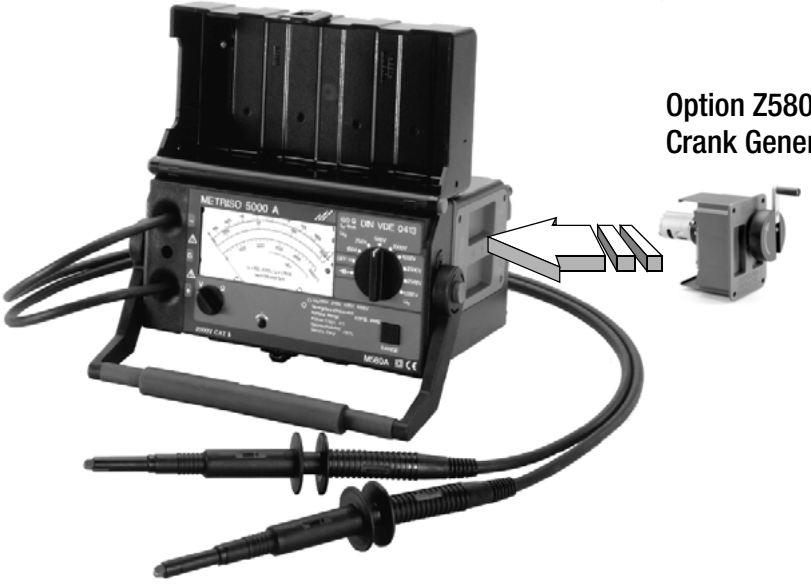
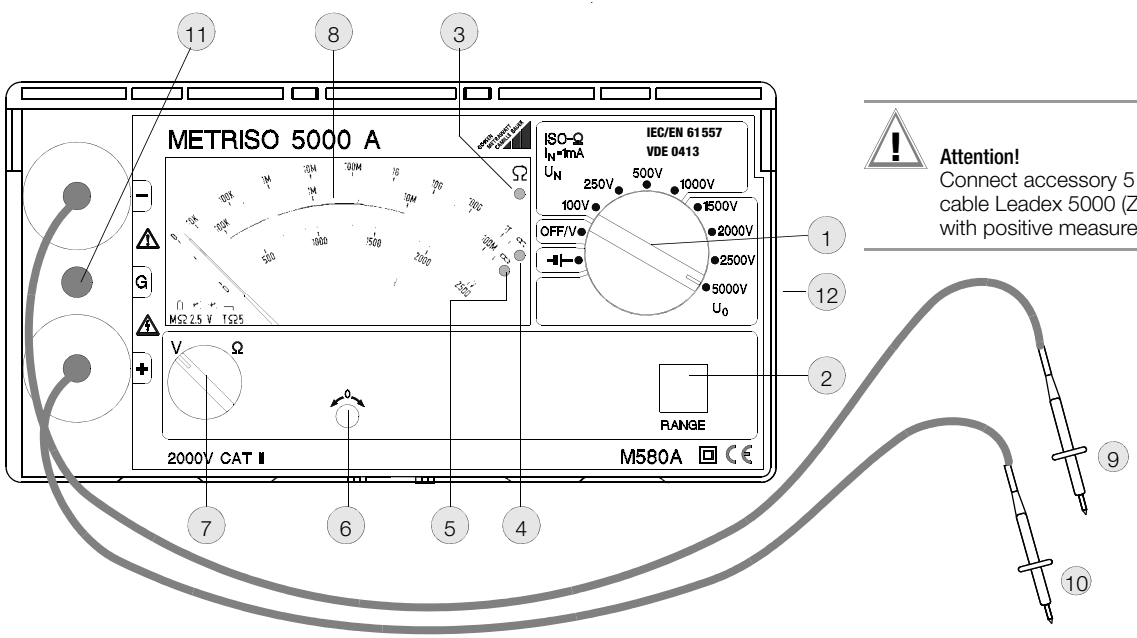
GOSSEN METRAWATT

METRISO®5000 A/AK

High-Voltage Insulation Tester With Battery or Crank Generator Operating Mode

3-348-857-37
7/8.05





Attention!
Connect accessory 5 m extension cable Leadex 5000 (Z580D) only with positive measurement cable!

1 Selector switch for test voltage, battery test and power supply interruption
2 RANGE key for measuring range selection
3 Ω indicator LED – green:measurement OK
– off: invalid measurement, battery too weak
4 LED lit: measuring range or scale up to 1 TΩ is selected
5 LED lit: measuring range or scale up to 100 MΩ is selected
6 Adjustor screw for mechanical zero adjustment
7 Selector switch for voltage or insulation resistance measurements
8 Analog display
9 Test prod for **–** measurement cable
10 Test prod for **+** measurement cable
11 Guard cable connector jack (accessory Guard 5000A (Z580C))
12 Battery or crank generator module

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1 Safety Precautions

This instrument fulfills the requirements of the applicable European and national EC guidelines. We confirm this with the CE marking. The relevant declaration of conformity can be obtained from GOSSEN METRAWATT GMBH.

The METRISO®5000 A/AK insulation tester is manufactured and tested in accordance with the following standards:

IEC 61010-1/EN 61010-1/VDE 0411-1,
IEC 61557/EN 61557/VDE 0413

In order to maintain flawless technical safety conditions and to assure safe use, it is imperative that you read the operating instructions carefully and thoroughly before placing your instrument into service, and that you follow all points contained therein.

Repair and Parts Replacement

Voltage conducting parts may be exposed when the instrument is opened. The instrument must be disconnected from all sources of voltage before repair or replacement of parts. If the repair of an open, live instrument cannot be avoided, this may only be performed by trained personnel who are familiar with the dangers involved.

Errors and Extraordinary Strains

If it may be assumed that the instrument can no longer be operated safely, it must be removed from serviced and secured against unintentional use. Send the instrument to the Repair and Replacement Parts Service Department; see Chapter 9, page 12. Safe operation can no longer be relied upon,

- if measurement cables are damages,
- if the instrument demonstrates visible damage,
- if the needle gauge no longer responds,
- if one of the LEDs is defective,
- if the instrument no longer functions,
- after lengthy periods of storage under unfavorable conditions.

Observe the following safety precautions:

- The instrument may only be operated with batteries or storage batteries. Mains driven power packs are not permissible, because the use of such is life endangering.
- Be prepared for the occurrence of unexpected voltages at devices under test. (For example, capacitors can be dangerously charged.)
- Make certain that measurement cables are in flawless condition, e.g. no damage to insulation, no creases, no interruptions etc.



Caution: High Voltage!
Do not touch the test prods or the device under test during voltage testing!
High-voltage of up to **5 kV** is present!



Attention!
Accumulation of Moisture
An accumulation of moisture on the tester, on the measurement cables or on the DUT must be avoided, because leakage currents may be caused by high-voltages at exposed surfaces. Even isolated components may carry high-voltages.



Note
Overvoltage Influence
If the reversible fuse (PTC thermistor) responds to an overvoltage or an extraneous voltage, measurement may not be resumed immediately. A cool-down period of approximately 2 minutes must be observed.

Meaning of symbols on the instrument



Warning concerning a point of danger
(Attention: observe documentation)



Caution: high-voltage!
A life endangering high-voltage of up to 5 kV is present at the test prods.

2000 V CAT II Measurement category II device



Continuous double, or reinforced insulation



Seal of approval from VDE testing authority



Seal of approval from CSA



This device may not be disposed with the trash.
For further details on the WEEE marking, please refer to our website www.gossenmetrawatt.de and enter search key 'WEEE'.



Indicates EU conformity

2 Applications

The METRISO®5000 A/AK insulation tester complies with regulation IEC 61557/EN 61557/VDE 0413 "Measuring and Monitoring Equipment for the Testing of Electrical Safety in Systems with Nominal Voltages of up to AC 1000 V and DC 1500 V" Part 2, insulation resistance testers.
It is suited for the measurement of insulation resistance for devices and systems in a voltage-free condition with nominal voltages of up to 1000 V. It is also suited for the measurement of insulation resistance of up to 1 TΩ with open-circuit voltages of up to 5000 V.
Additionally, the tester is equipped with a 2000 V measuring range for direct and alternating voltages. This is especially advantageous for the testing of DUTs for the absence of voltage, and for the discharging of capacitive DUTs.

3 Initial Start-Up

For initial start-up of the METRISO®5000 AK with crank generator or of the METRISO®5000 A with accessory crank generator module see Chapter 8 and Chapter 3.4. For initial start-up of the METRISO®5000 A with battery operation mode see Chapter 3.1 to Chapter 3.4.

3.1 Battery Installation

Attention!
Before opening the battery compartment (green side panel) be absolutely certain that the function selector switch is set to the "V" position, and that the range selector switch is set to the "OFF/V" position, and that the device is completely disconnected from all external power circuits.

- Unscrew and remove the battery compartment.
- Remove the battery clip.
- Pull the battery holder out of the battery compartment.
- Insert 6 commercially available 1.5 V type IEC R20 or IEC LR20 batteries or storage batteries (single cell) into the battery holder with correct poling as indicated by the symbols.
- Push the battery holder back into the battery compartment.
- Push the battery clip back over the contacts making certain that correct poling is assured.
- Return the battery compartment to the housing in the correct direction (labeling must be legible) and fasten with screws.

3.2 Testing the Batteries

After the batteries have been installed, or if the Ω indicator LED fails to light up during insulation resistance measurement, the batteries should be tested. For battery testing the range selector switch must briefly be set to the ⊣⊢ position. Deflection of the needle gauge within the ⊣⊢ scale for the battery test indicates the condition of the batteries or storage batteries at an average load of 1000 V test voltage. The position of the function selector switch need not be taken into consideration. The left end of the scale represents minimum required supply voltage, and the right end represents maximum available supply voltage.

Note
If the needle only moves into the minimal supply voltage range, several measurements can still be performed for test voltages of less than 1000 V, because the battery test is conducted with the same load as is used for a test voltage of 1000 V.

3.3 Switching the Tester On and Off

As long as the function selector switch is set to Ω, and the range selector switch is not in the OFF/V position, the tester remains activated. For purposes of transport and maintenance we recommend that the function selector switch be set to the V position, and the range selector switch to the OFF/V position, in order to prevent unintentional activation of the tester.

Note
Be certain that the grip on the function selector switch points exactly to "V" or "Ω". No intermediate selector switch positions have been defined, and inaccurate switch positioning leads to meaningless measurement results. This is especially important during discharging of capacitive devices under test, because voltages are not displayed in intermediate selector switch positions.

3.4 Analog Display

Logarithmic representation of the upper resistance scale allows for quick recognition of the magnitude involved.
In order to achieve the required accuracy for testing of protective measures, the RANGE key allows for switching to the expanded lower limit measuring range of 100 kΩ ... 100 MΩ.
The orange colored LEDs, (4) and (5), at the right end of the scale indicate which of the two resistance measuring ranges is currently active.
The Ω indicator LED lights up green to confirm correct insulation measurement. If this LED does not light up, test voltage has not been achieved. In this event a battery test is advisable.
The two lower scales are for voltage measurement and battery testing; see Chapter 3.2.

4 Direct and Alternating Voltage Measurements

Direct voltages and sinusoidal alternating voltages with frequencies ranging from 15 to 500 Hz can be measured with the tester. Deflection of the needle at the instrument is always positive for direct voltage measurements, regardless of polarity at the connections. Alternating voltage is indicated as an effective value.

Voltage measurements are used to test for the absence of voltage prior to insulation resistance measurements, as well as for the automatic discharge of capacitive devices under test. The voltage drop can be observed at the display.

Note

Voltage measurement can always be performed with the function selector switch in the "V" position, regardless of the position of the range selector switch (even without batteries).

- Set the function selector switch to the "V" position.
- Check to see that the needle points to "0" in the V scale when the test prods are not connected. Reset the needle as required with the adjustor screw for mechanical zero adjustment.
- The position of the range selector switch has no influence on voltage measurements, although we recommend setting it to the OFF/V position.
- Contact the measuring points with both test prods.
- Read the measurement value at the V scale.

Note

Voltages of greater than 2000 V may not be applied. Input resistance for the voltage measuring range is equal to 5 MΩ.

5 Insulation Resistance Measurement

Be certain that the device under test is voltage-free before performing measurements; see Chapter 4.

For measurements within a range of 100 GΩ (10 GΩ) ... 1 TΩ, the guard cable should be used; see Chapter 5.3, page 8.

5.1 Measurement Procedure

- Set the function selector switch to the Ω position, in order to activate test voltage.
- A range of either 10 kΩ ... 1 TΩ or 100 kΩ ... 100 MΩ can be pre-selected with the RANGE key.
- Select the required nominal voltage of 100 V, 250 V, 500 V, 1000 V, 1500 V, 2000 V, 2500 V or 5000 V with the range selector switch depending upon the nominal voltage of the DUT.
  When lit, the LED (4) indicates that the upper limit measuring range of 10 kΩ ... 1 TΩ has been activated.
- Contact the measuring point with both test prods and wait until the needle has come to rest. Depending upon the DUT this might take only a few, or up to 30 seconds, if, for example, large capacities (long cables) must be charged.
- Read the measurement value from the upper scale.
  If the Ω indicator LED (3) lights up green, the insulation measurement is valid. If this LED does not light up, test voltage has not been achieved. In this event a battery test is advisable; see Chapter 3.2, page 5.
- In order to achieve the required accuracy for testing of protective measures, select the high resolution range, 100 kΩ ... 100 MΩ, with the help of the RANGE key. The LED (5) lights up.
- Contact the measuring point with both test prods once again.
- Read the measurement value from the lower scale.

Attention!
Contact Hazard
Do not touch the conductive ends of the test prods when the instrument has been activated for the measurement of insulation resistance.
This may cause current to flow over your body, which, although it does not reach life endangering levels, causes a clearly discernible shock.
When measurements are made at capacitive devices under test, e.g. cables, the DUT may be charged with voltages of up to approximately 5000 V, depending upon selected nominal voltage. Contact with the device under test after measurement is, in this event, life endangering!
Safe Discharge
For this reason the DUT must be discharged in a controlled fashion by switching to V and contacting the DUT with the test prods until the measurement display indicates 0 V. Do not reverse the poles of the DUT during discharging, because internal overvoltage protection would otherwise be triggered. If the capacity to be discharged is greater than 3 µF, the poles may absolutely not be reversed, because the device might otherwise be damaged.

Note
Overvoltage Influence
If the reversible fuse (PTC thermistor) responds to an overvoltage or an extraneous voltage, measurement may not be resumed immediately. A cool-down period of approximately 2 minutes must be observed.

5.2 Evaluation of Measurement Values

In order to assure that insulation resistance values do not fall below those required by DIN VDE regulations, insulation tester inherent deviation and influence errors must be taken into consideration. Required minimum display values for insulation resistance which take maximum operational measurement deviation of the METRISO®5000 A/AK into consideration (under nominal conditions of use) can be determined with the following table. These are the minimum values which must be displayed, in order to assure that actual values do not fall below the required limit values. Intermediate values can be interpolated.

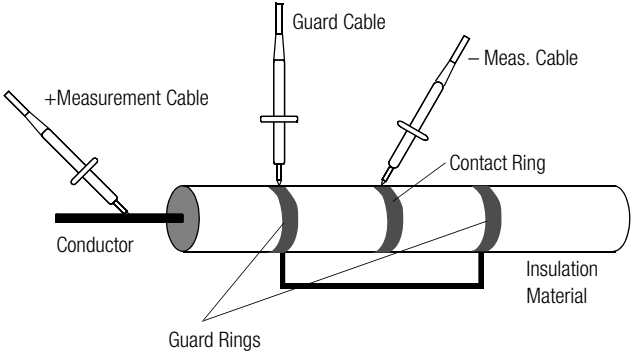
The table is valid for test voltages ranging from 100 V ... 1000 V.

Scale, 100 kΩ ... 100 MΩ	
Limit Value **[kΩ]**	Display Value **[kΩ]**
100	130
200	260
300	400
400	550
500	700
Limit Value **[MΩ]**	Display Value **[MΩ]**
1	1.3
2	2.6
3	4
4	5.5
5	7
10	13

5.3 Measurements with the Guard Cable (with Accessory Guard 5000A)

The measurement of very high impedance resistances presupposes extremely small measurement currents, and can be rendered problematic by influences such as electromagnetic fields, moisture or surface currents. For this reason, the measurement set-up must be implemented in an accurate fashion.

For measurements within a range of 100 GΩ (10 GΩ) ... 1 TΩ, a guard cable must be used in order to prevent the distortion of measurement results caused by surface currents. 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.



- ➪ Insert the guard cable plug into the appropriate jack at the tester.
- ➪ Plug the crocodile clip onto the guard cable test prod.
- ➪ Clip the crocodile clip onto the guard ring located between the two measuring points of the insulation material to be measured.
- ➪ See Chapter 5.1, page 6 for measurement procedures.

Note
The following materials can be used as guard rings: aluminum foil, copper foil or metal tubing clamps.

6 Characteristic Values

Insulation Resistance

Meas. Range	Nominal Range of Use	Nominal/ Open-Circuit Voltage U_N/U_0	Nominal Current I_N	S-C Current I_K	Inherent Deviation [1]	Service Meas. Deviation
100 kΩ ... 100 MΩ	100 kΩ ... 10 MΩ	100 V 250 V 500 V 1000 V	1 mA	1.3 mA	± 2.5%	±30% rdg.
10 kΩ ... 1 TΩ	100 kΩ ... 100 GΩ	100/1500 V 250/2000 V 500/2500 V 1000/5000 V	0.7 mA 0.5 mA 0.4 mA 0.1 mA	1.3 mA	± 5%	

Direct and Alternating Voltage

Measuring Range	Frequency	Internal Resistance	Max. Allowable Voltage	Inherent Deviation [1]
0 ... 2000 V AC/DC	15 ... 500 Hz	5 MΩ	2200 V AC/DC max. 10 s	±5%

Protective Devices

Terminal	Internal Resistance	Max. Allowable Voltage	Protective Device
–Measurement Cable	—	—	via grounded damping diodes
+Measurement Cable Insulation Measurement	—	to –meas. cable: to guard cable: 2000 V AC/DC max. 10 s	diodes in high-voltage cascade, PTC thermistor [2] and series resistors
Guard Cable	between guard and meas. cables 90 kΩ	to –meas. cable 2000 V AC/DC max. 10 s	PTC thermistor [2] and series resistors
Battery	—	10 V	pole protection with diodes voltage limiting in battery charger (optional)

[1] as related to scale length
[2] PTC thermistor cool-down period until start of new measurement: at least 2 minutes must be observed!

Display

Movement	core-magnet moving-coil mechanism
Scale Length	111.5 mm (longest scale)

Reference Conditions

Ambient Temp.	+23 °C ±2 K
Relative Humidity	40 ... 60%
Meas. Quantity	
Frequency	50 Hz ±10 Hz (for voltage measurement)
Mains Voltage	
Waveform	sine, deviation between effective and rectified value < 1%
Battery Voltage	8 V ±1%
Operational Position	horizontal

Power Supply

Battery or Storage Battery	6 ea. 1.5 V single cell per IEC R20 (6 · D-Size)
Working Range	6 V ... 10 V
Battery Service Life	7500 measurements at 1000 V test voltage with 1 MΩ measuring shunt, 15,000 measurements at 500 V test voltage with 500 kΩ measuring shunt, with 5 s measurement and 25 s pause

Ambient Conditions

Operating Temp.	0 °C ... + 40 °C
Storage Temp.	–20 °C ... + 60 °C (without batteries)
Relative Humidity	max. 75%, no accumulation of moisture
Elevation	to 2000 m

Electrical Safety

Protection Class	II
Test Voltage	8.5 kV~
Measurement Category	II
Contamination Level	2

Electromagnetic Compatibility EMC

Product Standard	DIN EN 61326: 2002

Interference Emission		Class
EN 55022		B
Interference Immunity	Test Value	Performance Feature
EN 61000-4-2	Contact/Atmosphere. - 4 kV/8 kV	B
EN 61000-4-3	10 V/m	B

Mechanical Design

Dimensions	W x D x H: 290 mm x 250 mm x 140 mm
Weight	3.4 kg with batteries
Protection	IP 52

Extract from table on the meaning of IP codes

IP XY (1^{st} digit X)	Protection against foreign object entry	IP XY (2^{nd} digit Y)	Protection against the penetration of water
0	not protected	0	not protected
1	≥ 50.0 mm dia.	1	vertically falling drops
2	≥ 12.5 mm dia.	2	vertically falling drops with enclosure tilted 15°
3	≥ 2.5 mm dia.	3	spraying water
4	≥ 1.0 mm dia.	4	splashing water
5	dust protected	5	water jets

Making Capacity for Insulation Resistance Measurement

Response Time	< 100 GΩ < 3 s; > 100 GΩ < 8 s also valid for test voltage or measuring range changes

7 Maintenance

Attention!
Before replacing batteries completely disconnect the device from all external power circuits.
For purposes of transport and maintenance we recommend that the range selector switch be set to the OFF/V position, in order to prevent unintentional activation of the tester.

7.1 Batteries

The condition of the batteries should be checked from time to time. Discharged or corroded batteries must be removed from the battery compartment. If leakage occurs at the batteries, battery electrolyte must be completed removed and the batteries replaced. The batteries must be replaced when:

- the needle gauge no longer climbs into the scale which contains the battery symbol when the range selector switch is set to the battery test position.
- the indicator LED for the selected test voltage does not light up green.

Batteries are to be replaced as described in Chapter 3.1, page 5. Always replace batteries as a complete set!

7.2 Housing

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

7.3 Measurement Cables

Damaged or buckled measurement cables may not be used under any circumstances, because this may cause a reduction in insulation performance. The permanently connected test cables are double insulated. Inspect the measurement cables on a regular basis. We recommend that a thorough inspection be carried out every 6 to 12 months.

Attention!
Even if only very slight damage is apparent at the measuring cables, we recommend that you send the tester, together with the cables, to the GOSSEN METRAWATT GMBH Repair and Replacement Parts Service Department.

7.4 Repair, Parts Replacement and Device Balancing

Voltage conducting parts may be exposed when the instrument is opened. The instrument must be disconnected from the measuring circuit before repair, replacement of parts or balancing. If the repair of an open, live instrument cannot be avoided, this may only be performed by trained personnel who are familiar with the dangers involved.

8 Appendix – Z580A Crank Generator Operating Mode

8.1 Installing the Crank Generator

- ➪ Set the range selector switch at the METRISO®5000 AK to the OFF/V position and the function selector switch to V.
- ➪ Disconnect the measurement cables from the device under test!
- ➪ Unscrew and remove the battery module.
- ➪ Pull the battery clip out, and save the battery module for possible later use.
- ➪ Plug the battery clip onto the crank generator module.
- ➪ Insert the crank module into the instrument with the crank handle on top. Be certain that the rubber ring is not separated from the crank generator.
- ➪ Secure the crank module with the 4 screws.

8.2 Operating the Crank Generator

➪ Fold the crank handle out until it snaps into place.



Attention!
Turn the crank only in the direction indicated by the arrow.
The crank generator is difficult to turn in the other direction, and the protective devices at the generator and in the instrument may be destroyed after several rotations! Brief, inadvertent rotation in the wrong direction causes no damage.

Fold the crank handle to its closed position before transporting the instrument.

8.3 Measuring Insulation Resistance in the Crank Generator Operating Mode

➪ Establish contact with the DUT first, preferably with the included alligator clips. If this is not possible, and if contact must be established with the test probes, you will need a second person for assistance.

➪ Select the test voltage with the range selector switch.

➪ Set the function selector switch to Ω.

➪ Turn the crank in the direction indicated by the arrow at a speed which causes the Ω signal LED at the upper right hand portion of the display to light up and burn continuously.



Note
If the Ω signal LED is not lit, or if it flickers, test voltage is too low, i.e. too little power is being delivered by the crank generator. Measurement values are only valid if the Ω signal LED is continuously lit.

For high capacitance DUTs (cables, large machines and transformers), continue cranking until the needle gauge has stabilized. The Ω signal LED must be continuously lit during testing. This may take as long as several minutes, depending upon the capacitance of the DUT. Battery operation is recommended in such cases.

8.4 Discharging the Device Under Test

The function selector must be switched from Ω back to V, in order to discharge test voltage from the DUT. Contact with the DUT must be maintained until the discharge process has been completed. The range selector switch can be left at its original setting. The crank need not be operated in order to discharge the device under test.

8.5 Measuring Voltage in the Crank Generator Operating Mode

The crank need not be operated for the measurement of voltage. Voltage applied to the DUT is always displayed when the V/Ω function switch is set to V.

8.6 Characteristic Values

Nominal Voltage	7.5 V (at approx. 2.5 r.p.sec.)
Nominal Power	4 W (at approx. 2.5 r.p.sec.)

Ambient Conditions

Same as METRISO®5000 A (M580A)

Electrical Safety (installed)

Measurement Category	2000 V CAT II or 5000 V CAT I
Contamination Level	2
Protection	IP52

Extract from table on the meaning of IP codes

IP XY (1^{st} digit X)	Protection against foreign object entry	IP XY (2^{nd} digit Y)	Protection against the penetration of water
0	not protected	0	not protected
1	≥ 50.0 mm dia.	1	vertically falling drops
2	≥ 12.5 mm dia.	2	vertically falling drops with enclosure tilted 15°
3	≥ 2.5 mm dia.	3	spraying water
4	≥ 1.0 mm dia.	4	splashing water
5	dust protected	5	water jets

9 Repair and Replacement Parts Service DKD Calibration Lab* and Rental Instrument Service

When you need service, please contact:

GOSSEN METRAWATT GMBH
Service-Center
Thomas-Mann-Straße 20
90471 Nürnberg, Germany
Phone +49-(0)-911 86 02 - 0
Fax +49-(0)-911 86 02 - 2 53
E-mail service@gossenmetrawatt.com

This address is for Germany only. Abroad, our representatives or establishments are at your disposal.

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

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

Competent Partner

GOSSEN 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 Calibration 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 specialized personnel are capable of completing repairs using original replacement parts.
As a full service calibration laboratory, we can calibrate instruments from other manufacturers as well.

10 Product Support

When you need support, please contact:

GOSSEN METRAWATT GMBH
Product Support Hotline
Phone +49-(0)-911 86 02 - 112
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Edited in Germany • Subject to change without notice • A pdf version is available on the Internet.

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