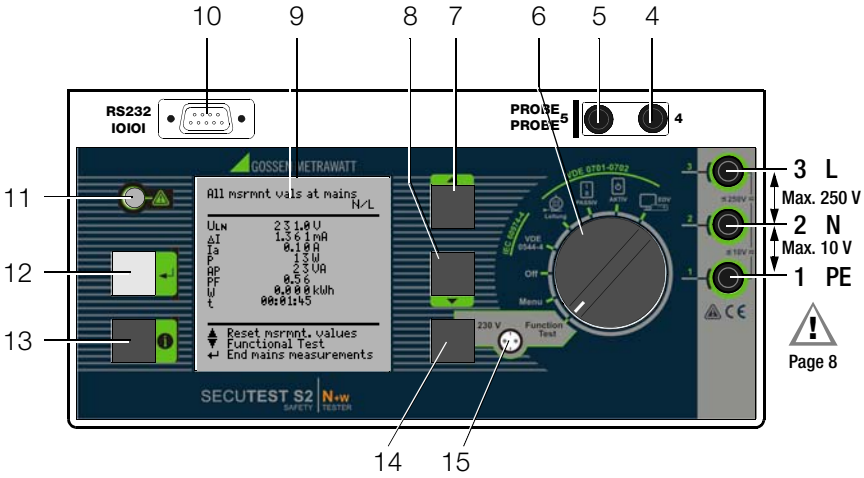
GOSSEN METRAWATT

SECUTEST S2 N+w

Test Instrument with Automatic Test Sequences for IEC 60974-4 and Draft IEC 62638

3-349-630-03
8/4.18



Connection of Standard Probe 1
Insert the probe's double plug into sockets 4 and 5 such that the plug with the white ring makes contact with socket 5 (vertical bar).

Connection of Probe 2 (for Test per IEC 60974-4/VDE 0544-4)
Insert the probe's double plug into sockets 2 and 3 after being prompted to do so.

Note
Contact problems with exposed conductive parts when using the standard probe with test tip
In order to assure good contact, surface coatings must be removed from devices under test with special tools at a suitable location.
The tip of the test probe is not suitable for scratching away paint, because this may impair its coating and/ or mechanical strength. The Z745G brush probe may be more suitable than the test prob e in certain individual cases.

Scope of delivery:
1 **SECUTEST S2N+w** test instrument
2 Probe cables with test probe
1 Plug-on alligator clip for test probes
3 Plug-on quick clips
1 Calibration certificate per DAkkS
1 Set operating instructions
1 Carrying strap

Up-to-date PC software (free starter program or demo software for data management, as well as report and list generation) can be downloaded from our website.

SECUTEST S2N+w

- Protective conductor resistance measurement: Test current of ±200 mA DC or 10 A AC

These operating instructions describe an instrument with firmware version 9.1

Upper Left Figure

1 Jack for protective conductor at device under test
2 Jack for neutral conductor at device under test (test per VDE 0544-4:2009-06: connect to measurement output at the SECULOAD* adapter)
Jack for connecting probe 2
3 Jack for phase conductor at device under test (test per VDE 0544-4:2009-06: connect to measurement output at the SECULOAD* adapter)
Jack for connecting probe 2
4 Jack for connecting probe 1
5 Jack for connecting probe 1
6 Function Selector Switch-
– **VDE**-…: Automated test sequence per selected standard
– **Off**: Instrument is switched off (no disconnection from mains)
– **Menu**: Setup …: Configure device parameters (see section 8)
R_{PE}…: Individual measurements (see section 9)
– **Function test**: Function test (see section 10)
7 key for selecting menus and parameters
8 key for selecting menus and parameters
9 LCD panel
10 Socket connector for RS232 interface – for SI module **SECUTEST SI+, SECUSTORE** memory adapter, barcode scanner or RFID reader)
11 Signal lamp for mains connection error
12 key for entry, for starting test sequences and for finger contact
13 help key (context sensitive)
14 Key next to the symbol for switching test voltage to the test socket (only possible if symbol LED is blinking)
15 Signal lamp for the function test

Lower Left Figure

16 Push-buttons (left and right) for releasing the handle from its snap-in position
17 Standard outlet socket (test socket) for connecting the device under test (see section 7)
18 Push-buttons (left and right) for releasing the lid
19 Compartment for probe and accessories
20 Lid
21 Probe with test tip (accessory probe with SK2W coil cable (Z745N))
22 Carrying handle and tilt stand
23 Cover or SI module (accessory: **SECUTEST PSI** or **SECUTEST SI+**)

* Accessory, Z745V (not included in scope of delivery)

Overview of Available Probe Types

Probe Type	Article No.	Applications	Special Features
Standard probe 1(cable with test probe and alligator clip)	—	Test current: max. 25 A	Probe with straight cable
Probe 2 (cable with test probe)	—	Test current: max. 25 A	Probe with straight cable
SK2 (accessory)	Z745D	Test current: max. 25 A	Probe with straight cable, 2 m long
SK2W (accessory)	Z745N	Test current: max. 25 A	Test probe with coil cable, 2 m long
Option SK5 (accessory)	Z745K	Testing of several protective conductor connections	Special probe in combination with "automatic recognition of measuring point change" function (see page 13).
Brush probe (accessory) Can be plugged onto all above listed probes and test probes	Z745G	Leakage current, protective conductor resistance	For contacting devices under test with rotating, vibrating, exposed conductive parts

Note

Use of probes other than those specified above:
Cables plugged into jacks 4 and 5 must be short-circuited in order to perform the probe test, either by plugging the cable ends together or by means of a conductive surface at the device under test (4-wire measurement).
Remove any corrosion from the device under test.

Data Backup

Measurement data, report data and user entries are stored to RAM at the SI module (accessory), as long as the respective battery supplies the required amount of voltage.

Save your data to a PC on a regular basis in order to prevent any loss of data at the SI module.
We assume no responsibility for any data loss.

Up-to-date PC software (free starter program or demo software for data management, as well as report and list generation) can be downloaded from our website.

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1 Applications

1.1 Table: Types of DUTs – Tests – Regulations

	Testing after Repairs / Periodic Testing	
DUTs to be tested in accordance with the following regulations	Draft IEC 62638 / VDE 0701-0702	IEC 60974-4 / VDE 0544-4
Electrical equipment for measurement, control and laboratory use	•	
Voltage generating devices	•	
Electrical tools	•	
Electrical heaters	•	
Devices with electric motors	•	
Light fixtures	•	
Consumer electronics, IT equipment and communications electronics	•	
Cable reels, extension cables and device connector cables	•	
Data processing equipment and office machines	•	
Arc welding equipment		•

Attention!
The test instrument may not be used for measurements within electrical systems!

1.2 Table: Individual Measurements and Regulations

Individual Measurements per Regulation	Test Current [A]	Draft IEC 62638 / VDE 0701-0702	IEC 60974-4 / VDE 0544-4
Protective conductor resistance	0.2	•	
Insulation resistance		•	
Equivalent leakage current		•	
Equivalent (device) leakage current			
Differential current		•	•
Protective conductor current			•
Primary leakage current			•
Touch current		•	•
Absence of voltage (exposed conductive parts)		•	
Patient leakage current			
Device leakage current			
Welding circuit leakage current			•

Key

- Specified test

1.3 Table: Leakage Current Types

Draft IEC 62638 / VDE 0701-0702	IEC 60974-4 / VDE 0544-4	The following is measured:
Equivalent leakage current		PROBE (connected to protective conductor) to L & N
Touch current / current measurement for absence of voltage	Welding circuit leakage current	Probe to PE
		Protective conductor to PE
	Primary leakage current during operation, direct measurement	Protective conductor interrupted, probe to PE
Protective conductor current with differential current method	Primary leakage current during operation, differential current method	See section 9.3.2

Key
NC = Normal conditions
PE = Potential earthing ⏚, mains protective conductor
DPE = Protective conductor of the device under test

2 Safety Features and Precautions

This instrument fulfills the requirements of the applicable EU guidelines and national regulations. We confirm this with the CE mark. The relevant declaration of conformity can be obtained from GMC-I Messtechnik GmbH.

The **SECUTEST S2N+w** test instrument has been manufactured and tested in accordance with the following safety regulations:

IEC 61010-1 / DIN EN 61010-1 / VDE 0411-1, DIN VDE 0404, DIN VDE 0413, parts 2 and 4

The safety of the user, the test instrument and the device under test (electrical equipment) is only assured when the instrument is used for its intended purpose.

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

Tests may only be performed by a qualified electrician, or under the supervision and direction of a qualified electrician. The user must be instructed by a qualified electrician concerning performance and evaluation of the test.

Observe the following safety precautions:

- The instrument may only be connected to a 230 V/240 V mains system that complies with the applicable safety regulations (e.g. IEC 60346, VDE 0100) and is protected with a fuse or circuit breaker with a maximum rating of 16 A.
- Measurements within electrical systems are prohibited.
- Be prepared for the occurrence of unexpected voltages at devices under test (for example, capacitors may be dangerously charged).
- Make certain that the measurement cables are in flawless condition, e.g. no damage to insulation, no cracks in cables or plugs etc.
- If a probe with coil cable (SK2W) is used:
  Grip the test probe firmly, for example during insertion into a jack socket. Tensioning at the coil cord may otherwise cause the test probe to snap back resulting in possible injury.
- **Measurement of Insulation Resistance and Equivalent Leakage Current**:
  Testing is conducted with up to 500 V. Current limiting is utilized ($I < 3.5$ mA), but if the terminals (3 or 2) are touched, electrical shock may occur which could result in consequential accidents.
  If the DUT is connected via jacks 1 through 3, special care must be taken to avoid contact with open cables.
- **Leakage Current Measurement:**
  It is absolutely essential to assure that the device under test is operated with line voltage during performance of the leakage current measurement. Exposed conductive parts may conduct dangerous contact voltage during testing, and may not under any circumstances be touched (mains power is disconnected if leakage current exceeds approx. 10 mA).

Attention!
The function test may only be performed after the DUT has successfully passed the safety test!

Switching Loads
Be sure to adhere to the sequence specified below when switching DUTs which are subjected to a load. Excessive wear of the mains relay in the test instrument is avoided in this way.

Start the measurement:

1) **DUT**: Turn the DUT off with its own switch.
2) **SECUTEST S2N+w**: Switch line voltage to the test socket ⏚.
3) **DUT**: Turn the DUT on with its own switch.

End the measurement:

4) **DUT**: Turn the DUT off with its own switch.
5) **SECUTEST S2N+w**: Disconnect line voltage from the test socket ⏚.

Measurement at Jacks 1 – 2 – 3
First start the respective measurement and contact the measuring point.
No more than 10 V nay be applied between jacks 1 and 2.
Up to 250 V nay be applied between jacks 2 and 3.

Attention: Jacks 2 and 3 are short-circuited during all measurements conducted at the test socket (exception: see section 9.6)!

The measuring and test instrument may not be placed into service:

- If external damage is apparent
- With damaged connector cables, measuring cables or patient ports
- If the instrument no longer functions flawlessly
- After extraordinary stresses due to transport

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

Opening of Equipment / Repair
The equipment may be opened only by authorized service personnel to ensure the safe and correct operation of the equipment and to keep the warranty valid.
Even original spare parts may be installed only by authorized service personnel.
In case the equipment was opened by unauthorized personnel, no warranty regarding personal safety, measurement accuracy, conformity with applicable safety measures or any consequential damage is granted by the manufacturer.

Meaning of Symbols on the Instrument
The symbols on the instrument have the following meanings:


Warning regarding dangerous electrical voltage


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


Test socket

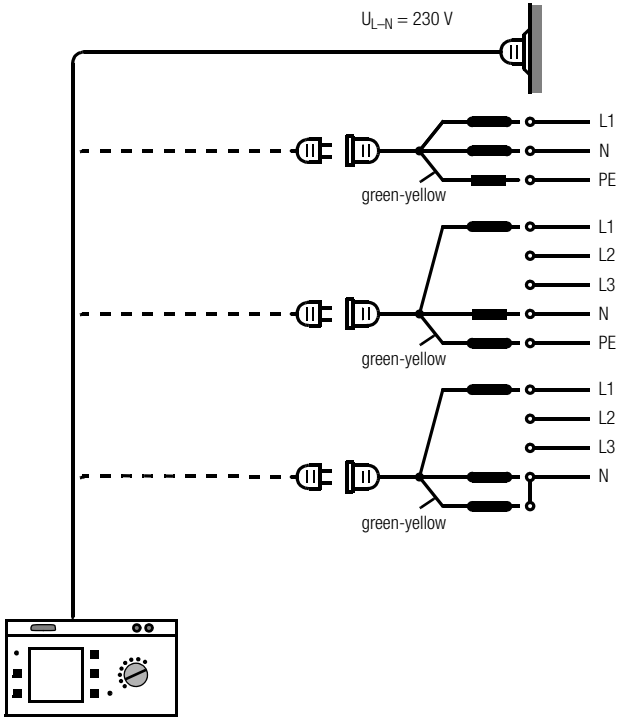

This device may not be disposed of with the trash.
Further information regarding the WEEE mark can be accessed on the Internet at www.gossenmetrawatt.com by entering the search term “WEEE”.

3 Initial Start-Up

3.1 Connection to the Mains (230 V, 50 Hz)

➪ Connect the mains plug at the test instrument to the mains power outlet. The function selector switch can be set to any position.
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.

Attention!
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 using pick-off clips in accordance with the diagram. Disconnection of the test instrument from mains power is only possible with the mains plug.



Mains Connection

3.2 Automatic Recognition of Mains Connection Errors

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	Measurement
Phase conductor L at protective conductor PE to finger contact (↵ key)	Text at LCD panel	Press ↵ key $U > 100$ V	Disabled
Protective conductor PE and phase conductor L reversed and/or neutral conductor N interrupted	⚠ lamp lights up	Voltage at PE > 65 V	Impossible (no supply power)
Contact voltage at protective conductor PE to neutral conductor N	Text at LCD panel	$U > 50$ V	Disabled, although disabling can be deactivated [1]
Line voltage too low	⚠ lamp lights up	$U_{L-N} < 180$ V	Possible under certain circumstances

[1] Switch position: **Setup** – menu: **Test Sequence** – parameter: **IT system**

Attention!
If you discover during the protective conductor potential test that **the mains protective conductor is charged with voltage** (in accordance with the two cases mentioned first), **you may no longer perform any measurements with your test instrument.** Voltage is actually present at the exposed earthing contacts of the standard socket (17) and may be dangerous to you. Disconnect the test instrument from the mains immediately and see to it that the defect at the mains connection is repaired.

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.

4 General Notes

4.1 Prompting

Integrated online instructions inform the user regarding all required connections, necessary work steps, operator errors, measurement results and more in all measuring modes.
Information and test results appear at the dot matrix LCD in plain text.

4.1.1 Changing the User Interface Language

If you would like to change the user interface language, the desired language can be uploaded to the test instrument with the help of the SECU-Up update and enabling program. The software can be downloaded from the Internet at: www.gossenmetrawatt.com (Products > Software for Testers > SECU-Up).

After installing the program and starting it at your PC, select the “Update” menu and then the desired language: *Deutsch, English, Français, Italiano, …*

Only one language can be loaded to the test instrument at any given time, and the previous language is overwritten.

Attention!
Under no circumstances may the test instrument or the PC be disconnected from supply power during data transmission.
No other programs may be running in Windows during the update!

4.1.2 Automatic Protection Class Selection

Depending upon the type of mains plug or the connection configuration for the device under test, the test instrument recognizes the respective protection class and recommends its use for the measurement to be performed.

4.1.3 Manual or Automatic Operating Sequences

Depending upon selections made in the setup menu (switch position: **VDE...**, menu: **setup...**, menu: **Sequence...** , parameter: “Manual Sequence”), the next measurement is started automatically after the current measurement has been completed, or can only be started after manual acknowledgment.
The integrated online instructions are adequate for most tests and measurements. However, the contents of these operating instructions should nevertheless be read and observed.

4.2 Help Function

Online help can be queried and displayed at the LCD for all measuring and test functions, and for almost all settings. Schematic diagrams which illustrate proper connection of devices under test to the test instrument can be displayed as well.

➪ Press the following key in order to query online help:

➪ Press the same key again in order to exit online help.

Note
Online help can be queried during measurement by pressing and holding the help key.

4.3 Adjusting Contrast

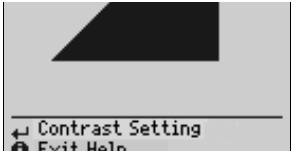
Select any switch position except for **Function Test** or **Off**.

Access the **Setup...** menu.

Enter

Activate contrast adjustment.

Press and hold the key.



Adjust contrast.

Return to the **Setup** menu.

Store the contrast setting to permanent memory with the **save** function.

4.4 Configuring Device Parameters, Setting Date and Time

Device parameters and functions which are valid for all selector switch positions can be activated or deactivated in the **Setup...** menu with the selector switch in the **Menu** position (see section 8 on page 15).

4.5 Configuring Measurement and Sequence Parameters

Measurement and sequence parameters, as well as functions, can be activated or deactivated in the **Setup** menu (switch position: **VDE...**) for the respective test regulation. Refer to section 11.3 on page 29 for the significance of the various parameters.

4.6 Setting Standard-Specific Limit Values (not in IEC 60974-4)

Upon delivery, the limit values set forth (at the point in time of issue) in applicable national and international standards are stored to the test instrument. Limit values for each of the respective standards can be queried and changed if required with the **Setup > Limit Values** menu (with the selector switch in the **VDE...** position), but changes can only be made which result in even stricter testing than is required by the respective standard.

Newly entered limit values become effective immediately. However, these are only stored to memory permanently after activating the **Store** function in the **Setup** menu for the respective standard.

If the limit values set forth in the standards for certain protection classes need to be restored despite individualized settings, the **All Values per Standard** menu function in the **Limit Values** submenu must be selected and acknowledged with the Enter key.

If the limit values set forth in the standards are changed, the instrument's device software can be updated via the RS232 port.

4.7 Saving Settings

All of the settings and changes which have been entered to the **Sequence and Limit Values** menus (switch position: **VDE...**), and the **Zero Point menu (temperature measurement)** (switch position: **Menu**), as well as the selected **contrast** setting are retained until the selector switch is turned, or the test instrument is disconnected from mains power. If settings and changes should be retained even after mains power has been interrupted, they must be saved in the **Setup** menu for the respective test regulation or selector switch position (acknowledge the "Save" function).

5 Classification of Devices Under Test

5.1 Protection Classes

Devices assigned to all of the following protection classes are equipped with basic insulation, and provide for protection against electrical shock by means of various additional precautions as well.

Protection Class I Devices 

Exposed, conductive parts are connected to the protective conductor so that they are not charged with voltage if the basic insulation should fail.

Protection Class I + II Devices

Same as protection class I, except that they also include accessible conductive parts which are not connected to the protective conductor.

Protection Class I + III Devices

Same as protection class I, except that they also include protection class III features, e.g. battery operation or safety extra-low voltage (SELV/PELV).

Protection Class II Devices 

These devices are equipped with double insulation or reinforced insulation.

Protection Class II + III Devices

Same as protection class II, except that they also include protection class III features, e.g. battery operation or safety extra-low voltage (SELV/PELV).

Protection Class III Devices 

These devices are powered with safety extra-low voltage (SELV). Beyond this, no voltages are generated which exceed SELV. These devices may not be connected to the mains.

Note: The DUT may only be connected to jacks 1 through 3 at the test instrument. Only visual inspection, insulation resistance measurement or line voltage measurement can be conducted (see parameter "PC III U_V" on page 29).

Parameter Classification (Draft IEC 62638 / VDE 0701-0702 with active mains) (in Sequence... menu)

The **SECUTEST S2N+w** always tests in accordance with the strictest limit values of the respectively selected protection class. The test is failed if this limit value is exceeded.

However, devices under test exist for which higher limit values are allowable.

If parameter classification is activated (= x), the user is asked if higher limit values are permissible for the DUT. If "Yes" is entered, reevaluation ensues and the DUT may pass the test.

Examples

If the insulation resistance test is failed, or if interference suppression capacitors have been replaced, equivalent leakage current measurement must be performed on DUTs with heating elements in accordance with Draft IEC 62638 / VDE 0701-0702.

The test is failed by a DUT with 300 kΩ if the classification function is deactivated (= _), but it is passed with activated classification function (= x) if the question is answered accordingly.

If the DUT is connected via the jacks instead of the test socket, other limit values apply because higher power consumption is possible in this case (e.g. part 1 specifies a limit value of 1 mA per kW for equivalent leakage current).

See also table: "Maximum Allowable Limit Values for Equivalent Leakage Current in mA" on page 20.

6 Abbreviations

E	Electrical energy (during function test)
ΔI	Differential current, residual current (during function test)
ΔI_{max}	Maximum residual current (during function test)
I_{LC}, I_{DL}, I_{Probe}	Leakage current (differential, probe or touch current)
I_{DI}	Differential current (protective conductor current during the test sequence)
$I_{DI\ wc}$	Worst case differential current
I_{EL}, I-EL	Equivalent leakage current
I_{EDL}, I-EDL	Equivalent device leakage current (protective conductor current)
I_{EPL}, I-EPL	Equivalent patient leakage current
I_{HL}, I-HL	Housing leakage current (probe or touch current)
I_{PE}	Protective conductor current
IT system	The IT system has no direct contact between active conductors and grounded parts: bodies within the electrical system are grounded.
$I_{V(max)}$	(Maximum) load current (during function test)

I_C	Clamp current
L	Phase conductor terminal at the DUT
N	Neutral conductor terminal at the DUT
NC	Normal conditions
P	Active power (during function test)
PELV	Protective extra-low voltage with grounded secondary side
PE	Protective conductor of the device under test
PF	Power factor (during function test)
R	Resistance
R_{INS}, R-INS	Insulation resistance
R-INS NL-PE	Insulation resistance: neutral conductor to PE
R-INS NL-PE	Insulation resistance: neutral conductor to protective conductor
R-INS LN-W	Insulation resistance: LN to welding circuit W
R-INS W-PE	Insulation resistance: welding circuit W to protective conductor PE
R_{PE}, R-PE	Protective conductor resistance
R-PE±Mains	Protective conductor resistance limit value for +mains: DUT with mains power cable -mains: DUT without mains power cable (protective conductor resistance limit value for mains power cable only = 0.1 Ω)
S	Apparent power (during function test)
SELV	Safety extra-low voltage, secondary side not grounded
$U_{AC/DC}$	Alternating/direct voltage
U_{REF}	Reference voltage: voltage to which all leakage voltages make reference (as a rule nominal line voltage)
U_{INS}, U-INS	Test voltage for insulation measurement
U_{LN}, U-LN	Line voltage
U_{MEAS}	Voltage with which testing was executed. Displayed for all leakage current measurements.
U_{probe}	Probe voltage
t	On-time (during function test)
T, Temp	Temperature
ZVEH	General Association of German Electricians

7 Connecting the Device Under Test

⇨ Connect the DUT in accordance with the schematic diagrams included in the online help function.

Connection of the DUT to the test instrument depends upon:

- **Type of connection:**
  – With plug ("**to test socket**" parameter), applies to EL1 adapter as well
  – Without plug, single or multi-phase connection ("**to jacks**" parameter)
  – No connection at tester ("**permanent connection**" parameter)
  Whether or not an adapter is used (= parameter connection type):
  – **AT16-DI/AT32-DI** (also for AT3-II S and AT3-III E for tests in selector switch position VDE 0544-4, see note on the following page)
  – **AT3-med** to socket, adapter for devices which are equipped with 5-pole, 16 A CEE plugs
  – **AT3-IIIE** to socket, adapter for devices which are equipped 5-pole, 32 A CEE plugs;
  See AT3-III operating instructions regarding the test sequence (for tests with AT3-III E in selector switch position VDE 0544-4, choose **AT16-DI/AT32-DI**)
  – **EL1** to probe, adapter for single-phase devices with earthing contact plug
  – **VL2E** to socket, adapter for devices which are equipped with 5-pole, 16 or 32 A CEE plugs.
- **Its protection class** (I, II, III, I + II, I + III or II + III) (see section section 5.1 for meanings).

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

The test instrument automatically recognizes whether or not the DUT is connected to jacks 1 through 3. The test instrument also detects whether or not a DUT has been connected to the test socket. As a default setting, the program sequence assumes that the plug from the DUT has been connected to the test socket.

Note
Protection Class II Devices with Protection Class I Mains Plug:
If the device under test is equipped with a protection class I plug although it complies with protection class II, protection class I is recognized by the test instrument. If this is the case, switch from protection class I to protection class II in the initial menu.

If the test instrument is unable to automatically recognize the **type of connection**, the recommended connection setup should be double checked and determined manually if necessary.

- ⇨ Position the △ cursor at the second line in the start menu for the test sequence.
- ⇨ A selection of possible connection setups can be displayed by activating the ↵ key.
- ⇨ Select the desired connection setup with the △ scroll key and acknowledge with the ↵ key.

Note regarding the application of adapters AT3-II S and AT3-III E in selector switch position IEC 60974-4 / VDE 0544-4

In this switch position it is only possible to perform direct leakage current measurements. Differential current measurements are without function here. For this reason, the measuring cables of the respective adapter may not be connected to jacks 2 and 3 of the **SECUTEST S2N+w** test instrument.

When entering the parameters in the second headline of the start menu (as described above), „**Adapter 16/32 DI**“ must be selected as measuring connection.

The question referring to the selector switch position at the adapter must be answered with **„no“** (upward cursor key △).

Note regarding connection types EL1 and VL2E: After once selecting connection type EL1 or VL2E, this selection can be specified for all following tests under **save** in the setup menu for the test sequence in accordance with the standard, until the connection type is once again changed.

Skipping the Protective Conductor Test for Fully Insulated Devices

Assume that you need to test a fully insulated protection class I device (e.g. a monitor, a submersible pump etc.), which doesn't have a protective conductor which exits the device.

Whether or not the protective conductor test can be skipped in this case should be decided by a qualified electrician.

The protective conductor test can be skipped by pressing the ▽ key as soon as the following prompt appears: “Connect the probe to the DUT's protective conductor”.

Testing Several Protective Conductor Connections using the “Automatic Recognition of Measuring Point Change” Function with the Switch in the VDE... Position

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

This function can be set up with the switch in the **Menu** position in the **Setup...** menu with the help of the “Auto Measuring Point” function in the **Test Sequence** submenu.

Protective Conductor and Insulation Resistance Measurements for Permanently Installed Devices Under Test

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

- ⇨ Remove the mains fuses from the device under test and disconnect the neutral conductor N inside the device under test.

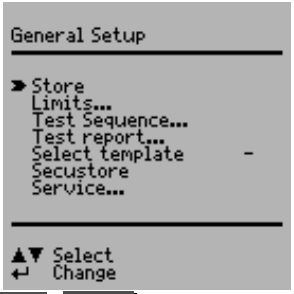
Measuring Touch Current (absence of voltage)

Make sure that the contacted parts are not grounded.

8 Configuring Device Parameters

Menu

General device parameters can be configured and saved in the **Setup** submenu with the selector switch in the **Menu** position.



Select submenu and acknowledge.

Select a parameter, acknowledge, change and acknowledge the change.

Limit values ...

Settings x / – = function activated / deactivated

Illumination	Background illumination for the LCD. One of three different conditions can be selected* with the up and down scroll keys: x: continuously on, –: off Numbers 1 through 9: duration in minutes after which illumination is automatically deactivated.

* The background illumination of test instruments equipped with panels produced as of 2014 can no longer be deactivated.

Test Time	Duration of a single test (0 … 255 seconds)
Reference Voltage	Voltage to which leakage current is related (as a rule nominal line voltage)
Earth Fault	During the short-circuit test, testing is also performed to determine whether or not a connection exists between L/N and PE (short-circuit to exposed conductive part). We assume that a short-circuit to an exposed conductive part exists in the event of leakage current greater than 15 mA from L/N to PE. This value should be increased for some DUTs (in particular high-current consumers), because greater leakage currents are present.
Mains Wait	Line voltage is initially applied to the test socket. However, testing does not begin until after the number of seconds selected in "Mains Wait" has elapsed, e.g. in order to suppress measured values during the warm-up phase.
Auto-Mode	x: Most messages are suppressed for fully automated test sequences.

Test Sequence ...

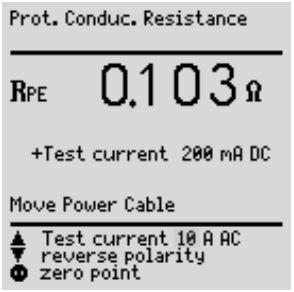
Settings x / – = function activated / deactivated

Single-Fault	If the single-fault condition has been activated, the test is interrupted as a failure as soon as an error occurs.
Auto Class PSI	Test results (passed or failed) for the various selector switch positions are automatically assigned to the 8 statistics channels.
With Operating Error	Measurement results are compensated by taking operating error into consideration (measuring error).
IT System	Testing in IT systems can be performed by suppressing tests for U_{PE-N}. The U_{PE-N} test determines whether or not voltage is present at PE. (Leakage current measurement results may otherwise be distorted.)
Acst Sig, Seq	An acoustic signal is generated for: incorrect connection of the DUT, error in the electrical supply system and the next test step.
Acst Sig, Meas	An acoustic signal is generated for: measured value fluctuations and test current polarity reversal.
Auto Point	An acoustic signal indicates whether or not the probe is connected to the protective conductor. The test sequence is run automatically. Rapid signal frequency: probe connected Slow signal frequency: next measuring point
Direct Printing	See section 13 on page 43.
Reports ...	Reports which have been saved to memory can be selected from a list with an ID number and displayed (see section 13 on page 43).
Secustore	Optimize the data transfer for the **SECUSTORE** adapter connection (in this configuration, no data can be saved to the SI module. Neither is a test report signalled to the RS232 interface.
Service ...	– Time and date settings (if a SI module is used, the same time and date must also be entered to the SI menu) – Service functions (password required)

9 Individual Measurements

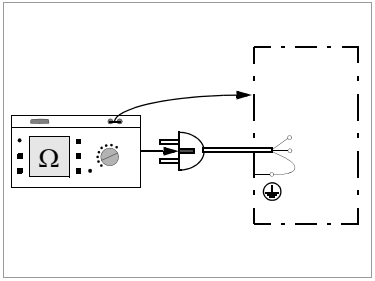
Menu 

9.1 Measuring Protective Conductor Resistance



Definition
Protective conductor resistance is the sum of the following resistances:

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



Resistance is measured:

- Between each exposed *conductive part of the housing* and the earthing contacts at the mains and the device plug (if a removable mains connector cable is used), or the protective conductor terminal for permanently installed devices.
- As a 4-pole measurement
- Between the earthing contacts at the mains plug and the earthing contacts at the device plug for *device connector cables*
- Between the earthing contacts at the mains plug and the earthing contacts at the coupling socket for *extension cables*

Connecting Protection Class I Devices to the Test Socket
When the DUT is connected, resistance is measured between the protective conductor terminal at the test socket or at the PE jack, and the probe connection at the DUT (contact with conductive parts of the housing).

⇨ In order to measure protective conductor resistance, contact a conductive part of the housing with the probe, which is connected to the protective conductor.

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

Selecting Polarity
Test current **polarity** can be reversed by pressing the ▽ key.

Selecting Test Current Amperage
You can switch back and forth between the two **test current amperages (200 mA DC or 10 A AC)** by pressing the △ key.

Testing with 10 A Test Current
Maximum **test time** is 30 seconds (fixed value) for the 10 A test current. After this test time has elapsed, the last measured value is frozen and "Data hold, measurement stopped" appears at the display. If the test instrument heats up, the test cannot be repeated until after a waiting time of 1 minute has elapsed. When the 10 A test current is used, the last measurement can be repeated if the test is not passed.

Testing Extension Cables
See section 11.4 on page 30 regarding the test sequence.

Note
"DUT connection: PC I/II" is not displayed when the test is performed individually, but rather only during the automatic test sequence.

Combined Test – Differential Protective Conductor Resistance
Zero balancing is also possible for protective conductor measurement. With zero balancing, all subsequent measurements are adjusted with an offset such that 0 Ω is displayed for a selected reference point which is connected to the protective conductor. When test points are contacted with the probe which are electrically connected to this reference point, differential resistance ΔR_{PE} between the reference point and the contacted test point is displayed.

The mains enabling key must be activated during measurement in order to perform zero balancing. The acquired value can either be applied (the value remains in memory until the instrument is disconnected from mains power), permanently saved or deleted.

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

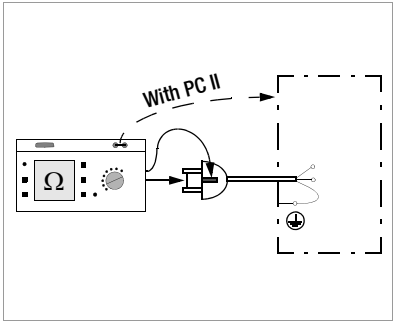
Test Standard	Test Current	Open-Circuit Voltage	R_{PE} Housing – Device Plug	R_{PE} Housing – Mains Plug
Draft IEC 62638 / VDE 0701-0702 IEC 62353:2007	> 200 mA⎓ or 10 A~	4 V < U_L < 24 V		0.3 Ω + 0.1 Ω [1] for each additional 7.5 m
IEC 60974-4 / VDE 0544-4			0.2 Ω	

[1] Total protective conductor resistance of max. 1 Ω

9.2 Insulation Resistance R_{INS}

Definition
Protection Class I
Insulation resistance is measured between short-circuited mains terminals and the protective conductor.

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



Exception for Permanently Installed Protection Class I Devices

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

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

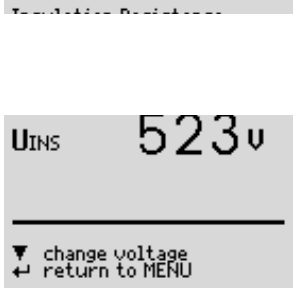
Sequence

Attention!
Insulation Resistance Measurement (equivalent leakage current)
Testing is conducted with up to 500 V. Current limiting is utilized (I < 3.5 mA), but if the terminals (3 or 2) are touched, electrical shock may occur which could result in consequential accidents. If the DUT is connected via jacks 1 through 3, special care must be taken to avoid contact with open cables.

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

R-INS

Start measurement.



Nominal voltage is 500 V DC in this case.

Nominal voltage can be adjusted within a range of 50 V to 550 V DC.

Note
When insulation measurement is first started from the menu, nominal voltage is always set to 500 V. Open-circuit voltage is always greater than nominal voltage.

Minimum Allowable Limit Values for Insulation Resistance

Test Standard	Test Voltage	R_{INS}				
		LN → PE	LN → Probe	Probe → PE	PC III	Heating
Draft IEC 62638 / VDE 0701-0702	500 V	1 MΩ	2 MΩ	5 MΩ	0.25 MΩ	0.3 MΩ *
IEC 60974-4 / VDE 0544-4		2 MΩ	5 MΩ	5 MΩ		

* With activated heating elements (if heating power > 3 kW and R_{INS} < 0.3 MΩ: leakage current measurement is required)

Notes
Insulation resistance and/or leakage current must be measured at all exposed, conductive parts for protection class II and III devices, as well as for battery powered devices.

Batteries must be disconnected during testing of battery powered devices.

During the test of the primary side LN to standard probe 1 (jacks 4-5), the protective conductor of the test socket is connected with standard probe 1.

If the test is to be conducted without the protective conductor, the test may not be performed via the test socket, but must be performed via a second probe connection at jacks 2 and 3.

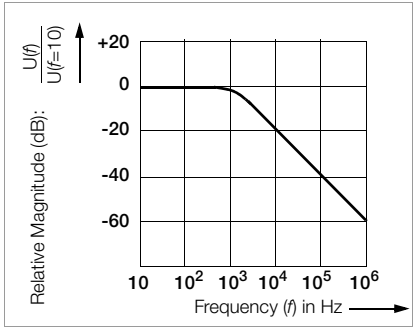
9.3 Measuring Leakage Current

Attention!
It is absolutely essential to assure that the device under test is operated with line voltage during performance of the leakage current measurement. Exposed conductive parts may conduct dangerous contact voltage during testing, and may not under any circumstances be touched (mains power is disconnected if leakage current exceeds approx. 10 mA).

Select the I_{xx} measurement and start.

Each time line voltage is applied to the test socket, L and N are reversed, if this function has been selected in the leakage current menu (see section 9.3 on page 19).

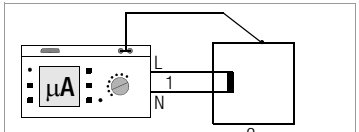
Frequency response is taken into consideration in accordance with the diagram to the right when leakage current is measured.



9.3.1 Touch Current I_T (welding circuit leakage current)

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

The current's AC component is measured. The DC component can also be measured by means of an individual measurement (but not with a test sequence).



1 Test socket (without protective conductor contact)
2 Device housing

9.3.2 Protective Conductor Current (primary leakage current), Differential Current Method (I_{DI})

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

Attention: Differential current includes touch current as well.

Maximum Allowable Limit Values in mA

Test Standard	I_{PE} (I_{DI})	I_T
		NC
Draft IEC 62638 / VDE 0701-0702	SC I: 3.5 1 mA/kW *	0.5
IEC 60974-4	5 mA	10 mA

* For devices with heating power of greater than 3.5 kW

Note 1: Devices which are not equipped with accessible parts that are connected to the protective conductor, and which comply with requirements for touch current and, if applicable, patient leakage current, e.g. computer equipment with shielded power pack

Note 2: Permanently connected devices with protective conductor

Note 3: Portable x-ray devices with mineral insulation

Key

I_T Touch current (welding circuit leakage current)

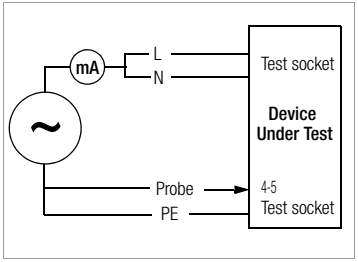
I_{PE} Current in the protective conductor (primary leakage current)

9.4 Equivalent Leakage Current

General

Measurement of equivalent leakage current is required for:

- Draft IEC 62638 / VDE 0701-0702 after passing the insulation test



Equivalent Device Leakage Current I_{EDL} IEC 62353 (VDE 0751-1)

Measurement of equivalent device leakage current is required for:

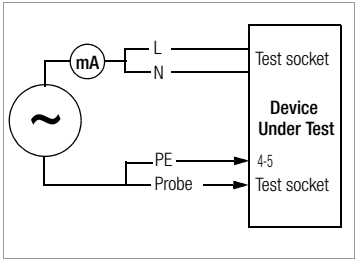
- Electrical medial devices in accordance with IEC 62353 (VDE 0751-1)

Prerequisites

A high-impedance power supply is connected between the short-circuited mains terminals and all exposed metal parts of the housing (which are connected to one another).

Measurement

Current which flows over the insulation at the device under test is measured.



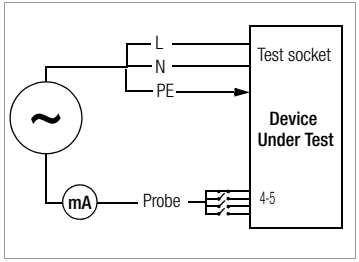
Equivalent Patient Leakage Current I I_{EPL}, IEC 62353 (VDE 0751-1)

Prerequisites

A high-impedance power supply is connected between respectively short-circuited L, N, PE and the probe.

Measurement

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



Maximum Allowable Limit Values for Equivalent Leakage Current in mA

Test Standard	I_{EL}	I_{EDL}		I_{EPL}	
Draft IEC 62638 / VDE 0701-0702	SC I: 3.5 1 mA/kW [1] PC II: 0.5				
IEC 62353: 2007 (VDE 0751-1)		PC II	0.2	Type BF	5
		SC I (PE or parts connected to PE)	1	Type CF	0.05
		Permanently connected devices with PE	10		
		Portable x-ray devices with additional PE	5		
		Portable x-ray devices without additional PE	2		
		Devices with mineral insulation	5		

I_{EL} Equivalent leakage current
I_{EDL} Equivalent device leakage current
I_{EPL} Equivalent patient leakage current
PE Protective conductor
[1] For devices with heating power ≥ 3.5 kW

Connection
Refer to the schematic diagrams included with the online help for connection instructions.

Connection Exception for Permanently Installed Protection Class I Devices
Current is measured between the probe, with which the L and N conductors must be contacted, and the protective conductor terminal PE at the device under test for permanently installed protection class I devices under test.

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

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

Special Case: Connection of Multiphase Devices

Equivalent leakage current measurements is not suitable for multiphase devices.

Sequence
Current, which would flow during leakage current measurement conducted in accordance with device regulations at nominal voltage, is displayed during this type of equivalent leakage current measurement. Leakage current measurement in accordance with the respective device regulations is frequently not possible, because the device would have to be set up in an electrically isolated fashion, or connected to an earth isolated power supply to this end.

Equivalent Leakage Current I_{EDL} Draft IEC 62638 / VDE 0701-0702 / 2 K

Select and start the **I-EL** measurement.

Equivalent leakage current is measured between short-circuited N and L, and the **protective conductor PE**.

Measuring circuit resistance is equal to 2 kΩ for Draft IEC 62638 / VDE 0701-0702 for simulation of mean body resistance of a human being.

Equivalent Device Leakage Current I_{EDL} for IEC 62353 / 1 K

Select and start the **I-EDL** measurement.
Equivalent device leakage current is measured between short-circuited N and L, and the **probe**.

Measuring circuit resistance is equal to 1 k1 kΩ for **IEC 62353** for the simulation of mean patient resistance.

Refer to section 16.2 regarding evaluation of measured values for equivalent leakage current.

Equivalent Patient Leakage Current I I_{EPL} IEC 62353

Select and start the **I-EPL** measurement.

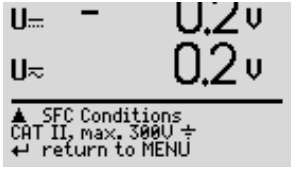
Equivalent patient leakage current is measured between short-circuited L, N, PE and the probe.

9.5 Probe Voltage U_{probe} – Max. 300 V

Voltage is measured between the mains PE terminal at the test instrument and the probe. In this case the probe can also be used as a phase finder.

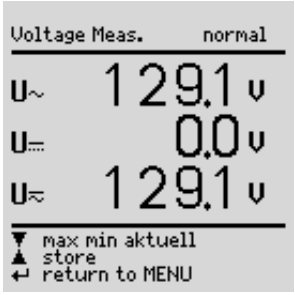
The DUT must be started up with the ⏻ key (14) before performing measurement.

Start the U_{Probe} measurement.



9.6 Alternating / Direct Voltage $U_{AC/DC}$ – Max. 253 V (open circuit voltage U_0)

Direct, alternating and pulsating voltages of up to 253 V can be measured between connector jacks 2 and 3. Switching amongst minimum, maximum and current measured value is also possible with the ▽ key. This is especially useful in combination with the **SECULOAD** test adapter for welding units (article no. Z745V).



Attention!
As of firmware version 8.12, differentiation is made between 2 sequences:

Sequence 1DUT not connected to test socket (permanently connected)

- Set the selector switch to Menu and select the $U_{AC/DC}$ measurement.
- Connect the measurement cables to jacks 2 and 3.
- Contact the measuring point with the test probes.
- Read the measured values.
- Remove the test probes from the measuring point and disconnect the measurement cable from jacks 2 and 3.
- Press the enter key in order to return to the menu.

Sequence 2DUT connected to the test socket

The following sequence of test steps must be adhered to:

Initially, nothing may be connected to jacks 1 through 3. (Jacks 2 and 3 are short-circuited for all measurements conducted at the test socket. Exception: The short-circuit is eliminated as soon as the explicit prompt to connect the measurement cable appears at the display.)

- Remove any cables which are connected to jacks 1 through 3.
- Connect the device under test to the test socket.
- Set the selector switch to Menu and select the $U_{AC/DC}$ measurement.
- Switch the device under test on (short-circuit test is conducted).
- Start up the DUT by connecting line voltage to the test socket with the switch (14).
- **It is absolutely essential to observe the following:**
  Do not connect the measurement cable until the following prompt appears at the display: "Connect measurement cable to jacks 2 and 3 for voltage measurement."
- Contact the measuring point with the test probes.
- Read the measured values.
- Remove the test probes from the measuring point and disconnect the measurement cable from jacks 2 and 3.
- Press the enter key in order to return to the menu.

Measurement of Safety Extra-Low Voltage (see Sequence no. 2 on page 22)
Voltage can be applied to the DUT via the test socket by pressing the key (14), for example in order to be able to measure **safety extra-low voltage** at the DUT's output.

Attention!
Voltage measured at the DUT's output must be safety extra-low voltage which is electrically isolated from the mains, because an overvoltage protection device included within the installation might otherwise be tripped.

9.7 Resistance R

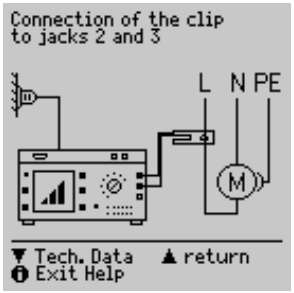
Resistance of up to 150 kΩ can be measured between jacks 1 and 2.

Select and start the **R** measurement.

9.8 Measurements with Accessories

9.8.1 Alternating Current I_Z with Current Clamp

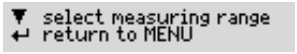
Connection



Alternating current can be measured in two measuring ranges (1 mA … 10 A ~, 1 A … 100 A~) with a current-voltage transformer clamp connected to jacks 2 and 3 (e.g. the WZ12C).

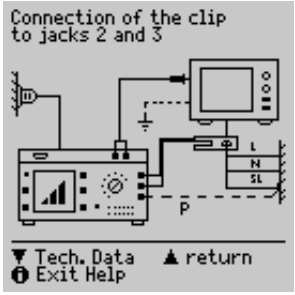
Start the I_Z measurement.

Select measuring range.



9.9 Protective Conductor Resistance R_{PE} via Current Clamp

Connection



Protective conductor resistance can be determined with the WZ12C current clamp transformer.

Prerequisite:

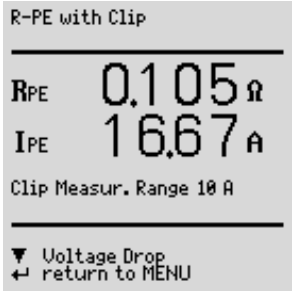
Test current 10 A AC has been choosen.

P: potential conductor for 4-pole measurement

The potential conductor must be connected to the outgoing protective conductor in the distributor.

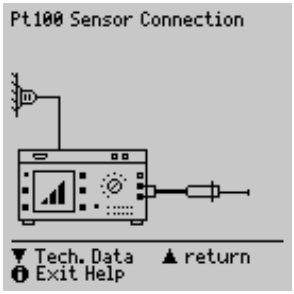
Without potential conductor P, conductor resistance is measured from the DUT to the test instrument. This value may differ greatly from actual protective conductor resistance, because the supply line including test instrument installation is measured as well. With the potential conductor, resistance is measured from the probe connection to contact point P at the protective conductor.

Select and start the R_{PE} measurement.



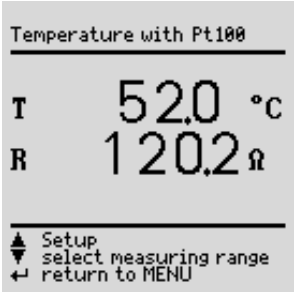
9.9.1 Temperature T with Pt100/1000 Sensor

Connection



Temperature can be measured within a range of -200° C … +850° C with a Pt100 or Pt1000 sensor (default setting) connected to jacks 1 and 2.

Select and start the **Temp** measurement. Select Pt100 or Pt1000 with the “select measuring range” function – ▽ key. The temperature unit of measure can be selected in the “TEMPERATURE” setup menu △. Selection can be made amongst °C (Celsius), °F (Fahrenheit) or Kelvin. Zero balancing is also accessible via the “TEMPERATURE” setup menu.



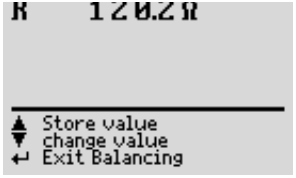
Zero Balancing

Sensor cable resistance can be compensated with this function:

- Short circuit the ends of the sensor leads and determine resistance as shown below.

Zero Point

The determined value can be stored directly (△ key) or changed first. The data entry menu is opened with the ▽ key.



- Change the measured value manually with the help of the △ and ▽ keys.
- Press the ↵ key in order to acknowledge the selected value, and to display other menu functions at the bottom of the window.

Save the selected value by activating the “store value” key (△), before exiting the balancing function with the ↵ key.

The “delete value” command can only be accessed via the “change value” menu. The “no zero balancing” setting is saved at the same time by activating the ▽ key.

10 Function Test

Function Test

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

In addition to testing with the selector switch in the function test position, or with the **Function** parameter in the **Menu** position, a function test can also be performed immediately after safety testing has been passed in accordance with the selected standard (not possible for protection class III devices).

Attention!
The function test may only be performed after the DUT has successfully passed the safety test.

Note
Each time line voltage is applied to the test socket, phase conductor L and neutral conductor N are automatically reversed, if the "mains polarity reversal" function has been activated (= x).
Switch position: **VDE ...** > menu: **Setup ...**
> menu: **Sequence ...** > parameter: ***Polarity Reversal***
or > menu: **Limit Values ...** > parameter: ***Polarity Reversal***.

Note
The function test is only possible if the device under test has been connected to the test socket (21).

Measurement
The function test includes the following measurements:

- Voltage U_{LN} between the L and N conductors
- Differential current ΔI (corresponds to fault current between L and N)
- Load current I_L
- Active power P
- Apparent power S (calculated)
- Power factor PF (cos φ calculated, display > 10 W)
- Electrical energy W
- On-time t for U_{LN} at the socket (21)

The following values are also displayed for all selector switch positions except for **Menu** and **Setup**, after the function test has been completed:

- Maximum residual current ΔI_{max}
- Maximum load current I_{Lmax}
- Maximum active power P_{max}

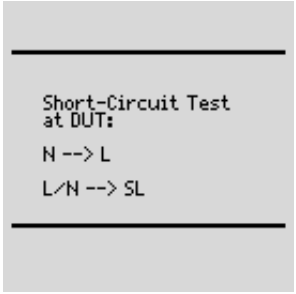
Power factor is calculated from active power and apparent power. Power factor corresponds to cos φ for sinusoidal quantities (line voltage and load current).

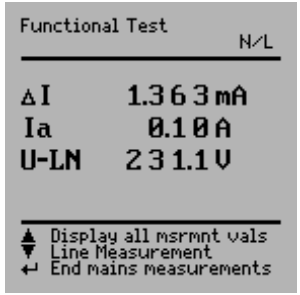
Attention!
Starting the Function Test
For reasons of safety*, the device under test must be switched off before the function test is started. This precaution prevents inadvertent start-up of a device under test which may represent a hazard during operation, e.g. a circular saw or a disc grinder.
Ending the Function Test
After completion of the function test, devices under test must be turned off with their own switch – especially devices with relatively high inductivity.

* And to avoid increased wear of the mains relay in the test instrument

Short-Circuit Test

1 Test for shorts between conductors N and L
2 Test to determine whether or not the N or L conductors are short-circuited to the protective conductor

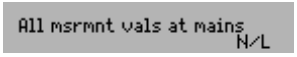


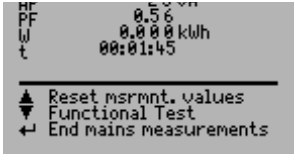


The test socket can be rendered voltage-free with the key (14), or the function test can be ended with the ↵ key (12).

Note
A short-circuit at the device under test is recognized automatically by the test instrument. A message appears at the display (9), and the function test is disabled.

If the ⏻ lamp blinks (15), line voltage can be switched to the test socket with the key (14), and the measurement can be started. If the lamp (15) is lit continuously, line voltage is present at the test socket.





11 Measurements – Switch Position: Standard (VDE ...)

If measurements need to be performed in accordance with given standards which require specific tests, and if results need to be documented with a test report, an automatic test sequence is advisable instead of individual measurements.

- Connect the **SECUTEST S2N+w** to mains power.
  A **mains connection test** is initialized (see section 3.2 on page 9).
- Connect the DUT to the test socket at the **SECUTEST S2N+w** (see section 7 on page 13). The test instrument initializes **connection type recognition**.
- Set the selector switch to the appropriate standard.
  If the test instrument has been connected via the test socket, **protection class checking** is executed. Otherwise, the protection class must be specified manually. Move the cursor up into the third line in the initial window with the △ key, and acknowledge with the ↵ key. A protection class can now be selected with the △ and ▽ keys and acknowledged with the ↵ key.
- The test sequence can be configured in the **Setup**… menu, limit values can be changed if necessary and database options can be selected.
- The test sequence is started by selecting **Start test** and acknowledging with the ↵ key (see following chapter, “Test Sequences”).

Tests which have already been included in chapters 9 through 14 are not described here again.

11.1 Test Sequences

Test sequences for the various standards are always run in the same order, assuming that the device under test has been properly connected and the mains connection test has been passed.
The test sequence can be run step by step with manual activation of each subsequent step if this function has been specified, or automatically. Step by step manual operation can be selected if “Manual Sequence” has been activated under Sequence… in the setup menu in the initial window.

- Visual inspection: If “Visual Inspection” has been activated under Sequence… in the setup menu in the initial window.
  If a part is recognized as defective by the user, it must be identified as such by selecting it with the cursor and acknowledging with the ↵ key.
- Protective conductor measurement (for SC I devices under test only)

Note
If protective conductor connection is not possible, the measurement can be skipped by pressing the ▽ key (when “connect probe to protective conductor” appears at the display).

- Evaluation of protective conductor testing
- Measure insulation resistances
  IEC 60974-4:
  Only insofar as insulation resistance measurements have been selected in the initial window
  Draft IEC 62638 / VDE 0701-0702:only if **R-INS LN-PE** is activated in the initial window
- Evaluation of insulation test
- Leakage current measurement
- Evaluation of each individual leakage current measurement (see also section 16.2)
- Evaluation of the overall test
- Perform function test if required:
  The function test can be performed each time a safety test has been successfully completed. The blinking signal lamp indicates that the function test should be started. Beyond this, the function test can also be started from the **Function Test** selector switch position. See section 10 on page 26 regarding performance of the function test.
- Display test results (the worst measured values for the test sequence).
- Save test results and print if required.

11.2 Setting Up Test Sequences

All possible sequence settings for all of the regulations are listed below.

Select the **Setup...** menu from the initial program window and acknowledge

Repair tests, periodic testing

Save	All of the settings in the setup menu, i.e. configuration of measuring parameters and current limit values, can be saved with this command. These values remain active even after setting the selector switch to a different position, and after disconnection from mains power.
Sequence …	See below
Limit values …	See section 4.6 on page 11
Database …	**Start with ID no.** x: Before each measurement is started, an entry prompt appears requesting entry of an ID no. An individual number can be entered here (max. 20 characters) via the keypad at the SI module (option) or read in with a barcode scanner (option), or the type of DUT can be selected directly from a list. In case of incorrect entry: Only deletion of complete lines is possible, and only be means of the ⌫ key at the test instrument. **ID no. = test sequence (DBmed option)** See section 12 on page 42.

11.3 Configuring Measuring Parameters

Depending upon the test regulation, various measuring parameters can be configured for the test sequence (settings: x / – = function activated / deactivated). All possible parameters for all of the regulations are listed below. The **Sequence ...** menu is accessed via the setup parameter in the initial program window for the respective regulation.

Select the **Sequence ...** menu and acknowledge.

Select a parameter, acknowledge, change and acknowledge the change.

Sequence (general parameters)

Visual Inspection	This menu appears at the very beginning of the test sequence.
Manual Sequence	Each test step must be acknowledged with the ↵ key (see test sequence in section 8 on page 15 regarding test duration for automatic sequence).
Auto-Store	After testing is finished, test data are automatically stored to the **SECUTEST S2N+w** (Dbmed option), or to the SI module (accessory).
Polarity Reversal	Test with mains: L an N are reversed each time line voltage is applied to the test socket.
Classification	Test with mains: Questions regarding classification appear if limit values are exceeded (see section 5 on page 12).
PC III U_V	Supply voltage is measured instead of insulation resistance for active devices under test.
R-PE AC > 10 A	The protective conductor test is conducted with 10 A AC.
No Leakage Current	No leakage current measurements are performed.

11.4 Testing Extension Cables in Accordance with Draft IEC 62638 / VDE 0701-0702

x: Single and multi-phase extension cables or connector cables which are longer than 5 m can **also** be tested with the help of adapters, either separately or in combination with a device.

- EL1: Adapter for single-phase extension cables
- VL2E, AT3-IIIE: Adapter for single and 3-phase extension cables with and without CEE connection

The following measurements can be performed in accordance with the above mentioned standard:

- Protective conductor resistance R_{PE}
  – Test current: ±200 mA DC
  – Test current: 10 A AC
- Insulation resistance measurement R_{INS}

Extension Cables up to 5 m Long

Protective conductor resistance between the earthing contact at the mains plug and all exposed metal parts may not exceed 0.3 Ω for protection class I devices.

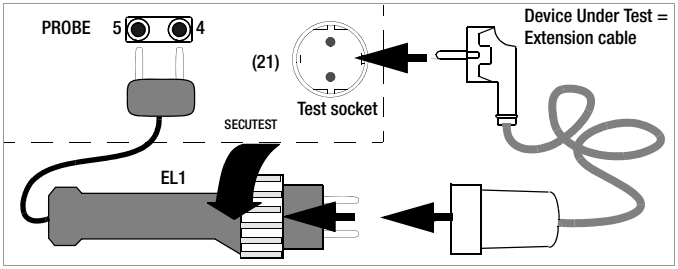
Extension and Connector Cables Longer than 5 m

Per Draft IEC 62638 / VDE 0701-0702, additional cable resistance of 0.1 Ω is permissible for each additional 7.5 m as of a length of 5 m, but is limited to a maximum of 1 Ω .

Resistance testing for cables longer than 5 m is thus advisable (see also limit values on page 17).

For cables with a rated current of greater than 16 A, wire cross-section must be taken into consideration during measurement (use of 3-phase adapter only, not EL1).

Connecting the Extension Cable or the Multiple Outlet



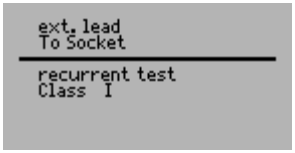
Cable Reel Features

Sequence parameter: Manual sequence must be activated here.

Visual inspection: The cable has to be unreeled to this end.

Protective conductor resistance measurement: Contact the first outlet with the EL1 adapter. Each time you are ready to contact the next outlet, press the △ key to repeat the test.

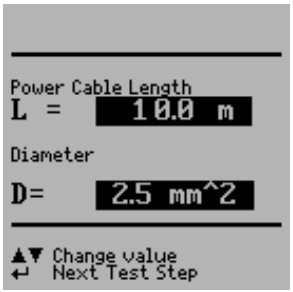
Check connection parameters and start test.



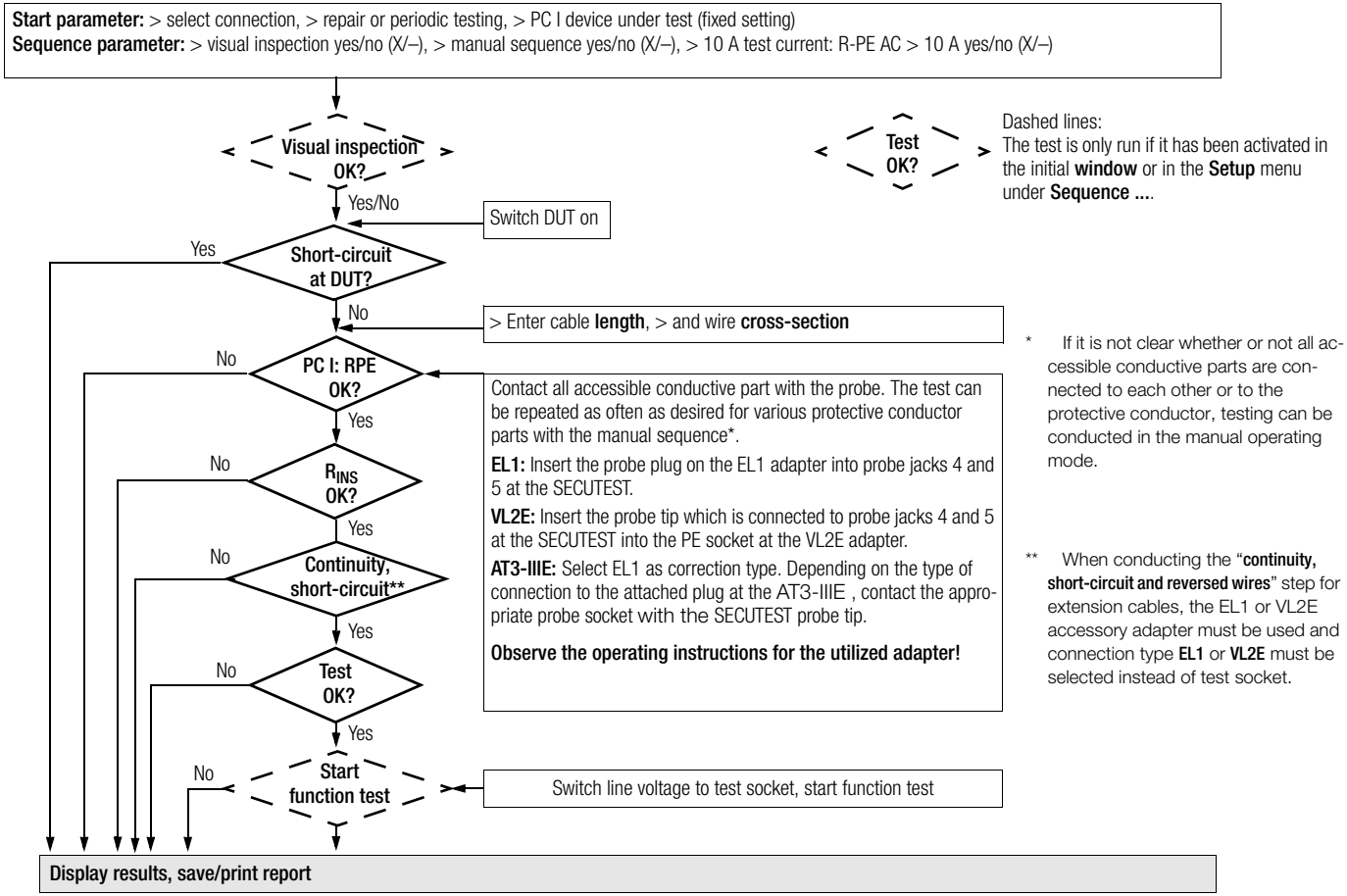
To Socket	This is the default setting. Refer to section 7 on page 13 for other types of connection.
Repair	Select repair or periodic testing.
Class I	Extension cables are usually protection class I. For this reason, no selection is possible here.
ID No.	See parameters database in section 11.2 on page 29.
Setup…	Refer to section 11.2 on page 29 regarding setup of the measuring sequence.

For conductors with a rated current of > 16 A, the cross section (Diameter) has to be taken into account during measurement.

The cross section is only queried if a 3-phase current adapter has been connected and the connection parameter has been set to VL2E or AT3-IIIE. Upon entering the cross section, the limit value for the protective conductor resistance is recalculated.



Test Sequence per Extension Cable (Draft IEC 62638 / VDE 0701-0702)



* If it is not clear whether or not all accessible conductive parts are connected to each other or to the protective conductor, testing can be conducted in the manual operating mode.

** When conducting the "**continuity, short-circuit and reversed wires**" step for extension cables, the EL1 or VL2E accessory adapter must be used and connection type **EL1** or **VL2E** must be selected instead of test socket.

11.5 Testing Devices per Draft IEC 62638 / VDE 0701-0702 – Passive

The following measurements can be performed in accordance with the above mentioned standard:

- Protective conductor resistance R_{PE} (*permanently connected or via plug*)
  – Test current: ±200 mA DC
  – Test current: 10 A AC
- Insulation measurement R_{INS} *(cannot be deactivated here)*
- Equivalent Leakage Current

Part 1

The following safety class I through III appliances and electrical equipment can be tested in this selector switch position, for example:

- Devices with electric motors
- Electrical heating devices
- Electrical tools
- Light fixtures

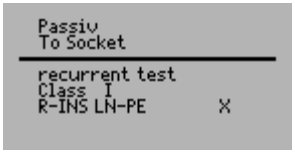
Appendices (previously part 260)

Appendix E: Electric tools

“Passive” Test Sequence

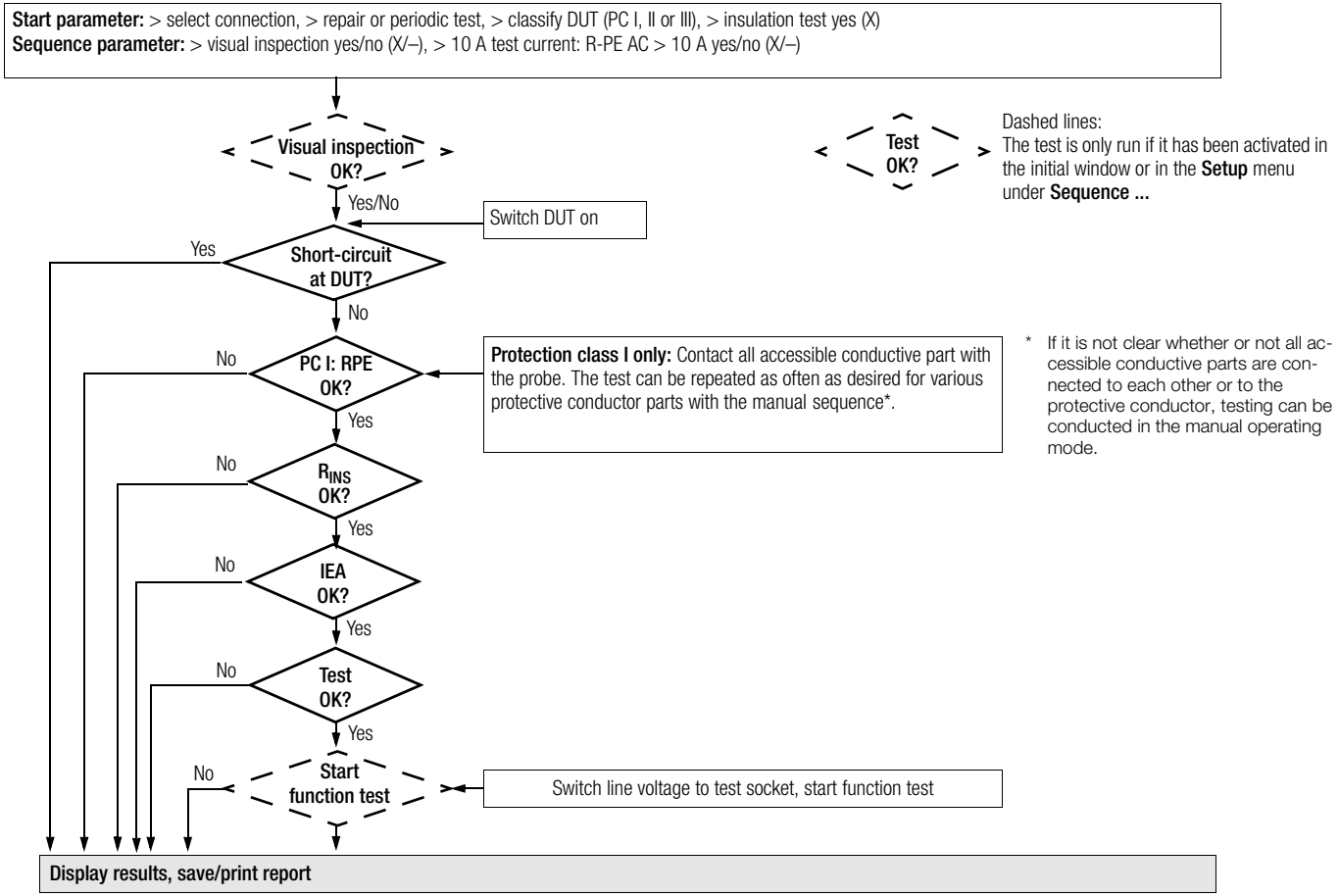
The “passive” test sequence can be used if the device under test does **not** include any line voltage dependent switching devices.

Check connection parameters and start test.



To Socket	This is the default setting. Refer to section 7 on page 13 for other types of connection.
Repair	Here you can specify whether the test is being conducted after completion of repairs or as a periodic test.
Class	If the device under test is connected to the test socket, protection class checking is executed (PC I or PC II). Otherwise, the protection class must be specified manually.
R-INS LN-PE	X: Insulation resistance is measured between the short-circuited L and N conductors, and protective conductor PE.
ID No.	See parameters database in section 11.2 on page 29.
Setup…	Refer to section 11.2 on page 29 regarding setup of the measuring sequence.

Test Sequence per Draft IEC 62638 / VDE 0701-0702 – Passive



11.6 Testing Devices per Draft IEC 62638 / VDE 0701-0702 – Active

The following measurements can be performed in accordance with the above mentioned standard:

- Protective conductor R_{PE} *(permanent connection or with plug)*
  – Test current: ±200 mA DC
  – Test current: 10 A AC
- Insulation measurement R_{INS} *(can be deactivated, e.g. if there is any danger of damaging voltage-sensitive components in data processing equipment) plus equivalent leakage current*

or

- Touch current for protection class II

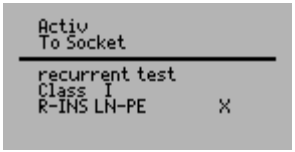
or

- Differential Current

"Active" Test Sequence

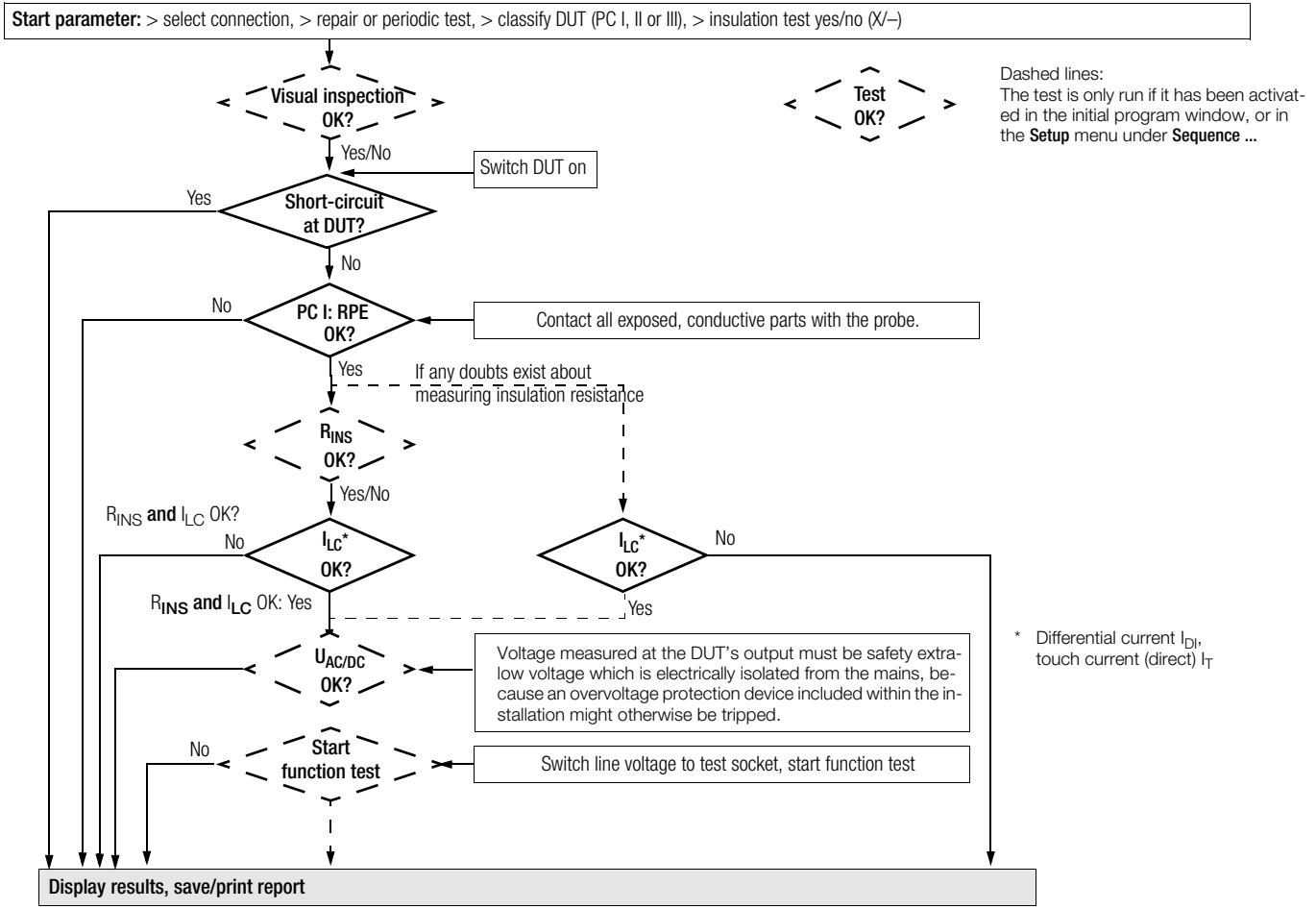
The "active" test sequence is used if the device under test includes line voltage dependent switching devices.

Check connection parameters and start test.



To Socket	This is the default setting. Refer to section 7 on page 13 for other types of connection.
Repair	Here you can specify whether the test is being conducted after completion of repairs or as a periodic test.
Class	If the device under test is connected to the test socket, protection class checking is executed (PC I or PC II). Otherwise, the protection class must be specified manually.
R-INS LN-PE	X: Insulation resistance is measured between the short-circuited L and N conductors, and protective conductor PE.
ID No.	See parameters database in section 11.2 on page 29.
Setup…	Refer to section 11.2 on page 29 regarding setup of the measuring sequence.
Battery charger	Only for the particular test of battery charging units must this parameter be set at „on" in the setup submenu, see section 11.6.1.

Test Sequence per Draft IEC 62638 / VDE 0701-0702 – Active



11.6.1 Testing of Battery Charging Units

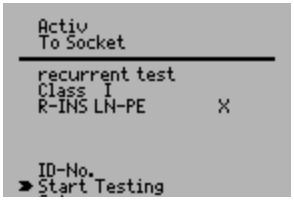
In connection with the testing of battery charging units, an insulation test, amongst others, is performed from the secondary side versus PE. The DUT may not be connected with the test socket during this test (same test sequence as for permanent connection).

As many battery charging units contain capacitance between the secondary circuit and PE, it is necessary to charge the capacitance first during the test and to discharge it after the test.

From software version 9.1 onwards, the **SECUTEST S2N+w** takes this into account in an optimized test sequence in switch position „active“.

Check connection parameters and start test.

The start menu at the right appears when a DUT has been connected to the test socket.

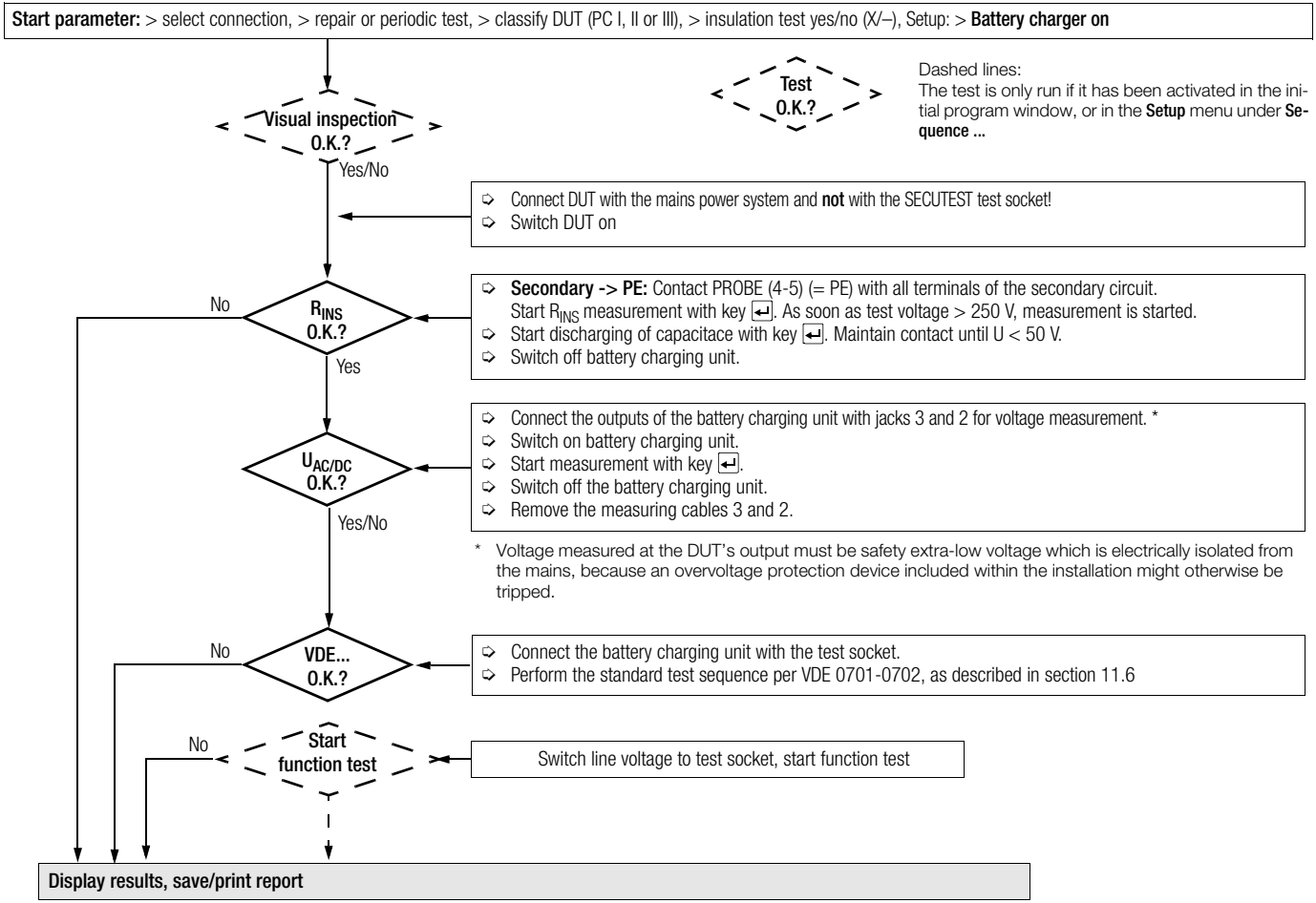


To Socket	This is the default setting. Refer to section 7 on page 13 for other types of connection.
Repair	Here you can specify whether the test is being conducted after completion of repairs or as a periodic test.
Class	If the device under test is connected to the test socket, protection class checking is executed (PC I or PC II). Otherwise, the protection class must be specified manually.
R-INS LN-PE	X: Insulation resistance is measured between the short-circuited L and N conductors, and protective conductor PE.
ID No.	See parameters database in section 11.2 on page 29.
Setup…	Refer to section 11.2 on page 29 regarding setup of the measuring sequence.
Battery charger	Only for the particular test of battery charging units must this parameter be set at „on“ in the setup sub-menu.

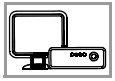
*The start menu at the right appears when **no** DUT has been connected to the test socket and parameter „battery charger“ has been set at „on“ in the setup sub-menu.*

A special test sequence for battery charging untis can be started here. At first, an insulation resistance and voltage measurement is performed at the secondary side of the battery charging unit. This is followed by a standard measurement in accordance with VDE0701-0702, as described in section 11.6.

Test Sequence for the Testing of Battery Charging Units



11.7 Testing Devices per Draft IEC 62638 / VDE 0701-0702 – ICT



Testing protection class I and II **data processing equipment and office machines** as individual devices and in combination with one another.

The following measurements can be performed in accordance with the above mentioned standard:

- Protective conductor R_{PE} (*permanent connection or with plug*)
  Test current: DC ± 200 mA
- Touch current and differential current (direct measurement and differential current method)
- According to DIN VDE 0701, the device's protective conductor must be tested after maintenance, repair or modification of data processing equipment and office machines, and exposed, conductive parts must be tested for the absence of voltage. This applies to:
  – Protection class I devices for all exposed, conductive parts which are accessible to the user, and which are not connected to the protective conductor
  – Protection class II devices (totally insulated devices) for all exposed, conductive parts which are accessible to the user

- With the mains plug poled in both directions

Setting Up the Test Sequence

See section 11.5 regarding the test sequence.

Special Parameters

Combined Testing: Protection class I and II devices can be tested individually or in combination. All protective conductor connections are tested first for interconnected safety class I devices, and then – as is also the case for interconnected safety class II devices – all exposed, conductive parts.

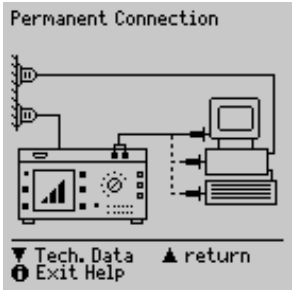
Connecting the Device Under Test

➪ Connect the test instrument and the DUT as described below:

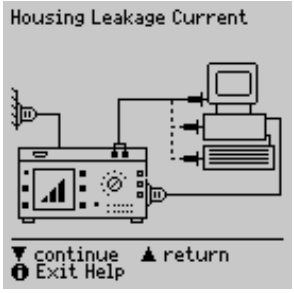
– Connect both devices to separate mains outlets.
  The outlets to which the test instrument and the safety class I DUT are connected must share a common protective conductor!
– Or connect the test instrument to the mains and the DUT to the test socket at the test instrument.

Data Processing / Office Machines

Permanently connected or with plug



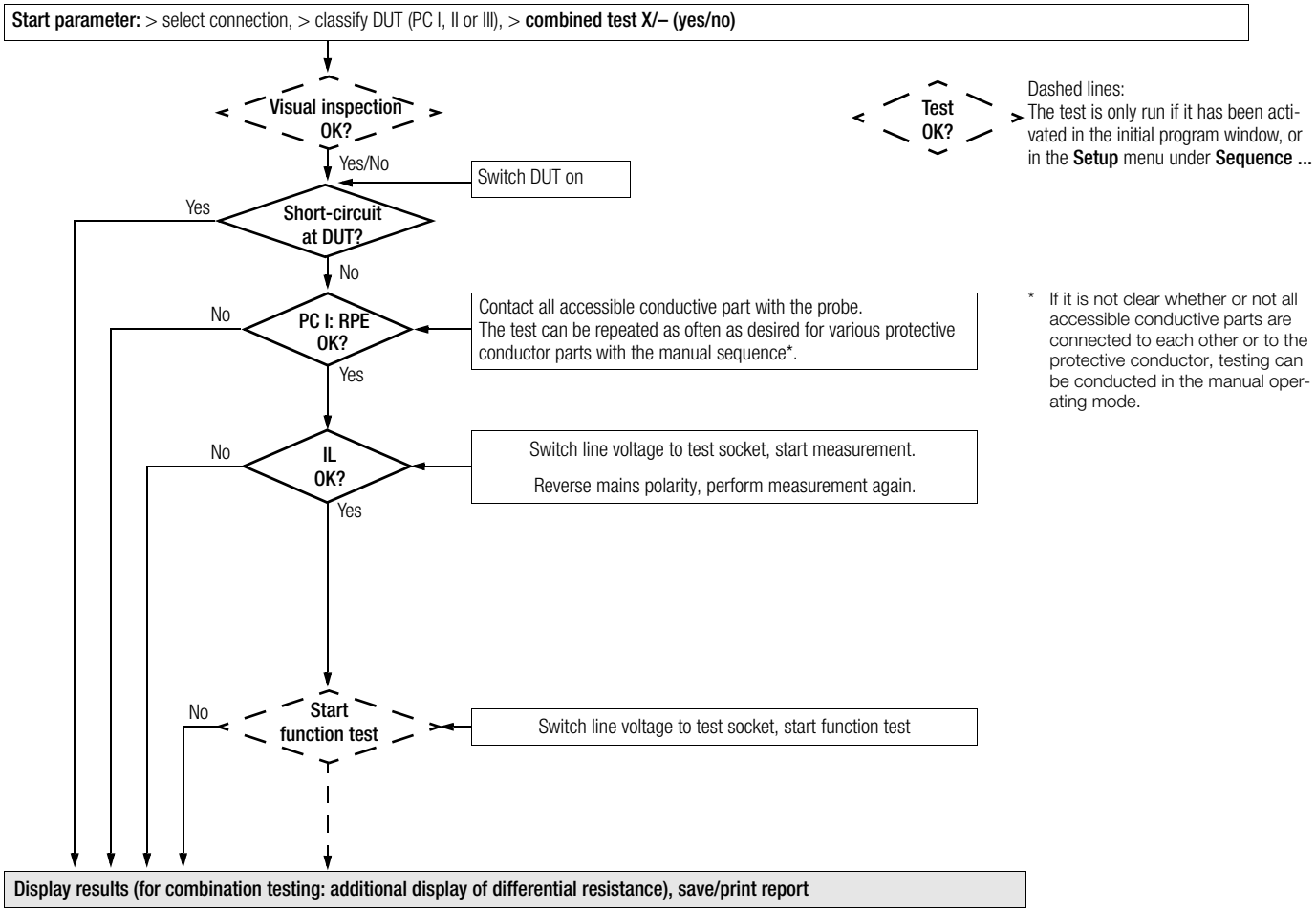
To test socket at the test instrument



The requirement for **testing with the mains plug poled in both directions** can be fulfilled by connecting the DUT to the test socket at the instrument, and by activating mains polarity reversal under "Setup – Sequence" in the setup menu. Each time the key (14) is activated, phase conductor L and neutral conductor N are reversed at the test socket.

Attention!
Testing with mains polarity reversal or with the mains plug poled in both directions results in **interruption of supply power to the affected data processing equipment** or office machine. This test may thus only be conducted with the consent of the operator of the data processing equipment or office machine.
If the **DUT is defective**, the electrical system's RCCB may be tripped during testing which would also result in interruption of supply power to the affected equipment or office machine.
The manufacturer of the test instrument assumes no liability for loss of data or other damage which results from use of the test instrument.

Test Sequence per Draft IEC 62638 / VDE 0701-0702 Symbol – ICT



11.8 Testing Welding Equipment per IEC 60974-4

The following measurements can be performed in accordance with the above mentioned standard:

- Protective conductor resistance R_{PE}
  – Test current: 200 mA DC
  – Test current: 10 A AC
- Insulation measurements *(can be additionally activated)*
  – **R-INS LN-PE** (insulation resistance LN at the mains plug to protective conductor PE of the primary circuit)
  LN mains plug at test socket to probe 1 (jacks 4-5)
  – **R-INS LN-W**[1] (insulation resistance between LN at the mains plug and welding circuit output S)
  2-pole measurement: probe 1 (jacks 4-5) at LN from mains plug to probe 2 (jacks 2-3)
  at welding circuit output S
  – **R-INS W-PE** (insulation resistance: welding circuit W to PE
  Probe 1 (jacks 4-5) to PE in mains power system

- Primary leakage current
- Touch current
- Measurement of open circuit voltage with the **SECULOAD**[2] test adapter

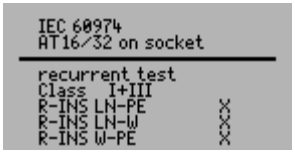
Leakage current is recalculated to reference voltage.
Reference voltage must be matched to the supply voltage range.

[1] Prerequisite: PC I + III is preset
[2] Accessory, Z745V (not included in scope of delivery)

Setting of limit value for open circuit voltage

Before measuring the open circuit voltage, the setpoint value of the open circuit voltage specified in the name plate of the DUT can be adopted.

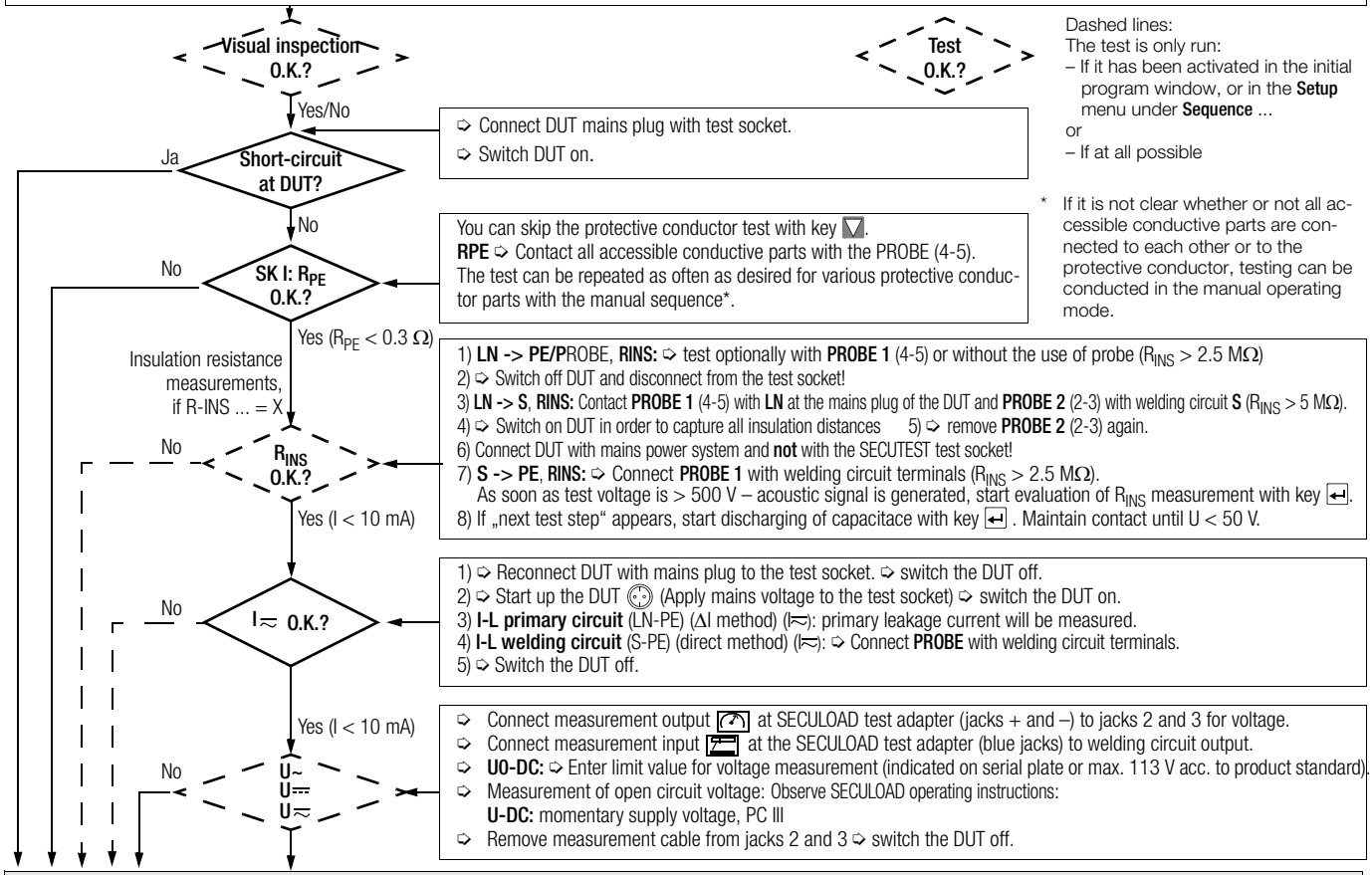
Check connection parameters and start test.



AT16/32 to Socket	This is the default setting. Refer to section 7 on page 13 for other types of connection.
Test Type	Periodic testing or repair
Class	If the device under test is connected to the test socket, protection class checking is executed (PC I + III or PC II + III). In all other cases, or if it is not clear whether or not all exposed, conductive parts are connected to one another or to the protective conductor, the protection class can be selected manually.
R-INS LN-PE	X: Insulation resistance is measured between the short-circuited L and N conductors at the test socket and protective conductor PE (probe 1 at jacks 4-5).
R-INS LN-W	X: Insulation resistance is measured between the short-circuited L and N conductors (probe 2 at jacks 2-3), and welding circuit W (probe 1 at jacks 4-5).
R-INS W-PE	X: Insulation resistance is measured between welding circuit W (probe 1 at jacks 4-5) and protective conductor PE in mains power system.
ID No.	See parameters database in section 11.2 on page 29.
Setup…	Refer to section 11.2 on page 29 regarding setup of the measuring sequence.

Test Sequence per IEC 60974-4

Start parameter: > select connection, > periodic test or repair > classify DUT (PC I + III or PC II + III) > DUT with (X) / without (–) R-INS LN-PE



12 Saving Data to the SI Module (accessory) and Database Operations

12.1 Saving Measurement Data to the SI Module (accessory)

After a measurement has been completed – “test passed / not passed” is displayed – the measurement data can be saved to memory at the SI module.

- ➪ Press the **STORE** key on the SI module to this end. An entry field appears.
- ➪ You can enter a comment for the measurement here, and/or an ID number.
- ➪ Press the **STORE** key once again in order to save the measurement data along with your comment. “Saving data·...” appears at the display.

A complete description is included in the operating instructions for the SI module in the section entitled “Displaying, Printing and Storing Reports”.

12.2 Storing Test Results to the SECUTEST S2N+w

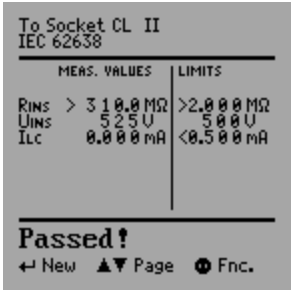
If a SI module has not been connected, up to 125 test reports are saved to the test instrument (without function test values or entries regarding the DUT). The reports can be viewed as required at the instrument and can be printed out, for example with the help of a terminal program.

The reports are sorted by time and date and are displayed with the ID number. If no ID number was assigned, date and time are automatically saved instead.

13 Storing Test Results to the Test Instrument and Printing them in Report Form

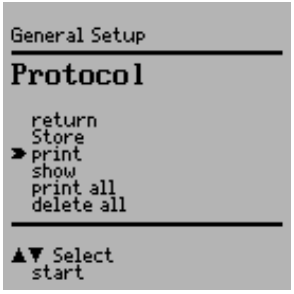
Connect the SECUSTORE memory adapter to the test instrument via the RS232 port. The SI module may not be connected.

You can switch from any of the displayed test results (1st page) to the **Report** menu with the help of the △ key.



Measurement results for the momentary test can be stored to memory at the test instrument, the results of the momentary test can be printed out to the corresponding report form, previously stored test results can be queried (scroll: DBmed option, see section 12) and all saved measurement results can be printed out from this menu.

The matching report form is automatically selected for the standard chosen with the rotary switch.



Direct Printing

After completion of each test (individual test or at the end of a test sequence), test results are read out directly via the RS232 port.

If a SECUSTORE memory adapter has been connected, the test results are saved to memory in the SECUSTORE.

In this operating mode no results can be saved to the internal memory or the SI module.

14 Characteristic Values

Function	Measured Quantity	Measuring Range / Nominal Range of Use	Resolution	Nominal Voltage U_N	Open-Circuit Voltage U_0	Nom. Current I_N	Short-Circuit Current I_K	Internal Resistance R_I	Ref. Resistance R_{REF}	Measuring Uncertainty[4]	Intrinsic Uncertainty[4]	Overload Capacity Value	Overload Capacity Time
Individual Measurements	Device protective conductor resistance R_{PE}	0.000 … 2.100 Ω	1 mΩ	—	4.5 … 9 V DC	—	> 200 mA DC	—	—	±(5% rdg. + 10 d) > 10 d	±(2.5% rdg.+ 5 d) > 10 d	253 V	Cont.
		2.11 … 31.00 Ω	10 mΩ										
		0.000 ... 2.100 Ω	1 mΩ	—	< 6 V AC	—	> 10 A AC[5] >5 s	—	—			No protection [3]	
	Insulation resistance R_{INS}	0.050 … 1.500 MΩ	1 kΩ	50 … 500 V DC	1.0 • U_N … 1.5 • U_N	> 1mA	< 10 mA	—	—	±(5% rdg. +10 d)	±(2.5 % rdg. +5 d) > 10 d	253 V	Cont.
		1.01 … 10.00 MΩ	10 kΩ										
		10.1 … 310.0 MΩ	100 kΩ							±(10% rdg. +10 d)	±(10% rdg.+10d)		
	Equivalent leakage current I_{EL} or I_{EDL}	0.00 … 21.00 mA	10 µA	—	230 V~ –20 / +10%	—	< 3.5 mA	> 72 kΩ	≤ 2 kΩ	±(5% rdg. +10 d)	±(2.5 % rdg. +5 d) > 10 d	253 V	Cont.
		20.1 … 120.0 mA	100 µA										
	Equivalent patient leakage current I_{EPL}	0.0 ... 310.0 µA	100 nA	—	230 V~ –20 / +10%	—	< 3.5 mA	> 72 kΩ	1 kΩ ±10 Ω	±(5% rdg. +10 d)	±(2.5 % rdg. +5 d) > 10 d	253 V	Cont.
		0.300 ... 2.100 mA	1 µA										
		2.00 ... 11.00 mA	10 µA										
	Touch current I_T (leakage current from welding circuit)	0 … 310 µA 0.300 … 3.500 mA	0.1 µA 1 µA	—	—	—	—	≤ 2 kΩ	—	±(5% rdg. +10 d)	±(2.5 % rdg. +5 d) > 10 d	253 V	Cont.
	Differential current I_{DI}, (primary leakage current) between L and N	0.000 … 3.100 mA~ 3.00 … 31.00 mA~[1]	1 µA 10 µA	—	—	—	—	≤ 2 kΩ	—	±(10% rdg. +10 d) > 10 d	±(5 % rdg. +5 d) > 10 d	1	1
Function test	Line voltage $U_{L–N}$	207.0 ... 253.0 V~	0.1 V		—		—	—		—	±(2.5% rdg.+5 d)	253 V	Cont.
	Load current I_L	0 ... 16.00 A_{RMS}	10 mA		—		—	—		—	±(2.5% rdg.+5 d)	20 A	10 min
	Active power P	0 ... 3700 W [2]	1 W		—		—	—		—	±(5 % rdg.+10 d) > 20 digits	253 V	Cont.
												20 A	10 min
	Apparent power S	0 ... 4000 VA	1 VA	Calculated value, $U_{L–N}$ • I_V							±(5% rdg.+10 d) > 20 digits		
	Power factor PF With sinusoidal waveshape: cos φ	0.00 ... 1.00	0.01	Calculated value, P / S, display > 10 W							±(10% rdg.+5 d)		
	Residual current ΔI between L and N	0.00 ... 31.00 mA~	10 µA		—		—	—		±(10% rdg.+10 d) > 10 digits	±(5% rdg.+5 d)	1	1
U_{Probe}	Probe voltage	0 ... 253.0 V ⎓, ∼ and ≂	0.1 V		—		—			—	±(2.5% rdg.+5 d) > 10 digits	253 V	Cont.

1 As of 25 mA: shutdown within 100 ms as a result of differential current measurement

2 Measured value P and calculated value S are compared, and the smaller of the two is displayed.

3 Maximum test duration: 40 seconds, protection against overheating: measurement cannot be restarted until after waiting for 1 minute.

4 Applies only to displayed values at the test instrument. Data transmitted via the RS232 interface may differ.

5 Measurement with AC test current is not possible at sockets 1 through 3.

Multimeter Measurements

Function	Measured Quantity	Measuring Range / Nominal Range of Use	Resolution		Open-Circuit Voltage U_0		Short-Circuit Current I_K	Internal Resistance R_I		Measuring Uncertainty[5]	Intrinsic Error [5]	Overload Capacity	
												Value	Time
$U_{AC/DC}$	Voltage	0 ... 253.0 V ⎓ , ∼ and ≂	0.1 V		—		—	—		±(5% rdg.+10 d)	±(2.5% rdg.+5 d) > 10 digits	253 V	Cont.
R	Resistance	0 ... 150.0 kΩ	100 Ω		< 20 V –		1.1 mA	—		—	±(1 % rdg.+3 d)	253 V	Cont.
I_{Clamp}	Current via current-voltage transformer WZ12C	0.000 ... 10.00 A ∼	1 mA		—		—	1.5 MΩ		—	±(3 % rdg.+10 d) > 10 digits without clamp	253 V	Cont.
		0 ... 100 A ∼	1 A		—		—	1.5 MΩ		—		253 V	Cont.
Temp	Temperature with Pt100/Pt1000 sensor	– 200 ... – 50 °C	1 °C		< 20 V –		1.1 mA	—		—	±(2% rdg.+1 °C)	10 V	Cont.
		–50.1 ... +300.0 °C	0.1 °C								±(1% rdg.+1 °C)	10 V	Cont.
		+300 ... +850 °C	1 °C								±(2% rdg.+1 °C)	10 V	Cont.

Reference Ranges

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

Nominal Ranges of Use

Line voltage	103.5 V ... 126.5 V or 207 V … 253 V
Line frequency	50 Hz
Line voltage waveform	Sine
Temperature	0 °C … +50 °C

Ambient Conditions

Storage temperature	–20 °C ... +60 °C
Operating temperature	–10 °C ... +50 °C
Accuracy range	0 °C ... +50 °C
Relative humidity	Max. 75%, no condensation allowed
Elevation	Max. 2000 m
Deployment	Indoors, except within specified ambient conditions

Key: rdg. = reading (measured value), d = digit(s)

Influencing Quantities and Influence Error

Influencing Quantity / Sphere of Influence	Designation per DIN VDE 0404	Influence Error ± … % rdg.
Change of position	E1	—
Change to supply voltage at tester	E2	2.5
Temperature fluctuation	E3	Specified influence error valid starting with temperature changes as of 10 K:
0 … 21° C and 25 … 40° C		1 for protective conductor resistance
		0.5 for all other measuring ranges
Amount of current at DUT	E4	2.5
Low frequency magnetic fields	E5	2.5
DUT impedance	E6	2.5
Capacitance during insulation measurement	E7	2.5
Waveshape of measured current	E8	
49 … 51 Hz		2 with capacitive load (for equivalent leakage current)
45 … 100 Hz		1 (for touch current)
		2.5 for all other measuring ranges

Power Supply

Line voltage	103.5 V ... 126.5 V or 207 V … 253 V
Line frequency	50 / 60 Hz
Power consumption	Approx. 30 VA
for function test	Continuous max. 3600 VA, power is conducted through the instrument only, switching capacity ≤ 16 A

Electrical Safety

Protection class	I per IEC 61010-1/EN 61010-1
Nominal voltage	230 V
Test voltage	2.3 kV 50 Hz
Measuring category	250 V CAT II (does not apply to sockets 1, 2 and 3)
Pollution degree	2
Safety shutdown	Where differential current at the DUT > 25 mA Shutdown time: < 100 ms Probe current: > 10 mA, < 1 ms

Electromagnetic Compatibility

Product standard EN 61326

Interference emission		Class
EN 55011		B
Interference immunity	**Test Value**	**Evaluation Criterion**
EN 61000-4-2	Contact/atmos. – 4 kV/8 kV	A
EN 61000-4-3	3 V/m or 1 V/m	A
EN 61000-4-4	1 kV	B
EN 61000-4-5	1 kV or 2 kV	A
EN 61000-4-6	3 V/m	A
EN 61000-4-11	0.5 / 1 / 25 periods	A
	250 periods	C

Mechanical Design

Display	Multiple dot matrix display, 128 x 128 pixels
Dimensions	L x W x H: 292 x 138 x 243 mm
Weight	Standard instrument: approx. 4.0 kg
Protection	Housing: IP 40 Terminals: IP 20 per IEC / EN 60529

Table Excerpt Regarding Significance of IP Codes

IP XY (1st digit X)	Protection Against Foreign Object Entry	IP XY (2nd digit Y)	Protection Against Penetration by Water
0	Not protected	0	Not protected
1	≥ 50.0 mm dia.	1	Vertically falling droplets
2	≥ 12.5 mm dia.	2	Dripping (at 15° angle)
3	≥ 2.5 mm dia.	3	Spraying water
4	≥ 1.0 mm dia.	4	Splashing water

RS232 Interface

Type	RS 232C, serial, per DIN 19 241
Configuration	9600, N, 8, 1
Connection	9-pin subminiature socket connector

15 RS232 Interface

The RS232 port is intended for connection of the following devices:

- SI module (accessory), can be inserted into the lid of the test instrument
- PC
- Barcode scanners of the following types:
  B3261 with RS232 port (article no. GTZ3261000R0001)
  Z720A with RS232 port (article no. Z720A)

  or RFID readers of the following type:
  Z751G with RS232 port (article no. Z751G)

15.1 Transmission of Measurement Results to the SI Module

Test results – except for results from individual measurements (selector switch in **Menu** position) and the function test – can be transmitted from the **SECUTEST S2N+w** to the SI module, where they can be stored and printed out in the form of measuring, test and statistical reports at any time.

15.2 PC Connection

Connection to an IBM compatible PC is also possible. The PC is connected to the interface at the test instrument, or to the interface port at a previously installed SI module.

15.2.1 Software Evaluation of Measurement Results

Up-to-date PC software (free starter program or demo software for data management, as well as report and list generation) can be downloaded from our website.

15.2.2 Instrument Control via Interface Commands

All key functions which can be executed with the **SECUTEST S2N+w** can be simulated with the help of interface protocols, and the following parameters can be queried:

- Type of measurement and measuring range
- Test setup
- Measurement sequence progress
- Detailed measurement results

15.3 Interface Configuration and Protocol

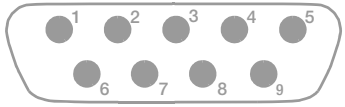
The interface included with the **SECUTEST S2N+w** is in compliance with the RS232 standard.

Technical Data:

Baud rate	9600 baud, permanently set
Character length	8 bit
Parity	None
Stop bits	1
Data protocol	per DIN 19244, X_ON / X_OFF protocol

Connector Pin Assignments for 9-Pin SUB-D Socket Connector

1: External in + (for internal use only)
2: TXD (transmitter output)
3: RXD (receiver input)
4: External in +
5: GROUND
6: +5 V (500 mA output, for barcode scanner only)
7: Ext. In –
8: Control output
9: +9 V (for SI module only)



Note
Contact our product support department for a complete description of the interface protocol (see contact data in section 19).

16 Appendix

16.1 Evaluation of Measured Values for Individual Measurements as well as for Calculated Quantities

In order to assure that the limit values for the individual measurements are always observed, device measuring error must be taken into consideration.

The table in the appendix allows for calculation of the required minimum display value for each respective measurement which must appear at the instrument in consideration of measuring error (under nominal conditions of use), in order to assure that the required limit value is not fallen short of (DIN VDE 0413, part 1). Intermediate values can be interpolated.

Measuring Error for Test Sequences

The test instrument takes respective measuring error into consideration during automatic test sequences, and corrected results are entered into the test report, as long as this function has been activated in the Test Sequence menu under “include service error” with the selector switch in the **Setup** switch position.

Tables for the calculation of minimum display values for insulation resistance and maximum display values for protective conductor resistance, equivalent leakage current, probe current and residual current in consideration of device measuring error:

R_{INS} MΩ		R_{PE} Ω	
Limit Value	Minimum Display Value	Limit Value	Maximum Display Value
0.100	0.115	0.100	0.085
0.250	0.273	0.200	0.180
0.500	0.535	0.300	0.275
1.000	1.060	0.400	0.370
2.000	2.200	0.500	0.465
5.000	5.350	0.600	0.560
7.000	7.450	0.700	0.655
10.00	10.60 or 12.5 [1]	0.800	0.750
20.00	23.00	0.900	0.845
75.00	83.50	1.000	0.940
		1.100	1.035

[1] Depending upon resolution

I_{EL} mA		I_{probe} mA		I_{DI} mA	
Limit Value	Maximum Display Value	Limit Value	Maximum Display Value	Limit Value	Maximum Display Value
1.00	0.85	0.100	0.085	0.25	0.12
3.50	3.23	0.250	0.227	0.50	0.35
7.00	6.55	0.500	0.465	1.00	0.80
10.00	9.40	1.000	0.940	2.00	1.70
15.00	14.15	2.000	1.890	3.50	3.05
20.00	18.90	3.500	3.315	5.00	4.40
				7.00	6.20
				10.00	8.90
				15.00	13.40
				20.00	17.90
				25.00	22.40

16.2 Evaluation of Measured Values for Leakage Current Measurements (Automatic Test Sequence in Accordance with the Standard)

L and N are connected to each other during equivalent leakage current measurement, after which a test voltage of 230 V is applied between LN and PE and leakage current is measured. In this way, the worst case (interrupted neutral conductor) is tested.

As a rule, this results in a value which is at least twice as high as the value obtained with direct measurement of leakage current (because in this case all bypass capacitors are connected in parallel).

If frequency converters are also used, directly measured values and values obtained with the equivalent leakage current procedure are no longer comparable. In this case, it’s advisable to perform individual measurements using the differential current method.

16.3 Index

17 Maintenance – Recalibration

17.1 Housing Maintenance

No special maintenance is required for the housing. Keep outside surfaces clean. Use a slightly dampened cloth for cleaning. Avoid the use of cleansers, abrasives or solvents.

17.2 Recalibration

The measuring tasks performed with your instrument, and the stressing it's subjected to, influence aging of its components and may result in deviation from the specified levels of accuracy.

In the case of strict measuring accuracy requirements, as well as in the event of use at construction sites with frequent stress due to transport and considerable temperature fluctuation, we recommend a relatively short calibration interval of once per year. If your instrument is used primarily in the laboratory and indoors without considerable climatic or mechanical stressing, a calibration interval of once every 2 to 3 years is sufficient as a rule.

During recalibration* at an accredited calibration laboratory (DIN EN ISO/IEC 17025), deviations from traceable standards demonstrated by your measuring instrument are documented. Ascertained deviations are used to correct displayed values during later use of the instrument.

We would be happy to perform DAkkS or factory calibration for you at our calibration laboratory. Further information is available at our website:

www.gossenmetrawatt.com (→ Company → DAkkS Calibration Center or → FAQs → Questions and Answers Regarding Calibration).

In accordance with Draft IEC 62638 / VDE 0701-0702 and IEC 60974-4 / VDE 0544-4, only measuring instruments which are tested and calibrated at regular intervals may be used for testing.

Recalibration of your instrument at regular intervals is essential for the fulfillment of requirements according to quality management systems per DIN EN ISO 9001.

* Examination of the specification, as well as adjustment, are not included in calibration. However, in the case of our own products, any required adjustment is performed and adherence to the specification is confirmed.

17.3 Safety Inspections

Subject your test instrument to safety inspections at regular intervals. We recommend an inspection interval of the same duration as for recalibration.

The SECUTEST... is laid out as a device with protective insulation in accordance with the IEC 61010 and VDE 0404 standards. The protective conductor is used for measuring purposes only, and is thus not accessible in the idle state. The protective conductor at the test socket can be tested as follows:

- ➪ Connect the SECUTEST... to a multiple socket outlet.
- ➪ Perform a touch current measurement for a permanently connected DUT (nothing may be connected to the test socket).
- ➪ Measure protective conductor resistance between the neighboring socket at the multiple socket outlet and the test socket.
- ➪ The measured value may not exceed 0.3 Ω.

For technical reasons, insulation resistance between LN and PE in the SECUTEST... amounts to roughly 150 kΩ.
This must be taken into consideration during safety inspections or, instead of the insulation resistance measurement, the protective conductor current measurement must results in a value of less than 3.5 mA (or a value of less than 7 mA if the equivalent leakage current measurement method is used).

Furthermore, there are three conductive parts on the SECUTEST... at which the touch current measurement must result in a value of less than 0.5 mA:

- RS232 interface
- Metalized start key
- Protective conductor bar in the test socket

17.4 Return and Environmentally Sound Disposal

The instrument is a category 9 product (monitoring and control instrument) in accordance with ElektroG (German electrical and electronic device law). This device is subject to the RoHS directive. Furthermore, we make reference to the fact that the current status in this regard can be accessed on the Internet at www.gossenmetrawatt.com by entering the search term WEEE.

We identify our electrical and electronic devices in accordance with WEEE 2012/19/EU and ElektroG using the symbol shown at the right per DIN EN 50419.

These devices may not be disposed of with the trash.

Please contact our service department regarding the return of old devices (see address in section 18).

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

If required please contact:

GMC-I Service GmbH
Service-Center
Beuthener Str. 41
90471 Nürnberg, Germany
Phone: +49 911 817718-0
Fax: +49 911 817718-253
e-mail: service@gossenmetrawatt.com
www.gmci-service.com

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

*** DAkkS Calibration Laboratory for Measured Electrical Quantities: D-K-15080-01-01 accredited per DIN EN ISO/IEC 17025:2005**

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

Competent Partner
GMC-I Messtechnik GmbH is certified in accordance with DIN EN ISO 9001:2008.

Our DAkkS calibration laboratory is accredited by the Deutsche Akkreditierungsstelle GmbH (National accreditation body for the Federal Republic of Germany) in accordance with DIN EN ISO/IEC 17025:2005 under registration number D-K-15080-01-01.

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

Our spectrum of offerings is rounded out with free **test equipment management**.

An on-site **DAkkS calibration station** is an integral part of our service department. If errors are discovered during calibration, our specialized personnel are capable of completing repairs using original replacement parts.

As a full service calibration laboratory, we can calibrate instruments from other manufacturers as well.

19 Product Support

If required please contact:

GMC-I Messtechnik GmbH
Product Support Hotline
Phone +49-911-8602-0
Fax: +49 911 8602-709
e-mail: support@gossenmetrawatt.com

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GOSSEN METRAWATT
GMC-I Messtechnik GmbH
Südwestpark 15
90449 Nürnberg • Germany

Phone: +49 911 8602-111
Fax: +49 911 8602-777
e-mail: info@gossenmetrawatt.com
www.gossenmetrawatt.com