



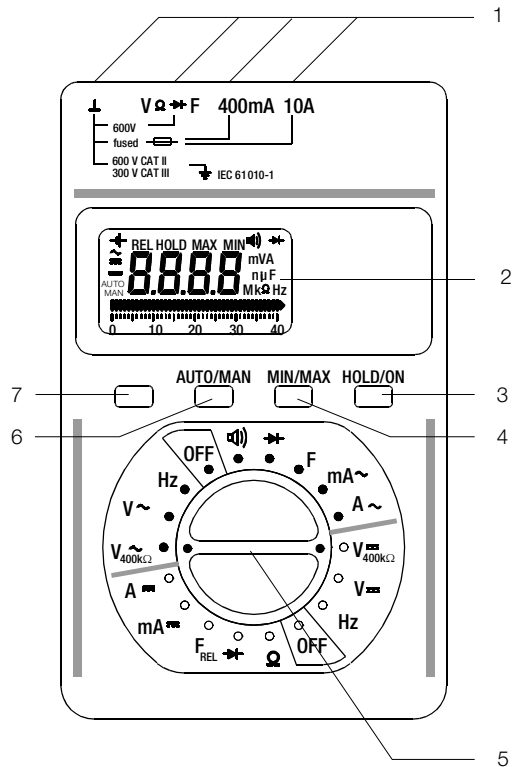
Operating Instructions

METRAmax[®] 12/14

Analog-Digital Multimeters

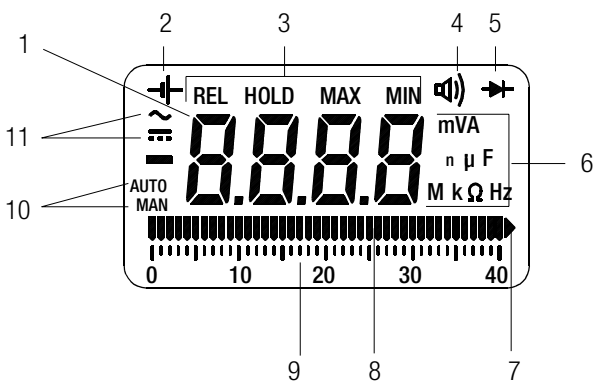
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Operating and Connector Elements

- 1 Connector Jacks
- 2 LCD Display
- 3 Measurement Value Storage Key / On Switch
- 4 Key for Storage of Minimum or Maximum Value
- 5 Selector Switch for ON/OFF and Measurement Function Selection
- 6 Selector Switch for Automatic or Manual Measurement
- 7 Multifunction Key (yellow)



Display

- 1 Digital Display with Decimal Point and Polarity Indicator
- 2 Low Battery Display
- 3 REL, HOLD, and MIN and MAX Display
- 4 Continuity Test Display:
Loudspeaker symbol appears when acoustic signal is activated
- 5 Diode Measurement Display
- 6 Unit of Measure Display
- 7 Exceeded Measuring Range Display
- 8 Pointer for Analog Display
- 9 Analog Display Scale
- 10 Display for Manual or Automatic Measuring Range Selection
- 11 Display of Selected Current Type

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1 Safety Features and Precautions

You have selected an instrument which provides you with a high level of safety.

The METRAmax 12/14 analog-digital multimeter is manufactured and tested in accordance with safety regulations IEC 61010–1 / EN 61010–1 / VDE 0411–1. When properly used, safety of the operator, as well as that of the instrument, is assured. Their safety is however not guaranteed, if the instrument is used improperly or handled carelessly.

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

Observe the following safety precautions:

- The instrument may only be operated by persons who are capable of recognizing contact hazards and taking the appropriate safety precautions. Contact hazards exist anywhere, where voltages of greater than 30 V may occur (effective value).
- Avoid working alone when taking measurements which involve contact hazards. Be certain that a second person is present.
- *The maximum allowable voltage* between any given connector jack (1) and earth is equal to 600 V. Voltages of greater than 500 V may only be applied to jacks "L", and "V" with the selector switch in the voltage measurement position (selector switch in "V" position).
- Be prepared for the occurrence of unexpected voltages at devices under test (e.g. defective devices). For example, capacitors can be dangerously charged.
- Make certain that the measurement cables are in flawless condition, e.g. no damage to insulation, no interruptions in cables or plugs etc.
- No measurements may be made with this instrument in electrical circuits with corona discharge (high-voltage).
- Special care is required when measurements are made in HF electrical circuits. Dangerous pulsating voltages may be present.
- Measurements under moist ambient conditions are not allowable.
- Be absolutely certain that the *measuring ranges are not overloaded beyond their allowable capacities*. Limit values can be found in the table "Measuring Ranges" in chapter 14 "Characteristic Values".

- All current ranges are equipped with fuses. The maximum allowable voltage for the measuring current circuit (= nominal voltage of the fuse) is equal to 500 V \sim .
- **The instrument may only be used in power installations when the electrical circuit is protected with a 20 A fuse or circuit breaker, and the nominal voltage of the installation does not exceed 500 V.**
- We recommend the *KS30 measuring adapter* for hazard-free voltage measurements in power installations of up to 1000 V, which is available as an accessory. The internal resistance of the KS30 limits measuring current in case of excessive voltage or operator error, and assures for the reliable quenching of ignited spark paths. For additional information see chapter 8.2 "Voltage Measurements in Power Installations of up to 1000 V with the KS30 Measuring Adapter".

Meaning of symbols on the instrument



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



Earth



Continuous, doubled or reinforced insulation



VDE testing authority approval mark



CSA approval mark



Indicates EU conformity

Repair, Parts Replacement and Balancing

When the instrument is opened, voltage conducting parts may be exposed. The instrument must be disconnected from the measuring circuit for repair, replacement of parts or balancing. If repair or balancing of a live, open instrument is required, this may only be carried out 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 service and secured against unintentional use.

Safe operation can no longer be relied upon,

- if the instrument demonstrates visible damage,
- if the instrument no longer functions,
- after a long period of storage under unfavorable conditions,
- after extraordinary stresses due to transport.

2 Initial Start-Up

Battery

The instrument is delivered in operational condition with battery (batteries) installed.

Please see chapter 15.1, page 26, before initial start-up of your instrument, or after a lengthy period of storage.

Switching the Instrument On

⇒ Turn the selector switch from the OFF position to the desired measuring range.

An acoustic signal acknowledges that the instrument has been switched on. All of the LCD elements are activated briefly. A drawing of the LCD can be found on page 2.



Note!

Electrical discharge and high frequency interference can cause incorrect displays, and may block the measuring sequence. To reset, switch the instrument off, and then back on. If this procedure is unsuccessful, briefly disconnect the battery from the contact terminals.



Attention!

Before opening, disconnect the instrument from the measuring circuit and observe chapter 15, page 26!

Automatic Shut-Down

Your instrument switches itself off automatically after 30 minutes, if no keys or the selector switch have been activated during this time.

Switching the Instrument back On

⇒ Activate the HOLD/ON key. Press briefly twice.

Switching the Instrument Off

⇒ Turn the selector switch to the OFF position.

3 Selecting Measuring Functions and Ranges

3.1 Measuring Function Selection

The desired measuring function is selected with the selector switch (white or yellow printing). In order to select the function printed in yellow, the yellow multifunction key must also be pressed. If the multifunction key is pressed again, the function printed in white is reactivated.

3.2 Automatic Measuring Range Selection

These multimeters are equipped with automatic measuring range selection for all measuring ranges except for the ranges 400 mV ~ and 10 A. Automatic selection is functional as soon as the instrument has been switched on.

The instrument automatically selects the measuring range in accordance with the applied measuring magnitude, which provides for optimum resolution.

The instrument switches automatically to:

the next highest range at $\pm (3999 D + 1 D)$
 the next lowest range at $\pm (380 D - 1 D)$

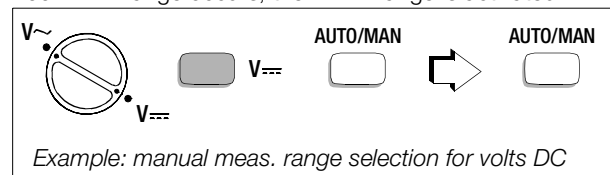
3.3 Manual Measuring Range Selection

You can deactivate automatic measuring range selection and select and define the ranges manually in accordance with the following table.

- ⇒ First select the desired measuring function with the selector switch and, if appropriate, the multifunction key.
- ⇒ Briefly activate the AUTO/MAN key.

Manual operation is **deactivated** if you press and hold the AUTO/MAN key until you hear a second acoustic signal, and the display switches from MAN to AUTO.

When switching back to automatic operation in the 400 mV ~ range occurs, the 4 V ~ range is activated.



↓ AUTO/ MAN	Function	Acknowledge- ment	
		Display	Acoust. Signal
Brief	Manual Operation ON: Measuring Range is defined	MAN	1 x
Brief	Switching Sequence at: 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 Ω → 4 kΩ → 40 kΩ → 400kΩ → 4000 kΩ → 40 MΩ ... F : 4 nF → 40 nF → 400 nF → 4 μF → 40 μF ...	MAN	1 x
Long	Return to Automatic Range Selection	AUTO	2 x

4 LCD Display

4.1 Digital Display

The digital display shows the measurement value, decimal point and sign. The selected unit of measure and type of current are displayed. A minus sign appears in front of the digits for the measurement of direct magnitudes, if the positive pole of the measurement magnitude is applied to the “⊥” input. A blinking “4000” appears if the measuring range upper limit of 3999 is exceeded.

The digital display is updated twice per second for V, A and Ω measurements.

4.2 Analog Display

The analog bar display, which demonstrates the dynamic performance of a moving coil mechanism, is updated 20 times per second for V, A and Ω measurements. This is especially advantageous for the observation of measurement value fluctuations and for balancing.

5 Acoustic Signal

The following sequence steps are acknowledged by an acoustic signal:

- New measurement function selection
- Activation or deactivation of the following functions: AUTO/MAN, MIN/MAX or HOLD

A repetitive acoustic signal indicates that a function cannot be selected, or an operator error.

6 Measurement Value Storage “HOLD”

By pressing the HOLD/ON key, the currently displayed measurement value can be “held”, and “Hold” is simultaneously displayed.

The Hold display is deactivated if:

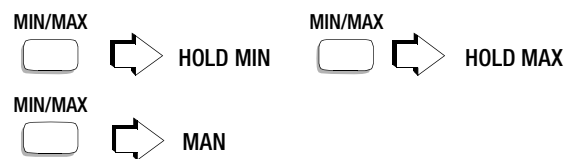
- the Hold key is reactivated
- the selector switch is activated
- the yellow function key is activated for a change of function, e.g. AC → DC.

7 Storing Minimum or Maximum Values “MIN/MAX” Hold

With the MIN/MAX function, you can “hold” either the minimum or the maximum measurement value which was present at the measuring instrument input immediately after activation of MIN or MAX. The most important application is the determination of the minimum or the maximum measurement value in the long-term observation of measurement magnitudes.

MIN/MAX has no influence on the analog display; it continues to display the current measurement value.

- ⇨ Select the measurement function with the selector switch and, if appropriate, with the yellow multifunction key.
- ⇨ Select the measuring range manually. Automatic measuring range selection is not active in this mode.
- ⇨ Connect the device under test as described in the following measurement instructions.
- ⇨ Press the MIN/MAX key.
HOLD MIN is displayed. The measuring instrument continually updates and digitally displays the smallest occurring measurement value. This function remains active, and the respective minimum remains in storage, until the MIN/MAX key is once again activated.
- ⇨ Press the MIN/MAX key.
HOLD MAX is displayed. The measuring instrument continually updates and digitally displays the largest occurring measurement value. If the MIN/MAX key is activated again, this function is deactivated and the maximum value is deleted.



8 Voltage Measurement

- ⇒ Turn the selector switch, depending upon the desired input resistance, to $V \sim$ ($R_E > 10 \text{ M}\Omega$) or $V \sim_{400\text{k}\Omega}$ ($R_E = 400 \text{ k}\Omega$).



Note!

The measuring instrument is provided with the switch position $V_{400\text{k}\Omega}$ for electricians, which has an input resistance of approx. $400 \text{ k}\Omega$. This reduces incorrect message displays due to capacitive interference during voltage measurements in power supply networks to a minimum.

- ⇒ Connect the measurement cable as shown. Connector jack “ \perp ” should be grounded, and the second measuring cable with a higher potential connected to jack “V”.



Note!

The measuring range $400 \text{ mV} \sim$ can only be selected manually with the “AUTO/MAN” key!

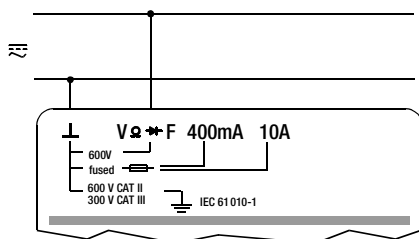


Attention!

Make certain that the *current ranges* (“mA” or “A”) are deactivated and that the measurement cables are connected to the correct jacks, “V and \perp ”, before connecting your multimeter for the measurement of voltage! If the fuse tripping limit values are exceeded due to operator error, both the operator and the instrument are in danger! Observe the voltage limit values as printed on the instrument!

- ⇒ Select the respective voltage type which corresponds to the measuring magnitude by briefly pressing the yellow multifunction key. Each activation of the key causes alternate switching between DC and AC, as well as acknowledgement by means of an acoustic signal. The symbols \equiv DC and \sim AC indicate the selected voltage type in the LCD display.

After selection of this function with the selector switch, the voltage type AC is always activated.



8.1 Voltage Measurement with Distorted Waveform (TRMS Value – only METRAmax 14)

The use of the display range of up to 2000 digits is recommended for measurements with unknown waveforms (see page 23), especially for phase intersection controllers. If required, switch the measuring range to the next most sensitive setting.

8.2 Voltage Measurements in Power Installations of up to 1000 V with the KS30 Measuring Adapter

Transient overvoltages of several kilovolts or lightning discharge can occur in low voltage systems due to switching functions. Direct connection of the multimeter to a network of this type for the purpose of voltage measurement can thus be dangerous for the operator and the instrument.

Use the KS30 meas. adapter for voltage measurement in power installations with nominal voltages of up to 1000 V. This is an adapter for the multimeter, which eliminates dangers caused by overvoltages and operator errors with the following protective functions:

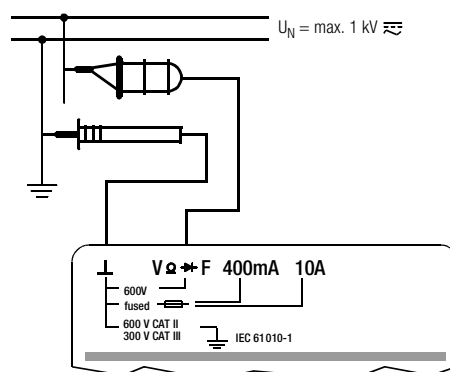
- Input circuit protection for multimeter voltage measuring ranges. The internal resistance of the KS30 limits current when excessive voltage occurs.
- Overload capacity: continuous $1200 \text{ V}_{\text{eff}}$ transient (rise: $10 \mu\text{s}$ /fall: $1000 \mu\text{s}$) max. 6 kV .
- Reliable quenching of ignited spark paths after the occurrence of excessive voltage, even if a substantial voltage source is applied.
- Current limiting for operator error (e.g. application of measuring voltage to a current input).

Voltages of over 1000 V can be measured with a high-voltage probe. The required safety precautions must be observed!



Note!

For correct voltage measurement, the measurement function $V \sim_{400\text{k}\Omega}$ may not be used.



9 Current Measurement



Attention!

First switch off the power supply to the measuring circuit or the load component and discharge any capacitors which might be present.

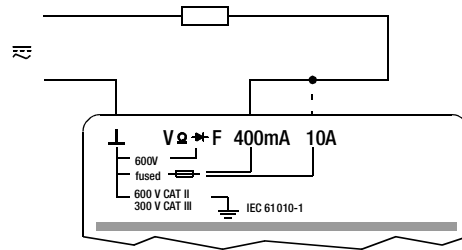
- ⇒ Select function A with the selector switch for currents > 400 mA, or function mA for currents < 400 mA. Switch to the next highest measuring range, or activate automatic measuring range selection first for the measurement of currents of an unknown magnitude.
- ⇒ Select the respective voltage type which corresponds to the measuring magnitude by briefly pressing the yellow multifunction key. Each activation of the key causes alternate switching between DC and AC, as well as acknowledgement by means of an acoustic signal. The symbols \equiv DC and \sim AC indicate the selected voltage type in the LCD display.

After selection of this function with the selector switch, the voltage type AC is always activated.

- ⇒ Securely connect the measuring instrument in series to the load component as shown (without transition resistance).

Current Measurement Tips:

- The instrument may only be used in power installations when the electrical circuit is protected with a 20 A fuse or circuit breaker, and the nominal voltage of the installation does not exceed 500 V.
- The measuring circuit must be mechanically stable and protected against unintentional opening. Conductor cross sections and connection points must be substantial enough to avoid excessive overheating.
- In the 400 mA measuring range an intermittent acoustic signal warns you, if the measurement value has exceeded the measuring range upper limit value.
- Current ranges up to 400 mA are protected with a FF1.6 A/500 V fuse in combination with power diodes up to a short-circuit current of 25 A. The breaking capacity of the fuse is equal to 50 kA at a nominal voltage of 500 V \sim with resistive load.
- The 10 A current measuring range is protected with a 16 A/500 V fuse. The breaking capacity of the fuse is equal to 50 kA at a nominal voltage of 500 V \sim with resistive load.
- If a fuse blows, eliminate the cause of the overload before placing the instrument back into operation!
- Fuse replacement is described in chapter 15.2, page 27.



9.1 AC Measurement with (Clip-On) Current Transformers

9.1.1 Transformer Output mA/A



Attention!

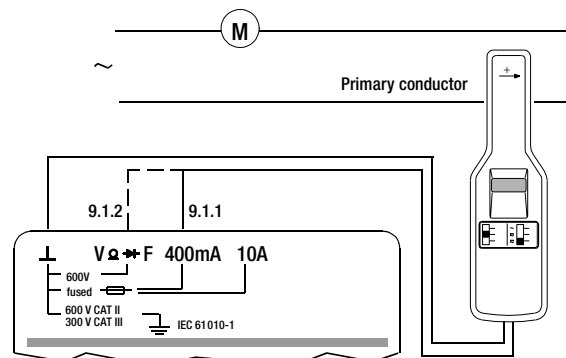
If current transformers are used at the secondary side in an open condition, e.g. due to defective or non-connected power cables, a blown device fuse or incorrect connection, dangerously high voltages can occur at the connections. For this reason, check to see if the measuring instrument's current path and transformer's secondary winding, which is connected to the instrument, complete a closed current circuit, and connect the transformer to the \perp and mA or A jacks.

Some current transformers (e.g. Z3511 ... 3514) include safety devices, which prevent dangerous voltage increases at open electrical circuits.

The maximum allowable operating voltage at the primary conductor is equal to the nominal voltage of the current transformer. When reading the measurement value, consider the transformation ratio of the transformer, as well as additional display error.

9.1.2 Transformer Output mV/A (z. B. Z201A ... 203A)

Some transformers have a voltage output (designation: mV/A). Consequently, the secondary connection must be connected to \perp and V.



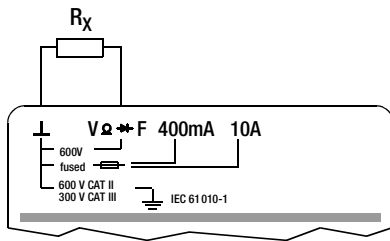
10 Continuity Testing and Resistance Measurement



Attention!

Be absolutely certain that the device under test is voltage-free. Extraneous voltages distort the measurement results!

- ⇒ Set the selector switch to “ Ω ”.
- ⇒ Connect the DUT as shown.



Continuity Testing

The instrument generates a continuous acoustic signal at a measured resistance of 0 ... approx. 40Ω.

Resistance Measurement

- ⇒ Press the yellow multifunction key to switch to the resistance measuring range. Display of the Ω symbol is deactivated.

11 Diode Testing



Attention!

Be absolutely certain that the device under test is voltage-free. Extraneous voltages distort the measurement results!

- ⇒ Set the selector switch to “ \rightarrow ”.
- ⇒ 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 3.000 V, you can test several elements connected in series, or reference diodes with small reference voltages.

Reverse Direction or Interruption

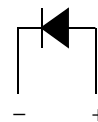
The measuring instrument displays a voltage of approx. 3 V (battery voltage test for METRAmax 12).



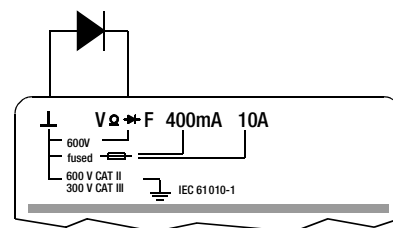
Note!

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

Conducting Direction



Reverse Direction



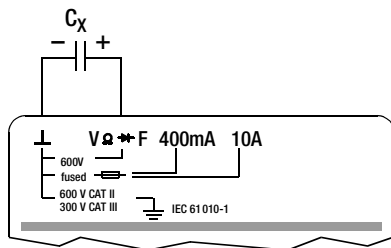
12 Capacitance Measurement



Attention!

Be absolutely certain that the device under test is voltage-free. Extraneous voltages distort the measurement results!

- ⇒ Set the selector switch to “F”.
- ⇒ Connect the (discharged!) device under test to jacks “⊥” and “F” with measurement cables. Polarized capacitors must be connected to the “⊥” jack at the “-” pole.



Note!

Resistors and semiconductor paths in parallel to the capacitor distort the measurement results! To measure small capacities please use short measurement cables!
METRAMax 14: If ⊥ is displayed the measured values are not valid.

Only digital display is available in this mode.

Zero Adjustment (relative mode)

For the measurement of small capacitive values in the 4 nF and 40 nF ranges, the inherent capacity of the measuring instrument and the cables can be eliminated with zero balancing:

- ⇒ Connect the measurement cables to the measuring instrument without a DUT.
- ⇒ Press the yellow multifunction key briefly.
The instrument acknowledges zero balancing with an acoustic signal, and a value close to “00.00” and REL are displayed at the LCD. The capacitance measured at the moment the key is activated serves as a reference value. This value is then automatically subtracted from all measured values.

Delete Zero Balancing

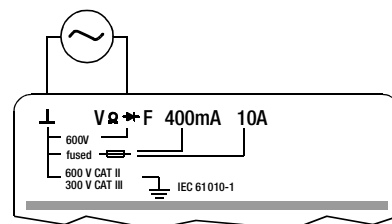
- ⇒ Press and hold the yellow multifunction key and a two-fold acoustic signal acknowledges deletion,
- or
- ⇒ Activate the selector switch
- or
- ⇒ Switch the multimeter off.

13 Frequency Measurement

- ⇒ Set the selector switch to Hz.

The frequency measurement mode is activated. Frequency is displayed at the LCD. Display occurs digitally only, and is expanded to 9999 digits. Only the auto-range mode of operation is possible, because the AUTO/MAN key is required for sensitivity selection.

- ⇒ Apply the measurement magnitude in the same fashion as for voltage measurement.
- ⇒ Select sensitivity with the AUTO/MAN key. You can switch between sensitivity levels of 0.1 V, 1 V and 10 mV. After each activation of the AUTO/MAN key, the corresponding sensitivity level is displayed.
After selection of this function with the selector switch, the triggering threshold is always set to the highest level of sensitivity (10 mV).
- ⇒ The lowest measurable frequencies and the maximum allowable voltages can be found in the chapter “Characteristic Values”.



14 Characteristic Values

Measuring Function	Measuring Range			Resolution	Input Impedance 100 pF // X Ω	
	METRAmax	12	14		V _{DC} / ~	V _{400kΩ}
V _{DC}	400.0 mV	●	●	100 μV	> 20 MΩ	400 kΩ
	4.000 V	●	●	1 mV	11 MΩ	400 kΩ
V _{DC} 400kΩ	40.00 V	●	●	10 mV	10 MΩ	400 kΩ
	400.0 V	●	●	100 mV	10 MΩ	400 kΩ
	600 V	●	●	1 V	10 MΩ	400 kΩ
V _~	400.0 mV	●	● ¹⁾	100 μV	> 20 MΩ	400 kΩ
	4.000 V	●	● ¹⁾	1 mV	11 MΩ	400 kΩ
V _~ 400kΩ	40.00 V	●	● ¹⁾	10 mV	10 MΩ	400 kΩ
	400.0 V	●	● ¹⁾	100 mV	10 MΩ	400 kΩ
	600 V	●	● ¹⁾	1 V	10 MΩ	400 kΩ
					Voltage Drop at Maximum Measuring Current, approx.	
A _{DC}	40.0 mA	●	●	10 μA	450 mV	
	400.0 mA	●	●	100 μA	1.5 V	
	10.00 A	●	●	10 mA	750 mV	
A _~	40.0 mA	●	● ¹⁾	10 μA	450 mV	
	400.0 mA	●	● ¹⁾	100 μA	1.5 V	
	10.00 A	●	● ¹⁾	10 mA	750 mV	
					Open-Circuit Voltage	
Ω	400.0 Ω	●	●	100 mΩ	approx. 0.5 V	
	4.000 kΩ	●	●	1 Ω		
	40.00 kΩ	●	●	10 Ω		
	400.0 kΩ	●	●	100 Ω		
	4.000 kΩ	●	●	1 kΩ		
	40.00 MΩ	●	●	10 kΩ		
Ω _Ⓜ)	400.0 Ω	●	●	100 mΩ		
→	3.000 V	●	●	1 mV	approx. 3 V ³⁾	
F	4.000 nF	●	●	1 pF	f _{min}	
	40.00 nF	●	●	10 pF		
	400.0 nF	●	●	100 pF		
	4.000 μF	●	●	1 nF		
	40.00 μF	●	●	10 nF		
Hz ²⁾	100.00 Hz	●	●	0.01 Hz	10 Hz	
	1.0000kHz	●	●	0.1 Hz		
	10.000kHz	●	●	1 Hz		
	100.00kHz	●	●	10 Hz		
	400.0 kHz	●	●	100 Hz		

1) True effective value measurement (TRMS) for METRAmax 14

2) Indication for frequency measurement expanded to 9999 D

3) METRAmax 12: Battery voltage 2.2 V ... 3.2 V
METRAmax 14: Battery voltage 3 V ±5%

Measuring Function	Measuring Range	Digital Display Intrinsic Error at Reference Conditions ±(...% of rdg. + ... D)	Overload Capacity ¹⁾	
			Overload Value	Overload Duration
V _{DC}	400.0 mV	0.75 + 2	720 V _{DC}	continuous
	4.000 V	0.5 + 2		
40.00 V				
400.0 V				
V _{DC} 400kΩ	400.0 V	1.5 + 5 ²⁾	720 V _~ effective sine	continuous
	600 V			
V _~ ²⁾	400.0 mV	1 + 5 ²⁾	720 V _~ effective sine	continuous
	4.000 V			
V _~ 400kΩ ²⁾	40.00 V	1 + 10 ²⁾	720 V _~ effective sine	continuous
	400.0 V			
	600 V			
A _{DC}	40.00 mA	0.8 + 2	480 mA	continuous
	400.0 mA	1.5 + 5	4)	4)
	10.00 A ⁴⁾			
A _~	40.00 mA	1 + 5 ²⁾	480 mA	continuous
	400.0 mA	2 + 5 ²⁾	4)	4)
	10.00 A ⁴⁾			
Ω	400.0 Ω	0.8 + 5	420 V DC AC effective sine	10 min.
	4.000 kΩ	0.8 + 2		
	40.00 kΩ			
	400.0 kΩ	1 + 5		
	4.000 kΩ	2 + 5		
	40.00 MΩ			
Ω _Ⓜ)	400.0 Ω	Acoustic signal for 0 ... < 40 Ω		
→	3.000 V	2 + 10		
F	4.000 nF	3 + 40 ³⁾	420 V DC / AC effective sine	10 min.
	40.00 nF	3 + 10 ³⁾		
	400.0 nF	3 + 10		
	4.000 μF			
	40.00 μF	5 + 10		
Hz	100.00 Hz	0.2 + 2	≤ 1kHz: 600 V ≤ 10 kHz: 100 V ≤ 400 kHz: 40 V	continuous
	1.0000kHz			
	10.000kHz			
	100.00kHz			
	400.0 kHz			

1) At 0 °C ... + 40 °C

2) The specified intrinsic error applies to METRAmax 14 as of a display of "0200"

3) With zero adjustment "REL"; without zero adjustment +300 D in 4 nF range
+30 D in 40 nF range

4) Maximum 10 A/30 minutes
12 A/5 minutes
16 A/30 seconds

Reference Conditions

Ambient Temperature	+ 23 °C ± 2 K
Relative Humidity	45% ... 55%
Measuring Magnitude Frequency	Sine, 50 Hz
Measuring Magnitude Waveform	Sine
Battery Voltage	METRA ^{max} 12: 3 V ± 0.1 V METRA ^{max} 14: 8 V ± 0.1 V

Ambient Conditions

Working Temperature Range	-10 °C ... + 50 °C
Storage Temperature Range	- 25 °C ... + 70 °C (without batteries)
Relative Humidity	45 ... 75%
Elevation	to 2000 m

Display

LCD display field (50 mm x 30 mm) with analog and digital display and display of unit of measure, current type and various special functions.

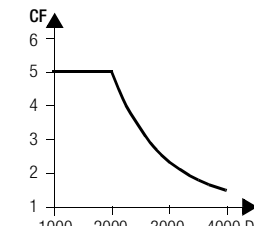
Analog

Display	LCD scale with bar graph pointer
Scale Length	40 mm
Scaling	0 ... 40 with 40 graduations
Polarity Display	with automatic switching
Overflow Display	Bar with triangle
Measuring Rate	20 measurements/s

Digital

Display/Char. Height	7 segment digits / 10 mm
Number of Places	3 3/4 place \cong 3999 steps
Overflow Display	“4000” with blinking “4”
Polarity Display	“-” sign is displayed when plus pole is at “⊥”
Measuring Rate	2 measurements/s for U, I, and Ω 1 measurement/s for capacitance and frequency

Influence Variables and Effects

Influence Variable	Influence Range	Meas. Magnitude/ Measuring Range	Influence Effect
Temperature	0 °C ... +21 °C and +25 °C ... +40 °C	V \equiv	0.1 x intrinsic error/K
		V \sim	
		A \equiv	
		A \sim	
		Ω	
		F Hz	
Waveform METRA ^{max} 14	Crest factor CF 1 ... 1.4 > 1,4 ... 5	4, 40, 400 V, mA, A ²⁾	±1% of rdg.
			±5% of rdg.
Measuring Magnitude Waveform ¹⁾	The allowable crest factor CF of the alternating magnitude to be measured is dependent upon the displayed value: 		

- 1) Measurement is to be made with manual range selection for unknown waveforms (crest factor CF > 2),
2) Except for sinusoidal waveforms

Influence Variable	Influence Range (max. resolution)	Frequency	Inherent Error at Ref. \pm (... % of rdg. +... D)
Frequency V _{AC}	4, 40, 400 V	20 Hz ... < 50 Hz > 50 Hz ... 500 kHz	2 + 3
	400 mV, 600 V	20 Hz ... < 50 Hz > 50 Hz ... 100 Hz	2 + 3

Influence Variable	Influence Range	Meas. Magnitude/ Measuring Range	Influence Effect
Relative Humidity	55 ... 75%	V \cong A \cong Ω F Hz	1x Inherent Error


Influence Variable	Interference Magnitude	Measuring Range	Attenuation
Common Mode Interference Voltage	600 V DC/AC 50 Hz sinus	all V DC	> 100 dB
	600 V DC	all V AC	> 100 dB
	600 V AC 50 Hz sinus	400 mV / 4 V AC	> 80 dB
		40 V AC	> 63 dB
		400 V AC	> 43 dB
600 V AC	> 23 dB		
Series-Mode Interference Voltage	max. 600 V AC 50/60 Hz sinus	V DC	> 43 dB
	max. 600 V DC	V AC	> 55 dB

Aux. Voltage Influence (without \pm display) all ranges except AC: \pm 5 D
AC range: \pm 20 D

Power Supply

Battery METRAmax 12:
2 x 1.5 V mignon cell
zinc-carbon cell per IEC R6
alkaline manganese cell per
IEC LR 6
METRAmax 14:
9V flat cell battery;
zinc-carbon cell per IEC 6 F 22,
alkaline manganese cell per IEC 6
LR 61 or equivalent NiCd storage
battery

Service Life METRAmax 12:
with zinc-carbon cell:
approx. 300 hr.
with alkaline manganese cell:
approx. 600 hr.
METRAmax 14:
with zinc-carbon cell:
approx. 150 hr.
with alkaline manganese cell:
approx. 300 hr.

Battery Test Automatic display of the symbol
“” when battery voltage falls
below the following values:
METRAmax 12: approx. 2.3 V
METRAmax 14: approx. 7 V

Fusing

Fuse for ranges
up to 400 mA FF(UR) 1.6 A / 700 V;
6.3 mm x 32 mm;
breaking capacity 50 kA at
700 V ~ with resistive load,
 $\cos \varphi < 0.2$; protects all current
measuring ranges up to 400 mA
in combination with power diodes

Fuse for
10 A Range FF(UR) 16 A / 500 V;
6.3 mm x 32 mm
breaking capacity 50 kA at
500 V ~ with resistive load,
 $\cos \varphi < 0.2$

Electrical Safety

Protection Class II per IEC 61010-1/EN 61010-1/
VDE 0411-1

Overvoltage
Classification II III
Nominal Voltage 600 V 300 V
Pollution degree 2 2

Nominal
Insulation Voltage 600 V per IEC 61010-1/
EN 61010-1/VDE 0411-1
Test Voltage 3.7 kV~ per IEC 61010-1/
EN 61010-1/VDE 0411-1

Electromagnetic Compatibility EMC

Interference Emission EN 61326 Class B
Interference Immunity EN 61326
EN 61000-4-2:
8 kV atmospheric discharge
EN 61000-4-3: 3 V/m

Mechanical Design

Protection Housing: IP 50
Connector Jacks: IP 20
Dimensions W x H x D:
92 mm x 154 mm x 25 mm
Weight approx. 0.2 kg with battery

15 Maintenance


Attention:

Disconnect the instrument from the measuring circuit before opening the instrument to replace the battery or the fuse !

15.1 Battery

Before initial start-up, or after storage of your instrument, make sure that no leakage has occurred at the instrument battery. Repeat this inspection at regular intervals.

If battery leakage has occurred, electrolyte from the battery must be carefully and completely removed and a new battery must be installed, before the instrument can be placed back into operation.

If the “” symbol appears in the LCD display, you should change the battery as soon as possible. You can continue to take measurements, but reduced measuring accuracy may result.

Replacing the Battery(ies)

The housing base must be removed from the instrument in order to replace the battery(ies).

- ⇨ Press the tab located beneath connector jacks with a test prod, a banana plug or a similar object in the direction indicated by the arrow as shown on the housing base, and remove the base.

METRAmax 12:

- ⇨ Remove the battery from the battery compartment.
- ⇨ Insert two new 1.5 V mignon cells in accordance with the polarity symbols in the battery compartment. Place both battery cables between the cells before closing the housing in order to prevent pinching of the cables.

METRAmax 14:

- ⇨ Remove the battery from the battery compartment and carefully disengage the connector contacts from the battery.
- ⇨ Snap the connector contacts onto a new 9 V battery and insert it into the battery compartment.
- ⇨ Replace the housing base and press until it snaps audibly into place.
- ⇨ Dispose of the dead battery in an environmentally sound fashion.

15.2 Fuses

The 16 A fuse interrupts the 10 A current measuring range, and the 1.6 A fuse the mA current measuring ranges. All other measuring ranges continue to function.

If a fuse blows, eliminate the cause of the overload before placing the instrument back into operation!

Replacement of Fuses

- ⇨ Open the instrument as described under battery replacement.
- ⇨ Remove the defective fuse with the help of, for example, a test prod, and replace it with a new fuse.
- ⇨ Make certain that the new fuse makes good contact.

The following fuses may be used:

- for current measuring ranges up to 400 mA:
type Siba FF(UR) 1.6 A / 700 V~ ; 6.3 mm x 32 mm
- for the 10 A measuring range:
type Siba FF(UR) 16 A / 500 V~ ; 6.3 mm x 32 mm
- Both fuses have a breaking capacity of 50 kA.





Attention!

Be absolutely certain that only the specified fuses are used! The use of a fuse with different triggering characteristics, a different nominal current or a different breaking capacity places the operator, the system and the measuring instrument in danger.

The use of repaired fuses or short-circuiting of the fuse holder is prohibited.

Fuse Testing

- ⇨ Set the selector switch to „“.
- ⇨ Plug the measurement cable into the “V, Ω, , F” socket.
- ⇨ Contact the mA socket with the other end of the measurement cable. A continuous audible signal and the display of approx. 10.2 Ω, indicate that the fuse for the mA current range is OK.
- ⇨ Contact the A socket with the other end of the measurement cable. A continuous audible signal and the display of approx. 0.5 Ω, indicate that the fuse for the A current range is OK.

If a value other than those indicated above, or if overflow (“400.0”; 4 blinks) is displayed, the corresponding fuse must be replaced.

15.3 Housing

No special maintenance is required for the housing. Excessive contamination has an adverse effect on isolation and reduces input resistance. The surface must be kept clean for this reason. Use a slightly dampened cloth for cleaning. Avoid the use of cleansers, abrasives or solvents.

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

If required please contact:

GOSEN METRAWATT GMBH
Service-Center
Thomas-Mann-Straße 20
90471 Nürnberg • Germany
Phone +49-(0)-911-8602-410/256
Fax +49-(0)-911-8602-253
E-Mail service@gmc-instruments.com

This address is only valid for Germany. In other countries our representatives or subsidiaries may be contacted.

* **DKD** Calibration Laboratory for Electrical Quantities DKD-K-19701

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

17 Product Support

If required please contact:

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