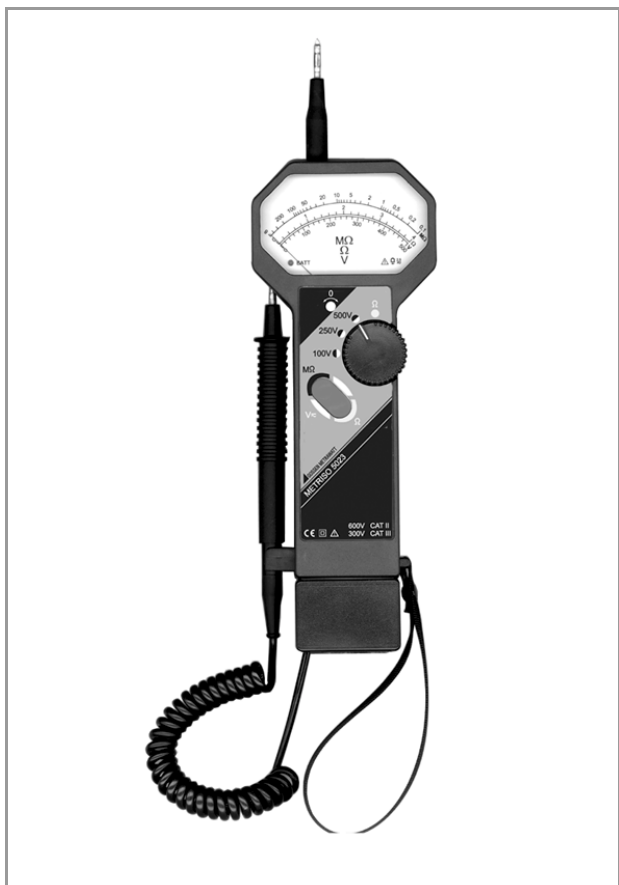


METRISO[®] 5023

Insulation and Resistance Measuring Instrument
with Voltage Measuring Range



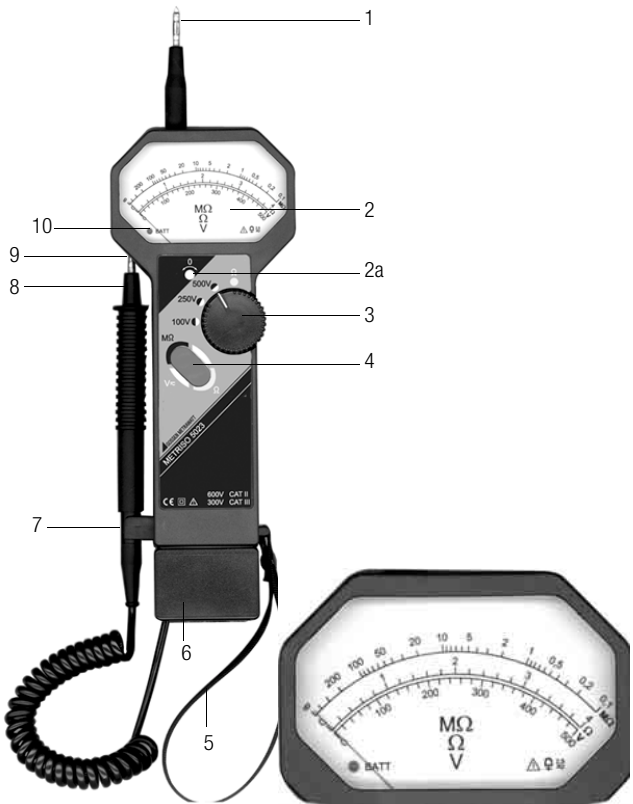




Figure 1 Controls

- 1 Measuring probe on housing (positive pole)
- 2 Scale
- 2a Adjusting screw for mechanical zero balancing
- 3 **Rotary switch** for
 - Ω : Low-resistance measurement (rocker switch in Ω position)
 - 100 V/250 V/500 V:
 - Rocker switch in neutral position:*
 - Voltage measurement
 - Test for absence of voltage and discharge capacitive DUTs
 - Rocker switch in $M\Omega$ position:*
 - Select test voltage for insulation measurement
- 4 **Rocker switch** for switching amongst V, Ω and $M\Omega$
- 5 Carrying strap
- 6 Battery compartment
- 7 Detaining fork
- 8 Test probe on coil cord (negative pole)
- 9 Opening for securing the test probe
- 10 LED for indicating device and battery status (see chapter 4.1)

Meanings of symbols on the instrument:

 Indicates EC conformity

 Continuous, doubled or reinforced insulation

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

CAT II **Maximum allowable voltage** between the test probes (1 and 8) and earth is **600 V, category II**.

| Table of Contents | Page |
|--|-----------|
| 1 Safety Precautions | 4 |
| 1.1 Defects and Excessive Stressing | 4 |
| 2 Device Description | 4 |
| 2.1 Using Device | 4 |
| 2.2 Design Description | 4 |
| 3 Preparation for Device Operation | 5 |
| 3.1 Unpacking the Device | 5 |
| 3.2 Power Supply – Battery Replacement | 5 |
| 3.3 Checking the Mechanical Zero Point | 5 |
| 3.4 Checking Device Functions | 6 |
| 4 Operation | 6 |
| 4.1 LED Function Indicator | 6 |
| 4.2 Voltage Measurement | 7 |
| 4.3 Insulation Resistance Measurement (VDE 0413, part 2 / EN 61557, part 2) | 8 |
| 4.3.1 Test Voltages | 9 |
| 4.4 Low-Resistance Measurement (VDE 0413, part 4 / EN 61557, part 4) ... | 9 |
| 5 Maintenance | 10 |
| 5.1 Housing | 10 |
| 5.2 Batteries | 10 |
| 5.3 Power Consumption Information | 10 |
| 5.4 Replacing the Fuse | 10 |
| 6 Characteristic Values | 11 |
| 7 Repair and Replacement Parts Service, DKD Calibration Lab and Rental Instrument Service | 12 |

1 Safety Precautions

The METRISO 5023 insulation measuring instrument is manufactured and tested in accordance with the following standards:

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

IEC 61557-2/EN 61557-2/VDE 0413-2

IEC 61557-4/EN 61557-4/VDE 0413-4

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

1.1 Defects and Excessive Stressing

If it can be assumed that safe operation is no longer possible, the instrument must be removed from service and secured against inadvertent use. It must be assumed that safe operation is no longer possible:

- If the device demonstrates visible damage
- If the instrument no longer functions
- After long periods of storage under unfavorable conditions
- After extraordinary stressing due to transport

2 Device Description

2.1 Using Device

The METRISO 5023 measuring instrument is a battery operated combination device with direct display. It is suitable for the following measurements:

- **AC and DC voltages** without indication of polarity within a range of 0 to 500 V. This function is especially well suited for testing DUTs for absence of voltage before performing resistance or insulation measurements.
- **Low resistance measurement** within a range of 0 to 4 Ω . Advantageous for resistance measurements at coils, over contacts, and at equipotential bonding conductors and protective conductors.
- **Measurement of insulation resistance** within a range of 100 k Ω to 400 M Ω . The device is suitable for measuring and testing insulation resistance at electrical systems and devices and allows for the selection of the following nominal voltages: 100 V, 250 V or 500 V DC.

2.2 Design Description

Thanks to its design and the use of two-hand operation (Figure 1), the device is well suited for safe, daily use. It can be secured against dropping with the attached carrying strap.

The METRISO 5023 includes two switches for device operation:

- Rocker switch for function selection (4)
- Rotary switch (3)

Measured values are displayed at three analog scales (2). Figure 1 shows these scales in detail. Insulation resistance is displayed at the uppermost scale, low-resistance at the middle scale and voltage at the bottom scale. The device's operating status and battery charge level are indicated with the 2-color LED in the scale (Figure 1).

The battery compartment is located in the housing base (6). The procedure for replacing batteries is described in 3.2.

All measurements are performed with two test probes:

- One test probe (1) is permanently attached to the housing – positive pole.
- The other (8) is attached to a coil cord – negative pole

This test probe (8) can be inserted into the opening (9) and secured by snapping the handle into the detaining fork (7).

As long as the rocker switch (4) is in the neutral middle position, the METRISO 5023 can be utilized as a voltmeter.

The rotary switch must be set either to the 100 V, 250 V or 500 V position in order to perform voltage measurements. No batteries are required for this function.

The rotary switch must be set to the Ω position in order to perform low-resistance measurements. Measurement is performed with the rocker switch (4) in the Ω position. Voltage cannot be measured as long as the rotary switch (3) remains in this position.

The desired test voltage must be selected with the rotary switch (3) before performing insulation measurements. Measurement is performed with the rocker switch (4) in the $M\Omega$ position.

3 Preparation for Device Operation

3.1 Unpacking the Device

Check for mechanical damage after unpacking the device. The device is ready for use as soon as the batteries have been inserted into the battery compartment.

3.2 Power Supply – Battery Replacement

The METRISO 5023 is operated exclusively with batteries for safety reasons. Batteries are inserted or replaced as follows:

- First disconnect the measurement cables from the device under test.
- Loosen the fastening screw at the bottom of the battery compartment (6) and remove the battery compartment.
- Remove the depleted batteries and replace them with new or fully charged batteries. Make sure that battery polarity is not reversed during insertion (see printed symbols on the compartment).
- Push the battery compartment back in and secure it with the screw.

Recommended batteries: 4 ea. alkaline batteries per LR6, mignon cells, AA cells, 1.5 V, at least 2300 mAh

3.3 Checking the Mechanical Zero Point

- Lay the device horizontally onto a work surface.
- Check the pointer for correct zero point adjustment and reset with the adjusting screw (2a) if necessary.

The device may not be connected to a measuring circuit during this procedure, and the rocker switch may not be activated.

Don't forget: Negative pointer deflection is suppressed by the scale's limit stop. Always turn the adjusting screw clockwise for this reason, and then slowly turn it counterclockwise until the 0 Ω or 0 V position is reached.

3.4 Checking Device Functions

The METRISO 5023 functions as a voltmeter when the rocker switch (4) is in the neutral position:

- The **voltmeter function** can be checked by applying a voltage to both test probes (1 and 8), e.g. line voltage from a mains outlet.
- When the rocker switch (4) is in either the Ω or $M\Omega$ position, the batteries are activated and the METRISO 5023 remains in the selected function as long as the rocker switch is activated. Correct measurements in the Ω and $M\Omega$ ranges are indicated by means of the green LED (10).
- The **ohmmeter function** – rotary switch in the Ω position and rocker switch in the Ω position – can be tested by short-circuiting the two test probes (1 and 8): $0\ \Omega$ appears at the display. Avoid open test probes (resistance approaching ∞).
- The **insulation measuring function** – rotary switch in the xxx V position and rocker switch in the $M\Omega$ position – can be tested with the help of the two limit values: Short-circuit the two test probes (1 and 8): $0.1\ M\Omega$ appears at the display. Separate the test probes: ∞ appears at the display.

Display accuracy can be tested using the ISO Calibrator 1 (article no. M662A) as an accessory by connecting it to the low or high value resistor.

4 Operation

4.1 LED Function Indicator

The 2-color LED in the scale indicates device status and the battery charge level:

- LED does not light up:
 - No batteries inserted
 - Voltage measurement can be performed
- LED continuously illuminated, green:
 - Batteries are OK
 - Device can measure low and high resistance
- LED blinks green:
 - In the case of insulation resistance measurement, test voltage is too low or DUT capacitance is being charged
- LED lights up red:
 - Battery voltage is too low *
 - Replace the batteries as soon as possible in accordance with chapter 3.2 in this case!

* With rocker (4) switch in the $M\Omega$ position: The pointer is deflected from one limit stop to the other in order to indicate that incorrect values are being displayed.
With rocker switch (4) in the Ω position: Displayed values are incorrect.

4.2 Voltage Measurement



Attention!

Before connecting the measuring instrument to an external source of voltage, make sure that the battery compartment has been correctly secured to the housing because the battery connector terminals are electrically connected to the measuring circuit!

No auxiliary power is required for voltage measurement, i.e. no batteries need to be inserted into the battery compartment. Direct and alternating voltages of up to 500 V can be measured without switching between zero-frequency and periodic quantities. Pointer deflection is always positive for the measurement of direct voltage, regardless of polarity.

Devices under test can be conveniently tested for absence of voltage using the voltage measuring function without activating any of the controls. Immediately after connecting the device under test, the instrument indicates whether or not external voltage is present. The voltage measuring range can also be used for discharging capacitive devices under test. The falling voltage value can be observed at the display.

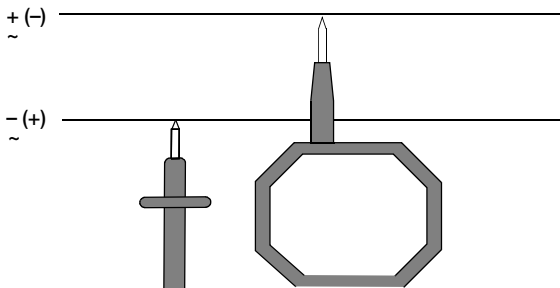
Adhere to the prescribed sequence for the performance of voltage measurement:

- Set the rotary switch (3) to the xxx V position.

The rotary switch may be set to any position other than Ω !



- Leave the rocker switch (4) in its neutral position (do not press).
- Contact the device under test with the test probes (1 and 8). Read the measured value from the voltage scale within a range of 0 to 500 V.



- End the measurement by removing the test probes from the device under test.

4.3 Insulation Resistance Measurement (VDE 0413, part 2 / EN 61557, part 2)



Attention!

Insulation resistance measurements may only be performed on voltage-free system components and devices!

Adhere to the prescribed sequence:

- Set the rotary switch (3) to the desired test voltage: 100 V, 250 V or 500 V.
- Contact the device under test with the test probes (1: positive pole and 8: negative pole).
- When the rocker switch is in the neutral position, the METRISO 5023 functions as a voltmeter for **testing for the absence of voltage**.
Immediately after contacting the device under test, the user can determine whether or not it is voltage-free.
A capacitively charged device under test is discharged directly via the voltmeter's internal resistance. Discharging can be observed at the display. However, if the voltage value remains constant insulation resistance cannot be measured until the device under test has been disconnected from all sources of voltage.
If zero voltage is displayed, measurement can be performed immediately.
- **Insulation resistance measurement** is performed for as long as the rocker switch is held in the $M\Omega$ position. Read the measured value from the logarithmic scale within a range of 100 $k\Omega$ to 400 $M\Omega$.
- End the measurement by releasing the rocker switch. Capacitive devices under test which have been charged by direct test voltage are discharged by the voltmeter.
- Remove the test probes from the device under test.



Attention!

When insulation resistance is measured at capacitive devices under test, e.g. cables, they may be charged with an open-circuit voltage of up to approximately 700 V, and may retain this charge for a lengthy period of time. This is a life endangering voltage, and the device under test must be discharged after measurement for this reason (see "testing for the absence of voltage" above).

Evaluating Measured Values

According to DIN VDE 0100, the insulation resistance of system components must have a value of at least 1000 Ω per V nominal voltage without any current-consuming apparatus in the line section between two overcurrent protection devices or switches, or downstream from the last overcurrent protection device, for example 380 $k\Omega$ at an operating voltage of 380 V.

In order to assure that the insulation resistance limit values specified in the applicable standards are not exceeded, maximum measuring error of the measuring instrument must be taken into consideration. The required minimum display values for various limit values are listed in the following table. Intermediate values can be interpolated in a linear fashion.

| M Ω Range | |
|------------------|-----------------|
| Limit Value | Min. Display* |
| 0.4 M Ω | 0.52 M Ω |
| 0.5 M Ω | 0.65 M Ω |
| 0.6 M Ω | 0.78 M Ω |
| 0.7 M Ω | 0.91 M Ω |
| 0.8 M Ω | 1.04 M Ω |
| 1 M Ω | 1.30 M Ω |
| 2 M Ω | 2.60 M Ω |

* Minimum display values for insulation resistance with specified limit values in consideration of maximum measuring error

Example:

With a limit value of 220 k Ω , a value of at least 286 k Ω must be displayed in the k Ω range according to the table.

4.3.1 Test Voltages

During measurement of insulation resistance, a test voltage U is applied to the device under test, which lies between the nominal voltage U_N selected with the rotary switch (3), and open-circuit voltage U_0 :

| U_N Position at Rotary Switch (3) | Test Voltage at DUT |
|-------------------------------------|---------------------|
| 100 V | 100 V < U < 110.8 V |
| 250 V | 250 V < U < 277.0 V |
| 500 V | 500 V < U < 554.0 V |

4.4 Low-Resistance Measurement (VDE 0413, part 4 / EN 61557, part 4)

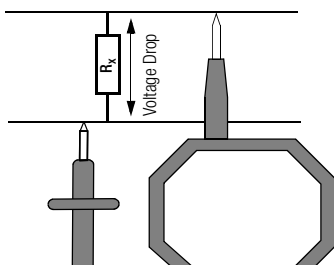
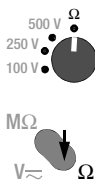


Attention!

Resistance measurements may only be performed on voltage-free devices under test, because interference voltages distort measurement results.

Adhere to the prescribed sequence:

- Make sure that the device under test is voltage-free in accordance with chapter 4.2.
- Set the rotary switch to Ω .
- Contact the device under test with the test probes (1: positive pole of the 200 mA constant current source and 8: negative pole of the constant current source).
- Measurement is performed for as long as the rocker switch is held in the Ω position. Observe the LED. Read the measured value from the scale within a range of 0 to 4 Ω . It is advisable to perform a second measurement with reversed polarity in order to eliminate semiconductor circuits.
- End the measurement by releasing the rocker switch.
- Remove the test probes from the device under test.



5 Maintenance

5.1 Housing

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

5.2 Batteries

Check the batteries at short regular intervals to make sure no leakage has occurred. If leakage occurs, electrolyte must be fully removed from the instrument and new batteries must be installed. Remove the batteries from the battery compartment if the measuring instrument will not be used for a lengthy period of time. Refer to chapter 3.2 regarding battery replacement

Attention: If the LED lights up red before or during measurement, the batteries must be replaced immediately.

Use only recommended battery types (see chapter 3.2).

5.3 Power Consumption Information

Power consumption during insulation resistance measurement depends upon the selected test voltage and the actual measured resistance value, i.e. load connected to U_N . The following table provides information regarding power consumption with various test voltages:

| Test Voltage U_N | Measured R_X/I_{BAT} ($U_{BAT} = 6 V$) | | |
|--------------------|--|----------------------------|----------------------------|
| 500 V | 0 k Ω / < 0.3 A * | > 1 M Ω / < 0.6 A | > 400 M Ω / < 0.3 A |
| 250 V | 0 k Ω / < 0.3 A * | > 500 k Ω / < 0.4 A | > 400 M Ω / < 0.2 A |
| 100 V | 0 k Ω / < 0.3 A * | > 200 k Ω / < 0.3 A | > 400 M Ω / < 0.2 A |

* If the LED blinks green, the transformer is overloaded.

Number of possible measurements with one set of batteries (alkaline-manganese)

Measurements with a duration of 1 minute each are assumed.

| Test Voltage U_N | AlMn Battery, Min. 2300 mAh |
|--------------------|-----------------------------|
| 500 V | > 300 measurements * |
| 250 V | > 500 measurements * |
| 100 V | > 750 measurements * |

* measured values correspond to those in column 3 of the table above

5.4 Replacing the Fuse

The low-resistance measuring range is protected with a fuse: F0.25A/500V, 6.3x32.

The fuse blows if a voltage is applied to the test probes which may cause damage to the instrument as a result of its magnitude or polarity.

Adhere to the prescribed sequence when replacing the fuse:

- Remove the test probes from the device under test.
- Loosen the 3 screws in the housing base.
- Turn the device over so that the control panel faces up and remove the housing top (i.e. control panel).
- Remove the fuse from its holder with the help of an object such as a test probe, and replace it with a new fuse.



Attention!

Use specified fuses only! If fuses with other blowing characteristics, other current ratings or other breaking capacities are used, the operator is placed in danger, and resistors and other components may be damaged.
The use of repaired fuses or short-circuiting the fuse holder is prohibited.

- Set the housing top back into place without applying pressure.
- Lay the carrying strap over the metal pin.



Note!

Make sure that the cable from the measuring element is not pinched when the housing bottom and the housing top are fitted together.

- Position the measuring instrument so that you view it from the side with the test probe snapped in to the detaining fork. The support included on the housing top must slide into the guide in proximity to the test probe holder, and may not be tilted at the display module. In this way, the housing top can be pressed onto the housing bottom without applying excessive force.
- Hold the housing top and bottom together and turn the entire instrument over so that the housing bottom faces up.
- Retighten the screws.

6 Characteristic Values

Insulation Resistance Measurement, Measuring Voltages: 100 / 250 / 500 V

| Measuring Range | Intrinsic Error | Overload | Measuring Current | Short-Circuit Current |
|-----------------|-----------------|----------|-------------------|-----------------------|
| 0.1 ... 400 MΩ | 2.5% * | 600 V AC | > 1 mA | < 10 mA |

* Measuring error under reference conditions relative to scale length (l = 84.6 mm)

Low-Resistance Measurement, Measuring Voltage: 4.5 V

| Measuring Range | Intrinsic Error | Overload | Measuring Current |
|-----------------|-----------------|----------|-------------------|
| 0 ... 4 Ω | 2.5% * | 250 V DC | >200 mA |

* Measuring error under reference conditions relative to upper range value (l = 74.9 mm)

Voltage Measurement, DC / AC (40 ... 200 Hz)

| Measuring Range | Intrinsic Error | Overload | Internal Resistance |
|-----------------|-----------------|----------|---------------------|
| 0 ... 500 V | 2.5% * | 600 V AC | 450 kΩ |

* Measuring error under reference conditions relative to scale length (l = 73.3 mm)

Reference Conditions

| | |
|-----------------------------|---|
| Normal position of use | horizontal |
| Ambient temperature | +23 °C ±2 K |
| Relative humidity | 40 ... 60% |
| Measured quantity frequency | 45 ... 65 Hz (during voltage measurement) |
| Line voltage waveshape | sinusoidal (RMS value) |
| Battery voltage | 5.5 V ±0.5 V |

Influence Error under Nominal Conditions of Use

Total error caused by battery, temperature and normal position of use = 10%

Nominal Conditions of Use

| | |
|------------------------|---------------|
| Temperature | 0 ... 40 °C |
| Normal position of use | any |
| Battery voltage | 4.4 ... 6.5 V |

Ambient Conditions

| | |
|---------------------|--|
| Storage temperature | -25 °C ... + 60 °C (without batteries) |
| Relative humidity | max. 75%, no condensation allowed |
| Elevation | to 2000 m |
| Deployment | indoors only, except within specified ambient conditions |

EMC

| | |
|-----------------------|---|
| Interference emission | EN 61326 EN 55022 class B |
| Interference immunity | EN 61000 -4-2 power feature A -4-3 power feature B |

Power Supply

| | |
|---------------|---|
| Batteries | 4 ea. 1.5 V mignon-cell per IEC LR6 (size AA) |
| Working range | 4.4 ... 6.5 V |
| Battery test | by means of LED (see chapter 4.1) |

Electrical Safety

| | |
|----------------------|-------------|
| Safety class | II |
| Test voltage | 3.7 kV |
| Overvoltage category | II / 600 V |
| Fouling factor | 2 |
| Fuse | F0.25A/500V |

Mechanical Design

| | |
|------------|--|
| Protection | housing: IP 50, terminals: IP 00 per DIN VDE 0470 part 1/EN 60529 |
| Dimensions | 98 mm x 310 mm x 40 mm |
| Weight | approx. 0.5 kg with batteries |

7 Repair and Replacement Parts Service, DKD Calibration Lab and Rental Instrument Service

When you need service, please contact:

GOSSSEN METRAWATT GMBH
Service Center
Thomas-Mann-Str. 20
90471 Nuremberg, Germany
Phone +49-(0)-911-8602-410/256
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.

Printed in Germany • Subject to change without notice

GOSSSEN METRAWATT GMBH
Thomas-Mann-Str. 16-20
90471 Nürnberg, Germany
Phone+49-(0)-911-8602-0
Fax +49-(0)-911-8602-669
e-mail info@gmc-instruments.com
www.gmc-instruments.com

 Member of
GMC Instruments Group

 GOSSSEN METRAWATT