

METRISO[®] 5000 D-PI

Digital High-Voltage Insulation Test Instrument

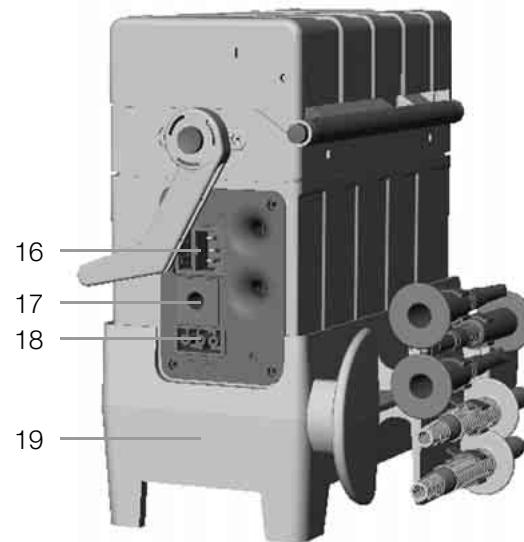
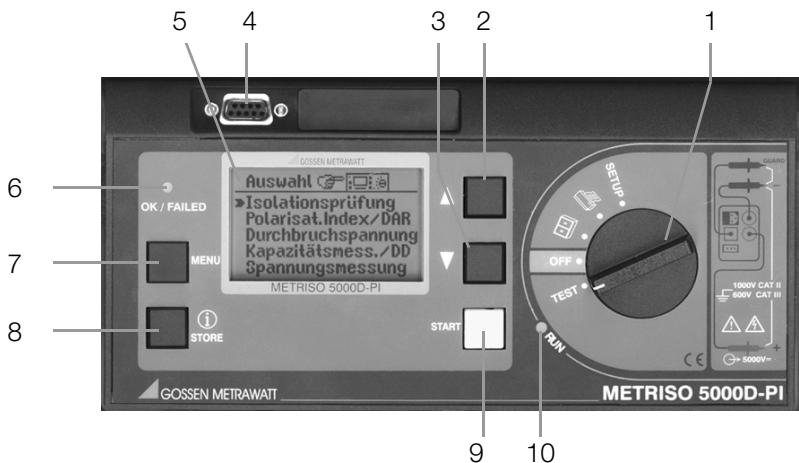
3-349-210-03

3/03



**Test instrument may only
be operated under the
supervision of a qualified
electrician!**





1 Function selector switch

Switch positions:

SETUP: General device settings



Print out measured values and reports



Select data memory function

OFF: Switches the test instrument off *

TEST: Select measuring and test parameters, and execute measurements and tests

2 Select main menus and submenus, and adjust values

3 Select main menus and submenus, and adjust values

4 Socket connector for RS 232 interface

5 LCD panel

6 Signal lamp for test passed (green) / test failed (red)

7 **MENU:** Key for selecting and querying menus for setting parameters, for returning to the main menu and for stopping the measuring process

8 **i/STORE:** Before performing a measurement:
Key for querying context sensitive help
After performing a measurement:
Key for saving measured values and parameters to memory

9 **START:** Key for starting the selected test

10 Signal lamp: "testing ..." (yellow)

11 Pushbuttons (left and right) for releasing the handle

12 Pushbuttons (left and right) for releasing the cover

13 Cover

14 SECUTEST PSI printer module

15 Handle and bar function as a tilt stand

16 Inlet plug for supply power with fuse compartment

17 Connector jack for guard cable (feature G1)

18 Connection for automotive charging adapter J1

19 Device base

Outside: With uptake for measurement cable, test probes and alligator clips

Inside: Uptake for guard cable with test probe (feature G1),
battery compartment



Attention!

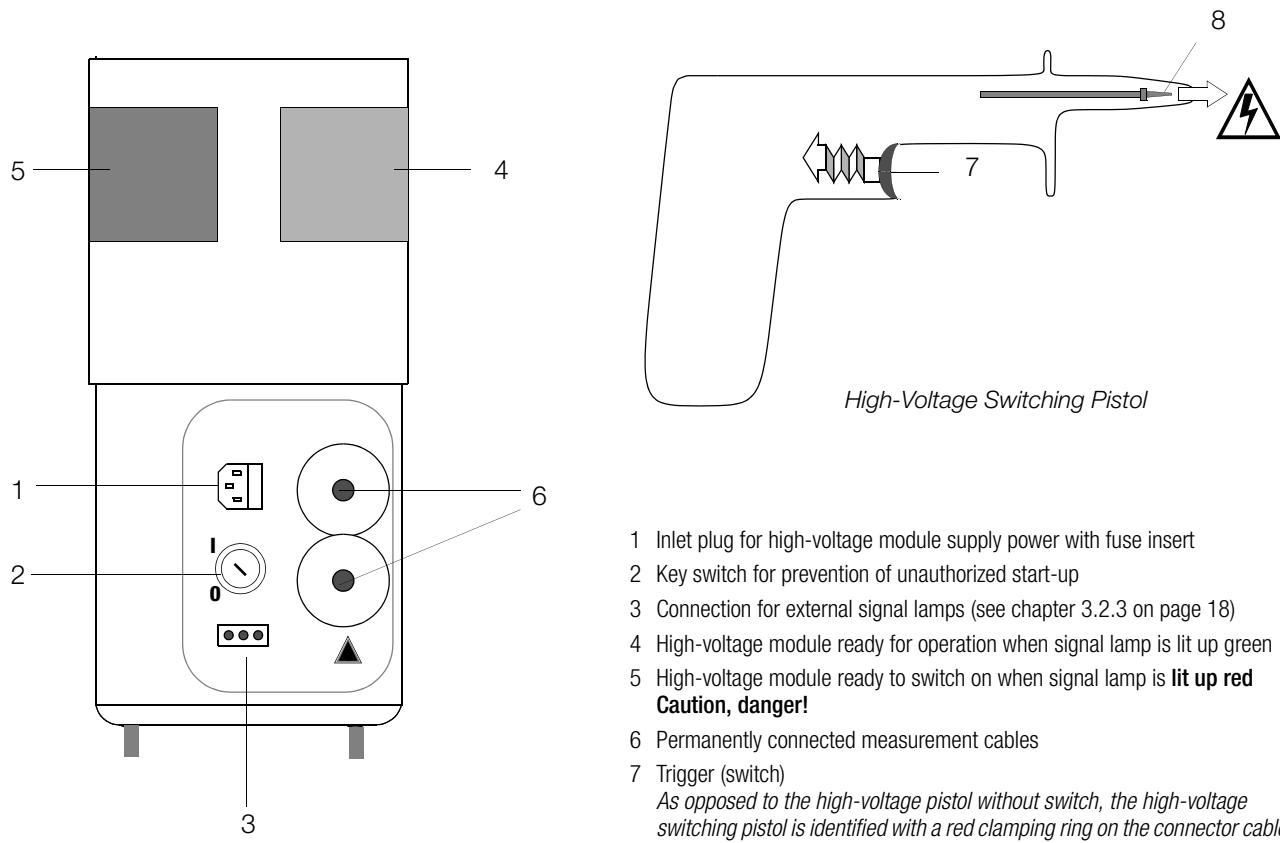
Connect 5 m long Leadex 5000 accessory extension cable (feature H1) to + measurement cable only!



Note

Maximum rated voltage to earth is **1000 V~**, even if permanently connected measurement cables for 2 kV~ CAT II are permissible.

* During battery operation: battery is disconnected
During mains operation: transformer is still connected to the mains



PROFITEST 204 HP/HV High-Voltage Module,
Connection Panel

PC Program WinProfi for communication with METRISO®5000 D-PI

The PS3 CD ROM includes the PC program WinProfi (for this tester valid as from V2.2.9) with the following contents and functions:

- up-to-date test instrument software
 - for loading a different language
 - for loading an updated software version
- exchange of measurement data between test instrument and PC
- preparation and modification of templates for test reports at the PC and transmission of the templates to the test instrument
- preparation, printout and filing of test reports at the PC

Interface cable Z3241 is required for communication between test instrument and PC.

Contents	Page	Contents	Page
1 Applications	8	4 Performing Tests	29
1.1 List of Available Features	9	4.1 Insulation (resistance) Test	29
2 Safety Features and Precautions	10	4.1.1 Setting Test Parameters	30
2.1 Checklist for High-Voltage Tests	11	4.1.2 Starting the Test (U_{NOM} ; U_{VAR})	31
2.2 Significance of Symbols	12	4.1.3 Starting the Test (U_{STEP})	31
2.2.1 Symbols on the Device	12	4.1.4 Measurements with the Guard Cable (feature G1)	33
2.2.2 Symbols in the Operating Instructions	12	4.2 High-Voltage Test with Feature B1/B2	34
2.2.3 Symbols in the User Interface	12	4.2.1 Performance Test (preparation for testing)	34
2.2.4 Symbols in the User Interface with Feature B1/B2	13	4.2.2 Setting Test Parameters for High-Voltage Testing	36
2.3 Special Safety Precautions and Instructions for Feature B1/B2	13	4.2.3 High-Voltage Testing Sequence	37
3 Initial Start-Up	15	4.2.4 Pulse Control Mode	39
3.1 Battery Operation, Feature C1 (not with B1/B2)	15	4.2.5 Ending the High-voltage Test	39
3.1.1 Removing the Device Base and Inserting or Replacing the Battery Pack	15	4.3 Polarization Index Measurement	40
3.2 Initial Start-Up with Feature B1/B2	17	4.3.1 Setting Test Parameters	41
3.2.1 Retrofitting Feature B1/B2	17	4.3.2 Starting the Test	41
3.2.2 Key Switch (feature B1 or B2)	17	4.4 Breakdown Voltage	42
3.2.3 Indication of Operating States	18	4.4.1 Setting Test Parameters	43
3.3 Mounting the METRISO-5000 D-PI with Feature B1/B2 to the Trolley (feature D1)	19	4.4.2 Starting the Test	43
3.4 Mains Connection	20	4.5 Capacitance Measurement and Determination of Dielectric Discharge (optional)	44
3.4.1 DC Operation (automotive charging adapter in preparation)	20	4.5.1 Setting Test Parameters	44
3.5 User Interface	21	4.5.2 Starting the Test	45
3.6 Help Functions	21	4.6 Voltage Measurement (protection against residual voltage)	46
3.7 Setup	22	4.6.1 Setting Test Parameters	47
3.7.1 Adjusting Contrast and LCD Illumination	22	4.6.2 Starting the Test	47
3.7.2 Setting Date and Time	23		
3.7.3 Beep Settings	24		
3.7.4 Executing the Self-Test	25		
3.7.5 Downloading a Language or a Software Update	26		

Contents	Page	Contents	Page
5 Processing, Reorganizing and Deleting Data	48	11 Appendix	63
5.1 Select Device under Test (DUT)	48	11.1 Glossary	63
5.1.1 Entering Descriptions	49	11.2 Minimum Display Values in Consideration of Measuring Error	63
5.1.2 Copying Descriptions	50	11.3 Voltage at Device Under Test During Insulation Resistance Test	64
5.1.3 Deleting Descriptions	50	11.4 Index	65
5.2 Processing Data (checking measured values)	50		
5.3 Data Reorganization	51		
5.3.1 Deleting Already Printed Data	51	12 Repair and Replacement Parts Service, DKD Calibration Lab and Rental Instrument Service	66
5.3.2 Memory Test	51		
5.4 Clearing the Memory	52		
6 Printing Test Results	53	13 Product Support	67
7 Characteristic Values	54		
8 Data Interfaces	57		
8.1 RS 232 Serial Interface	57		
8.1.1 Software Analysis of Measurement Results	57		
8.1.2 Interface Specification and Protocol	57		
8.1.3 Connector Pin Assignments	57		
9 Displays and Error Messages – Causes – Remedies	58		
10 Maintenance	61		
10.1 Replacing the Mains Fuse	61		
10.2 Disposing of Rechargeable Batteries	61		
10.3 Housing and Test Probes	61		
10.4 Measurement Cables	62		
10.5 High-Voltage Module Test Cables (Feature B1/B2)	62		
10.6 Replacing Bulbs in the External Signal Lamps (Feature F1)	62		
10.7 Software	62		

1 Applications

The METRISO®5000 D-PI insulation measuring instrument is in compliance with the following standards and regulations:

Standard	DIN EN 61557-1:1998-05
	DIN EN 61557-2:1998-05
VDE regulation	VDE 0413 Part 1:1998-05
	VDE 0413 Part 2:1998-05

“Equipment for testing, measuring or monitoring protective measures in systems with line voltages of up to 1000 V AC and 1500 V DC, part 2, insulation resistance measuring instruments”.

The instrument is suitable for the measurement of insulation resistance at voltage-free devices and equipment with nominal voltages of up to 1000 V. It is also suitable for the measurement of insulation resistance with values of up to 1 TΩ, and open-circuit voltages of up to 5000 V.

The instrument is also equipped with a 1000 V measuring range for direct and alternating voltages. This provides users with the advantage of checking devices under test for the absence of voltage, and discharging capacitive devices under test.

All of the values required for approval reports can be measured with this instrument.

The SECUTEST PSI module (feature I1) – a printer which can be inserted into the cover which includes an integrated interface and keypad – expands the range of possible applications for the METRISO®5000 D-PI.

All measured data can be archived with the help of measurement and test reports which can be printed out directly via a PC. This is a very important feature, especially with regard to product reliability.

Notes Regarding SECUTEST PSI Operating Instructions

In combination with the METRISO®5000 D-PI, the SECUTEST PSI printer module is only used for printing out measured values and for entering comments with the alphanumeric keypad.

The following chapters from the SECUTEST PSI operating instructions are relevant as regards operation together with the METRISO®5000 D-PI:

- Chapter 2 Safety Features and Precautions
- Chap. 3.1 and 3.2 Installing the Batteries and the PSI Module
- Chapter 12 Characteristic Values
- Chapter 13 Maintenance
- Chapter 14 Repair and Replacement Parts Service

The following functions are **not active**, or only make sense in combination with a SECUTEST ... test instrument:

- Display, print and store reports to memory
- Statistics
- Operation with a barcode scanner

1.1 List of Available Features

Features		0	01	02	03	04	05	07	08	09	10	11	12	13	14	15	17	22	40	41	42	43
Country version (user interface language, mains plug type)	A		D	GB international	GBR UK	FRA F	NLD NL	ESP E	FIN FIN	SWE S	ITA I	NOR N	BEL B	DNK DK	CZE CZ	CHE CH	KRO HR	POL PL	Port P	Slo SLO	Slow SK	USA USA
PROFITEST204HP/2.5kV (not with C1)	B ²⁾	none	with																			
PROFITEST204HV/5.4kV (not with C1)	B ²⁾	none		with ⁴⁾																		
Set of batteries (not with B1, B2)	C	none	with																			
Caddy 204	D	none	with																			
DKD calibration certificate	E ¹⁾	none	with																			
“Signal 204” external signal lamp	F ³⁾	none	with																			
“Guard 5000A” measurement cable	G	none	with																			
“LEADEX 5000” extension cable	H	none	with																			
SECUTEST®PSI printer module	I	none	with																			
Automotive charging adapter (in preparation)	J	none	with																			

¹⁾ The test instrument can be recalibrated by our calibration department at any time. We recommend a calibration interval of 1 to 2 years.

²⁾ If the high-voltage module is purchased after the basic instrument, it can only be retrofitted by our service department.

³⁾ The external signal lamp can only be connected with the high-voltage module (feature B1 or B2).

⁴⁾ Only for line voltage 207 V ... 253 V / 49 Hz ... 61 Hz

Specify the designation of the basic M5810 instrument in your order, as well as any features which deviate from feature 0!

Example of a complete type designation (= article number, = order code) for a METRISO®5000 D-PI:

– Test instrument for German speaking countries with DKD calibration certificate and SECUTEST®PSI printer module:
M5810 A01 E1 I1

2 Safety Features and Precautions

The METRISO®5000 D-PI test instrument, and the PROFITEST204HP/2.5kV and PROFITEST204HV/5.4kV high voltage modules have been manufactured and tested in accordance with the following safety regulations:

Standard	DIN EN 61557-1:1998-05 DIN EN 61557-2:1998-05 IEC 1010-1:1990, IEC 1010-1/A2:1995 EN 61010-1:1993, EN 61010-1/A2:1995
VDE regulation	VDE 0413 Part 1:1998-05 VDE 0413 Part 2:1998-05 VDE 0411 Part 1, 1994-03

If used for its intended purpose, safety of the user, the instrument and the device under test is assured.

Read the operating instructions completely and carefully before using the device, and follow all instructions included therein.

The operating instructions should be made available to all users.

Observe the following safety precautions:

- The instrument may only be connected to a 230 V or 120 V electrical system (depending on the country-specific design) which is protected with a fuse or circuit breaker with a maximum nominal current rating of 16 A.
- Be prepared for the occurrence of unexpected voltages at devices under test (for example, capacitors may be dangerously charged).
- Make sure that connector, measurement and test cables are not damaged (i.e. broken insulation, kinks, interruptions etc.).
- The instrument may only be used indoors.
- Impulse withstand voltage of up to 2.5 kV may occur in over-voltage category II systems with 230/400 V.

- If only the batteries are to be charged (instrument is ready for operation in SETUP position), please ensure that the test instrument cannot be used by unauthorized personnel during the charging process.
- Measurement may only be performed on voltage-free equipment and devices.
- Measurements may not be performed under moist ambient conditions, where condensation has occurred, or in explosive atmospheres.
- Do not disconnect the measurement cables until the device under test has been fully discharged.
- Observe accident prevention regulation BGV A2, "Electrical Systems and Equipment".
- Do not perform measurements alone: always have a second person help if possible.
- Make sure that measurement cables are connected correctly.
- Do not touch the test probes at any point beyond the finger guard.

The METRISO®5000 D-PI may not be used:

- If visible damage is apparent
- With damaged connector, measuring or test cables (test cables may not, under any circumstances, be mechanically damaged or kinked, because impaired insulation characteristics may otherwise result)
- If these no longer function flawlessly
- If the signal lamps on the PROFITEST204HP/2.5kV (feature B1) and PROFITEST204HV/5.4kV (feature B2) high-voltage modules are defective

In such cases, the devices must be removed from service and secured against any possible inadvertent use.

Send the instrument to our Repair and Replacement Parts service department in such cases (see chapter 12 on page 66).

2.1 Checklist for High-Voltage Tests



Attention!

Measurements may not be performed under moist ambient conditions, where condensation has occurred or in explosive atmospheres.

Personnel Safety

- ❖ Turn the machine under test off and lock it in the off position.
- ❖ Perform insulation resistance measurement.
- ❖ Make sure that the system is grounded.
- ❖ Secure the danger zone with barriers, closing even narrow entrance ways.
- ❖ Set up warning signs such that they are plainly visible.
- ❖ Set up warning lamps such that they are plainly visible.
- ❖ Attach the emergency stop button in a plainly visible fashion.
- ❖ Warn personnel working in the area of possible danger.
- ❖ Always turn the test instrument off with the key switch and remove the key before leaving the work area.

Safety Precautions for the Machine Under Test (recommended)

- ❖ Review the circuit diagrams and make a note of all electrical circuits.
- ❖ Disconnect the neutral conductor from the mains.
- ❖ Short circuit each electrical circuit to itself.
- ❖ Disconnect control circuits with overvoltage arresters, if the arresters would be triggered by utilized test voltage.
- ❖ Disconnect PELV circuits (no high-voltage testing is required for these circuits).

- ❖ Test insulation at each circuit with 1000 V. (If insulation resistance is OK at 1000 V, no failures should occur during the high-voltage test.)
- ❖ Disconnect frequency converters.
- ❖ **Caution in TN systems!**
The protective conductor is connected to the neutral conductor in the junction box. High-voltage is thus applied between the phase conductors and the neutral conductor. The neutral conductor must be cut if necessary, because it is not disconnected from the mains by means of fuses.

Setting Up the Test Instrument

High-Voltage Test

- ❖ Test all circuits (conductors) against the protective conductor (all switches in the mains circuit must be turned on, and testing must be performed upstream and downstream from all relays and contactors).
- ❖ Remove all shorting devices after testing has been completed.

Testing Without Short-Circuiting

- ❖ Separately test all conductors from all circuits against the protective conductor (the machine could be damaged in the case of arc-over).

Functions Test

- ❖ The machine must be tested for correct functioning after the high-voltage test, especially as regards safety functions.

2.2 Significance of Symbols

2.2.1 Symbols on the Device

The symbols on the device have the following meanings:



Indicates EC conformity



Life endangering for the operator if the wiring diagram and the operating instructions are not observed!



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



Report functions



Data management

2.2.3 Symbols in the User Interface



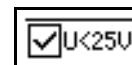
High-voltage warning,
Voltage at the test probe
between 1000 and 5000 V



Warning concerning a source of danger,
Voltage at the test probe
between 25 and 1000 V



Insulation measurement:
interference voltage at the test probes



All-clear after an insulation test:
voltage at test probes less than 25 V



Timer function: symbolizes test duration



This symbol appears after the voltage measurement value has been frozen (see chapter 4.6 on page 46).

2.2.2 Symbols in the Operating Instructions

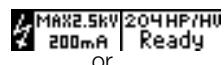


Life endangering for the operator if instructions identified with this symbol are not observed

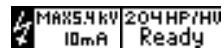


Danger for the operator and the device if instructions identified with this symbol are not observed

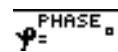
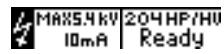
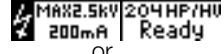
2.2.4 Symbols in the User Interface with Feature B1/B2



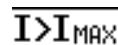
High-voltage module ready to be switched on



Life endangering high voltage of up to **5.35 kV** is present at the test probes of the high-voltage module.



Test completed successfully,
residual voltage less than 25 V
Display of phase angle



The specified limit value I_{MAX} has been exceeded.
Current limiting has switched the device to the
"standby" mode.

*The last voltage value measured before interrupting current
was exceeded, as well as interrupting current limit value
 I_{MAX} are displayed*



Excessive temperature inside the test instrument
(high-voltage test)

Allow the device to cool for approximately 10 minutes.

2.3 Special Safety Precautions and Instructions for Feature B1/B2

Precautions for the prevention of *unauthorized* start-up:

- Key switch

Precautions for the prevention of *inadvertent* start-up:

- **Multiple key operation:**

Before test voltage can be applied to the test probes by activating the trigger at the high-voltage switching pistol, the START key must be pressed at the primary device.

- **Two-hand operation:**

Each of the high-voltage pistols is equipped with a trigger. Both triggers must be activated simultaneously in order to expose both test probes.

- **High-voltage switching pistol** (pistol with yellow marking) with double safety feature:

If the trigger at the high-voltage switching pistol is pulled to the first point of mechanical resistance, the test probe is exposed. High-voltage is not applied to the test probe until the trigger is pulled beyond this point, assuming the device is switched on.

General Safety Precautions

- **Integrated signal lamps** indicate the switching status of the test instrument.

- Test probes are **electrically isolated** from the mains:
This prevents current from flowing from the high-voltage switching pistol to earth.

- **Current limiting in the event of arc-over:**

If the current limit value entered as a device parameter is exceeded due to arc-over, switching to the "standby" mode takes place automatically.

- When **mains voltage is restored after a power failure**, switching to the "standby" mode takes place automatically.



Attention!

The vent slots in the bottom of the high-voltage module may not be covered!



Attention!

Observe the **Rules for Electrical Testing Equipment** issued by the GERMAN TRADE ASSOCIATION FOR PRECISION ENGINEERING AND ELECTRICAL ENGINEERING (see enclosed brochure).



Attention!

Observe DIN VDE 0104 regulations:
"Setup and Operation of Electrical Test Equipment"



Attention!

If safety test probes are used, the operator must inspect them to assure that the test probes and their cables are in flawless condition before placing them into service.

All equipment must be inspected for visible, external damage before use (see chapter 10.3 on page 61 through chapter 10.5 on page 62).



Attention!

Before initializing any tests, and before enabling test equipment, make sure that all means of access to the danger zone are closed, and that all persons have exited the danger zone.



Attention High-Voltage!

When the trigger at the high-voltage switching pistol is pulled to the first point of discernible mechanical resistance, the test probe is exposed.

If the trigger is pulled beyond this point of mechanical resistance, high-voltage is applied to the test probe, assuming the high-voltage module is in the "standby" mode.



Attention High-Voltage!

Touch **neither** the test probe **nor** the device under test during the high-voltage test!

Life endangering high-voltage of up to **5.35 kV** is present at the test probes of the high-voltage module!

Limitation of Liability

PCs located in proximity to the test equipment may "crash" in the event of arc-over, resulting in possible data loss. All data and programs should be suitably saved, and computers shut down before performing the high-voltage test. PCs may crash even if no RS 232 connection has been established.

The manufacturer of the test instrument assumes no liability for direct or consequential damages to computers or peripheral devices, or for data loss during performance of the high-voltage test.

Furthermore, the manufacturer assumes no liability for defects at devices under test resulting from the high-voltage test. This applies in particular to electronic components included in the device under test.

Observe checklist for performance of high-voltage tests in chapter 2.1.

3 Initial Start-Up

The METRISO[®]5000 D-PI test instrument is supplied with a base which serves as a compartment for storing test cables, the guard cable (feature G1), the test probes and the battery pack (feature C1).



Attention!

The test instrument may only be operated if the base is properly attached and secured.

3.1 Battery Operation, Feature C1 (not with B1/B2)

The battery pack is required for operation of the METRISO[®]5000 D-PI without mains power. The battery back includes 8 NiMH batteries. No other battery packs may be used.

The battery pack is charged automatically by the integrated mains power pack. Optional use of an automotive charging adapter is also possible. The device must be switched on in this case (any switch position other than OFF).



Attention!

If only the batteries are to be charged (instrument is ready for operation in SETUP position), please ensure that the test instrument cannot be used by unauthorized personnel during the charging process.

3.1.1 Removing the Device Base and Inserting or Replacing the Battery Pack

Please observe instructions included in this chapter if the device is to be retrofitted with a battery pack, or if the battery pack requires replacement.

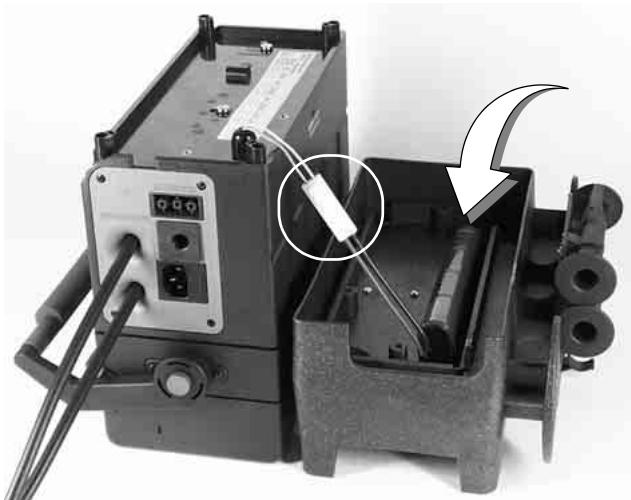


Attention!

Before dismantling the device base:

- Disconnect the device from the measuring circuit at all poles.
- Disconnect the device from mains power.
- Turn the device off (set the switch to OFF).

- ⇒ Close the cover and position the handle at the side of the device.
- ⇒ Turn the device upside down, i.e. place it onto its cover.
- ⇒ Unwind the test cables from the cable uptake at the side.
- ⇒ Remove the guard cable from the device base if one is included (feature G1).
- ⇒ Loosen the three Phillips head screws at the bottom of the device base.
- ⇒ Lift the device base up, and set it down at the side of the device with the feet at the bottom.
- ⇒ Place the battery pack onto the two rubber cushions in the recess in the device base such that the connector cable with plug connector from the battery pack is on the same side as the device's connector cable with socket connector.
Double-check: The opening at the side of the base coincides with the device's connection panel.



- ❖ Connect the two cables to each other and secure the connection with the snap hooks.
- ❖ Position the cable such that is cannot be pinched during subsequent assembly.



- Carefully set the device onto the base as shown in the photo by grasping the handle with one hand, and guiding the bottom of the device into position with the other hand.
- Grasp the base and the device, and turn the entire unit upside down.
- Secure the base with the included screws and washers.



Attention!

Use only the screws furnished with the device together with washers. Longer screws may reduce creepage distances or damage the device.

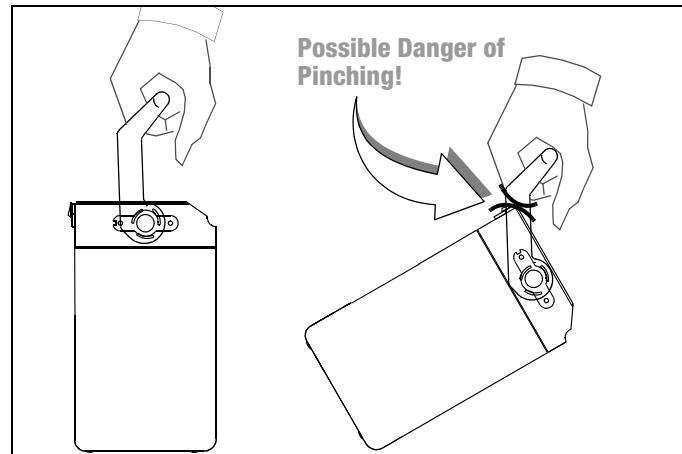
If a battery pack (feature C1) has been installed and the device is not connected to the mains, the battery symbol  appears at the display when the device is switched on, and the number of dark bars displayed in the symbol indicates the battery charge level.

After installing the battery pack, the device is automatically supplied with power from the batteries.

3.2 Initial Start-Up with Feature B1/B2

3.2.1 Retrofitting Feature B1/B2

Retrofitting with a high-voltage module (feature B1 or B2) can only be performed by the GOSSEN METRAWATT GMBH service department.



3.2.2 Key Switch (feature B1 or B2)

The key switch prevents unauthorized start-up of the high-voltage module. Keep the key in a safe place which can only be accessed by authorized personnel.

Turn the key to the "0" position and remove after each test has been completed.



Note

When the key is removed or the high-voltage module is turned off, the menu functions for the high-voltage module cannot be accessed at the METRISO®5000 D-PII!

3.2.3 Indication of Operating States

Signal Lamps at the High-Voltage Module

The signal lamps integrated into the high-voltage module indicate two different operating states:

Green: Test instrument ready for use

- Key switch is in the “I” position (ON).
- Power supplies for signal and control circuits at the high-voltage module are switched on.
- Test voltage supply circuits are still switched off, and are still secured against inadvertent activation.



Attention!

All safety precautions required before entering the danger zone must now have been implemented, amongst others: set up WS1 warning signs and ZS2 auxiliary signs in accordance with DIN 40008, part 3.

Red: Instrument ready for operation, **caution: danger!**

- The menu for starting the voltage test has been opened, and the START key has been activated.
- The power supply circuit for the safety test probe is still switched off, assuming the trigger has not been pulled at the high-voltage pistol.
- The test probes are secured against inadvertent contact, assuming the triggers at the high-voltage pistols have not been pulled.



Attention!

All means of access to the danger zone must be closed when the high-voltage module is in the “standby” mode!

The device must be sent to the GOSSEN METRAWATT GMBH Repair and Replacement Parts service department in order to replace lamps.

External Signal Lamps (feature F1)

The external signal lamps indicate the same operating states as the signal lamps integrated into the high-voltage module. They provide additional security at the test site, and must be plainly visible beyond the boundaries of the danger zone.

The external signal lamps can only be connected to the 12 V/5 W output jack at the high-voltage module (feature B1 or B2).



Note

For reasons of safety, only Z504D signal lamps available from GOSSEN METRAWATT GMBH may be used.

Refer to chapter 10.7 on page 62 regarding lamp replacement

3.3 Mounting the METRISO® 5000 D-PI with Feature B1/B2 to the Trolley (feature D1)

- ❖ Set the complete unit consisting of test instrument and high-voltage module onto the trolley's platform (1) such that the cover of the test instrument can still be opened.
- ❖ Secure the test instrument's handle to the vertical supports with the handle clamps (3). Loosen the screws in the handle clamps (9) to this end with a 4 mm hollow hex wrench.
- ❖ Push the handle clamps (3) over the handle and retighten the screws (9).
- ❖ Wind the two cables from the safety test probes onto the bottom cable uptake (2 at bottom).
- ❖ Then wind the two cables from the test instrument's test probes onto the top cable uptake (2 at top).
- ❖ Secure the cables and the test probes with the included rubber straps (12).



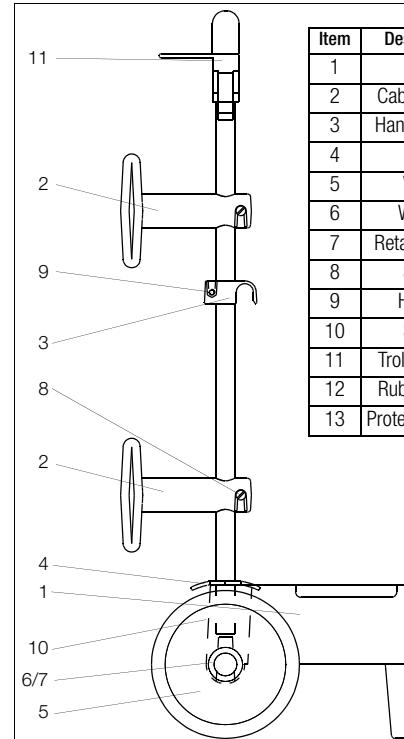
Attention!

Observe regulations for portable test equipment in accordance with DIN VDE 0104 (3.6).



Note

Wind the test cables from the safety test probes onto the provided cable uptakes at the back of the trolley after each use. Test cables may not, under any circumstances, be mechanically stressed or kinked, because impaired insulation characteristics may otherwise result. Do not forget that externally caused damage is not always recognizable.



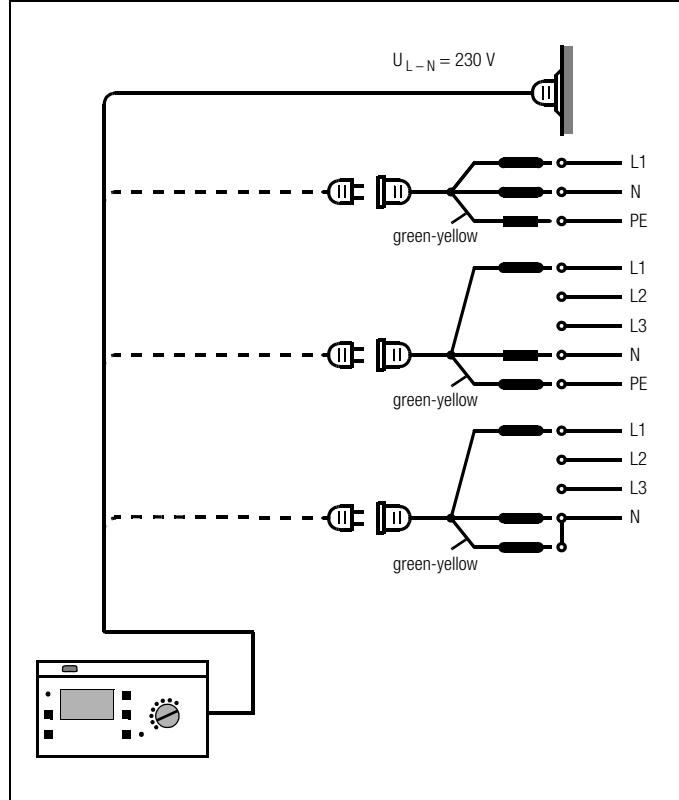
Caddy 204 Trolley



Attention!

Inspect the test cables for mechanical damage before placing the high-voltage module into service each time it is used.

3.4 Mains Connection



- Connect the test instrument to 230 V or 120 V mains power (depending on the country-specific design) with the included mains connector cable.



Attention!

If a connection via earthing contact outlet is not possible, disconnect the mains from all sources of voltage before connecting the cables of the coupling socket via pick-up clips with the mains connections, as shown in the drawing.

If a battery pack has not been installed, the mains connection symbol appears after the test instrument has been switched on.

If a battery pack has been installed (feature C1), it is automatically recharged. The battery symbol appears at the display, and the blinking bars shown in this symbol indicate the remaining capacity which still needs to be charged. The device need not be disconnected from mains power after the batteries have been fully charged (overcharge protection).

3.4.1 DC Operation (automotive charging adapter in preparation)

If a battery pack (feature C1) has been installed and the device is not connected to the mains, the battery symbol appears at the display when the device is switched on, and the number of dark bars displayed in the symbol indicates the battery charge level.

After installing the battery pack, the device is automatically supplied with power from the batteries.

The automotive charging adapter (feature J1) can be used to operate the device and charge the batteries.

3.5 User Interface

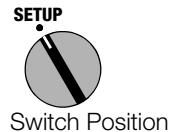
Measuring and testing with the METRISO® 5000 D-PI is quick and easy. The integrated user interface provides the operator with information regarding required operating steps, operator errors, measurement results and more for all measuring functions. All information and measurement results appear at a dot matrix LCD panel in plain text.

The integrated user interface is entirely adequate for the great majority of all tests and measurements. Nevertheless, operators should carefully read and understand the contents of these operating instructions.

3.6 Help Functions

Help texts can be queried and displayed at the LCD for all measuring and test functions, and for practically all settings.

Example: Display Contrast Function



- ⇒ Press the STORE key in order to query online help:



Query Help



- ⇒ Press the same key once again, or the MENU key, in order to exit the help function:



Exit Help

or

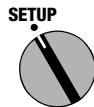
- ⇒ Start the selected function directly from the help menu by pressing the START key:



Start Function

3.7 Setup

Various basic settings can be selected for the test instrument with the selector switch in the SETUP position.



Select Parameter



MENU

Open Menu for Entering Parameters

All setting and changes entered to the menu accessed in the SETUP switch position are saved to memory automatically, and are retained after disconnecting the device from mains power.



MENU

Exit Function

Restoring default setting – standard values

Switch off the test instrument: switch position OFF.

Then press and hold the MENU and i/STORE keys simultaneously, and turn the function key to TEST position. The standard values of the default setting are thus restored.

3.7.1 Adjusting Contrast and LCD Illumination

Contrast can be increased or decreased with this function. LCD illumination can be switched on or off as well.



Select Display Contrast



MENU

Open Entry Menu



Adjust Contrast



START Switch Illumination On or Off *



* Background illumination is switched off automatically after approximately 2.5 minutes if none of the keys are activated during this time. Each time a key is activated, background illumination is extended for an additional 2.5 minutes.

3.7.2 Setting Date and Time

The test instrument's internal clock can be set with this function. The clock continues to run after supply power has been disconnected. Date and time are included in the test reports.

Entries are made using the following formats:

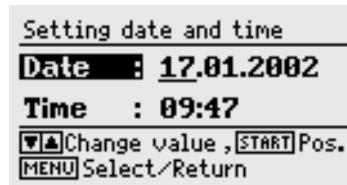
Date: DD.MM.YYYY (Day.Month.Year)
Time: hh:mm (Hour:Minute)



Select Date/Time



MENU



Open Entry Menu
(and select date or time)



Select Cursor Position



START

Change Values

3.7.3 Beeper Settings

The beeper can be completely deactivated or activated as indicated in the table below.

	Beep activated	Beep deactivated	Beep for measuring functions	Beep for high-voltage
Beep upon key stroke	—	•	—	—
Beep upon good/bad measurement results *	—	•	•	—
Intermittent beeper for high-voltage > 1000 V	—	•	•	•
Intermittent beeper for operation with Feature B1/B2	—	•	•	•

* a good measurement result (passed) is indicated with one long acoustic signal, a bad result (failed) with three brief acoustic signals.



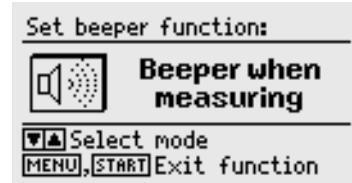
Select Beeper



Open Entry Menu

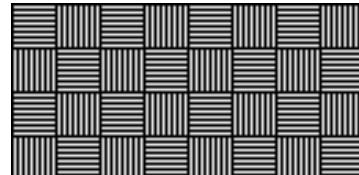
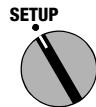


Select Beeper Function



3.7.4 Executing the Self-Test

This function displays important device data first. If required, display lamp and relay functions, as well as other options, can be tested automatically and results appear at the display.

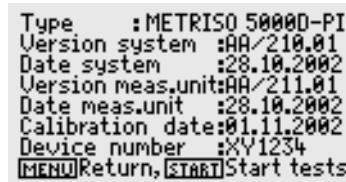


Select Self-Test

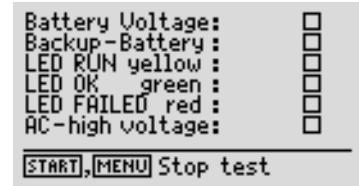


MENU

Open Entry Menu



Continue Test



Results: OK



Error message:

- Test failed
- component defective
- component not available (e.g. batteries not inserted or high-voltage module not available)

LCD Test

Neighboring horizontal and vertical segments of the LCD panel are activated separately or test images are indicated by means of the following tests. If one of the segments fails to blink, send the test instrument to an authorized service center for repair.



Note

Before a check mark appears to indicate correct functioning the LEDs must first blink, and the relays must switch.

3.7.5 Downloading a Language or a Software Update

If you require a language other than one of those included with the instrument, it can be downloaded with the help of WinProfi PC software. The data file with the desired language is transmitted to the test instrument via the serial interface. The previously installed language is overwritten.

Software updates can be downloaded with the help of the same program, regardless of the currently installed language.



Note

You can use WinProfi software at the PC side (included with the METRISO®5000 D-PI) to download a language to the test instrument. This software includes all of the functions required for communications between the METRISO®5000 D-PI and the PC. A description of the program is included in the online user's manual which can be accessed from WinProfi.

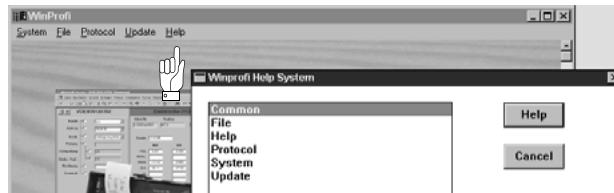
A Installing WinProfi to the PC and Starting the Program

- ⇒ First install the software to your PC.
Insert the CD into the CD drive, for example drive E.
Execute the file: **E:GMCDEMO**
- ⇒ Click the globe icon.
- ⇒ Follow the instructions which appear at the monitor.
The program is added to your start menu after installation.

- ⇒ Establish a connection between the PC and the METRISO®5000 D-PI. Use the Z3241 cable to this end.
- ⇒ Start WinProfi again.
- ⇒ Switch the test instrument on.

Displaying and printing out the online user's manual

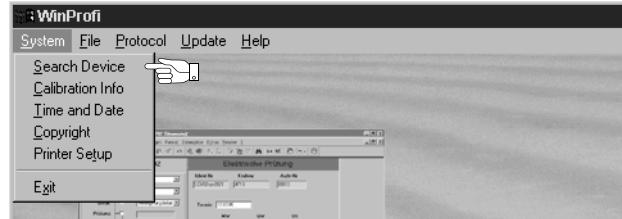
(contains information concerning the software which is not included in these operating instructions).



WinProfi Software

B Prerequisites for Software Update or Exchange of Data

- Find the interface to which the METRISO®5000 D-PI is connected.

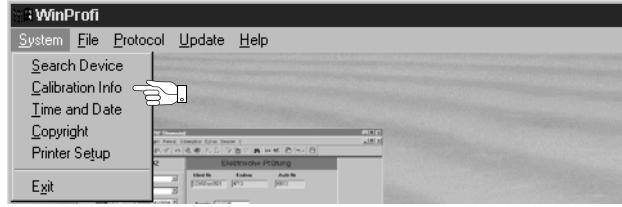


Note

Always start this function first, **before performing an update or changing report templates**. After starting this function, WinProfi loads the report files required specifically for the connected instrument.

Due to the fact that WinProfi has been created for use with several types of test instruments, incorrect test reports may otherwise be loaded, or erroneous options may be made available.

- Querying information regarding current software version



C Transmitting a Software Update to the Test Instrument



- PC: Select **Update all** from the **update** menu. Follow the instructions which appear at the monitor.

Depending upon the utilized PC, updating takes from 1 to 2 minutes.

The green LED indicates that the instrument is ready to receive data. If the PC and the test instrument are correctly synchronized, the yellow LED lights up and the green LED goes out. The red LED lights up during programming sequences. After transmission has been completed, the LED goes out and the device is restarted.

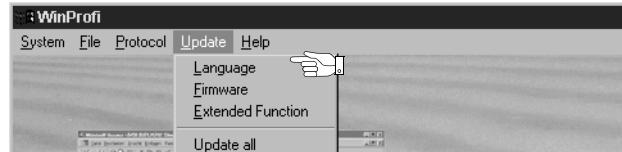
The message "Transmission done" appears at the PC.



Attention!

The instrument may not, under any circumstances, be switched off during transmission, nor may the connection between the instrument and the PC be interrupted!

- Subsequently select "Language" (loading the respective language), if applicable.



D Organizing Report Data

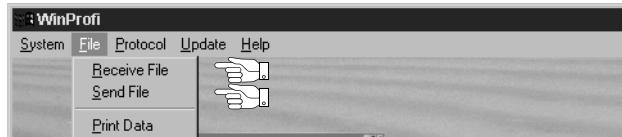
- Connect the test instrument directly via cable Z3241 with the PC.



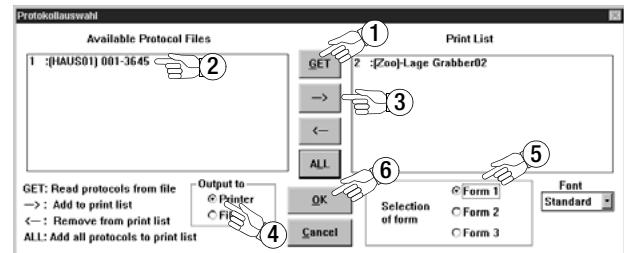
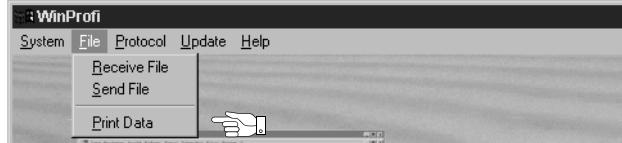
Note

Do not connect the PC to the PSI module.

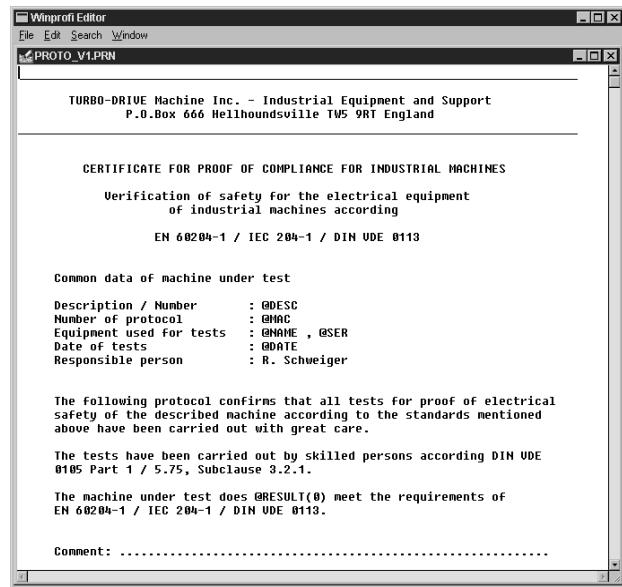
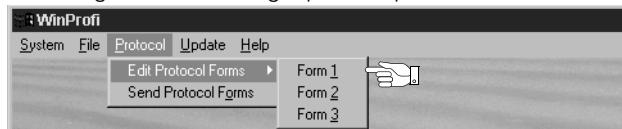
- Sending and receiving data



- Printing out data



- Editing and transmitting report templates



4 Performing Tests

Each of the following tests is automatically assigned to one currently available object number. Any given test which is saved to memory with the “STORE” key is stored with reference to this number. The object number can be entered in the “DUT data” menu (see chapter 5.1 on page 48).

Measuring mode operation is always carried out according to the following sequence:

- Select the desired test.
- Enter test parameters (if required).
- Start the measurement or return to the initial menu.
- Save measured values to memory and enter a description (if desired).

Observe the following for all tests:

- Safety features and precautions, see chapter 2.
- Disconnect the device under test from all sources of voltage first.
- Test for absence of voltage.
- Do not disconnect the measurement cables until the device under test has been fully discharged.

4.1 Insulation (resistance) Test

Test voltage can be set between 100 V and 5,000 V for this test. This voltage, as well as the allowable limit value for insulation resistance, can be selected as a test parameter.

Voltage at the device under test appears at the LCD in addition to measured insulation resistance.

Discharge

After the measurement has been completed, the device under test is discharged automatically in order to assure zero voltage. The falling voltage value can be observed at the display during the discharging process. The measured insulation resistance value remains in memory during this period of time.

Interference Voltage

If voltage is present at the test probes after measurement is started, an “**external voltage**” warning appears at the display. The level of the interference voltage is shown at the display. The insulation test is aborted after the test probes have been removed from the DUT. The test has to be conducted again on the de-energized DUT.





Attention!

Do **not** touch the test probes during measurement!
A direct voltage of up to 5000 V is present between the test probes.



Note

Testing the Measurement Cables:

Initial testing should be performed after short-circuiting the measurement cables with their test probes. The instrument should display nearly zero $M\Omega$. A broken measurement cable can be detected in this way.



TEST



Select the Test



MENU

Open the Submenu



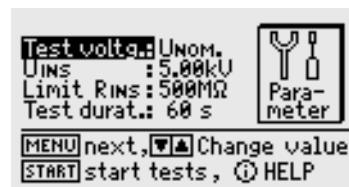
Select Parameter



Set Value



MENU



Significance of Parameters with Variable and Fixed Test Voltage

Test voltage U_{nom} : Test voltage in fixed steps (100/250/500 V, 1.00/1.50/2.00/2.50/5.00 kV)

U_{var} : Variable test voltage (100 V ... 5.00 kV in 50 V steps)

U_{ins} Test voltage

Limit R_{ins} Limit value for insulation resistance (If value stays below limit value: measurement failed)

Test duration Maximum test duration in seconds
<Auto>: measurement until steady state is reached
Specified time: measurement = x seconds
>>>: cont. measurement: stop with MENU key

Significance of Parameters with Step Voltage

Test v. U_{step} : Test voltage as a sequence of steps

$U_{(\text{INS}) \text{ END}}$ Final value of the step sequence (250 V ... 5.00 kV in steps of 250 V)

ΔR_{Lim} Maximum allowable statistical deviation from the measured mean value

$\Delta t/250\text{V}$ Dwell time per step (10 s ... 50 s)

Resetting parameter values to default setting, see page 22.

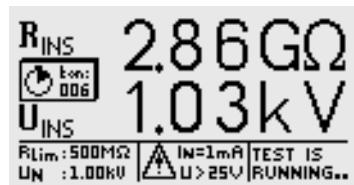


Note

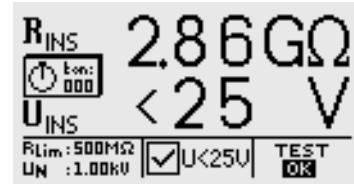
In the event of very high insulation resistances the capacitive influence of the person performing the measurement and/or of the measuring cable may distort the measured value.

4.1.2 Starting the Test ($U_{\text{NOM}}, U_{\text{VAR}}$)

START

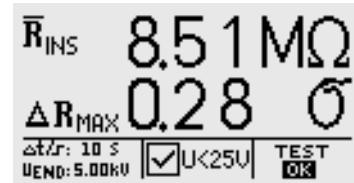
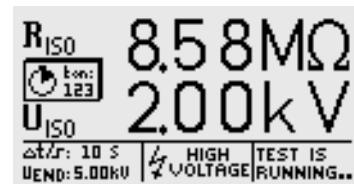


Display of results after completion of test



4.1.3 Starting the Test (U_{STEP})

START





Statistical analysis

U _{MEAS} [kV]	R _{MEAS} [Ω]	1.75	8.49M	3.75	8.51M
0.25	8.56M	2.00	8.48M	4.00	8.51M
0.50	8.51M	2.50	8.51M	4.50	8.52M
0.75	8.51M	2.75	8.50M	4.75	8.52M
1.00	8.53M	3.00	8.52M	5.00	8.53M
1.25	8.51M	3.25	8.53M	
1.50	8.50M	3.50	8.51M	$\Delta R = 0.286$

Press the CURSOR DOWN or CURSOR UP keys to return to the previous LCD display.



Note

If the measuring range is exceeded (overflow of display range), no statistical analysis will be performed. In this case, the individual measured values are listed, but no value for ΔR_{MAX} is calculated.



Press briefly: Save results

Press & hold: Save results and activate the entry field:

A description of the measurement with up to 15 characters can be entered to the information field at the bottom. See chapter 5.1.1 regarding entry.

4.1.4 Measurements with the Guard Cable (feature G1)

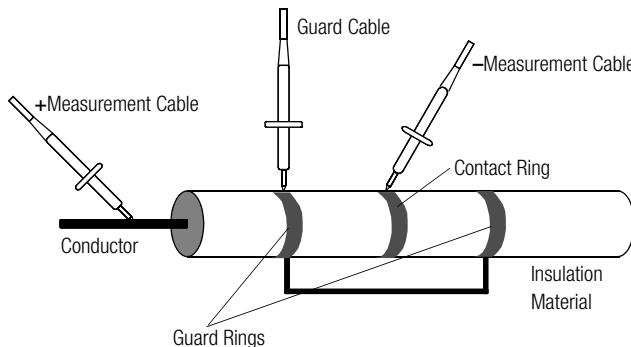
The measurement of very high resistances necessitates extremely minimal measuring current and may be rendered problematic as a result of influences such as electromagnetic fields, humidity or surface current. An accurate test set-up is thus absolutely essential.

A guard cable must be used for measurements within a range of $100 \text{ G}\Omega$ ($10 \text{ G}\Omega$) ... $1 \text{ T}\Omega$, in order to prevent surface current from distorting measurement results. The guard rings prevent current at the surface of the insulation material from flowing from the +measurement cable to the -measurement cable, instead of through the insulation material itself.



Note

The following materials can be used as guard rings: aluminum foil, copper foil or metallic hose clamps.



- ⇒ Insert the plug from the guard cable into the appropriate jack in the test instrument.
- ⇒ Plug the alligator clip onto the guard cable test probe.
- ⇒ Connect the alligator clip to the guard ring between the two measuring points at the insulation material under test.
- ⇒ Refer to chapter 4.1.2 on page 31 regarding the measuring sequence

4.2 High-Voltage Test with Feature B1/B2

The electrical equipment of the machine under test must withstand a test voltage of twice its own rated voltage value or 1000 V~ (whichever is greater) applied between the conductors of all circuits and the protective conductor system for a period of at least 1 second. The test voltage must have a frequency of 50 Hz, and must be generated by a transformer with a minimum power rating of 500 VA.



Note

Feature B must be included for testing in accordance with DIN VDE 0113.

Feature B2 is used for testing at up to 5 kV.

The METRISO® 5000 D-PI automatically recognizes which type of high-voltage module has been connected. Communications between the test instrument and the high-voltage module can be tested as described in chapter 3.7.4.



Attention!

Before beginning work, the test instrument, the high voltage cables and the high-voltage pistols must be inspected to assure that they are in flawless condition (see also chapter 10.5 on page 62).

4.2.1 Performance Test (preparation for testing)

Execute the following performance test in the specified order from a) through e).

a) Key Switch

- Set the key switch to the "0" position.
- Neither the green nor the red signal lamps may light up.

b) Voltage Test

- Set the key switch to the "I" position.
- The green signal lamps must light up.
- Select the insulation test with the or the .



Select the Test



MENU

Open the Submenu



The test voltage parameter is switched from U_{NOM} or U_{STEP} to AC-HV.

- Set parameters for test duration, test voltage, interrupting current I_{MAX} and rise time to the desired values (see chapter 4.2.2 on page 36).

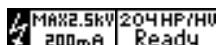


Note

Do not set I_{MAX} to pulse control mode!

- Press the START key.
- The red signal lamps must light up.
- The following values appear at the LCD:
 $U_T = \text{--- V}$
 $I_T = \text{--- mA}$

The following symbols appear:





Attention High-Voltage!

Touch **neither** the test probes **nor** the device under test during the high-voltage test!

Life endangering high-voltage of up to 5.3 kV is present at the test probes of the high-voltage module!

- ⇒ Pull the trigger of the identified high-voltage switching pistol to the limit stop and hold.
- The following values and symbols appear at the LCD:
 $U_T = \text{acquired voltage value}$
 $I_T \sim 0.0 \text{ mA or } 0.00 \text{ mA}$ 
- After the specified test time has elapsed, test voltage is switched off automatically and the following appears:

- If the trigger (switch) is release prematurely, the test is aborted.

c) Shutdown Functions

- ⇒ Short circuit the two high-voltage pistols.
- ⇒ Pull the trigger of the identified high-voltage switching pistol to the limit stop and hold.
- The instrument is shut down immediately.
- The green signal lamps must light up, and the red signal lamps may not light up.

- The following values appear at the LCD:

$U_T = \text{XXX V}$

$I_T > \text{XXX mA}$

The last voltage value measured before interrupting current was exceeded and breaking current limit value I_{MAX} are displayed.

The following symbols appear:



d) Power Failure

- ⇒ Press the START key.
- The red signal lamps must light up.
- ⇒ Set the key switch to the “0” position and wait at least 1 second.
- ⇒ Set the key switch to the “I” position.
- The green signal lamps must light up, and the red signal lamps may not light up.

e) Indicator Signals

Signal Lamps

Two lamps are included on the test instrument, arranged diagonally, for the indication of operating states. If both “ready for operation” lamps (red) go out, test voltage is no longer generated. Do not start voltage testing unless all signal lamps indicate correct operation.

Replace defective lamps as described in chapter 10.6 under “Maintenance”.

Acoustic Signals (acoustic signal “on” or “measuring mode operation”)

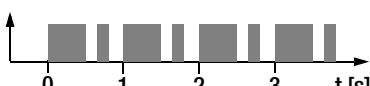
Ready

Repetitive sequence



Test in Progress

Repetitive sequence



$I_T > I_{MAX}$

Single sequence



Refer to chapter 3.7.3 on page 24 regarding activation.

4.2.2 Setting Test Parameters for High-Voltage Testing

The following parameters can be set in the “standby” mode with illuminated green signal lamps:

Test v. AC-HV

$U_{AC.MAX.}$ Max. test voltage, final value after T_R has elapsed

Setting limits: **HP-2.5kV**: 250 V ... 2.50 kV
HV-5.4kV: 650 V ... 5.35 kV

$I_{MAX.}$: Max. allowable current before high-voltage is switched off

Setting limits: **HP-2.5kV**: 10.0 ... 250 mA
HV-5.4kV: 0.50 ... 10.0 mA

The pulse mode symbol >>>>> can be selected with the key at less than 10.0 or 0.50 mA.

T_D : Test duration at maximum test voltage $U_{AC.MAX.}$ (not including rise time T_R)

Setting limits: 1.00 ... 120 s, the continuous operation symbol >>>>> can be selected at under 1.00 s with the key.

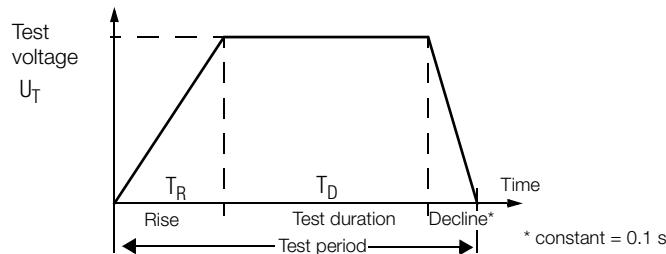
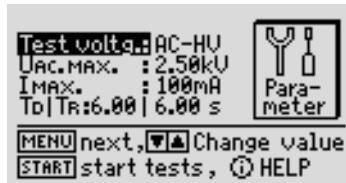
T_R : Rise time: time, during which test voltage rises to the selected value $U_{AC.MAX.}$
Setting limits: 100 ms ... 99.9 s



Select Parameter



Set Value



4.2.3 High-Voltage Testing Sequence



Attention!

Before initializing any tests, and before enabling the test equipment, make sure that all means of access to the danger zone are closed, and that all persons have exited the danger zone.

- Set the key switch to the "I" position.

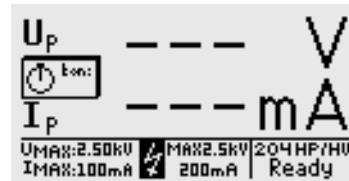
The test instrument is switched to the "standby" mode.

The green signal lamps are illuminated.

- Check the test parameters.
- Press the START key.

The test instrument is switched from the "standby" mode to "ready for operation". **The red signal lamps are illuminated.**

START



Attention High-Voltage!

Touch **neither** the test probes **nor** the device under test during the high-voltage test!

Life endangering high voltage of up to **5.3 kV** is present at the test probes of the high-voltage module!

- Position the high-voltage pistols in close proximity to the device under test.
- Pull both triggers, but only pull the trigger at the high-voltage switching pistol up to the first point of mechanical resistance.

The test probes are enabled.

- Establish contact with the electrical circuits.
- Pull the trigger of the high-voltage switching pistol to the limit stop.



High-voltage is now switched to the test probes.

Test time is indicated by an internal beeper which can be activated or deactivated, and visually by the timer symbol (ton = t_R + t_D).

The test continues until test time (selected rise time plus test duration) has elapsed: ton = 000.

- For subsequent testing of neighboring circuits, allow the trigger to return to the first point of mechanical resistance, establish contact with the next circuit and pull the trigger to the limit stop once again. Testing is started anew.



Saving Measured Values

After the test sequence has been completed, the last measured U_T and I_T values remain at the display. Results can be saved to memory with or without a comment. An automatically generated consecutive number is assigned to the results for allocation to the respective test.

A description with up to 15 characters can be entered for the measurement to the field at the bottom left. See chapter 5.1.1 on page 49 regarding entry.

The measured values at the display are overwritten when the next test is executed.



Press briefly: Save results

Press & hold: Save results and initialize entry field



Aborting the High-Voltage Test Before Completion

The high-voltage test can be aborted prematurely at any time by releasing the trigger at the high-voltage switching pistol.

If testing is aborted by releasing the trigger at the high-voltage switching pistol before the selected test duration has elapsed, displayed U_T and I_T values may deviate from the last measured values as a result.



Note

Breakdown Voltage

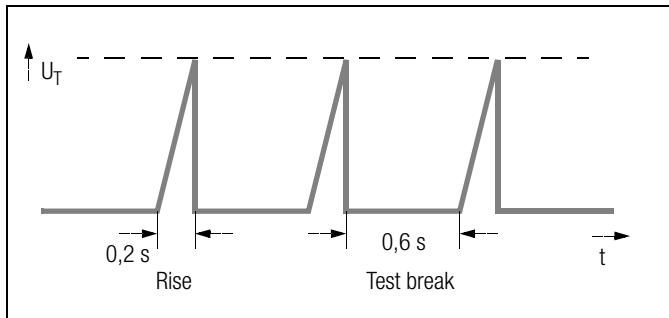
If interrupting current I_{MAX} is exceeded before the selected test voltage has been reached, test voltage U_T and current I_{MAX} measured at this point in time appear at the display preceded by the ">" symbol, and are saved to memory. The appropriate symbol is displayed simultaneously.

$I > I_{MAX}$

4.2.4 Pulse Control Mode

We recommend selecting the pulse control mode for troubleshooting purposes (arc-over pinpointing).

Interrupting current I_{MAX} is fixed to a value of approximately 125 mA with feature B1, and to approximately 5 mA with feature B2 in the pulse control mode. If this value is exceeded, test voltage is switched off within 0.5 ms. After approximately 0.6 s, test voltage is increased from 0 to its final value within a period of 0.2 s, or is switched back off if interrupting current is exceeded.



- ❖ Set I_{MAX} to >>>>> in order to activate the pulse control mode (see chapter 4.2.2 on page 36).
- ❖ If **continuous operation** is required, set test duration to >>>>>> as well (see chapter 4.2.2 on page 36).

4.2.5 Ending the High-voltage Test

- ❖ Release the triggers at the high-voltage pistols.
- ❖ Press the MENU key.
- ❖ The signal lamps change from red to green.
- ❖ The test system must be removed from service (signal lamps off) if left unattended.
- ❖ Set the key switch to the "0" position and remove the key, and secure the device against unauthorized use.

4.3 Polarization Index Measurement

A polarization index test is recommended for electrical machines. This procedure involves expanded testing of insulation resistance. DC measuring voltage from the METRISO®5000 D-PI is applied to the insulation for a duration of 10 minutes. Measured values are documented after one minute, and after ten minutes. If the insulation is good, the value measured after ten minutes is higher than the value measured after one minute. The relationship between the two measurement values is the polarization index. Charged material within the insulation is aligned due to the application of measuring voltage over a long period of time, resulting in polarization. The polarization index indicates whether or not the charged material contained in the insulation can still be moved, thus allowing for polarization. This, in turn, is an indication of the condition of the insulation.

The following rules apply in general:

PI values < 1 Troubleshooting is required.

PI values = 1 ... 2 Maintenance is recommended.

PI values = 2 ... 4 DUT is OK, no immediate action is required. Preventive maintenance can be planned according to the number of tests to be performed.

PI values > 4 DUT is in flawless condition.

Applications

Determination of moisture and contamination levels

Absorption Index (DAR) – DC Charging Test

The absorption index test is part of the polarization index test. Insulation resistance measurements are placed in relationship to one another after 30 and 60 seconds.

Application: Faster version of the polarization index test



Select the Test



Open the Submenu

4.3.1 Setting Test Parameters

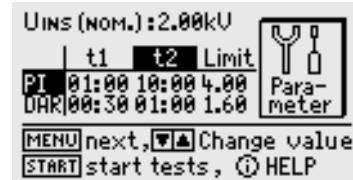


MENU

Select Parameter



Set Value



Significance of Parameters

U_{ins[nom]} Nominal insulation voltage
100/250/500 V, 1.00/1.50/2.00/2.50/5.00 kV

PI(t2/t1) Polarization index PI is the relationship between insulation resistance values measured after 1 minute PI(t1), and after 10 minutes PI(t2). Other durations can be selected if required.

PI (limit) Selected polarization index limit value: appears in the footer in the measuring menu

DAR(t2/t1) Absorption ratio DAR is the relationship between insulation resistance values measured after 30 seconds DAR(t1), and after 60 seconds DAR(t2). Other durations can be selected if required.

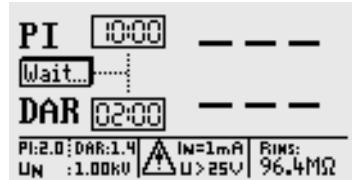
DAR (limit) Selected absorption ratio limit value: appears in the footer in the measuring menu

For resetting parameter values to default setting, see page 22.

4.3.2 Starting the Test



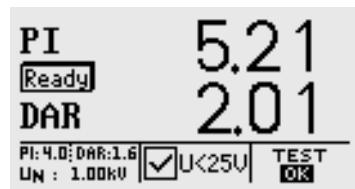
START



The two countdown timers (10:00 and 02:00) display remaining test time for each respective function.



STORE



Press briefly: Save results

Press & hold: Save results and activate the entry field:

A description of the measurement with up to 15 characters can be entered to the information field at the bottom. See chapter 5.1.1 regarding entry.

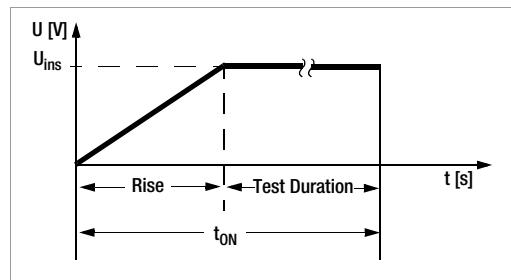
4.4 Breakdown Voltage

Step-Voltage Test – DC Charging Test

Voltage is increased up to the limit value (selected maximum test voltage) over the selected rise time during the breakdown voltage test. If voltage breakdown occurs before this value is reached, breakdown voltage U_{brk} is displayed.

If the selected test voltage is reached, testing is continued at this voltage level until the time period selected under "test duration" has elapsed.

If no breakdown occurs before the selected test duration has elapsed, the test has been passed, in which case the following display appears: $U_{brk} --$. Breakdown voltage is displayed in all other cases.



Applications

For the recognition of cracks and holes in the insulation



Select the Test

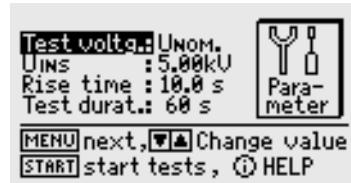
Open the Submenu

Function
Insulation Test
Polarisation Ind./DAR
Withstand/Breakdown
Capacitance/DD
Voltage Measurement

4.4.1 Setting Test Parameters



Set Parameters



Significance of Parameters with Variable and Fixed Test Voltage

Test voltage U_{nom} : Test voltage in fixed steps (100/250/500 V, 1.00/1.50/2.00/2.50/5.00 kV)

U_{var} : Variable test voltage (100 V ... 5.00 kV)

U_{ins} : Test voltage (see fixed steps above)

Rise: Time after which maximum test voltage will be reached (5 s ... 300 s)

Test duration: Test duration at maximum test voltage (AUTO, 1 s ... 120 s, >>> (continuous, burn mode))

For resetting parameter values to default setting, see page 22.

4.4.2 Starting the Test



Press briefly: Save results

Press & hold: Save results and activate the entry field:
A description of the measurement with up to 15 characters can be entered to the information field at the bottom. See chapter 5.1.1 regarding entry.

4.5 Capacitance Measurement and Determination of Dielectric Discharge (optional)

Capacitance measurement is performed with adjustable test voltage by charging with constant current. The measurement is performed with automatic range selection. One of the nominal test voltages (U_{nom}), or a freely selectable test voltage (U_{var}) can be used.

Dielectric Discharge Test (DD)

This test was developed for use with large machines and is performed, as its name indicates, during discharge. It designates the ratio of the discharge current after one minute and the product of voltage by capacitance:

$$DD = \frac{I_{\text{Disch}}(1\text{min})}{U \cdot C} \cdot 1000$$

DD values > 4: Troubleshooting is required

DD values = 2 ... 4 Maintenance is recommended

DD values < 2 DUT is OK, no immediate action is required.

Application: Determination of the magnitude of absorbed contamination or moisture



Select the Test



MENU

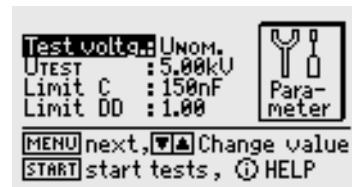
Open the Submenu



4.5.1 Setting Test Parameters



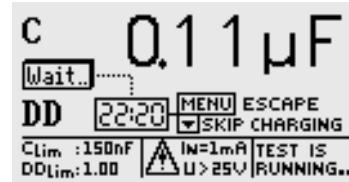
Set Parameters



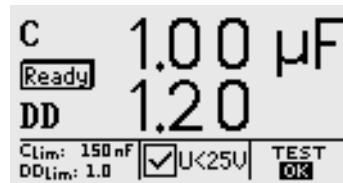
For resetting parameter values to default setting, see page 22.

4.5.2 Starting the Test

START



After capacitance has been determined, the instrument automatically continues with dielectric discharge testing. This takes about 30 minutes. However, the measurement can be aborted at any time by pressing the MENU key. Only capacitance is displayed in this case.



Press briefly: Save results

Press & hold: Save results and activate the entry field:

A description of the measurement with up to 15 characters can be entered to the information field at the bottom. See chapter 5.1.1 regarding entry.

4.6 Voltage Measurement (protection against residual voltage)

EN 60204 requires that voltages in excess of 60 V occurring at all accessible machine components during operation must drop to a residual voltage value of 60 V or less within a period of 5 seconds after supply power has been switched off.

Testing for the absence of voltage is performed by means of a voltage measurement which involves measuring discharge time with the METRISO® 5000 D-PI. Elapsed time as of disconnection from supply power is displayed continuously at the LCD during discharge, until the limit value of 60 is reached.

In addition to voltage type (AC, DC or AC+DC), frequency is measured and displayed as well. The mean value is always read out.

In addition to voltage and frequency, voltage type (AC, DC or AC+DC) appears at the symbol field in the display.

If voltage drops by more than 5% of the measured value during a single measuring period (approx. 0.7 sec.) while performing a voltage measurement which results in a value of greater than 60 V, a time measurement is started automatically in order to test protection against residual voltage. This time measurement can be observed at the display in the symbol field. Time measurement is stopped after voltage drops to below the limit value of 60 V.

Time required to discharge down to 60 V then appears at the display in seconds. Voltage measurement continues until maximum allowable discharge time has elapsed (normally 5 seconds). The results of the voltage measurement are then “frozen”, and the DATA HOLD symbol appears at the display. If the 60 V limit value is not reached before allowable discharge time has elapsed, the voltage value is “frozen” and time measurement continues until the 10 second time limit has elapsed. If voltage is still greater than 60 V after 10 seconds, the test is aborted and the instrument restarts voltage measurement.

When the display is “frozen”, voltage measurement is not started again until:

- The START key is pressed.
- The measured value is saved to memory by pressing the i/Store key.
- Voltage measurement is restarted from the menu.
- Or voltage at the test probes climbs back up to a value of greater than 60 V, or if the next measured value after a measurement of greater than 60 V is even higher, i.e. if a climbing tendency can be observed.

Both elapsed time and the prevailing voltage value after allowable discharge time has elapsed are saved to memory by pressing the i/Store key. If no discharge takes place, only the voltage value is saved.



Note

If, for example, conductors are exposed when a machine is switched off – e.g. if plug connectors are disengaged – and if these are not protected against direct contact, maximum allowable discharge time is 1 second!



TEST



Select the Test



MENU

Open the Submenu

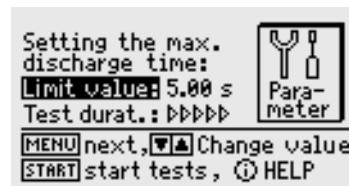
Function
Insulation Test
Polarisation Ind./DAR
Withstand/Breakdown
Capacitance/DD
► Voltage Measurement

4.6.1 Setting Test Parameters

The **discharge** time during which the voltage value must drop to a non-hazardous value of less than 60 V can be specified as a **limit value** between 1.0 and 9.00 seconds. The following message appears in order to indicate that the limit has been reached: "residual voltage less than 60 V!".



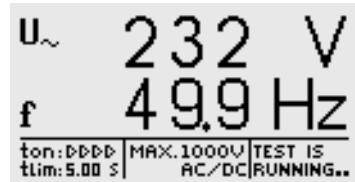
Set Discharge Time



Test duration is always set to continuous measurement in this case because residual voltage testing is triggered automatically and voltage measurement is always active for safety reasons.

For resetting parameter values to default setting, see page 22.

4.6.2 Starting the Test



Press briefly: Save results

Press & hold: Save results and activate the entry field:

A description of the measurement with up to 15 characters can be entered to the information field at the bottom. See chapter 5.1.1 regarding entry.

5 Processing, Reorganizing and Deleting Data

Previously stored data and data records can be processed with the selector switch in the **data management** position.

The following functions are available:

- **DUT data**

An object number can be assigned here, and measurements can be saved with reference to the selected number. Beyond this, a description can be entered for the respective object.

- **Data Processing**

Individual data resulting from a measurement (e.g. insulation measurement) performed on a previously selected object can be displayed with this function, and subsequently deleted if desired.

- **Data Reorganization**

Previously entered objects can be deleted from memory with this function, and memory can be tested as well.

- **Clear Memory**

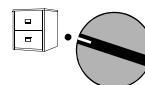
This command deletes data records previously saved to memory for all objects. Full memory capacity is made available by means of this procedure.

Memory Occupancy

Current memory occupancy is continuously displayed as a bar graph for the first three menu items listed above.

Depending upon the number of objects stored to memory (max. 254), up to 1,600 measurements can be saved.

5.1 Select Device under Test (DUT)



Select a Command



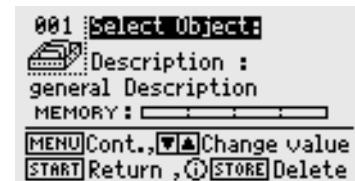
MENU

Submenu

Object no.



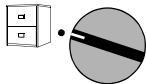
Select Number



Status:

A filled file cabinet indicates that measurement data have already been saved to memory for the selected object.

5.1.1 Entering Descriptions



Description

Description: A description can be entered here for an object, which is displayed and subsequently printed out when the respective object is selected.

There are five different ways to enter descriptions:

- Convenient entry with the PSI module (feature I1)
In this case, descriptions are entered using the alphanumeric keypad included with the PSI module (see operating instructions for SECUTEST PSI).
- Entry with the help of a barcode scanner (accessory no. B3261)
- Entry from a terminal
- Entry with PC keyboard via the PROFI-MFII adapter (accessory no. Z504H)

- Entry using keys at the METRISO® 5000 D-PI



Select Letter, Number or Character.



Move Cursor Left



Move Cursor Right



Completed entries must be acknowledged with the MENU key. The entry is then saved to memory. Alternatively, the "Store" key can be pressed at the PSI module.

Up to 250 characters can be entered. The entry line scrolls automatically.

A comment can be entered for each test step in the same way, immediately after the test has been performed. However, the length of these comments is limited to 15 characters.

5.1.2 Copying Descriptions

- Select the object with the description to be copied and press the MENU key 3 times.
- Select the new object and press the MENU key.

The copied text is displayed and can be edited.

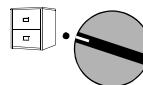
5.1.3 Deleting Descriptions

- Simultaneously press the i/STORE and START keys.

The description is deleted and the cursor is sent to the first character entry position in the description field.

5.2 Processing Data (checking measured values)

Measured values can be checked with this function, and individual measurements can be deleted if desired.



Select a Command



MENU



Select an Object



Delete the Object



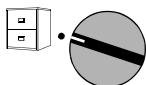
"Data record deleted" appears after deletion of the respective measurement has been started.

In order to delete a data record, the i/Store key must be pressed and held for approximately 1 second, thus avoiding inadvertent deletion. If the key is not released, all subsequent data records are then deleted sequentially at a rate of 1 record per second.

5.3 Data Reorganization

5.3.1 Deleting Already Printed Data

Data for individual DUTs which have already been printed out in report form, or DUTs which have been entered although no measured values have been saved for them yet, can be deleted here if desired.



Select a Command



MENU

Submenu



Start Deletion



STORE

Delete the Object

Security acknowledgement must be entered before deleting each individual object. As soon as objects whose data have already been printed out in report form have been deleted, a message to this effect appears. If the START key is pressed once again, a

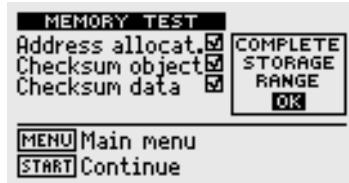
print-out is generated including all DUTs for which measured data are stored to memory.

5.3.2 Memory Test

The memory module is checked for errors with this function. Errors can be corrected in some cases. Follow the instructions which appear at the display.



MENU



Test Memory (press 3 times)



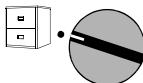
5.4 Clearing the Memory

This command deletes data records previously saved to memory for all DUTs. Full memory capacity is made available by means of this procedure.



Attention!

Data should be downloaded to a PC and saved before clearing the memory!



Select a Command



Submenu



Execute the Command

A security acknowledgement must be entered before memory is cleared. Final deletion is initialized with the **i/STORE** key.



Clearing the memory entirely may take several seconds. "Memory cleared" is then displayed.

6 Printing Test Results

The test instrument's report functions can be activated with the selector switch in the **printer** position. The following functions are available:

- **Print out values at the PSI module (feature I1):**

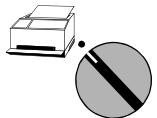
Measured values for a selected object can be printed out at the utilized printer module via the serial interface.

- **Print out values via the DA-II printer adapter (accessory):**

Measured values for the selected object can be printed out at an external printer with Centronics interface via the DA-II printer adapter.

- **Download templates from a PC (see WinProfi PC software in chapter 3.7.5):**

Report layouts can be specified by the user. A template with a header, a text body and a footer is required to this end. A template created by the user at a PC can be downloaded to the test instrument via the serial interface.



Select Printer



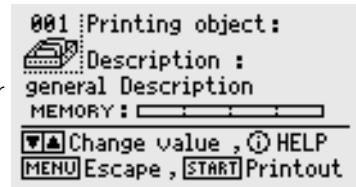
Printer Menu



Select an Object or a Number



Start Printing *



Change value, HELP
MENU Escape, START Printout

Status: A filled file cabinet indicates that measurement data have already been saved to memory for the selected DUT.
A printer symbol appears as long as data is being transmitted to the printer.

* A print-out which has already been started can only be aborted by turning the selector switch. An error message is generated if the printer does not work. Printing must be restarted in this case.



Select Printer

7 Characteristic Values

Standards	DIN EN 61557-1:1998-05
	DIN EN 61557-2:1998-05
VDE regulations	VDE 0413 Part 1:1998-05
	VDE 0413 Part 2:1998-05

Insulation Resistance

Display Range [Ω]	Measuring Range [Ω]	Test Voltage	Intrinsic Error	Measuring Error
0.00 M ... 50.0 G	0.60 M ... 10.0 G	100 V ... 250 V	±(10% rdg. + 5 d)	± (15% rdg. + 7 d)
	>10.0 G...50.0 G		±(25% rdg. + 5 d)	± (50% rdg. + 20 d)
0.00 M ... 250 G	0.40 M...50.0 G	>250 V ... 1.00 kV	±(7% rdg. + 5 d)	± (10% rdg. + 7 d)
	>50.0 G...250 G		±(25% rdg. + 5 d)	± (50% rdg. + 20 d)
0.00 M ... 999 G	0.40 M...200 G	>1.00 kV ... 5.00 kV	±(7% rdg. + 5 d)	± (10% rdg. + 7 d)
	>200 G...999 G		±(25% rdg. + 5 d)	± (50% rdg. + 20 d)

Test duration: automatic (until measured value stabilizes),
manual (1 ... 120 s) or continuous measurement (lock function)

Polarization Index (PI), Absorption Ratio (DAR)

	t1	t2	Limit
PI	00:00 ... 01:00 ... 99:50 min	00:00 ... 10:00 ... 99:50 min	0.10 ... 4.00 ... 9.80 min
DAR	00:00 ... 00:30 ... 99:50 min	00:00 ... 01:00 ... 99:50 min	0.10 ... 1.60 ... 9.80 min

PI and DAR are calculated values. Insulation measurement specifications apply.

Insulation Test Voltage

Nominal Values, Test Voltage	Variable Test Voltage	Nominal Current	Intrinsic Error
100 V, 250 V, 500 V, 1.00 kV		≥ 1.0 mA	0 ... +25% rdg.
1.50 kV, 2.00 kV, 2.50 kV		≥ 0.4 mA	± 5% rdg.
5.00 kV		≥ 0.1 mA	± 3.5% rdg.
	100 V...1.00 kV	≥ 1.0 mA	± 15% rdg.
	> 1.00 kV...2.50 kV	≥ 0.4 mA	± 5% rdg.
	> 2.50 kV...5.00 kV	≥ 0.1 mA	± 3.5% rdg.

Variable test voltage selectable in 50 V steps

Short-circuit current less than 2 mA with test voltage to 1.00 kV

Voltage Measurement

Measuring Range	Impedance	Intrinsic Error	Measuring Error
50 V ... 5.00 kV ins. test voltage		±(2.5% rdg. + 5 d)	±(5% rdg. + 5 d)
50 V ... 1.00 kV ac/dc	1 MΩ	±(2.5% rdg. + 2 d)	±(5% rdg. + 5 d)

Measured quantity frequency: 15 Hz to 1 kHz

Frequency Measurement

Measuring Range	Impedance	Intrinsic Error	Measuring Error
15.0 Hz ... 1.00 kHz	1 MΩ	±(0.5% rdg. + 2 d)	±(1% rdg. + 2 d)

Measured quantity voltage: 50 V ... 1 kV

Breakdown Voltage

Parameter	Setting Range	Intrinsic Error	Measuring Error
Voltage range	100 ... 5,000 V	±(10% rdg. + 8 d)	±(15% rdg. + 10 d)
Rise time	5 ... 300 s	—	—
Measuring time	1 ... 120 s / auto / continuous measurement	—	—

Capacitance Measurement

Display Range	Measuring Range	Test Voltage	Intrinsic Error	Measuring Error
0.00 ... 10.0 μ F	0.10 ... 5.00 μ F	100...450 V	$\pm(10\% \text{ rdg.} + 5 \text{ d})$	$\pm(15\% \text{ rdg.} + 8 \text{ d})$
		500...5 kV	$\pm(5\% \text{ rdg.} + 5 \text{ d})$	$\pm(10\% \text{ rdg.} + 8 \text{ d})$

Dielectric Discharge (DD)

	Limit
DD	0.10 ... 2.00 ... 9.80

Reference Conditions

Ambient temperature	+23 °C ± 2 K
Relative humidity	40 ... 60%
Measured quantity frequency	50 Hz ± 10 Hz (during voltage measurement)
Line voltage waveshape	Sinusoidal, deviation between RMS and rectified value < 1 %

Power Supply METRISO®5000 D-PI

Line voltage	207 V ... 253 V / 49 Hz ... 61 Hz <i>or (depending on country-specific design)</i> 108 V ... 132 V / 59 Hz ... 61 Hz
Power consumption	< 18 VA
Set of batteries	NiMH 9.6 V, 3 Ah, charging time 6 hours

Number of measurements with nominal current per VDE 0413 700

Power Supply PROFITEST 204HP/HV

Line voltage	207 V ... 253 V / 49 Hz ... 61 Hz
Power consumption	PROFITEST 204HP-2.5kV: max. 700 VA PROFITEST 204HV-5.4kV: max. 100 VA

Electrical Safety

Standards	IEC 1010-1:1990, IEC 1010-1/A2:1995 EN 61010-1:1993, EN 61010-1/A2:1995
VDE regulations	VDE 0411 Part 1, 1994-03
Fouling factor	2
Protection	IP 40

– METRISO®5000 D-PI

Oversupply category	Insulation measurement – 5000 V DC – no oversupply
	Voltage measurement – 600 V – CAT III
	Voltage measurement – 1000 V – CAT II

Safety class

II

– PROFITEST 204HP/HV

Safety class	I
Safety shutdown	if instrument overheats
Fuses	mains: F 3.15 / 250

Electromagnetic Compatibility (EMC) METRISO®5000 D-PI

Product standards EN 61326-1: 1997
EN 61326: 1997/A1: 1998

Interference Emission		Class
EN 55022		A
Interference Immunity	Test Value	Performance Feature
EN 61000-4-2	Contact/atmos. - 4 kV/8 kV	B
EN 61000-4-3	10 V/m	C
EN 61000-4-4	Mains connection - 2 kV	B
EN 61000-4-5	Mains connection - 1 kV	B
EN 61000-4-6	Mains connection - 3 V	B
EN 61000-4-11	0.5 period / 100%	A

Warning!

This is a class A device. This device may cause radio interference in residential areas.
If this is the case, the owner may be required to implement appropriate corrective measures.

Ambient Conditions

Accuracy 0 °C ... + 40 °C
Operating temperature -5 °C ... + 40 °C
Storage temperature -20 °C ... + 60 °C (without battery set)
Relative humidity max. 75%, no condensation allowed
Elevation to 2000 m

Mechanical Design METRISO®5000 D-PI

Display Multiple display with dot matrix
128 x 64 pixels

Dimensions W x H x D:
255 mm x 133 mm x 240 mm
approx. 5 kg with batteries

Mechanical Design

METRISO®5000 D-PI and PROFITEST 204HP/HV (Feature B1/B2)

Dimensions PROFITEST 204HP/HV:
W x D x H: 254 mm x 130 mm x 285 mm

METRISO®5000 D-PI and PROFITEST 204HP/HV completely mounted on Caddy204:
W x D x H: 380 mm x 250 mm x 650 mm
PROFITEST 204HP/HV: approx. 8 kg
METRISO®5000 D-PI and PROFITEST HP/HV:
completely assembled: approx. 13 kg

Feature B1: PROFITEST 204HP-2.5kV

	Nominal Range of Use	Resolution	Measuring Error	Intrinsic Error
Test voltage U AC	250 V ... 2.5 kV	1 V 10 V	±(5% rdg. + 5 d)	±(2.5% rdg. + 5 d)
Measured Quantity Current I AC	10.0 ... 200 mA	0.1 mA 1 mA	±(7% rdg. + 5 d)	±(5% rdg. + 5 d)

Feature B2: PROFITEST 204HV-5.4kV

	Nominal Range of Use	Resolution	Measuring Error	Intrinsic Error
Test voltage U AC	650 V ... 1.00 kV 1.00 kV ... 5.35 kV	1 V 10 V	+2 ... -7% rdg. +2 ... -5% rdg.	0 ... -5% rdg. 0 ... -3% rdg.
Measured Identity Current I AC	1.0 ... 10.0 mA	0.01 mA 0.1 mA	±(7% rdg. + 5 d)	±(5% rdg. + 5 d)

8 Data Interfaces

8.1 RS 232 Serial Interface

The data interface socket connector (4) is used to connect the SECUTEST PSI module (feature I1), a barcode scanner (accessory no. B3261) or the PROFI-MFII interface adapter (accessory no. Z504H) for entering data with a PC keyboard.

Test results can be printed out at the SECUTEST PSI as a report by listing measured values only.

An IBM compatible PC can also be connected to this interface, thus allowing for data exchange.

Pins 9 and 6 may not be short jumpered to pin 5!

8.1.1 Software Analysis of Measurement Results

Test reports can be conveniently created at a PC and downloaded to the test instrument with the included software.

8.1.2 Interface Specification and Protocol

The interface included with the METRISO®5000 D-PI complies with the RS 232 standard.

Technical Data:

Baud rate 9600 baud, fixed

Character length 8 bit

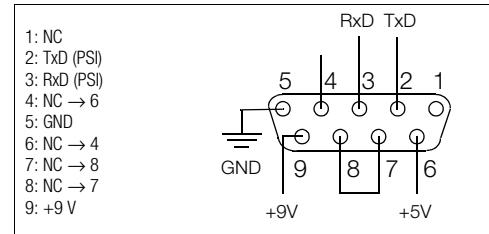
Parity none

Stop bits 1

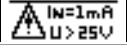
All METRISO®5000 D-PI control functions can also be remote controlled via this interface. Signal and display values can be read out as well.

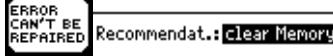
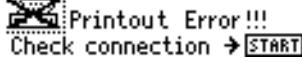
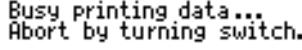
A description of the interface protocol, as well as commands and syntax, can be requested from GOSSEN METRAWATT GMBH.

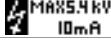
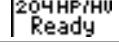
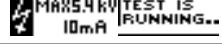
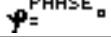
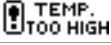
8.1.3 Connector Pin Assignments



9 Displays and Error Messages – Causes – Remedies

Displays and Error Messages	Meaning / Cause	Remedy
METRISO®5000 D-PI		
Test Sequence		
	Countdown runs here until residual voltage is less than 60 V.	
 	All-clear after an insulation test: voltage at test probes less than 25 or 60 V depending upon measuring function	
	The test has been passed.	
	The test results are not within allowable limit values.	
LCD does not light up	– Mains cable not plugged in – Mains fuse is blown	– Plug in the mains cable (see chapter 3.4 on page 20). – Replace the mains fuse (see chapter 10.1 on page 61).
	Indicates type of voltage: Alternating voltage with superimposed direct voltage – direct voltage – alternating voltage	
	Insulation measurement: Interference voltage at the test probes, measurement aborted	
	Warning against high voltage, voltage at the test probe between 1,000 V and 5,000 V	
	Warning concerning a source of danger, voltage at the test probe between 25 V and 1,000 V	
	This symbol appears after the voltage measurement value has been frozen (see chapter 4.6 on page 46).	
Database Operations		
	– No measurement has been performed. – The measurement has already been saved to memory.	
	See text at the display.	Press the START key to repair.

Displays and Error Messages	Meaning / Cause	Remedy
	An error has occurred while saving data to memory.	Save data to a PC and then clear the memory.
	See text at the display.	Press the START key to repair.
	Memory is no longer able to save new measurement data.	Save data to a PC and then clear the memory.
	See text at the display.	Transmit data to a PC or print them out, and then delete DUTs which are no longer necessary, or clear the entire memory.
	No data have yet been saved to this data record.	
	Printing is not possible.	Check connections at the printer and make sure paper is available. Check the printer for possible errors.
	Data are being transferred to the printer. The printer may wait until data transmission has been entirely completed before it starts printing.	
	A filled file cabinet indicates that measurement data have already been saved to memory for the selected DUT.	
	The data record has been deleted for a DUT.	
 No usable data in memory!!!!	The printer is not working.	Check the data record.
 Printout Error !!! Check connection → 	The printer is not working.	Check the connection between the printer and the METRISO®5000 D-PI. Then press the START key.
 Busy printing data... Abort by turning switch.	The printer is working correctly.	Turn the selector switch in order to abort the print-out.

Displays and Error Messages	Meaning / Cause	Remedy
	The measurement has been saved to memory.	
METRISO®5000 D-PI (with feature B1 or B2)		
	The displayed high-voltage module has been detected.	Turn device on with key switch.
	The displayed high-voltage module has been detected.	Turn device on with key switch.
PROFITEST 204HV / HP not found!	The displayed high-voltage module has not been detected. – Mains cable not plugged in – Key switch set to "0" – Blown fuse – Defective signal lamp	– Plug in the mains cable. – Set the key switch to "I". – Replace the fuse – Service
Green signal lamps do not light up.		
PROFITEST 204HV / HP not found!	– No data transfer between METRISO®5000 D-PI and 204HP/HV – Defective signal lamp	– See "Device defective!" error message. – Replace signal lamp, service
Red signal lamps do not light up.		
	High-voltage module ready to be switched on	
 or 	High-voltage is present at the test probes during measurement. Do not touch the test probes!	
	The specified limit value I_{MAX} has been exceeded. Current limiting has switched the device to the "standby" mode.	
	Test completed successfully. Residual voltage less than 25 V Phase angle display	
	Continuous operation with high test power during high voltage testing	Allow the device to cool for approximately 10 minutes.
	One of the two signal lamps in the high-voltage module is defective.	Send the high-voltage module to the GOSSEN METRAWATT GMBH service department for repair.

10 Maintenance

10.1 Replacing the Mains Fuse



Attention!

Disconnect the device from the measuring circuit at all poles before opening the fuse compartment!
Disconnect the device from the mains.



Attention!

Use only **specified, original replacement fuses!**

Bypassing or repairing fuses is prohibited!

If **fuses** with other current ratings, breaking capacities or blowing characteristics are used, the device may be damaged!

- ⇒ Open the fuse compartment at the inlet socket with a suitable tool (e.g. a screwdriver).
- ⇒ Replace the blown fuse with a new fuse with identical specifications.
- ⇒ Close the fuse compartment.

10.2 Disposing of Rechargeable Batteries

Check the batteries for leakage or damage at short regular intervals, and after long periods of storage. If damage or leakage has occurred, carefully and completely clean the electrolyte from the instrument with a damp cloth, and replace the batteries with a new battery pack (accessory no.) before placing the instrument back into service.

If the battery test (see chapter 3.7.4 on page 25) indicates that backup battery voltage or rechargeable battery voltage has dropped below the minimum allowable value, recharge the battery pack or have the backup battery replaced by the GOSSEN METRAWATT GMBH service department.



Note

Do not dispose of old batteries with the trash! Bring them to a designated collection point.

10.3 Housing and Test Probes

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



Attention!

No **condensation** may be permitted to occur at the test instrument, the test cables or the device under test, because high-voltage may otherwise cause leakage current at the surfaces. Insulated components may also conduct high-voltage in this case.

Measurements may not be performed under moist ambient conditions, where condensation has occurred or in explosive atmospheres.

10.4 Measurement Cables

Inspect the measurement cables for mechanical damage at regular intervals.



Attention!

Even if only minimal damage is discovered at the test cables, it is advisable to send them immediately to the GOSSEN METRAWATT GMBH Repair and Replacement Parts service department.

10.5 High-Voltage Module Test Cables (Feature B1/B2)

Wind the test cables onto the provided cable uptakes at the back of the trolley (feature D1) after each use if included. Test cables may not, under any circumstances, be mechanically damaged or kinked, because impaired insulation characteristics may otherwise result.

Inspect the test cables and the high-voltage pistols for mechanical damage before placing the high-voltage module into service each time it is used.



Attention!

Even if only minimal damage is discovered at the test cables or high-voltage pistols, it is advisable to send them immediately to the GOSSEN METRAWATT GMBH Repair and Replacement Parts service department.

10.6 Replacing Bulbs in the External Signal Lamps (Feature F1)



Attention!

Before replacing bulbs in the external signal lamps, disconnect them from the connector terminals at the test instrument.

- ⇒ Unscrew the red or green lens by turning it counterclockwise.
- ⇒ Remove the defective bulb from the bayonet socket and insert a new 12 to 15 V / 2 W bulb with BA9s base, e.g. OSRAM miniwatt T10 no. 3453B.
- ⇒ Screw the lens back into place by turning it clockwise.

10.7 Software

Internal test instrument software can be updated with the help of a PC with CD ROM drive and an interface cable for the RS 232 interface. The software is downloaded to the flash EPROM in the METRISO®5000 D-PI.

The data file with the desired software version is transmitted to the test instrument via the serial interface with the help of the update function included with WinProfi software. Previously installed software is overwritten in the process.

Downloading Procedure

- ⇒ Establish a connection between the PC and the METRISO®5000 D-PI.
- ⇒ Switch the PC and the test instrument on.
Continue as described in chapter 3.7.5 on page 26.



Note

After updating the software, reinstall the desired language to the test instrument as well, even if the language will not be changed. This assures that all of the additional functions included in the update are correctly displayed.

11 Appendix

11.1 Glossary

Abbreviation	Meaning
DAR	Absorption Ratio: Ratio between insulation resistance values measured after 30 and 60 seconds
DD	Dielectric Discharge
ΔR_{lim}	Maximum allowable statistical deviation from the measured mean value
$\Delta t/250V$	Dwell Time per Step
PI	Polarization Index: Ratio between insulation resistance values measured after 1 and 10 minutes
I_{MAX}	Max. allowable current before high-voltage is switched off
I_T	Interrupting current for high-voltage test
R_{ins}	Insulation Resistance
Limit R_{ins}	Limit value for insulation resistance
T_R	Rise time: time during which test voltage climbs to $U_{\text{AC},\text{MAX}}$.
T_D	Test duration at maximum test voltage $U_{\text{AC},\text{MAX}}$. (not including rise time TR)
$U_{\text{AC},\text{MAX.}}$	Maximum test voltage for high-voltage testing
U_{brk}	Breakdown Voltage
U_{ins}	Test Voltage
$U_{(\text{ins})\text{ end}}$	Ramp Function Upper Limit
U_{meas}	Measuring Voltage
U_{nom}	Nominal Test Voltage
U_T	Voltage value before exceeding interrupting current during high-voltage testing
U_{STEP}	Test voltage as ramp sequence
U_{test}	Test Voltage
U_{var}	Variable Test Voltage

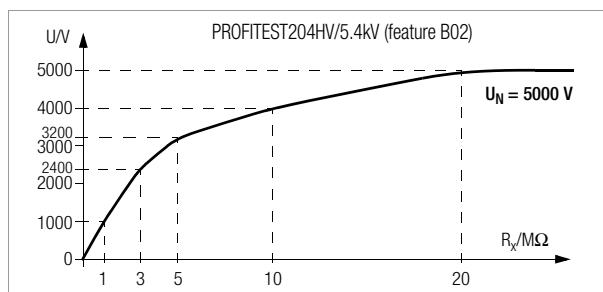
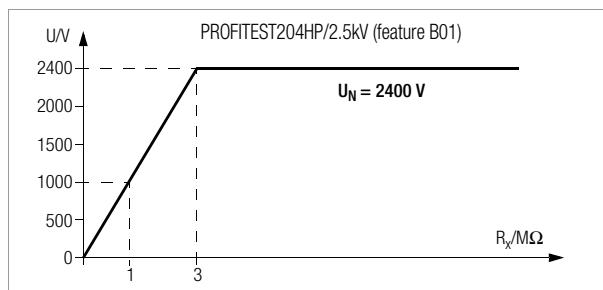
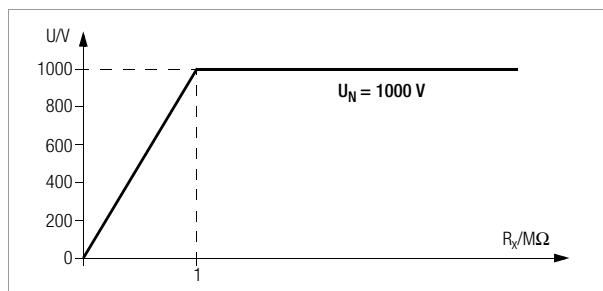
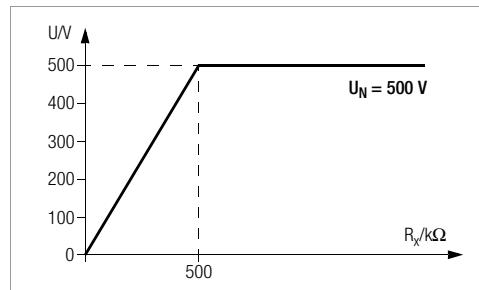
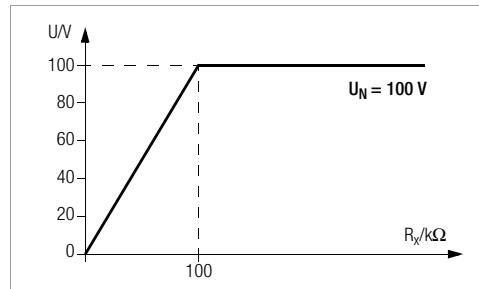
11.2 Minimum Display Values in Consideration of Measuring Error

Table for determining minimal display values for insulation resistance in consideration of the instrument's measuring error:

Limit Value	Minimum Display Value	Limit Value	Minimum Display Value
0.10 MΩ	0.12 MΩ	100 MΩ	118 MΩ
0.20 MΩ	0.23 MΩ	200 MΩ	228 MΩ
0.50 MΩ	0.56 MΩ	500 MΩ	558 MΩ
1.00 MΩ	1.18 MΩ	1.00 GΩ	1.18 GΩ
2.00 MΩ	2.28 MΩ	2.00 GΩ	2.28 GΩ
5.00 MΩ	5.58 MΩ	5.00 GΩ	5.58 GΩ
10.0 MΩ	11.8 MΩ	10.0 GΩ	11.8 GΩ
20.0 MΩ	22.8 MΩ		
50.0 MΩ	55.8 MΩ		

11.3 Voltage at Device Under Test During Insulation Resistance Test

Test voltage U at the device under test depending upon its resistance R_x at nominal voltage 100, 500, 1000, 2400 and 5000 V:



11.4 Index

B

Beeper

- acoustic 35
- Setting 24

Breaking current

- Display messages 13
- in case of breakdown voltage 38
- in pulse control mode 39

C

Current limiting in the event of arc-over

E

Electrical isolation

..... 13

F

Fuses

- Data 55
- Replacement 61

I

Interference voltage

 during insulation test 29

M

Measuring of

- Absorption index 40
- Breakdown voltage 42
- Capacitance 44
- High resistances 33
- Polarization index 40
- Voltage 46

P

Power failure

..... 13

R

Residual voltage

- Determining the value 46
- Display of discharge time 46

S

Safety measures

 Control circuits 11

- Frequency Converters 11
- Neutral conductor 11
- PELV circuits 11
- Persons 11
- TN systems 11

Signal lamp

 optical 35

Statistical analysis

 during insulation measurement 32

Storage batteries

- Display of measuring voltage 25
- Display of remaining capacity 20
- Operation with battery pack 15
- Recharging during mains operation 20

T

Test voltage

 during HV test

 in pulse control mode 39

 on device under test 64

 during insulation test

 Fixed steps 31

 on device under test 64

 variable/50 V steps 31

 during insulation test as a sequence of steps 31

W

WinProf

 Functions 5

 Installation and program start 26

 Transmission and print-out of report data 28

Discharge

- Automatic after insulation test 29
- Dielectric during capacitance measurement 44

12 Repair and Replacement Parts Service, DKD Calibration Lab* and Rental Instrument Service

When you need service, please contact:

GOSEN METRAWATT GMBH
Service Center
Thomas-Mann-Str. 20
90471 Nuremberg, Germany
Phone +49-(0)-911-8602-0
Fax +49-(0)-911-8602-2 53
e-mail service@gmc-instruments.com

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

Competent Partner

GOSEN METRAWATT GMBH is certified in accordance with
DIN EN ISO 9001:2000.

Our DKD calibration laboratory is accredited by the Physikalisch
Technische Bundesanstalt (*German Federal Institute of Physics
and Metrology*) and the Deutscher Kalibrierdienst (*German Cali-
bration Service*) in accordance with DIN EN ISO/IEC 17025 by
under registration number DKD-K-19701.

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

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

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

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

* **DKD** Calibration Laboratory for Measured Electrical Quantities:
DKD – K – 19701 accredited as per DIN EN ISO/IEC 17025

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

13 Product Support

When you need service, please contact:

GOSSEN METRAWATT GMBH

Product Support Hotline

Phone +49-(0)-911-8602-112

Fax +49-(0)-911-8602-709

e-mail support@gmc-instruments.com

Printed in Germany • Subject to change without notice

GOSSEN METRAWATT GMBH
Thomas-Mann-Str. 16-20
90471 Nuremberg, Germany



Phone: +49-(0)-911-8602-0
Fax: +49-(0)-911-8602-669
e-mail: info@gmc-instruments.com
www.gmc-instruments.com



GOSSEN METRAWATT