Operating Instructions

GOSSEN METRAWATT
GMC-INSTRUMENTS GROUP

METRALINE DM 41

Digital Multimeter

3-447-024-03
3/6.24

Contents Page

1 Safety Instructions

Read and follow these instructions carefully and completely in order to ensure safe and proper use.
The instructions must be made available to all persons who use the device.
Keep for future reference.

General

- The device may only be used by electro-technically trained persons (ETP) and qualified electricians in the commercial field.
- Never work alone when carrying out measurements in an environment where there is a risk of electric shock.
- Observe the five safety rules in accordance with DIN VDE 0105-100, Operation of electrical installations – Part 100: General requirements.
  (1: Shut down entirely. 2. Secure against restart. 3. Assure absence of voltage at all poles. 4. Ground and short circuit. 5. Cover neighboring live components, or make them inaccessible.
- Observe and comply with all safety regulations which are applicable for your work environment.
- Wear suitable and appropriate personal protective equipment (PPE) whenever working with the instrument.

Accessories

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

Handling

- Use the device in undamaged condition only.
  Inspect the device before use. Pay particular attention to damage, interrupted insulation or kinked cables.
- Use the accessories and all cables in undamaged condition only.
  Inspect accessories and all cables before use. Pay particular attention to damage, interrupted insulation or kinked cables.
- If the device or its accessories don't function flawlessly, permanently remove the device/accessories from operation and secure them against inadvertent use.
- If the device or accessories are damaged during use, for example if they're dropped, permanently remove the device/accessories from operation and secure them against inadvertent use.
- If there are any signs of interior damage to the device or accessories (e.g. loose parts in the housing), permanently remove the device/accessories from operation and secure them against inadvertent use.
- The device and the accessories may only be used for the tests/measurements described in the documentation for the device.
- Equipment and accessories from Gossen Metrawatt GmbH are designed to function ideally with products from Gossen Metrawatt GmbH which are specifically intended for this purpose. Unless expressly confirmed otherwise in writing by Gossen Metrawatt GmbH, they are not intended or suitable for use with other products.
- Route cables in an orderly fashion, e.g. the mains power cable and accessory cables. Loose, disorderly cables result in unnecessary danger of tripping and falling.
- The instrument may only be used in electrical systems in which the electrical circuit is protected by a fuse or a circuit breaker with 20 A and the nominal voltage of the system does not exceed 600 V.

- The maximum permissible voltage between any connector sockets (1) and earth is 600 V. Voltages of more than 500 V can only be applied to the "⊥" and "V" sockets, with the selector switch in the voltage measurement position (changeover switch in "V" position).
- Unexpected voltages may occur in the devices under test (e.g. defective devices), for example capacitors may be dangerously charged.
- Special care must be taken when carrying out measurements in HF circuits. Dangerous pulsating voltages may be present here.
- This multimeter must not be used to measure circuits with corona discharge (high voltage).

Operating Conditions

- Do not use the device and its accessories after long periods of storage under unfavorable conditions (e.g. humidity, dust or extreme temperature).
- Do not use the device and its accessories after extraordinary stressing due to transport.
- Do not expose the device to direct sunlight.
- Only use the device and its accessories within the limits of the specified technical data and conditions (ambient conditions, IP protection code, measuring category etc.).
- Do not use the device in potentially explosive atmospheres. Danger of explosion!
- Do not use the device in areas subject to the risk of fire. Danger of fire!

Rechargeable Batteries/Batteries

- Use batteries in undamaged condition only. Risk of explosion and fire in the case of damaged batteries!
  Inspect the batteries before use. Pay particular attention to leaky and damaged batteries.
- When using (rechargeable) batteries, the respective test/measuring instrument may only be used with inserted and secured battery compartment lid. Otherwise, dangerous voltages may occur at the battery contacts under certain circumstances.

Fuses

- The device may only be used as long as the fuses are in flawless condition. Defective fuses must be replaced.
  Fuses may only be replaced by our repair service department.
- Never bridge the fuses. Never put the fuses out of operation.

Measurement Cables and Establishing Contact

- Plugging in the measurement cables must not necessitate any undue force.
- Never touch conductive ends (for example of test probes).
- Fully unroll all measurement cables before starting a test/measurement. Never perform a test/measurement with the measurement cable rolled up.
- Avoid short circuits due to incorrectly connected measurement cables.
- Ensure that alligator clips, test probes or Kelvin probes make good contact.
- As far as possible, do not move or remove plugs, test probes, alligator clips or Kelvin probes until testing/measurement has been completed.
  Unwanted sparking may otherwise occur due to test current.

2 Applications

Please read this important information!

2.1 Intended Use / Use for Intended Purpose

The METRALINE DM41 is a digital multimeter with digital display and automatic blocking sockets (ABS). It is used for measuring voltage (AC/DC), current (AC/DC), resistance, capacitance, frequency, continuity/diode, duty cycle and temperature (with thermocouple type K). Measuring ranges can be selected either automatically or manually.

Safety of the user, as well as that of the instrument, is only assured when it's used for its intended purpose.

2.2 Use for Other than Intended Purpose

Any use of the device that is not described in these condensed operating instructions is contrary to its intended use. Use for other than intended purpose may lead to unpredictable damage!

2.3 Repairs and Modifications

Unauthorized modification of the product is prohibited. Only authorized, trained personnel is permitted to perform repairs.

2.4 Liability and Guarantee

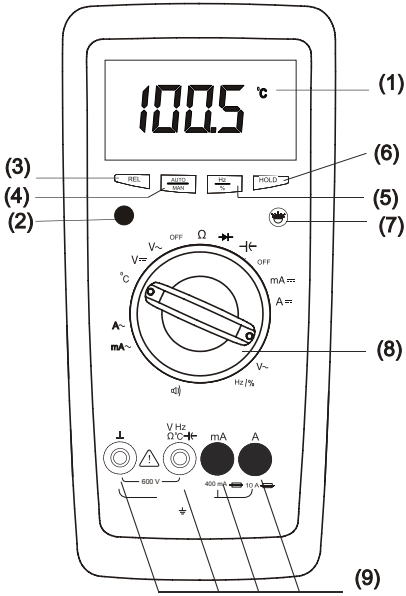
Liability and warranty granted by Gossen Metrawatt GmbH are governed by the applicable contractual and mandatory statutory provisions.

3 The Instrument

3.1 Scope of Delivery

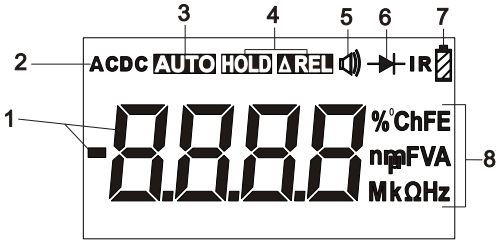
1 Multimeter METRALINE DM41
1 Rubber holster with carrying strap
1 Cable set
1 Set of batteries
1 Set of operating instructions

3.2 Multimeter Controls



1 LCD display
2 Multifunction key (yellow)
3 Button for relative values
4 Button for automatic or manual measuring range selection
5 Hz/% key for V_{AC} & V_{DC}
6 Key for data HOLD function (freeze measured value)
7 Backlight key (optional)
8 Rotary switch for ON/OFF and measuring functions
9 Connector jacks

3.3 LCD display



1 Digital display with decimal point and polarity display
2 Display of the selected current/voltage type
3 Display for automatic measuring range selection
4 REL, HOLD display
5 Continuity test indicator: Buzzer display
6 Diode measurement display
7 Low battery display
8 Display of the unit of the measured quantity

The digital main display shows the measured value with the correct decimal place and symbol. The selected measuring unit and measuring function are displayed.
When measuring direct current quantities, a minus sign appears to the left of the digits if the positive pole of the measured quantity is applied to the "⊥" input socket.
"**0L**" is displayed if the upper limit of the measuring range is exceeded.
The digital display is refreshed three times per second for V, A, Ω, capacitance, frequency and duty cycle measurements.

Backlight (optional)

By pressing the ☼ **key**, the backlight can be switched on or off to enable the user to conduct measurements in poor lighting conditions.

3.4 Buzzer

The following steps are indicated by an acoustic signal:

- Activation or deactivation of the following functions: AUTO/MAN, REL or HOLD, Hz / %, backlighting.
- If > 750 V, DC voltage > 1000 V, AC/DC mA > 400.0 mA and AC/DC A > 10 A are applied, the buzzer sounds as an overload warning.

For approximately 1 minute before the multimeter switches off automatically, the buzzer emits 5 beeps continuously as a warning signal. Before the multimeter switches off, the buzzer emits a long beep to warn the user.

3.5 Meanings of Symbols on the Instrument

	Warning concerning a source of danger (Attention, observe the operating instructions)
	Earth connection (earth terminal)
	Double or reinforced insulation
CAT II / III / IV	Device for measurement categories category II / III or IV
	European conformity marking

3.6 Technical Data

Measuring Function	Measuring Range	Resolution	Input Impedance V_{AC} / V_{DC}	Intrinsic Uncertainty of the Digital Display under Reference Conditions +(… % rdg. + …digits)	Overload Capacity [3] Overload Values	Overload Duration
V ⎓	400.0 mV	100 µV	> 20 MΩ	0.75 + 2	1050 V_{DC}	Cont.
	4.000 V	1 mV	11 MΩ	0.5 + 2		
	40.00 V	10 mV	10 MΩ			
	400.0 V	100 mV	10 MΩ			
	600 V	1 V	10 MΩ			
V ∼	400.0 mV	100 µV	11 MΩ	1.5 + 5	1050 V_{AC} RMS	Cont.
	4.000 V	1 mV	11 MΩ	1 + 5		
	40.00 V	10 mV	10 MΩ			
	400.0 V	100 mV	10 MΩ			
	600 V	1 V	10 MΩ	1 + 10		
			approximate voltage drop at maximum measuring current			
A ⎓	40.00 mA	10 µA	450 mV	0.8 + 2	480 mA	Cont.
	400.0 mA	100 µA	4.2 V			
	10.00 A [1]	10 mA	750 mV	1.5 + 5	[1]	[1]
A ∼	40.00 mA	10 µA	450 mV	1 + 5	480 mA	Cont.
	400.0 mA	100 µA	4.2 V			
	10.00 A [1]	10 mA	750 mV	2 + 5	[1]	[1]
			Open-Circuit Voltage			
Ω	400.0 Ω	100 mΩ	approx. 0.45 V	0.8 + 5	500 $V_{DC/AC}$ RMS	10 min.
	4,000 kΩ	1 Ω		0.8 + 2		
	40.00 kΩ	10 Ω				
	400.0 kΩ	100 Ω				
	4,000 MΩ	10 kΩ		1 + 5		
	40,000 MΩ	100 mΩ		2 + 5		
	400.0 Ω	100 mΩ		Acoustic Signal for 0 … < approx. 75 Ω		
	1.000 V	1 mV	approx. 1 V	2 + 10		

Measuring Function	Measuring Range	Resolution	Input Impedance	Intrinsic Uncertainty of the Digital Display under Reference Conditions +(… % rdg. + …digits)	Overload Capacity [3]	
			V_{AC} / V_{DC}		Overload Values	Overload Duration
⊣⊢	5.000 nF	1 pF	—	3 + 40 [4]	500 $V_{DC/AC}$ RMS	10 min.
	50.00 nF	10 pF		2 + 10 [4]		
	500.0 nF	100 pF		0.5 + 3 [4]		
	5,000 µF	1 nF		1 + 2 [4]		
	50.00 µF	10 nF		1.5 + 2 [4]		
	200.0 µF	100 nF		5 + 10 [5]		
			f min			
Hz [2]	10,000 Hz	0.001 Hz	1 Hz	0.2 + 2	≤ 1kHz: 1000 V ≤ 10kHz: 400 V ≤ 500kHz: 40 V except 400 mV	Cont.
	100.00 Hz	0.01 Hz				
	1.0000 kHz	0.1 Hz				
	10,000 kHz	1 Hz				
	100.00 kHz	10 Hz				
	500.0 kHz	100 Hz				
%	2.0 … 98.0 %	0.1%	—	10 Hz … 1 kHz: ± 5D 1 kHz 10 kHz: ± 5D/kHz		
			Sensor			
°C	0 … + 1300 °C	1 °C	K-type NiCr-Ni	2 + 3	$500_{VDC/AC}$ rms	10 min.

1) limited by 10A fuse
2) Display for frequency measurement extended to 9999 digits
3) at 0 °C ... + 40 °C
4) With zero adjustment "REL".
5) The time required for the measurement is approximately 60 seconds.

Reference Conditions

Ambient temperature	+ 23 °C ±2 K
Relative humidity	45% ... 55%
Measured quantity Frequency	Sine wave, 50 Hz
Measured quantity Waveform	Sinusoidal
Battery voltage	3 V ±0.1 V

Ambient Conditions

Operating temperature range	-10° C…+ 50° C
Storage temperature range	-25 °C ... + 70 °C
Relative humidity	45 to 75%
Height	To 2000 m

Display

LCD display (58 mm × 31.4 mm) with digital display and indication of the measured unit, the type of current and various special functions.

Digital details

Display/character height	7-segment characters / 15 mm
Number of places	3¾ digits correspond to 3999 steps
Overflow display	"OL"
Polarity display	The "-" sign is displayed when the positive pole is at "⊥"
Sampling rate	3 measurements per second for V, I, Ω, capacitance, frequency and duty cycle measurement

Influencing factors and effects

Influencing Variable	Sphere of Influence	Measured Quantity / Measuring Range	Influence Error
Temperature	0 °C … +21 °C and +25 °C … +50 °C	V ⎓, V ∼	1 × Intrinsic uncertainty/K
		mA/A ⎓, mA/A ∼	
		Ω	
		F	
		Hz	
		Duty cycle (%)	
		°C	

Influencing Variable	Sphere of Influence (max. resolution)	Frequency	Intrinsic uncertainty for reference ± (… % rdg. + … d)
Frequency V_{AC}	4, 40, 400 V	20 Hz … < 50 Hz > 50 Hz … 1 kHz	2 + 3
	400 mV, 600 V	20 Hz … < 50 Hz > 50 Hz … 500 Hz	2 + 3

Influencing Variable	Sphere of Influence	Measured Quantity / Measuring Range	Influence Error
Relative humidity	55 to 75%	$V_{AC/DC}$ $mA_{AC/DC}$ / $A_{AC/DC}$ Ω F Hz(%) °C	1 × intrinsic uncertainty

Influencing Variable	Interference Quantity	Measuring Range	Damping
Common Mode Interference Voltage	1000 $V_{DC/AC}$ 50 Hz sine	all V_{DC}	> 100 dB
	1000 V_{DC}	all V_{AC}	> 100 dB
	1000 V_{AC} 50 Hz sine	400 mV_{AC} / 4 V_{AC}	> 55 dB
		40 V_{AC}	> 55 dB
		400 V_{AC}	> 43 dB
		600 V_{AC}	> 23 dB
Series Mode Interference Voltage	max. 1000 V_{AC} 50/60 Hz sine	V_{DC}	> 43 dB
	max. 1000 V_{DC}	V_{AC}	> 55 dB

Influence of the auxiliary voltage:
(without 🔋 display) - all ranges except capacity: ± 8 D
cap. range ±20 D

Power Supply

Battery	2 × 1.5 V mignon cell (2 × AA size) Alkaline manganese per IEC LR6
Operating time	With alkaline manganese batteries: about 600 hours
Battery Test	Automatic display of the "▭" symbol when the battery voltage falls below approx. 2.4 V.

Fuses

Fuse for ranges up to 400 mA:	FF 315 mA/1000 V; 6.3 mm × 32 mm; switching capacity 30 kA at 1000 $V_{AC/DC}$ and resistive load; Protects all current measuring ranges up to 400 mA in combination with power diodes.
Fuse for ranges up to 10 A:	FF 10 A/600 V; 6.3 mm × 32 mm; Switching capacity 10 kA at 600 $V_{AC/DC}$ and ohmic load; protects the 10 A ranges up to 600 $V_{AC/DC}$.

Attention!
Defective fuses are not displayed. Current measurement is not possible with a defective fuse.

Electromagnetic Compatibility (EMC)

Interference emission	EN 61326, class B
Interference immunity	IEC 61000-4-2: 8 kV atmospheric discharge, 4 kV contact discharge IEC 61000-4-3: 3 V/m

Note
Electromagnetic interference can cause a short-term deviation in the measured values and thus reduce the specific operating quality.

Electrical Safety	IEC 61010-1
Measuring category	600 V CAT III / 300 V CAT IV
Pollution degree	2
High-voltage test	3.5 kV ~ (IEC 61010-1)

Mechanical Design

Protection	per DIN EN 60529 / IEC 60529 for multimeters: IP 50 (protection against ingress of solid foreign objects: protected against harmful amounts of dust; protection against ingress of water: not protected) for terminals: IP 20 (protection against ingress of solid foreign objects: ≥ 12.5 mm, ∅; protection against ingress of water: not protected)
Dimensions	(L ×W ×H): with protective rubber cover: 86 mm × 188 mm × 53 mm without protective rubber cover: 79 mm × 174 mm × 38 mm
Weight	approx. 480 g with batteries and protective rubber cover

Applicable Regulations and Standards

IEC 61010-1 EN 61010-1 VDE 0411-1	Safety requirements for electrical equipment for measurement, control and laboratory use
DIN EN 61326-2-1 VDE 0843-02-2-1	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-1: Special requirements for sensitive test and measuring instruments
DIN EN 60529 DIN VDE 0470-1	Test instruments and test procedures Degrees of protection provided by enclosures (IP code)

Inserting Batteries

Attention!
The multimeter must not yet be connected to the measuring circuit and must be switched off!

Attention!
Only use batteries that comply with the technical data! See chapter 3.6 on page 12.

- Loosen the screws of the battery compartment from the bottom of the housing. There is no reason to remove the entire housing bottom.
- Insert two new 1.5 V mignon cells, observing the polarity symbols in the battery compartment.

Attention!
When inserting the batteries, start with the positive pole of the battery and then insert the negative pole in the correct position to prevent damage to the contacts of the negative pole.

- Secure the battery compartment cover with the screw.

Switching on the Multimeter

Turn the function selector switch from the OFF position to the desired measuring function.
All segments of the LCD display are switched on briefly.
You can find a drawing of the LCD display on page 10 .

Note
Electrical discharge and high-frequency interference may lead to incorrect readings and block the measuring sequence. Reset the multimeter by setting it to OFF and then back to ON. If the procedure is unsuccessful, disconnect the battery from the contacts for a short time.

Automatic device shutdown (MoFF)

Your multimeter switches OFF automatically after 15 minutes if no keys or the function selector switch have been pressed during this time.

Switching the multimeter back on

Press the HOLD key.

Switching off the multimeter

Turn the function selector switch to the OFF position.

5 Operation

5.1 Selecting the Measuring Function

The desired measuring function is selected by using the function selector switch (white or green labeling). To select a function that is printed in green, press the yellow multifunction key. When the multifunction key is pressed again, the function printed in white is reactivated.

5.2 Automatic Measuring Range Selection

This multimeter offers auto-ranging for all measuring ranges, with the exception of the 400 mV~ and 10 A ranges. The automatic selection works as soon as the multimeter is switched on. The multimeter automatically selects the measuring range with the best resolution based on the applied quantity.

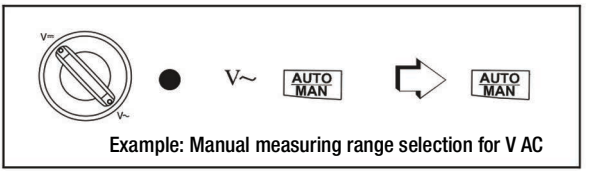
5.3 Manual Measuring Range Selection

You can switch off auto-ranging. You can manually select and define the measuring ranges according to the table on page 21.

First use the function selector switch to select the desired measuring function and, if necessary, use the multifunction key.

Briefly press the AUTO/MAN key.

Manual mode is switched off if you press and hold the AUTO/MAN key until you hear a second beep and the display switches to AUTO. If you switch back to automatic operation in the 400 mV~ range, the 4 V~ range is activated.



Example: Manual measuring range selection for V AC

⇓ AUTO / MAN	Function	Acknowledgement	
		Display	Acoustic Signal
brief	Manual mode **ON:** utilized measuring range is fixed		1 ×
brief	V ⎓: 400 mV → 4 V → 40 V → 400 V → 600 V → 400 mV → 4 V → ... V ∼/: 4 V → 40 V→ 400 V → 600 V → 400 mV → ... mA ⎓: 40 mA → 400 mA → 40 mA ... mA ∼/:40 mA → 400 mA → 40 mA ... Ω: 40 mΩ → 400 mΩ → 4 kΩ → 40 kΩ → 400 kΩ → 4 mΩ → 40 mΩ ...		1 ×
Long	Return to automatic measuring range selection	AUTO	2 ×

Note

For temperatures (°C), frequencies (Hz), duty cycles (%) and capacitance (F) the measuring range selection is always automatic. No manual measuring range selection is possible.

5.4 Measured Value Memory "HOLD"

By pressing the HOLD key, the currently displayed measured value can be "frozen" and "HOLD" is shown on the LCD display at the same time.

The HOLD display is switched off if:

- the HOLD key is pressed again,
- the function selector switch is pressed,
- the yellow multifunction key is pressed for a function change, e.g. AC → DC,
- the REL key is pressed,
- the AUTO/MAN key is pressed.

5.5 REL - Relative value measurement

The REL key is used to measure relative values and acts as an activation. All functions can be used with the relative value measurement, except Hz / duty.

6 Voltage Measurement

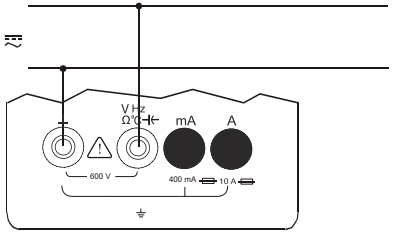
- ➪ Turn the function selector switch to V ⎓.
- ➪ Connect the measurement cable as shown. Terminal "⊥" should be grounded and the second measurement cable with a higher potential should be connected to terminal "V".

Note
The 400 mV~ measuring range can only be selected manually using the AUTO/MAN key.

Attention!
Ensure that the current ranges ("mA" or "A") are deactivated and that the measurement cables are connected with the appropriate "V" and "⊥" terminals before using your multimeter for voltage measurement.
If the limit values for fuse tripping are exceeded due to an operating error, both the operator and the instrument are in danger! Observe the voltage limit values printed on the multimeter!

- ➪ Select the respective voltage type (AC or DC) that corresponds to the measured values by briefly pressing the yellow multifunction key. Each time the key is pressed, it switches between AC and DC, which is also confirmed by an acoustic signal.

The AC and DC symbols indicate the selected voltage type on the LCD display. After selecting this function using the rotary switch, the DC voltage type is always activated.



7 Current Measurement

Notes on Current Measurement

- The multimeter may only be used on electrical systems in which the circuit is protected by a fuse or circuit breaker of maximum 20 A and the rated voltage of the system is not higher than 600 V.
- Set up the measuring circuit mechanically in a stable manner and secure it against inadvertent opening. The conductor cross sections and connection points should be designed so as to avoid excessive heating.
- Current ranges up to 400 mA are protected with an FF 315 mA / 1000 V fuse.

Note
Avoid continuous currents > 400 mA below the tripping value of the fuse!
In the long term, these may damage the instrument.

- In the 400 mA current measuring range, an intermittent acoustic signal warns you if the measured value exceeds the upper limit of the current measuring range.
- The 10 A current measuring range is protected by a 10 A / 600 V fuse.

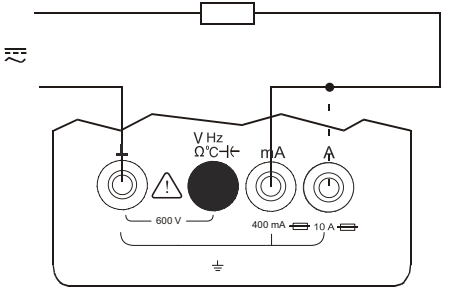
Procedure

Attention!
First disconnect the power supply from the measuring circuit and/or the load and discharge any capacitive elements in this circuit.

1 Select function A with the function selector switch for currents > 400 mA or function mA for currents < 400 mA. When measuring currents of unknown quantity, switch on the highest current measuring range first.

2 Select the AC or DC current type of the measured quantity by briefly pressing the yellow multifunction key. Each time the key is pressed, the system switches alternately between DC and AC and the switchover is confirmed by an acoustic signal. The AC and DC symbols indicate the selected voltage type on the LCD display.
After selecting the current measurement function using the rotary switch, the DC current type is always activated.

3 Safely connect the measuring instrument (without contact resistance) in series to the power consumer as shown.



Attention!
Interrupt the current flow immediately after you have completed the measurement!
Continuous high current flow may damage the instrument.
Please note in particular that currents continue to flow even after the instrument has been switched off automatically (MoFF).

7.1 AC Current Measurement with Current Transformer

Current transformers are available as optional accessories. For information see data sheet.

7.1.1 Transformer output mA/A

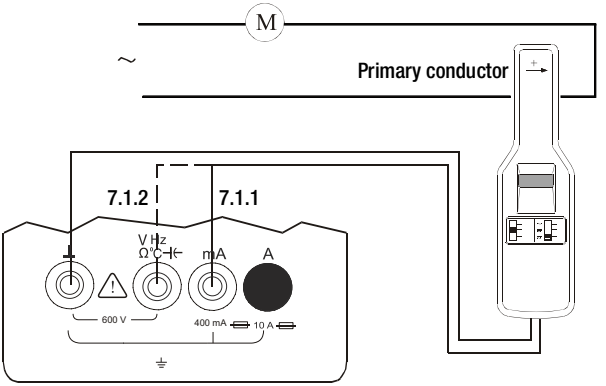
Attention!

If current transformers are operated with an open circuit on the secondary side, e. g. due to defective or disconnected leads, a blown fuse in the multimeter, or a wrong connection, dangerously high voltages may occur at the connectors. Therefore, make sure that the current circuit of the multimeter and secondary winding of the transformer connected to the multimeter form an intact circuit. Connect the transformer to the ⊥ and mA or A sockets.

Some current transformers include safety devices which prevent dangerous voltage increases at open electrical circuits. The maximum permissible operating voltage is equal to the rated voltage of the current transformer. When reading the measured value, consider the transformation ratio of the transformer as well as the additional display error.

7.1.2 Transformer Output mV/A

Some transformers have a voltage output (referred to as mV/A). The secondary connection must therefore be connected to the connection sockets "⊥" and "V".



When reading the measured values in V, consider the transformation ratio of the transformer and the fact that the display shows current values as well as the additional display error.

8 Diode Testing and Continuity Testing

8.1 Diode Testing

Attention!
Make sure that the device under test is voltage-free. Interference voltages would distort measurement results!

- Set the function selector switch to "→|←".
- Connect the device under test as shown.

Conducting Direction and Short-Circuit

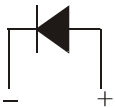
The measuring instrument displays the forward voltage in volts. As long as the voltage drop does not exceed the maximum display value of 1,000 V, you can also test several elements connected in series.

Reverse Direction or Interruption

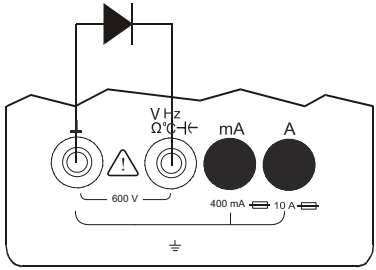
The measuring instrument displays a voltage of „OL“.

Note
Resistors and semiconductor paths parallel to the diode distort the measurement results!

Conducting Direction



Reverse Direction



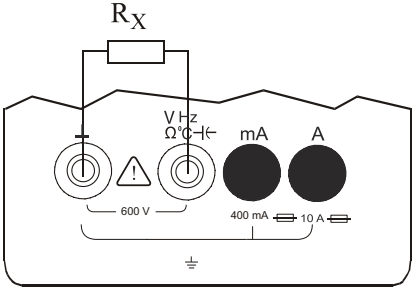
8.2 Continuity Testing

Attention!
Make sure that the device under test is voltage-free. Interference voltages would distort measurement results!

- Set the function selector switch to "**⊣▶⊢**".
- Press the yellow multifunction key to switch to the measuring range for the continuity test.

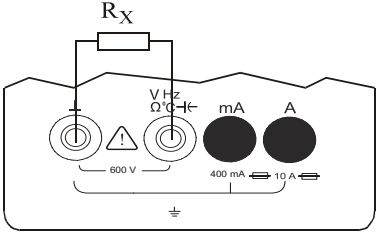
The display of the 🔊 symbol is activated.
The instrument generates a continuous acoustic signal at a measured resistance of 0 to approximately < 75 Ω.

- Connect the device under test as shown below.



Attention!
Make sure that the device under test is voltage-free. Interference voltages would distort measurement results!

- Set the function selector switch to "Ω".
- Connect the device under test as shown below.



Zero Adjustment (Relative Mode)

When measuring resistances, the inherent error of the multimeter and the resistance of the cables can be eliminated via the zero adjustment.

- Short-circuit the leads connected with the multimeter.
- Press the REL key.

The instrument confirms zero adjustment with an acoustic signal and values close to 00 and REL are shown on the LCD display.
The resistance value that is measured when the REL key is pressed serves as a reference value. This value is then automatically deducted from all measured values.

Deleting Zero Adjustment

- Short-circuit the leads that are connected with the multimeter and press the REL key afterwards.

or

- press the function selector switch

or

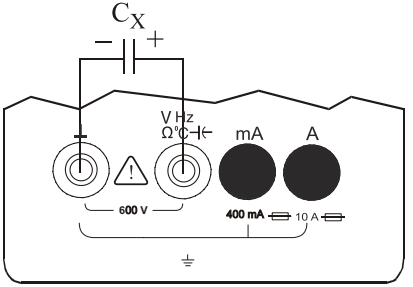
➪ switch off the multimeter.

10 Capacitance Measurement

Attention!
Make absolutely sure that the device under test is voltage-free. Interference voltages would distort measurement results!

- Set the function selector switch to "⊣⊢".

Connect the (discharged!) device under test to sockets „⊥ “ and „⊣⊢“ with measurement cables. Polarized capacitors must be connected to the "⊥" socket at the "-" pole.



Note
Resistors and semiconductor paths connected in parallel to the capacitor distort the measurement results!
To measure small value capacitors, please use short measurement cables!
If the symbol is displayed, the measured values are invalid.

Zero Adjustment (Relative Mode)

For the measurement of small capacitance values in the 5 nF and 50 nF ranges, the inherent error of the multimeter and the capacitance of the leads can be eliminated by zero adjustment.

- ➪ Connect the test leads to the multimeter without the device under test.
- ➪ Briefly press the REL key.

The instrument acknowledges zero adjustment with an acoustic signal, and a value close to „00.00“ and REL are displayed on the LCD. The capacitance measured at the moment the key is activated serves as a reference value. This value is then automatically deducted from all measured values.

Deleting Zero Adjustment

- ➪ Press the REL key. Clearance is acknowledged by buzzer sound.

or

- ➪ press the function selector switch

or

- ➪ switch off the multimeter.

11 Frequency and Duty Cycle Measurement

11.1 Frequency measurement

- ➪ Set the function selector switch to V~ (V AC) (white letter) and press the Hz/% key as shown on page 33. The frequency measurement mode is activated and the "Hz" symbol is shown on the LCD display. The digital display is extended to 9999 digits. Automatic mode only, no manual measuring range selection possible.
- ➪ Connections are established in the same way as for voltage measurement.
- ➪ The lowest measurable frequencies and maximum allowable voltages are specified in chapter 3.6 „Technical Data“.

11.2 Duty Cycle Measurement

With the duty cycle measurement, we can determine the ratio of the pulse duration to cycle time of recurring square wave signals. The duty cycle, which is the time ratio of the pulse duration to the period duration, is shown on the LCD display as follows:

$$\text{Duty cycle (\%)} = \frac{\text{Pulse duration}}{\text{Cycle duration}} \times 100$$

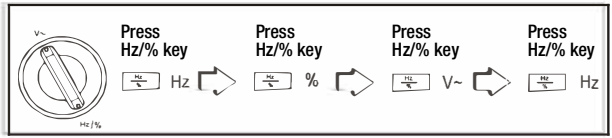
Note
The applied frequency must remain constant during duty cycle measurement.

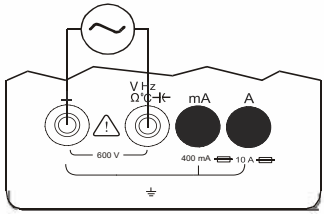
- ➪ Set the function selector switch to V~ (white letter) and press the Hz/% key twice, as shown in page 33. The duty cycle (%) mode is activated. The "%" symbol is shown on the LCD display.

Note
The Hz/% key only applies to V~ (white letter).

- ➪ Connections are established in the same way as for voltage measurement.

➪ The measuring range for the duty cycle and the maximum permissible voltage can be found in chapter 3.6 „Technical Data“.



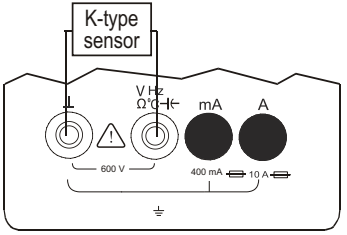


12 Temperature Measurement

The multimeter allows you to measure the temperature with a K-type thermocouple (NiCr-Ni) in the range from 0 °C to +1300 °C.

Thermocouples are available as optional accessories. For information see data sheet.

- ➪ Set the function selector switch to "°C".
- ➪ Connect the sensor as shown below.



13 Storage and Transport

Attention!
Improper Storage
Damage to the product and measuring error due to environmental influences
Store the instrument in a protected location and only within the limits of permissible ambient conditions. The environmental conditions (temperatures, humidity, etc.) can be found in chapter 3.6 on page 12.

Attention!
Improper Transport
Damage to the product and measuring error
- Only transport the device within the permissible environmental conditions (temperatures, humidity, etc.), see chapter 3.6 on page 12.
- For protection, we recommend the accessories available for the instrument (transport case etc.); details can be found in the device data sheet.

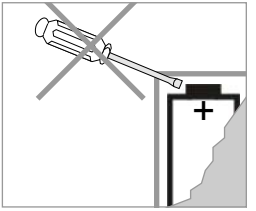
Attention!
Disconnect the multimeter from the measuring circuit before opening it to replace the fuse or battery!

14.1 Replacing the Batteries

When the symbol appears on the LCD display, replace the batteries as soon as possible. Although measurements can still be carried out, reduced measurement accuracy must be taken into account in this case.

- Loosen the screws of the battery compartment from the bottom of the housing. There is no reason to remove the entire housing base.
- Remove the batteries from the battery compartment.

Attention!
Remove the batteries by levering out the **negative pole** of the battery with a screwdriver **first**. Otherwise, the contacts of the positive pole in the battery compartment might be damaged and the battery lead might be severed.



Dispose of used batteries in an environmentally friendly manner, see chapter 15 on page 39.

- Insert two new 1.5 V mignon cells in accordance with the polarity symbols in the battery compartment.

Attention!
Only use batteries that comply with the technical data! See chapter 3.6 on page 12.

Attention!
When inserting new batteries, start with the positive pole of the battery and fit the negative pole into place afterwards, in order to avoid damage to the contacts of the negative pole.

➪ Tighten the battery compartment cover with the screw.

14.2 Fuses

The 10 A fuse interrupts the 10 A current measuring range and the 1.6 A fuse protects the mA current measuring ranges. All other measuring ranges remain functional.

Attention!
Defective fuses are not displayed.
Current measurement is not possible with a defective fuse.

Replacing the Fuses

Attention!
If a fuse should blow, eliminate the cause of overload before placing the instrument back into service!

Attention!
Only use fuses that comply with the technical data! See chapter 3.6 on page 12.

➪ Unscrew the cover of the housing base from the top housing.
➪ Remove the defective fuse from the fuse holder, e.g. using a test probe, and replace it with a new one.
➪ Screw the cover of the housing base back onto the top.
➪ Make sure that the new fuses make good contact.

14.3 Housing / Cleaning

No special maintenance is required for the housing.
Excessive contamination has an adverse effect on isolation and reduces input resistance.
Keep outside surfaces clean.

Attention!
Life endangering due to electric shock!
The instrument and its accessories are operated with electrical power, therefore there is a general risk of electric shock. This can be fatal or cause serious injuries.
– The instrument, the accessories and all connected conductors must be voltage-free before and during cleaning. Switch off the instrument and remove all connected measurement cables.
– Never immerse the instrument/accessories in water or other liquids.
– Never touch the instrument/accessories with wet hands.

Attention!
Unsuitable cleaning agents such as aggressive or abrasive cleansers result in damage to the instrument/accessories.
Use a cloth for cleaning, which has been slightly dampened with water.
Avoid the use of cleansers, abrasives or solvents.

15 Disposal and Environmental Protection

Proper disposal makes an important contribution to the protection of our environment and the conservation of natural resources.

Attention!
Environmental Damage
Improper disposal results in environmental damage.
Follow the instructions concerning return and disposal included in this section.

The following comments refer specifically to the legal situation in the Federal Republic of Germany. Owners or end users who are subject to other regulations must comply with the respective local requirements and implement them correctly on site. Further information can be obtained, for example, from the responsible authorities or local distributors.

Waste Electrical Equipment, Electrical or Electronic Accessories and Waste Batteries (including rechargeable batteries)

Electrical equipment and batteries (including rechargeable batteries) contain valuable raw materials that can be recycled, as well as hazardous substances which can cause serious harm to human health and the environment, and they must be recycled and disposed of correctly.

The symbol at the left depicting a crossed-out garbage can on wheels refers to the legal obligation of the owner or end user (German electrical and electronic equipment act ElektroG and German battery act BattG) not to dispose of used electrical equipment and batteries with unsorted municipal waste ("household trash"). Waste batteries must be removed from the old device (where possible) without destroying them and the old device and the waste batteries must be disposed of separately. The battery type and its chemical composition are indicated on the battery's labelling. If the abbreviations "Pb" for lead, "Cd" for cadmium or "Hg" for mercury are

included, the battery exceeds the limit value for the respective metal.

Please observe the owner's or end user's responsibility with regard to deleting personal data, as well as any other sensitive data, from old devices before disposal.

Old devices, electrical or electronic accessories and waste batteries (including rechargeable batteries) used in Germany can be returned free of charge to Gossen Metrawatt GmbH or the service provider responsible for their disposal in compliance with applicable regulations, in particular laws concerning packaging and hazardous goods. Waste batteries must be returned in discharged state or with appropriate precautions against short circuiting. Further information regarding returns can be found on our website.

Packaging Materials

We recommend retaining the respective packaging materials in case you might require servicing or calibration in the future.

Attention!
Danger of Asphyxiation Resulting from Foils and Other Packaging Materials
Children and other vulnerable persons may suffocate if they wrap themselves in packaging materials, or their components or foils, or if they pull them over their heads or swallow them.
Keep packaging materials, as well as their components and foils, out of the reach of babies, children and other vulnerable persons.

In accordance with German packaging law (VerpackG), the user is obligated to correctly dispose of packaging and its components separately, and not together with unsorted municipal waste ("household trash").

Packaging which is not subject to so-called system participation is returned to the appointed service provider. Further information regarding returns can be found on our website.

16 Contact, Support and Service

Gossen Metrawatt GmbH contacted directly and conveniently – we have a single number for everything! Whether you require support or training, or have an individual inquiry, we can answer all of your questions here:

+49 911 8602-0

Monday to Thursday: 08:00 am - 4:00 pm
Friday: 08:00 am - 2:00 PM

Or contact us by e-mail at:
info@gossenmetrawatt.com

Do you prefer support by e-mail?
support@gossenmetrawatt.com

Please contact GMC-I Service GmbH for repairs, replacement parts and calibration:

+49 911 817718-0

Beuthener Str. 41
90471 Nürnberg
Germany

service@gossenmetrawatt.com
www.gmci-service.com

17 Guarantee Statement

Digital multimeters of the METRALINE DM series are guaranteed for a period of 3 years after shipment.

You can find the guarantee statemne with all the information at

www.gossenmetrawatt.de/company/general-terms-and-conditions-of-business-of-gossen-metrawatt-gmbh/

Registration in the myGMC customer portal (only available on the German website) is a prerequisite for making a warranty claim.

Further advantages of registration:

- In the event of theft or loss, the serial number is registered with us.
  (This data is important when filing claims with your insurance company)
- Access to special downloads (e.g. software and firmware updates)
- Information about important new products

www.gossenmetrawatt.de/services/mygmc/

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