

▶ **Search by text**

✓ The database view is open.

1. Press the softkey next to the **Search ALL** icon.
   ↳ The input field for the text search is displayed.
2. Enter the text you want to search for in the database.

NOTE

When searching for text, elements are found regardless of whether they are written in uppercase or lowercase.

3. Press **OK**.
   ↳ The search is executed.
   ↳ The ID number of each object found is displayed inversely.

▶ **Search by ID**

✓ The database view is open.

1. Press the softkey next to the **Search ID** icon.
   ↳ The input field for searching by ID is displayed.
2. Enter the ID of the object you want to search for in the database.

NOTE

ID searches are case-sensitive.

3. Press **OK**.
   ↳ The search is executed.

▶ **Evaluate the search results**

✓ The search has been completed.

✓ The ID number of each object found is displayed inversely.

1. If multiple objects are found that match the search string, you can use the **Up** or **Down** keys to switch between the different search results.
2. Press the softkey next to the **Show structure label** icon to show the corresponding designation and ID number.
3. Press the softkey next to the **Hide structure label** icon to hide the corresponding designation and ID number.

12.9 Deleting the Database

▶ **Delete a database via SETUP**

1. Turn the rotary switch to the **SETUP** position.
2. Open the **SETUP 1/3 > Database 1/2** menu page.
3. Select **Delete**.
   ↳ A confirmation prompt appears.
4. Confirm with **OK**.

↳ The database is deleted.

▶ **Delete a database via MEM**

1. Press **MEM**.
2. Press the softkey next to the **Up** icon to navigate to the **Database** entry.
   ↳ The **Database** entry is marked.
3. Press the softkey next to the **DEL** icon.
   ↳ A confirmation prompt appears.
4. Confirm with **OK**.

↳ The database is deleted.

12.10 Quick Edit Function (QEDIT)

This function is only available with SECUTEST DB COMFORT (Z853S or feature KD01).

Quick Edit is an add-for the entry of new DUTs. Without it, only the ID of the DUT can be defined. Quick Edit can be used to fill in all other fields after entering the ID numbers.

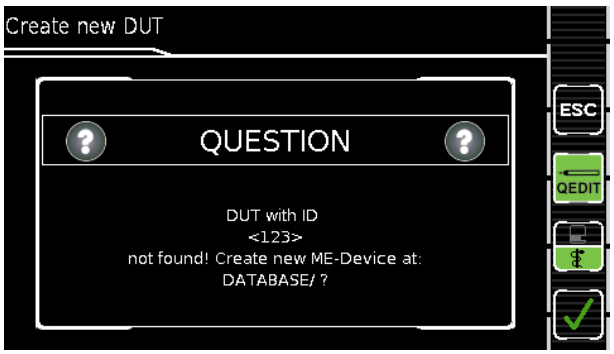
Quick Edit is available whenever you search for a DUT ID that does not already exist in the database.

You can search for a DUT ID in the following ways:

- Using the ID softkey in the test sequence or in the Save menu of the single measurement
- ID search using the ID softkey in the database, MEM 3/3 page
- Scanning a DUT ID using the barcode or RFID reader

▶ **Create a new DUT**

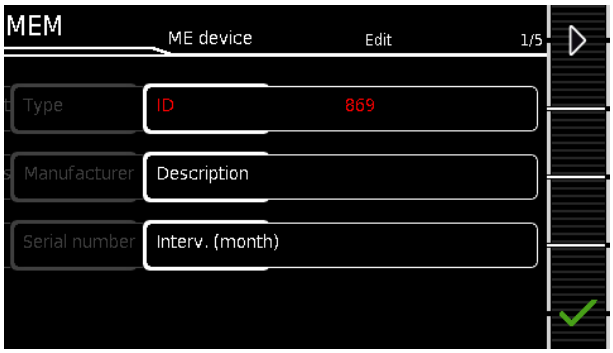
✓ The DUT ID you searched for was not found.



✓ A confirmation dialog appears.

1. Press the softkey next to the **Standard device / ME device** icon to select whether to create a DUT in the "Standard Device" or "ME Device" category.
2. Press the softkey next to the **QEDIT** icon to activate/deactivate the function.

3. Confirm the prompt in the confirmation dialog with **OK**.
   ↳ The input window for memory management, used to create the DUT and enter additional attributes, is displayed.



4. Edit the desired attributes.
5. Press **OK** again.
   ↳ The user interface returns to the screen from which you opened the creation of the DUT.

13 Connecting the DUT

NOTE

Always connect the DUT in accordance with the schematic diagrams included in the online help function.

Connection of the DUT to the test instrument depends on the following factors:

- Type of DUT
  - Direct connection to the test socket (TS) for DUTs with single-phase connection, also for extension cords via the EL1 adapter, in which case the EL1 is connected to probe sockets P1
  - Permanent connection to the mains power by contacting the housing with the probe (for the measurement of protective conductor resistance or with the direct measuring method for the touch current measurement). Measurement of protective conductor current via a current clamp (possible with feature I01 only)
  - Connection via adapter:
  - With single-phase extension cords via the EL1 adapter in which case the EL1 is connected to probe sockets P1
  - With single- and three-phase extension cords via the VL2E adapter to the test socket – with DUTs with 5-pole, 16 A CEE plug via the AT16-DI differential current adapter to the test socket
  - With DUTs with 5-pole, 32 A CEE plug via the AT32-DI differential current adapter to the test socket
- Protection category (PC I, PC II, or PC III) or any combinations of protection categories

NOTE

The DUT must be switched on for all tests. Switches, relays, temperature regulators, etc. must all be taken into consideration.

As a default setting, the program sequence assumes that the plug from the DUT has been connected to the test socket.

13.1 List of Possible DUT Connections Depending on Measurement Type

R_{PE}

Measurement type	Suitable for test connection via
PE(TS) - P1 passive	Test socket, EL1 test socket, VL2E, AT3-IIIE, AT3-IIS, AT3-IIS32, AT16DI/AT32DI
PE(TS) - P1 active	Test socket (for PRCDs)
PE(mains) - P1	Permanent connection
PE(mains) - P1 clamp	Permanent connection
P1 - P2	Permanent connection

Table 57: R_{PE}

R_{INS}

Measurement type	Suitable for test connection via
LN(TS) - PE(TS)	Test socket, EL1, VL2E, AT3-IIIE, AT3-IIS, AT3-IIS32, AT16DI/AT32DI, CEE adapter
LN(TS) - P1	Test socket, VL2E, AT3-IIIE, AT3-IIS, AT3-IIS32, AT16DI/AT32DI
P1 - P2	No connection (PC3)
PE(mains) - P1	Permanent connection
PE(TS) - P1	Test socket
LN(TS) - P1||PE(TS)	Test socket, VL2E, AT3-IIIE, AT3-IIS, AT3-IIS32, AT16DI/AT32DI

Table 58: R_{INS}

U_{HV}

Measurement type	Suitable for test connection via
PHV - P1 [1]	Without connection (contacting of the DUT via HV pistol to PHV connection and test probe to P1 connection)
LN(TS) – PE(TS)||P1	DUT mains plug to test socket
LN(TS) - P1	DUT mains plug to test socket

[1] Only with feature F02

Table 59: U_{HV}

I_{PE}

Measurement type	Suitable for test connection via
Direct	Test socket, AT16DI/AT32DI (direct or diff.)
Differential	Test socket
Alternative	Test socket, VL2E, AT3-IIIE, AT3-IIS, AT3-IIS32, AT16DI/AT32DI
AT3 adapter	AT3-IIIE, AT3-IIS, AT3-IIS32
AT16/32DI Diff.	Test socket, AT16DI/AT32DI
Clamp	Permanent connection

Table 60: I_{PE}

I_T

Measurement type	Suitable for test connection via
Direct P1	Test socket, AT3-IIIE, AT3-IIS, AT3-IIS32, AT16DI/AT32DI
Differential P1	Test socket
Alternative P1	Test socket, AT3-IIIE, AT3-IIS, AT3-IIS32, AT16DI/AT32DI, VL2E
Permanent connection P1	Permanent connection
Alternative (P1–P2)	No connection (PC3)

Table 61: I_T

I_E

Measurement type	Suitable for test connection via
Direct	Test socket, AT16DI/AT32DI (only diff. is possible)
Differential	Test socket
Alternative	Test socket, AT16DI/AT32DI
Permanent connection	Permanent connection
AT3 adapter	AT3-IIIE, AT3-IIS, AT3-IIS32
AT16/32DI Dir.	Test socket, AT16DI/AT32DI
Clamp	Permanent connection

Table 62: I_E

I_A

Measurement type	Suitable for test connection via
Direct P1	Test socket
Alternative P1	Test socket
Permanent con. P1	Permanent connection

Table 63: I_A

I_P

Measurement type	Suitable for test connection via
Direct P1	Test socket
Permanent con. P1	Permanent connection

Table 64: I_P

I_{PA}

Measurement type	Suitable for test connection via
Direct AP	Test socket and terminals for applied parts
Permanent connection AP	Permanent connection and terminals for applied parts

Table 65: I_{PA}

U

Measurement type	Suitable for test connection via
PE - P1	Permanent connection
PE - P1 (with mains)	Test socket
V - COM	Permanent connection
V - COM (with mains)	Test socket

Table 66: U

t_{PRDC}

Measurement type	Suitable for test connection via
Mains to test socket	Test socket

Table 67: t_{PRDC}

P

Measurement type	Suitable for test connection via
Function test	Test socket, AT3-IIIE, AT3-IIS, AT3-IIS32, AT16DI/AT32DI, CEE adapter

Table 68: P

Continuity test EL1

Measurement type	Suitable for test connection via
EL1 adapter	EL1 and test socket
AT3-IIIE adapter	AT3-IIIE
VL2E adapter	VL2E

Table 69: Continuity test EL1

Temperature

Measurement type	Suitable for test connection via
V-COM PT100(0)	Permanent connection

Table 70: Temperature

Current (via clamp)

Measurement type	Suitable for test connection via
V-COM	Permanent connection
V-COM (with mains)	Test socket

Table 71: Current (via clamp)

Relay continuity check (test function only)

Measurement type	Suitable for test connection via
Relay L(TS)	Test function only - always disconnect DUT from the test instrument before starting
Relay N(TS)	Test function only - always disconnect DUT from the test instrument before starting
Relay PHV	Test function only - always disconnect DUT from the test instrument before starting

Table 72: Relay continuity check (test function only)

13.2 Residual Current Monitoring

WARNING



Dangerous electrical voltage!

The residual current monitoring is not shut down as quickly as by an RCD; as such, there is a risk of injury due to electric current flowing through the body.

With leakage current measurements with a clamp or adapter, there is no automatic safety shutdown.

— The test instrument may only be connected to TN, TT, or IT electrical systems with a maximum of 264 V (nominal voltage) which comply with applicable safety regulations (e.g., IEC 60346, VDE 0100) and are protected with a fuse or circuit breaker with a maximum rating of 16 A.

— Observe the safety instructions.

For your safety, the test instrument is equipped with continuous residual current monitoring. If residual current exceeds a specified limit value, all measuring processes are stopped, and if line voltage is fed through the test socket it is disconnected.

This limit value can be set to one of two levels with the rotary switch in the **SETUP** position:

- **Setup 1/3 > All Measurements 2/2 > Residual Current Protection > 10 mA**
- **Setup 1/3 > All Measurements 2/2 > Residual Current Protection > 30 mA**

13.3 Reference Voltage L-PE and Test Sequence Alternative

The reference voltage L-PE and the test frequency Alternative has an impact on the following measurements and rotary switch positions:

- Single measurements (rotary switch level: green)
- Measurements included in integrated test sequences preconfigured in the factory
- Measurements included in user-defined test sequences (only with SECUTEST DB+ database expansion – Z853R or feature KB01).

The values entered for *Reference voltage* and *Frequency(set)* when creating user-defined test sequences are not evaluated in the case of leakage current measurements, but replaced with the values specified as follows in the instrument:

▶ **Specifying Reference Voltage L-PE**

Reference (line) voltage is the voltage to which the measured values for leakage current have been standardized.

It is used in the case of leakage current for mathematical adaptation of measured current values to the specified voltage.

- Measurements with line voltage at the test socket: The setting value has no influence on the voltage with which the DUT is supplied via the test instrument's test socket.
- Leakage current measurements with "Alternative" method: The setpoint value of the synthetic test voltage is derived from the value specified here.

NOTE



The displayed measured values for leakage current are standardized to an adjustable reference value (typically 230 V) in order to permit reproducible measurement of leakage current even with fluctuating mains supply voltage.

Reference voltage can be adjusted in Setup: **Setup 1/3 > All Measurements 1/2 > Ref.Voltage L-PE**

▶ **Specifying an Alternative Test Frequency**

Selectable frequency setpoint value for synthetic test voltage for all leakage current measurements of measurement type “Alternative”.

You can adjust the **Test Freq. Alt.** parameter in the setup:

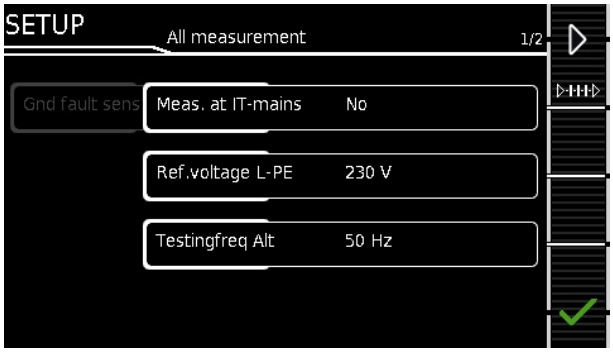


Fig. 32: “Setup 1/3 > All Measurements” page

1. Call up the **Setup 1/3 > All Measurements 1/2 > Test Freq. Alt.**
2. Set the **Test Freq. Alt.** parameter.

13.4 Manually Specifying the Connection Type for Single Measurements

In the case of single measurements, the test instrument is unable to automatically detect the respective connection type (e.g., test socket or permanent connection (voltage measuring inputs)). You must specify the connection type manually.

1. Press **Set Parameters**.
2. Select the **Measurement Type** parameter.
   ↳ A list of possible connection types is displayed.
3. Select a connection type.

↳ Once a connection type has been selected, it remains active for all following tests until it is changed again.

13.5 Manually Specifying the Connection Type / Protection Category for Test Sequences

If the test instrument is unable to automatically detect the respective connection type or protection class, the suggested connection type must be examined and the connection type or protection category must be specified manually if necessary.

1. Press the **SEL** key.
   ↳ The list of classification parameters **Classific. Parameters** is displayed.
2. Select the **Protection Category** or **Connection Type** parameter.
   ↳ A list of possible settings is displayed.
3. Select the desired parameter.
4. Acknowledge the **Class. Param.** (classification parameters) again.
   ↳ The connection type appears in the middle of the header.
   The icon for the respective protection category appears to the right of the connection type.

↳ Once a connection type or a protection category has been selected, it remains active for all following tests until it is changed again.

13.6 Special Conditions

NOTE

DUTs of protection category II with earthing contact plug

If the DUT belongs to the protection category II and has an earthing contact plug, the test instrument detects a DUT of protection category I.

— If this is the case, switch the protection category parameter from I to II.

Testing several protective conductor connections with the function for "automatic detection of measuring point changes"

During protective conductor measurement, the test instrument recognizes whether or not test probe P1 is in contact with the protective conductor, which is indicated by means of two different acoustic signals.

You can set this function in the **SETUP** rotary switch position: **Setup 1/3 > Autom. Measurements > Auto Meas. Point**.

Protective Conductor and Insulation Resistance Measurements for Permanently Installed DUTs

WARNING

Dangerous electrical voltage!

In the case of permanently connected DUTs, the mains power of the DUT cannot be disconnected from the test instrument. The user themselves must do this to be able to measure RPE and RISO safely. There is a risk of injury here due to current flowing through the body.

— The test instrument may only be connected to TN, TT, or IT electrical systems with a maximum of 264 V (nominal voltage) which comply with applicable safety regulations (e.g., IEC 60346, VDE 0100) and are protected with a fuse or circuit breaker with a maximum rating of 16 A.

— Observe the safety instructions.

- Before connecting the DUT, deactivate the electrical system which supplies power to it!
- Remove the mains fuses from the DUT and disconnect the neutral conductor N inside the DUT.

Touch Current Measurement

NOTE

Make sure that the contacted parts are not inadvertently grounded.

If ungrounded parts are connected to grounded parts when contacting parts for the touch current measurement, the touch current bypasses the probe and is discharged to ground.

13.7 2nd test probe

This function is available with feature H01 only.

CAUTION



Internally generated test voltage! Consequential accidents!

With the insulation measurement, the maximum test voltage of 500 V, with current limited to 2 mA, can be applied between the probes. When touching bare probe tips there is a risk of injury due to electric shock.

— Never touch conductive ends (e.g., of test probes).
— Observe the safety instructions.

If your DUT is not equipped with a country-specific mains plug that fits into the test socket at the test instrument, or if a permanently installed DUT is involved, the second test probe – in combination with the first test probe – permits 2-pole measurement (dual-lead measurement) of R_{PE}, R_{ISO} and leakage current.

Measurements with test probe 1 to test probe 2 (P1 – P2) are electrically isolated from the mains. No line voltage can be delivered or applied via the test probes.

13.8 Connection Prompts

If a single measurement (green rotary switch positions) or a specific (integrated) automatic test sequence (orange rotary switch positions) is started, checking is conducted to determine whether or not all of the probe and measurement terminals required to this end are occupied (depending on the configuration level of your test instrument). If this is not the case, you are prompted to connect probes, measuring leads or the test adapter to the test instrument.

NOTE



Checking is only performed to determine whether or not the corresponding sockets are occupied.

In any case, make sure that appropriate accessories for the selected measurement/connection type are connected.

— A list of possible DUT connections depending on the type of measurement is included here: ⇨ **"List of Possible DUT Connections Depending on Measurement Type " 93**

13.9 Connection Tests Conducted by the Test Instrument

In orange rotary switch positions and with active auto classification, the following tests are conducted automatically when connecting the DUT to the test socket:

- Protection Category Detection
- On test as indicator whether the DUT contains electronic switches.

The following tests are conducted when starting a single measurement:

- Detection of Probes/Measuring Leads

  During the single measurement, a check is conducted to determine whether or not the measuring connections required for the measurement are occupied.

- Short-circuit test (if this involves an active measurement)

  Before switching mains voltage to the DUT: test for short-circuiting between L and N or L/N and PE. if applicable additionally as an “inspection test step” in test sequences.

The following tests are conducted when starting an integrated test sequence:

- Detection of probes/measuring leads
  During the automatic test procedure, a check is conducted to determine whether the measurement connections required for the test procedure are occupied.

- Short-circuit test
  Before switching mains voltage to the DUT: test for short-circuiting between L and N or L/N and PE. Additionally.
- Switchable control

  If high internal DUT resistance is detected (R > 500 Ω), mains power is switched on automatically; if low internal DUT resistance is detected, a pop-up window appears prompting the user to switch off the DUT at its mains switch before mains power is switched on.

Automatic Recognition of States when Connecting DUTs and Probes

Test Function		Condition [1]
Short-circuit test L-N [2]	Short circuit/DUT starting current	R ≤ 2.5 Ω
	No short-circuit (AC test)	R > 2.5 Ω
Open-circuit voltage U_0 4.3 V, short-circuit current I_K < 250 mA		
Short-circuit test LN–PE	Short-circuit	R ≤ 2 kΩ
	No short-circuit (AC test)	R > 2 kΩ
Open-circuit voltage U_0 230 V AC, short-circuit current I_K < 1.5 mA		
On test	ON (DUT passive)	R < 250 kΩ
	OFF (DUT active)	R > 300 kΩ
Open-circuit voltage U_0 230 V AC, short-circuit current IK < 1.5 mA		
Switchable control	Mains power switched on automatically	R > 500 Ω
	Pop-up (switch off DUT first)	R < 500 Ω
Probe Check	No probe	R > 2 MΩ
	Probe detected	R < 500 kΩ
Protection category detection (only with country-specific version) [3]	Protective conductor found: PC I	R < 1 Ω
	No protective conductor: PC II	R > 10 Ω
Safety shutdown	Triggered at following residual current values (selectable)	> 10 mA / > 30 mA
	Triggered at following probe current values (electronic fuse)	
	During leakage current measurement	> 30 mA [4]
	During protective conductor resistance measurement	> 250 mA
Connection test (only with country-specific version) [3]	Checks whether the DUT is connected to the test socket.	
	DUT power cable found	R < 1 Ω
	No DUT power cable	R > 10 Ω
Insulation test	DUT set up in a well-insulated fashion	R ≥ 500 kΩ
	DUT set up in a poorly insulated fashion	R < 500 kΩ
PE(mains) – PE(socket): Open-circuit voltage U_0 500 V DC, I_K < 2 mA		

Test Function		Condition [1]
Overcurrent protection	Shutdown in the event of a continuous flow of current via the test socket at: Our SECUTEST ST BASE(10)/PRO, SECUTEST ST PRIME, and SECULIFE ST BASE(25) test instruments permit active testing of DUTs with a nominal current (load current) of up to 16 A. The test socket on the respective test instrument is equipped with 16 A fuses to this end, and the switching capacity of the internal relays is also 16 A. Starting current of up to 30 A is permissible. In the case of DUTs for which a starting current of greater than 30 A can be expected, we urgently recommend the use of a test adapter for larger starting currents, e.g., a test adapter from the AT3 series.	I > 16.5 A

[1] The specified values of instruments with features F01 and F02 are to be interpreted as reference values.

[2] Not for instruments with features F01 and F02.

[3] Applies to M7050 with feature B00, B09

[4] Firmware version 3.2.0 and lower: 12 mA

Table 73: Automatic Recognition of States when Connecting DUTs and Probes

14 Important Basic Information on Tests and Measurements

14.1 Important Safety Information

Observe and comply with the following safety information when performing individual measurements and test sequences.

14.1.1 Switching Loads - Maximum Starting Current

The test instruments permit active testing of DUTs with a nominal current (load current) of up to 16 A.

The test socket on the respective test instrument is equipped with 16 A fuses to this end, and the switching capacity of the internal relays is also 16 A. Starting current of up to 30 A is permissible.

ATTENTION

Fusing Together of Relay Contacts!

Despite extensive protective measures targeted at preventing overloading, the relay contacts may be fused together if starting current exceeds 30 A.

— Follow the procedure described below and observe information concerning defective relays.

NOTE

Observe correct sequence

Be absolutely sure to adhere to the sequence specified below when switching the live DUT. This prevents excessive wear of the mains relays at the test instrument.

▶ **Start of measurement**

1. DUT: Turn the DUT off via its own switch.
2. Test instrument: Switch line voltage to the test socket.
3. DUT: Turn the DUT on via its own switch.
4. Perform the measurement.

▶ **End of measurement**

1. DUT: Turn the DUT off via its own switch.
2. Test instrument: Deactivate line voltage to the test socket.

Safer Testing with Test Adapter

In the case of DUTs for which a starting current of greater than 30 A can be expected, we urgently recommend the use of a test adapter for larger starting currents, e.g., a test adapter from the AT3 series (AT3-IIIE, AT3-IIICH, AT3-IIS, AT3-IIS32, AT16DI, or AT32DI).

Alternative: Passive Test

If necessary on the basis of the hazard assessment, testing can be conducted as a passive test (alternative method, formerly equivalent leakage current measuring method), i.e., without switching line voltage to the test socket.

Defective Relay (“L(N) test socket fuse defective”)

If the following error message is displayed, the fuses and/or relays are defective: “L(N) test socket fuse defective”.

- Check both of the mains connection’s fuses. If they are defective, replace them with new ones.
- If the error message described above still appears, it must be assumed that the relay is defective. If this is the case, the test instrument must be sent to our service department for repair.

14.2 Measurement with DUT Connected to Line Voltage

DANGER



Electric Shock! Risk of Consequential Accidents!

If the **PROCEED in case of limit violation** setting has been selected, there is a risk of electric shock. For example, an additional fault can result in current flowing through the body.

— Take the necessary precautions when testing; use an RCD 30 mA.
— Wear personal protective equipment (PPE).
— Make sure that the workplace (mobile test station) is safe.

WARNING



Dangerous Touch Voltage!

Exposed parts may conduct dangerous touch voltage during testing.

— Do not touch the parts.
— Use a special cover in order to avoid touch contact.

Mains power is disconnected by the test instrument if leakage current exceeds approximately 10 mA (can also be set to 30 mA). However, this does not fulfill the requirements specified for a PRCD.

WARNING



Mechanical Hazard due to DUT Startup

Unintentional startup of a DUT or associated functions (such as rotating parts) can lead to serious injuries.

— Do not perform function testing until the DUT has passed the safety test.

14.3 Measurement of Insulation Resistance and Equivalent Leakage Current (alternative measuring methods for leakage current)

DANGER



Electric Shock! Risk of Consequential Accidents!

Testing is conducted with up to 500 V. If terminals L or N at the test socket or the test tip are touched, an electric shock may occur (despite the current being limited to I< 3 mA for the test).

— Do not touch terminals L or N at the test socket or the test probe.

14.4 UHV High-Voltage Testing, DC

This function is available in the ST PRIME version .... only.

DANGER



High voltage! Life endangering!

Testing is conducted with up to 6000 V. Terminals L or N at the test socket or the tip of the HV test pistol, along with all contacted parts (such as the DUT), carry this voltage.

Despite the current being limited to I < 3 mA, there is a risk of electric shock; due to capacitances in the DUT, for example – which lie outside the range of influence of the test instrument – the current may be even higher!

— During testing, do not touch the L or N terminals at the test socket, the test tip of test probe P1, the test tip of the HV test pistol, parts of the DUT or the conductive surface.
— Even after the test, make sure that all parts mentioned are discharged before touching the DUT.

DANGER



High voltage! Life endangering!

Residual voltages may still be present after releasing the button of the HV test pistol or after interrupting an ongoing measurement.

— Do not touch the test probe contacts or connected parts (such as the DUT).
— When using the probe or the test pistol, maintain the electrical connection to the DUT to enable the voltage to be dissipated.
— Always wait until discharging has been completed. The discharge time varies and depends on the capacity of the DUT.

14.5 Measurement Parameters for Single Measurements and Test Sequences

Measurement parameters that apply to both single measurements and test sequences must be entered in the **SETUP** switch position.

Setup 1/3 > All measurements

Measurement Parameter	Test Sequence
Meas. at IT system (Yes / No)	Yes: active leakage current measurements (or all measurements with reference to PE at the mains connection side) are prevented. Test sequences which include such measurements are also prevented. The **IT** symbol is displayed in the header on every display page. If, when being connected to mains voltage, the test instrument detects a change at PE as compared with the previously used mains connection, the testing person is asked immediately after commissioning if the currently used mains socket belongs to an IT system. The IT system option in **SETUP** is activated based on the user's answer. Regardless of this, it is possible to manually change the option in **SETUP** at any time. The setting for the "Meas. at IT system" option remains saved even after disconnection from the mains.

Measurement Parameter	Test Sequence
Ref.voltage L-PE	Reference (mains) voltage is the voltage to which the measured values for leakage current have been standardized. This is used for leakage currents to mathematically adjust the measured current values to the specified voltage. **Measurements with mains voltage at the test socket:** The setting has no influence on the voltage supplied to the DUT via the test socket of the test instrument. **Leakage current measurements with "Alternative" measuring mode:** The setting value of the synthetic test voltage is derived from the value specified here.
Testingfreq Alt (48 Hz ... 400 Hz)	Selectable frequency setting value for synthetic test voltage for all leakage current measurements of measuring mode "Alternative", affecting the following measurements and/or rotary switch positions: ■ Single measurements (green rotary switch level) ■ Measurements in integrated test sequences ■ Measurements in user-defined test sequences (only with SECUTEST DB+ (Z853R or feature KB01))
Gnd fault sens. (10 mA, 30 mA)	Selectable ground fault for safety shutdown
HV acoustic signal Signal[1] (Yes / No)	Yes: An audible signal sounds during a electrical strength test. (The signal sounds only if the tone is not switched off under **Setup > System > Volume > Measurements**.)

[1] Applies only to ...ST PRIME devices.

Table 74: Measurement parameters for single measurements and test sequences

14.6 Next Test Date

The test instrument automatically determines when the next test is due. For this, the current test must meet the following prerequisites:

- Test passed
- Test saved

Calculation

The next test date is calculated using the set default interval (in months). The factory setting for this interval is 12 months. You can change the interval under **SETUP > Autom. measurem. > Std. interv. (mon.)**.

Inclusion in Report

The due date for the next test is included by default in the report.

You can switch this off by setting **SETUP > Test reports > Next test date** to **Off**.

Interaction with a Customized Test Interval (from a DUT in the database)

For test instruments with feature KB01, the SECUTEST DB+ database extension (Z853R or feature KB01) or the SECUTEST DB COMFORT database extension (Z853S or feature KD01), each DUT can be assigned its own test interval. If you have filled in the **Test interval** field for the respective DUT, this value will be used for the calculation instead of the default interval.

NOTE

The customized test interval entered to the database for the DUT has priority over the default interval.

The default interval has no influence on the **Test interval** database field (no entry, no change to existing customized test intervals).

You can enter customized test intervals here: ⇨ **"Internal Database "** 🗋 **80**

Interaction with a Test Interval in IZYTRONIQ

For test instruments with feature KB01 or the SECUTEST DB+ database extension (Z853R or feature KB01), data can be transferred from IZYTRONIQ to the test instrument.

In IZYTRONIQ, you can also enter a test interval for each DUT. If data is then transferred between IZYTRONIQ and the test instrument, existing data are overwritten/refreshed accordingly:

- Data transfer from IZYTRONIQ to the test instrument:
  The test interval specified in IZYTRONIQ is written to the test instrument's database.
- Data transfer from the test instrument to IZYTRONIQ:
  The test interval specified in the test instrument's database is written to IZYTRONIQ (and overwrites any existing interval there).

NOTE

The actual test dates – whether calculated using the default interval or the database interval – are NOT transferred to IZYTRONIQ.

15 Single Measurements

15.1 General

- The desired measurement is selected with the help of the green pointer on the rotary switch and the green semicircle.
- The respective measurement is configured with the help of the softkeys. The parameter settings can be accessed by pressing the **Setting Parameters** softkey.
- The measurement type parameter displayed in each case in the measuring view footer can be changed directly using the **Set Measurement Type** key without having to exit the measuring view.
- The display and selection of polarity for line voltage at the test socket can be changed directly using the **Polarity normal** or **Polarity reversed** key without having to exit the measuring view.
- No limit values can be specified for single measurements, and thus there is no evaluation.
- Checking is performed before each measurement in order to assure a trouble-free procedure and to prevent any damage to the DUT.
- Single measurements can be saved to memory. The assignment of an ID is possible to this end.
- Single measurements can be combined into measurement series.
- Mains power can be connected to the DUT with the desired polarity by making a preselection in the parameter settings.

Progress Bar

The progress bar shows the measurement status:

- Measurement standstill: Static lines
- Measurement in progress: Space between the lines is gradually filled in, pulsating



Fig. 33: Message status - progress bar

15.2 Measurements Display View

Measurement View of a Single Measurement

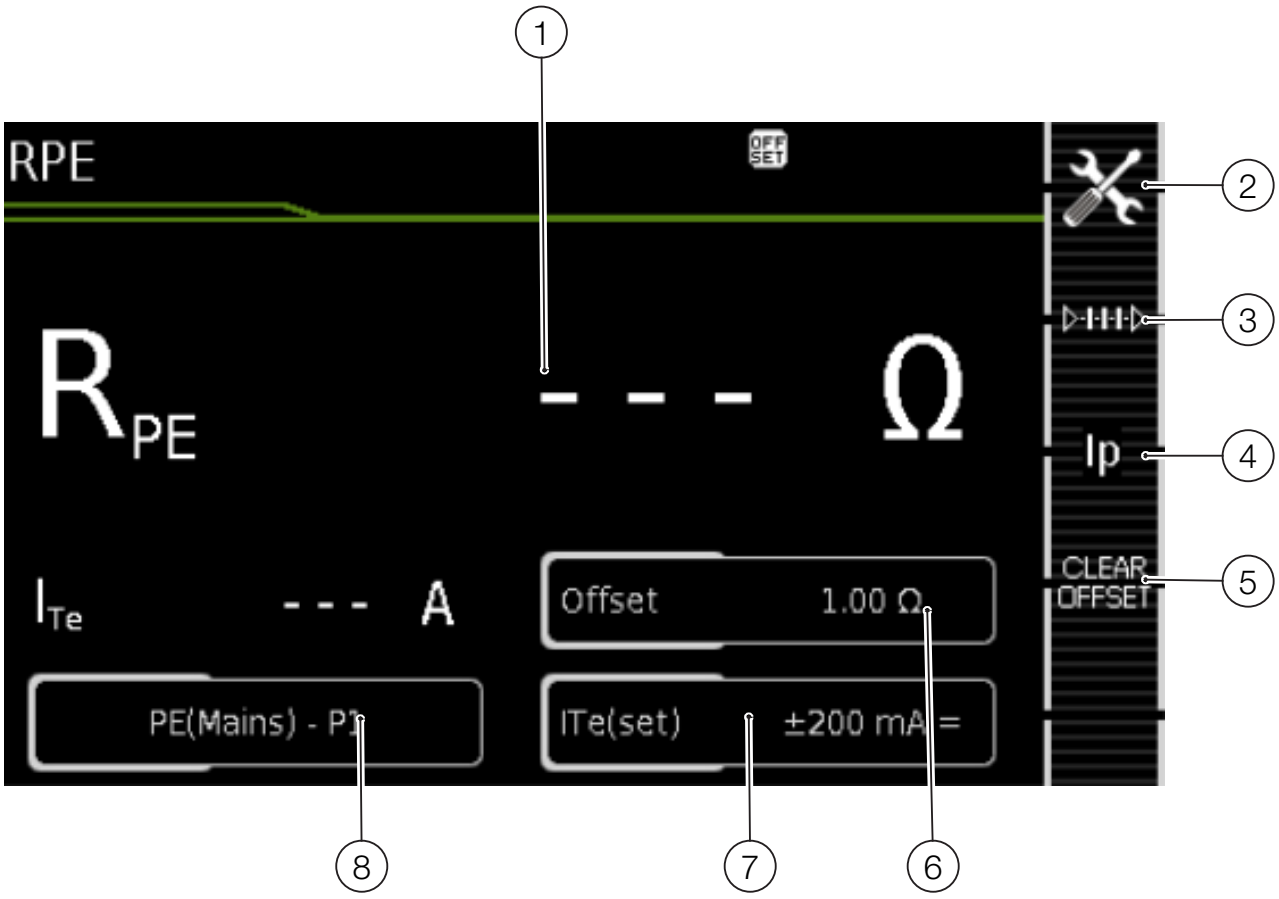


Fig. 34: Measurement view of a single measurement

1	Current measured value	5	Reset offset to 0 Ohm
2	Select parameters	6	Offset
3	Select measuring mode / connection type	7	Test current
4	Adjust test current	8	Measuring mode / connection type

Measurement Parameters Display: Single Measurement

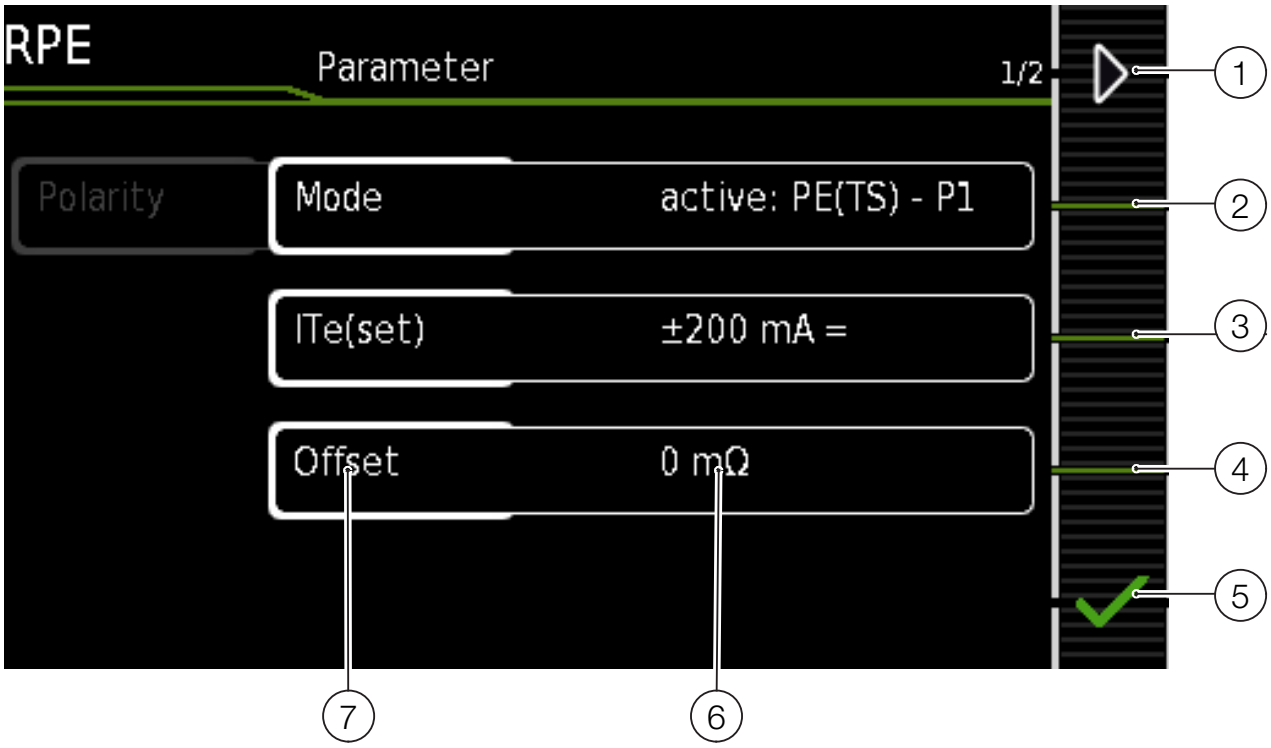


Fig. 35: Measurement parameters display: single measurement

1	Browse through parameter pages	5	Apply changes, return to measurement view
2	Select measurement parameter directly	6	Set parameter value
3	Select measurement parameter directly	7	Selectable parameter
4	Select measurement parameter directly		

Parameters that currently cannot be selected from the selection parameters (but are compatible with other set parameters) are deactivated and displayed in gray.

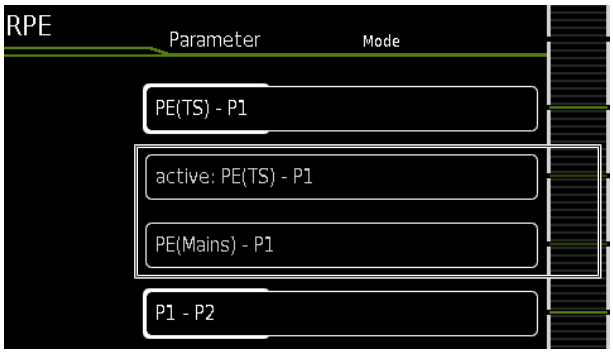


Fig. 36: Grayed-out parameters

Numeric Entry (for Parameters $UINS_{ISO}$(set), Offset ...) Using Softkeys



Fig. 37: Numeric entry using softkeys

Numeric Entry (for Parameters $UINS_{ISO}$(set), Offset ...) Using a Touchscreen Keyboard

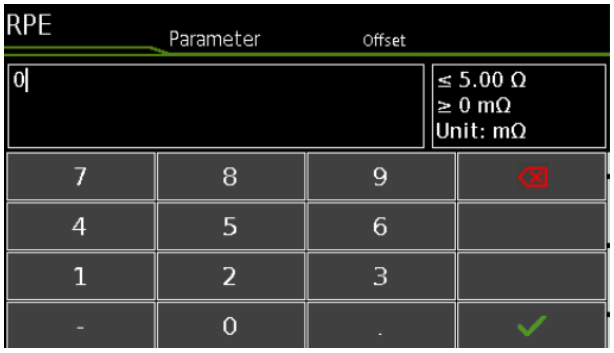
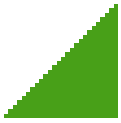
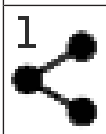
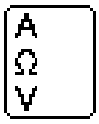


Fig. 38: Numeric entry using a touchscreen keyboard

15.3 Icons for User Guidance – Measurements

Icon	Designation	Meaning
	**Set Parameters**	Set Parameters
	**START/STOP**	Start/stop measurement
	**OK**	Accept changed parameters, acknowledge memory location
	**Resume test**	Acknowledges messages during tests/measurements or resumes the test sequence
	**Abort**	Abort measurement
	**Set measurement type**	Direct selection key for selecting the measurement type

Icon	Designation	Meaning
	**Polarity normal**	Currently selected polarity: “normal” (green field) Pressing the key switches to “reversed” polarity
	**Polarity reversed**	Currently selected polarity: “reversed” (green field) Pressing the key switches to “normal” polarity
I_P	**Set test current**	Direct selection key for selecting test current for protective conductor measurement
U+ **U–**	**Change voltage value**	Direct selection key for gradually changing the voltage
	**Start evaluation**	Start evaluation – record measured value. Each time this softkey is pressed, an additional measured value is saved and the number is increased by one.
	**ID**	The ID number to which the measurement(s) will be stored can be entered here.
	**Save**	Valid measured values have been obtained for a measurement. This measurement can be saved.
	**Save as**	Save measurement data as (with display of directory path/test object ID or new entry of a test object ID other than the preselected one)
	**Push-Print**	Send measurement data to the PC, e.g., for saving to IZYTRONIQ report generating software (push-print function) (see online help for IZYTRONIQ)
	**Display measured values**	Display measured values from performed measurements
	**Show details**	Show details from the measurement results list
	**Hide details**	Hide details from the measurement results list
	**OFFSET**	Offset for RPE active
	**SET OFFSET**	Copy currently measured R_{PE} measured value as offset value

Icon	Designation	Meaning
CLEAR OFFSET	**CLEAR OFFSET**	Reset offset to 0 Ω

Table 75: Icons for user guidance – measurements

15.4 Displaying the Last Measured Values

1. Press the **START/STOP** function key.
   ↳ The measurement is started.
   ↳ The Start evaluation icon appears and indicates how many measurements have already been performed.
2. Press the **START/STOP** function key to end the measurement. The measurement does not need to be ended if a fixed measurement time is specified.
   ↳ The **Save as** icon appears and indicates that one valid measured value has been recorded, which can now be saved.
3. Press the **Save as** key.
   ↳ "No test object selected!" appears.
4. Press the **Display measured values** key.
   ↳ The last measured values are displayed.
5. Press the **Up** or **Down** keys to select the desired measurement.
6. Press the **Show details** or **Hide details** keys to show or hide the associated measurement parameters.
7. Press **OK** to exit the measured values view.

You can then save the measured values or return to the initial view using **ESC**.

15.5 Saving Single Measurements and Measurement Series

The **Save as** key can be used to record the measured value. Repeatedly pressing the **Save as** key allows several measured values, in other words measurement series, to be generated. The **Save as** key indicates in each case whether one or several measured values have been acquired.

The measurements or measurement series can be saved after measurement has been completed.

NOTE

Measured values can only be added to intermediate buffer memory during a measurement. If no measured values have been saved to buffer memory before the **STOP** key (interrupt/pause, end) is pressed, the last value is automatically saved so that no "empty" measurements or measurement series are saved.

NOTE

The storage process can be aborted: Press **ESC** twice in order to switch to the measuring view. If you press **ESC** again, a prompt appears asking whether or not you want to delete the measuring points in order to continue with the measurement without saving.

NOTE

Customer, location, and other entries cannot be changed in the memory menu. These have to be selected directly in the database and entered or changed.

15.5.1 Conducting a Measurement Procedure with Preselection of the Test Object

✓ You have already set up a test structure in the test instrument or uploaded one with the help of the IZYTRONIQ software.

1. Press the **MEM** key.
   ↳ The database view is activated.
2. Press the **Up** or **Down** keys to select the test object or its ID for the following measurements.
3. Press **ESC** or **START/STOP** to return to the measurement view.
4. Press **START/STOP**.
   ↳ The measurement is started. The **Start evaluation** icon appears and the zero indicates that no measurements have yet been recorded or saved to buffer memory.
5. Press **Start evaluation**.
   ↳ Each time the **Start evaluation** key is pressed, the respective current measured value is saved to buffer memory and the number shown in the icon increased. In this way, you always know how many measurements have already been recorded.
6. Press the **START/STOP** function key to end the measurement. The measurement does not need to be ended if a fixed measurement time is specified.
   ↳ The **Save as** icon appears and shows the number of measured values saved to the buffer memory.
7. Press **Save as**.
   ↳ The display switches to the test object in the database view.
8. Press **Save as** again.
   ↳ Feedback confirms that the data has been saved successfully. The display switches to the measurement view.

15.5.2 Conducting a Measurement Procedure with Subsequent Entry of the Test Object

1. Press **START/STOP**.
   ↳ The measurement is started. The **Start evaluation** icon appears and indicates how many measurements have already been performed.
2. Press the **START/STOP** function key to end the measurement. The measurement does not need to be ended if a fixed measurement time is specified.
   ↳ The **Save as** icon appears and indicates through the number 1 that one valid measured value has been recorded, which can now be saved.
3. Press **Save as**.
   ↳ A message appears stating that no test object was selected in the database.
4. Press the **ID** key.
5. Enter the test object ID number. Alternatively, you can select the test object ID using the barcode scanner.
   ↳ The cursor jumps to the location of the test object with the selected test object ID number.
6. Press **OK** to acknowledge the position.
7. Press **Save as**.
   ↳ Feedback confirms that the data has been saved successfully. The display switches to the measurement view.

15.5.3 Conducting a Measurement Procedure with Entry of a New Test Object at the End of the Test

If you have not yet created a test structure in the test instrument, the test object can be initially created. This also applies if you have already entered a test object ID number but it is not found (because it has not yet been saved to the database, for example).

1. Press **START/STOP**.
   ↳ The measurement is started. The **Start evaluation** icon appears and indicates how many measurements have already been performed.

2. Press the **START/STOP** function key to end the measurement. The measurement does not need to be ended if a fixed measurement time is specified.
   ↳ The **Save as** icon appears and indicates through the number that one or more valid measured values has/have been recorded, which can now be saved.
3. Press **Save as**.
   ↳ A message appears stating that no test object was selected in the database.
4. Optional: To call up details of the measured values, press **Display measured values**. To call up details of the measurements, press **Display details**. Press **OK** to return to the save menu.
5. Optional: To add a comment to the measurement, press **Edit**. Press **OK** to return to the save menu.
6. Press the **ID** key.
7. Enter the test object ID number.
   ↳ If the ID has not yet been entered in the database, a prompt appears asking you if you want to enter a new test object.
8. Press the **OK** key.

▶ **Entering a test object**

✓ The **QEDIT** function is enabled.

1. Select either device or ME equipment.
2. Fill out the fields for the DUT object.
3. Press the **OK** key.
   ↳ An overview of the database appears along with the newly entered test object.
4. Press **Save**.
   ↳ Feedback confirms that the data has been saved successfully. The display switches to the measurement view.

NOTE

You can abort the storage process by pressing the **ESC** key. The display is returned to the memory menu. You can delete all measured values by pressing the **ESC** key.

15.5.4 Alternative: Transferring Measurement Data to the PC (IZYTRONIQ - push-print)

You can transfer the test results to a PC on which IZYTRONIQ software is running. This function is known as "push-print" and can be implemented via USB or Bluetooth®.

Database expansion SECUTEST DB COMFORT (Z853S or feature KD01) and, if applicable, feature M01 (Bluetooth®) are required to this end.

Full information regarding push-print and a description of the application can be found in the IZYTRONIQ online help.

15.6 Abbreviations for Measuring Functions (overview)

Measuring Function	Rotary Switch Position	Displayed Abbreviation per Language			
		DE	EN	F	I
Protective conductor resistance	R_{PE}	R_{PE}	R_{PE}	R_{PE}	R_{PE}
Test current	R_{PE}	I_P	I_{Te}	I_{Te}	I_{Te}
Insulation resistance	R_{INS}	R_{ISO}	R_{INS}	R_{ISO}	R_{ISO}
Test voltage	R_{INS}	U_{ISO}	U_{INS}	U_{ISO}	U_{ISO}

Measuring Function	Rotary Switch Position	Displayed Abbreviation per Language			
		DE	EN	F	I
Determined minimum voltage value during the set test time (SECULIFE ST PRIME only)	U_{HV}	U_{min}	U_{min}	U_{min}	U_{min}
Test voltage (SECULIFE ST PRIME only)	U_{HV}	U_{Gen}	U_{Gen}	U_{Gen}	U_{Gen}
Protective conductor current	I_{PE}	I_{PE}	I_{PE}	I_{PE}	I_{PE}
Touch current	I_T	I_T	I_T	I_T	I_T
Device leakage current	I_E	I_G	I_E	I_E	I_E
Leakage current from the applied part	I_A	I_A	I_A	I_A	I_A
Patient leakage current	I_P	I_P	I_P	I_P	I_P
Patient auxiliary current	I_{PA}	I_{PH}	I_{PA}	I_{PA}	I_{PA}
Measuring voltage	U	U	U	U	U
Line voltage	I_{PE}, I_T, I_E, I_A, I_P, I_{PA}	U_{LPE}	U_{LPE}	U_{LPE}	U_{LPE}
Test voltage	I_{PE}, I_T, I_E, I_A, U_{HV}	U_{Gen}	U_{Gen}	U_{Gen}	U_{Gen}
Function test	P	FT	FT	FT	FT
Temperature measurement	EXTRA	T[°C]	T_C	T[°C]	T_C
Temperature measurement	EXTRA	T[°F]	T_F	T[°F]	T_F
PRCD time to trip	EXTRA	t_A	t_B	t_A	t_B
Current clamp measurement	EXTRA	IZ~	ICL~	ICL~	ICL~

Table 76: Abbreviations for Measuring Functions

15.7 Measuring Protective Earth Resistances – RPE



Fig. 39: R_{PE} measurement

Single Measurements – Switch Positions on the Green Rotary Switch Level					
Rotary Switch Position	Measuring Mode with Mains to Test Socket	Measuring Mode without Mains to Test Socket	Measuring Functions		
			R_{PE}	Protective Earth Resistance	
			I_P	Test Current	
			200 mA	10 A [1]	25 A [1]
R_{PE}		PE(TS) – P1	x	x	x
	Active: PE(TS) – P1 [2]		x		

Single Measurements – Switch Positions on the Green Rotary Switch Level					
Rotary Switch Position	Measuring Mode with Mains to Test Socket	Measuring Mode without Mains to Test Socket	Measuring Functions		
			R_{PE}	Protective Earth Resistance	
			I_P	Test Current	
			200 mA	10 A [1]	25 A [1]
		PE(Mains) – P1	x	x	
		PE(Mains) - P1 clamp [3]		x	
		P1 – P2 [4]	x	x	x

1 10/25 A RPE measurements are only possible with line voltages of 115/ 230 V and line frequencies of 50/60 Hz.

2 Can only be selected with SECUTEST ST BASE or if the IP(set) parameter has been set to 200 mA.

3 Can only be selected if 10 A~ is selected for the IP(set) parameter and only for test instruments with feature G01 (e.g., SECUTEST ST PRO/SECULIFE ST BASE).

4 Connection for 2nd test probe for 2-pole measurement, only for test instruments with feature H01 (e.g., SECUTEST ST PRO/ SECULIFE ST BASE(25))

15.7.1 Protective Earth Resistance: Application, Definition, Measuring Method

Protective earth resistance is the sum of the following resistances:

- Resistance of the conductor in the power supply cord or device connection cable
- Contact resistance at plug and terminal connections
- Resistance of the extension cord, if applicable

Class I DUTs

- Measuring mode PE(TS) – P1 (passive)
  - Mains plug DUT to test socket
  - Test probe P1 to P1 connections

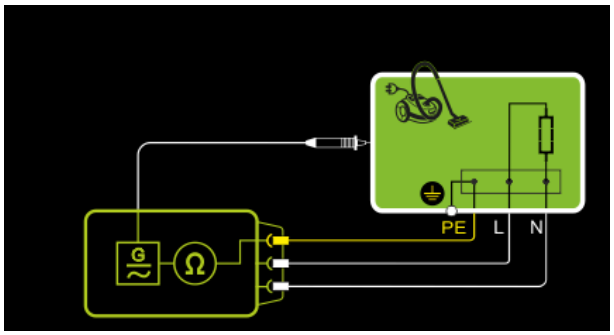


Fig. 40: Class I DUTs, schematic diagram

Protective earth resistance is measured between the protective contacts of the mains plug and the protective contact connected to the housing by making contact with the housing via test probe P1.

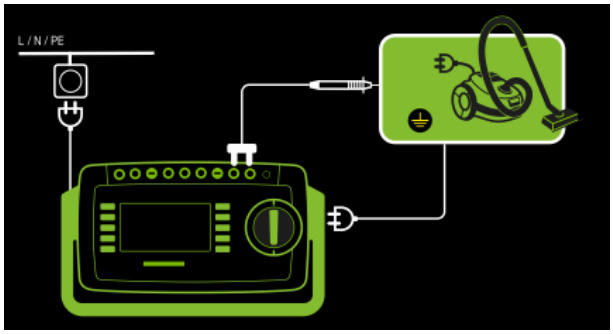


Fig. 41: Class I DUTs, connection diagram

Measuring RPE at Single-Phase Extension Cords with EL1

- Measuring mode PE(TS) – P1 (passive)
  - Extension cord plug to test socket
  - EL1 to P1 connections

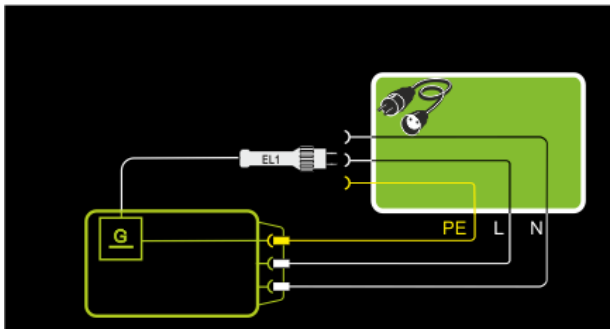


Fig. 42: Measurement of R_{PE} on single-phase extension cords with EL1, schematic diagram

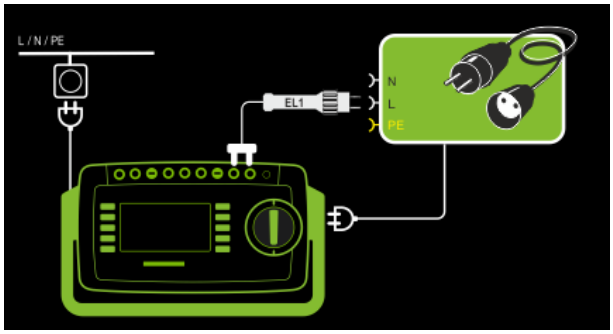


Fig. 43: Measurement of R_{PE} on single-phase extension cords with EL1, connection diagram

Class I DUTs – Special Case: Mains Voltage at Test Socket (for testing PRCDs)

- Measuring mode PE(TS) – P1 (active)
  - Mains plug DUT to test socket
  - Test probe P1 to P1 connections

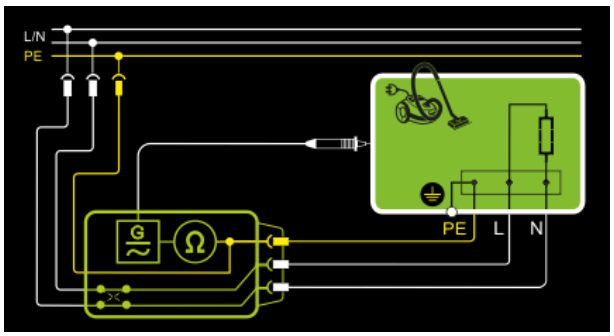


Fig. 44: Class I DUTs – special case: mains voltage at test socket (for testing PRCDs), schematic diagram

Protective earth resistance is measured between the protective contacts of the mains plug and the protective contact connected to the housing by making contact with the housing via test probe P1.

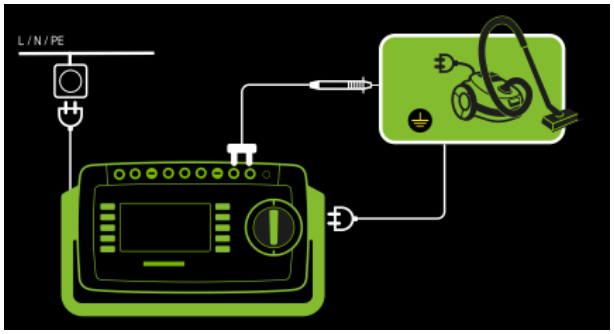


Fig. 45: Class I DUTs – special case: mains voltage at test socket (for testing PRCDs), connection diagram

Protection Category I DUTs– Special Case: Permanently Installed DUTs

- Measuring mode PE(Mains) – P1
  - Test probe P1 to P1 connections

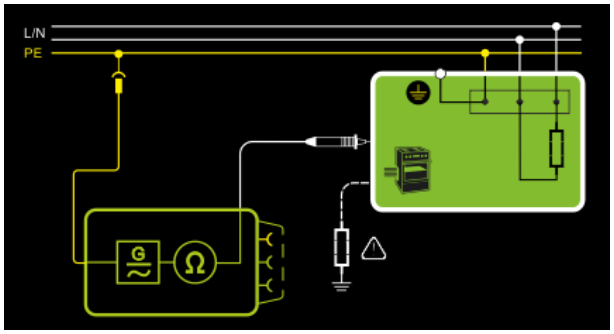


Fig. 46: Protection Category I DUTs – permanently installed DUTs, schematic diagram

In the case of permanently installed DUTs, protective earth resistance is measured between protective contact of the mains supply and the protective contact connected to the housing by making contact with the housing via test probe P1.

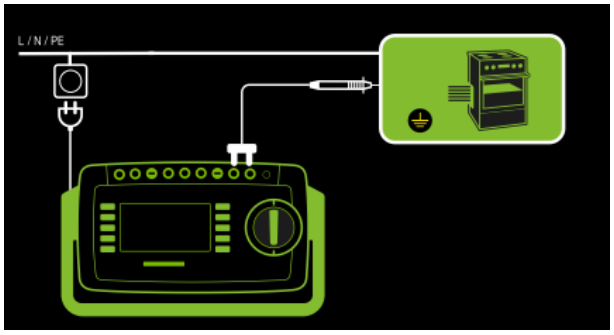


Fig. 47: Class I DUTs – special case: permanently installed DUTs, connection diagram

Measurement Using a Current Clamp Sensor on Permanently Installed DUTs (only test instruments with features I01 and G01)

- Measuring mode PE(Mains) – P1 clamp
  - Test probe P1 to P1 connections
  - Clamp to COM-V (only with optional current clamp sensor)

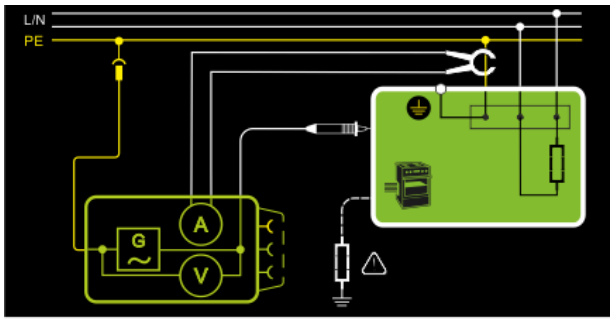


Fig. 48: Measurement using a current clamp sensor on permanently installed DUTs, schematic diagram

Measurement of Test Current by Closing the Current Clamp Sensor Around Mains PE and Contacting the Housing with Test Probe P1 for a Permanently Installed Class I DUT

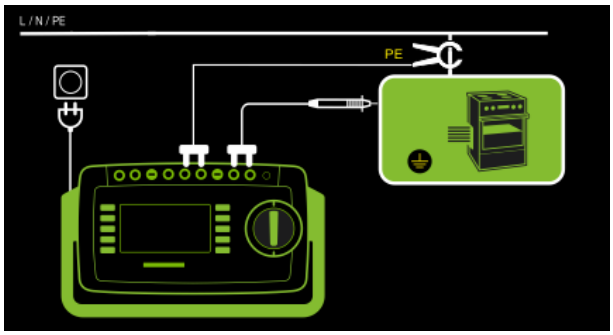


Fig. 49: Measurement using a current clamp sensor on permanently installed DUTs, connection diagram

Setting the Measuring Range on the Clamp and Parameters in Devices with Feature G01

This measuring mode can only be selected if test current is set to 10 A AC.

SECUTEST ST PRO	Clamp		SECUTEST ST PRO
Transformation Ratio Parameter	**Transformation Ratio (Switch, only for WZ12C)**	**Measuring Range**	**Display Range with Clamp**
1 mV : 1 mA	WZ12C		0 mA ... 300 A
	1 mV : 1 mA	1 mA ... 15 A	

2-Pole Measurement on Permanently Installed DUTs (only test instruments with feature H01, e.g., SECUTEST ST PRO)

- Measuring mode P1 – P2
  - Test probe P1 to P1 connections
  - Test probe P2 to P2 connections

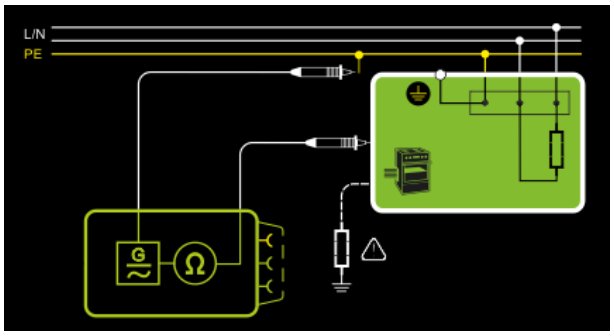


Fig. 50: 2-pole measurement on permanently installed DUTs, schematic diagram

Instead of using the mains plug of the test instrument, the second test probe is connected to the PE terminal of the mains connection.

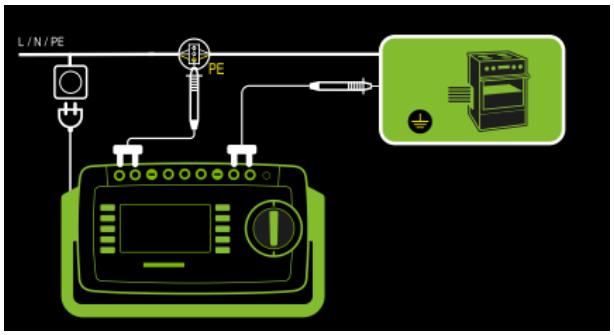


Fig. 51: 2-pole measurement on permanently installed DUTs, connection diagram

Measurements are performed as follows:

- For permanently installed DUTs, between each accessible conductive part of the housing and the protective contacts of the mains and the device plug (if a detachable power supply cord is used) or the PE connector.
- As a 4-pole measurement
- For device connection cables, between the protective contacts of the mains plug and the protective contacts of the mains plug on the device
- For extension cords, between the protective contacts of the mains plug and the protective contacts of the plug

15.7.2 Measurement Parameters for RPE

Measurement Parameter	Meaning	
Measuring Mode		**Suitable for DUT Connection**
PE(TS) – P1	Testing is performed between the two PE connections of the test socket and test probe P1.	Test socket, EL1 with DUT at test socket, VL2E, AT3 Adapter (AT3-IIIE, AT3-IIS, AT3-IIS32), AT16DI/ AT32DI
Active: PE(TS) – P1 [1]	Same as PE(TS) – P1, but with mains voltage to the test socket – 200 mA AC flows immediately. At +200 mA DC, –200 mA DC, and ±200 mA DC, a ramp-shaped, slowly increasing DC test current flows (PRCD tripping is prevented).	Test socket (for PRCDs)
PE(Mains) – P1	Testing is performed between the earth connection of the mains and test probe P1.	Permanent connection
P1 – P2	Feature H01 (e.g., SECUTEST ST PRO/ SECULIFE ST BASE): 2-pole measurement between test probes 1 and 2	Permanent connection
PE(Mains) – P1 clip [2]	Feature G01 and I01(e.g., SECUTEST ST PRO/ SECULIFE ST BASE): Test current measurement with current clamp sensor	Permanent connection
I_P (set)		
+200 mA (DC)	Test current: positive direct current	
-200 mA (DC)	Test current: negative direct current	
±200 mA (DC)	Test current: direct current that reverses polarity every 2 s	
200 mA (AC)	Test current: alternating current, adjustable frequency f, see below	
10 A (AC)	10 A test current, only with feature G01 (e.g., SECUTEST ST BASE(10) or PRO)	
25 A (AC)	25 A test current, only with feature G02 (e.g., SECULIFE ST BASE25)	
f – only at 200 mA (AC)		
50 ... 200 Hz	Test frequency (adjustable in steps: 50, 60, 110, 150, 200 Hz)	
Offset		
> 0 ... < 5 Ω	Zero balancing for a selected reference point	
Factor V:A – only for Clamp measuring mode		
1 mV : 1 mA	Transformation ratio of the WZ12C current clamp sensor To set the current clamp factor on the WZ12C clamp and SECUTEST ST PRO, see the table above.	

[1] In this measuring mode, measurements cannot be performed at 10 A AC/25 A AC.

[2] Feature G01 (e.g., SECUTEST ST PRO / SECULIFE ST BASE): This measuring mode can only be selected when the test current is set to 10 A AC.

Table 77: Measurement parameters for R_{PE}

15.7.3 Entering or Deleting Offset Values

The test instrument determines protective earth resistance using a 4-pole measurement. When using measuring leads or extension cords whose ohmic resistance is to be automatically subtracted from the measurement result, there are two ways to save this as an offset value in the RPE rotary switch position:

- Entry using the numeric keypad
- Apply the current measured value with the **SET OFFSET** softkey.

▶ **Apply the measured value**

1. Start the measurement.
2. Wait until the measured value is stable.
3. Press the **SET OFFSET** key.
   ↳ The value is applied in the **Offset** field.
   ↳ The entered or applied offset value is permanently stored and subtracted from all protective earth resistance values measured in the future. This applies to single measurements as well as to measurements performed in the A9 rotary switch positions.
   ↳ The **OFFSET** icon is displayed in the header for each position of the rotary switch until the offset is deleted again.

▶ **Clear the offset**

✓ The rotary switch is in the R_{PE} position.

1. Press the **CLEAR OFFSET** key.
   ↳ The offset is cleared.

15.7.4 Protective Earth Measurement with 25 A AC

ATTENTION

Risk of arcing and surface damage (feature G01 or G02 only)

During test steps of the RPE IP sequence parameter with a test current of 10 A or 25 A, a high test current is applied. It is activated as soon as the rating period starts and remains active until the rating period has ended. Outside the rating period, the measured value for the current test current is therefore < 300 mA when the probe is in contact with the PE. If contact between the test probe and the DUT is terminated too early, there is a risk of an arc.

— Maintain contact between the probe and the DUT for the entire rating period.

In accordance with numerous product standards, at least 25 A must be achieved at a load of 0.1 Ω with a maximum voltage of 6.0 V.

Due to contact resistance at the sockets, continuous operation of the protective earth resistance measurement with a 25 A test current is not possible.

If the test instrument is operated at room temperature, an uninterrupted test duration of at least 15 seconds is possible. Under other conditions, the achievable test duration may be shorter or the measurement may be canceled prematurely.

ATTENTION

Device overheating due to unsuitable accessories

If unsuitable accessories are used, the required standard values might not be met.

— When measuring the protective earth resistance with a test current of 25 A AC, use measuring leads with a conductor cross-section of at least 2.5 mm^2.

— Use suitable test probes.

TIP



Suitable test probes are included with SECULIFE ST BASE 25, for example: test probe with a green kink-resistant sleeve.

For subsequent orders, we recommend the SK2-25A test probe (Z746E).

NOTE



When using test probe SK15-25A, the selected test current may fall below 25 A due to the increased load on the electrical circuit. The user must take this into account.

ATTENTION

Device overheating due to exceeding the measuring duration

The measuring duration with a 25 A test current is limited. Exceeding the measuring duration causes the test instrument to overheat, and the test instrument will switch off the measurement. A error message will be displayed.

— Reduce the measuring duration when performing measurements with a test current of 25 A.

15.7.5 Protective Earth Resistance: Executing a Test

▶ **Prepare the test procedure for a connection to the test socket**

1. Set the rotary switch to the R_{PE} position.
2. Select measurement mode or connection type and the test current.
3. Press the I_P key to access the test current parameters directly.
   ↳ Each time you press the key, the setting value displayed in the measurement window changes to the next value.
4. Connect the DUT to the test socket.
   ↳ The test procedure has been prepared.

▶ **Prepare the test procedure for tests on extension cords**

1. Set the measuring mode parameter to **PE(TS) – P1**.
2. Connect the EL1 Adapter to the P1 sockets on the test instrument.
3. Connect the plug of the extension cord to the test socket.
4. Connect the coupling socket at the other end of the extension cord to the plug on the EL1 Adapter.
   ↳ The test procedure has been prepared.

Further options for testing extension cords are included in the description of the single measurement in the EL1 rotary switch position (in SECUTEST ST PRIME under “Switch Position Extra”) and under the following integrated test sequences:

- VDE 0701-0702-ExtC / OEVE E 8701-ExtC / SNR 462638-ExtC
- EN 50678-ExtC / VDE 0701-ExtC
- EN 50669-ExtC / VDE 0702-ExtC

▶ **Start a test**

✓ The test procedure has been prepared.

1. Press the **START/STOP** key.
   ↳ The test begins.
2. Use test probe P1 to contact the conductive parts connected to the protective earth.
   During the measurement, the power supply cord must be moved only as far as it is accessible during repair, modification, or testing.
   If a change in resistance occurs during the manual continuity test, it must be assumed that the protective conductor is damaged or that a connection point is no longer flawless.
   ↳ The measured values are displayed.
   ↳ The **Start rating** symbol appears on the right.
3. Click the **Start rating** key.
   ↳ The currently displayed measured value is saved in the buffer.
4. Press the **START/STOP** key.
   ↳ The test is ended.
   ↳ The **Save as** symbol appears (showing the number of cached measured values) and prompts you to save the measured values under a DUT ID number.
5. Read the measured values and compare them with the table of permissible limits.
6. Save the measured values under a DUT ID number.
7. To discard the cached measurement values, press the **ESC** key and confirm with the **OK** key.

▶ **Execute a test with a permanently installed DUT**

✓ The test procedure has been prepared.

1. Press the **START/STOP** key.
   ↳ The test begins.
2. Use test probe P1 to contact the conductive parts of the housing.
   ↳ The measured values are displayed.
   ↳ The **Start rating** symbol appears on the right.
3. Click the **Start rating** key.
   ↳ The currently displayed measured value is saved in the buffer.
4. Press the **START/STOP** key.
   ↳ The test is ended.
   ↳ The **Save as** symbol appears (showing the number of cached measured values) and prompts you to save the measured values under a DUT ID number.
5. Read the measured values and compare them with the table of permissible limits.
6. Save the measured values under a DUT ID number.
7. To discard the cached measurement values, press the **ESC** key and confirm with the **OK** key.

▶ **Execute a test of protective earth resistances on PRCDs**

For PRCDs whose protective earth resistance cannot be measured when switched off, SECUTEST ST BASE(10) offers the "Active: PE(TS) - P1" measurement mode, with which the PRCD can be switched on to determine the protective earth resistance.

1. Set the measuring mode parameter to **Active: PE(TS) – P1**.
2. Connect the EL1 Adapter (or alternatively a standard test probe) to the P1 sockets on the test instrument.
3. Connect the PRCD to be tested to the test socket via its plug.
4. Connect EL1 Adapter to the outlet on the PRCD (alternative: connect the test probe to the protective earth of the PRCD's outlet, e.g., using an alligator clip).
5. Press the **START/STOP** key.
   ↳ The test begins.
6. Connect the mains voltage to the test socket.
7. Switch on the PRCD.
   ↳ The measured values are displayed.
   ↳ The **Start rating** symbol appears on the right.
8. Click the **Start rating** key.
   ↳ The currently displayed measured value is saved in the buffer.
9. Press the **START/STOP** key.
   ↳ The test is ended.
   ↳ The **Save as** symbol appears (showing the number of cached measured values) and prompts you to save the measured values under a DUT ID number.
10. Read the measured values and compare them with the table of permissible limits.
11. Save the measured values under a DUT ID number.
12. To discard the cached measurement values, press the **ESC** key and confirm with the **OK** key.

NOTE

In the +200 mA=, -200 mA= and 200 mA= measuring modes, the test current rises very slowly to prevent the residual current protection of the PRCD from tripping. Therefore, in this measuring mode, it may take longer than usual for a valid measured value to be displayed. For this reason, the test probe should not be manually connected to the protective earth, in order to prevent a sudden increase in test current and thus an accidental tripping of the PRCD.

15.7.6 Maximum Permissible Limits for Protective Earth Resistance with Power Supply Cords up to 1.5 mm²

Test Standard	R_{PE} Housing – Device Plug	R_{PE} Housing – Mains Plug	Mains Cable
IEC 60974-4 / EN 60974-4 / VDE 0544-4 EN 50678 / VDE 0701 VDE 0701-0702 / OEVE E 8701 / SNR 462638		0.3 Ω + 0,1 Ω[1] for every additional 7.5 m or, for > 1.5 mm² bare *l/A + 100 mΩ	
IEC 62353 / EN 62353 / VDE 0751-1	0.2 Ω	0.3 Ω	0.1 Ω

Test Standard	R_{PE} Housing – Device Plug	R_{PE} Housing – Mains Plug	Mains Cable
IEC 62368 / EN 62368 / VDE 0868-1	0.1 Ω		
IEC 62911 / EN 62911 / VDE 0868-911			
IEC 60601-1 / EN 60601-1 / VDE 0750-1	0.1 Ω	0.2 Ω	
IEC 60335-1 / EN 60335-1 / VDE 0700-1			
IEC 61010-1 / EN 61010-1 / VDE 0411-1			

[1] Total protective earth resistance: max. 1 Ω

Table 78: Maximum permissible limits for protective earth resistance with power supply cords up to 1.5 mm^2

15.8 Insulation Resistance Measurements – RINS

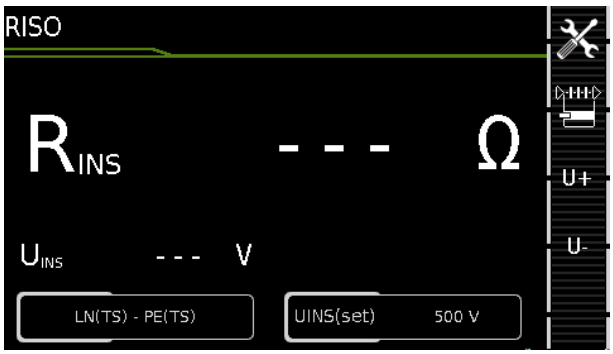


Fig. 52: R_{INS} measurement

Single Measurements – Switch Positions on the Green Rotary Switch Level			
Rotary Switch Position	**Measuring Functions**		**Measuring Mode without Mains to Test Socket**
R_{INS}	R_{INS}	Insulation resistance (Class I/Class II)	LN(TS) – PE(TS) LN(TS) – P1 P1 – P2 [1] PE(Mains) – P1 PE(TS) – P1 LN(TS) - P1||PE(TS) LN(TS) – AP PE(Mains) – AP PE(TS) – AP P1||PE(TS) – AP P2 – AP
	U_{ISO}	Test voltage	

[1] Connector socket for 2nd test probe for 2-pole measurement only with test instrument with feature H01

Table 79: Insulation Resistance Measurements – R_{INS}

15.8.1 Insulation Resistance Measurement: Application, Definition, Measuring Method

▶ **Class I DUTs**

- Measuring mode LN(TS) – PE(TS)
  - Mains plug DUT to test socket

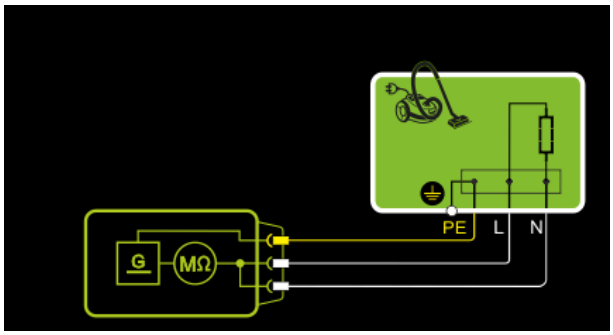


Fig. 53: Class I DUTs, schematic diagram

Insulation resistance is measured between short-circuited mains connections (L-N) and protective earth (PE).

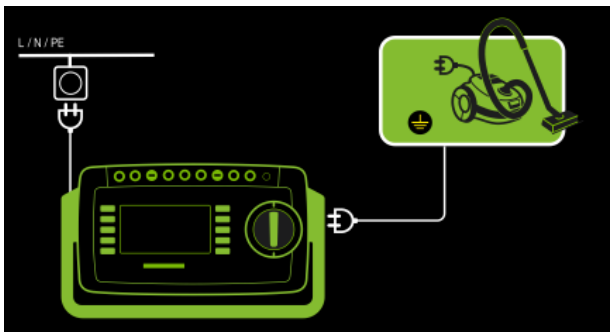


Fig. 54: Class I DUTs, connection diagram

▶ **Class II DUTs with accessible conductive parts**

- Measuring mode LN(TS) – P1
  - Mains plug DUT to test socket
  - Test probe P1 to P1 connections

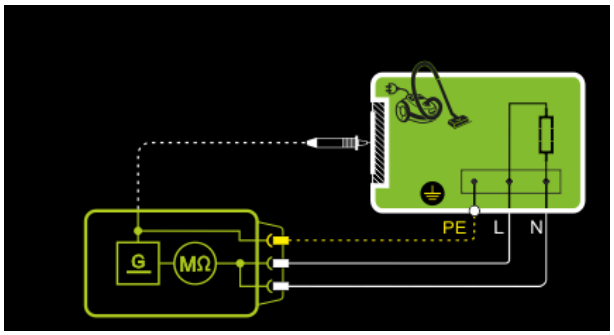


Fig. 55: Class I DUTs with accessible conductive parts, schematic diagram

Insulation resistance is measured between short-circuited mains connections (L-N) and the conductive parts that are accessible from the outside with test probe P1 and not connected to the housing.

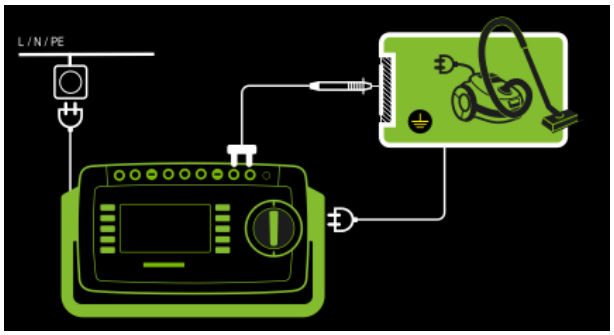


Fig. 56: Class II DUTs with accessible conductive parts, connection diagram

▶ **Class II DUTs with outputs for safety extra-low voltage**

- Measuring mode LN(TS) – P1
  - Mains plug DUT to test socket
  - Test probe P1 to P1 connections

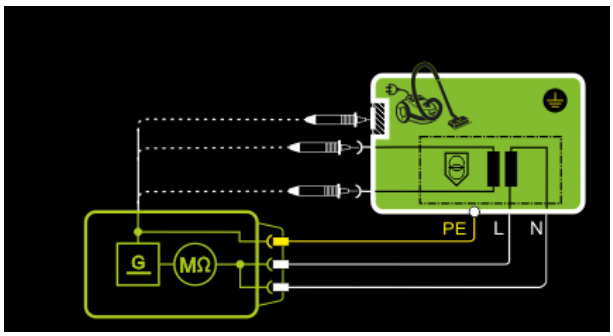


Fig. 57: Class II DUTs with outputs for safety extra-low voltage, schematic diagram

Insulation resistance is measured between short-circuited mains connections (L-N) and the short-circuited safety extra-low voltage outputs that are contacted with test probe P1.

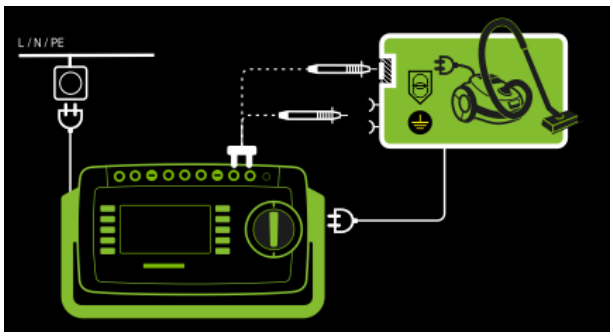


Fig. 58: Class II DUTs with outputs for safety extra-low voltage, connection diagram

▶ **Class I DUTs with outputs for safety extra-low voltage and accessible conductive parts**

- Measuring mode LN(TS) – P1
  - Mains plug DUT to test socket
  - Test probe P1 to P1 connections

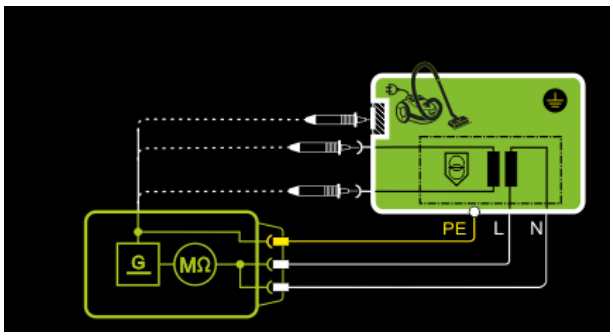


Fig. 59: Class I DUTs with outputs for safety extra-low voltage, schematic diagram

Insulation resistance is measured sequentially between short-circuited mains connections (L-N) and the safety extra-low voltage outputs accessible with test probe P1, as well as accessible conductive parts that are not connected to the housing.

If measurement points should be contacted one after another, this is indicated by a dashed line. However, in RINS measurement using the measurement parameter LN(TS) – P1||PE(TS), there are two parallel measurement paths that are established simultaneously against the short-circuited mains connections L and N: one insulation resistance is measured via PE at the test socket and, at the same time, a second insulation resistance is measured via Probe P1.

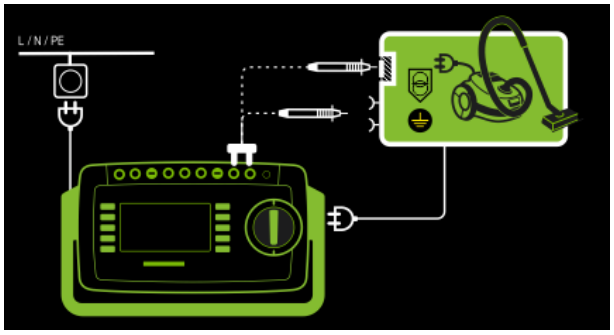


Fig. 60: Class I DUTs with outputs for safety extra-low voltage, connection diagram

▶ **2-pole measurement on Class I housing parts (only with feature H01)**

- Measuring mode P1 – P2

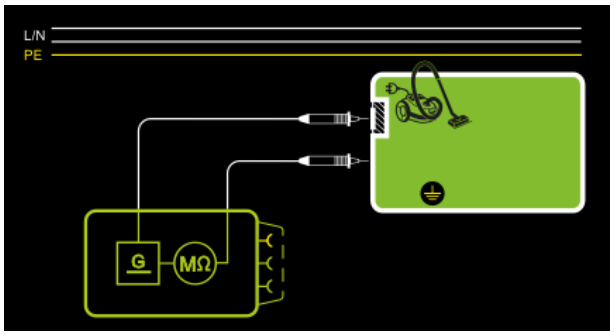


Fig. 61: 2-pole measurement on Class I housing parts, schematic diagram

Insulation resistance is measured between the conductive parts that are accessible from the outside with test probe P2 – and not connected to the housing – and the housing itself using test probe P1.

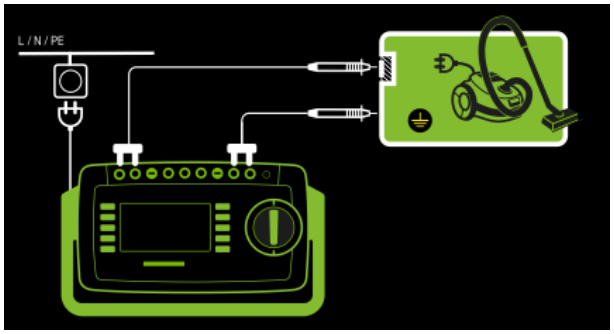


Fig. 62: 2-pole measurement on Class I housing parts, connection diagram

▶ **Special case: permanently installed Class I DUTs**

- Measuring mode PE(Mains) – P1
  - Test probe P1 to P1 connections

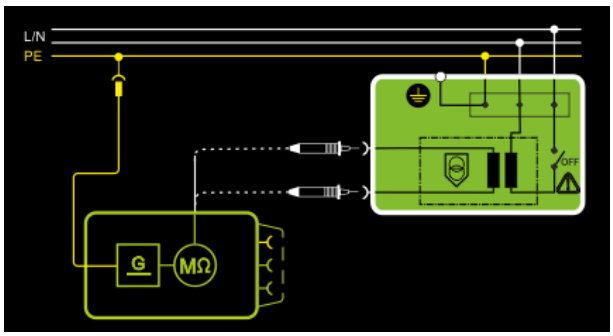


Fig. 63: Special case: permanently installed Class I DUTs, schematic diagram

Insulation resistance is measured sequentially between PE at the mains connection and the safety extra-low voltage inputs by contacting each of them with test probe P1.

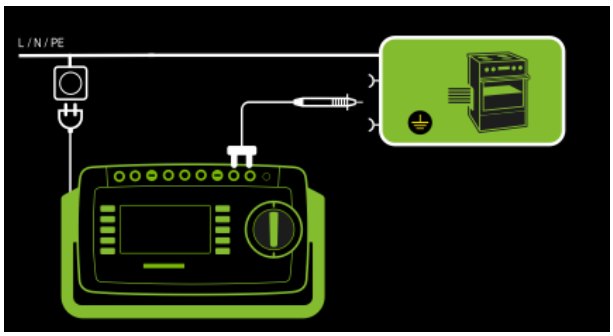


Fig. 64: Special case: permanently installed Class I DUTs, connection diagram

WARNING



Dangerous electrical voltage

For permanently connected DUTs, the mains supply of the DUT cannot be disconnected from the test instrument. The user must do this themselves in order to measure R_{PE} and R_{INS} accurately. There is a risk of injury due to electric shock.

— The test instrument may only be connected to a TN, TT or IT power supply network with a maximum of 264 V (rated voltage) that complies with applicable safety regulations (e.g., IEC 60346, VDE 0100) and is protected by a fuse or circuit breaker with a maximum rated current 16 A.

— Follow the safety instructions.

1. Remove the mains fuses from the DUT and disconnect neutral conductor N inside the DUT.
2. Connect test probe P1 to phase conductor L on the DUT to measure insulation resistance.

Class I DUTs with Connections for Electric Applied Parts

- Measuring mode PE(TS) – P1
  - Mains plug DUT to test socket
  - Test probe P1 to P1 connections

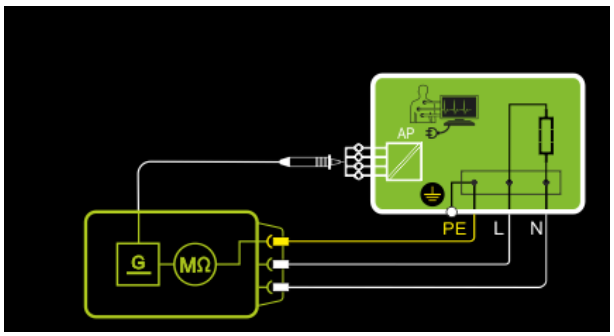


Fig. 65: Class I DUTs with connections for electric applied parts, schematic diagram

Insulation resistance is measured between the PE connection and short-circuited applied part connections that are accessible from the outside with test probe P1.

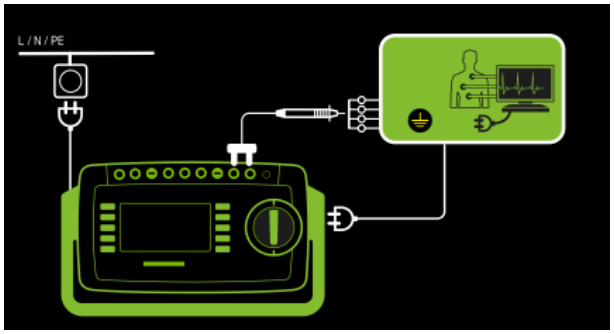


Fig. 66: Class I DUTs with connections for electric applied parts, connection diagram

Class I DUTs with Outputs for Safety Extra-Low Voltage

- Measuring mode PE(TS) – P1
  - Mains plug DUT to test socket
  - Test probe P1 to P1 connections

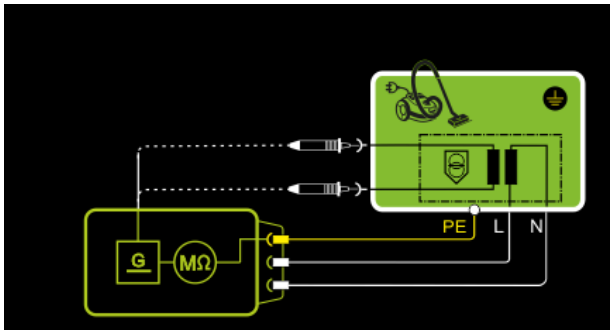


Fig. 67: Class I DUTs with outputs for safety extra-low voltage, schematic diagram

Insulation resistance is measured between the PE terminal and the safety extra-low voltage outputs, which must be contacted one after another with test probe P1.

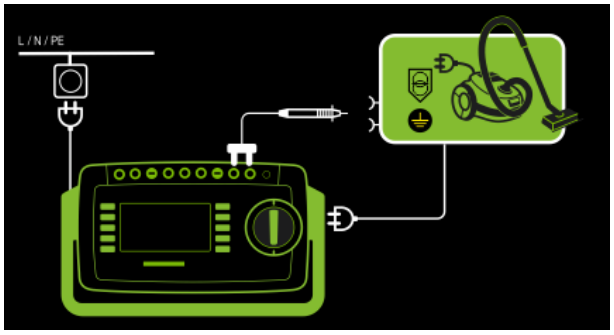


Fig. 68: Class I DUTs with outputs for safety extra-low voltage, connection diagram

Class I DUTs with Accessible Conductive Parts

- Measuring mode LN(TS) – P1||PE(TS)
  - Mains plug DUT to test socket
  - Test probe P1 to P1 connections

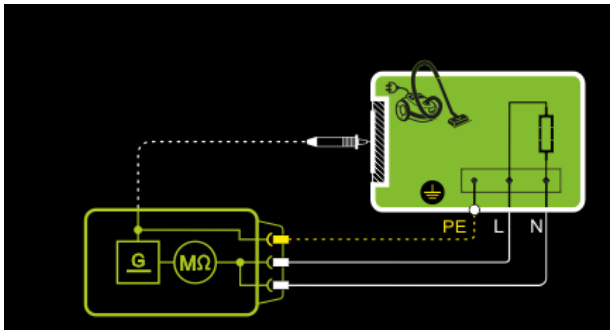


Fig. 69: Class I DUTs with accessible conductive parts, schematic diagram

Insulation resistance is measured between short-circuited mains connections (L-N) and the conductive parts that are accessible from the outside with test probe P1 and not connected to the housing, as well as the PE connection on the housing.

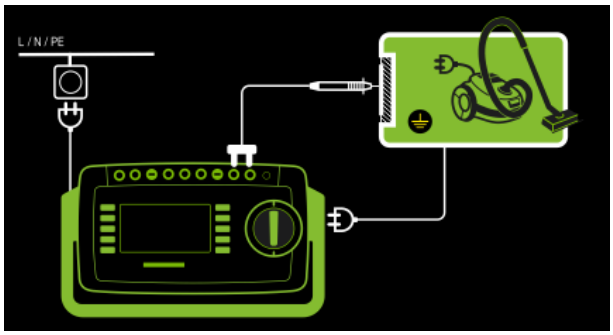


Fig. 70: Class I DUTs with accessible conductive parts, connection diagram

Class I DUTs with Connections for Electric Applied Parts

- Measuring mode LN(TS) – AP
  - Mains plug DUT to test socket
  - AP to AP socket(s)

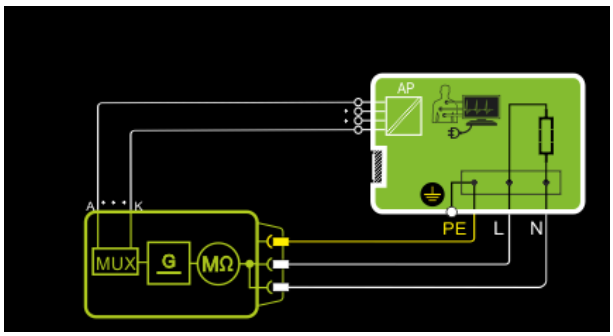


Fig. 71: Class I DUTs with connections for electric applied parts, schematic diagram

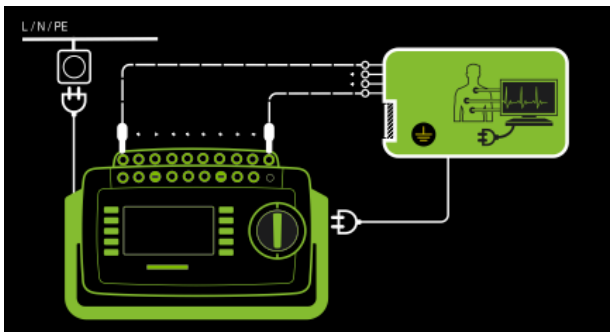


Fig. 72: Class I DUTs with connections for electric applied parts, connection diagram

Class I DUTs with Connections for Electric Applied Parts

- Measuring mode PE(Mains) – AP
  - Mains plug DUT to test socket
  - AP to AP socket(s)

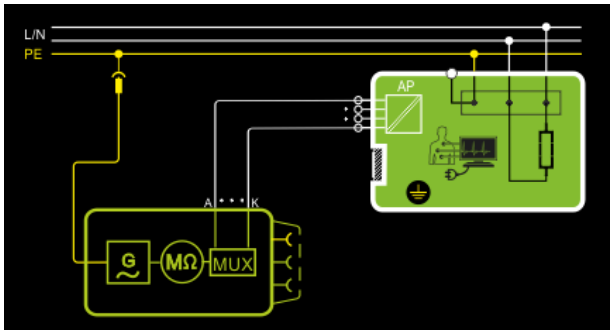


Fig. 73: Class I DUTs with connections for electric applied parts, schematic diagram

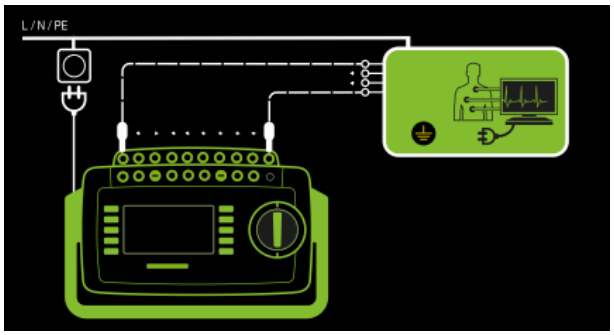


Fig. 74: Class I DUTs with connections for electric applied parts, connection diagram

Class I DUTs with Connections for Electric Applied Parts

- Measuring mode PE(TS) – AP
  - Mains plug DUT to test socket
  - AP to AP socket(s)

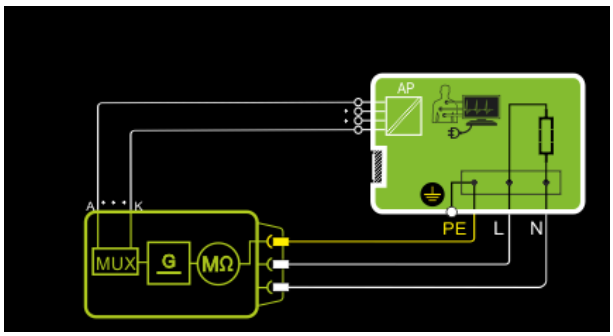


Fig. 75: Class I DUTs with connections for electric applied parts, schematic diagram

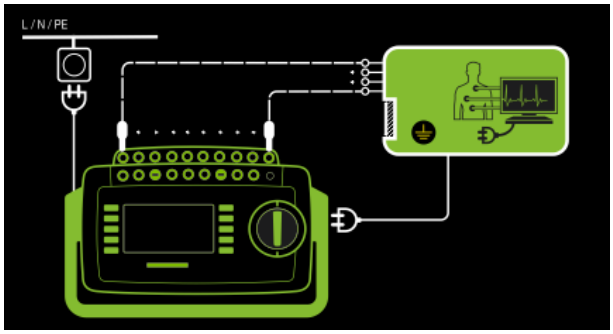


Fig. 76: Class I DUTs with connections for electric applied parts, connection diagram

Class I DUTs with Connections for Electric Applied Parts

- P1||PE(TS) – AP
  - Mains plug DUT to test socket
  - AP to AP socket(s)

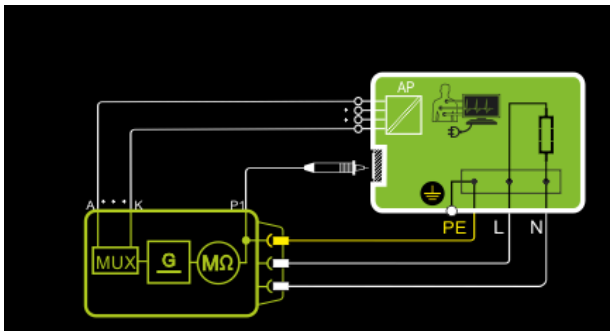


Fig. 77: Class I DUTs with connections for electric applied parts, schematic diagram

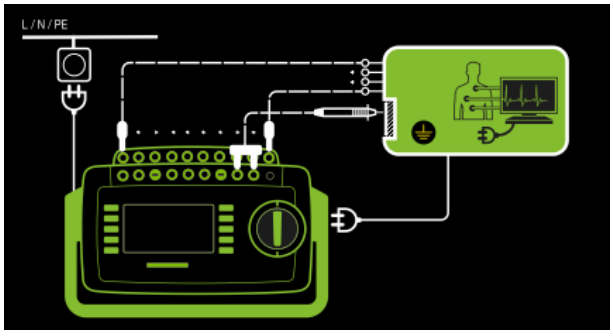


Fig. 78: Class I DUTs with connections for electric applied parts, connection diagram

Class I DUTs with Connections for Electric Applied Parts

- P2 – AP
  - Mains plug DUT to test socket

– AP to AP socket(s)

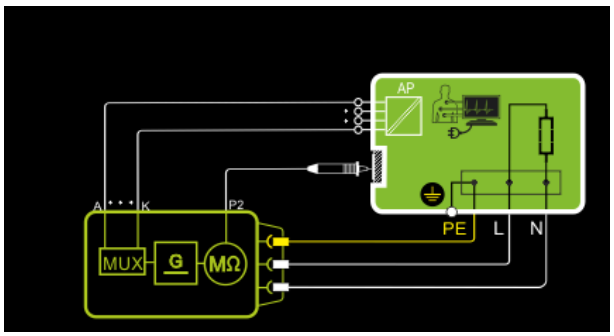


Fig. 79: Class I DUTs with connections for electric applied parts, schematic diagram

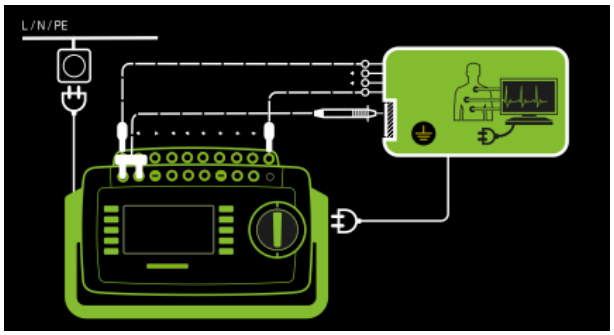


Fig. 80: Class I DUTs with connections for electric applied parts, connection diagram

15.8.2 Measurement Parameters for RINS

Measurement Parameter	Meaning	
Measuring Mode		**Suitable for DUT Connection**
LN(TS)-PE(TS)	Class I: Testing is performed between the short-circuited LN mains connections of the test socket and the PE terminal of the DUT.	Test socket, EL1, VL2E, AT3 Adapter (AT3-IIIE, AT3-IIS, AT3-IIS32), AT16DI/AT32DI, CEE Adapter
LN(TS)-P1	Testing is performed between the short-circuited LN mains connections of the test socket and test probe P1.	Test socket, VL2E, AT3 Adapter (AT3-IIIE, AT3-IIS, AT3-IIS32), AT16DI/AT32DI
P1 – P2	Feature H01: 2-pole measurement between test probes 1 and 2	Without terminal (Class III)
PE(Mains)-P1	Cable test: Testing is performed between the earth connection of the mains and test probe P1.	Permanent connection
PE(TS)-P1	Testing is performed between the PE terminal of the test socket and test probe P1.	Test socket
LN(TS)-P1 || PE(TS)	Testing is performed between the short-circuited LN mains connections of the test socket and test probe P1, including the PE of the test socket.	Test socket, VL2E, AT3 Adapter (AT3-IIIE, AT3-IIS, AT3-IIS32), AT16DI/AT32DI
LN(TS) – AP	Testing is performed between LN(TS) and selected AP sockets.	Test socket, VL2E, AT3 Adapter (AT3-I I I E, AT3-I IS, AT3-I IS32), AT16DI/AT32DI
PE(Mains) – AP	Testing is performed between PE(Mains) and selected AP sockets.	Permanent connection

Measurement Parameter	Meaning	
PE(TS) – AP	Testing is performed between PE(test socket) and selected AP sockets.	Test socket, VL2E, AT3 Adapter (AT3-I I I E, AT3-I IS, AT3-I IS32), AT16DI/AT32DI
P1 // PE(TS) – AP		Permanent connection
P2 – AP	Testing is performed between Probe P2 and selected AP sockets.	
AP – applied parts		
Single selection: A / B / C / D / E / F / G / H / I / K, each via on/off		
U_{ISO}(set)		
> 50 ... < 500 V	Variable test voltage can be entered with the numeric keypad.	

Table 80: Measurement parameters for R_{INS}

15.8.3 Insulation Resistance: Executing a Test

WARNING



Risk of electric shock when disconnecting the power supply cords! Risk of secondary accidents!

There is a risk of injury from electric shock when disconnecting the power supply cords during the test.

— Do not disconnect the power supply cord of the DUT until the test is ended, in order to ensure that the capacitors have been discharged.

WARNING



Risk of electric shock from touching the DUT during measurement! Risk of secondary accidents!

Testing is performed at up to 500 V. Although the current is limited (I < 3.5 mA), touching the DUT during measurement poses a risk of injury from an electric shock.

— Do not touch the DUT during measurement.

ATTENTION

Damage to the DUT

For sensitive electronic devices (e.g., certain electronic devices, computer equipment, or medical devices), some manufacturers have prohibited R_{INS} measurements.

— Read the operating instructions or service manual for the DUT to determine if an R_{INS} measurement is permissible.

ATTENTION

Damage to the DUT

In order to prevent damage to the DUT, measurement of insulation resistance may only be performed between applied parts, measurement inputs or interfaces and the protective earth or housing if the DUT is designed for measurements of this type.

— Tests/measurements may only be performed by a qualified electrician, or under the supervision and direction of a qualified electrician in the commercial sector. The user must be instructed by a qualified electrician on how to perform and rate the test or measurement.

— Follow the safety instructions.

NOTE

The testing person must ensure that an R_{INS} measurement is performed correctly. Otherwise, false measured values will be displayed. To do this, all switches on the DUT must be set to "On." This also applies to temperature-controlled switches or temperature controllers. For equipment with a program timer, measurements must be performed at all program stages.

NOTE

Measurement of insulation resistance must not be conducted on Class I DUTs that have not passed the protective earth resistance test. Otherwise, false measurement values will be displayed if the protective earth resistance test has failed.

▶ **Prepare a test procedure**

1. Set the rotary switch to the **R_{INS}** position.
2. Select the measuring mode by setting the parameters.
   Or
   Select the measuring mode via the **Set measuring mode** key.
3. Select the test voltage U_{ISO}(set).
4. Connect the DUT to the test socket.
   ↳ The test procedure has been prepared.

▶ **Start a test**

✓ The test procedure has been prepared.

1. Press the **START/STOP** key.
   ↳ The test begins.
2. Switch on the DUT. **ATTENTION!**
   The measurement is disabled if a voltage of > 25 V is measured between the connections.
   ↳ The measured values are displayed.
   ↳ The **Start rating** symbol appears on the right.
3. Click the **Start rating** key.
   ↳ The currently displayed measured value is saved in the buffer.
4. Switch off the DUT.

5. Press the **START/STOP** key.
   ↳ The test is ended.
   ↳ The **Save as** symbol appears (showing the number of cached measured values) and prompts you to save the measured values under a DUT ID number.
6. Read the measured values and compare them with the table of permissible limits.
7. Save the measured values under a DUT ID number.
8. To discard the cached measurement values, press the **ESC** key and confirm with the **OK** key.

15.8.4 Minimum Permissible Limits for Insulation Resistance

Test Standard	Test voltage	R_{INS}				
		LN→PE	LN→probe	Probe→ PE	Class III	Heating
VDE 0701-0702 / OEVE E 8701 / SNR 462638 EN 50678 / VDE 0701 EN 50699 / VDE 0702	500 V	1 MΩ	2 MΩ	–	0.25 MΩ	0.3 MΩ [1]
IEC 60974-4 / EN 60974-4 / VDE 0544-4		2 MΩ	5 MΩ	5 MΩ		

[1] With activated heating elements (if heating capacity > 3.5 kW and RINS < 0.3 MΩ: leakage current measurement is required)

Table 81: Minimum permissible limits for insulation resistance

Test Standard	Test Voltage	R_{INS}	
		Class I	Class II
IEC 62353 / EN 62353 / VDE 0751-1	500 V	2 MΩ	7 MΩ
		BF or CF	BF or CF
		70 MΩ	70 MΩ

NOTE

For Class II and III DUTs and for battery-powered DUTs, you must measure the insulation resistance and/or leakage current by contacting all accessible conductive parts with test probe P1.

For battery-powered DUTs, the battery must be disconnected during the measurement.

15.9 Electrical Strength Test – UHV

Only SECULIFE ST PRIME.

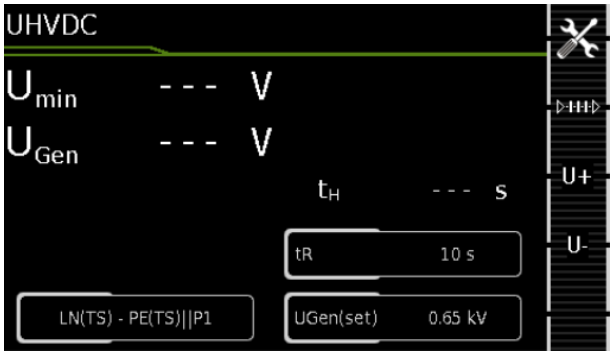


Fig. 81: UHVDC Test

DANGER



High voltage! Life endangering!

Testing is conducted with up to 6000 V. Terminals L or N at the test socket or the tip of the HV test pistol, along with all contacted parts (such as the DUT), carry this voltage.

Despite the current being limited to I < 3 mA, there is a risk of electric shock; due to capacitances in the DUT, for example – which lie outside the range of influence of the test instrument – the current may be even higher!

— During testing, do not touch the L or N terminals at the test socket, the test tip of test probe P1, the test tip of the HV test pistol, parts of the DUT or the conductive surface.
— Even after the test, make sure that all parts mentioned are discharged before touching the DUT.

DANGER



High voltage! Life endangering!

Residual voltages may still be present after releasing the button of the HV test pistol or after interrupting an ongoing measurement.

— Do not touch the test probe contacts or connected parts (such as the DUT).
— When using the probe or the test pistol, maintain the electrical connection to the DUT to enable the voltage to be dissipated.
— Always wait until discharging has been completed. The discharge time varies and depends on the capacity of the DUT.

Single Measurements – Switch Positions on the Green Rotary Switch Level			
Rotary Switch Position	**Measuring Functions**		**Measuring Mode without Mains to Test Socket**
U_{HV}	U_{min}	Measured minimum value of the test voltage during the test duration. For the test to be successful, this value must be at least equal to or greater than the set target voltage U_{Gen}(set).	LN(TS) – PE(TS)||P1 LN(TS) – P1 PHV – P1 [1]
	U_{Gen}	Current applied test voltage	

[1] Only with feature F02

Table 82: Electrical strength test – UHV

15.9.1 Electrical Strength Test: Application, Definition, Measuring Method

Class I and I+II DUTs

- Measuring mode LN(TS) – PE(TS)||P1
  - Mains plug DUT to test socket

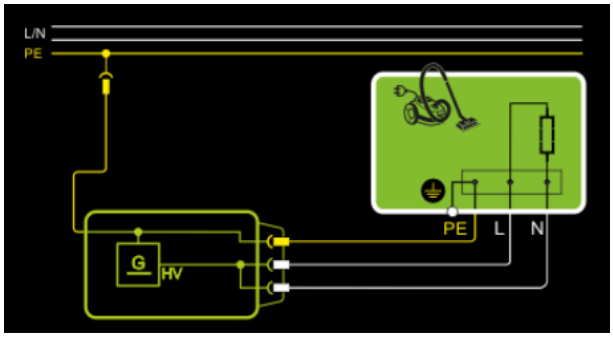


Fig. 82: Class I and I+II DUTs, schematic diagram

Testing is performed between short-circuited mains connections L and N of the test socket and protective earth (PE) of the test socket (while test probe P1 is parallel to the PE of the test socket).

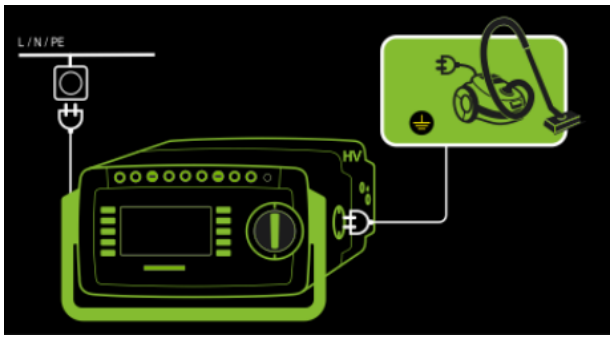


Fig. 83: Class I and I+II DUTs, connection diagram

Class II DUTs

NOTE

This measuring mode is only for Class II DUTs without PE.

- Measuring mode LN(TS) – P1
  - Mains plug DUT to test socket
  - Test probe P1 to P1 connections

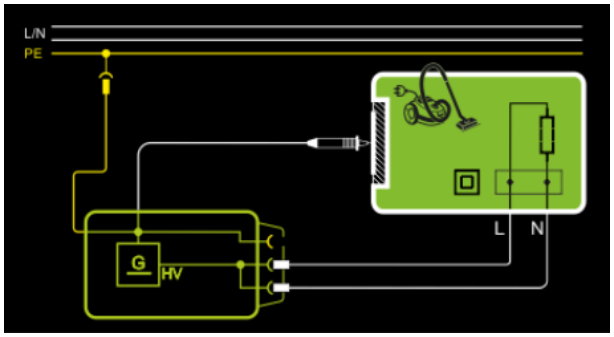


Fig. 84: Class II DUTs, schematic diagram

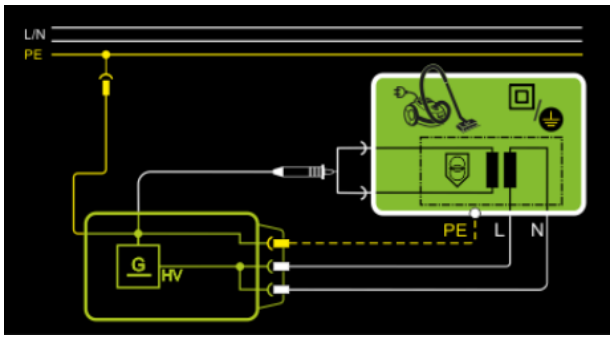


Fig. 85: Class II DUTs, schematic diagram

Testing is performed between short-circuited LN mains connections of the test socket and test probe P1 (connection via test socket).

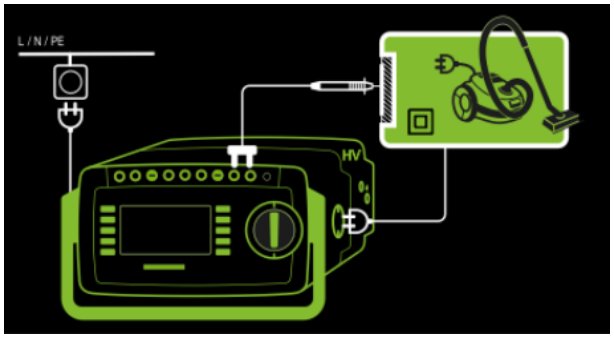


Fig. 86: Class II DUTs, connection diagram

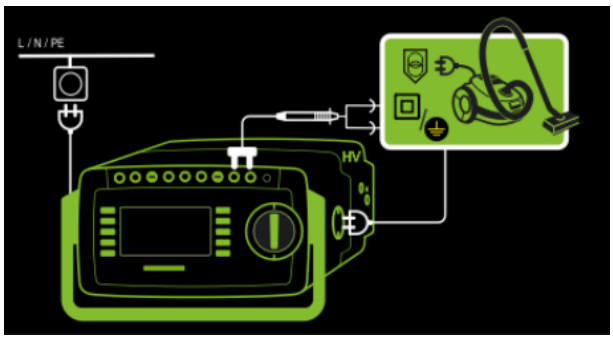


Fig. 87: Class II DUTs, connection diagram

Other or Any DUTs

- Measuring mode PHV – P1 [1]
  - Mains plug DUT to test socket (L, N, and PE of test socket are short-circuited and grounded)
  - HV test gun connected to the HV test gun terminal (optional)

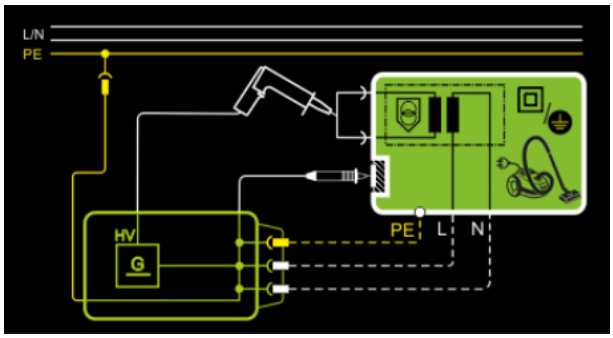


Fig. 88: Other or any DUTs, schematic diagram

Testing is performed between the high-voltage test gun (PHV) and test probe P1, and, if applicable, the L, N, and PE mains cables of the DUT.

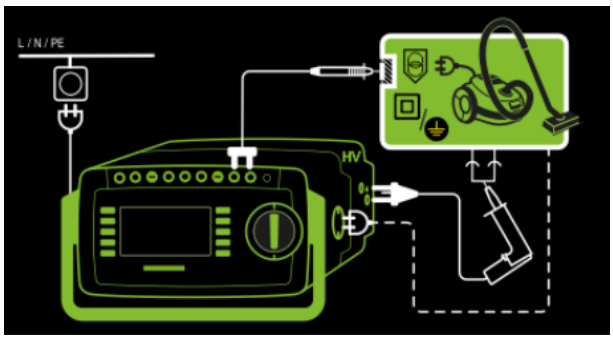


Fig. 89: Other or any DUTs, connection diagram

15.9.2 Measurement Parameters for UHV

Measurement Parameter	Meaning	
Measuring Mode		**Suitable for DUT Connection**
LN(TS)-PE(TS)||P1 [1]	Testing is performed between short-circuited L and N mains connections of the test socket and protective earth (PE) of the test socket (while test probe P1 is parallel to the PE of the test socket).	Test socket, and probe 1 if necessary for LN(TS)-PE(TS)||P1

[1] Only with feature F02

Measurement Parameter	Meaning	
LN(TS)-P1 [2]	Testing is performed between short-circuited LN mains connections of the test socket and test probe P1 (connection via test socket).	Test socket and probe 1 for LN(TS)-P1
PHV-P1 [3 4]	Testing is performed between the HV test gun (PHV) and test probe P1.	PHV and probe 1, and, if necessary, a test socket for L, N, and PE
U_{Gen}(set)		
≥ 50 ... ≤ 6000 V [5]	Variable test voltage can be entered with the numeric keypad.	
t_R		
≥ 1 ... ≤ 999 s	Variable test voltage can be entered with the numeric keypad. If the test fails during the rise time, increase the rise time and try again if necessary. Under certain circumstances, your DUT may contain certain capacitances, preventing the voltage from being increased quickly enough.	

1 Measuring mode for Class I or Class I+II DUTs that have a PE contact in the mains cable. The full test voltage of 6 kV cannot be used.

2 The PE of the test socket is also grounded. Measuring mode for Class II DUTs that do not have a PE contact in the mains cable. Test voltages up to 6 kV can be set.

3 Only with feature F02

4 All three contacts of the test socket (L, N, and PE) are short-circuited and grounded. This may simplify the generation of defined potentials on the DUT.

5 The actual usable voltage depends on the selected measuring mode and the test socket of your test instrument.

Table 83: Measurement parameters for UHV

15.9.3 Electrical Strength Test: Executing a Test

▶ **Prepare a test procedure**

1. Set the rotary switch to the **U_{HV}** position.
2. Select the measuring mode by setting the parameters.
   Or
   Select the measuring mode via the **Set measuring mode** key.
3. Select the test voltage U_{ISO}(set). Use the **U–** and **U+** key to directly access the test voltage parameters. Each time you press one of these keys, the setting value U_{Gen}(set) displayed in the measurement window is decreased or increased by 50 V.
4. Set the variable rise time by adjusting the parameters.
5. Connect the DUT.
   ↳ The test procedure has been prepared.

▶ **Start a test**

✓ The test procedure has been prepared.

1. Press the **START/STOP** key.
   ↳ The test begins.
2. Switch on the DUT.
   ↳ The measured values are displayed.
   ↳ The **Start rating** symbol appears on the right.
3. Click the **Start rating** key.
   ↳ The currently displayed measured value is saved in the buffer.

4. Switch off the DUT.
5. Press the **START/STOP** key.
   ↳ The test is ended.
   ↳ The **Save as** symbol appears (showing the number of cached measured values) and prompts you to save the measured values under a DUT ID number.
6. Read the measured values and compare them with the table of permissible limits.
7. Save the measured values under a DUT ID number.
8. To discard the cached measurement values, press the **ESC** key and confirm with the **OK** key.

NOTE

The electrical strength test is considered passed only if tH > 0 and the set test voltage was reached and maintained!

15.10 Leakage Current Measurement

WARNING

Risk of electric shock from touching the DUT during measurement! Risk of secondary accidents!

When performing leakage current measurements – with either the direct or differential current measuring method – it is essential to ensure that the DUT is operating under mains voltage during the measurement. Accessible conductive parts may conduct a dangerous touch voltage during testing and cause injuries due to electric shock.

The mains power is shut off if the leakage current > approx. 10 mA (switchable to 30 mA).

— Do not touch the DUT during measurement.

For all leakage current measurements (I_{PE}, I_T, I_E, I_P)) (direct, differential, alternative), the frequency response is taken into account as shown in the following figure:

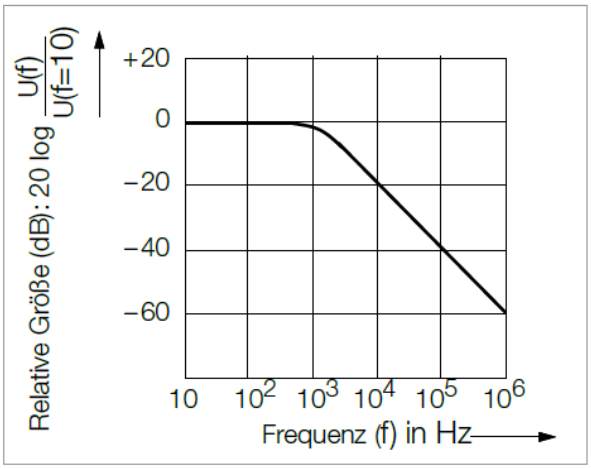


Fig. 90: Frequency Response

15.10.1 Protective Conductor Current – IPE

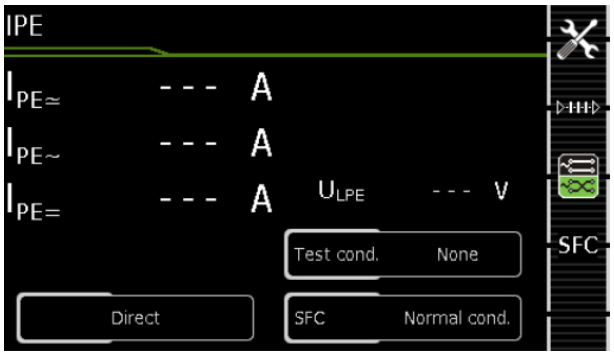


Fig. 91: Protective conductor current – IPE

Single Measurements – Switch Positions on the Green Rotary Switch Level				
Rotary Switch Position	**Measuring Mode with Mains to Test Socket**	**Measuring Mode without Mains to Test Socket**	**Measuring Functions**	
I_{PE}	Direct		I_{PE}≂	Protective conductor current, RMS
			I_{PE}~	AC component
			I_{PE}=	DC component
			U_{LPE}	Mains voltage
	Differential		I_{PE}≂	Protective conductor current, RMS
			U_{LPE}	Mains voltage
		Alternative	I_{PE}≂	Protective conductor current, RMS
			U_{Gen}	Test voltage
	AT3 Adapter [1]		I_{PE}≂	Protective conductor current, RMS
			U_{LPE}	Mains voltage
	AT16/32DI Diff.		I_{PE}≂	Protective conductor current, RMS
			U_{LPE}	Mains voltage
		Clamp [2]	I_{PE}≂	Protective conductor current, RMS
			U_{LPE}	Mains voltage

[1] Adapter AT3-IIIE, AT3-IIS or AT3-II S32: Voltage measurement inputs for leakage current measurement with the differential method only for a test instrument with feature I01.

[2] Voltage measurement inputs for leakage current measurement with the differential method and a current clamp sensor only with test instrument with feature I01.

Table 84: Protective conductor current – IPE

15.10.1.1 Protective Conductor Current: Application, Definition, Measuring Method

Application

For Class I DUTs, the protective conductor current must be measured.

Definition

Protective conductor current (direct measurement)	Current that flows through the protective earth in housings that are insulated from ground.
Differential current	The sum of the instantaneous values of all currents that flow through the L and N conductors at the mains connection of a DUT. In the event of a fault, the differential current is practically identical to the ground fault.
Ground current	Current that is caused by an insulation fault and flows through the fault point.
Alternative measuring method (equivalent leakage current)	Equivalent leakage current is current that flows through the interconnected active conductors (L/N) of the DUT to the protective earth (Class I) or to the accessible conductive parts (Class II).

Measuring Method

Measuring method: differential current	The DUT is operated with mains voltage. The sum of the instantaneous values of all currents that flow through all active conductors (L/N) at the test instrument's mains-side connection is measured. The measurements must be performed using both connection polarities of the mains plug.
Alternative measuring method (equivalent leakage current)	A high-impedance voltage source is connected between the short-circuited mains terminals and the (interconnected) accessible metal parts of the housing. The current flowing through the insulation of the DUT is measured.
Protective conductor current measuring method (direct measurement)	The DUT is operated with mains voltage. Current that flows through the PE conductor to ground at the mains side of the test instrument connection is measured.

NOTE

Regardless of the currently set connection type, all help images and connection diagrams can be opened for the selected measuring function.

Direct Measuring Method

- Measuring mode Direct
  - Mains plug DUT to test socket

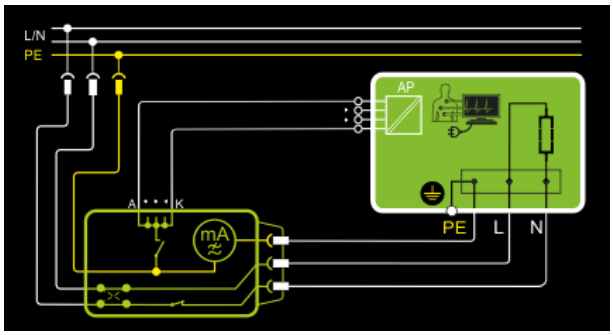


Fig. 92: Direct measuring method, schematic diagram

The DUT is operated with mains voltage.

Protective conductor current is measured between the protective earth of the mains and the PE connector on the DUT via the mains power cable of the test instrument.

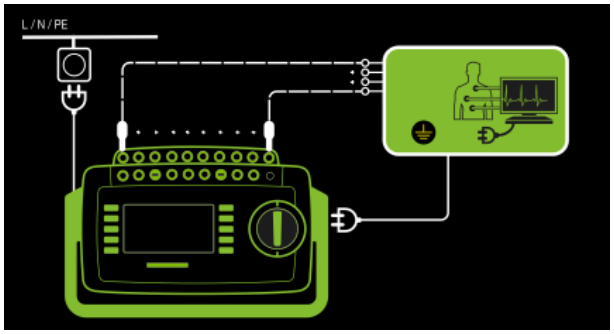


Fig. 93: Direct measuring method, connection diagram

Differential Current Measuring Method

- Measuring mode Differential
  - Mains plug DUT to test socket

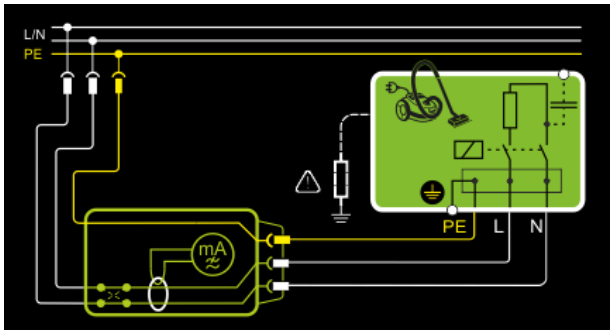


Fig. 94: Differential current measuring method, schematic diagram

The DUT is operated with mains voltage. Differential current is measured between mains conductors L and N (current clamp method).

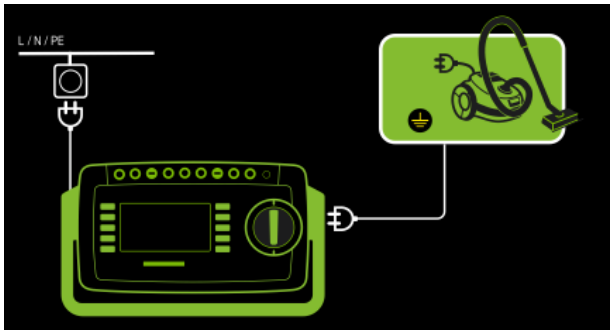


Fig. 95: Differential current measuring method, connection diagram

Alternative Measuring Method (equivalent leakage current)

- Measuring mode Alternative
  - Mains plug DUT (Class I) to test socket

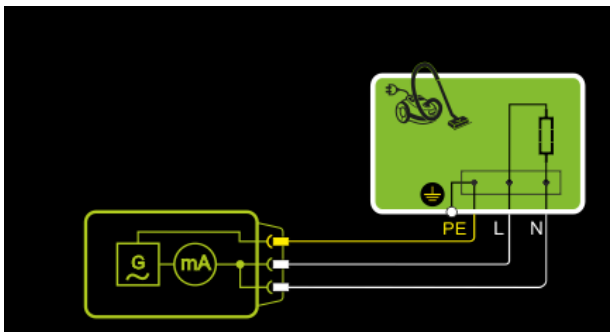


Fig. 96: Alternative measuring method (equivalent leakage current), schematic diagram

The leakage current is measured after the test voltage is applied between the short-circuited mains conductors L-N and the PE connector on the DUT via the mains power cable of the DUT.

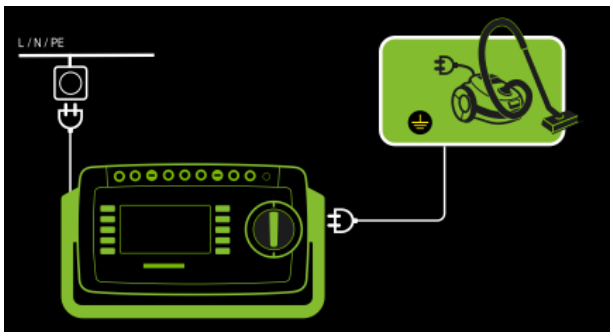


Fig. 97: Alternative measuring method (equivalent leakage current), connection diagram

Connection of 3-Phase DUTs (only with feature I0 and optional test adapter AT3)

- Measuring mode AT3 Adapter
  - Mains plug DUT to test adapter AT3
  - Probe AT3 to COM-V connections
  - Test plug AT3 to test socket

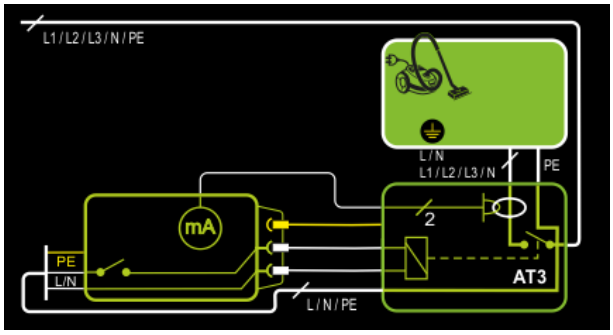


Fig. 98: Connection of 3-phase DUTs, schematic diagram

Measurement of the DUT with a 3-Phase Mains Connection via Adapter AT3

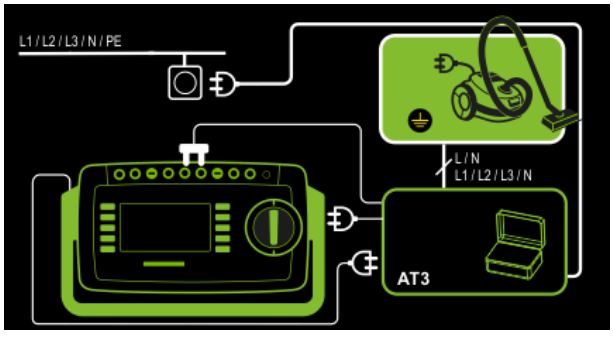


Fig. 99: Connection of 3-phase DUTs, connection diagram

Measurement of Protective Conductor Current Using a Current Clamp Sensor with Voltage Output for Permanently Installed DUTs (only with feature I0 and optional current clamp sensor)

- Measuring mode Clamp

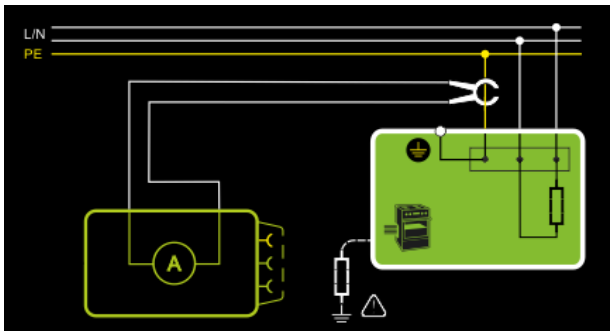


Fig. 100: Measurement of protective conductor current using a current clamp sensor with voltage output for permanently installed DUTs, schematic diagram

Measurement of Protective Conductor Current by Closing the Current Clamp Sensor around Mains Cable PE for Permanently Installed Class I DUTs

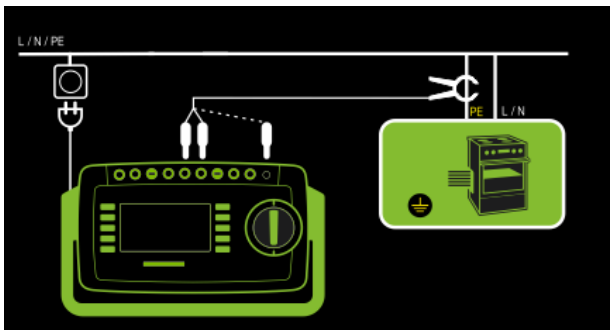


Fig. 101: Measurement of protective conductor current using a current clamp sensor with voltage output for permanently installed DUTs, connection diagram (current clamp sensor to COM-V)

Setting the Measuring Range on the Clamp and Parameters in Devices with Feature G01

SECUTEST ST PRO	Clamp		SECUTEST ST PRO
Transformation Ratio Parameter	**Transformation Ratio (Switch, only for WZ12C)**	**Measuring Range**	**Display Range with Clamp**
1 mV : 1 mA	WZ12C		0 mA ... 300 A
	1 mV : 1 mA	1 mA ... 15 A	
100 mV : 1 mA	SECUTEST CLIP		
	100 mV : 1 mA	0.1 ... 25 mA	0.00 mA ... 3.00 A

Table 85: Setting the measuring range on the clamp and parameters in devices with feature G01

15.10.1.2 Measurement Parameters for IPE

Measurement Parameter	Meaning	
Measuring Mode		**Suitable for DUT Connection**
Direct	Direct measuring method	Test socket, AT16DI/AT32DI (direct)
Differential	Differential current measuring method	Test socket
Alternative	Equivalent leakage current measuring method	Test socket, VL2E, AT3 Adapter (AT3-IIIE, AT3-IIS, AT3-IIS32), AT16DI/AT32DI

Measurement Parameter	Meaning	
AT3 Adapter	Feature I01: Measurement with AT3 Adapter	AT3-IIIE, AT3-IIS, AT3-IIS32
Clamp	Feature I01: Measurement of protective conductor current using a current clamp sensor with voltage output, as well as conversion and display of the results as current values.	Permanent connection
AT16/32DI Diff	Differential current measuring method	AT16DI, AT32DI (any toggle switch on the adapter must be set to **Differential**)
Test cond. – Test conditions – only for Direct measuring mode		
None AP > PE: Connect AP to PE; all AP sockets are connected to PE potential when this option is activated.		
Single fault (SFC) – only for Direct measuring mode		
Normal state	No single-fault simulation active	
N interrupted	Fault simulation – only phase and protective earth are connected to the DUT [1]	
Polarity [2] – only for Direct, Differential, AT3 Adapter [3] and AT 16/32DI Diff measuring mode [3]		
Normal polarity	Selection of polarity for mains voltage at the test socket	
Reverse polarity		
Factor V:A – only for Clamp measuring mode		
1 mV : 1 mA	Transformation ratio of the WZ12C current clamp sensor To set the current clamp factor on the WZ12C clamp and SECUTEST ST PRO, see the table above.	
10 mV : 1 mA		
100 mV:1 mA	Transformation ratio of the SECUTEST CLIP current clamp sensor For setting the current clamp factor on SECUTEST ST PRO	
1 V : 1 A		

[1] Only suitable for connecting the DUT to the test socket. Not suitable for measurements with adapter AT16DI or AT32DI.

[2] For the Direct and Differential measuring modes, measurement must be performed for both mains polarities (when connected using 3-phase adapters, the polarity selected on the test instrument is irrelevant). The largest value must be used for limit assessment.

[3] The Polarity parameter only affects the DUT when the DUT is connected directly to the test socket, not when using 3-phase adapters.

Table 86: Measurement parameters for I_{PE}

When testing in accordance with product standards (e.g., EN 61010 or EN 60335), measurements must be performed under all fault conditions. For testing after a repair or for periodic testing, it is usually sufficient to perform the measurement in the Normal State setting.

15.10.1.3 Protective Conductor Current Measurement: Executing a Test

▶ **Prepare a test procedure: Direct measuring method**

✓ The measurement parameters **Ref.voltage L-PE** and **Testingfreq Alt.** in **SETUP** are set correctly.

1. Set the rotary switch to the I_{PE} position.
2. Select the **Direct** measuring mode by setting the parameters.
   Or
   Select the **Direct** measuring mode via the **Set measuring mode** key.
3. Connect the DUT via its mains plug (Class I) to the test socket of the test instrument.

4. Make sure that the DUT is switched off.
   ↳ The test procedure has been prepared.

▶ **Prepare a test procedure with AT3-IIIE Adapter – Differential current method**

NOTE



For information on the correct connection of the test adapter and the DUT, as well as any special considerations during testing, please refer to the operating instructions for the AT3-IIIE test adapter.

✓ The measurement parameters **Ref.voltage L-PE** and **Testingfreq Alt.** in **SETUP** are set correctly.

1. Set the rotary switch to the I_{PE} position.
2. Select the **Differential** measuring mode by setting the parameters.
   Or
   Select the **Differential** measuring mode via the **Set measuring mode** key.
3. Connect the DUT via its mains plug (Class I) to the test socket of the test instrument.
   ↳ The test procedure has been prepared.

▶ **Prepare a test procedure with Adapter AT3-IIIE – Alternative measuring method**

✓ The measurement parameters **Ref.voltage L-PE** and **Testingfreq Alt.** in **SETUP** are set correctly.

1. Set the rotary switch to the I_{PE} position.
2. Select the **Alternative** measuring mode by setting the parameters.
   Or
   Select the **Alternative** measuring mode via the **Set measuring mode** key.
3. Connect the DUT via its mains plug (Class I) to the test socket of the test instrument.
4. Make sure that the DUT is switched off.
   ↳ The test procedure has been prepared.

▶ **Execute a test**

✓ The test procedure has been prepared.

1. Press the **START/STOP** key.
   ↳ The test begins.
2. The measurement must be performed using both connection polarities of the mains plug. Press the **Normal polarity** or **Reverse polarity** softkey to switch the polarity.
3. Confirm the warning which indicates that mains voltage will be connected to the test socket.
4. Switch on the DUT.
   ↳ The measured values are displayed.
   ↳ The **Start rating** symbol appears on the right.
5. Click the **Start rating** key.
   ↳ The currently displayed measured value is saved in the buffer.
6. Switch off the DUT.
7. Press the **START/STOP** key.
   ↳ The test is ended.
   ↳ The **Save as** symbol appears (showing the number of cached measured values) and prompts you to save the measured values under a DUT ID number.
8. Read the measured values and compare them with the table of permissible limits.
9. Save the measured values under a DUT ID number.

10. To discard the cached measurement values, press the **ESC** key and confirm with the **OK** key.

Maximum Permissible Limits for Protective Conductor Current in mA

Test Standard	I_{PE}
VDE 0701-0702 / OEVE E 8701 / SNR 462638 EN 50678 / VDE 0701 EN 50699 / VDE 0702	Class I: 3.5 1 mA/kW[1]
IEC 60974-4 / EN 60974-4 / VDE 0544-4	5 mA
IEC 62368 / EN 62368 / VDE 0868-1	For ES2 5 mA AC 25 mA DC

[1] For DUTs with heating capacity > 3.5 kW

Table 87: Maximum permissible limits for protective conductor current in mA

15.10.2 Touch Current – IT

NOTE

When measuring touch current on multiphase DUTs with the measuring modes **Direct P1**, **Differential P1** and **Perman. Con. P1**, it must be ensured that all non-conductively interconnected parts are also contacted and measured one after another and that the worst value is determined/rated. Interconnecting all accessible parts for the measurement can cause leakage currents from different phases to cancel each other out so that dangerous live parts are not noticed!

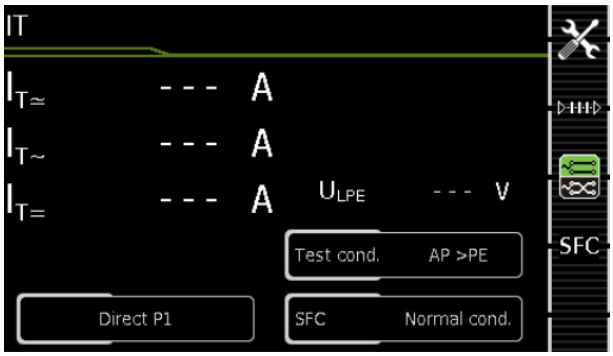


Fig. 102: Touch Current

Single Measurements – Switch Positions on the Green Rotary Switch Level				
Rotary Switch Position	**Measuring Mode with Mains to Test Socket**	**Measuring Mode without Mains to Test Socket**	**Measuring Functions**	
I_T	Direct P1		$I_{T\simeq}$	Touch current, RMS
			$I_T\sim$	AC component
			$I_T=$	DC component
			U_{LPE}	Mains voltage
	Differential P1		$I_{T\simeq}$	Touch current, RMS
			U_{LPE}	Mains voltage
		Alternative P1	$I_{T\simeq}$	Touch current, RMS
			U_{Gen}	Test voltage (alternative method)

Single Measurements – Switch Positions on the Green Rotary Switch Level				
Rotary Switch Position	**Measuring Mode with Mains to Test Socket**	**Measuring Mode without Mains to Test Socket**	**Measuring Functions**	
		Perman. Con. P1	$I_{T\simeq}$	Touch current, RMS
			$I_{T\sim}$	AC component
			$I_{T=}$	DC component
			U_{LPE}	Mains voltage
		Alternative P1-P2	$I_{T\simeq}$	Touch current, RMS
			U_{LPE}	Mains voltage

Table 88: Touch Current – IT

15.10.2.1 Touch Current: Application, Definition, Measuring Method

Application

Make sure that the contacted parts are not inadvertently grounded.

Definition

Current that flows from housing parts that are not connected to the protective earth via an applied external conductive connection to ground or another part of the housing. In this case, current flow through the protective earth is excluded.

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

Direct Measuring Method

- Measuring mode Direct P1
  - Mains plug DUT to test socket
  - Test probe P1 to P1 connections

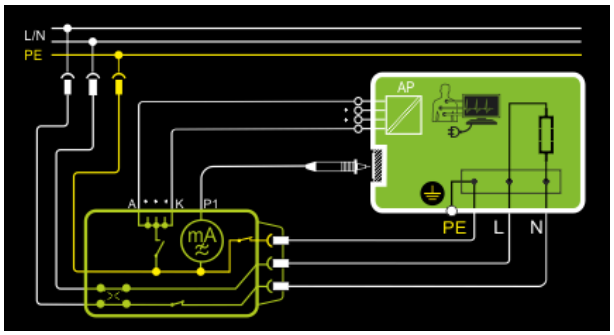


Fig. 103: Direct measuring method, schematic diagram

The DUT is operated with mains voltage.

Current that flows to the protective earth via accessible conductive parts and via the probe is measured. The measurements must be performed using both connection polarities of the mains plug. The polarity is reversed with the Polarity softkey. The RMS, AC or DC component of the current is measured.

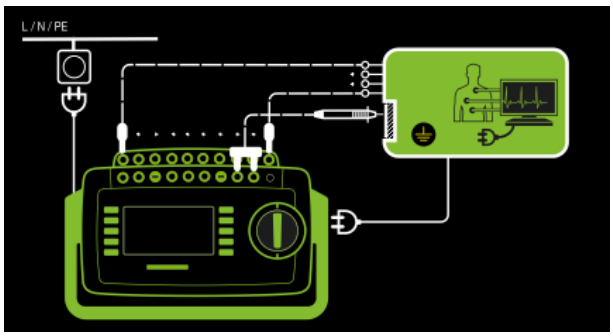


Fig. 104: Direct measuring method, connection diagram

NOTE

For Class I DUTs: Parts may or may not be grounded. Accidental grounding only occurs in the event of a fault.

Differential Current Measuring Method

- Measuring mode Differential P1
  - Mains plug DUT to test socket
  - Test probe P1 to P1 connections

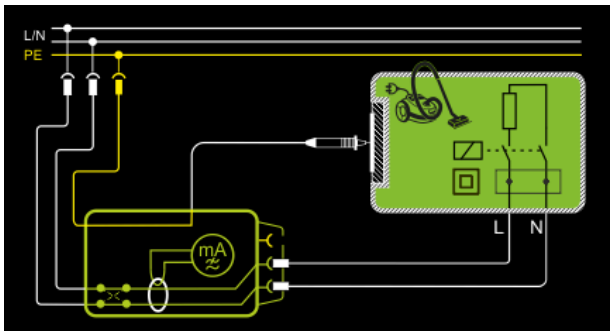


Fig. 105: Differential current measuring method, schematic diagram

The DUT (Class II) is operated with mains voltage.

Differential current that flows via the two mains conductors is measured (current clamp measurement method). The measurements must be performed using both connection polarities of the mains plug. The polarity is reversed with the **Polarity** softkey. The AC component of the current is measured. Accessible conductive parts must be contacted with test probe P1.

NOTE

Use the differential current method only to determine touch current on Class II DUTs.

(For Class I DUTs, the measured value includes full protective conductor current due to the measuring method).

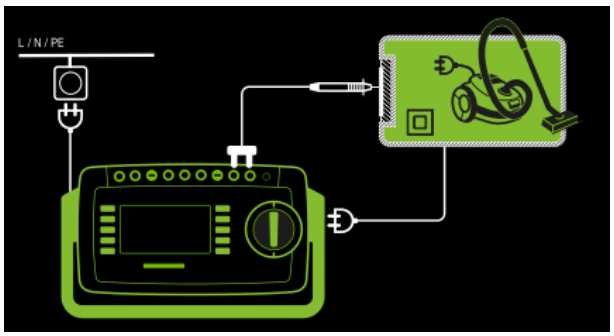


Fig. 106: Differential current measuring method, connection diagram

Alternative Measuring Method (equivalent leakage current)

- Measuring mode Alternative P1
  - Mains plug DUT to test socket
  - Test probe P1 to P1 connections

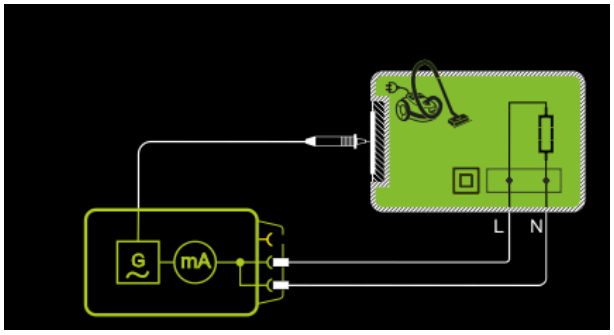


Fig. 107: Alternative measuring method (equivalent leakage current), schematic diagram

The leakage current is measured after the test voltage is applied between the short-circuited mains conductors L-N (DUT mains plug) and accessible conductive parts (probe contact).

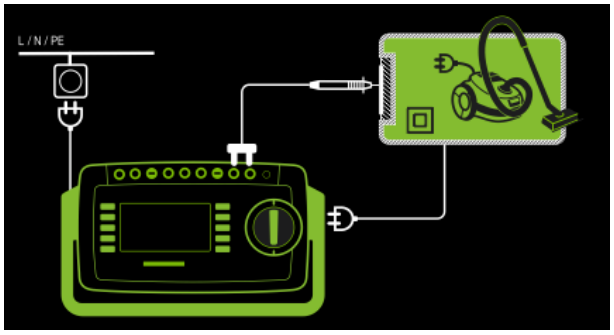


Fig. 108: Alternative measuring method (equivalent leakage current), connection diagram

Direct Measuring Method for Permanently Installed DUTs

- Measuring mode Permanent Connection P1
  - Test probe P1 terminal to P1 connections

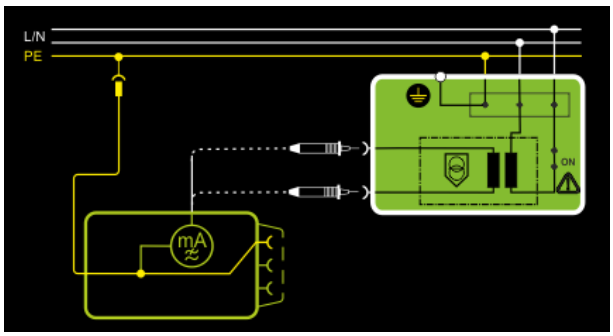


Fig. 109: Direct measuring method for permanently installed DUTs, schematic diagram

The DUT is operated with mains voltage from a permanent installation. Leakage current is measured sequentially between the protective earth of the mains and the output sockets for safety extra-low voltage on the DUT using the test probe. Furthermore, any accessible conductive parts that are not connected to the housing must also be contacted.

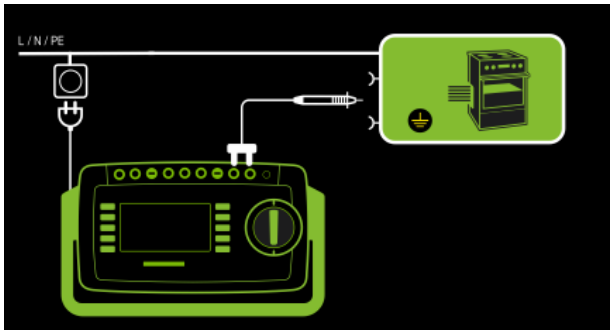


Fig. 110: Direct measuring method for permanently installed DUTs, connection diagram

Alternative Measuring Method with 2-Pole Measurement (P1–P2)

- Measuring mode Alternative P1 – P2
  - Test probe P1 to P1 connections
  - Test probe P2 to P2 connections

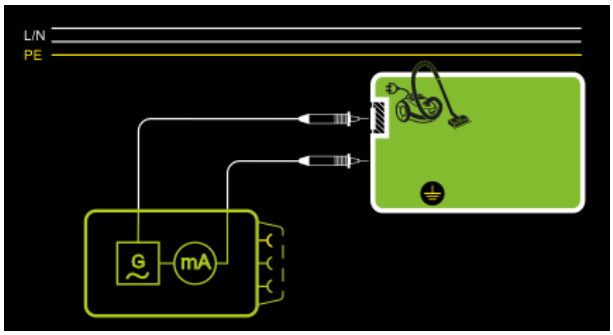


Fig. 111: Alternative measuring method with 2-pole measurement, schematic diagram

Touch current is measured between the conductive parts that are accessible from the outside with test probe P2 – and not connected to the housing – and the housing using test probe P1.

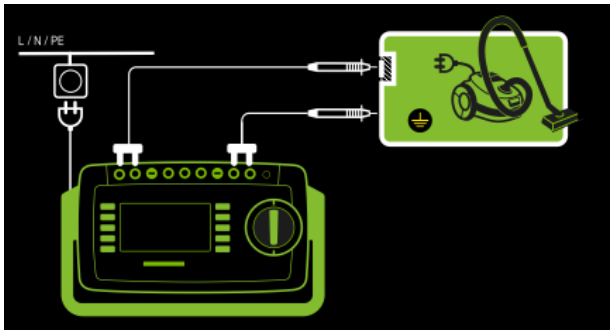


Fig. 112: Alternative measuring method with 2-pole measurement, connection diagram

15.10.2.2 Measurement Parameters for IT

Measurement Parameter	Meaning	
Measuring Mode		**Suitable for DUT Connection**
Direct P1	Direct measuring method	Test socket, AT3 Adapter (AT3-IIIE, AT3-IIS, AT3-IIS32), AT16DI/ AT32DI
Differential P1	Differential current measuring method	Test socket
Alternative P1	Equivalent leakage current measuring method	Test socket, AT3 Adapter (AT3-IIIE, AT3-IIS, AT3-IIS32), AT16DI/ AT32DI, VL2E
Perman. Con. P1	Permanently installed DUT	Permanent connection
Alternative P1-P2	Equivalent leakage current measuring method with feature H01	Without terminal Class III: 2-pole measurement between test probes 1 and 2
Test cond. – Test conditions – only for Direct P1 and Permanent Connection P1 measuring mode		
None AP > PE: Connect AP to PE; all AP sockets are connected to PE potential when this option is activated.		
Single Fault (SFC) – only for Direct P1 measuring mode		
Normal state	No single-fault simulation active	
N interrupted	Fault simulation – only phase and protective earth are connected to the DUT[1]	
PE interrupted	Fault simulation active – protective earth is disconnected from the DUT for the duration of the measurement	
Polarity[2]– only for Direct, Differential and AT3 Adapter measuring mode		
Normal polarity	Selection of polarity for mains voltage at the test socket	
Reverse polarity		

1 Only suitable for connecting the DUT to the test socket. Not suitable for measurements with adapter AT16DI or AT32DI.

2 For the Direct and Differential measuring modes, measurement must be performed for both mains polarities (when connected using 3-phase adapters, the polarity selected on the test instrument is irrelevant). The largest value must be used for limit assessment.

Table 89: Measurement parameters for IT

When testing in accordance with product standards (e.g., EN 61010 or EN 60335), measurements must be performed under all fault conditions. For testing after a repair or for periodic testing, it is usually sufficient to perform the measurement in the Normal State setting.

15.10.2.3 Touch Current Measurement: Executing a Test

▶ **Prerequisites for touch current measurement**

- The visual inspection was passed.
- For Class I DUTs: The protective earth resistance test was passed.
- The insulation resistance test was passed.

▶ **Prepare a test procedure: Direct and differential current method**

✓ The measurement parameters **Ref.voltage L-PE** and **Testingfreq Alt.** in **SETUP** are set correctly.

1. Set the rotary switch to the I_T position.
2. Select the **Direct P1** or **Differential P1** measuring mode by setting the parameters.
   Or
   Select the **Direct P1** or **Differential P1** measuring mode via the **Set measuring mode** key.
3. The measurement must be performed using both connection polarities of the mains plug. Press the **Normal polarity** or **Reverse polarity** softkey to switch the polarity.
4. Connect the DUT via its mains plug (Class II) to the test socket of the test instrument.
5. Testing is performed in the presence of mains voltage.

   ↳ The test procedure has been prepared.

▶ **Execute a test: Direct and differential current method**

✓ The test procedure has been prepared.

1. Press the **START/STOP** key.

   ↳ The test begins.
2. Confirm the warning which indicates that mains voltage will be connected to the test socket.
3. Switch on the DUT.
4. Use test probe P1 to contact all accessible conductive parts that are not connected to the housing, one after the other.

   ↳ The measured values are displayed.

   ↳ The **Start rating** symbol appears on the right.
5. Click the **Start rating** key.

   ↳ The currently displayed measured value is saved in the buffer.
6. Switch off the DUT.
7. Press the **START/STOP** key.

   ↳ The test is ended.

   ↳ The **Save as** symbol appears (showing the number of cached measured values) and prompts you to save the measured values under a DUT ID number.
8. Read the measured values and compare them with the table of permissible limits.
9. Save the measured values under a DUT ID number.
10. To discard the cached measurement values, press the **ESC** key and confirm with the **OK** key.

▶ **Prepare a test procedure: Alternative measuring method Alternative P1**

✓ The measurement parameters **Ref.voltage L-PE** and **Testingfreq Alt.** in **SETUP** are set correctly.

1. Set the rotary switch to the I_T position.
2. Select the **Alternative P1** measuring mode by setting the parameters.
   Or
   Select the **Alternative P1** measuring mode via the **Set measuring mode** key.

3. Connect the DUT via its mains plug to the test socket of the test instrument.
   ↳ The test procedure has been prepared.

▶ **Execute the test procedure: Alternative measuring method Alternative P1**

✓ The test procedure has been prepared.

1. Press the **START/STOP** key.
   ↳ The test begins.
2. Use test probe P1 to contact all accessible conductive parts that are not connected to the housing, one after the other.
   ↳ The measured values are displayed.
   ↳ The **Start rating** symbol appears on the right.
3. Click the **Start rating** key.
   ↳ The currently displayed measured value is saved in the buffer.
4. Press the **START/STOP** key.
   ↳ The test is ended.
   ↳ The **Save as** symbol appears (showing the number of cached measured values) and prompts you to save the measured values under a DUT ID number.
5. Read the measured values and compare them with the table of permissible limits.
6. Save the measured values under a DUT ID number.
7. To discard the cached measurement values, press the **ESC** key and confirm with the **OK** key.

▶ **Prepare a test procedure: Alternative measuring method Alternative P1-P2 (only with feature H01)**

✓ The measurement parameters **Ref.voltage L-PE** and **Testingfreq Alt.** in **SETUP** are set correctly.

1. Set the rotary switch to the I_T position.
2. Select the **Alternative P1-P2** measuring mode by setting the parameters
   Or
   Select the **Alternative P1-P2** measuring mode via the **Set measuring mode** key.
   ↳ The test procedure has been prepared.

▶ **Execute the test procedure: Alternative measuring method Alternative P1-P2**

✓ The test procedure has been prepared.

1. Press the **START/STOP** key.
   ↳ The test begins.
2. Use test probe P1 to contact the first accessible part that is not connected to the protective earth.
3. Use test probe P2 to contact all accessible conductive parts, one after the other, that are neither connected to the protective earth nor to the first accessible part contacted by test probe P1.
   ↳ The measured values are displayed.
   ↳ The **Start rating** symbol appears on the right.
4. Click the **Start rating** key.
   ↳ The currently displayed measured value is saved in the buffer.
5. Press the **START/STOP** key.
   ↳ The test is ended.
   ↳ The **Save as** symbol appears (showing the number of cached measured values) and prompts you to save the measured values under a DUT ID number.
6. Read the measured values and compare them with the table of permissible limits.
7. Save the measured values under a DUT ID number.
8. To discard the cached measurement values, press the **ESC** key and confirm with the **OK** key.

Maximum Permissible Limits for Touch Current in mA

Test Standard	I_T
VDE 0701-0702 / OEVE E 8701 / SNR 462638 EN 50678 / VDE 0701 EN 50699 / VDE 0702	0.5
IEC 60974-4 / EN 60974-4 / VDE 0544-4	10 mA
IEC 62368 / EN 62368 / VDE 0868-1	For ES1 0.5 mA AC 2 mA DC

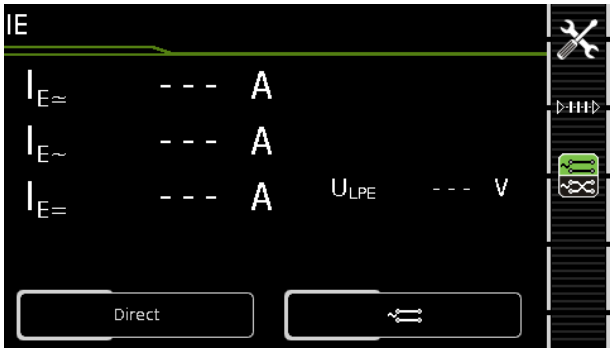
Table 90: Maximum permissible limits for touch current in mA

15.10.3 Equipment Leakage Current – IE

NOTE

When performing equipment leakage current measurements on multiphase DUTs, dangerous touch current components may be canceled out by leakage currents from other parts in all measuring modes except for the alternative method!

Therefore, always perform a touch current measurement as well. When measuring touch current, make sure to contact and measure each accessible conductive part, one after another.



Single Measurements – Switch Positions on the Green Rotary Switch Level				
Rotary Switch Position	**Measuring Mode with Mains to Test Socket**	**Measuring Mode without Mains to Test Socket**	**Measuring Functions**	
I_E	Direct		$I_{E\simeq}$	Equipment leakage current, RMS
			$I_{E\sim}$	AC component
			$I_{E=}$	DC component
			U_{LPE}	Mains voltage
	Differential		$I_{E\simeq}$	Equipment leakage current, RMS
			U_{LPE}	Mains voltage
		Alternative	$I_{E\simeq}$	Equipment leakage current, RMS
			U_{Gen}	Test voltage (alternative method)

Single Measurements – Switch Positions on the Green Rotary Switch Level				
Rotary Switch Position	**Measuring Mode with Mains to Test Socket**	**Measuring Mode without Mains to Test Socket**	**Measuring Functions**	
		Permanent connection	$I_{E}\simeq$	Equipment leakage current, RMS
			$I_{E}\sim$	AC component
			$I_{E}=$	DC component
			U_{LPE}	Mains voltage
		AT3 Adapter [1]	$I_{E}\simeq$	Equipment leakage current, RMS
			U_{LPE}	Mains voltage
		AT16/32DI Dir.	$I_{E}\simeq$	Equipment leakage current, RMS
			$I_{E}\sim$	AC component
			$I_{E}=$	DC component
			U_{LPE}	Mains voltage
		Clamp [2]	$I_{E}\simeq$	Equipment leakage current, RMS
			U_{LPE}	Mains voltage

[1] Adapter AT3-III E, AT3-II S or AT3-II S32: Voltage measurement inputs for leakage current measurement with the differential method only for a test instrument with feature I01.

[2] Voltage measurement inputs for leakage current measurement with differential method and a current clamp sensor only with test instrument with feature I01.

Table 91: Equipment Leakage Current – I_{E}

15.10.3.1 Equipment Leakage Current: Application, Definition, Measuring Method

Application

The measurement of equipment leakage current is required for electrical medical devices in accordance with IEC 62353 / EN 62353 / VDE 0751-1.

In the case of equipment leakage current as the sum of all leakage current, all probe contact points must be recorded or contacted simultaneously.

Definition

The equipment leakage current is the sum of all leakage currents from the housing, accessible conductive parts, and applied parts to the PE (potential earth).

Direct Measuring Method

- Measuring mode Direct
  - Mains plug DUT to test socket
  - Test probe P1 to P1 connections

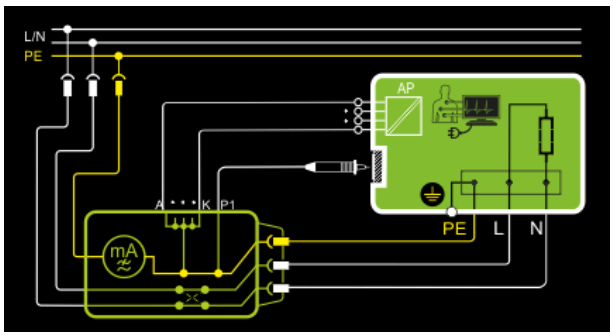


Fig. 113: Direct measuring method, schematic diagram

The DUT (Class II) is operated with mains voltage.

Protective conductor current is measured between the protective earth of the mains (mains supply of the test instrument) and the PE connector on the DUT via the DUT's mains power cable. The measurements must be performed using both connection polarities of the mains plug. The polarity is reversed with the Polarity softkey.

Test probe P1 must be used to contact both the accessible conductive parts that are connected to the housing and those that are not connected to the housing.

If the DUT includes connections for applied parts, they must also be short-circuited and contacted with test probe P1.

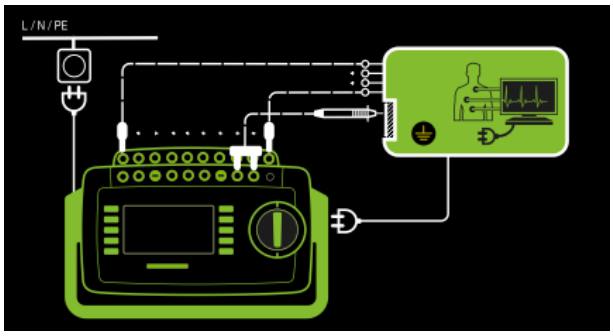


Fig. 114: Direct measuring method, schematic diagram

Differential Current Measuring Method

- Measuring mode Differential
  - Mains plug DUT to test socket
  - Test probe P1 to P1 connections

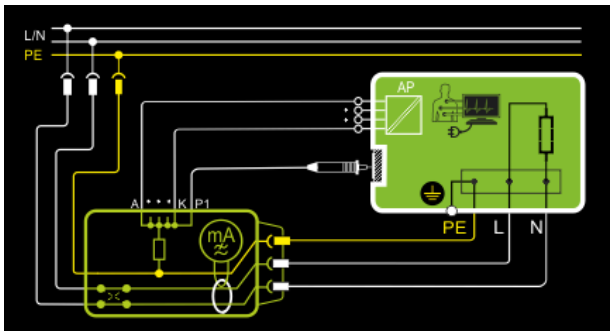


Fig. 115: Class I differential current measuring method, schematic diagram

The DUT (Class II) is operated with mains voltage.

Differential current that flows via the two mains conductors is measured (current clamp measurement method). The measurements must be performed using both connection polarities of the mains plug. The polarity is reversed with the Polarity softkey.

Test probe P1 must be used to contact short-circuited connections for applied parts or accessible conductive parts that are not connected to the housing.

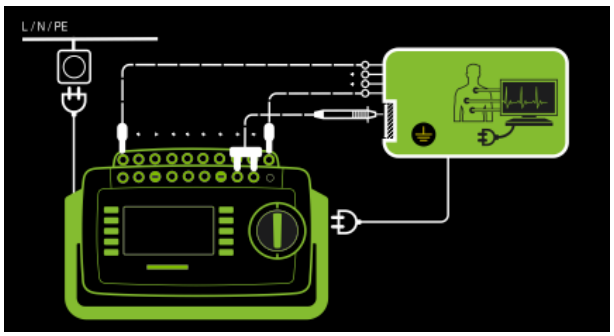


Fig. 116: Class I differential current measuring method, connection diagram

Alternative Measuring Method (equivalent leakage current)

- Measuring mode Alternative P1
  - Mains plug DUT to test socket
  - Test probe P1 to P1 connections

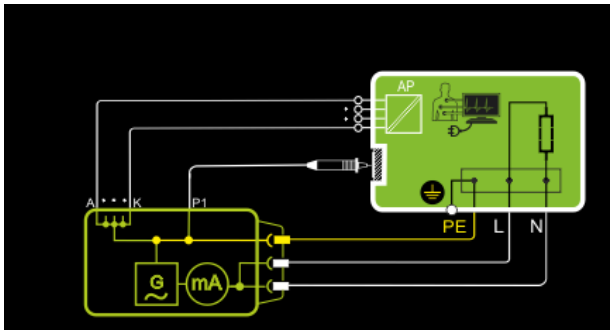


Fig. 117: Class I alternative measuring method (equivalent leakage current), schematic diagram

The leakage current is measured after the test voltage is applied between the short-circuited mains conductors L-N (DUT mains plug) and accessible conductive parts (probe contact) that are not connected to the housing.

If the DUT includes connections for applied parts, they must also be short-circuited and contacted with test probe P1.

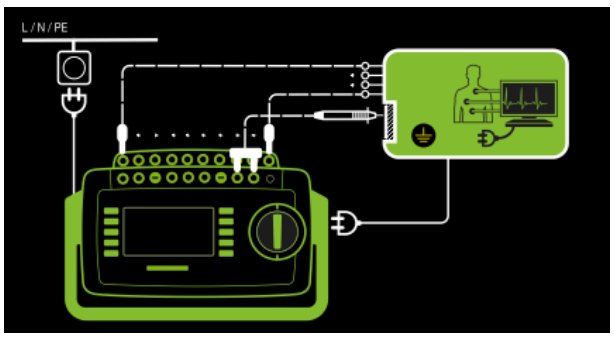


Fig. 118: Class I alternative measuring method (equivalent leakage current), connection diagram

Differential Current Measuring Method

- Measuring mode AT3 Adapter
  - Mains plug DUT to test adapter AT3
  - Test probe P1 to P1 connections
  - Probe AT3 to COM-V connections
  - Test plug AT3 to test socket

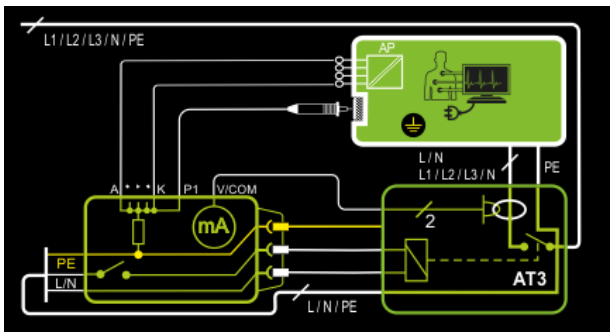


Fig. 119: Differential current measuring method, schematic diagram

Measurement of the DUT with a 3-Phase Mains Connection via Adapter AT3

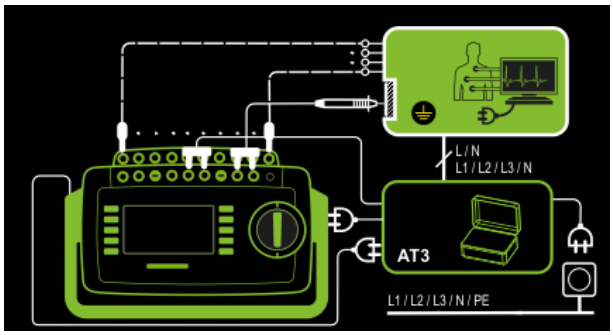


Fig. 120: Differential current measuring method, connection diagram

Measuring Method with Current Clamp Sensor for Permanently Installed DUTs

- Measuring mode Clamp
  - Clamp to COM-V (only with feature I01 and optional current clamp sensor)

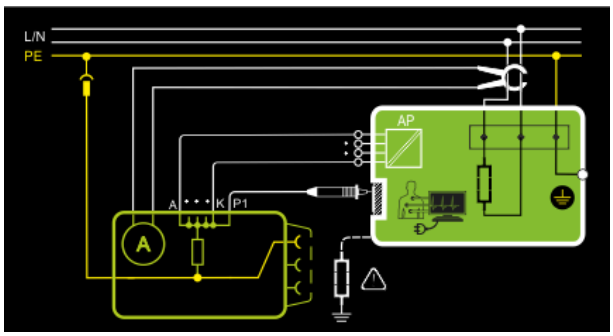


Fig. 121: Measuring method with current clamp sensor for permanently installed DUTs, schematic diagram

Measurement of equipment leakage current by closing the current clamp sensor around the L and N conductors of the mains cable for permanently installed Class I DUTs,

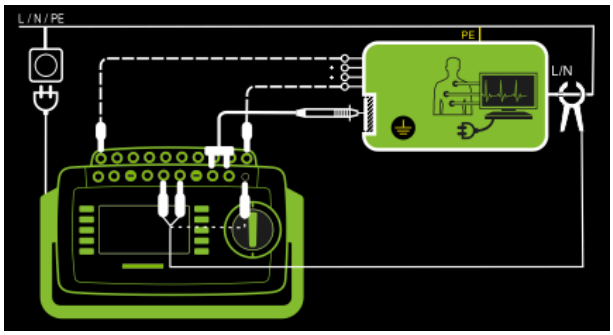


Fig. 122: Measuring method with current clamp sensor for permanently installed DUTs, connection diagram

Setting the Measuring Range on the Clamp and Parameters in SECUTEST ST PRO

SECUTEST ST PRO	Clamp		SECUTEST ST PRO
Transformation Ratio Parameter	**Transformation Ratio (Switch, only for WZ12C)**	**Measuring Range**	**Display Range with Clamp**
1 mV : 1 mA	WZ12C		0 mA ... 300 A
	1 mV : 1 mA	1 mA ... 15 A	
100 mV : 1 mA	SECUTEST CLIP		
	100 mV : 1 mA	0.1 ... 25 mA	0.00 mA ... 3.00 A

Table 92: Setting the measuring range on the clamp and parameters in SECUTEST ST PRO

15.10.3.2 Measurement Parameters for IE

Measurement Parameter	Meaning	
Measuring Mode		**Suitable for DUT Connection**
Direct	Direct measuring method	Test socket
Differential	Differential current measuring method	Test socket
Alternative	Equivalent leakage current measuring method	Test socket, AT16DI/AT32DI
Permanent connection	Permanently installed DUT	Permanent connection
AT3 Adapter	Feature I01: Measurement with AT3 Adapter	AT3-IIIE, AT3-IIS, AT3-IIS32
AT16/32DI Dir.	Direct measurement method with adapter AT16DI or AT32DI	AT16DI, AT32DI (any toggle switch on the adapter must be set to **Direct**)[1]
Clamp	Feature I01 (e.g., SECUTEST ST PRO): Measurement of equipment leakage current using a current clamp sensor with voltage output, as well as conversion and display of the results as current values.	Permanent connection
Polarity[2] **– only for Direct, Differential, AT3 Adapter**[3] **and AT 16/32DI Dir. measuring mode**[3]		
Normal polarity	Selection of polarity for mains voltage at the test socket	
Reverse polarity		
Factor V:A – only for Clamp measuring mode		
1 mV : 1 mA	Transformation ratio of the WZ12C current clamp sensor To set the current clamp factor on the WZ12C clamp and SECUTEST ST PRO, see the table above.	
10 mV : 1 mA		
100 mV:1 mA	Transformation ratio of the SECUTEST CLIP current clamp sensor For setting the current clamp factor on SECUTEST ST PRO	
1 V : 1 A		

1 If your AT16DI or AT32DI adapter does not have a toggle switch, it is an older version that is not suitable for measuring device leakage currents on SECUTEST ST/SECULIFE ST BASE.

2 For the Direct and Differential measuring modes, measurement must be performed for both mains polarities (when connected using 3-phase adapters, the polarity selected on the test instrument is irrelevant). The highest value is documented.

[3] The Polarity parameter only affects the DUT when the DUT is connected directly to the test socket, not when using 3-phase adapters.

Table 93: Measurement parameters for I_E

15.10.3.3 Equipment Leakage Current Measurement: Executing a Test

▶ **Prepare a test procedure**

✓ The measurement parameters **Ref.voltage L-PE** and **Testingfreq Alt.** in **SETUP** are set correctly.

1. Set the rotary switch to the I_E position.
2. Connect the DUT in accordance with the selected measuring method.
3. Select the measuring mode by setting the parameters.
   Or
   Select the measuring mode via the **Set measuring mode** key.
4. For direct and differential current measurement, the measurement must be performed using both connection polarities of the mains plug. Press the **Normal polarity** or **Reverse polarity** softkey to switch the polarity.
   ↳ The test procedure has been prepared.

▶ **Execute a test**

✓ The test procedure has been prepared.

1. Press the **START/STOP** key.
   ↳ The test begins.
   ↳ After each reconnection to the mains, and as soon as the first test is started, a mains connection test is executed.
2. For Direct or Differential measuring modes: Confirm the warning which indicates that mains voltage will be connected to the test socket.
3. Switch on the DUT.
   ↳ The measured values are displayed.
   ↳ The **Start rating** symbol appears on the right.
4. Click the **Start rating** key.
   ↳ The currently displayed measured value is saved in the buffer.
5. Switch off the DUT.
6. Press the **START/STOP** key.
   ↳ The test is ended.
   ↳ The **Save as** symbol appears (showing the number of cached measured values) and prompts you to save the measured values under a DUT ID number.
7. Read the measured values and compare them with the table of permissible limits.
8. Save the measured values under a DUT ID number.
9. To discard the cached measurement values, press the **ESC** key and confirm with the **OK** key.

Preparing a Test Procedure with Adapter AT3-IIIE

NOTE

For information on the correct connection of the test adapter and the DUT, as well as any special considerations during testing, please refer to the operating instructions for the AT3-IIIE test adapter.

Maximum Permissible Limits for Equipment Leakage Current in mA

Test Standard	All Measuring Modes Except "Alternative"	Measuring Mode "Alternative"	
IEC 62353 / EN 62353 / VDE 0751-1	Class I: 0.5 Class II: 0.1	Class II	0.5
		Class I (PE or parts connected to PE)	1
		Permanently connected DUTs with PE	10
		Portable X-ray devices with additional PE	5
		Portable X-ray devices without additional PE	2
		DUTs with mineral insulation	5

Table 94: Maximum permissible limits for equipment leakage current in mA

PE = protective earth

15.10.4 Leakage Current from Applied Part – IA

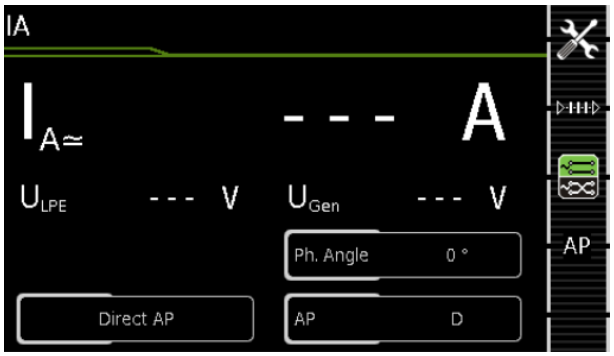


Fig. 123: "IA" page

Single Measurements – Switch Positions on the Green Rotary Switch Level				
Rotary Switch Position	**Measuring Mode with Mains to Test Socket**	**Measuring Mode without Mains to Test Socket**	**Measuring Functions**	
I_A	Direct P1		$I_{A\simeq}$	Current from applied part, RMS
			U_{LPE}	Mains voltage
			U_{Gen}	Test voltage
	Direct AP		$I_{A\simeq}$	Current from applied part, RMS
			U_{LPE}	Mains voltage
			U_{Gen}	Test voltage
		Alternative P1	$I_{A\simeq}$	Current from applied part, RMS
			U_{Gen}	Test voltage
		Alternative AP	$I_{A\simeq}$	Current from applied part, RMS
			U_{Gen}	Test voltage

Single Measurements – Switch Positions on the Green Rotary Switch Level				
Rotary Switch Position	**Measuring Mode with Mains to Test Socket**	**Measuring Mode without Mains to Test Socket**	**Measuring Functions**	
		Perman. Con. P1	$I_{A\sim}$	Current from applied part, RMS
			U_{LPE}	Mains voltage
			U_{Gen}	Test voltage
		Perman. Con. AP	$I_{A\sim}$	Current from applied part, RMS
			U_{LPE}	Mains voltage
			U_{Gen}	Test voltage
		AP-P2	$I_{A\sim}$	Current from applied part, RMS
			U_{Gen}	Test voltage

Table 95: Leakage Current from Applied Part – I_A

15.10.4.1 Leakage Current from Applied Part: Application, Definition, Measuring Method

Direct Measuring Method

- Measuring mode Direct P1
  - Mains plug DUT (Class I) to test socket
  - Probe to P1 terminal

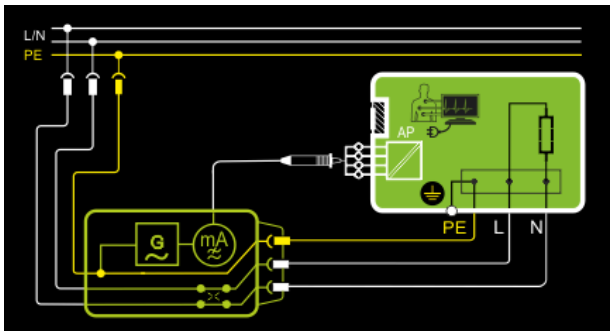


Fig. 124: Direct measuring method, schematic diagram

The DUT (Class II) is operated with mains voltage.

The measurements must be performed using both connection polarities of the mains plug. The polarity is reversed with the Polarity softkey. The leakage current from the applied part is measured after the test voltage and mains voltage are applied between the short-circuited connections of the applied parts and PE (DUT mains plug).

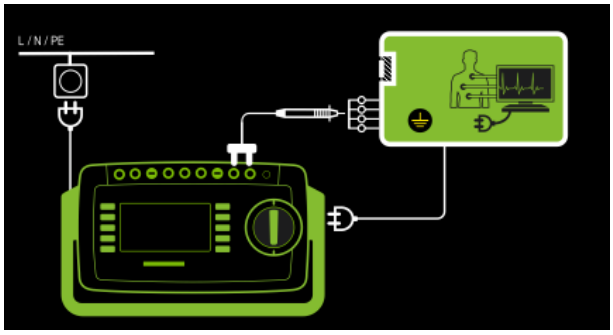


Fig. 125: Direct measuring method, connection diagram

Direct Measuring Method

- Measuring mode Direct AP
  - Mains plug DUT (Class I) to test socket
  - APs to AP sockets

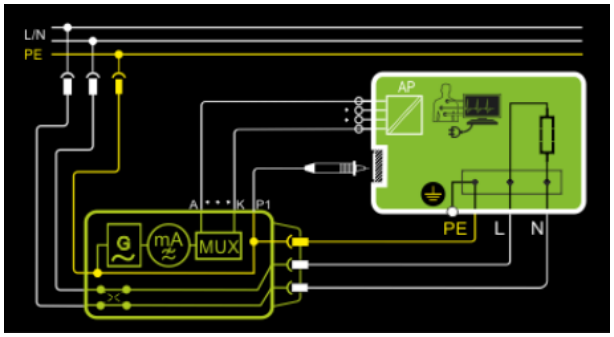


Fig. 126: Schematic diagram

The leakage current from the applied part is measured after the test voltage and the mains voltage are applied between the applied parts connected to the AP sockets of the test instrument and PE (DUT mains plug).

The DUT is powered via the test instrument. The DUT (Class I) is operated with mains voltage.

The measurements must be performed using both connection polarities of the mains plug. The polarity is reversed with the **Polarity** softkey.

Test probe P1 must be used to contact accessible conductive parts that are not connected to the housing.

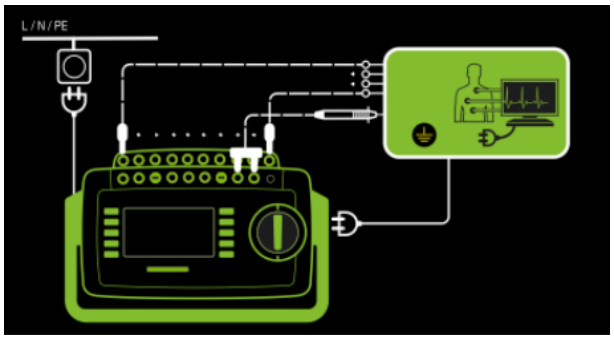


Fig. 127: Connection diagram

Alternative Measuring Method (equivalent patient leakage current)

- Measuring mode Alternative P1
  - Mains plug DUT (Class I) to test socket
  - Probe to P1 terminal

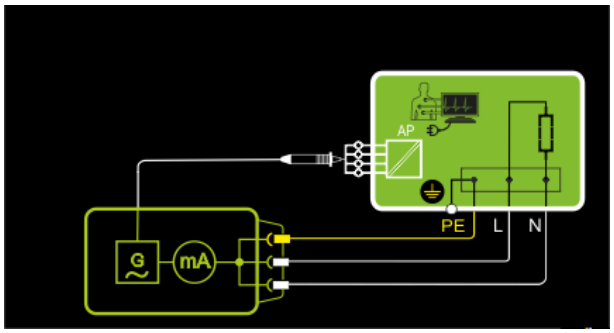


Fig. 128: Alternative measuring method (equivalent patient leakage current), schematic diagram

The leakage current from the applied part is measured after the test voltage is applied between the short-circuited conductors LN-PE (DUT mains plug) and the short-circuited connections of the applied parts.

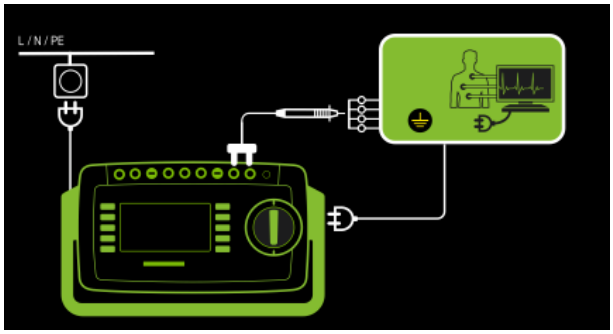


Fig. 129: Alternative measuring method (equivalent patient leakage current), connection diagram

Alternative Measuring Method (Equivalent Patient Leakage Current)

- Measuring mode AP
  - Mains plug DUT (Class I) to test socket
  - APs to AP sockets

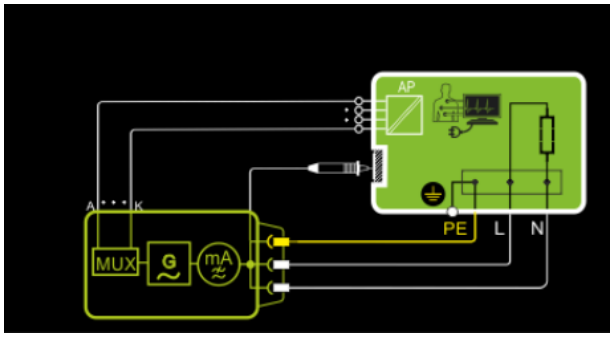


Fig. 130: Schematic diagram

The leakage current from the applied part is measured after the test voltage is applied between the short-circuited conductors L-N-PE (DUT mains plug) and the applied parts connected to the AP sockets of the test instrument.

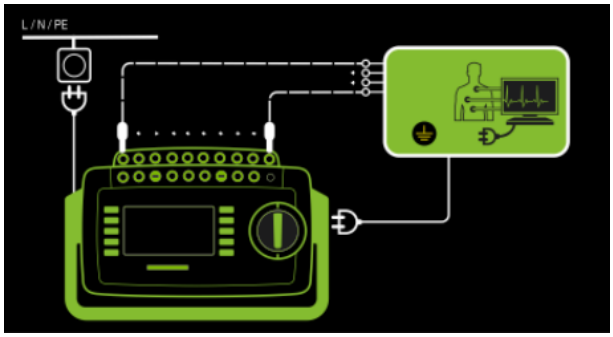


Fig. 131: Connection diagram

Direct Measuring Method

- Measuring mode Permanent Connection P1
  - Permanent connection
  - Probe to P1 terminal

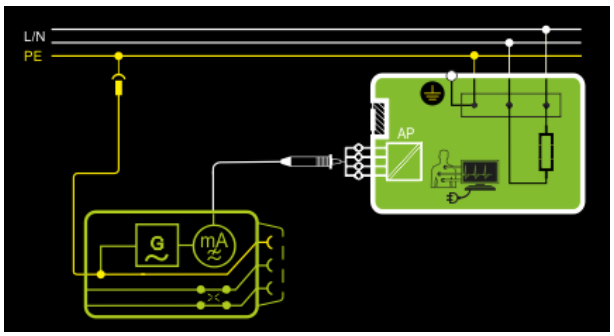


Fig. 132: Direct measuring method, schematic diagram

Leakage current from the applied part is measured between the short-circuited connections of the applied parts and the PE of the mains connection.

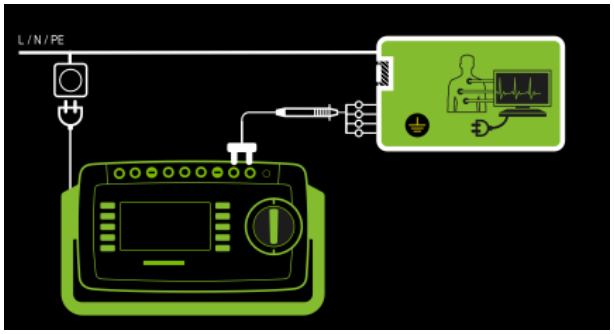


Fig. 133: Direct measuring method, connection diagram

Direct Measuring Method

- Measuring mode Permanent Connection AP
  - Permanent connection
  - APs to AP sockets

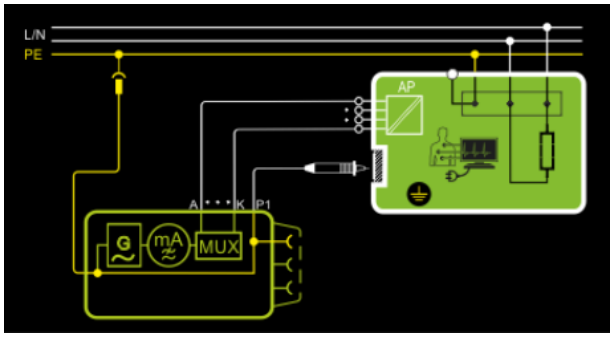


Fig. 134: Schematic diagram

Leakage current from the applied part is measured between the applied parts connected to the AP sockets of the test instrument and the PE of the mains connection.

Test probe P1 must be used to contact accessible conductive parts that are not connected to the housing.

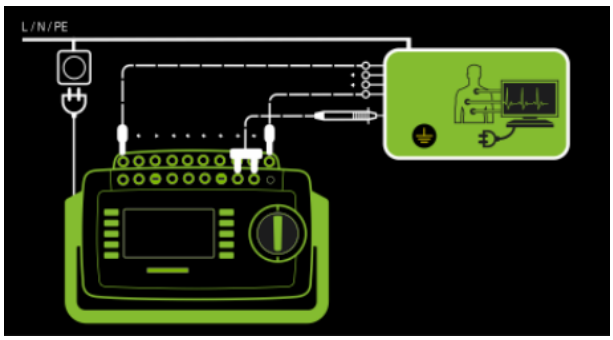


Fig. 135: Connection diagram

Direct Measuring Method

- Measuring mode P1 – AP-P2
  - Mains plug DUT (Class I) to test socket
  - Probe to P2 terminal
  - APs to AP sockets

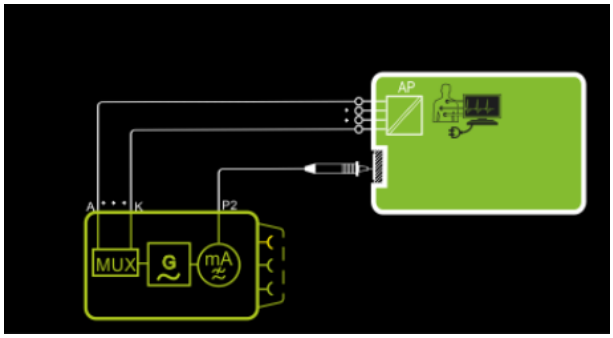


Fig. 136: Schematic diagram

Leakage current from the applied part is measured between the applied parts connected to the AP sockets on the test instrument and accessible conductive parts (test probe P2) that are not connected to the housing.

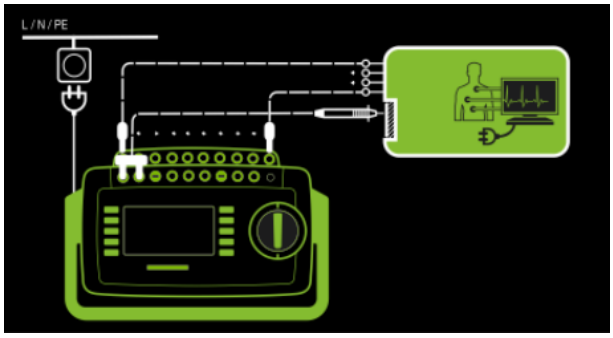


Fig. 137: Connection diagram

15.10.4.2 Measurement Parameters for IA

Measurement Parameter	Meaning	
Measuring Mode		**Suitable for DUT Connection**
Direct P1	Direct measuring method (via test socket) with test probe P1	Test socket, AT3 Adapter (AT3-IIIE, AT3-IIS, AT3-IIS32), AT16DI/ AT32DI
Direct AP	As above – here via the AP socket	Test socket, AT3 Adapter (AT3-IIIE, AT3-IIS, AT3-IIS32), AT16DI/ AT32DI
Alternative P1	Equivalent leakage current measuring method (via test socket) with test probe P1	Test socket
Alternative AP	As above – here via the AP socket	Test socket
Permanent connection P1	Direct measuring method	Permanent connection
Perman. Con. AP	As above – here via the AP socket	Permanent connection
AP – P2	Test probe P2 to conductive parts without PE	Permanent connection
AP – applied parts		
Single selection: A / B / C / D / E / F / G / H / I / K, each via on/off		
Phase angle – only for Direct (P1, AP) and Permanent Connection (P1, AP)		
0° or 180°	Selectable phase angle of the internal generator relative to the mains phase angle	
Polarity – only for Direct (P1, AP) measuring mode		
Normal polarity	Selection of polarity for mains voltage at the test socket	
Reverse polarity		

Table 96: Measurement parameters for I_A

15.10.4.3 Leakage Current from Applied Part: Executing a Test

▶ **Prepare a test procedure**

✓ The measurement parameters **Ref.voltage L-PE** and **Testingfreq Alt.** in **SETUP** are set correctly.

1. Set the rotary switch to the **I_A** position.
2. Connect the DUT in accordance with the selected measuring method.
3. Select the measuring mode by setting the parameters.
   Or
   Select the measuring mode via the **Set measuring mode** key.
4. For direct measurement, the measurement must be performed using both connection polarities of the mains plug. Press the **Normal polarity** or **Reverse polarity** softkey to switch the polarity.

   ↳ The test procedure has been prepared.

▶ **Execute a test**

✓ The test procedure has been prepared.

1. Press the **START/STOP** key.

   ↳ The test begins.

   ↳ After each reconnection to the mains, and as soon as the first test is started, a mains connection test is executed.

2. For measuring mode Direct P1: Confirm the warning which indicates that mains voltage will be connected to the test socket.
3. Switch on the DUT.
4. Contact the short-circuited applied parts with test probe P1.
   ↳ The measured values are displayed.
   ↳ The **Start rating** symbol appears on the right.
5. Click the **Start rating** key.
   ↳ The currently displayed measured value is saved in the buffer.
6. Switch off the DUT.
7. Press the **START/STOP** key.
   ↳ The test is ended.
   ↳ The **Save as** symbol appears (showing the number of cached measured values) and prompts you to save the measured values under a DUT ID number.
8. Read the measured values and compare them with the table of permissible limits.
9. Save the measured values under a DUT ID number.
10. To discard the cached measurement values, press the **ESC** key and confirm with the **OK** key.

Maximum Permissible Limits for Leakage Current from the Applied Part in µA

Test Standard	Leakage Current from Applied Part – Alternating Current		
	Type B	Type BF	Type CF
IEC 62353 / EN 62353 / VDE 0751-1	–	5000	50

Table 97: Maximum permissible limits for leakage current from the applied part in µA

15.10.5 Patient Leakage Current – IP

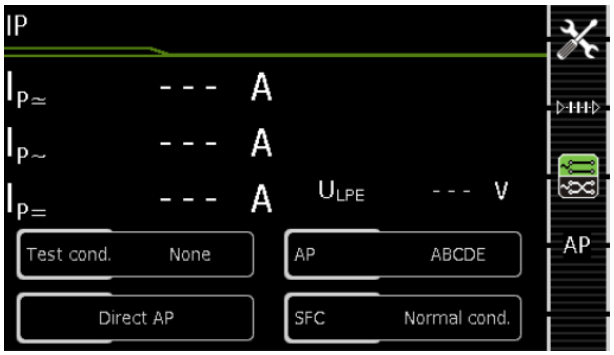


Fig. 138: Patient leakage current

Single Measurements – Switch Positions on the Green Rotary Switch Level				
Rotary Switch Position	**Measuring Mode with Mains to Test Socket**	**Measuring Mode without Mains to Test Socket**	**Measuring Functions**	
I_P	Direct P1		$I_{P\simeq}$	Patient leakage current, RMS
			$I_{P\sim}$	AC component
			$I_{P=}$	DC component
			U_{LPE}	Mains voltage
	Direct AP		$I_{P\simeq}$	Patient leakage current, RMS
			$I_{P\sim}$	AC component
			$I_{P=}$	DC component
			U_{LPE}	Mains voltage
		Perman. Con. P1	$I_{P\simeq}$	Patient leakage current, RMS
			$I_{P\sim}$	AC component
			$I_{P=}$	DC component
			U_{LPE}	Mains voltage
		Perman. Con. AP	$I_{P\simeq}$	Patient leakage current, RMS
			$I_{P\sim}$	AC component
			$I_{P=}$	DC component
			U_{LPE}	Mains voltage

Table 98: Patient leakage current – I_P

15.10.5.1 Patient Leakage Current: Application, Definition, Measuring Method

Definition

Patient leakage current is the current that flows from the DUT in operation through the patient connections, via the patient, and to ground or the PE.

Both the AC and DC components of the current are measured.

Direct Measuring Method

- Measuring mode Direct P1
  - Mains plug DUT (Class I) to test socket
  - Probe to P1 terminal

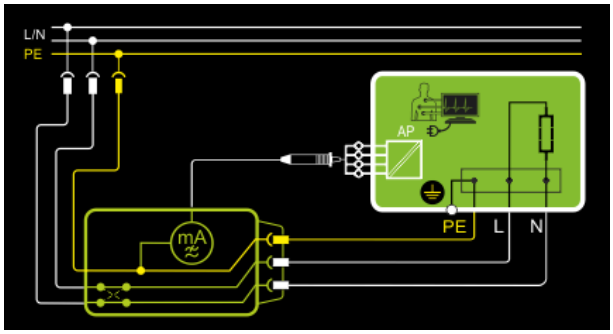


Fig. 139: Direct measuring method, schematic diagram

Patient leakage current is measured between PE (DUT mains plug) and the short-circuited applied parts on the DUT.

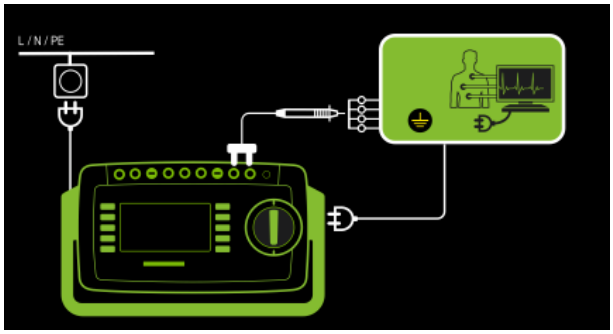


Fig. 140: Direct measuring method, connection diagram

Direct Measuring Method

- Measuring mode Direct AP
  - Mains plug DUT (Class I) to test socket
  - APs to AP sockets
  - Probe to P1 terminal

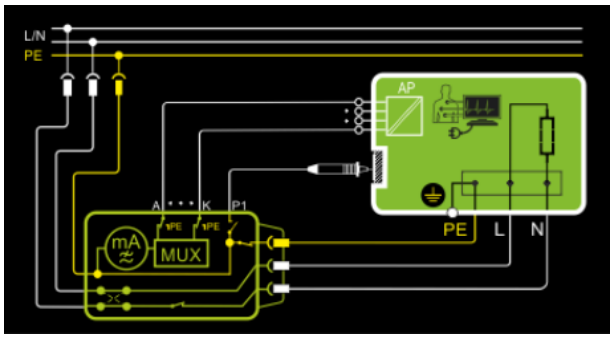


Fig. 141: Schematic diagram

The patient leakage current is measured after the test voltage is applied between PE (DUT mains plug) and the applied parts connected to the AP sockets of the test instrument.

The DUT is powered via the test instrument. The DUT (Class I) is operated with mains voltage.

The measurements must be performed using both connection polarities of the mains plug. The polarity is reversed with the **Polarity** softkey.

Test probe P1 must be used to contact accessible conductive parts that are not connected to the housing.

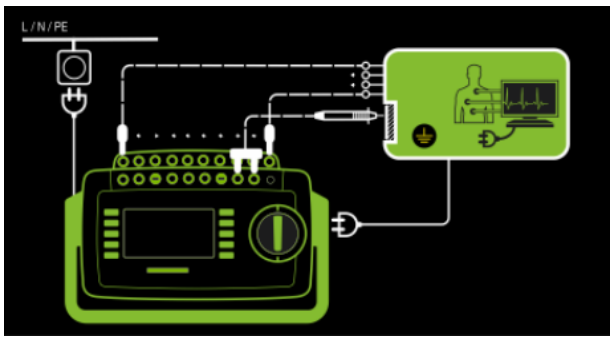


Fig. 142: Connection diagram

Direct Measuring Method

- Measuring mode Permanent Connection P1
  - Permanent connection
  - Probe to P1 terminal

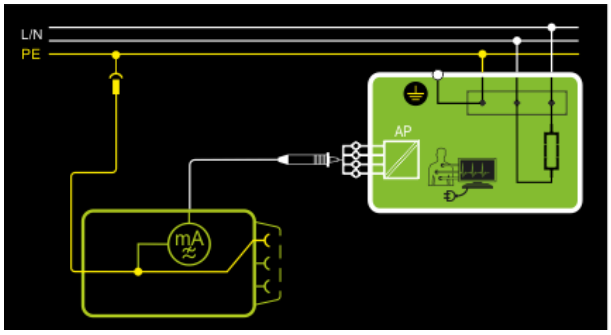


Fig. 143: Direct measuring method, schematic diagram

Patient leakage current is measured between the patient connections and the PE of the mains connection.

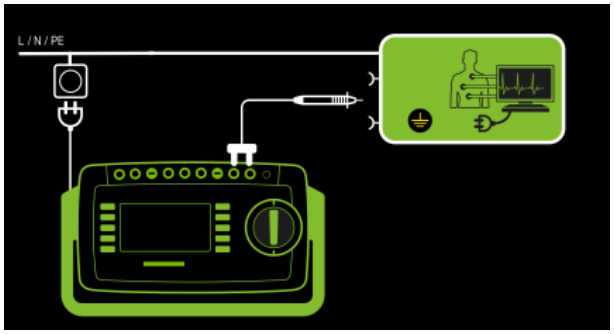


Fig. 144: Direct measuring method, connection diagram

Direct Measuring Method

- Measuring mode Permanent Connection AP
  - Permanent connection
  - APs to AP sockets

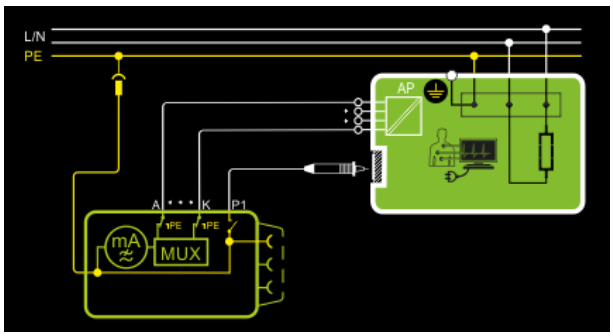


Fig. 145: Schematic diagram

Patient leakage current is measured between the applied parts connected to the AP sockets of the test instrument and the PE of the mains connection.

The DUT is powered via the DUT's permanent connection. The DUT (Class I) is operated with mains voltage.

Test probe P1 must be used to contact accessible conductive parts that are not connected to the housing.

The fault condition Normal State is shown here.

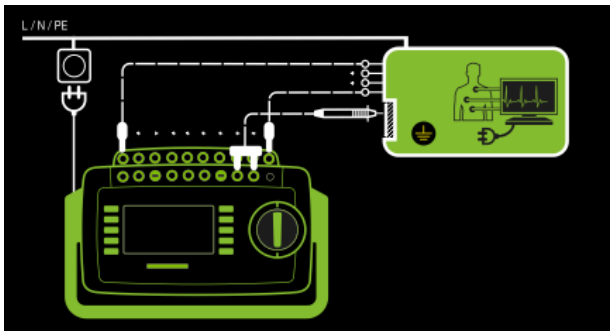


Fig. 146: Connection diagram

15.10.5.2 Measurement Parameters for IP

Measurement Parameter	Meaning	
Measuring Mode		**Suitable for DUT Connection**
Direct P1	Direct measuring method (via test socket) with test probe P1	Test socket, AT16DI, AT32DI, AT3-IIS, AT3- IIS32, AT3-IIIE
Direct AP	Direct measuring method (via test socket) via selected AP socket(s).	Test socket
Permanent connection P1	Measurement on permanently installed DUT with test probe P1	Permanent connection
Permanent connection AP	Measurement on permanently installed DUT via selected AP socket(s).	Permanent connection
Test cond. Test conditions – only for measuring mode with AP socket(s)		
AP > PE: Connect the applied part to PEM; all AP sockets are connected to PE potential when this option is activated. Housing > PE: Connect the housing to PE Ho.+AP > PE: Connect the housing and applied part to PE		
Connect the applied part to PE; A~P – applied parts		
Single selection: A / B / C / D / E / F / G / H / I / K, each via on/off		

Measurement Parameter	Meaning
Single fault (SFC)	
Normal state	No single-fault simulation active
N interrupted [1]	Fault simulation – only phase and protective earth are connected to the DUT [2]
PE interrupted [1]	Fault simulation active – protective earth is disconnected from the DUT for the duration of the measurement
U low to AP	Fault simulation active – low voltage to applied part
Polarity [3] – only for Direct (P1, AP) measuring mode	
Normal polarity	Selection of polarity for mains voltage at the test socket
Reverse polarity	

1 Only for Direct P1 and Direct AP measuring mode

2 Not suitable for measurements using a test adapter.

3 The measurement must be performed for both mains polarities. The largest value must be used for limit assessment.

Table 99: Measurement parameters for I_P

15.10.5.3 Patient Leakage Current Measurement: Executing a Test

▶ **Prepare a test procedure**

✓ The measurement parameters **Ref.voltage L-PE** and **Testingfreq Alt.** in **SETUP** are set correctly.

1. Set the rotary switch to the **I_P** position.
2. Connect the DUT to the test socket.
3. Select the measuring mode by setting the parameters.
   Or
   Select the measuring mode via the **Set measuring mode** key.
4. For direct measurement, the measurement must be performed using both connection polarities of the mains plug. Press the **Normal polarity** or **Reverse polarity** softkey to switch the polarity.

   ↳ The test procedure has been prepared.

▶ **Execute a test**

✓ The test procedure has been prepared.

1. Press the **START/STOP** key.

   ↳ The test begins.

   ↳ After each reconnection to the mains, and as soon as the first test is started, a mains connection test is executed.
2. For measuring mode Direct P1: Confirm the warning which indicates that mains voltage will be connected to the test socket.
3. Switch on the DUT.
4. Use test probe P1 to contact the short-circuited inputs for the applied parts.

   ↳ The measured values are displayed.

   ↳ The **Start rating** symbol appears on the right.
5. Click the **Start rating** key.

   ↳ The currently displayed measured value is saved in the buffer.
6. Switch off the DUT.

7. Press the **START/STOP** key.
   ↳ The test is ended.
   ↳ The **Save as** symbol appears (showing the number of cached measured values) and prompts you to save the measured values under a DUT ID number.
8. Read the measured values and compare them with the table of permissible limits.
9. Save the measured values under a DUT ID number.
10. To discard the cached measurement values, press the **ESC** key and confirm with the **OK** key.

Maximum Permissible Values for Patient Leakage Current in mA

Test Standard		I_P		
		Type B	**Type BF**	**Type CF**
IEC 62353 / EN 62353 / VDE 0751-1 (or IEC 60601)	Direct current	0.01	0.01	0.01
	Alternating current	0.1	0.1	0.01

Table 100: Maximum permissible values for patient leakage current in mA

15.10.6 Patient Auxiliary Current IPA

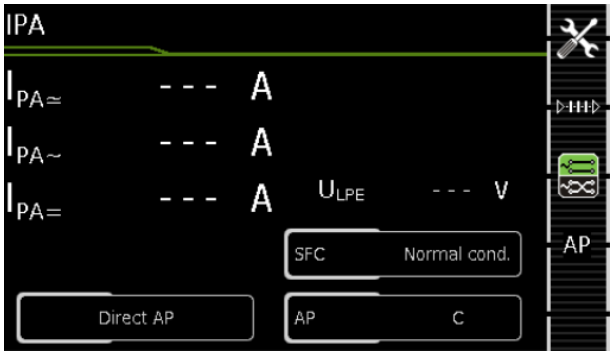


Fig. 147: Patient auxiliary current

Single Measurements – Switch Positions on the Green Rotary Switch Level				
Rotary Switch Position	**Measuring Mode with Mains to Test Socket**	**Measuring Mode without Mains to Test Socket**	**Measuring Functions**	
I_{PH}	Direct AP		$I_{PH\simeq}$	Patient auxiliary current, RMS
			$I_{PH\sim}$	AC component
			$I_{PH=}$	DC component
			U_{LPE}	Mains voltage
		Perman. Con. AP	$I_{PH\simeq}$	Patient auxiliary current, RMS
			$I_{PH\sim}$	AC component
			$I_{PH=}$	DC component
			U_{LPE}	Mains voltage

Table 101: Patient auxiliary current – I_{PH}

This is not a leakage current measurement. Therefore, no conversion to the reference voltage UL-PE takes place.

15.10.6.1 Patient Auxiliary Current: Application, Definition, Measuring Method

Direct Measuring Method

- Measuring mode Direct AP
  - Mains plug DUT (Class I) to test socket
  - APs to AP sockets

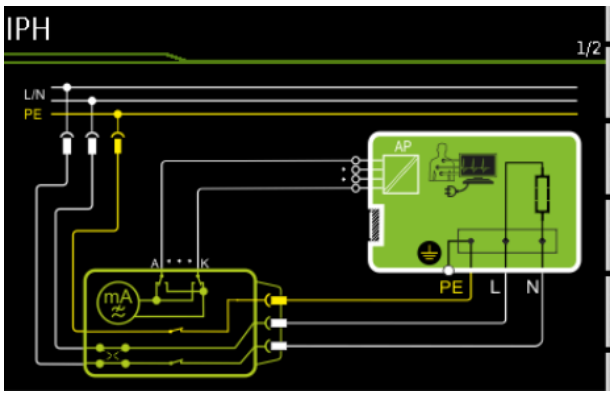


Fig. 148: Direct measuring method, schematic diagram

Here, measurements are performed from the selected applied part connector to all other applied part connectors after the test voltage and the mains voltage are applied.

The DUT is powered via the test instrument. The DUT (Class I) is operated with mains voltage.

The measurements must be performed using both connection polarities of the mains plug. The polarity is reversed with the **Polarity** key.

The measurements are performed under the fixed fault condition Normal State.

The measurements must be performed under all fault conditions. The selection is made via the Measurement Parameters menu under Single Fault.

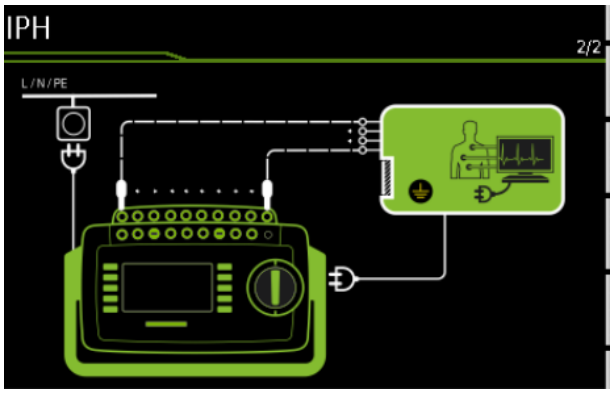


Fig. 149: Direct measuring method, connection diagram

Direct Measuring Method

- Measuring mode Permanent Connection AP
  - Permanent connection
  - APs to AP sockets

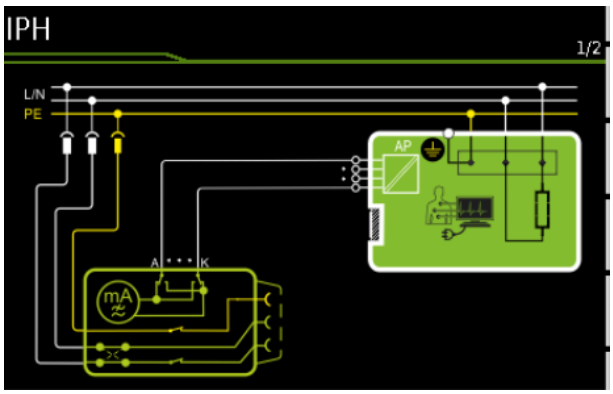


Fig. 150: Direct measuring method, schematic diagram

Here, measurements are performed from the selected applied part connector to all other applied part connectors.

The DUT is powered via the DUT's permanent connection. The DUT (Class I) is operated with mains voltage.

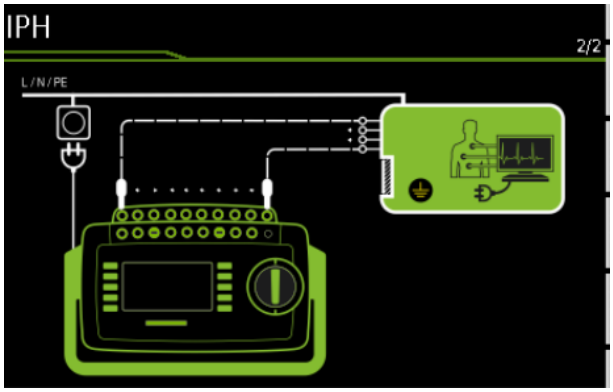


Fig. 151: Direct measuring method, connection diagram

15.10.6.2 Measurement Parameters for IPA

Measurement Parameter	Meaning	
Measuring Mode		**Suitable for DUT Connection**
Direct AP	Direct measurement (via test socket) from the selected AP socket to all others.	Test socket
Permanent connection AP	Measurement on a permanently installed DUT from the selected AP socket to all others.	Permanent connection
AP – applied parts		
A / B / C / D / E / F / G / H / I / K, each individually (via on/off) against the remaining APs		
Single fault (SFC) – only for Direct AP measuring mode		
Normal state	No single-fault simulation active	
N interrupted	Fault simulation active – only phase and protective earth are connected to the DUT	
PE interrupted	Fault simulation active – protective earth is disconnected from the DUT for the duration of the measurement	
Polarity – only for Direct AP measuring model		
Normal polarity	Selection of polarity for mains voltage at the test socket	
Reverse polarity		

Table 102: Measurement parameters for I_{PH}

15.10.6.3 Patient Auxiliary Current Measurement: Executing a Test

▶ **Prepare a test procedure**

1. Set the rotary switch to the I_{PA} position.
2. Connect the DUT in accordance with the selected measuring mode.
3. Connect the applied parts.
4. Select the measuring mode by setting the parameters.
   Or
   Select the measuring mode via the **Set measuring mode** key.
5. Select the respective applied parts by setting the assigned sockets to “on” and the unassigned sockets to “off”.
6. For direct measurement, the measurement must be performed using both connection polarities of the mains plug. Press the **Normal polarity** or **Reverse polarity** softkey to switch the polarity.
   ↳ The test procedure has been prepared.

▶ **Execute a test**

✓ The test procedure has been prepared.

1. Press the **START/STOP** key.
   ↳ The test begins.
   ↳ After each reconnection to the mains, and as soon as the first test is started, a mains connection test is executed.
2. For Direct AP measuring mode: Confirm the warning which indicates that mains voltage will be connected to the test socket.
3. Switch on the DUT.
   ↳ The measured values are displayed.
   ↳ The **Start rating** symbol appears on the right.
4. Click the **Start rating** key.
   ↳ The currently displayed measured value is saved in the buffer.
5. Switch off the DUT.
6. Press the **START/STOP** key.
   ↳ The test is ended.
   ↳ The **Save as** symbol appears (showing the number of cached measured values) and prompts you to save the measured values under a DUT ID number.
7. Read the measured values and compare them with the table of permissible limits.
8. Save the measured values under a DUT ID number.
9. To discard the cached measurement values, press the **ESC** key and confirm with the **OK** key.

Maximum Permissible Values for Patient Auxiliary Current in mA

Test Standard		I_{PH}					
		Type B		Type BF		Type CF	
		NC	SFC	NC	SFC	NC	SFC
EN 60601-2 EN 60601-3	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

Table 103: Maximum permissible values for patient auxiliary current in mA

15.11 Voltage Measurement (Probe P1) – U



Fig. 152: "U" page

Single Measurements – Switch Positions on the Green Rotary Switch Level				
Rotary Switch Position	**Measuring Mode with Mains to Test Socket**	**Measuring Mode without Mains to Test Socket**	**Measuring Functions**	
U		PE – P1	U≃	Probe voltage, RMS
			U~	AC component
			U=	DC component
	PE – P1 (with mains)		U≃	Probe voltage, RMS
			U~	AC component
			U=	DC component

Table 104: Voltage measurement (Probe P1) – U

15.11.1 Voltage Measurement: Application, Definition, Measuring Method

Mains to Test Socket

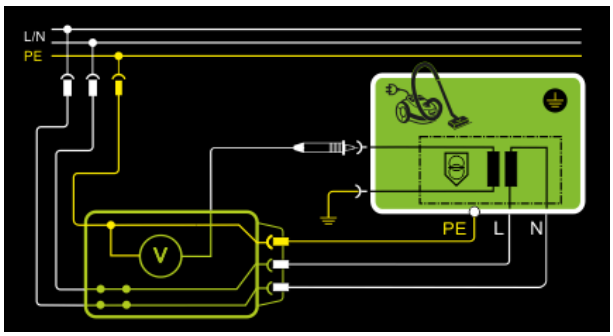


Fig. 153: Mains to test socket, schematic diagram

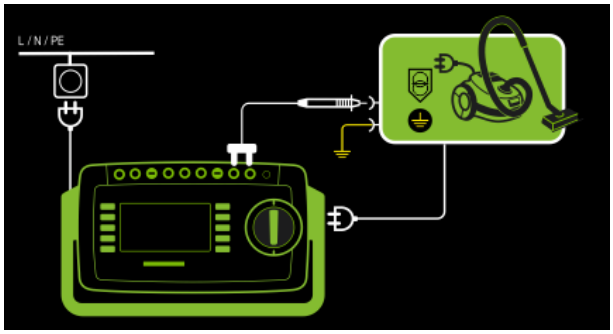


Fig. 154: Mains to test socket, connection diagram

Permanently connected DUT

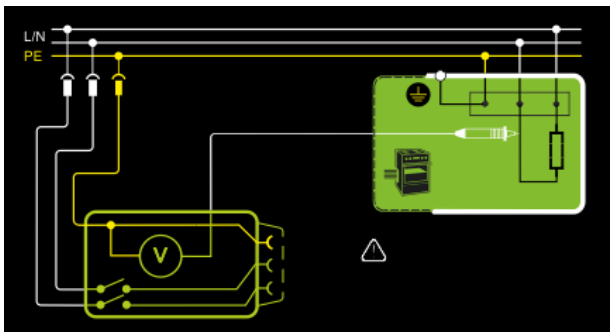


Fig. 155: Permanently connected DUT, schematic diagram

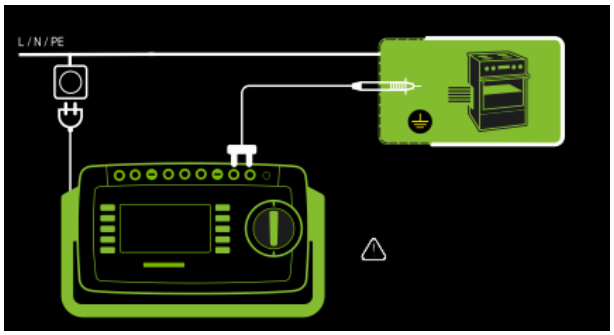


Fig. 156: Permanently connected DUT, connection diagram

Direct, alternating and pulsating voltages of up to 253 V can be measured. Two connection types are available, one of which has to be set in the Parameters menu.

15.11.2 Measurement Parameters for UProbe

Measurement Parameter	Meaning	
Measuring Mode		**Suitable for DUT Connection**
PE-P1	Measurement of voltages relative to PE, test socket remains voltage-free	Permanent connection
PE-P1 (with mains)	Measurement of voltages relative to PE, mains voltage is applied to the test socket	Test socket
Polarity – only for PE-P1 (with mains)		
Normal polarity	Selection of polarity for mains voltage at the test socket	
Reverse polarity		

Table 105: Measurement parameters for U_{Probe}

15.11.3 Voltage Measurement: Executing a Test

1. Set the rotary switch to the **U** position.
2. Connect the DUT via its mains plug to the test socket of the test instrument.
3. Press the **START/STOP** key.

   ↳ The test begins.
4. PE-P1 (with mains): Confirm the warning which indicates that mains voltage will be connected to the test socket.
5. Switch on the DUT.

6. Use test probe P1 to contact the ungrounded output for safety extra-low voltage.
   You can set the polarity using the direct selection option immediately before starting the measurement, without having to go to the **Set measuring mode** parameter menu.
   ↳ The measured values are displayed.
   ↳ The **Start rating** symbol appears on the right.
7. Click the **Start rating** key.
   ↳ The currently displayed measured value is saved in the buffer.
8. Switch off the DUT.
9. Press the **START/STOP** key.
   ↳ The test is ended.
   ↳ The **Save as** symbol appears (showing the number of cached measured values) and prompts you to save the measured values under a DUT ID number.
10. Save the measured values under a DUT ID number.
11. To discard the cached measurement values, press the **ESC** key and confirm with the **OK** key.

15.12 Voltage Measurement (Multimeter) – U

This function is available only for devices with feature I01.



Fig. 157: "U" page (multimeter)

Single Measurements – Switch Positions on the Green Rotary Switch Level				
Rotary Switch Position	**Measuring Mode with Mains to Test Socket**	**Measuring Mode without Mains to Test Socket**	**Measuring Functions**	
U		V – COM	U≃	Measuring voltage, RMS
			U~	AC component
			U=	DC component
	V - COM (with mains)		U≃	Measuring voltage, RMS
			U~	AC component
			U=	DC component

Table 106: Voltage Measurement (multimeter) – U

15.12.1 Voltage Measurement Multimeter: Application, Definition, Measuring Method

Mains to Test Socket

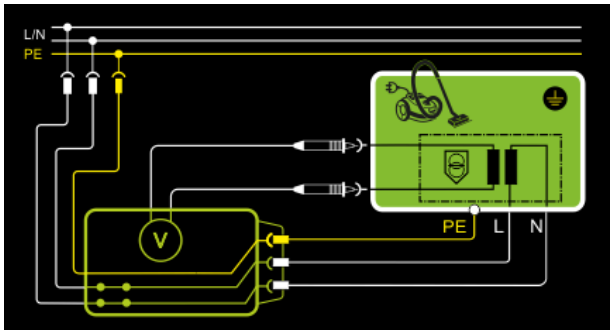


Fig. 158: Mains to test socket, schematic diagram

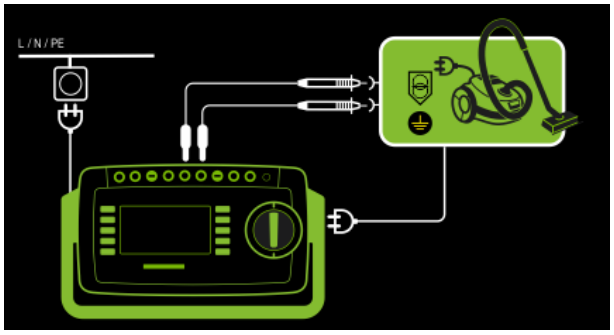


Fig. 159: Mains to test socket, connection diagram

Permanently Connected DUT

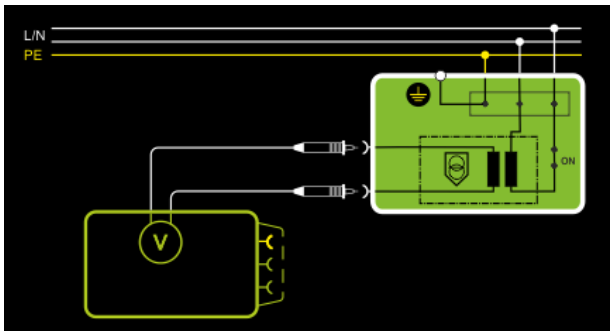


Fig. 160: Permanently connected DUT, schematic diagram

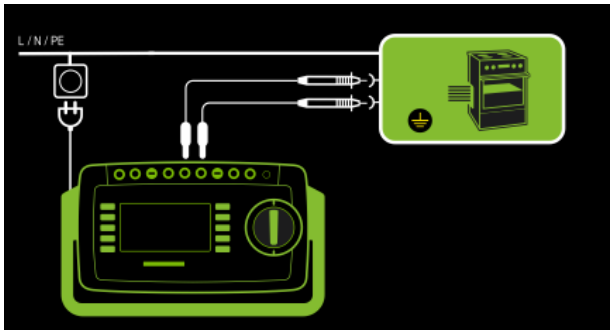


Fig. 161: Permanently connected DUT, connection diagram

Direct, alternating and pulsating voltages of up to 253 V can be measured between the connections of sockets V and COM.

- Measurements with the voltage measurement input for the voltmeter function (V-COM), electrically isolated from the mains

15.12.2 Measurement Parameters for U

Measurement Parameter	Meaning	
Measuring Mode		**Suitable for DUT Connection**
V – COM	Display: RMS + AC + DC	Permanent connection
V – COM (with mains)	Display: RMS + AC + DC; with mains to test socket, e.g., for measuring safety extra-low voltage on power supplies	Test socket

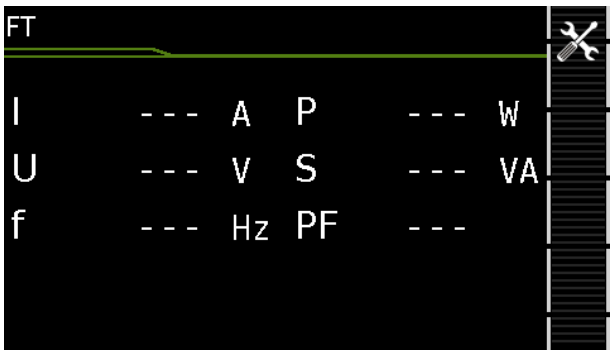
Table 107: Measurement parameters for U

15.12.3 Voltage Measurement Multimeter: Executing a Test

▶ **Test Procedure: Connect the DUT to the test socket (e.g., for measuring safety extra-low voltage on power adapters or chargers)**

1. Set the rotary switch to the **U** position.
2. Set the parameter to **V – COM (w. Mains)**.
3. **CAUTION!**
   When measuring hazardous voltages, use only the included KS17-ONE touch-protected measuring leads.
   Connect the DUT to the test socket of the test instrument via its mains plug.
4. Connect the output sockets of the DUT to the V and COM sockets, e.g., to measure a safety extra-low voltage at the output of the DUT.
5. Press the **START/STOP** key.
   ↳ The test begins.
6. V-COM (w. Mains): Confirm the warning which indicates that mains voltage will be connected to the test socket.
7. Switch on the DUT.
   ↳ The measured values are displayed.
   ↳ The **Start rating** symbol appears on the right.
8. Click the **Start rating** key.
   ↳ The currently displayed measured value is saved in the buffer.
9. Switch off the DUT.
10. Press the **START/STOP** key.
    ↳ The test is ended.
    ↳ The **Save as** symbol appears (showing the number of cached measured values) and prompts you to save the measured values under a DUT ID number.
11. Save the measured values under a DUT ID number.
12. To discard the cached measurement values, press the **ESC** key and confirm with the **OK** key.

15.13 Functional Test – P



Single Measurements – Switch Positions on the Green Rotary Switch Level			
Rotary Switch Position	**Measuring Functions**		**Measuring Mode with Mains to Test Socket**
P	Functional test at the test socket		Selection of polarity for mains voltage
	I	Current between L and N	
	U	Voltage between L and N	
	f	Frequency	
	P	Active power	
	S	Apparent power	
	PF	Power factor	

15.13.1 Functional Test: Application, Definition, Measuring Method

Functional Test

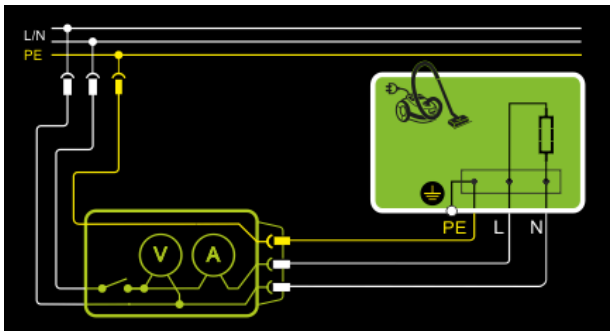


Fig. 162: Functional test, schematic diagram

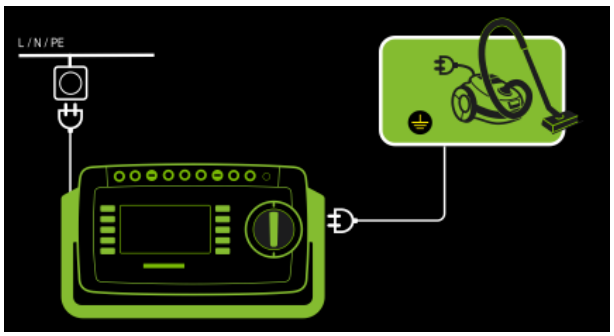


Fig. 163: Functional test, application circuit diagram

15.13.2 Measurement Parameters for P

Measurement Parameter	Meaning
Polarity	
Normal polarity	Selection of polarity for mains voltage at the test socket
Reverse polarity	

The following connection types are possible:

- Test socket
- CEE Adapter (only when connecting via a single-phase CEE or “caravan socket”)
- AT3 Adapter (AT3-IIIE, AT3-IIS, AT3-IIS32)
- AT16DI/AT32DI

NOTE

Although the adapters listed above can be used for the functional test (commissioning the DUT), measurement of apparent/active power, power factor, and current consumption is only possible if the DUT is connected directly to the test socket or via the CEE Adapter (single-phase CEE socket only).

The DUT can be subjected to a functional test with mains voltage via the integrated test socket.

The test socket is tested for short circuits before switching to mains voltage (the short-circuit test provides information about the DUT itself only when a single-phase DUT is being tested).

Except when the rotary switch is in this position, the functional test can be executed immediately after a successful safety test performed in accordance with a selected standard (not possible for Class III DUTs).

15.13.3 Functional Test: Executing a Test

WARNING

Risk of injury from devices/machines starting unexpectedly!

Depending on the type of device or machine, there is a risk of injury from a device or machine starting unexpectedly (e.g., a circular saw or angle grinder).

— Before beginning the functional test, first switch off the device/machine using its own switch.
— Follow the safety instructions.

WARNING

Risk of injury from a DUT that has not yet been fully safety-tested!

A DUT that has not (yet) been fully safety-tested is considered potentially dangerous.

— Do not execute a functional test until the DUT has passed the safety test.
— Test the DUT in accordance with the standards.
— Follow the safety instructions.

ATTENTION

Increased wear on relay contacts!

Switching high currents causes the relay contacts to wear out much faster.

— Switch off the device/machine using its own switch.
— Follow the safety instructions.

1. Set the rotary switch to the **P** position.
2. Connect the DUT via its mains plug to the test socket of the test instrument.
3. Press the **START/STOP** key.
   ↳ The test begins.
4. Confirm the warning which indicates that mains voltage will be connected to the test socket.
5. Switch on the DUT.
   ↳ The measured values are displayed.
   ↳ The **Start rating** symbol appears on the right.
6. Click the **Start rating** key.
   ↳ The currently displayed measured value is saved in the buffer.
7. Switch off the DUT.
8. Press the **START/STOP** key.
   ↳ The test is ended.
   ↳ The **Save as** symbol appears (showing the number of cached measured values) and prompts you to save the measured values under a DUT ID number.
9. Save the measured values under a DUT ID number.
10. To discard the cached measurement values, press the **ESC** key and confirm with the **OK** key.

15.14 Function Test of Extension Cords – EL1

TIP

For devices ... ST PRIME with the rotary switch set to **EXTRA**.



Single Measurements – Switch Positions on the Green Rotary Switch Level		
Rotary Switch Position	**Measuring Functions**	**Measuring Mode without Mains to Test Socket**
EL1 [1]	Extension cord test with adapter for single-phase or three-phase extension cords for testing: ■ Continuity ■ Short circuit ■ Polarity (reversed wired) [2]	EL1 Adapter EL1 Adapter (continuity only) AT3-IIIE Adapter - VL2E Adapter

[1] For devices ... ST PRIME with the rotary switch set to **EXTRA**.

[2] No checking for reversed wires when the EL1 Adapter is used

Testing For	Continuity L(1/2/3), N	Short Circuit Between L(1/2/3), N	Reverse Polarity / Clock-wise Phase Sequence
EL1 Adapter	x	x	– [1]
VL2E Adapter	x	x	x
AT3-IIIE Adapter	x	x	x

[1] Testing for reverse polarity is only performed for Swiss sockets, and only in combination with feature B09.

NOTE

This function allows you to rate the functionality of the active conductors L(1, 2, 3) and N in an extension cord. The PE conductor is not tested in this process.

15.14.1 Function Test of Extension Cords: Application, Definition, Measuring Method

Measurement of Single-Phase Extension Cords with EL1

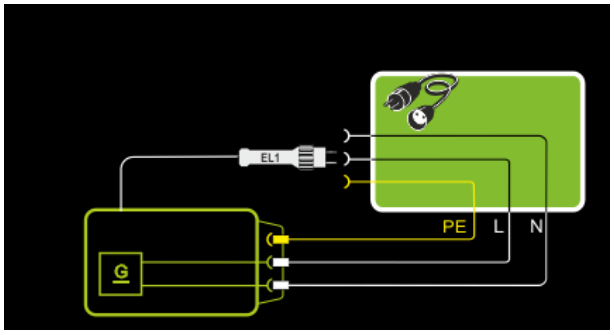


Fig. 164: Measurement of single-phase extension cords with EL1, schematic diagram

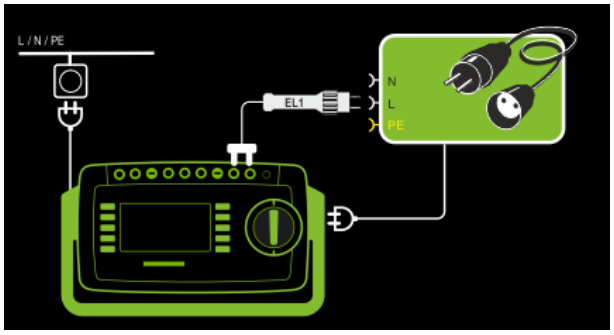


Fig. 165: Measurement of single-phase extension cords with EL1, connection diagram

Measurement of Single and 3-Phase Extension Cords with VL2E

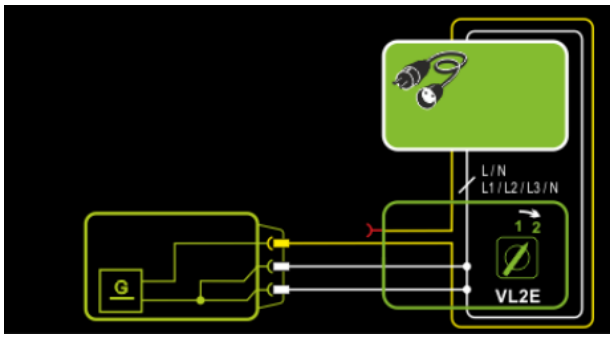


Fig. 166: Measurement of single and 3-phase extension cords with VL2E, schematic diagram

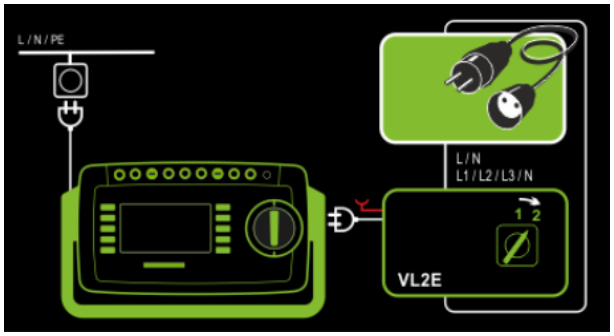


Fig. 167: Measurement of single and 3-phase extension cords with VL2E, connection diagram

Measurement of Single and 3-Phase Extension Cords with AT3-IIIE

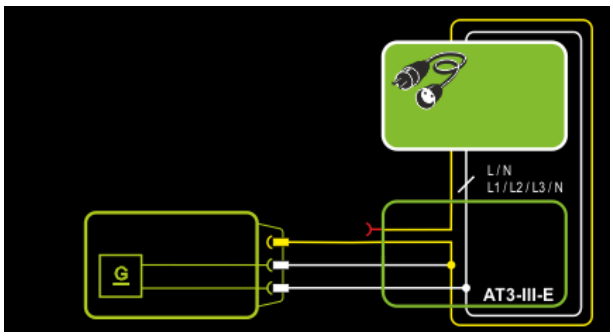


Fig. 168: Measurement of single and 3-phase extension cords with AT3-IIIE, Schematic Diagram

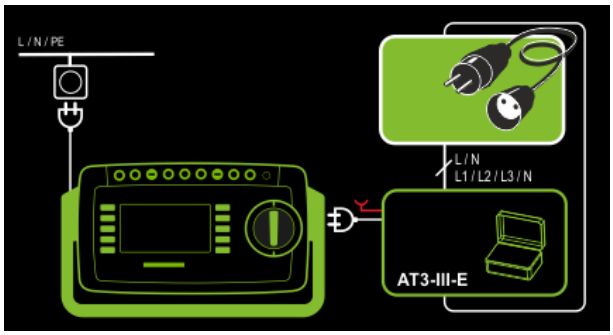


Fig. 169: Measurement of single and 3-phase extension cords with AT3-IIIE, connection diagram

15.14.2 Measurement Parameters for EL1

Testing For	Continuity L(1/2/3), N	Short Circuit Between L(1/2/3), N	Reverse Polarity / Clock-wise Phase Sequence
EL1 Adapter	x	x	–[1]
VL2E Adapter	x	x	x
AT3-IIIE Adapter	x	x	x

[1] Testing for reverse polarity is only performed for Swiss sockets, and only in combination with feature B09.

For testing RPE and RINS, see the corresponding single measurements.

NOTE

For testing extension cords in accordance with EN 50678 / VDE 0701 or EN 50699 / VDE 0702 / or VDE 0701-0702 / OEVE E 8701 / SNR 462638, for which RPE and RINS are measured.

NOTE

If the EL1 continuity test is executed on an extension cord together with a “travel adapter”, any statement made by the test instrument regarding the correct polarity of an extension cord is not reliable!

NOTE

For cables with an indicator lamp (usually a glow lamp in the switch), the result of the continuity check for L and N may be distorted by the additional resistance of the glow lamp.

If in doubt, perform a continuity check for L and N by means of resistance measurement (R-PE or R-INS):

SECUTEST ST PRO: R-PE between probe 1 and probe 2.

SECUTEST ST BASE(10): R-PE between probe 1 and measuring lead on the protective earth bar in the test socket (test type PE(TS)-P1).

15.14.3 Function Test of Extension Cords: Executing a Test

▶ **Test procedure with EL1 Adapter**

1. Set the rotary switch to the **El** or **EXTRA** position.
2. Select the continuity check (SECUTEST ST PRIME only).
3. Select the EL1 Adapter connection type with the **Set measuring mode** key.
4. Connect the EL1 Adapter to the P1 sockets on the test instrument.
5. Connect the plug of the extension cord to the test socket.
6. Connect the coupling socket at the other end of the extension cord to the plug on the EL1 Adapter.
7. Press the **START/STOP** key.
   ↳ The test begins.
   ↳ The measured values are displayed.
   ↳ The **Start rating** symbol appears on the right.
8. Click the **Start rating** key.
   ↳ The currently displayed measured value is saved in the buffer.
9. Press the **START/STOP** key.
   ↳ The test is ended.
   ↳ The **Save as** symbol appears (showing the number of cached measured values) and prompts you to save the measured values under a DUT ID number.
10. Save the measured values under a DUT ID number.
11. To discard the cached measurement values, press the **ESC** key and confirm with the **OK** key.

▶ **Test procedure with VL2E Adapter**

1. Set the rotary switch to the **El** or **EXTRA** position.
2. Select the continuity check (SECUTEST ST PRIME only).
3. Select the VL2E Adapter connection type with the **Set measuring mode** key.
4. Connect the cable of the VL2E Adapter to the test socket of the test instrument.
5. Connect the plug and socket of the extension cord to the VL2E Adapter.
6. Press the **START/STOP** key.
   ↳ The test begins.
7. Move the swivel switch on the VL2E Adapter to position 2 and hold it in that position.
   ↳ The measured values are displayed.
   ↳ The test instrument only shows if the cable is OK or not OK. In the case of “not OK”, the testing person must perform further measurements to determine if “not OK” indicates an open circuit or a short circuit.

8. Press the **START/STOP** key.
   ↳ The test is ended.
   ↳ The **Save as** symbol appears (showing the number of cached measured values) and prompts you to save the measured values under a DUT ID number.
9. Save the measured values under a DUT ID number.
10. To discard the cached measurement values, press the **ESC** key and confirm with the **OK** key.

Test procedure with AT3-IIIE Adapter

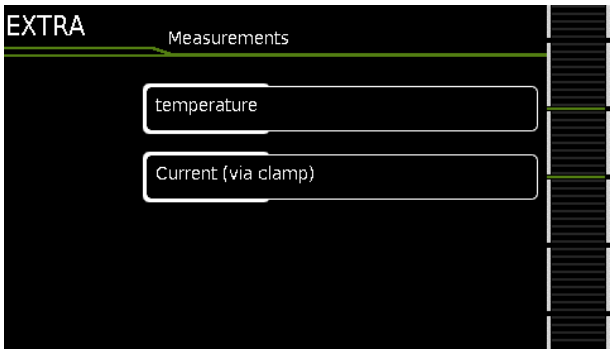
NOTE

For information on the correct connection of the test adapter and the DUT, as well as the specific details of the test procedure, please refer to the operating instructions for the AT3-III E test adapter.

15.15 Special Functions – EXTRA

Depending on the test instrument configuration, either the QR code for the Internet link to the operating instructions or the measurement view for the temperature measurement is displayed.

15.15.1 EXTRA: Feature I01

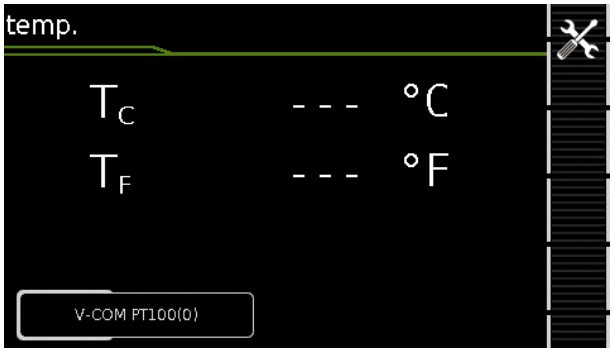


Single Measurements – Switch Positions on the Green Rotary Switch Level		
Rotary Switch Position	**Measuring Functions**	**Measuring Mode**
EXTRA	Continuity Check [1]	EL1 Adapter AT3-IIIE Adapter VL2E Adapter
	Temperature	V-COM PT100(0)
	Current (via clamp)	V-COM V-COM (w. Mains)
	PRCD trip time [1]	
	Relay continuity check [1]	PHV L(TS) N(TS)

[1] Applies only to ...ST PRIME devices.

15.15.1.1 Temperature Measurement

▶ **Application, definition, measuring method**



Temperature measurement is performed with either a Pt100 or a Pt1000 temperature sensor – the sensor type is automatically detected internally.

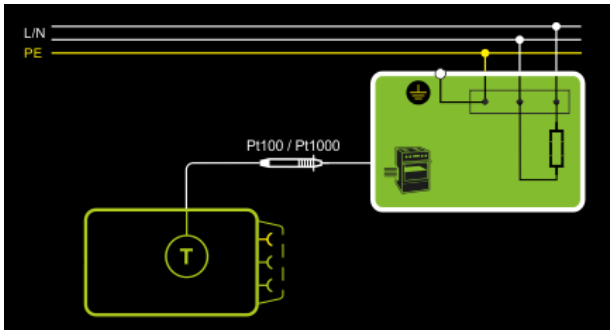


Fig. 170: Temperature measurement, schematic diagram

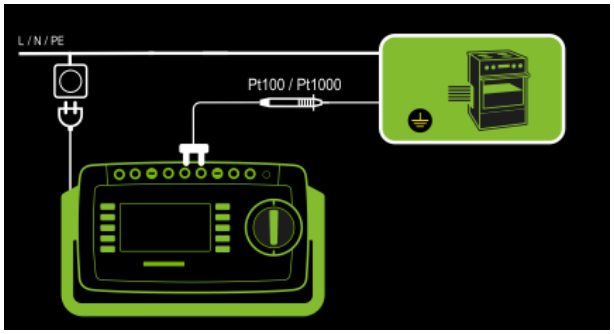


Fig. 171: Temperature measurement, connection diagram

▶ **Execute a test procedure with a temperature sensor**

1. Set the rotary switch to the **EXTRA** position.
2. Select the **Temperature** measuring function.
3. Connect the plug of the temperature sensor the V-COM sockets of the test instrument.
4. Contact the DUT.
5. Press the **START/STOP** key.
   ↳ The test begins.
   ↳ The measured values are displayed.
   ↳ The **Start rating** symbol appears on the right.
6. Click the **Start rating** key.
   ↳ The currently displayed measured value is saved in the buffer.

7. Press the **START/STOP** key.
   ↳ The test is ended.
   ↳ The **Save as** symbol appears (showing the number of cached measured values) and prompts you to save the measured values under a DUT ID number.
8. Save the measured values under a DUT ID number.
9. To discard the cached measurement values, press the **ESC** key and confirm with the **OK** key.

15.15.1.2 Current via Clamp — IZ

▶ **Application, definition, measuring method**



Here, a current measurement using a current clamp is possible independently of the measuring functions R_{PE}, I_{PE} or I_E, e.g., for measuring currents in permanently connected DUTs

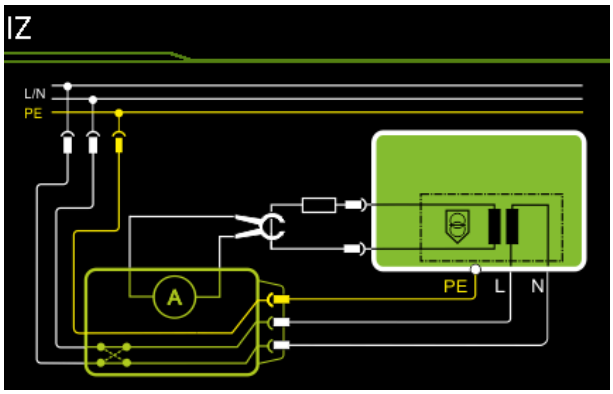


Fig. 172: Current via clamp, schematic diagram

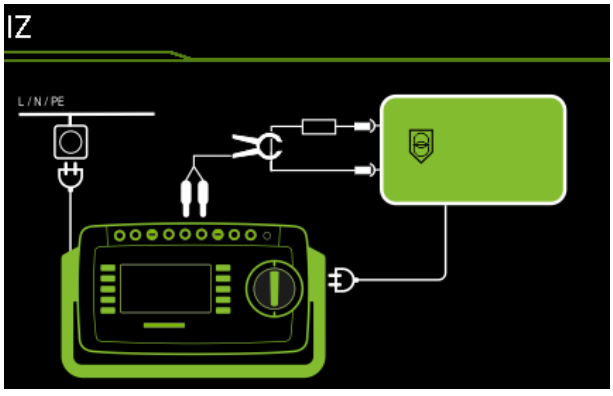


Fig. 173: Current via clamp, connection diagram

▶ **Measurement parameters for a current clamp sensor**

Measurement Parameter	Meaning	
Measuring Mode		**Suitable for DUT Connection**
V – COM	Display: A AC	Permanent connection
V – COM (with mains)	Display: A AC: with mains to test socket, e.g., for measuring safety extra-low voltage on power supplies	Test socket
Polarity – only for V-COM (with mains)		
Normal polarity	Selection of polarity for mains voltage at the test socket	
Reverse polarity		
Factor V:A		
On test instrument	**Transformation Ratio of Current Clamp Sensor**	**Suitable Clamps**
1 V : 1000 A (1 : 1000)	1 mV / 1 A	WZ12C, Z3512A, METRAFLEX 3000
1 V : 100 A (1 : 100)	10 mV / 1 A	WZ11B, Z3512A, METRAFLEX 3000/300M
1 V : 10 A (1 : 10)	100 mV / 1 A	WZ12B, WZ11B, Z3512A, METRAFLEX 3000/300M
1 mV : 1 mA (1 : 1)	1000 mV / 1 A	WZ12C, Z3512A, METRAFLEX 300M
10 mV : 1 mA (10 : 1)		
100 mV : 1 mA (100 : 1)	100 mV : 1 mA	SECUTEST CLIP
1 V : 1 mA (1000 : 1)		

▶ **Execute a test procedure with a current clamp sensor**

1. Set the rotary switch to the **EXTRA** position.
2. Select the **Current (via clamp)** measuring function.
3. Set the clamp factor on the current clamp sensor.
4. Factor V:A: Set the clamp factor on the test instrument to the same value as on the current clamp sensor.
5. Connect the plug of the current clamp to the V-COM sockets of the test instrument.
6. Enclose the cable of the load with the current clamp sensor as shown in the wiring diagrams.
7. Press the **START/STOP** key.
   ↳ The test begins.
   ↳ The measured values are displayed.
   ↳ The **Start rating** symbol appears on the right.
8. Click the **Start rating** key.
   ↳ The currently displayed measured value is saved in the buffer.
9. Press the **START/STOP** key.
   ↳ The test is ended.
   ↳ The **Save as** symbol appears (showing the number of cached measured values) and prompts you to save the measured values under a DUT ID number.

10. Save the measured values under a DUT ID number.
11. To discard the cached measurement values, press the **ESC** key and confirm with the **OK** key.

Setting the Measuring Range on the Clamp and Parameters in the Test Instrument

Test Instrument	Current Clamp Sensor		Test Instrument
Transformation Ratio Parameter	Transformation Ratio (Switch)	Measuring Range	Display Range with Clamp
	WZ12C		
1000 mV : 1 A	1000 mV : 1 A	1 mA ... 15 A	0 mA ... 300 A
1 mV : 1 mA	1 mV : 1 mA	1 A ... 150 A	1.0 A ... 300 A
	WZ12B		
100 mV : 1 A	100 mV : 1 A	10 mA ... 100 A	0 A ... 300 A
	WZ11B		
100 mV : 1 A	100 mV : 1 A	0.5 A ... 20 A	0 A ... 300 A
10 mV : 1 A	10 mV : 1 A	5 A ... 200 A	0 A ... 300 A
	Z3512A		
1000 mV : 1 A	1000 mV : 1 A	0.001 A ... 1 A	0 A ... 300 A
100 mV : 1 A	100 mV : 1 A	0.01 A ... 10 A	0 A ... 300 A
10 mV : 1 A	10 mV : 1 A	0.1 A ... 100 A	0 A ... 300 A
1 mV : 1 A	1 mV : 1 A	1 A ... 1000 A	0 A ... 300 A
	METRAFLEX 3000		
100 mV : 1 A	100 mV : 1 A	0.01 A ... 30 A	0 A ... 300 A
10 mV : 1 A	10 mV : 1 A	0.1 A ... 300 A	0 A ... 300 A
1 mV : 1 A	1 mV : 1 A	1 A ... 3000 A	0 A ... 300 A
	METRAFLEX 300M		
1000 mV : 1 A	1000 mV : 1 A	0.001 A ... 3 A	0 A ... 300 A
100 mV : 1 A	100 mV : 1 A	0.01 A ... 30 A	0 A ... 300 A
10 mV : 1 A	10 mV : 1 A	0.1 A ... 300 A	0 A ... 300 A
	SECUTEST CLIP		
100 mV : 1 mA	100 mV : 1 mA	0.1 ... 25 mA	0.01 mA ... 3.00 A

16 Test Sequences (Automatic Test Procedures)

A test sequence is a series of semi-automatic tests or test steps. If the same sequence of individual tests will be run frequently (one after the other with subsequent report generation), for example as specified in the standards, it is advisable to make use of such test sequences.

The test instrument includes two types of test sequences:

- Integrated Test Sequences
  - Available ex works or after enabling at the instrument
  - Cannot be changed (test parameters are configurable)

NOTE

The integrated test sequences do not include all of the tests stipulated by the product standard which are required for type testing! They are restricted to the tests which are required as a rule after repair or during maintenance work and for occupational health and safety measures, as well as for quality assurance in production.

- User-Defined Test Sequences
  - Created individually by the user with the associated IZYTRONIQ software and transferred to the test instrument.
  - (This function is available depending on test instrument model or features.)

NOTE

An insulation test can also be added to your instrument sequence as a control type test step in IZYTRONIQ. This type of step determines whether or not a DUT which is (directly) connected to the test socket is insulated. The DUT must be set up in an insulated manner in order to correctly determine protective conductor or device leakage current with the direct measurement type.
The test instrument automatically performs this type of test at the beginning of the sequence if test steps of this sort (protective conductor or device leakage current with the “Direct” measurement type) are included in the user-defined sequence – in such cases, it is not necessary to add this test step to the sequence manually!

All test sequences are run in orange rotary switch positions **A1** through **A9**. Each of the rotary switch positions is preconfigured at the factory with integrated test sequences, but they can be adapted to suit your needs,

i.e., integrated and user-defined test sequences can be subsequently assigned to the various rotary switch positions as required.

The measurements included in the test sequences are evaluated – either automatically by the test instrument (in the case of limit values) or manually by the user (e.g., visual inspection). Automatic evaluation by the test instrument is based on the worst-case and, depending on settings, in consideration of measuring uncertainty.

NOTE

The user selects standard designations (national designations) for the integrated test sequences during initial configuration. If the designations need to be changed, follow the instructions in ⇨ **"the section “Configuring Test Standards/Integrated Test Sequences”"** 🗋 **61** again. Note that designations cannot be changed retroactively. Standard designations in tests that have already been saved cannot be changed.

▶ **Loading demo test sequences into the test instrument**

Free examples are available in our myGMC portal to illustrate the wide-ranging applications of user-defined test sequences. To use these, load them into your test instrument.

1. Go to the Gossen Metrawatt GmbH website: **https://www.gossenmetrawatt.de/en/service-support/mygmc/**
2. Create a myGMC account and register your test instrument (both free of charge).
3. Download the test sequence(s).
4. Save the test sequences onto a USB flash drive.
5. Connect the USB flash drive to your test instrument.
6. On the test instrument, select the **SETUP** rotary switch position.
7. Select the menu entry **Own sequences > Load from file**.
   ↳ The test sequences are transferred to your test instrument and are available there.

▶ **Preparing Test Sequences**

First of all, prepare the test sequences and adapt them to your needs. Settings are made at two points in the test instrument to this end:

1. Enter general settings which apply to all test sequences, regardless of the respectively selected standard. (**SETUP** rotary switch position).
2. Configure the test sequences (rotary switch position **A1** through **A9**) as desired.
3. Familiarize yourself with the menu and the user interface.
4. Set the classification and sequence parameters which apply only to the respectively selected rotary switch position.

Depending on the test instrument model and its features, you can also create your own user-defined test sequences using the IZYTRONIQ software and transfer them to the test instrument.

▶ **Performing a Test Sequence**

1. Connect the DUT.
2. Select the test object from the database.
   ↳ The test instrument initializes connection type recognition.
3. Start the test sequence.
   ↳ The individual test steps are executed.
   ↳ The test instrument automatically evaluates the test steps.
4. Perform the manual assessment of the test steps.
   ↳ The test sequence is ended.
5. Optional: Display the test steps and results.
6. Optional: Save the results.

16.1 General Settings (Setup: Autom. measurem. Parameter)



Fig. 174: "Setup 1/3" page

The following settings can be entered for all test sequences collectively when the rotary switch is set to **SETUP** on the **SETUP 1/3 > Autom. measurem.** menu page.

Automatic Measurements (1/7)

- Auto meas. point

If **Yes** is selected, the test instrument detects if the protective earth is in contact with the probe during the protective earth resistance measurement of an automatic test sequence and automatically starts recording a new measurement point. The different states are indicated by various continuous beeps. The protective conductor test can thus be executed without using the keys on the test instrument.

NOTE

The "Auto meas. point" function is only active for "multi measurement" test steps. If you want to use this function, please note the following:

For built-in test sequences, make sure that "multi measurement step" is selected for the RPE test step in the sequence parameters.

For user-defined test sequences (only with the SECUTEST DB+ database extension (Z853R or feature KB01)), make sure that the RPE test step is included in the sequence as a "multi measurement".

- Autom. power off

For automatic test sequences, the system detects if the DUT is switched on or off.

DUT is off: The test sequence continues automatically (without pressing a key on the test instrument).

DUT is on: As soon as the user switches off the DUT, the mains voltage to the DUT is automatically switched off. The test sequence then continues automatically (without pressing any key on the test instrument).

NOTE

The function is NOT suitable for DUTs that must first be shut down properly (e.g., desktop PCs).

On/off detection is based on the current consumption of the DUT. If the instantaneous current consumption falls below a certain threshold, the test instrument disconnects the DUT from the power supply without user confirmation (and continues with the test).

Activate this feature only for DUTs that are not susceptible to damage from unexpected disconnection from the mains supply.

- Into operat. msg

When testing is active, this specifies if the test message "Please put the DUT into operation and confirm." is displayed after the mains voltage is switched on.

NOTE

False Measurement Result

For leakage current measurements, the DUT must be fully operational. If the message is deactivated, you must put the DUT into full operation immediately and without being prompted (after switching on mains voltage to the DUT). Otherwise, a false value will be recorded during the subsequent leakage current measurement.

In case of doubt, the measured leakage current value must be verified with the rotary switch in the I_{PE} or I_E position.

NOTE

Deactivate this message for experienced users only- Deactivate this message for "on/off" DUTs only.

For leakage current measurements, the DUT must be fully operational. Otherwise, the measurement result will be false.

Deactivate the message only in the following cases:

- If the DUT must be fully switched on within 3 seconds. (examples: lamps, handheld tools, power supplies, screens, etc.)

- If the testing person is very experienced and therefore knows when the DUT must be fully switched on during the measurement.

Incl. oper. uncert.

If **Yes** is selected, the BMU (operating uncertainty) is taken into account in the display of the measurement result. The final result is displayed with a deterioration equal to the BMU value.

Automatic Measurements (2/7)

- AutoStore

  This function is available only with SECUTEST DB COMFORT (Z853S or feature KD01).

If this function is activated ("on"), the test results in the automatic test sequence are immediately stored under the DUT (= device or ME device) that is currently selected in the database.

If you have not previously selected a DUT in the memory management (MEM key), a INFO message will appear indicating that the current test cannot be saved automatically.

You will be prompted to enter a DUT ID using a reader or the softkeys, or to select it from the database (MEM key). In this case, you must use the "Save" softkey to manually save the test to the database.

- AutoPrint

Determines if and when reports are printed automatically.

The following options are available:

- Off: No automatic printing of reports
- At the end of testing: Automatic printout of the report immediately after the test is completed. In this case, a report without DUT information is always printed.
- When saving: Automatic printout of the report when saving the test to the database. In this case, a report containing DUT information is printed.

TIP

If you select this option and AutoStore is activated at the same time, a report containing DUT information is printed immediately after the test is completed.

The printout can generated as HTML report if a USB flash drive is connected, or using the thermal printer included in the accessories, provided it is connected.

It does not matter if the test was passed or failed. If this option is activated, a printout is ALWAYS generated immediately.

- At end of sequence

Specifies if the main screen with the storage option ("memory screen") or a report with test results ("results list") is displayed at the end of a test sequence.

Automatic Measurements (3/7)

- Limit mode

If you want to rate the measurements exclusively based on the limits specified in the standard, set the parameter to **Normal**.

When set to Expert, if a measurement fails, the **LIMIT** softkey appears next to the "Measurement failed" pop-up. This key allows you to enter a user-defined limit (typically a value specified by the manufacturer that deviates from the standard) to pass the measurement under this new condition.

TIP

If you select **Continue** for the **At limit viol.** option, you cannot enter a user-defined limit.

- At limit viol.
  This function is available only with SECUTEST DB COMFORT (Z853S or feature KD01).

In **Retry** mode, if a limit violation occurs, the test instrument offers to restart the failed test step immediately and repeat the measurement.

In **Continue** mode, the test instrument does not end the test sequence if a limit violation occurs but continues it despite failed single test steps.

WARNING

Dangerous electrical voltage!

If the test sequence is continued, accessible conductive parts may carry a dangerous voltage during the test because the DUT is powered by mains voltage despite possible insulation faults, increased protective earth resistance, or similar issues.

— Do not touch metallic parts.

— If you want to continue, proceed as follows:
  1. Wear suitable personal protective equipment (PPE).
  2. Protect the DUT against contact with a suitable cover.
  3. Use a 30 mA PRCD.
  4. Continue by pressing **OK**.

— Some standards may not provide for test sequences in the **Continue** mode. Responsibility is borne by the user.

TIP

If a limit violation occurs during the test sequence, the designation of the respective test step is displayed in red in the header for all subsequent test steps, so that it is already apparent during the test sequence that a limit violation occurred in one of the preceding test steps and that the DUT will not pass the test.

In **Cancel** mode, the test instrument ends the test sequence if a limit violation occurs and marks the test as failed.

Automatic Measurements (4/7)

- Skip steps

Here you can configure if the user is allowed to skip measurement steps during a test sequence (“on”).

Skippable (non-standard-relevant) control steps are not affected by this!

- Skipped steps

Controls if each individual test step that was deactivated before the test sequence or skipped during the test sequence is saved as *skipped* in the test report.

Store is the default setting and ensures that every skipped test step, including its parameters, is saved in the report information, appears in the test reports, and is transmitted to IZYTRONIQ.

Don't store ensures that skipped test steps are not stored. As a result, they will be missing in all test reports and will not be transferred to IZYTRONIQ.

If you consider it important to document all skipped test steps, please be sure to select "Store."

Activate **Don't store** if you do not need documentation of the skipped test steps and instead prioritize faster test execution and, in some cases, shorter test reports.

- Std. interv. (mon.)

Default interval (in months) for calculating the next test date. The factory setting for this interval is 12 months.

Automatic Measurements (5/7 and subsequent pages)

- Startscreen

Here you can choose between tree view and detail view for the start screen of the test sequence.

- Standards, e.g., VDE 0701-0702

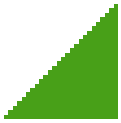
Here you can select the national designation of the standards. The designations selected here are used in the test instrument and in reports.

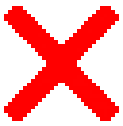
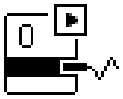
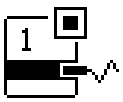
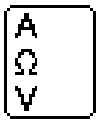
TIP

Changing the standard designation(s) requires a restart of the test instrument, and the settings for rotary switch positions **A1** ... **A9** are lost. (Database structure and content are retained.) The change is not retroactive; previous measurements retain their previous designations!

16.2 User Interface Icons – Test Sequences

Icon	Designation	Meaning
	**Class I**	Test for Class I DUTs Accessible conductive parts are connected to the protective earth so that they cannot carry voltage in the event of a failure of the basic insulation.
	**Class II**	Test for Class II DUTs These DUTs are equipped with double or reinforced insulation.
	**Class III**	Test for Class III DUTs These DUTs are supplied with safety extra-low voltage (SELV). Beyond this, no voltages greater than those of SELV are generated.
	**Type B**	Type B applied parts (body)
	**Type BF**	Type BF applied parts (body float)

Icon	Designation	Meaning
	**Type CF**	Type CF applied parts (cardiac float)
	**Type of applied part**	You can use this to assign a type (B, BF, or CF) to a group of applied parts. Prerequisite: You have opened the classification parameters (here, the Applied Parts menu) and used the **Expand group** softkey to create a group
	**Expand group**	Each time you press the key, another applied part connector is added to the group. Prerequisite: You have opened the Classification Parameters and selected the Applied Parts menu.
	**Reduce group**	Each time you press the key, an applied part connector is removed from the group. Prerequisite: You have opened the Classification Parameters and selected the Applied Parts menu.
	**Next group**	Each time you press the key, the input frame jumps to a position that is either unassigned or already assigned – depending on whether you want to create a new group or edit an existing group. Prerequisite: You have opened the Classification Parameters and selected the Applied Parts menu. At least one group has already been created.
	**Set Parameters**	Set sequence parameters,
	**SEL**	Set classification parameters.
	**OK** **NOT OK**	Toggle key Rate a visual inspection or functional test as OK or not OK.
	**Comment**	Enter a comment, e.g., for the visual inspection or functional test.
	**Continue test**	Continue test; proceed to next test step in the test sequence.
	**End continuous measurement**	End continuous measurement, proceed to next test step in the test sequence
	**OK**	Apply changed parameters, return to the memory view.

Icon	Designation	Meaning
	**Cancel** **Not OK**	End the test sequence.
	**Repeat**	■ Repeat the check (if it failed). ■ Repeat the test step.
	**Skip**	■ Skip the check test step. ■ Skip single tests in the test sequence: This option can be set for the user in SETUP under "Autom. measurem.".
	**Start rating**	Start rating – record measured value. Each time you press the softkey, another measured value is saved and the number is incremented.
	**Start rating process of continuous measurement**	Start the rating process during a continuous measurement. The number flashes.
	**Record a measured value of continuous measurement**	Record a measured value during the rating process of a continuous measurement.
	**Repeat measured value recording**	Repeat a measured value recording,
	**Delete measured value**	Delete a measured value.
	**Show measured values**	Show measured values of performed measurements.
	**Show details**	Show details of the measurement results list.
	**Hide details**	Hide details of the measurement results list.
	**ID**	The ID number under which the measurement(s) should be stored can be entered here.
	**Store**	Valid measured values have been obtained for a measurement. This measurement can be stored.

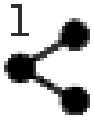
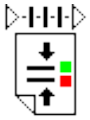
Icon	Designation	Meaning
	**Store as**	Store the measurement data as (with display of directory path / DUT ID or new entry of a DUT ID other than the preselected one)
	**Push/Print**	Send measurement data to the PC, e.g., for storage in the IZYTRONIQ logging software (Push/Print function); for a description, see the IZYTRONIQ online help
	**Test report complete**	Generate a complete test report at the end of a test sequence.
	**Test report merged**	Generate a merged test report at the end of a test sequence.
	**Failed test steps**	Generate a list of all failed test steps instead of a test report at the end of the test sequence.

Table 108: User interface icons – test sequences

16.3 Test Sequence Menu: View and Symbols

Test Sequence Start Screen

The start screen of the test sequence displays all available settings and allows you to access and modify them.

You can choose between the tree view (structure view) and the detail view (information about the DUT).

The tree view can be structured by location or customer.

Rotary switch position SETUP > Setup menu 1/3 > Autom. measurem. 2/4 > Startscreen: **Customer tree view** or **Location tree view** or **Show details**

For test instruments with feature E01 (touchscreen), you can also switch between views with “touch-and-click”: i.e., by briefly tapping the respective area.

On test instruments with feature E01 (touchscreen), you can open a quick selection of test sequences by briefly tapping the standard/test sequence.

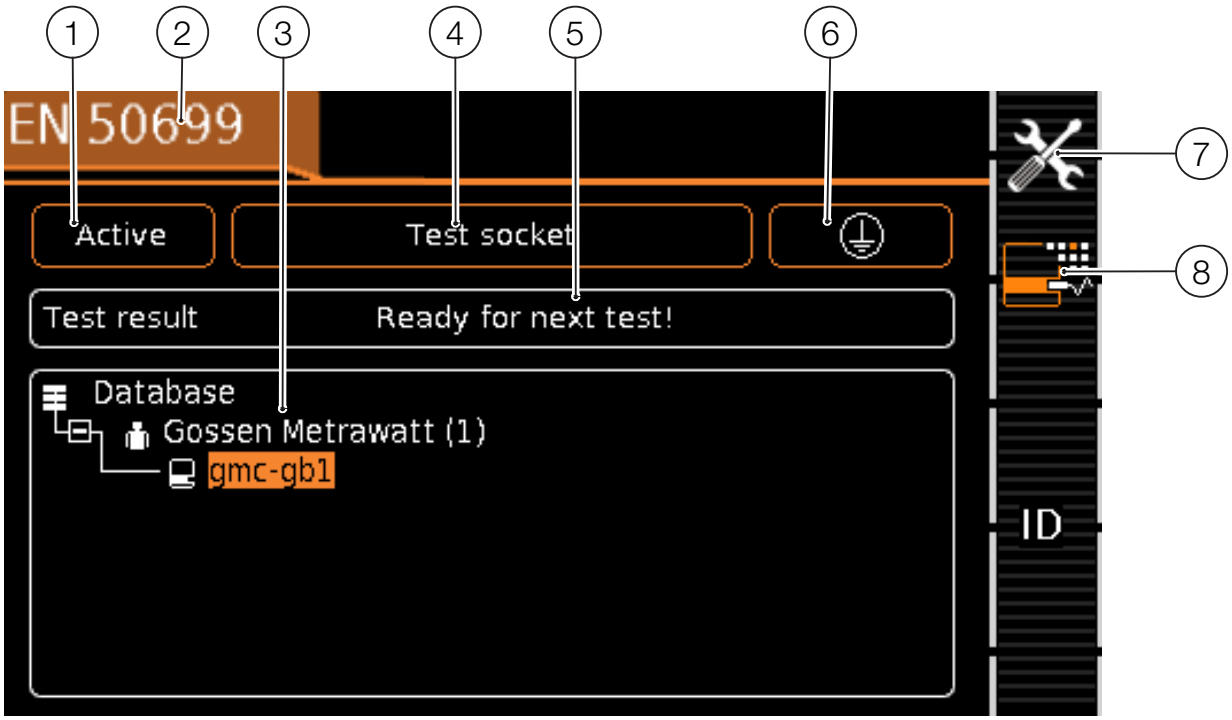


Fig. 175: Customer Tree View

1	Measuring mode	5	Status line
2	Standard / Test sequence	6	Protection class
3	Customer tree	7	Sequence parameters
4	Connection type	8	Classification parameters

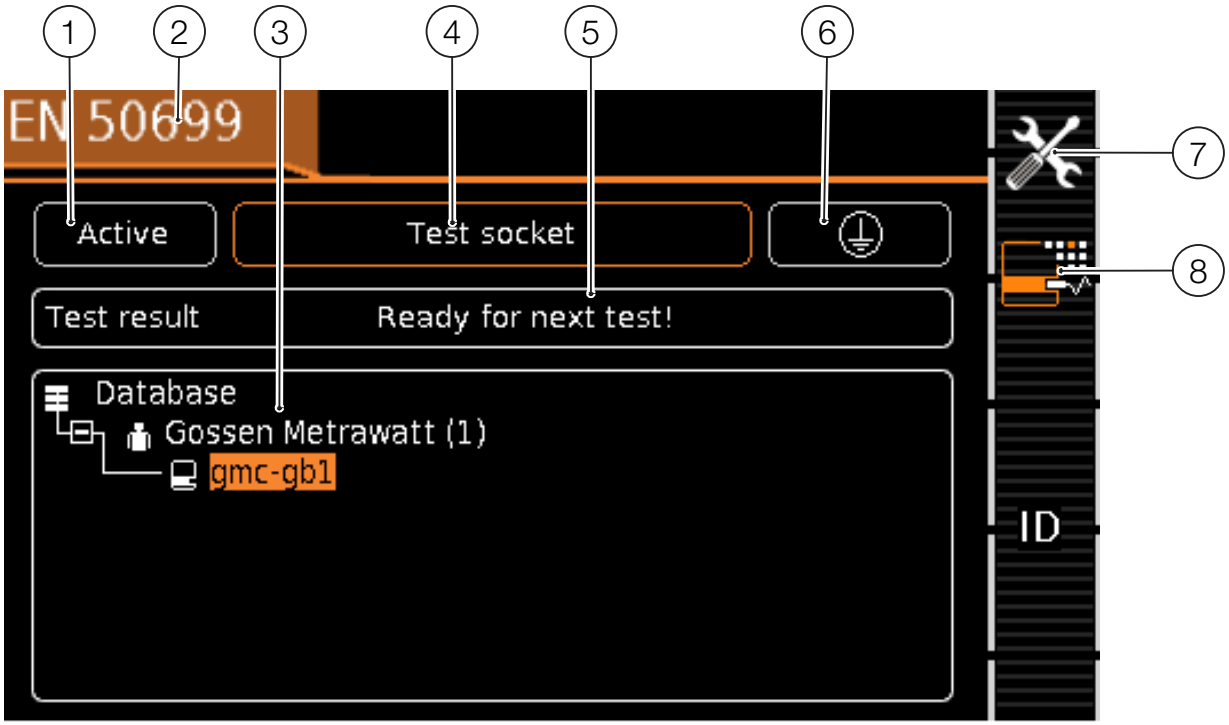


Fig. 176: Location Tree View

1	Measuring mode	5	Status line
2	Standard / Test sequence	6	Protection class
3	Location tree	7	Sequence parameters
4	Connection type	8	Classification parameters

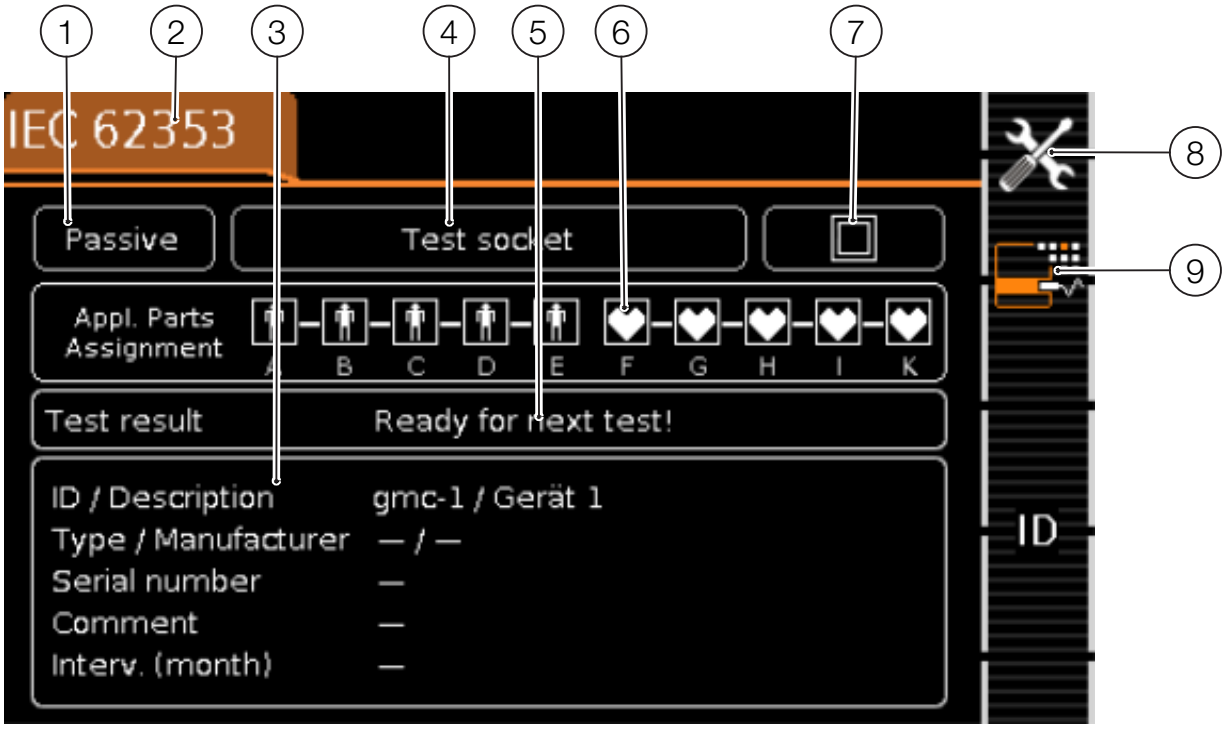


Fig. 177: Detail view and AP

1	Measuring mode	6	Applied parts
2	Standard / Test sequence	7	Protection class
3	Detail view	8	Sequence parameters
4	Connection type	9	Classification parameters
5	Status line		

16.4 Configuring Test Sequences

The test instrument includes factory-integrated, preconfigured test sequences.

Alternatively, you can use user-defined test sequences (depending on the test instrument model and its features).

Factory Settings / Default Configuration

Which integrated test sequences are factory-set on your test instrument to rotary switch positions **A1**... **A9**, or which sequences are assigned to these positions after a rest of the test instrument, depends on several factors: your test instrument type (SECUTEST ST... or SECULIFE ST...), the selected features, and the activated add-ons.

In addition, during commissioning you selected standard designations and deactivated unnecessary standards in the test instrument.

Due to the wide variety of possible combinations, listing the standard assignments for rotary switch positions **A1**... **A9** would go beyond the scope of this documentation. You can find an example in the “Scope of Delivery” section.

You can determine the current configuration of your test instrument by selecting the individual rotary switch positions.

Customizing Integrated Test Sequences

You can change the integrated, preconfigured test sequences to suit your needs: You can adjust and change settings of the single test sequences, i.e., classification parameters and sequence parameters, directly on the test instrument. To do this, first familiarize yourself with the menu, and then change the desired parameters.

User-Defined Test Sequences

If you have specific requirements, as an alternative to the integrated test sequences, you can create customized user-defined test sequences using the IZYTRONIQ software on a PC, transfer them to the test instrument, and use them (depending on the test instrument model and its features).

16.4.1 Selecting and Configuring the Integrated Test Sequence on the Test Instrument

You can adjust all the settings for the integrated test sequences on the test instrument. DUT classification is set on the test instrument via classification parameters (protection class, connection type, measuring mode, etc.).

▶ **Open a test sequence**

1. Select a rotary switch position (**A1**... **A9**).
   ↳ The start screen for the respective integrated test sequence is displayed. Either the default integrated test sequence or the previous setting is displayed.
   ↳ The classification parameters and sequence parameters can be set.
   ↳ The test instrument attempts to automatically detect the settings of certain classification parameters. . If this is successful, an orange frame appears to indicate this.



Automatic Detection for Protection Class Active

When connecting or disconnecting a DUT, the protection class can be changed without confirmation.



Automatic Detection for Protection Class Inactive

When connecting or disconnecting a DUT, the test instrument retains the selected protection class setting.

▶ Specify classification parameters manually

You must check the automatic configuration of classification parameters. If the classification parameters are not detected automatically or are detected incorrectly, you must specify them manually.

✓ The test sequence is open.

1. Open the Classification Parameters menu with the **SEL** key.
   ↳ The available parameters are displayed.
2. Select the parameter you want to change with the **SEL** key.
   ↳ A selection of possible settings appears.
3. Select the desired setting with the **SEL** key.
   ↳ The Classification Parameters menu is displayed again.
4. Change additional settings as needed.
5. Confirm and save all changes you have made with **OK**.
   ↳ The start screen of the Test menu is displayed again.

▶ Change classification parameters for test instruments with touchscreen

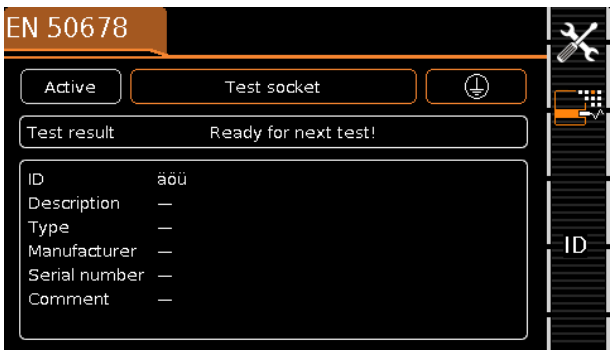
For test instruments with a touchscreen (feature E01), you can easily change the classification parameters. This also applies to PRCD types and to the voltage type for welding standards.

1. Tap briefly in the respective classification parameters window.
   ↳ The selection menu opens.
2. Select the desired parameter.
   ↳ The selection is applied.
   ↳ The program returns to the Start menu.

▶ Select a standard/test sequence via touch

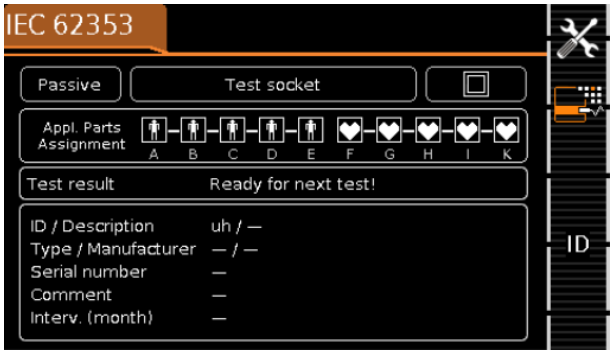
As of firmware version 3.5.0, standard/test sequence selection via touch is possible (only with feature KD01, or with Z853S and feature E01 “Touchscreen” installed) in rotary switch positions **A1** ... **A9**. The logged-in testing person must be assigned the “Test Planner” role.

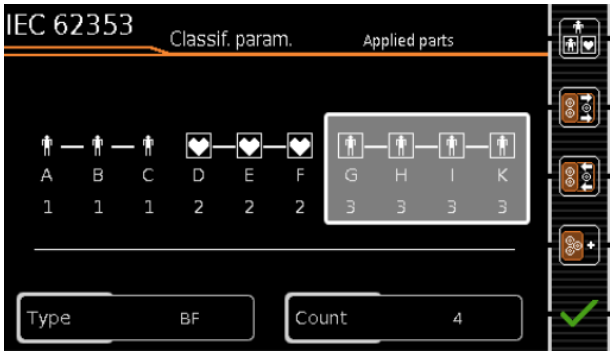
If the function is active, the touch-sensitive area is displayed in orange.



1. Press the standard designation.
   ↳ The **Classif. param. > Standard/Test sequences** menu opens directly.

▶ **Select applied parts for the test sequence**





1. Press the **Classification parameters** softkey.
2. Go to page 2/2.
3. Press the **Applied parts** softkey.
   Touch-and-click operation: Alternatively, you can access this submenu by touching the “AP Assignment” field.
4. Select the desired applied part connectors with the **Expand group** softkey. A frame identifies the currently selected sockets, always beginning with socket A. Each time you press the softkey, another socket is added. The currently selected number is displayed in the field at the bottom right.
   Pressing the **Reduce croup** softkey reduces the selection of sockets again.
5. After you select the sockets, assign the respective type with the **Type of AP** softkey. The corresponding symbols are assigned to the selected sockets, and the type is displayed in the field at the bottom left.
6. After you select the applied parts and assign the type, you can press the **Next group** softkey to create additional groups.

By selecting an existing group using the input frame, you can also edit it.

NOTE

You can only add additional groups with the **Next group** softkey if a type has already been assigned to a selected group.

16.4.1.1 EN 50678 / VDE 0701

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class [1] [2]	Class I, Class II, Class I+II, Class I+III, Class II+III, Class I+II+III
Connection type [1] [2]	Test socket Permanent connection Adapter: AT1 6/32-DI Adapter Adapter: VL2E Adapter: AT3 Adapter (feature I01) Permanent connection: P1+P2 (only with feature H01)
2/2	
Measuring mode (MM) [1]	Passive Active
Auto detection	Conn. & PC & MM Conn. & PC Conn. & MM Conn. only PC & MM Prot. Class only Meas. Mode only Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

[1] These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

[2] The limit for protective earth resistance is determined based on length and cross-section. Data remains in memory until a new entry is made.

Table 109: Classification parameters – EN 50678 / VDE 0701

16.4.1.2 EN 50678-ExtC / VDE 0701-ExtC

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class [1] [2]	Class I
Connection type [1] [2]	Test socket Adapter: AT3-IIIE Adapter: EL1 Adapter Adapter: VL2E Adapter
2/2	
Measuring mode (MM) [1]	ExtC [2]

Parameter	Setting Options / Meaning
Auto detection	Conn. & PC & MM Conn. & PC Conn. & MM Conn. only PC & MM Prot. Class only Meas. Mode only Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

1 These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

2 The limit for protective earth resistance is determined based on length and cross-section (for EL1, only length). Data remain in memory until a new entry is made.

Table 110: Classification parameters – EN 50678-ExtC / VDE 0701-ExtC

16.4.1.3 EN 50678-PRCD / VDE 0701-PRCD

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class[1 2]	Class I, Class I+II
Connection type[1 2]	Test socket
2/2	
Measuring mode (MM)[1]	PRCD[3]
PRCD Type[3]	PRCD (standard) PRCD (SPE) PRCD-S (SPE) PRCD-K (SPE)
Auto detection	Conn. & PC & MM Conn. & PC Conn. & MM Conn. only PC & MM Prot. Class only Meas. Mode only Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

1 These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

2 The limit for protective earth resistance is determined based on length and cross-section. Data remains in memory until a new entry is made.

[3] New classification parameters “PRCD Type” (displayed only when selecting parameters in accordance with standard VDE 0701-0702-PRCD / OEVE E 8701-PRCD / SNR 462638-PRCD): PRCD (standard): For testing simple circuit breaker safety adapters in which the protective earth is permanently connected. Often referred to as 2-pole.

PRCD (SPE): (SPE = switched protective earth) For testing PRCDs in which the protective earth is only connected when the device is switched on. Often referred to as 3-pole.

PRCD-S (SPE): For testing type PRCD-S circuit breaker safety adapters.

PRCD-K (SPE): For testing type PRCD-K circuit breaker safety adapters.

Table 111: Classification parameters – EN 50678-PRCD / VDE 0701-PRCD

NOTE



For more information on testing single-phase and 3-phase type S and K PRCDs by simulating faults, see “PROFITEST PRCD test adapter” on our website.

NOTE



Testing of PRCDs (test procedure and trip time) is only possible for DUTs with a rated voltage of 230 V.

16.4.1.4 EN 50699 / VDE 0702

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class [1] [2]	Class I, Class II, Class I+II, Class I+III, Class II+III, Class I+II+III
Connection type [1] [2]	Test socket Permanent connection Adapter: AT16/32-DI Adapter Adapter: VL2E Adapter: AT3 Adapter (feature I01) Permanent connection: P1+P2 (only with feature H01)
2/2	
Measuring mode (MM) [1]	Passive Active
Auto detection	Conn. & PC & MM Conn. & PC Conn. & MM Conn. only PC & MM Prot. Class only Meas. Mode only Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

[1] These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

[2] The limit for protective earth resistance is determined based on length and cross-section. Data remains in memory until a new entry is made.

Table 112: Classification parameters – EN 50699 / VDE 0702

16.4.1.5 EN 50699-IT

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class [1] [2]	Class I, Class II, Class I+II, Class I+III, Class II+III, Class I+II+III
Connection type [1] [2]	Test socket Permanent connection Adapter: AT16/32 Adapter: AT3 Adapter (feature I01)
2/2	
Measuring mode (MM) [1]	Active
Auto detection	Conn. & PC & MM Conn. & PC Conn. & MM Conn. only PC & MM Prot. Class only Meas. Mode only Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

[1] These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

[2] The limit for protective earth resistance is determined based on length and cross-section. Data remains in memory until a new entry is made.

Table 113: Classification parameters – EN 50699-IT

16.4.1.6 EN 50669-ExtC / VDE 0702-ExtC

This function is available only with feature D01/D02 or the corresponding paid activation.

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class [1] [2]	Class I
Connection type [1] [2]	Test socket Adapter: AT3-IIIE Adapter: EL1 Adapter Adapter: VL2E Adapter
2/2	
Measuring mode (MM) [1]	ExtC [2]

Parameter	Setting Options / Meaning
Auto detection	Conn. & PC & MM Conn. & PC Conn. & MM Conn. only PC & MM Prot. Class only Meas. Mode only Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

[1] These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

[2] The limit for protective earth resistance is determined based on length and cross-section (for EL1, only length). Data remain in memory until a new entry is made.

Table 114: Classification parameters – EN 50669-ExtC / VDE 0702-ExtC

16.4.1.7 EN 50669-PRCD / VDE 0702-PRCD

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class [1 2]	Class I, Class I+II
Connection type [1 2]	Test socket
2/2	
Measuring mode (MM) [1]	PRCD [3]
PRCD Type [3]	PRCD (standard) PRCD (SPE) PRCD-S (SPE) PRCD-K (SPE)
Auto detection	Conn. & PC & MM Conn. & PC Conn. & MM Conn. only PC & MM Prot. Class only Meas. Mode only Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

[1] These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

[2] The limit for protective earth resistance is determined based on length and cross-section. Data remains in memory until a new entry is made.

[3] New classification parameters “PRCD Type” (displayed only when selecting parameters in accordance with standard VDE 0701-0702-PRCD / OEVE E 8701-PRCD / SNR 462638-PRCD): PRCD (standard): For testing simple circuit breaker safety adapters in which the protective earth is permanently connected. Often referred to as 2-pole.

PRCD (SPE): (SPE = switched protective earth) For testing PRCDs in which the protective earth is only connected when the device is switched on. Often referred to as 3-pole.

PRCD-S (SPE): For testing type PRCD-S circuit breaker safety adapters.

PRCD-K (SPE): For testing type PRCD-K circuit breaker safety adapters.

Table 115: Classification parameters – EN 50669-PRCD / VDE 0702-PRCD

NOTE

For more information on testing single-phase and 3-phase type S and K PRCDs by simulating faults, see “PROFITEST PRCD test adapter” on our website.

NOTE

Testing of PRCDs (test procedure and trip time) is only possible for DUTs with a rated voltage of 230 V.

16.4.1.8 IEC 62368 / EN 62368 / VDE 0868-1

These test sequences include the following test steps:

- Protective earth resistance
- Electrical strength test (only with feature F01 or F02) between L/N and PE or P1 (accessible conductive parts not connected to the protective earth)
- Protective conductor current
- Touch current (AC and DC considered separately)
- Functional test (not part of the standard)

Electrical Strength Test

TIP

If the electrical strength test terminates prematurely during the ramp-up phase of the high voltage, this may be due to an insufficient rise time.

— Increase the **tR** parameter in the sequence parameters and repeat the test.

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class[1]	Class I, Class II, Class I+II
Connection type[1]	Test socket Permanent connection Adapter: AT16/32-DI Adapter Adapter: AT3 Adapter

Parameter	Setting Options / Meaning
2/2	
Measuring mode (MM) [1]	Active
Auto detection	Conn. & PC & MM Conn. & PC Conn. & MM Conn. only PC & MM Prot. Class only Meas. Mode only Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

[1] These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

Table 116: Classification parameters – IEC 62368/ EN 62368 / VDE 0868-1

16.4.1.9 IEC 62911/ EN 62911 / VDE 0868-911

These test sequences include the following test steps:

- Protective earth resistance
- Insulation resistance (not normally part of the standard; can be switched off)
- Electrical strength test (only with feature F01 or F02) between L/N and PE or P1 (accessible conductive parts not connected to the protective earth)

Electrical Strength Test

Check the sequence parameters **HV Uset PC I** and **HV Uset PC II** and set the limits according to the rated voltage of the DUT:

Rated Voltage	Setting Value Class I	Setting Value Class II
90 V~ ... 150 V~	1.15 kV_{DC}	2.15 kV_{DC}
> 150 V~	2.15 kV_{DC}	3.55 kV_{DC}

TIP

If the electrical strength test terminates prematurely during the ramp-up phase of the high voltage, this may be due to an insufficient rise time.

— Increase the **tR** parameter in the sequence parameters and repeat the test.

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class [1]	Class I, Class II, Class I+II
Connection type [1]	Test socket Permanent connection Adapter: AT16/32-DI Adapter Adapter: AT3 Adapter

Parameter	Setting Options / Meaning
2/2	
Measuring mode (MM)[1]	Active
Auto detection	Conn. & PC & MM Conn. & PC Conn. & MM Conn. only PC & MM Prot. Class only Meas. Mode only Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

[1] These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

Table 117: Classification parameters – IEC 62911/ EN 62911 / VDE 0868-911

16.4.1.10 IEC 60974-4/ EN 60974-4 / VDE 0544-4

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class[1]	Class I, Class II, Class I+II
Connection type[1]	Test socket Permanent connection Adapter: AT16/32-DI Adapter Adapter: AT3 Adapter
2/2	
Measuring mode (MM)[1]	Active
Voltage specification on nameplate	$U(R)_{eff}$ (= value on nameplate) U(0) DC (open circuit voltage, DC, fixed: 113 V)
Auto detection	Conn. & Class & MM (not recommended, as MM selection is fixed) Conn. & PC Conn. & MM (not recommended, as MM selection is fixed) Conn. only PC & MM (not recommended, as MM selection is fixed) Prot. Class only Meas. mode only (MM) (not recommended, since MM selection is fixed) Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

[1] These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

Table 118: Classification parameters – IEC 60974-4 EN 60974-4 VDE 0544-4

16.4.1.11 IEC 60601 2nd edition / EN 60601 2nd edition / VDE 0750-1 2nd edition

The test sequences include the following test steps:

- Protective conductor current (including SFC N interrupted)
- Touch current (including SFC N interrupted and PE interrupted)
- Patient leakage current (including SFC N interrupted, PE interrupted, and mains on the applied part)
- Electrical strength test (only with feature F01 or F02) between L/N and PE or P1 (accessible conductive parts not connected to the protective earth)

Electrical Strength Test

Please check the sequence parameters *HV Uset PC I* and *HV Uset PC II* and set the limits according to the rated voltage of the DUT:

Rated Voltage	Setting Value Class I	Setting Value Class II
90 V ... 150 V~	1.50 kV_{DC}	4.50 kV_{DC}
150 V ... 250 V~	2.25 kV_{DC}	6.00 kV_{DC}

TIP

If the electrical strength test terminates prematurely during the ramp-up phase of the high voltage, this may be due to an insufficient rise time.

— Increase the **tR** parameter in the sequence parameters and repeat the test.

The following tests are not part of the integrated test sequence:

- Measurement of the patient auxiliary current
  - In this case, create your own complete test sequence that is suitable for your DUT, or
  - In this case, create your own test sequence, if necessary, to execute in addition to the integrated test sequence, containing only the required test steps for patient auxiliary current.
- Testing of applied parts for MOPP requirements (depending on the test voltage, this test is only possible with feature F02 and test gun part no.).

  To execute the test:

1. After the test sequence, disconnect the DUT from the test socket; connect the L+N terminals of the DUT to Probe P1.
2. Select the green rotary switch position U_{HV}.
3. Select the measuring mode **PHV – P1**.
4. Start the measurement.
5. Execute the test using the test gun on the relevant applied parts of the DUT.
   Optional: Also save this test result to the DUT.
   Optional: Switch to **MEM**, place the cursor on the DUT, and press **PRINT** to generate a combined report.

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class [1]	Class I, Class II, or Class I+II

Parameter	Setting Options / Meaning
Connection type [1]	Test socket Permanent connection Adapter: AT16/32-DI Adapter Adapter: AT3 Adapter Permanent connection: P1+P2 (only with feature H01)
2/2	
Measuring mode (MM) [1]	Active
APs	Applied parts: none, B, BF, CF or combinations Type B (Body): DUTs of this type are suitable for both external and internal applications on the patient, except for direct application to the heart. The following protection classes are permissible: I, II, III or devices with internal electric power supply. Type BF (Body Float): Type B DUTs, but with type F insulated applied parts Type CF (Cardiac Float): DUTs of this type are suitable for use directly on the heart. The insulated applied part must ungrounded. The following protection classes are permissible: I, II or devices with internal electric power supply.
Auto detection	Conn. & Class & MM (not recommended, as MM selection is fixed) Conn. & PC Conn. & MM (not recommended, as MM selection is fixed) Conn. only PC & MM (not recommended, as MM selection is fixed) Prot. Class only Meas. mode only (MM) (not recommended, since MM selection is fixed) Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

[1] These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

Table 119: Classification parameters – IEC 60601 2nd edition / EN 60601 2nd edition / VDE 0750-1 2nd edition

16.4.1.12 IEC 60601 3rd edition / EN 60601 3rd edition / VDE 0750-1 3rd edition

The test sequences include the following test steps:

- Protective conductor current (including SFC N interrupted)
- Touch current (including SFC N interrupted and PE interrupted)
- Patient leakage current (including SFC N interrupted, PE interrupted, and mains on the applied part)
- Electrical strength test (only with feature F01 or F02) between L/N and PE or P1 (accessible conductive parts not connected to the protective earth)

Electrical Strength Test

Please check the sequence parameters *HV Uset PC I* and *HV Uset PC II* and set the limits according to the rated voltage of the DUT:

Rated voltage	Setting Value Class I	Setting Value Class II
90 V ... 130,1 V~	1.50 kV_{DC}	3.00 kV_{DC}
130.1 V ... 250 V~	2.25 kV_{DC}	4.50 kV_{DC}



TIP

If the electrical strength test terminates prematurely during the ramp-up phase of the high voltage, this may be due to an insufficient rise time.

— Increase the **tR** parameter in the sequence parameters and repeat the test.

The following tests are not part of the integrated test sequence:

- Measurement of the patient auxiliary current
  - In this case, create your own complete test sequence that is suitable for your DUT, or
  - In this case, create your own test sequence, if necessary, to execute in addition to the integrated test sequence, containing only the required test steps for patient auxiliary current.
- Testing of applied parts for MOPP requirements (depending on the test voltage, this test is only possible with feature F02 and test gun part no.).

  To execute the test:

1. After the test sequence, disconnect the DUT from the test socket; connect the L+N terminals of the DUT to Probe P1.
2. Select the green rotary switch position $\mathbf{U_{HV}}$.
3. Select the measuring mode **PHV – P1**.
4. Start the measurement.
5. Execute the test using the test gun on the relevant applied parts of the DUT.
   Optional: Also save this test result to the DUT.
   Optional: Switch to **MEM**, place the cursor on the DUT, and press **PRINT** to generate a combined report.

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class [1]	Class I, Class II, or Class I+II

Parameter	Setting Options / Meaning
Connection type [1]	Test socket Permanent connection Adapter: AT16/32-DI Adapter Adapter: AT3 Adapter Permanent connection: P1+P2 (only with feature H01)
2/2	
Measuring mode (MM) [1]	Active
APs	Applied parts: none, B, BF, CF or combinations Type B (Body): DUTs of this type are suitable for both external and internal applications on the patient, except for direct application to the heart. The following protection classes are permissible: I, II, III or devices with internal electric power supply. Type BF (Body Float): Type B DUTs, but with type F insulated applied parts Type CF (Cardiac Float): DUTs of this type are suitable for use directly on the heart. The insulated applied part must ungrounded. The following protection classes are permissible: I, II or devices with internal electric power supply.
Auto detection	Conn. & Class & MM (not recommended, as MM selection is fixed) Conn. & PC Conn. & MM (not recommended, as MM selection is fixed) Conn. only PC & MM (not recommended, as MM selection is fixed) Prot. Class only Meas. mode only (MM) (not recommended, since MM selection is fixed) Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

[1] These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

Table 120: Classification parameters – IEC 60601 3rd edition / EN 60601 3rd edition / VDE 0750-1 3rd edition

16.4.1.13 IEC 60601 3rd edition TPLC / EN 60601 3rd edition TPLC / VDE 0750-1 3rd edition TPLC

The test sequences include the following test steps:

- Protective conductor current (including SFC N interrupted)
- Touch current (including SFC N interrupted and PE interrupted)
- Patient leakage current (including SFC N interrupted, PE interrupted, and mains on the applied part)
- Electrical strength test (only with feature F01 or F02) between L/N and PE or P1 (accessible conductive parts not connected to the protective earth)

Electrical Strength Test

Please check the sequence parameters *HV Uset PC I* and *HV Uset PC II* and set the limits according to the rated voltage of the DUT:

Rated voltage	Setting Value Class I	Setting Value Class II
90 V ... 130,1 V~	1.50 kV_{DC}	3.00 kV_{DC}
130.1 V ... 250 V~	2.25 kV_{DC}	4.50 kV_{DC}

TIP

If the electrical strength test terminates prematurely during the ramp-up phase of the high voltage, this may be due to an insufficient rise time.

— Increase the **tR** parameter in the sequence parameters and repeat the test.

The following tests are not part of the integrated test sequence:

- Measurement of the patient auxiliary current
  - In this case, create your own complete test sequence that is suitable for your DUT, or
  - In this case, create your own test sequence, if necessary, to execute in addition to the integrated test sequence, containing only the required test steps for patient auxiliary current.
- Testing of applied parts for MOPP requirements (depending on the test voltage, this test is only possible with feature F02 and test gun part no.).

  To execute the test:

1. After the test sequence, disconnect the DUT from the test socket; connect the L+N terminals of the DUT to Probe P1.
2. Select the green rotary switch position $\mathbf{U_{HV}}$.
3. Select the measuring mode **PHV – P1**.
4. Start the measurement.
5. Execute the test using the test gun on the relevant applied parts of the DUT.
   Optional: Also save this test result to the DUT.
   Optional: Switch to **MEM**, place the cursor on the DUT, and press **PRINT** to generate a combined report.

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class [1]	Class I, Class II, or Class I+II

Parameter	Setting Options / Meaning
Connection type [1]	Test socket Permanent connection Adapter: AT16/32-DI Adapter Adapter: AT3 Adapter Permanent connection: P1+P2 (only with feature H01)
2/2	
Measuring mode (MM) [1]	Active
APs	Applied parts: none, B, BF, CF or combinations Type B (Body): DUTs of this type are suitable for both external and internal applications on the patient, except for direct application to the heart. The following protection classes are permissible: I, II, III or devices with internal electric power supply. Type BF (Body Float): Type B DUTs, but with type F insulated applied parts Type CF (Cardiac Float): DUTs of this type are suitable for use directly on the heart. The insulated applied part must ungrounded. The following protection classes are permissible: I, II or devices with internal electric power supply.
Auto detection	Conn. & Class & MM (not recommended, as MM selection is fixed) Conn. & PC Conn. & MM (not recommended, as MM selection is fixed) Conn. only PC & MM (not recommended, as MM selection is fixed) Prot. Class only Meas. mode only (MM) (not recommended, since MM selection is fixed) Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

[1] These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

Table 121: Classification parameters – IEC 60601 3rd edition TPLC / EN 60601 3rd edition TPLC / VDE 0750-1 3rd edition TPLC

16.4.1.14 IEC 62353 / EN 62353 / VDE 0751-1

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class [1]	Class I, Class II, or Class I+II
Connection type [1]	Test socket Permanent connection Adapter: AT16/32-DI Adapter Adapter: AT3 Adapter Permanent connection: P1+P2 (only with feature H01)

Parameter	Setting Options / Meaning
2/2	
Measuring mode (MM) [1]	Passive Active
APs	Applied parts: none, B, BF, CF or combinations Type B (Body): DUTs of this type are suitable for both external and internal applications on the patient, except for direct application to the heart. The following protection classes are permissible: I, II, III or devices with internal electric power supply. Type BF (Body Float): Type B DUTs, but with type F insulated applied parts Type CF (Cardiac Float): DUTs of this type are suitable for use directly on the heart. The insulated applied part must ungrounded. The following protection classes are permissible: I, II or devices with internal electric power supply.
Auto detection	Conn. & PC & MM Conn. & PC Conn. & MM Conn. only PC & MM Prot. Class only Meas. Mode only Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

[1] These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

Table 122: Classification parameters – IEC 62353 / EN 62353 / VDE 0751-1

16.4.1.15 IEC/EN 61010-1

Test sequence available only with option KA02/03 or activation of Z853V.

The IEC/EN 61010-1 standard defines both *routine testing* and *type testing*.

The protection class must be selected on the test instrument:

- Class I = Testing WITHOUT insulation resistance and touch current measurements on conductive parts isolated from the protective earth (if in doubt, select Class I+II for Class I devices).
- Class I + II = Testing WITH insulation resistance and touch current measurements on conductive parts isolated from the protective earth.

The 25 A test current cannot be selected for the **Perman. Con.** measuring mode.

If it is possible to make contact with the PE conductor of the DUT before the power supply cord, select the **Fixed. P1+P2** measurement mode instead (only possible with option **H01**). Testing can then be performed at 25 A.

If, for devices with a detachable mains conductor, the 0.1 Ω resistance from the PE terminal inside the housing must also be verified, use the **P1-P2** measuring mode with the green rotary switch set to R_{PE} (feature H01 required).

Type Testing:

R_{PE}: 25 A (option G02 required)

⇨ **"Protective Earth Measurement with 25 A AC " 🗋 123**

⇨ **"Test Steps with Manual Start of the Rating (Multi Measurement), e.g., RPE " 🗋 253**

Routine Testing:

R_{PE}: Current not specified

Electrical Strength Test (only with feature F01 or F02)

The test voltage must be selected according to the rated operating voltage (phase conductor/neutral conductor) of the DUT:

AC Voltage of Phase Conductor/ Neutral Conductor of your DUT (RMS)	HV Uset PC I	HV Uset PC II
≤ 150 V	1.90 kV DC	3.80 kV DC
> 150 ... 300 V	2.10 kV DC	4.20 kV DC

The duration of the electrical strength test must be set according to its intended use:

Sequence Parameters	Use: Routine Testing	Use: Type Testing
Duration HV	≥ 2 s	≥ 60 s

16.4.1.16 IEC/EN 60335-1

Test sequence available only with option KA02/03 or activation of Z853V.

The IEC/EN 60335-1 standard defines both *routine testing* and *type testing*.

The protection class must be selected on the test instrument:

- Class I = Testing WITHOUT insulation resistance and touch current measurements on conductive parts isolated from the protective earth (if in doubt, select Class I+II for Class I devices).
- Class I + II = Testing WITH insulation resistance and touch current measurements on conductive parts isolated from the protective earth.

To specify limits for stationary motor or heating devices:

Select the rotary switch position **SETUP > Automatic measurem. > Expert limit mode**.

Protective Earth Resistance Test

The integrated test sequence always assumes a test with a power supply cord. Therefore, the limit is 0.2 Ω.

Type Testing:

In the **Sequence parameters** menu, select a test current of R_{PE} IP 25 A~ (order feature G02 required).

Routine Testing:

In the **Sequence parameters** menu select R_{PE} IP 10 A~ or 25 A~ as the test current when you use the device (order feature G01 required for 10 A~ or G02 for 25 A~).

For devices with a detachable mains cable, to additionally verify the 0.1 Ω resistance from the PE terminal inside the housing, in the green rotary switch position R_{PE} select the **P1-P2** measuring mode (feature H01 required).

Electrical Strength Test (only with feature F01 or F02)

For type testing, it may be necessary to use external devices to bring the DUT completely up to operating temperature. The default setting for the electrical strength test on the test instrument for the test voltage is routine testing. For type testing at operating temperature, the test voltages can be reduced.

Menu Item in the Sequence Parameters	**Routine testing** (default setting)		**Type Testing under Normal Conditions**		**Type Testing at Operating Temperature**	
Rated Voltage	≤ 150 V	> 150 V	≤ 150 V	> 150 V ... ≤ 250 V	≤ 150 V	> 150 V ... ≤ 250 V
HV Uset PC I	1.20 kV (DC)	1.50 kV (DC)	1.90 kV (DC)	1.90 kV (DC)	1.50 kV (DC)	1.50 kV (DC)
HV Uset PC II	3.00 kV (DC)	3.75 kV (DC)	3.75 kV (DC)	4.50 kV (DC)	3.75 kV (DC)	4.50 kV (DC)
Duration HV	1 s		60 s		60 s	

In the **Sequence parameters** menu, change the **HV Uset** settings accordingly to the value for *routine testing*, *type testing under normal conditions* or *type testing at operating temperature.*

Insulation Resistance Measurement (not part of the standard)

Optionally, you can activate a standard insulation resistance measurement in the **Sequence parameters** menu (RINS option).

Alternative Leakage Current Measurement (not part of the standard)

Optionally, you can activate an alternative leakage current measurement in the **Sequence parameters** menu.

Alt. leakage current	On	Test steps IPE/IT with alternative leakage current measurements are executed
	Off	Test steps IPE/IT with alternative leakage current measurements are skipped

Leakage Current Measurement

	Portable Device	**Stationary Motor Device**	**Stationary Heating Device**
I_{PE}	**0.75 mA**	3.5 mA [1]	0.75 mA or 0.75 mA/kW rated capacity of the device < 5 mA [1]
I_T	**0.25 mA** For operating temperature/type testing, an increase to 0.35 mA is permissible.		

[1] For combined motor and heating devices, the leakage current must remain within the limits specified for heating devices or motor devices, whichever is greater. The limits must *not* be added together.

In certain cases, the limits may also be doubled (e.g., if all control and/or regulation devices have an OFF position in all poles).

If the limits for the DUT fall outside the range shown in bold (see table above), press the **Limit** softkey after the limit violation message appears and specify an alternative limit. To do this, activate manual limit specification if necessary (⇨ **"Specifying Limits Manually "** 🗋 **256**).

If similar DUTs are tested frequently, it is recommended to create a specially adapted test sequence with specific limits (⇨ **"User-Defined Test Sequences "** 🗋 **247**).

Sequence Parameters for Clamp Leakage Current Measurements (only with order feature I01)

Specifically for the **Perman. Con.** or **Perman. Con. P1+P2** connection types, there are two additional sequence parameters intended solely for the test sequences specified in IEC/EN 60335:

Menu Item in the Sequence Parameters	Meaning	Available Options
IPE fixed with clamp	Measure protective conductor current measurement for permanent connection using a clamp	On = Clamp measurement is performed Off = Clamp measurement is not performed
Lkg. Clamp V:A	Transformation factor/conversion factor for current clamp sensor[1] during protective conductor current measurement	1mV 1mA 10 mV : 1 mA 100 mV : 1 mA 1 V : 1 mA

[1] Be aware of the accuracy range of the current clamp being used.

16.4.1.17 NEN 3140

This function is available only with feature D01/D02 or the corresponding paid activation.

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class[1 2]	Class I, Class II, Class I+II, Class I+III, Class II+III, Class I+II+III
Connection type[1 2]	Test socket Permanent connection Adapter: AT16/32-DI Adapter Adapter: VL2E Adapter: AT3 Adapter (feature I01) Permanent connection: P1+P2 (only with feature H01)
2/2	
Measuring mode (MM)[1]	Passive Active
Auto detection	Conn. & PC & MM Conn. & PC Conn. & MM Conn. only PC & MM Prot. Class only Meas. Mode only Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

[1] These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

[2] The limit for protective earth resistance is determined based on length and cross-section. Data remains in memory until a new entry is made.

Table 123: Classification parameters – NEN 3140

16.4.1.18 NEN 3140-IT

This function is available only with feature D01/D02 or the corresponding paid activation.

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class [1] [2]	Class I
Connection type [1] [2]	Test socket Adapter: AT3-IIIE Adapter: EL1 Adapter Adapter: VL2E Adapter
2/2	
Measuring mode (MM) [1]	ExtC
Auto detection	Conn. & PC & MM Conn. & PC Conn. & MM Conn. only PC & MM Prot. Class only Meas. Mode only Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

[1] These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

[2] The limit for protective earth resistance is determined based on length and cross-section. Data remains in memory until a new entry is made.

Table 124: Classification parameters – NEN 3140-IT

16.4.1.19 NEN 3140-ExtC

This function is available only with feature D01/D02 or the corresponding paid activation.

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class [1] [2]	Class I
Connection type [1] [2]	Test socket Adapter: AT3-IIIE Adapter: EL1 Adapter Adapter: VL2E Adapter
2/2	
Measuring mode (MM) [1]	ExtC [2]

Parameter	Setting Options / Meaning
Auto detection	Conn. & PC & MM Conn. & PC Conn. & MM Conn. only PC & MM Prot. Class only Meas. Mode only Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

1 These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

2 The limit for protective earth resistance is determined based on length and cross-section (for EL1, only length). Data remain in memory until a new entry is made.

Table 125: Classification parameters – NEN 3140-ExtC

16.4.1.20 NEN 3140 -PRCD

This function is available only with feature D01/D02 or the corresponding paid activation.

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class [1] [2]	Class I, Class I+II
Connection type [1] [2]	Test socket
2/2	
Measuring mode (MM) [1]	PRCD [3]
PRCD Type [3]	PRCD (standard) PRCD (SPE) PRCD-S (SPE) PRCD-K (SPE)
Auto detection	Conn. & PC & MM Conn. & PC Conn. & MM Conn. only PC & MM Prot. Class only Meas. Mode only Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

1 These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

2 The limit for protective earth resistance is determined based on length and cross-section (for EL1, only length). Data remain in memory until a new entry is made.

[3] New classification parameters “PRCD Type” (displayed only when selecting parameters in accordance with standard VDE 0701-0702-PRCD / OEVE E 8701-PRCD / SNR 462638-PRCD): PRCD (standard): For testing simple circuit breaker safety adapters in which the protective earth is permanently connected. Often referred to as 2-pole.

PRCD (SPE): (SPE = switched protective earth) For testing PRCDs in which the protective earth is only connected when the device is switched on. Often referred to as 3-pole.

PRCD-S (SPE): For testing type PRCD-S circuit breaker safety adapters.

PRCD-K (SPE): For testing type PRCD-K circuit breaker safety adapters.

Table 126: Classification parameters – NEN 3140 -PRCD

NOTE



For more information on testing single-phase and 3-phase type S and K PRCDs by simulating faults, see “PROFITEST PRCD test adapter” on our website.

NOTE



Testing of PRCDs (test procedure and trip time) is only possible for DUTs with a rated voltage of 230 V.

16.4.1.21 VDE 0701-0702 / OEVE E 8701 / SNR 462638

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class [1] [2]	Class I, Class II, Class I+II, Class I+III, Class II+III, Class I+II+III
Connection type [1] [2]	Test socket Permanent connection Adapter: AT16/32 Adapter: AT3 Adapter (feature I01)
2/2	
Measuring mode (MM) [1]	Active
Auto detection	Conn. & PC & MM Conn. & PC Conn. & MM Conn. only PC & MM Prot. Class only Meas. Mode only Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

[1] These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

[2] The limit for protective earth resistance is determined based on length and cross-section. Data remains in memory until a new entry is made.

Table 127: Classification parameters – VDE 0701-0702 / OEVE E 8701 / SNR 462638

16.4.1.22 VDE 0701-0702-ExtC / OEVE E 8701-ExtC / SNR 462638-ExtC

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class[1 2]	Class I
Connection type[1 2]	Test socket Adapter: AT3-IIIE Adapter: EL1 Adapter Adapter: VL2E Adapter
2/2	
Measuring mode (MM)[1]	ExtC[2]
Auto detection	Conn. & PC & MM Conn. & PC Conn. & MM Conn. only PC & MM Prot. Class only Meas. Mode only Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

[1] These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

[2] The limit for protective earth resistance is determined based on length and cross-section (for EL1, only length). Data remain in memory until a new entry is made.

Table 128: Classification parameters – VDE 0701-0702-ExtC / OEVE E 8701-ExtC / SNR 462638-ExtC

16.4.1.23 VDE 0701-0702-PRCD / OEVE E 8701-PRCD / SNR 462638-PRCD

Parameter	Setting Options / Meaning
1/2	
Standard/Test Sequence	Currently selected standard in its national designation (list of standards available for selection in the test instrument)
Protection class[1 2]	Class I, Class I+II
Connection type[1 2]	Test socket
2/2	
Measuring mode (MM)[1]	PRCD[3]
PRCD Type[3]	PRCD (standard) PRCD (SPE) PRCD-S (SPE) PRCD-K (SPE)

Parameter	Setting Options / Meaning
Auto detection	Conn. & PC & MM Conn. & PC Conn. & MM Conn. only PC & MM Prot. Class only Meas. Mode only Off (= no auto-detection: all classification parameters such as Conn. and Class must be entered manually)

[1] These parameters must be entered manually if they are not detected automatically or are detected incorrectly.

[2] The limit for protective earth resistance is determined based on length and cross-section. Data remains in memory until a new entry is made.

[3] New classification parameters “PRCD Type” (displayed only when selecting parameters in accordance with standard VDE 0701-0702-PRCD / OEVE E 8701-PRCD / SNR 462638-PRCD): PRCD (standard): For testing simple circuit breaker safety adapters in which the protective earth is permanently connected. Often referred to as 2-pole.

PRCD (SPE): (SPE = switched protective earth) For testing PRCDs in which the protective earth is only connected when the device is switched on. Often referred to as 3-pole.

PRCD-S (SPE): For testing type PRCD-S circuit breaker safety adapters.

PRCD-K (SPE): For testing type PRCD-K circuit breaker safety adapters.

Table 129: Classification parameters – VDE 0701-0702-PRCD / OEVE E 8701-PRCD / SNR 462638-PRCD

NOTE

For more information on testing single-phase and 3-phase type S and K PRCDs by simulating faults, see “PROFITEST PRCD test adapter” on our website.

NOTE

Testing of PRCDs (test procedure and trip time) is only possible for DUTs with a rated voltage of 230 V.

16.4.1.24 Sequence Parameters

The factory-preset test sequences can be adapted to the respective intended use or test standard using the sequence parameters.

The entered sequence parameter settings apply only to the currently selected switch position (**A1** ... **A9**) and are remain stored there until a change is made.

NOTE

Depending on the set DUT classification (protection class, etc.), not all parameters are relevant.

NOTE

The availability of the single integrated test sequences depends on the test instrument type (SECUTEST ST... or SECULIFE ST...), the selected features (order features) and the activated add-ons (activations).

Refer to your order, test instrument, and data sheet for details.

Sequence Parameter	Meaning
VisualInspection 1	Visual inspection (standard): On: activate Off: deactivate
VisualInspection 2	Visual inspection, functional test of welding devices: On: activate Off: deactivate
Functional test	On: activate Off: deactivate

Table 130: General Sequence Parameters

Protective Earth Resistance Test

Sequence Parameter	Meaning
R_{PE}	Protective earth resistance test: On: activate Off: deactivate
R_{PE} I_P	Protective earth resistance test at test socket: Select test current IP: ±200 mA= / 200 mA~ / Feature G01: 10 A~ / feature G02: 25 A~
R_{PE} I_P Perman. conn.	Protective earth resistance test with permanent connection: Select test current IP: ±200 mA= / 200 mA~ / Feature G01: 10 A~ / feature G02: 25 A~ Note: Applies only to RPE measurement with the “permanent connection” connection type. (For the “Perm. conn. P1+P2” connection type, the current value set in the “RPE IP” sequence parameter is used.)
R_{PE} as	Protective earth resistance test: Execute as a single or multi measurement. Multi measurement: Repeat the test on various conductive parts as many times as necessary if it is not clear if all accessible conductive parts are connected to each other or to the protective earth.
Duration R_{PE}	Protective earth resistance test: A measurement duration between 0 and 60 seconds can be entered here.

Table 131: Sequence parameters of protective earth resistance tests

Insulation Resistance Test

Sequence Parameter	Meaning
Duration R_{INS}	Insulation resistance LN-PE: A measurement duration between 0 and 60 seconds can be entered here. Factory setting: 3 s For long extension cables, enter 0 s to allow sufficient time to move the cable during the insulation test.
R_{INS} PC I	Insulation resistance tests for Class I: On: activate Off: deactivate
R_{INS} PC II	Insulation resistance tests for Class II: On: activate Off: deactivate
R_{INS} PCs I+II	Insulation resistance tests for Class I and Class II: On: activate Off: deactivate
R_{INS} U-Set PC I+II [1]	Test voltage for insulation resistance measurement between ■ LN and PE ■ LN and accessible conductive parts that are NOT connected to a protective earth: 250 – 500 V
R_{INS} U-Set PC III [1]	Test voltage for insulation resistance measurement between ■ LN and safety extra-low voltage outputs ■ PE and safety extra-low voltage outputs (SELV only) 250 – 500 V
Duration R_{INS} Probe	Insulation resistance test via probe: A measurement duration between 0 and 60 seconds can be entered here. Factory setting: 3 s
R_{INS} Pri./Sec.	Insulation resistance test between the primary and secondary sides of Class III DUTs: On: activate Off: deactivate
R_{INS} Class II as	Insulation resistance test: Execute as a single or multi measurement. Multi measurement: Repeat the measurement as often as necessary between the short-circuited mains connections (L-N) and the conductive parts that are accessible from the outside with test probe P1 and not connected to the housing.
Duration R_{INS} PC II	Insulation resistance test: A measurement duration between 0 and 60 seconds can be entered here. Factory setting: 3 s
R_{INS} Sec./PE As of firmware version 4.0.0 (in some cases) R_{INS} SELV	Insulation resistance test between the secondary side and the PE of Class III DUTs (not applicable to PELV protective extra-low voltage sources): On: activate Off: deactivate

[1] As of firmware version 4.0.0

Table 132: Sequence parameters of insulation resistance tests

Leakage Current Tests

Sequence Parameter	Meaning
Reverse polarity	Leakage current tests: On: Measurements are performed in both polarities. Off: Measurement is only performed with one or the current polarity.
I_{PE}	Protective conductor current: On: activate Off: deactivate
I_{PE} Mode TS/active	Protective conductor current test (mains to test socket): Measurement mode: Direct or differential
Duration I_{PE}	Protective conductor current test: A measurement duration between 0 and 60 seconds can be entered here. Factory setting: 3 s
I_E	Equipment leakage current test: On: activate Off: deactivate
I_E Mode TS/active	Equipment leakage current test (mains to test socket): Measurement mode: Direct or differential
Duration I_E	Equipment leakage current test: A measurement duration between 0 and 60 seconds can be entered here. Factory setting: 3 s
I_T Mode (active)	Touch current test (mains to test socket): Measurement mode: Direct P1 or Differential P1: The “Differential P1” method is recommended here only if the DUT has earth connections that cannot be disconnected for the test. This setting only affects IT measurements on DUTs without a protective earth.
I_T	Touch current test On: activate Off: deactivate
I_T as	Touch current test: Perform as a single or multi measurement. Multi measurement: Use test probe P1 to scan various accessible conductive parts in order to measure the current flowing from the probe to the protective earth and repeat this as often as desired.
Duration I_T	Touch current test: A measurement duration between 0 and 60 seconds can be entered here. Factory setting: 3 s
I_T Weld.	Touch current test on a welding circuit: On: activate Off: deactivate
I_T PC II as	Touch current test on a welding circuit: Perform as a single or multi measurement.

Sequence Parameter	Meaning
Duration I_T PC II	Touch current test on a welding circuit: A measurement duration between 0 and 60 seconds can be entered here. Factory setting: 3 s
I_P AC	Patient leakage current AC: On: activate Off: deactivate
I_P DC	Patient leakage current DC: On: activate Off: deactivate
Duration I_P	Patient leakage current: A measurement duration between 0 and 60 seconds can be entered here. Factory setting: 3 s

Table 133: Sequence parameters of leakage current tests

Test Sequences with Electrical Strength Test (features F01/F02 only)

These parameters can be used to configure various options for the test steps of the electrical strength test.

Sequence Parameter	Meaning
HV	Electrical strength test: On: activate Off: deactivate
HV Uset PC I	Target voltage for high-voltage testing between LN and PE in kV
HV Uset PC II	Target voltage for high-voltage testing between LN and P1 in kV (accessible conductive parts not connected to the protective earth)
Duration HV	Duration of electrical strength test in seconds
HV tR	Duration of the rise phase of the electrical strength test in seconds *May need to be increased if the voltage cannot be reached due to internal capacitances of the DUT.*

Table 134: Sequence parameters specifically for test sequences with electrical strength tests

Test Conditions / Fault Conditions

Sequence Parameter	Meaning
I_A	Leakage current test on the applied part: On: activate Off: deactivate
Duration I_A AP	Leakage current test on the applied part: A measurement duration between 0 and 60 seconds can be entered here. Factory setting: 3 s

Table 135: Sequence parameters of test conditions / fault conditions

Connection Checks and Fuse Checks

Sequence Parameter	Meaning
ShortCircuitTest L-N	Short-circuit check between L and N[1]: On: activate Off: deactivate
ShortCircuitTest LN-PE	Short-circuit check between LN and PE:[1]: On: activate Off: deactivate
Show Hints	Hints abouts testing that are not absolutely necessary for experienced testing persons On: activate Off: deactivate
Fuse Check	Testing the fuses: Mains fuses, test probe fuse P1, applied parts fuses

[1] Before applying mains voltage to the DUT, a short-circuit check is performed regardless of this setting.

Table 136: Sequence parameters of connection checks and fuse checks

Other Parameters

Parameter	Meaning
No Load Voltage	Open circuit voltage on welding device: On: activate Off: deactivate
PC III Supply Voltage	Supply voltage measurement (for Class III DUTs; only for “Active” measuring mode): On: activate Off: deactivate
Testing of extension cords – additional parameters (only in test sequences ending in -ExtC)	
Continuity Check	Testing the conductors (L, N, PE) for continuity using Adapter EL1/VL2E/AT3-IIIE: On: activate Off: deactivate
Testing of PRCDs – additional parameters (only in test sequences ending in -PRCD)	
R_{PE} IP (Std-PRCD)	Protective earth resistance test for standard PRCDs: Select test current I_P: ±200 mA= / 200 mA~ / feature G01: 10 A~ / feature G02: 25 A~ Applies only to PRCD types PRCD (Standard) and PRCD (SPE)
Varistor-Test PRCD-K	Varistor test on type K PRCDs: On: activate Off: deactivate
Sensor area test	Testing of the sensor area of the PRCD: On: activate Off: deactivate

Parameter	Meaning
Manual tripping	Manual tripping of the PRCD: On: activate Off: deactivate
Break Time	Tripping of the PRCD after xx seconds: On: activate Off: deactivate

Table 137: Other parameters

Suppressing Test Steps

Depending on the selected test standard, some of the following test steps can be disabled:

Parameter	Meaning
VisualInspection 1	Visual inspection, standard
VisualInspection 2	Visual inspection, functional test, welding devices
Functioning test	Functional test
R_{PE}	Protective earth resistance test
R_{INS} PC I+II	Insulation resistance tests for Class I and Class II
R_{INS} Pri./Sec.	Insulation resistance test between the primary and secondary sides of Class III DUTs
R_{INS} Sec./PE	Insulation resistance test between the secondary side and PE of Class CIII DUTs
R_{INS} BF/CF(IEC 62353)	Insulation resistance tests on BF/CF applied parts
R_{INS} BF/CF(IEC 60974-4)	RINS tests between the primary side and the welding output, as well as between PE and the welding output
Reverse polarity	All leakage current measurements with reversed polarity
I_{PE} Mode TS/active	Protective conductor current test
I_T	Touch current test
I_T Weld.	Touch current test at welding circuit
Show Hints	Hints about testing that are not absolutely necessary for experienced testing persons
ShortCircuitTest L-N	Short-circuit check between L and N[1]
ShortCircuitTest LN-PE	Short-circuit check between LN and PE[1]
Open circuit voltage (IEC 60974-4)	Open circuit voltage on welding device
Continuity Check (ExtC check only)	Continuity check using Adapter EL1/VL2E/AT3-IIIE
PCIII Supply Voltage	Supply voltage measurement (for Class III DUTs; only for “Active” measuring mode)

[1] Before applying mains voltage to the DUT, a short-circuit check is performed regardless of this setting.

Table 138: Suppressing test steps

Setting Measurement Parameters of Single Test Steps

Depending on the selected test standard, some of the following test steps can be adjusted:

Parameter	Meaning
R_{PE} IP	Select test current for protective earth resistance test: 200 mA AC, ±200 mA DC, 10 A AC[1] or 25 A AC[2]
I_{PE} Mode TS/active	Set the measuring mode for protective conductor current measurement during active device testing (differential/direct)
I_E Mode TS/active (IEC 62353).	Set the measuring mode for equipment leakage current during active device testing (differential/direct)

[1] Feature G01 (e.g., SECUTEST ST BASE(10)/PRO)

[2] Feature G02 (e.g., SECULIFE ST BASE25)

Table 139: Setting measurement parameters of single test steps

Selecting Between Single and Multi Measurement for Single Test Steps

Parameter	Meaning
R_{PE} as	Switch the “protective earth resistance test” test step between multi and single measurement

Table 140: Selecting between single and multi measurement for single test steps

Parameter	Meaning
R_{INS} Class II as	Switch between multi and single measurement for the insulation resistance measurement on Class II parts (measurements on applied parts and welding outputs are not affected)
I_T as	Switch between multi and single measurement for the touch current measurement
I_T PC II as	(IEC 60974 only) Switch the touch current measurement on Class II parts between multi and single measurement

Setting the Measurement Duration of Single Test Steps

These parameters can be used to adjust the test duration for the respective measurement. If a test step for a single measurement is involved, the entire test step has a duration of the time entered in seconds. If a test step for a multi measurement is involved, these parameters determine the measurement duration for each measurement point.

If 0 seconds is set, this corresponds to a continuous measurement that the testing person must terminate by pressing a key.

Parameter (as of firmware version 1.5.0)	Meaning
Duration R_{PE}[1]	Set the test duration for the protective earth resistance measurement (0 to 60 seconds)
Duration I_{PE}	Set the test duration for the protective conductor current measurement (0 to 60 seconds)
Duration I_E	Set the test duration for the equipment leakage current measurement (0 to 60 seconds)

[1] In the test sequence (VDE 0701-0702-PRCD / OEVE E 8701-PRCD / SNR 462638-PRCD, EN 50678 / VDE 0701, EN 50699 / VDE 0702) with the following setting: “PRCD type: PRCD (SPE)”, measurement duration cannot be changed.

The measurement duration set here only affects the RPE measurement for the PRCD types “PRCD (standard)” and “PRCD-S (SPE)”.

Table 141: Setting the measurement duration of single test steps (as of firmware version 1.5.0)

Parameter (as of firmware version 1.8.0)	Meaning
Duration I_T	Set the test duration for the touch current measurement (0 to 60 seconds)
Duration I_T PC II	(for IEC 60974 only) Set the test duration for touch current measurement on Class II parts (except for welding outputs) (0 to 60 seconds)
Duration R_{INS} PCII	Set the test duration for RINS measurements on Class II parts (0 to 60 seconds)

Table 142: Setting the measurement duration of single test steps (as of firmware version 1.8.0)

16.4.2 User-Defined Test Sequences

This feature requires SECUTEST DB+ (Z853R or feature KB01) and IZYTRONIQ.

Depending on the test instrument model and its features, you can create user-defined test sequences in the IZYTRONIQ software and transfer them to the test instrument. Unlike the factory-set test sequences, you can not only change settings here, but also design the entire test sequence to suit your needs by defining and configuring the single test steps yourself, as well as determining their order.

▶ **Prerequisites**

- SECUTEST DB+ (Z853R or feature KB01) includes:
  - Up to 24 test sequences (max. 1,200 test steps in total)
  - Transfer to the test instrument via USB connection or Bluetooth® (feature M01 is also required for Bluetooth® transfer.)
- IZYTRONIQ software

▶ **Implementation**

NOTE

For the *Reference voltage* and *Frequency (set)* parameters and **Protective conductor current**, **Touch current**, **Equipment leakage current**, **Protective conductor current** and **Applied parts leakage current** measuring functions in the test steps of your self-created test sequences, the values set in SETUP are used at the time of execution (⇨ **"Reference Voltage L-PE and Test Sequence Alternative "** 🗋 **97**).

NOTE

For the *Offset* parameter of the **Protective earth resistance** measurement function in the test steps of test sequences you have created yourself, the value set in the rotary switch position R_{PE} applied at the time of execution.

Make sure that the value 0 is entered for this parameter when creating the test sequences!

NOTE

Applies only to test instruments with feature F01/F02 (electrical strength test)

For the *acoustic. signal* parameter of the **Electrical strength test** test measurement function in test steps of test sequences you have created yourself, the value set centrally in the **SETUP** menu on the test instrument under **All measurements > HV acoustic signal** is applied at the time of execution (⇨ **"see Section 8.1"** 🗋 **57**).

The test sequences are created in the IZYTRONIQ software as “test instrument sequences” (not to be confused with “IZY remote sequences”, which are used for remote control).

The measurements and parameters available in your test instrument version are loaded from the test instrument into the IZYTRONIQ software and made available accordingly. These are used to create the test instrument sequence.

NOTE

Compliance with Standards / Verification of Operational Safety in Accordance with German Social Accident Insurance Association (DGUV) Regulation 3 or the Operational Safety Regulation (BetrSichV)

Creating and/or using self-created test sequences, or modifying or shortening the factory-implemented test sequences, carries the risk that these will no longer comply with standards (and, accordingly, will no longer serve as proof of operational safety in accordance with DGUV Regulation 3 or BetrSichV, or that they no longer meet these requirements).

The creator or user/testing person is responsible for ensuring that test steps comply with standards and that any preliminary tests are executed in the correct order.

NOTE

Some test steps require preliminary tests or explanatory notes.

At the time of execution, the testing person must, for example, have sufficient time to make contact with the relevant point using the probe or to bring the DUT into the appropriate state.

Add appropriate checks or hints.

NOTE

Probe check required when using Probe P1.

If Probe P1 is used in a test sequence, a “Probe Check” test step with “Probe: Probe Terminal P1” must be executed as part of the test sequence. Background: In addition to ensuring that a probe is connected to probe terminal P1, the probe check at terminal P1 also verifies that the probe fuse is intact. For more information, see Section 6.4, “Connecting Test Probe P1 or P2.”

Afterwards, the created test instrument sequence can be loaded directly to the test instrument and stored as an XML file on the computer. For detailed information on the entire process, refer to the IZYTRONIQ online help.

In the test instrument, your user-defined “test instrument sequences” always appear in the test instrument user interface with an asterisk preceding them.

NOTE

We recommend saving your user-defined test instrument sequences as XML files with the help of the IZYTRONIQ software. For more information, refer to the IZYTRONIQ online help.

▶ **Tip on limit violations / troubleshooting**

In the case of default settings, a test instrument sequence is terminated as soon as a limit is exceeded. Consequently, only one measured value is displayed as a limit violation in the test report.

Particularly when troubleshooting during repairs, but also for analyzing failure statistics, it is advisable to document all limit violations of a DUT in a test report.

The test sequences can be optimized for troubleshooting with the help of SECUTEST DB+ (Z853R or feature KB01): Test sequences are executed in full (even if limits are exceeded), and all faults are documented in the report.

▶ **Electrical strength test (only with feature F01/F02, as of firmware version 4.0.0)**

For test sequences that can be transferred to your test instrument, electrical strength tests can also be integrated into the test sequence.

NOTE

For your specific case, check if the electrical strength test step should be preceded by a test message that informs the user of the sequence that the electrical strength test is about to begin. Otherwise (except for measurements via the PHV pistol connector), the high voltage will build up immediately and without further warning.

How to integrate a electrical strength test into a test sequence:

1. Open the sequence editor in IZYTRONIQ.
2. Add a **Measurement** test step to your sequence.

Then configure the following for your test step:

3. Select **Electrical strength test** as the measurement mode.
4. Make sure that the **Multi measurement** checkbox is not activated (not supported for electrical strength tests). If you want to execute multiple electrical strength tests in succession, create multiple test steps in your test sequence as needed.
5. Set a measurement duration > 0 seconds (corresponds to the hold time for the electrical strength test). A measurement duration of 0 (continuous measurement) is not supported for the electrical strength test.

Set the parameters:

6. Select the measuring mode.
   The available test voltages may be limited depending on the measuring mode.
7. Enter your test voltage in the **UGen(set)** parameter.
   This value is also used as the limit!
8. Set the rise time **tR** to a value appropriate for your DUT or test requirements.
9. Enter 0.5 kV in the **Limits** field to save the test step.

The following fields are not evaluated during test execution:

- **Acoustic Signal** parameter: Derived from the value set in the **SETUP** rotary switch position
- Rating direction, Rated measurement result, Limits. Only the entry for **UGen(set)** is relevant.

NOTE

In the "Text" field, instruct the user:

— To expose the test probe by pulling back the trigger
— To reliably contact the DUT
— To pull the trigger all the way back so that the microswitch starts the measurement

NOTE

For the **PHV – P1** measuring mode, make sure that the trigger is pulled before starting the respective test step.

Therefore, add a "Check" test step with the following settings:

— Function: Test gun check
— Type: Continuous
— Passed when: Test gun is connected and the trigger is pressed

16.5 Connecting the DUT

The connection depends on the type of DUT (see the respective connection type in the Classification Parameters tables).

- Test socket
- Permanent connection
- Adapter

For testing extension cords in accordance with standards, connection to the test socket is made using the following adapter:

- EL1: for single-phase extension cords
- VL2E/: for single-phase and 3-phase extension cords

1. Connect the DUT to the test instrument in accordance with the selected test sequence.

Note on the Use of the AT3-IIIE Test Adapter

Please note that the polarity reversal function of the test instrument you are using will not work if you are using the AT3-IIIE Adapter to test single-phase DUTs (3-pin outlet/earthing contact). In this case, all leakage current measurements must be performed manually with the plug in both directions.

16.6 Selecting a DUT

Before you start the test sequence, you can select the DUT for which the test is to be executed. When the test is complete, you can then save the result directly. This requires that you have already created a test structure in the test instrument or loaded one using the IZYTRONIQ software.

As an alternative, you can select the DUT after the test sequence has ended or create it 8if it is not in the database9.

✓ No DUT is selected on the start screen.

1. Enter the DUT ID number of the DUT by selecting **ID**, e.g., by using a barcode scanner.
   Or
   Press **MEM** to activate the database view.
2. Press **Up** or **Down** to select the DUT for the test sequence.
   ↳ The DUT is selected.
3. Press **ESC** to return to the measurement view.

16.7 Starting the Connection Check and Test Sequence

NOTE



If you deselect important test steps under “Sequence Parameters” (set to “Off”), the test sequence may no longer meet the requirements of the standard.

1. Press **START/STOP**.
   ↳ The test process starts.
   ↳ The checks are performed automatically.
   ↳ The test sequence then runs automatically.

Automatic Checks Before the Test Sequence Begins

Probe check	Checks if test probe P1 is connected and if fuse P1 is intact. If there is a fuse defect in test probe P1, all subsequent measurements performed using this measurement path will be incorrectly rated as "good.”
Insulation check	Checks if the DUT is properly isolated.
Start-up and short-circuit check	Prerequisite: Sequence parameter “ShortCircuitTest” is preset to “On.” To detect a short circuit in the DUT, a test is executed between L-N and LN-PE. If a "L/N Short-Circuit Check" or "LN/PE Short-Circuit Check" test step has already been passed during the test sequence, no separate short-circuit check will be performed before applying mains voltage to the test socket within that test sequence.

If you have set the **Detected Classif.** parameter to **Always apply** and **Auto detection of** to **Conn. & PC** (before triggering a start), the following additional checks are performed before the test sequence starts:

Protection class detection for DUTs with a protective earth (M7050 with features B00, B09)	Protection class detection for DUTs with a protective earth
Connection check (M7050 with features B00, B09)	Checks if the DUT is connected to the test socket. For Class I, checks if both protective earth contacts are short-circuited.

16.8 Executing and Rating Test Steps

Depending on their type, test steps may require further action. This action may be executed automatically (e.g., automatic rating), or may require manual intervention on your part (e.g., applying mains voltage or rating the results).

Notes on Rating

Limits have been stored for test sequences in accordance with standards. A pass/fail rating based on the worst-case evaluation takes place even during the measurement.

If even a single measurement fails, the test sequence is canceled and the test according to the selected standard is considered a failure.

NOTE

The pass/fail rating of the measured values is performed with greater precision than is displayed on the screen. Under certain circumstances, due to these invisible decimal places, a measured value may appear to match the limit exactly on the display, yet it may still be indicated as a limit violation because of the decimal places.

Display of Measured Values

Color of the Measurement Value	Meaning
Green	The current measured value complies with the specified standard limits.
Orange	After this test step, additional entries (e.g., cable length) are required to determine if the test step is passed.
Red	Limit violation. The measured value does not meet the standard requirements.

Table 143: Display of measured values

16.8.1 Rating a Visual Inspection Manually

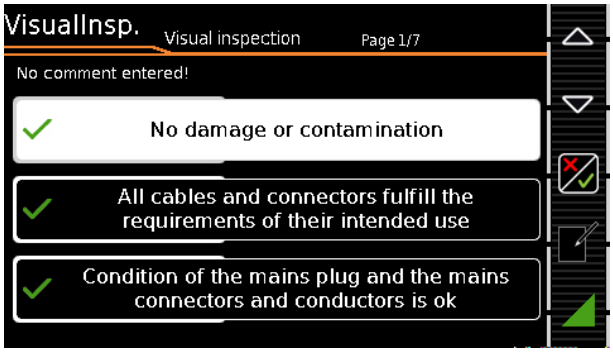


Fig. 178: "Visual Inspection" page

▶ **Visual Inspection OK**

✓ **Visual inspection** sequence parameter is preset to "On."

1. Perform the visual inspection.
   ↳ The criteria of the visual inspection are met.
2. Rate the visual inspection with **OK**.
3. Press **Continue test**.
   ↳ The test sequence continues.

▶ **Visual Inspection Not OK**

✓ **Visual inspection** sequence parameter is preset to "On."

1. Perform the visual inspection.
   ↳ The criteria of the visual inspection are not met.
2. Rate the visual inspection with **Not OK**.
   ↳ The sequence is ended and the test is rated as failed.

16.8.2 Applying Mains Voltage

✓ The DUT has passed the previous safety test (protective earth and insulation resistance measurement).

✓ The testing person has visual contact with the test instrument.

✓ The area around the test instrument is secured.

1. Apply mains voltage to the test socket of the test instrument.

16.8.3 Test Steps with Manual Start of the Rating (Multi Measurement), e.g., RPE

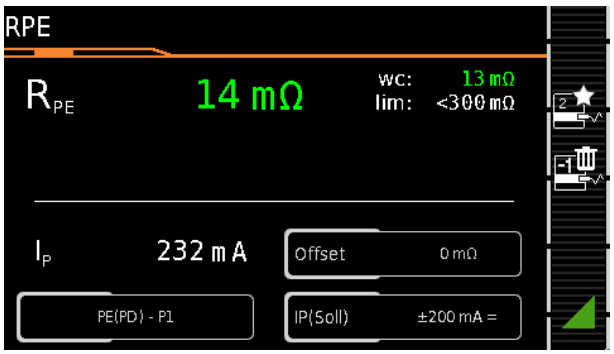


Fig. 179: "RPE" page

ATTENTION

Risk of arcing and surface damage (feature G01 or G02 only)

During test steps of the RPE IP sequence parameter with a test current of 10 A or 25 A, a high test current is applied. It is activated as soon as the rating period starts and remains active until the rating period has ended. Outside the rating period, the measured value for the current test current is therefore < 300 mA when the probe is in contact with the PE. If contact between the test probe and the DUT is terminated too early, there is a risk of an arc.

— Maintain contact between the probe and the DUT for the entire rating period.

▶ **Start rating**

✓ The on-screen notes were followed, such as those regarding making contact with parts using test probe P1.

1. Press **Start rating**.
   ↳ The digit in the **Start rating** icon flashes until the measured value is stable.
   ↳ The progress bar shows the progress of the rating cycle. When the progress bar reaches the far right position, the rating is complete.
   ↳ The **Start rating** icon displays the current number of measurements.
2. Repeat the measurement several times. Press **Start rating** to restart the measurement or rating process.
   ↳ At the end of the measurement, the worst measured value (wc: worst case) recorded during all rating phases appears on the report, possibly at multiple measurement points. The worst measured value determines the final result of the test step.

▶ **Optional: Delete a cached measurement**

✓ Measurements have been performed. The measurements have been cached (the **Start rating** icon displays the current number of measurements).

1. Press **Delete measured value**.
   ↳ The cached measurement is deleted.

▶ **Rate a measurement result**

Measurement Result OK

✓ The measurement was performed multiple times.

1. Rate the measurement.
   ↳ The measured value is displayed in green; it is within the specified limits.
2. Press **Continue test** to proceed to the next test step.

Measurement Result Not OK

✓ The measurement was performed multiple times.

3. Rate the measurement.
   ↳ The measured value is displayed in red; a limit violation has occurred.
4. Press **Repeat measured value recording**.
   ↳ A pop-up window appears with the options **Cancel** and **Continue**.
5. Option 1: Select **Cancel** to cancel the test procedure.
   ↳ The test procedure failed.
6. Option 2: Select **Continue**.
   ↳ The measurement is performed.

▶ **Continue a test despite a limit violation**



WARNING

Dangerous electrical voltage

If the test sequence is continued, accessible conductive parts may carry a dangerous voltage during the test because the DUT is powered by mains voltage despite possible insulation faults, increased protective earth resistance, or similar issues.

— Do not touch metallic parts.



NOTE

Regarding test sequence IEC 60974-4 / EN 60974-4 / VDE 0544-4: Section 5.2 of IEC 60974-4 / EN 60974-4 / VDE 0544-4 explicitly requires that, during the measurement, the conductors must be bent, flexed, and twisted along their entire length – especially near cable entries – in order to detect any breaks in the protective earth.

✓ The measurement was performed multiple times.

1. Rate the measurement.
   ↳ The measured value is displayed in red; a limit violation has occurred.
2. Wear appropriate personal protective equipment (PPE).
3. Secure the DUT against contact with a suitable cover.
4. Use a 30 mA PRCD.
5. Press **OK** to continue with the test.
   ↳ The test instrument proceeds to the next test step without displaying any further message.
   ↳ A test step that is classified as critical generates a warning message.

16.8.4 Test Steps with Automatic Stat of Rating (Single Measurement): RINS, IPE

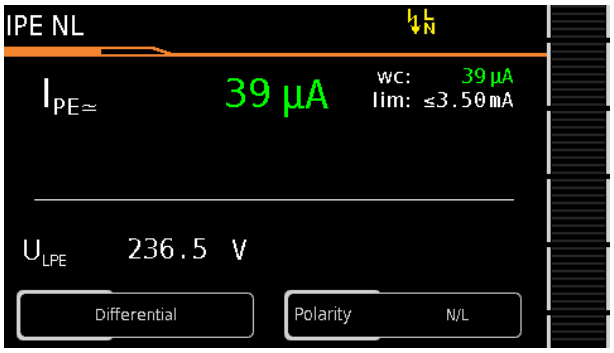


Fig. 180: "IPE NL" page

▶ **Start Rating**

1. Press **Start rating**.
   ↳ The digit in the **Start rating** icon flashes until the measured value is stable.
   ↳ The progress bar shows the progress of the rating cycle. When the progress bar reaches the far right position, the rating is complete.
   ↳ The measurement result is displayed.
   Green measurement result: Standard requirements are met. The test continues automatically.
   Red measurement result: Limit violation. The test is canceled.

16.8.5 Rating the Functional Test Manually

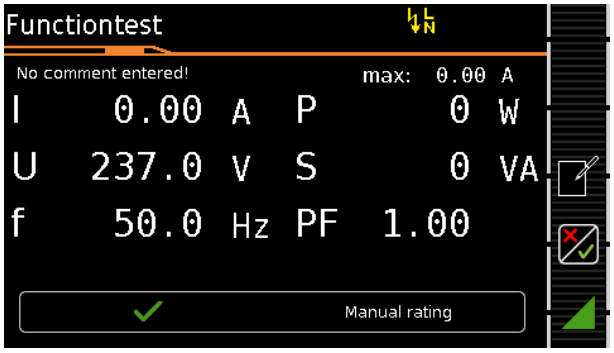


Fig. 181: "Functional test" page

▶ **Functional Test OK**

✓ **Functional test** sequence parameter is preset to "On."

1. Perform the functional test.
   ↳ The criteria of the functional test are met.
2. Rate the functional test with **OK**.
3. Press **Continue test**.
   ↳ The test sequence continues.

▶ **Functional Test Not OK**

✓ **Functional test** sequence parameter is preset to "On."

1. Perform the functional test.
   ↳ The criteria of the functional test are not met.
2. Rate the functional test with **Not OK**.
   ↳ The sequence is ended and the test is rated as failed.

TIP

In both cases, you can use the **Comment** key to enter a comment or edit an existing comment.

16.8.6 Specifying Limits Manually

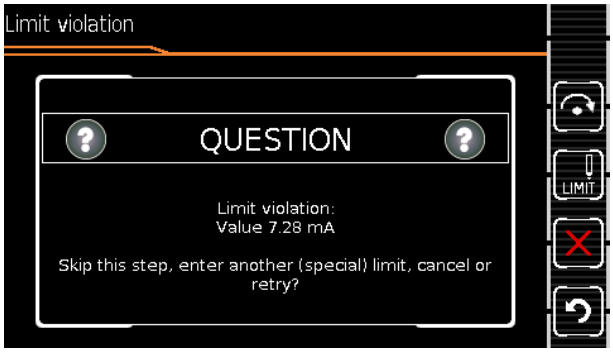


Fig. 182: Limit violation

If you set “Expert” instead of “Normal” in Setup under **Automatic measurem.**, and here under **Limit mode**, the **LIMIT** softkey appears next to the “measurement failed” pop-up. This allows you to enter a user-defined limit (typically a limit specified by the manufacturer that deviates from the standard).

NOTE

The selection **Cancel** or **Skip this step** prevents you from entering threshold values.

16.9 End of the Test Sequence

▶ **Memory screen (start screen)**

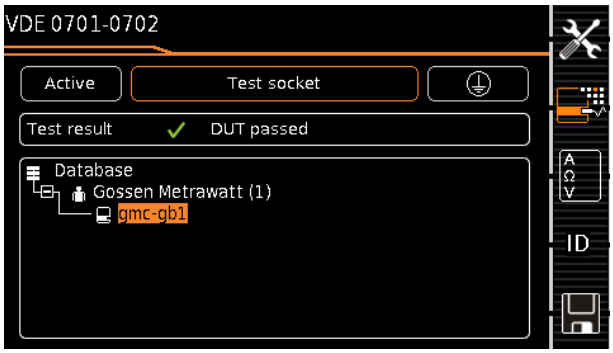


Fig. 183: Memory screen

The memory screen is displayed automatically after the test sequence is complete if the following setting is configured in the Setup menu when the rotary switch is set to **SETUP**:

Setup 1/3 > Automatic measurem. 1/4> At end of sequence > Memory screen.

▶ **Results list**

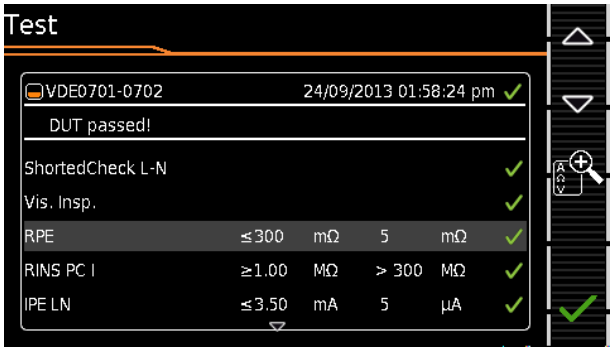


Fig. 184: Results list

The results list appears automatically if the following setting is configured in the Setup menu when the rotary switch is set to **SETUP**:

Setup 1/3 > Automatic measurem. 1/4> At end of sequence > Results list.

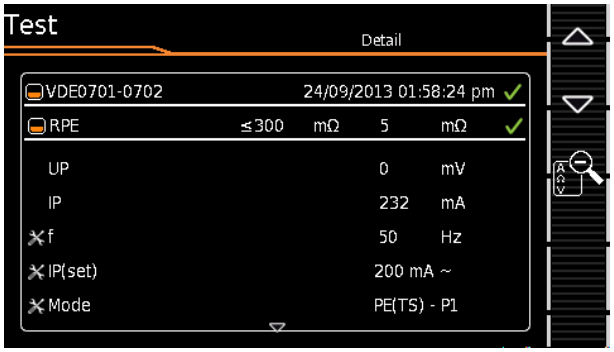
If **Results list** the start screen (memory screen) is skipped.

▶ **Open the results list**

✓ "Sequence finished" is displayed.

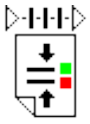
✓ The memory screen is displayed.

1. Press **Show measured values**.
   ↳ The results list opens.
2. Press **Up** or **Down** to select the desired test step.
3. Press **Show details** to show details about the selected test step. Press **Hide details** to close the detail view again.



4. Select the desired report view.
5. Press **OK** to return to the memory screen.

Report Views

Filter Symbol	Meaning of the Selectable Report View
	While the report is displayed: Show the complete test report
	While the report is displayed: Show a merged (condensed) test report. Skipped test steps are not displayed in the condensed view; only the worst measured value for each measuring mode is displayed.

Filter Symbol	Meaning of the Selectable Report View
	While the report is displayed: Show failed test steps only

Table 144: Report views

Whether the operating uncertainty (OU) is taken into account depends on the setting in Setup menu for the **SETUP** rotary switch position:: **Setup 1/3 > Automatic measurem. 1/4 > Incl. oper. uncert. > Yes**

16.10 Saving Test Results

Results from a successful test sequence must be saved.

NOTE

Please note the following before storing tests or measurements in the test instrument: The recalibration date of the DUT may be printed on test reports or sent when exporting test data to a PC.

Therefore, before you begin working with your new test instrument, check the recalibration date stored in the test instrument.

▶ **Save, DUT selected before measurement**

1. Press **Save**.
   ↳ The display switches to the **Store** view.
   ↳ The ID of the DUT is highlighted in green or orange.
2. Press **Save** again.
   ↳ The save process is complete.

▶ **Save, no DUT selected before measurement**

Scenario 1: DUT ID is available

1. Press **Save**.
   ↳ The following message appears: “No DUT selected!”
2. Press **ID**.
   ↳ The softkey keyboard opens.
3. Enter a DUT ID that was already created in the database.
   ↳ The database view (MEM navigation) opens automatically.
   ↳ The ID of the DUT appears in reverse.
4. Confirm the entry by pressing **OK**.
   ↳ The display switches to the **Store** view.
   ↳ The DUT ID appears with a green or orange background.
5. Press **Save** again.
   ↳ The save process is complete.

Scenario 2: DUT ID is not available

6. Press **Save**.
   ↳ The following message appears: “No DUT selected!”
7. Press **ID**.
   ↳ The softkey keyboard opens.

8. Enter a DUT ID that has not yet been created in the database.
   ↳ A prompt appears asking if you want to create a new DUT.
9. Confirm the entry by pressing **New DUT**.
   ↳ The database view (MEM navigation) opens.
10. Click **Next page** to go to the next page **Edit objects 2/3**.
11. Click **Add object**.
    ↳ All possible object types are displayed.
12. Press **Device**.
    ↳ The new DUT ID you entered is displayed in red to the right of the ID parameter.
13. Click **OK**.
    ↳ The display switches to the database view (MEM navigation).
    ↳ The newly entered DUT appears with inverse marking in the structure.
14. Press **ESC** to return to the **Save** view.
    ↳ The DUT ID appears with a green background.
15. Press **Save** again.
    ↳ The save process is complete.

NOTE

With the QEDIT function (QuickEdit; available only with SECUTEST DB COMFORT (Z853S or feature KD01)), you can enter all other fields immediately after you enter the ID number.

▶ **Cancel saving**

1. Press **ESC** twice.
   ↳ The measurement view opens.
2. Press **ESC**.
   ↳ A prompt appears asking if you want to delete the measurement points to continue the measurement without saving.
3. Confirm the prompt with **OK**.
   ↳ The save process is canceled.

Alternative: Send Measurement Data to a PC (IZYTRONIQ – Push/Print)

You can send the test results to a PC on which the IZYTRONIQ software is running. This function is known as "Push/Print" and can be performed via USB or Bluetooth®.

SECUTEST DB COMFORT (Z853S or feature KD01) and, if applicable, Bluetooth® (feature M01) are required for "Push/Print."

For complete information about Push/Print and a description of how to use it, refer to the IZYTRONIQ online help.

16.11 Remote Control – Automated Test Sequence Control with the IZYTRONIQ Software

In IZYTRONIQ, you can create an "IZY Remote Sequence" (not to be confused with a "Test Instrument Sequence"). This is a user-defined test sequence that you can execute remotely via the IZYTRONIQ software.

IZYTRONIQ controls the test instrument in remote mode: i.e., it sends control commands to the test instrument, which then performs the desired measurement. The connection between the IZYTRONIQ-equipped device and the test instrument is established via USB.

The test instrument, in turn, provides the measurement data. The measured values are not displayed on the test instrument's screen but are transmitted to IZYTRONIQ.

NOTE

Only for models ... ST PRIME

Test steps that use the "Electrical Strength Test" measuring function must not be integrated into IZY Remote Sequences: This functionality is not supported.
This is supported for user-defined test sequences that can be loaded into the test instrument ⇨ **"User-Defined Test Sequences "** 🗋 **247**.

NOTE

Remote control is also possible via the virtual COM port. A USB connection can be used for this purpose. This is not documented in these instructions, because it is not possible due to the wide variety of communication partners. Information on the virtual COM port is available on request.

NOTE

Predefined test sequences cannot be executed via remote control.

▶ **Prerequisites**

The following is required for remote control:

- SECUTEST DB+ (Z853R or feature KB01) (includes the “Remote Control via PC” functions)
- The IZYTRONIQ software
- At least one user-defined IZY Remote Sequence

▶ **Procedure**

NOTE

When using remote control or a self-created IZY Remote Sequence created by the user for the test instrument, the creator or user/testing person assumes responsibility for ensuring that test steps comply with standards and that any preliminary tests are executed in the correct order.

NOTE

Do not start any IZY Remote Sequences unless the test instrument and the DUT are in plain view. Do not connect mains voltage to the test socket of your test instrument before the surrounding area has been secured.

1. First, set up at least one user-defined IZY Remote Sequence in IZYTRONIQ (see the IZYTRONIQ online help).
2. Connect the test instrument to the PC with a USB cable (USB slave interface).
3. Follow the instructions provided in the IZYTRONIQ online help for executing remote control.

17 Reports

A report can be read out showing the results of individual measurements or test sequences stored to the internal database.

Various output formats can be selected:

- Printout with a printer directly on the test instrument
- Digital output (HTML) to a USB flash drive connected to the test instrument
- Transfer of the saved measurement data to the IZYTRONIQ software on the PC and subsequent printout via PC/ printer

17.1 Print Settings

Report Template for Printer and HTML Output

A report template is permanently stored in the test instrument. Depending on the executed test sequence, the standard designation in the report may change.

The report template includes the following parameters:

- ID
- Designation
- Customer name
- Location
- Date
- Time
- Comment with 64 characters
- Standard designation / Sequence name / Manual test
- Measured values
- Limits
- Ratings
- Test equipment (serial number)

NOTE



The image on the screen is not a print preview and does not correspond to the final printout.

Multiprint

The "Multiprint" function allows you to print multiple tests merged into a single report.

If you move the cursor in the memory menu to a DUT with multiple completed tests (single measurements or test sequences) and press the **PRINT** key, a combined test report containing all test results for this DUT will be printed.

17.2 Saving Reports to a USB flash drive (HTML)

You can connect a USB flash drive to the test instrument and save reports to it as HTML files.

▶ **Select the storage mode**

When you save reports as HTML files to a USB flash drive, you can choose between two storage modes:

- Offline: The reports are saved in full so they can be opened without an Internet connection. The storage process takes more time.

- Online: The reports are saved using less storage space and with a faster saving process. However, the reports can only be opened with an Internet connection.

1. On the test instrument, select **SETUP 2/3 > Test reports > HTML report > Online / Offline**.
2. Select the desired storage mode, "Online" or "Offline."
   ↳ The selected mode appears in the file name of the HTML report.
   Single test/measurement: [DUT ID]-[Test sequence name]-[Test time]-[Offline/Online].html
   All tests/measurements for a DUT: [DUT ID]-multi-[offline/online].html

NOTE

< > / \ : ? in the DUT ID are replaced with an underscore _.

▶ **Save an HTML report**

NOTE

If you want information about the DUT to appear in the report, you must save the test BEFORE printing (= establish the link between the test and the DUT).

✓ A USB flash drive is connected to the test instrument.

1. Press **MEM**.
2. Use the **Up** or **Down** key to select the measurement for which a report is to be saved to the USB flash drive.
3. Press **PRINT**.

↳ The message **Print job finished** appears.

↳ The HTML file has been created.

TIP

Reports can also be saved or printed immediately after completing an inspection or while the test list view is open.

17.3 Printing Reports on the Printer

You can connect thermal printer Z721S with report tapes (Z722S thermal paper accessory) to the test instrument to print test reports.

▶ **Printing**

NOTE

If you want information about the DUT to appear in the report, you must save the test BEFORE printing (= establish the link between the test and the DUT).

1. Press **MEM**.
2. Press the **Up** or **Down** key to select the single measurement or test sequence you want to print.

3. Press **PRINT**.

↳ The report is printed on the printer.

TIP



Reports can also be saved or printed immediately after completing an inspection or while the test list view is open.

18 Transferring and Saving Test Structures and Measurement Data (Test Instrument Database)

Test structures created in the test instrument and measurement data stored there can be transferred.

Data is transferred in XML format. The data structure can be taken from the corresponding XSD file, which is referenced in the header of the *.secu file.

Depending on the specific scenario, you can transfer the test structure and the data for further processing, save them as a backup, or restore a dataset.

- Export

  Transfer a test structure including measured values from the test instrument to the PC (IZYTRONIQ software).

  – Via USB connection
  – Via USB flash drive[1]

- Import[1]

  Transfer a test structure from the PC (IZYTRONIQ software) to the test instrument.

  – Via USB connection
  – Via USB flash drive

- Backup and restore

  backup or restore data via USB flash drive

NOTE

Export and import are possible via Bluetooth® when using the virtual COM interface. Information is available on request.

Prerequisites: Feature M01 (Bluetooth®), SECUTEST DB+ (Z853R or feature KB01) for import.

Bluetooth® transfer with IZYTRONIQ is NOT possible.

18.1 Export – Transferring Test Structures and Data to a PC

The test structures created in the test instrument and the stored measurement data can be transferred to the IZYTRONIQ software on the PC.

▶ **Transfer data via USB cable**

ATTENTION

Data loss

The memory structure in the test instrument will be corrupted if the data transfer is interrupted.

— While data is being transferred, the transfer dialog will appear on the test instrument's display. Do not disconnect the USB connection under any circumstances while this is occurring.
— Do not remove the interface cable.
— Do not disconnect the test instrument from the power supply.
— Wait an additional 5 seconds after the transfer dialog has closed before disconnecting the USB connection or switching off the test instrument.
— Do not start a data transfer to the PC during a single measurement or a test sequence.

✓ No single measurement or test sequence is active.

1. Connect the PC and the test instrument via a USB cable using the USB slave interface.

[1] Only with SECUTEST DB+ database expansion (Z853R or feature KB01)

2. In the IZYTRONIQ software on the PC, open the submenu **Portable objects > Import > From test instrument**.
   ↳ A drop-down menu appears.
3. Select your test instrument from the drop-down menu.
4. Follow the instructions in the software and the IZYTRONIQ online help.

▶ **Transfer data via a USB flash drive**

This function is only available with database extension SECUTEST DB+ (Z853R or feature KB01).

If the respective function is not available, it is grayed out.

ATTENTION

Data loss

The memory structure in the test instrument will be corrupted if the data transfer is interrupted.

— While data is being transferred, the transfer dialog will appear on the test instrument's display. Do not disconnect the USB connection under any circumstances while this is occurring.
— Do not remove the interface cable.
— Do not disconnect the test instrument from the power supply.
— Wait an additional 5 seconds after the transfer dialog has closed before disconnecting the USB connection or switching off the test instrument.
— Do not start a data transfer to the PC during a single measurement or a test sequence.

1. Connect a USB flash drive to the test instrument.
2. On the test instrument, select **Setup 1/3 > Database 2/2 > Export .secu/IZY USB**.
   ↳ The data is then converted into an IZYTRONIQ-compatible file (with the file extension ".secu") and saved to the USB flash drive.
3. After the save process has been completed, remove the USB flash drive from the test instrument.
4. Connect the USB flash drive to the PC.
5. In the IZYTRONIQ software on the PC, open the submenu **Portable objects > Import > From test instrument**.
   ↳ A drop-down menu appears.
6. Select **Secutest 4 file import** from the drop-down menu.
7. Follow the instructions in the software and the IZYTRONIQ online help.

18.2 Import – Loading Test Structures from the PC into the Test Instrument

This function is only available with database extension SECUTEST DB+ (Z853R or feature KB01).

A test structure can be created on the PC with the help of the IZYTRONIQ software. For a detailed description of how to create the database, refer to the IZYTRONIQ online help. The created test structure must then be transferred to the test instrument.

If the respective function is not available, it is grayed out.

ATTENTION

Data loss during import!

During a data import, existing data on the test instrument will be overwritten.

— If necessary, create a backup before the import.

ATTENTION

Data loss

The memory structure in the test instrument will be corrupted if the data transfer is interrupted.

- While data is being transferred, the transfer dialog will appear on the test instrument's display. Do not disconnect the USB connection under any circumstances while this is occurring.
- Do not remove the interface cable.
- Do not disconnect the test instrument from the power supply.
- Wait an additional 5 seconds after the transfer dialog has closed before disconnecting the USB connection or switching off the test instrument.
- Do not start a data transfer to the PC during a single measurement or a test sequence.

1. Connect the PC and the test instrument via a USB cable using the USB slave interface.
   Or
   Connect a USB flash drive containing the test structure to the test instrument.
2. On the test instrument, select **Setup 1/3 > Database 2/2 >Import .secu/IZY USB**.

↳ The data is transferred to the test instrument.

18.3 Backup – Backing Up and Restoring from a USB Flash Drive

The structures created in the test instrument and the stored measurement data can be backed up to a USB flash drive and restored from it. To do this, a USB flash drive must be connected to the test instrument.

If the respective function is not available, it is grayed out.

▶ **Back up to a USB flash drive**

ATTENTION

Data loss

The memory structure in the test instrument will be corrupted if the data transfer is interrupted.

- While data is being transferred, the transfer dialog will appear on the test instrument's display. Do not disconnect the USB connection under any circumstances while this is occurring.
- Do not remove the interface cable.
- Do not disconnect the test instrument from the power supply.
- Wait an additional 5 seconds after the transfer dialog has closed before disconnecting the USB connection or switching off the test instrument.
- Do not start a data transfer to the PC during a single measurement or a test sequence.

1. Connect a USB flash drive to the test instrument.
2. Select **Setup 1/3 > Database 1/2 > Backup**.

↳ The backup files are named with a timestamp (file extension .etcbak) and saved directly in the root directory of the USB flash drive.

▶ **Restore from the USB flash drive**

ATTENTION

Data loss during import!

During a data import, existing data on the test instrument will be overwritten.

— If necessary, create a backup before the import.

ATTENTION

Data loss

The memory structure in the test instrument will be corrupted if the data transfer is interrupted.

— While data is being transferred, the transfer dialog will appear on the test instrument's display. Do not disconnect the USB connection under any circumstances while this is occurring.
— Do not remove the interface cable.
— Do not disconnect the test instrument from the power supply.
— Wait an additional 5 seconds after the transfer dialog has closed before disconnecting the USB connection or switching off the test instrument.
— Do not start a data transfer to the PC during a single measurement or a test sequence.

1. Connect a USB flash drive, on which the test structure is saved, to the test instrument.
2. On the test instrument, select **Setup > Database 2/2 > Restore**.

↳ The data is restored.

NOTE



An existing backup can only be restored on a test instrument that has the same or a higher firmware/software version than the test instrument on which the backup was created.

19 Storage and Transport

ATTENTION

Improper storage

Damage to the product and measuring errors due to environmental influences.

— Store the device in a protected location and only within the limits of the specified permissible ambient conditions.

ATTENTION

Improper transport

Damage to the product and measuring errors.

— Transport the device only within the limits of the permissible ambient conditions.
— For best possible protection, we recommend using the accessories which are available for the device (carrying case, cover, etc.). Refer to the data sheet of the device for further details.

20 Maintenance

This section provides information on the various maintenance procedures required for the test instrument.

Depending on the type of procedure, you must perform it (or have it performed) on a regular basis (e.g., safety inspections and recalibration) or perform it (or have it performed) when necessary (e.g., fuse replacement).

20.1 Cleaning



DANGER

Danger to life due to electric shock!

The device and its accessories are operated with electricity, thus resulting in a general risk of electric shock. This can be fatal or cause serious injuries.

— The device, the accessories, and all connected conductors must be voltage-free before and during cleaning. Switch the device off and disconnect it from the power supply.
— Never immerse the device/accessories in water or other liquids.
— Never touch the device/accessories with wet hands.

ATTENTION

Unsuitable cleaning agents

Unsuitable cleaning agents such as aggressive or abrasive cleansers result in damage to the device/accessories.

— Clean the device by wiping it gently with a damp cloth.
— Avoid the use of cleansers, abrasives or solvents.

Keep the outside surfaces of the device and any accessories clean.

20.2 Calibration

The use of your device and the resulting stressing affect the device and lead to deviations from the specified accuracy. We recommend regularly checking the accuracy with a suitable (if necessary, certified) test instrument.

For applications with high measuring accuracy requirements and heavy stressing (e.g., severe climatic or mechanical stress), we recommend a relatively short calibration interval of 1 year. If this is not the case, a calibration interval of 2 to 3 years is usually sufficient.

Please contact GMC-I Service GmbH for calibration services, ⇨ **"Contact, Support, and Service " 🗋 285**.



NOTE

Date on calibration certificate / Calibration interval begins upon receipt

Your device is delivered with a calibration certificate that shows a date. This date may be further in the past if your device has been stored for some time prior to sale.
The devices ~are stored in accordance with the specified conditions. Drift is therefore negligible over a period of 1 year. Longer storage periods do not typically occur.
The performance of the device thus remains within specifications, and you can specify the first calibration interval as of the date of receipt.

Setting Calibration and Recalibration Dates

The calibration and recalibration dates are registered in the device. The dates of the last adjustment and calibration are set by the calibration laboratory.

You can adjust the date and time of the next calibration (recalibration date) yourself.

Viewing the Dates of the Last Adjustment and Calibration

You can view the date and time of the last adjustment or calibration:

Menu > **General setup** > **Info**

Changing the (Re)Calibration Date via Data Interfaces

You can set or change the date and time of the next recalibration via a data interface (Bluetooth® or USB).

Data is transferred bidirectionally via a virtual COM port.

The required driver can be installed using the **Driver Control** software.

The software is available for download on our website:

www.gossenmetrawatt.com

Communication between the PC and the test instrument takes place in UTF-8.

No checksums are generated for pure ASCII responses. Communication via the USB port is considered secure due to native CRC-16 checks.

Each command must be ended with an LF line break (ASCII 10).

After data transfer, the test instrument must be restarted for the changes to take effect.

Serial Port Settings:

Parameter	Value
Baud rate	9600 ... 115,000 (freely selectable)
Data bits	8
Parity	None
Stop bits	1

Setting the calibration date:
IDN:SET:CALIB_DATETIME 2016-11-11T10:11:12
(the time format hh:mm:ss is optional)

Setting the recalibration date:
IDN:SET:RECALIB_DATETIME 2017-11-11T10:11:12
(the time format hh:mm:ss is optional)

21 Troubleshooting: Warnings, Error Messages and Notes

Error messages or notes regarding single tests or test sequences are displayed as pop-ups.

21.1 Types

There are generally 5 types of messages:

- Fatal error
- Error
- Warning
- Note – INFO
- Question

Fatal error



This message indicates an extraordinary error. The fatal error must be acknowledged or cleared with **OK** and the cause of the error must be resolved before the test or test sequence can continue.

Error



This message indicates am operator error, for example. The error must be acknowledged or cleared with **OK** and the cause of the error must be resolved before the test or test sequence can continue.

Example: Object cannot be created. General database error!

Warning



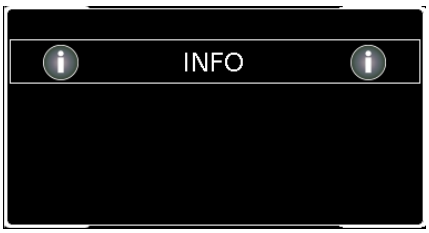
Warnings indicate hazards that, if not avoided, may result in serious injury. Single test: The warning must be acknowledged or cleared with **OK** before the test or test sequence can continue.

Test sequence: The test sequence can be canceled or continued without acknowledgment.

Examples:

- Attention: Mains voltage is applied to the test socket!
- Attention: The polarity of the mains voltage at the test socket will be reversed!

Note – INFO



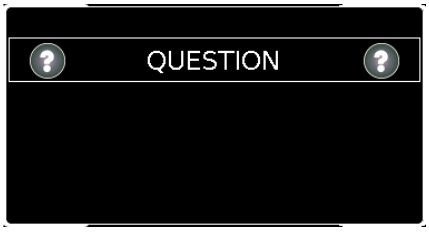
A note is either information about the activities of the test instrument or a procedural instruction that you may need to confirm with **OK** or skip.

Examples:

- Probe check
- Check if DUT is isolated
- On-off-check

- Short-circuit test (L-N)
- Short-circuit test (LN-PE)
- Prompt: Contact with test probe P1...
- Prompt: Switch the DUT on/off with its mains switch.
- Prompt: Start up / shut down the DUT.

Question

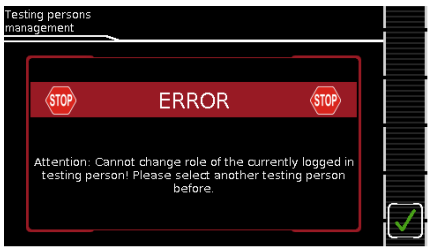
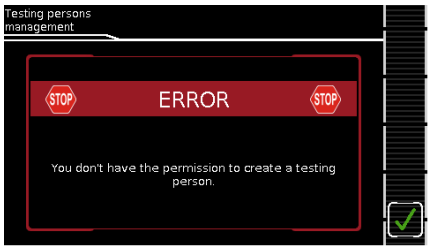
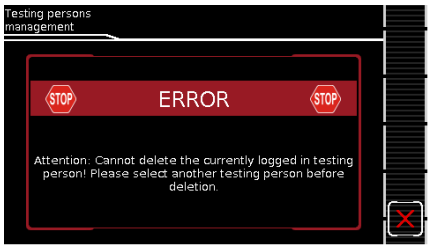
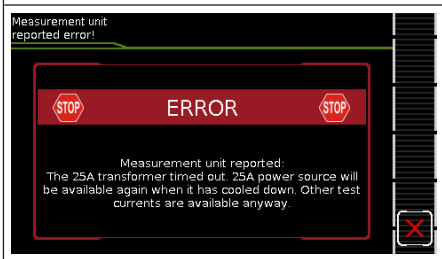


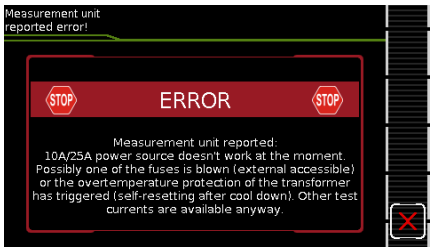
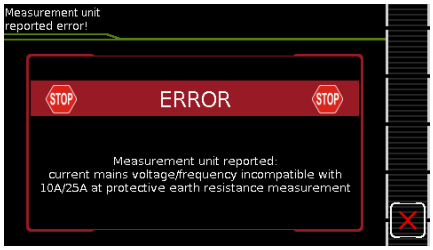
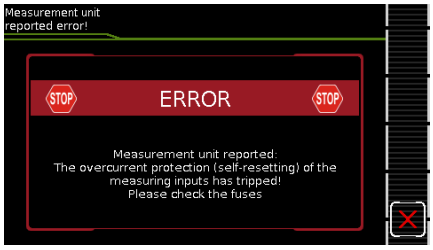
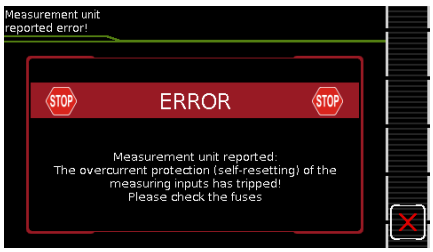
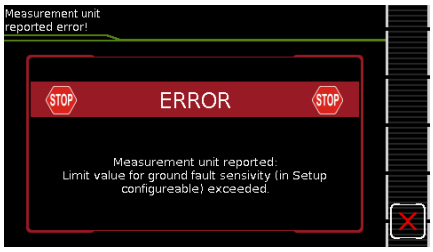
Questions must be answered by pressing YES or NO. Only then will the single test or test sequence will continue accordingly.

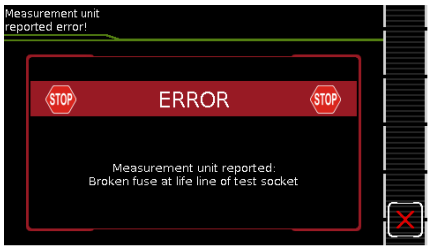
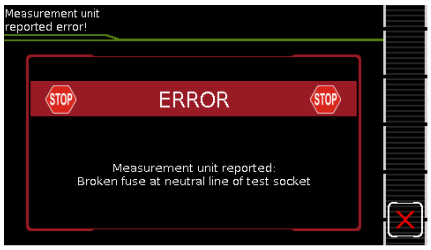
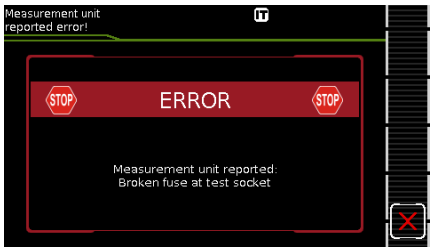
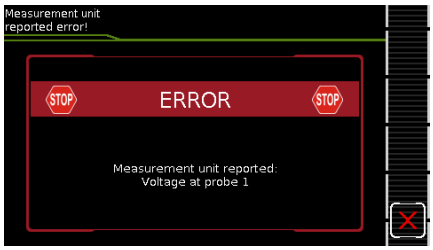
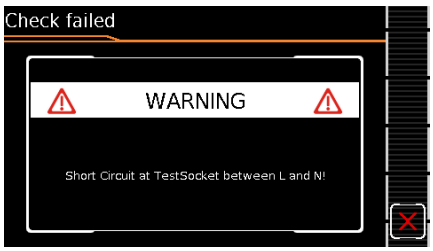
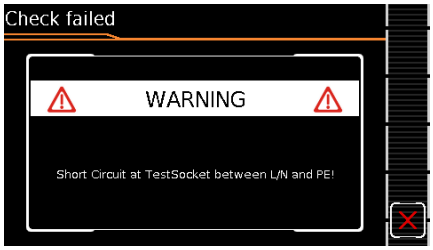
Example:

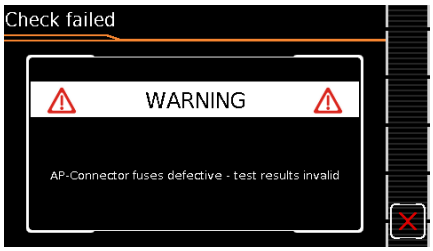
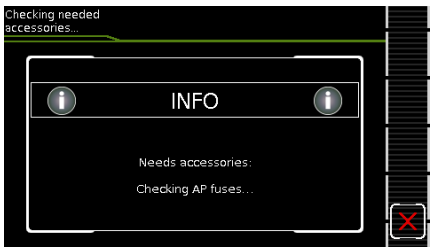
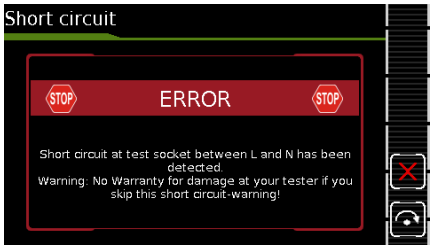
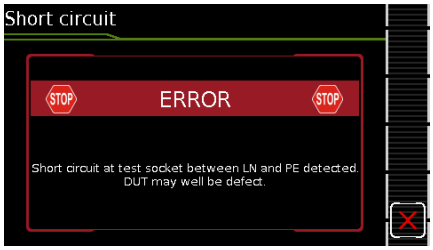
- Device/ME device not found!
  Create new object/database?

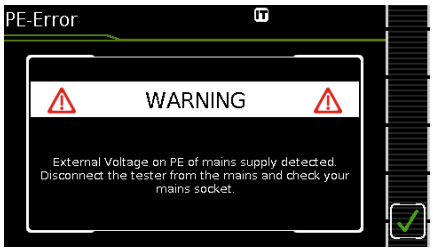
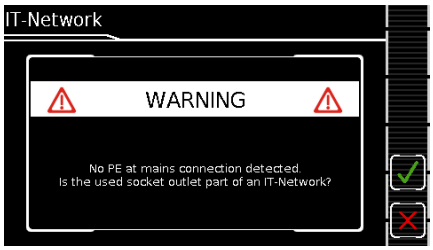
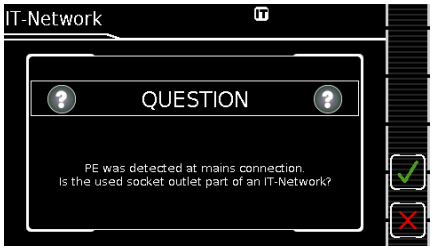
21.2 List of Error Messages

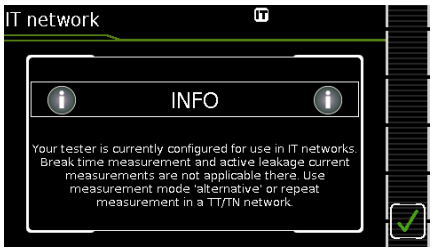
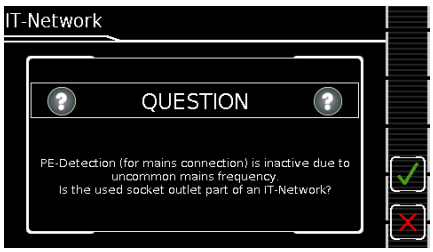
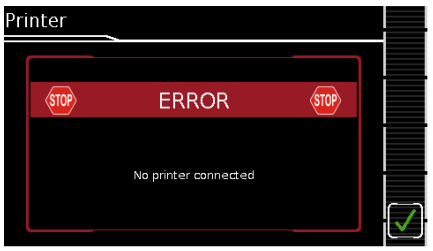
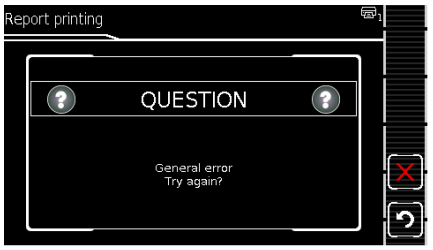
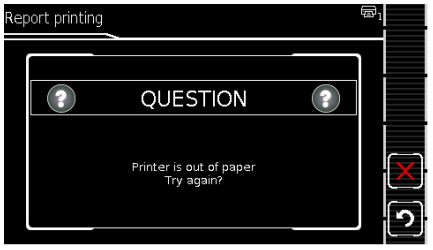
Error Messages	Possible Causes	Corrective Measures
Testing Person Management		
	■ The current testing person holds the role of an EIP (electric instructed person). ■ An EIP does not have the rights to change their own role or the role of another testing person.	■ Log in as a test planner to change your own role or the role of another testing person.
	■ The current testing person holds the role of an EIP (electric instructed person). ■ An EIP does not have the rights to create a new testing person.	■ Log in as a test planner if you want to create a new testing person.
	■ The testing person you want to delete is currently selected and therefore cannot be deleted.	■ Log in as a different test planner if you want to delete a testing person.
Measuring unit reports an error – R_{PE}		
	■ The 25 A measurement is taking too long, or the 25 A measurement was performed too frequently (without breaks).	**ATTENTION!** **The 10 A/25 A measurement is not suitable for continuous operation!** ■ Select a different test current (e.g., 200 mA) or wait until the transformer has cooled down, then repeat the measurement.

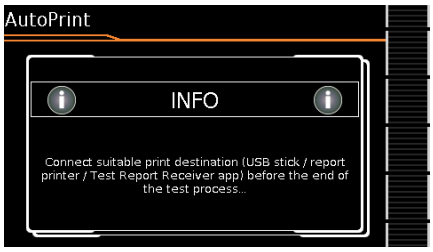
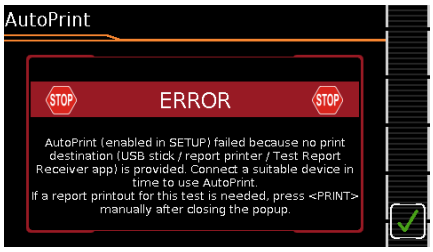
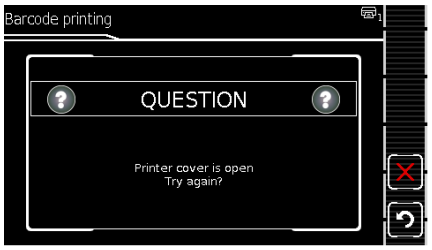
Error Messages	Possible Causes	Corrective Measures
	■ Test probe P1 is not connected. Or ■ The test instrument's 10 A/25 A transformer is overheated. Or ■ One of the fuses is defective (fuse holder near the mains input).	**ATTENTION!** **The 10 A/25 A measurement is not suitable for continuous operation!** ■ Repeat the measurement with Probe P1 connected. ■ Check the fuses and replace if necessary. ■ Select a different test current (e.g., 200 mA) or wait until the transformer has cooled down, then repeat the measurement.
	■ The 25 A measurement takes too long. Or ■ The 25 A measurement was performed too often (without breaks).	Wait until the test instrument has cooled down, then restart the measurement.
	■ During protective earth resistance measurement (test current: 200 mA), more than 200 mA flowed through the probe.	■ Check the fuses and replace if necessary.
Measuring unit reports an error – I_X (leakage currents)		
	■ During leakage current measurement, more than 30 mA flowed through the probe. ■ During leakage current measurement, more than 30 mA flowed through the AP sockets.	■ Check the fuses and replace if necessary.
	■ A DUT has been connected to the test instrument and put into operation, and its leakage current (measured using the differential current method) exceeds the limit set in SETUP.	■ If the DUT normally generates a leakage current greater than 10 mA (e.g., large heating devices), temporarily increase the value for "Gnd fault sens." to 30 mA in the SETUP menu and try again. ■ If such values are not to be expected for this DUT, or if the "Gnd fault sens." value in SETUP is already set to 30 mA, then there may be a ground fault at the DUT.

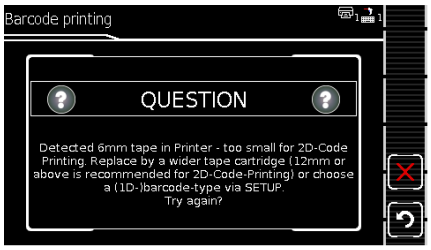
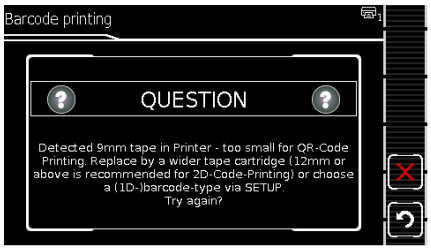
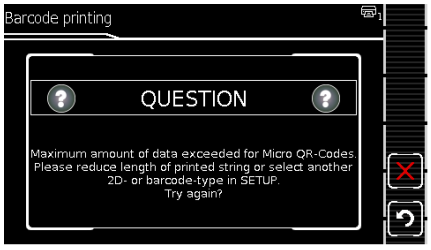
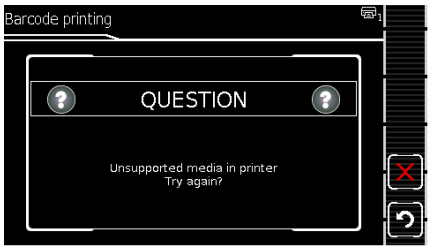
Error Messages	Possible Causes	Corrective Measures
	■ The fuse for the L conductor of the test socket is defective (fuse 2).	■ Disconnect the test instrument from the mains and inspect the fuses next to the mains connection of the test instrument.
	■ The fuse for the N conductor of the test socket is defective (fuse 1).	■ Disconnect the test instrument from the mains and inspect the fuses next to the mains connection of the test instrument.
	■ One of the two fuses in the test socket is defective (fuse 1 or 2).	■ Disconnect the test instrument from the mains and inspect the fuses next to the mains connection of the test instrument.
Measuring unit reports an error – voltage at probe		
	■ Voltage at Probe P1 during a voltage-free measurement.	■ Check the contacting to the DUT.
Check failed – short-circuit check at beginning of sequence		
	■ A short circuit was detected at the test socket between L and N.	■ Check if the DUT is defective. ■ In some cases, a short circuit may be detected in DUTs intended for operation with a 16 A-fused socket if they contain, e.g., a PTC thermistor (such as large headlights). Be sure to use a 3-phase test adapter (e.g., AT3-II-IE) when testing such DUTs. ■ You can deactivate this short-circuit test in the sequence parameters at your own risk.
	■ A short circuit was detected at the test socket between L/N and PE.	■ Check if the DUT is defective. Repeat the visual inspection.

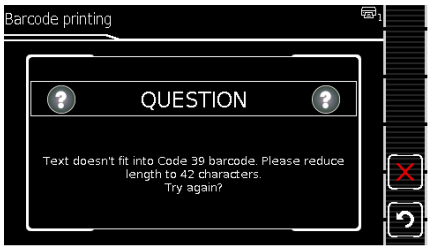
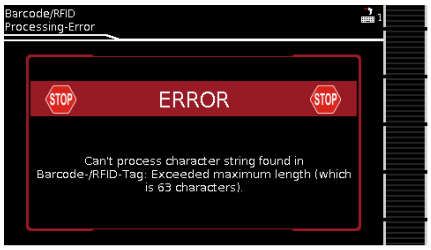
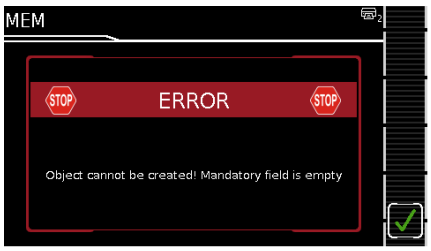
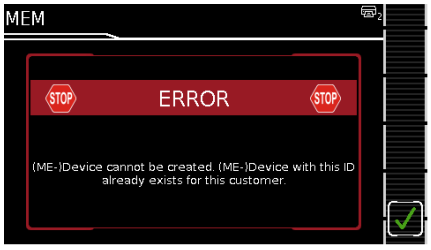
Error Messages	Possible Causes	Corrective Measures
Check failed – fuse check of the AP sockets at beginning of sequence		
	■ Fuses in the AP sockets are defective.	■ Check the fuses and replace if necessary.
Check for required accessories... – fuse check of the AP sockets at before a single measurement		
	■ Fuses of the AP sockets are defective. (message remains on the screen and does NOT disappear)	■ Check the fuses and replace if necessary.
Short circuit – Short-circuit check before connecting the mains to the test socket		
	■ A short circuit was detected at the test socket between L and N.	■ Check if the DUT is defective. ■ In some cases, a short circuit may be detected in DUTs intended for operation with a 16 A-fused socket if they contain, e.g., a PTC thermistor (such as large headlights). Be sure to use a 3-phase test adapter (e.g., AT3-I I I E) when testing such DUTs. ■ You may, at your own risk, ignore this short-circuit warning and put the DUT into operation anyway – any damage resulting from ignoring this warning is excluded from the warranty!
	■ A short circuit was detected at the test socket between L/N and PE.	■ Check if the DUT is defective. Repeat the visual inspection.

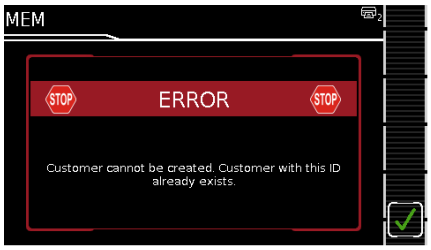
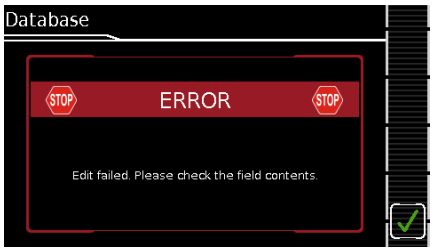
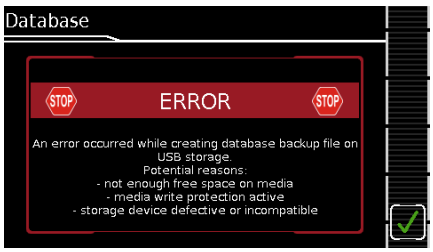
Error Messages	Possible Causes	Corrective Measures
PE error		
	The protective earth (PE) at the mains socket at which the test instrument is being operated is conducting voltage! This detection is performed with the test instrument's metallized **START/STOP** key. For correct detection, it is necessary that a connection to ground potential can be established via the testing person's finger. **ATTENTION!** **If the user's finger is insulated from the key when it is pressed, this error message may appear even though your installation is in good working order.**	■ Please remove the mains plug of the test instrument from this socket and have this socket/installation inspected immediately by a qualified electrician. Until then, do not operate any other test instruments from this socket. ■ To ensure that the detection works reliably, repeat the external voltage test while following these tips: – Unplug all USB devices from the test instrument's USB ports. – While pressing the **START/STOP** key, touch a grounded part (such as a heating pipe). – Be careful not to touch the **START/STOP** key with an object or while wearing gloves.
IT system – general		
	■ PE terminal not detected (at the socket at which the test instrument is being operated): – Due to a fault in the installation! – In special configurations of the TT system; detection may fail in these cases. – If the test instrument is operated in an IT system	■ If the test instrument is operated in an IT system: Confirm the prompt ✓, in this case, the IT system option will be activated. ■ If it is not an IT system: Remove the mains plug from the outlet and inspect the installation immediately! ■ If the system is a TT system without a neutral conductor, select ✗; direct leakage current measurements are possible (Please be sure to verify that direct leakage current measurements are possible in your current network configuration!)
	■ Compared to the previously used mains connection, a PE conductor was detected while the IT system option is activated in SETUP.	■ Operation in an IT system: Answer the question with ✓. This keeps the IT system option active. ■ Operation in a TN or TT system: Answer the question with ✗. As a result, the IT system option will be deactivated.

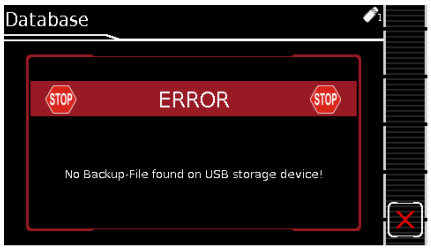
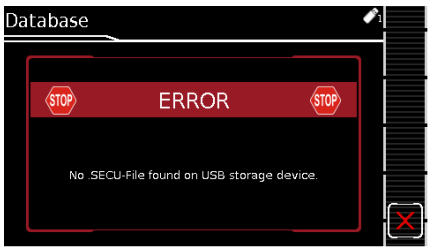
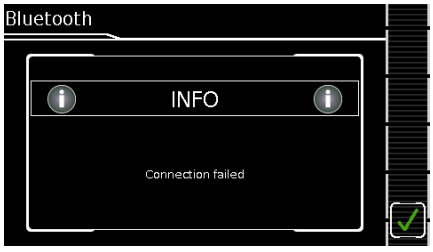
Error Messages	Possible Causes	Corrective Measures
	■ IT system option is activated (see section “Measurements in IT Systems”). An attempt was made to start an active leakage current measurement or a measurement that references the PE on the mains-connection side (or a test sequence containing such measurements).	■ Select the “passive” measuring mode. Or ■ Execute the desired tests in a TT/TN system instead of an IT system and configure the test instrument accordingly. Or ■ If possible, deactivate the leakage current measurements in the sequence parameters.
IT system – abnormal line frequency		
	■ Line frequency is lower than 48 Hz or higher than 62 Hz	■ PE detection does not work here: please select ✓ or ✗ accordingly, depending on whether the system in use is an IT system or not.
Printer – not connected/incompatible		
	■ The printer is not connected. ■ An incompatible printer is connected.	■ Connect the printer via the USB port before pressing the PRINT key. ■ Make sure that the printer you are using is a compatible model. See “Connecting and Configuring External Devices“ [QVJ].
Printing a Report		
	■ The printer is defective, or the cover on the thermal printer is not completely closed.	■ Close the cover on the thermal printer completely.
	■ There is no paper roll inserted in the thermal printer.	■ Insert a new paper roll.

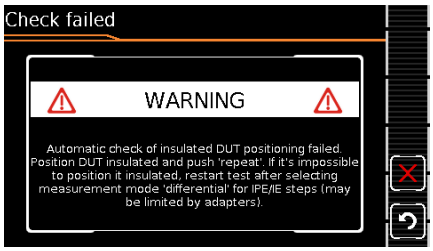
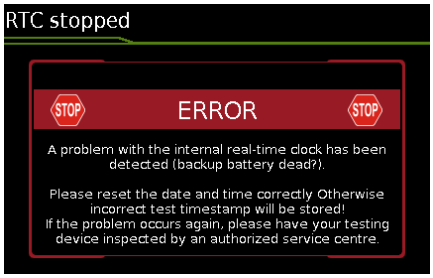
Error Messages	Possible Causes	Corrective Measures
AutoPrint		
	■ No compatible USB device was found to run AutoPrint.	■ AutoPrint is activated ([QV]). This feature requires a USB flash drive or a USB report printer (Z721S) as the print destination. – Connect a properly formatted USB flash drive ([QV]). Or – Connect a Z721S report printer. Or – Switch off AutoPrint.
	■ AutoPrint failed because no matching USB device was found for AutoPrint.	■ Make sure that – A properly formatted USB flash drive is connected ([QV]). – A Z721S report printer is connected, – The printer is switched on.
PRINT function		
	■ More than one compatible USB device is connected (USB flash drive and printer).	■ Select a USB device for the **PRINT** function.
Barcode printer		
	■ There is no ribbon cassette inserted in the barcode printer.	■ Insert a print cartridge.
	■ The top cover of the barcode printer is open.	■ Close the top cover on the barcode printer.

Error Messages	Possible Causes	Corrective Measures
	■ A ribbon cassette with a 6 mm ribbon width is inserted in the printer. – These are unsuitable for 2D code printing.	■ Insert a ribbon cassette with a ribbon width of 9 mm (preferably 12 mm or wider) and try printing again. Or ■ In SETUP, switch to CODE128, CODE39 or EAN13 (SETUP 2/3 > Printer > Z721E > Printer settings > ID Labels).
	■ A ribbon cassette with a 9 mm ribbon width is inserted in the printer; this is unsuitable for printing QR code labels.	■ Insert a ribbon cassette with a ribbon width of 12 mm and try printing again. Or ■ In SETUP, switch to another output format (MicroQR code, DataMatrix, Aztec, Code128, Code39 or EAN13) (SETUP 2/3 > Printer > Z721E > Printer settings > ID Labels).
	■ The DUT ID to be printed as a barcode contains an invalid character, such as an umlaut or special character, or it does not comply with the conventions that apply to the set barcode encoding (e.g., EAN-13: digits only, total length of 13 characters, last digit is a check digit only).	■ Select a different barcode encoding (SETUP 2/3 > Printer > Z721E > Printer settings > ID Labels). ■ Change umlauts such as “ä” to “ae”. ■ Avoid special characters in the ID. ■ Change the ID to the length required for this barcode encoding.
	■ Too much data for a Micro QR code in the ID to be printed.	■ Shorten the ID or switch to another output format (QR Code, DataMatrix, Aztec, Code128, Code39, EAN13) (SETUP 2/3 > Printer > Z721E > Printer settings > ID Labels).
	■ A ribbon cassette with a 3.5 mm ribbon width is inserted in the printer. This is unsuitable for printing any labels.	■ Insert a ribbon cassette with a ribbon width of 6 mm or more.

Error Messages	Possible Causes	Corrective Measures
	■ There is too much data for a Code 39 in the ID to be printed, or the length of the ID is too long to be printed using Code 39.	■ Shorten the ID to be printed to 42 characters.
Barcode/RFID processing error		
	■ The scanned barcode is too long.	■ Make sure that you – Have scanned the correct barcode. – Use only DUT IDs that are 25 characters or fewer.
Writing an RFID tag		
	■ While writing an RFID tag, an attempt was made to write an ID that contains umlauts such as ä, ü, ö, or special characters to the tag.	■ Change umlauts such as “ä” to “ae”. ■ Avoid special characters in the ID.
Move object – database editing		
	■ Moving an object failed. Moving a DUT would cause a DUT ID conflict. A DUT ID already exists for this customer.	■ Delete the object with the duplicate DUT ID. ■ Select a different customer the destination for the move.
MEM – database editing		
	■ When creating a new device/ME device, the DUT ID field was not filled in.	■ Fill in the DUT ID field.
	■ Duplicate ID – An attempt was made to create a device with an ID that already exists for this customer.	■ Use a search ([QV]) to check if the ID has already been assigned, or if the DUT that already exists might be the one you are currently trying to create. ■ Check if you have actually used two identical ID labels for two different DUTs.

Error Messages	Possible Causes	Corrective Measures
	■ Duplicate ID – An attempt was made to create a customer with an ID that already exists.	■ Switch to the "MEM Customer" view by pressing MEM again if necessary. Check – If the customer you currently want to create already exists: in which case, creating a new one would be unnecessary, – If the other customer can be deleted if necessary.
Database – database editing		
	■ While editing an existing database object, one of the fields was filled in with invalid content.	■ Please make sure that all required fields (marked in red) are filled in. ■ Please also check the fields for invalid special characters, if necessary
Database – export		
	■ Error writing the backup file to the USB flash drive. There is not (or no longer) enough free storage space on the storage medium. ■ Especially for FAT16-formatted USB flash drives: There are too many files on the USB drive, and the current consumption of the USB flash drive being used exceeds 500 mA. ■ The USB flash drive was disconnected during the import process. The USB flash drive is defective or incompatible with the test instrument.	■ Make sure that there is at least 100 MB of free storage space on the USB flash drive, or delete any files you no longer need. ■ If the problem persists, save the data from the USB flash drive to another storage device and reformat the USB flash drive (FAT32). ■ Only use USB flash drives with current consumption of less than 500 mA on the test instrument. ■ Make sure that the USB flash drive is not removed or moved during the entire data backup process. ■ If none of these measures resolves the issue, replace the USB flash drive. For a list of tested USB flash drives, see Section 10.1, “Using USB Flash Drives” [QV].

Error Messages	Possible Causes	Corrective Measures
	■ Error writing the ".secu" file to the USB flash drive. There is not (or no longer) enough free storage space on the storage medium. – Especially for FAT16-formatted USB flash drives: Too many files on the USB flash drive. – The current consumption of the USB flash drive being used exceeds 500 mA. – If the data on the USB flash drive is corrupted (e.g., due to an error during data export to the USB flash drive).	■ Make sure that there is at least 100 MB of free storage space on the USB flash drive, or delete any files you no longer need. ■ If the problem persists, save the data from the USB flash drive to another storage device and reformat the USB flash drive (FAT32). ■ Only use USB flash drives with current consumption of less than 500 mA on the test instrument. ■ Make sure that the USB flash drive is not removed or moved during the entire export process. ■ If none of these measures resolves the issue, replace the USB flash drive. For a list of tested USB flash drives, see Section 10.1, "Using USB Flash Drives" [QV].
Database – import/restore		
	■ No database backup found on the USB flash drive.	■ Make sure that – There is a database backup in the correct format (file extension *.etcbak) on the connected USB flash drive. – The USB flash drive is formatted correctly (see Section 10.1[QV]).
	■ No .secu file found on the USB flash drive.	■ Make sure that – A ".secu" file is present on the USB flash drive. – The USB flash drive is formatted correctly (see Section 10.1[QV]).
Bluetooth®		
	■ Error connecting a Bluetooth® keyboard.	■ Make sure that Bluetooth® is activated.

Error Messages	Possible Causes	Corrective Measures
Check failed		
	■ The DUT is not isolated, even though a test may be scheduled to run that was started using the "Direct" measurement mode for the I_E or I_{PE} test step.	■ If possible, position the DUT in an insulated configuration for the duration of the test and press “Repeat.” Or, if the DUT is suitable for this, execute a test sequence using the “Passive” measuring mode instead. ■ If an isolated setup is not possible, in the sequence parameters for "I_{PE} Mode TS/active," select "Differential" instead of "Direct." The check for isolated setup is then automatically omitted (as of firmware version 3.4.0) ■ If this message appears in a user-defined test sequence configured for the adapter AT16DI or AT32DI with the toggle switch set to position IΔ (differential measurement): Change the “Measuring Mode” parameter in all I_E/I_{PE} measurements from “Direct” to “AT16/32DI Diff” (available as of firmware version 3.4.0).
Malfunction in internal real-time clock		
	■ A malfunction in the internal real-time clock was detected. – The backup battery is dead (can only be replaced by authorized service personnel).	■ Reset the date and time on the test instrument (see Section 8). Otherwise, your test date may be recorded incorrectly. If this error message reappears after the mains supply of the test instrument has been restored, the test instrument should be inspected by an authorized service center and, if necessary, the backup battery of the real-time clock should be replaced.

22 Repair

If your device requires repair, please contact our service department, ⇨ **"Contact, Support, and Service " 🗋 285**.

NOTE

Loss of warranty and guarantee entitlements

Unauthorized modification of the device is prohibited. This also includes opening the device.
If it can be ascertained that the device has been opened by unauthorized personnel, no guarantee claims can be honored by the manufacturer with regard to personal safety, measuring accuracy, compliance with applicable protective measures, or any consequential damages.
If the guarantee seal is damaged or removed, all guarantee claims are rendered null and void.

- The device may only be repaired or opened by authorized, qualified personnel who are familiar with the associated dangers.
- Original replacement parts may only be installed by authorized, qualified personnel.
- The device may only be put back into service after troubleshooting, repair, and a final inspection of the calibration and dielectric strength at our factory or by one of our service centers.

NOTE

Data Protection

Data can be stored on the device. Data can be stored on the device, including personal and/or sensitive data.
Make a backup copy of your data before sending the device in for repair.
Please also note that the owner or end user is responsible for protecting personal data and, if applicable, other sensitive data on the device before handing it over.

23 Contact, Support, and Service

Gossen Metrawatt GmbH can be reached directly and simply – we have a single number for everything! Whether you require support or training, or have an individual inquiry, we can answer all of your questions here:

+49 911 8602-0	Monday to Thursday:	08:00 a.m. – 4:00 p.m.
	Friday:	08:00 a.m. – 2:00 p.m.
Or contact us by e-mail at:	info@gossenmetrawatt.com	

Do you prefer support by e-mail?

Measuring and test technology:	support@gossenmetrawatt.com
Industrial measuring technology:	support.industrie@gossenmetrawatt.com

You can also request training courses and seminars by e-mail and online:

training@gossenmetrawatt.com

https://www.gossenmetrawatt.de/en/knowledge/webinars

Please contact GMC-I Service GmbH for repairs, replacement parts and calibration [1]:

+49 911 817718-0	Beuthener Str. 41
service@gossenmetrawatt.com	90471 Nürnberg
	Germany

https://www.gmci-service.com/en/

[1] DAkkS calibration laboratory per DIN EN ISO/IEC 17025.
Accredited by the Deutsche Akkreditierungsstelle GmbH under reference number D-K-15080-01-01.

24 Certifications

The device fulfills all requirements of applicable EU directives and national regulations. We confirm this with the CE mark.

25 Disposal and Environmental Protection

Proper disposal makes an important contribution to the protection of our environment and the conservation of natural resources.

ATTENTION

Environmental damage

Improper disposal results in environmental damage.

— Follow the instructions concerning return and disposal included in this section.

25.1 Disposing of Waste Equipment and (Rechargeable) Batteries

Waste equipment and (rechargeable) batteries contain valuable raw materials that can be recycled, as well as hazardous substances that can cause serious harm to human health and the environment. These must be recycled and disposed of correctly.



The crossed-out wheeled bin symbol refers to the legal obligation of the owner or end user not to dispose of waste equipment and (rechargeable) batteries with unsorted municipal waste ("household waste"). The (rechargeable) batteries must be removed from the waste equipment (where possible) without destroying them and the waste equipment and the (rechargeable) batteries must be disposed of separately. The type and chemical composition of the (rechargeable) battery are indicated on the battery label. If the chemical symbols "Pb" for lead, "Cd" for cadmium, or "Hg" for mercury are included, the (rechargeable) battery exceeds the limit value for the respective metal.

You are obligated to comply with respective local requirements and implement them correctly on site. Further information can be obtained from the responsible authorities or your local distributor, for example.

Please also note that the owner or end user is responsible for deleting before disposal any personal data and, if applicable, other sensitive data from the waste equipment intended for disposal.

25.2 Disposing of Packaging Materials

Packaging and its components must be disposed of correctly, separate from unsorted municipal waste ("household waste"). You are obligated to comply with respective local requirements and implement them correctly on site. Further information can be obtained from the responsible authorities or your local distributor, for example.

We recommend retaining the packaging in case you require servicing or calibration in the future.

WARNING



Danger of asphyxiation from foils and other packaging materials

Children and other vulnerable persons may suffocate if they wrap themselves in packaging materials, their components, or foils or if they pull these over their heads or swallow them.

— Keep packaging materials, their components, and foils out of the reach of babies, children, and other vulnerable persons.

25.3 Regulations for the Federal Republic of Germany

The following comments refer specifically to the legal situation in the Federal Republic of Germany.

Waste Equipment, Electrical or Electronic Accessories, and (Rechargeable) Batteries

Waste equipment, electrical or electronic accessories, and (rechargeable) batteries used in Germany can be returned free of charge to Gossen Metrawatt GmbH or the service provider responsible for their disposal in compliance with applicable regulations, in particular laws concerning packaging and hazardous goods. (Rechargeable) batteries must be returned in the discharged state or with appropriate precautions against short circuiting.
For more information on returns, see our website.

Packaging Materials

Packaging that is not subject to mandatory system participation is taken back by the contracted service provider.
For more information on returns, see our website.

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