

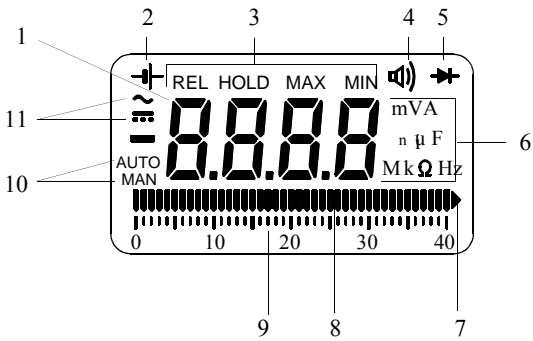
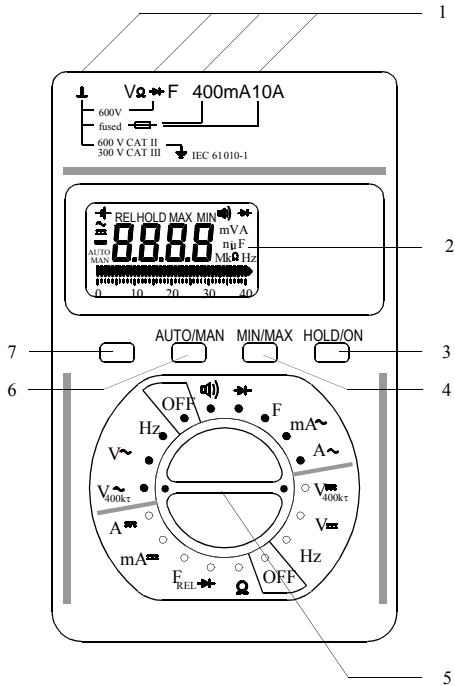
User's Manual

*RISH*Max 12/14

Analog-Digital Multimeters

30856





RISHmax 12/14 Operating Elements

- 1 Terminal Sockets
- 2 LCD Display
- 3 Data HOLD/ ON Pushbutton
- 4 Pushbutton for Storage of Minimum or Maximum Value
- 5 Function Selector Switch for ON/OFF and Measurement Function Selection
- 6 Pushbutton for Automatic or Manual range selection
- 7 Multifunction Pushbutton

RISHmax 12/14 Display

- 1 Digital Display with Indication of Decimal Point and Polarity
- 2 Low Battery Display
- 3 REL, HOLD, and MIN and MAX Display
- 4 Continuity Test Display: Buzzer Indication
- 5 Diode Measurement Display
- 6 Display for Unit of Measured Quantity
- 7 Overrange Indication
- 8 Pointer for Analog Indication
- 9 Scale for Analog Indication
- 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 RISHmax 12/14 analog-digital multimeter is manufactured in compliance with safety regulations IEC 61010-1 / EN 61010-1 / VDE 0411-1. In case of incorrect use or careless handling, the safety of both user and multimeter is not assured.

To maintain the safe and proper condition of the meters and to ensure their safe operation, it is absolutely necessary to carefully and completely read these operating instructions before using any meter. These instructions must be followed in all respects.

Observe the following safety precautions:

- The meter must only be operated by persons who understand the danger of shock hazards and know how to apply safety precautions. Shock hazards exist anywhere, where voltages of more than 30 V (TRMS) may occur.
- Do not work alone in shock hazardous environment while carrying out measurement
- *The maximum allowable voltage* between any terminal sockets (1) and earth is equal to 600 V. Voltages of greater than 500 V may only be applied to sockets “{”, and “V” with the selector switch in the voltage measurement position (selector switch in “V” position).
- Take into account that unexpected voltages can occur at devices under test (e.g. defective devices). For example, capacitors can be dangerously charged.
- Verify that the test leads are in good condition, e.g. no cracked insulation, no open circuits in the leads or connectors.
- This meter must not be used for measurements on circuits with corona discharge (high-voltage).
- Be particularly careful when measurements are made in HF electrical circuits. Dangerous composite voltages may be present.
- Measurements under moist ambient conditions are not permitted.
- Do not exceed the *permissible overload limits of the measuring ranges*. Limit values can be found in the table “Measuring Ranges” in chapter 14 “Specifications”.

- 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

Repair, Parts Replacement and Calibration

After opening the meter, live parts may be exposed. Therefore, the meter must be disconnected from the measuring circuit prior to opening its case for repair, replacement of parts or calibration. If repair or calibration cannot be avoided unless the meter is open and live, this work must be performed by a qualified person who understands the danger involved.

Faults and Extraordinary Stress

When it must be assumed that the safe operation is no longer possible, take the meter out of service and secure it against accidental use.

It is assumed that Safe operation is no longer possible,

- when the meter shows obvious sign of damage,
- when the meter no longer functions correctly,
- after a prolonged storage under adverse conditions,
- due to severe stress due to transportation.

2 Initial Start-Up

Battery

Fit the meter with battery (batteries) provided along with the meter

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

Switching the Meter ON

Turn the Function selector switch from the OFF position to the desired measuring function.

An sound signal acknowledges that the instrument has been switched on. All of the segments of LCD 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 meter off, and then back on. If this procedure is unsuccessful, briefly disconnect the battery from the contact terminals.



Attention!

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

Automatic turn-OFF

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

Switching the Meter back ON

Activate the HOLD/ON key. Press briefly twice.

Switching the Meter 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 Function 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 features autoranging for all measuring ranges except for the ranges 400 mV ~ and 10 A. Automatic selection is functional as soon as the meter is switched ON. According to the measured quantity applied, the meter automatically selects the measuring range which gives the best resolution.

The meter 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

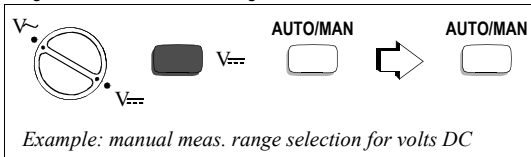
You can switch OFF autoranging ,select and fix the ranges manually according to the table given below.

First select the desired measuring function with the functionselector switch and, if appropriate, the multifunction key.

Briefly activate the AUTO/MAN key.

Manual mode is switched OFF 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	Acknowledgement	
		Display	Sound 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 ... τ : 40 Mτ { 400 τ { 4 kτ { 40 kτ { 400kτ { 4000 kτ { 40 Mτ ... F : 4 nF { 40 nF { 400 nF { 4 mF { 40 mF ...	MAN	1 x
Long	Return to Automatic Range Selection	AUTO	2 x

4 Liquid Crystal Display

4.1 Digital Display

The digital display shows the measurement value, decimal point and sign. The selected measuring unit and function are displayed. When measuring DC quantities minus sign appears in front of the digits, 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 τ measurements.

4.2 Analog Display

The analog indication gives the dynamic performance of a moving coil mechanism and is updated 20 times per second for V, A and τ measurements. This is especially advantageous for the observation of measurement value fluctuations and for calibration procedures.

5 Buzzer

The following steps are acknowledged by an sound signal:

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

A repetitive sound 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 on the LCD.

The Hold display is switched OFF if:

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

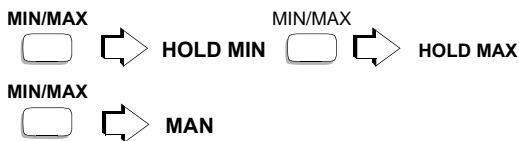
7 Storing Minimum or Maximum Values “MIN/MAX” Hold

With the MIN/MAX function, you can “HOLD” either the minimum or the maximum measurement value which was applied to the input of meter immediately after activating of MIN or MAX key. The most important application is the determination of the minimum or the maximum value for long-term monitoring of measured quantities.

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 required, 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 instructions.
- # Press the MIN/MAX key.
HOLD MIN is displayed. The meter continuously updates the measured values and digitally displays the smallest occurring measurement value. This function remains active, and the respective minimum value remains stored, until the MIN/MAX key is once again activated.

- # Press the MIN/MAX key.
HOLD MAX is displayed. The meter continuously updates the measured values 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 Function selector switch, depending upon the desired input resistance, to $V \sim (R_E > 10 M\tau)$ or $V \sim_{400k\tau} (R_E = 400 k\tau)$.



Note!

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

Ï Connect the measurement cable as shown. Terminal “{” should be grounded, and the second measuring cable with a higher potential connected to Terminal “V”.



Note!

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

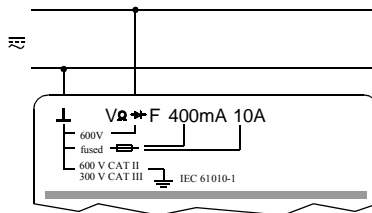


Attention!

Make certain that the *current ranges* (“mA” or “A”) are deactivated and that the measurement cables are connected to the correct terminals, “V and {”, 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 meter !

Select the respective voltage type which corresponds to the measuring value 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 sound 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 Wave form (TRMS Value –only RISHmax 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

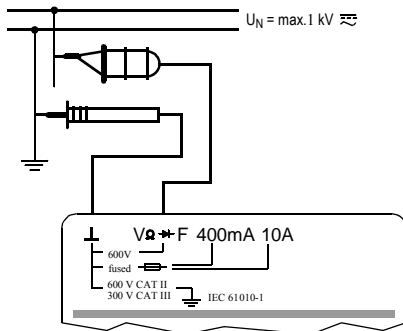
On low voltage systems, transient overvoltages of several kilovolts can occur due to switching functions of lightning discharges. Direct connection of the multimeter to a network of this type for the purpose of voltage measurement can thus be dangerous.

For voltage measurements in power systems with nominal voltages up to 1000V, Use the KS30 measuring adaptor. It is an adapter for the multimeter, which eliminates dangers caused by overvoltages and incorrect operation of multimeter. It provides following protective functions:

- Input circuit protection for multimeter voltage measuring ranges. The internal resistance of the KS30 limits current in case of overvoltage.
- Overload capacity: continuous 1200 V_{eff} transient (rise: 10 \leftarrow s/fall: 1000 \leftarrow s) max. 6 kV.
- Safe suppression of sparking after overvoltage.
- Current limiting in case of incorrect operation(e.g. application of voltage to a current input).

Voltages of over 1000 V can be measured with a high-voltage probe. The required safety precautions are taken

+ Note!
For correct voltage measurement, the measurement function $V_{\sim 400k\tau}$ may not be used.



9 Current Measurement



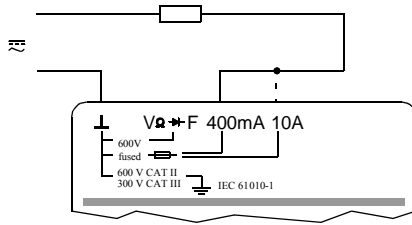
Attention!

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

- a) Select function A with the function selector switch for currents > 400 mA, or function mA for currents < 400 mA. When measuring currents of an unknown magnitude, *Select the highest measuring range first.*
- b) Select the function corresponding to the measured quantity by briefly pressing the yellow multi-function key. Each time the key is pressed, alternate switching takes place between DC and AC, and change over is acknowledged by sound signal. The symbols --- 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.
- c) Connect the measuring instrument in series to the load as shown (without contact resistance).

Notes on Current Measurement :

- The meter must be used only in power systems, when the current circuit is protected with a 20 A fuse or circuit breaker, and the nominal voltage of the system does not exceed 500 V.
- Make the measuring circuit connections mechanically strong and secure, so that they do not accidentally open. The conductor cross sections and connection points should be designed to avoid excessive heating.
- In the 400 mA measuring range an intermittent sound 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 meter 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



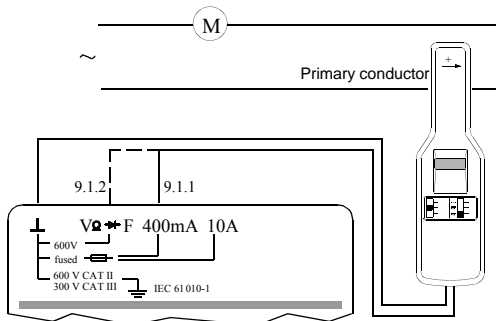
Attention!

If current transformers are operated with an open circuit on the secondary side, e.g. due to defective or disconnected leads, a blown fuse in the meter or a wrong connection, dangerously high voltages can occur at the connections. For this reason, verify that the current circuit of the multimeter and secondary winding of transformer connected to the multimeter form an intact circuit. Connect the transformer to the sockets { - and mA or A

Some current transformers 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 ration of the transformer, as well as additional display error.

9.1.2 Transformer Output mV/A.

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



10 Continuity Testing and Resistance Measurement

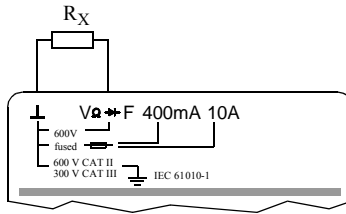


Attention!

Verify that the device under test is electrically dead.
External voltages would falsify the measurement results!

* Set the selector switch to “ Ω ”.

* Connect the Device Under Test as shown.



Continuity Testing

The instrument generates a continuous sound signal at a measured resistance of 0 ... approx. $< 40 \tau$.

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!

Verify that the device under test is electrically dead. External voltages would falsify the 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 3.000 V, you can test several elements connected in series, or reference diodes with small reference voltages.

Reverse Direction or Interruption

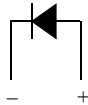
The measuring instrument displays a voltage of approx. 3 V (battery voltage test for RISHmax 12).



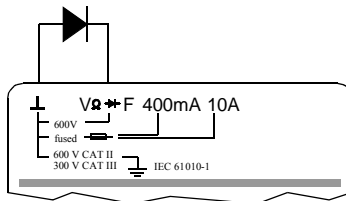
Note!

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

Conducting Direction



Reverse Direction



12 Capacitance Measurement

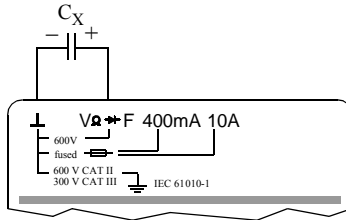


Attention!

Be absolutely certain that the device under test is electrically dead. External voltages would falsify the measurement results!

Set the function selector switch to "F".

Connect the (discharged!) device under test to socket "{ " and "F" with measurement leads. Polarized capacitors must be connected to the "{ " socket at the "-" pole.



Note!

Resistors and semiconductor paths in parallel to the capacitor falsify the measurement results!

To measure small value capacitors please use short measurement cables!

RISHmax 14: If \pm 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 capacitance values in the 4 nF and 40 nF ranges, the inherent error of the meter and the capacitance of the leads can be eliminated by zero adjustment.

-Connect the leads to the meter without Device under test.

-Briefly Press the yellow multifunction key .

The instrument acknowledges zero adjustment with an sound 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.

Deleting Zero adjustment

Press and hold the yellow multifunction key for long time, clearance is acknowledged by buzzer sounding twice.

or

Activate the function selector switch

or

Switch the multimeter off.

13 Frequency Measurement

a) Set the function selector switch to Hz.

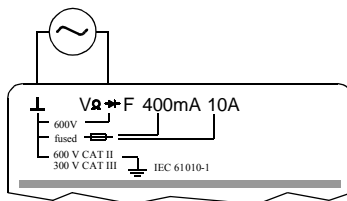
The frequency measurement mode is activated. Frequency is displayed at the LCD. There is no analog display and Digital display is expanded to 9999 digits. Only the auto mode of operation is possible, because the AUTO/MAN key is required for sensitivity selection.

b) Connections are made the same way as for voltage measurement.

c) 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).

d) The lowest measurable frequencies and the maximum allowable voltages can be found in the chapter "Specifications"



14 Specifications

Measuring Function	Measuring Range			Resolution	Input Impedance 100 pF // X τ	
	RISHmax	12	14		$V_{\sim} / V_{400k\tau}$	$V_{400k\tau}$
V_{\sim} $V_{\sim 400k\tau}$	400.0mV	1	1	100 \leftarrow V	> 20 Mτ	400 kτ
	4.000 V	1	1	1 mV	11 Mτ	400 kτ
	40.00 V	1	1	10mV	10 Mτ	400 kτ
	400.0 V	1	1	100mV	10 Mτ	400 kτ
	600 V	1	1	1 V	10 Mτ	400 kτ
V_{\sim} $V_{\sim 400k\tau}$	400.0mV	1	1 ¹⁾	100mV	> 20 Mτ	400 kτ
	4.000 V	1	1 ¹⁾	1 mV	11 Mτ	400 kτ
	40.00 V	1	1 ¹⁾	10 mV	10 Mτ	400 kτ
	400.0 V	1	1 ¹⁾	100 mV	10 Mτ	400 kτ
	600 V	1	1 ¹⁾	1 V	10 Mτ	400 kτ
					Voltage Drop at Maximum Measuring Current, approx.	
A_{\sim}	40.0 mA	1	1	10 \leftarrow A	450mV	
	400.0mA	1	1	100 \leftarrow A	1.5 V	
	10.00 A	1	1	10mA	750mV	
A_{\sim}	40.00mA	1	1 ¹⁾	10 \leftarrow A	450mV	
	400.0mA	1	1 ¹⁾	100 \leftarrow A	1.5 V	
	10.00 A	1	1 ¹⁾	10 mA	750mV	
					Open-Circuit Voltage	
τ	400.0 τ	1	1	100mτ	approx. 0.5 V	
	4.000kτ	1	1	1 τ		
	40.00kτ	1	1	10 τ		
	400.0kτ	1	1	100 τ		
	4000kτ	1	1	1 kτ		
40.00Mτ	1	1	10 kτ			
τ ²⁾	400.0 τ	1	1	100mτ		
\rightarrow	3.000 V	1	1	1 mV	approx. 3 V ³⁾	
F	4.000 nF	1	1	1 pF		
	40.00 nF	1	1	10 pF		
	400.0 nF	1	1	100 pF		
	4.000 \leftarrow F	1	1	1 nF		
	40.00 \leftarrow F	1	1	10 nF		
					f_{min}	
Hz ²⁾	100.00Hz	1	1	0.01 Hz	10 Hz	
	1.0000kHz	1	1	0.1 Hz		
	10.000kHz	1	1	1 Hz		
	100.00kHz	1	1	10 Hz		
	400.0 kHz	1	1	100 Hz		

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

2) Indication for frequency measurement expanded to 9999 D

3) RISHmax 12: Battery voltage 2.2 V ... 3.2 V

RISHmax 14: Battery voltage 3 V \pm 5%

Measuring Function	Measuring Range	Digital Display Intrinsic Error at Reference Conditions $\pm(\dots\% \text{ of rdg. } + \dots \text{ D})$	Overload Capacity ¹⁾	
			Overload Value	Overload Duration
$V_{\text{---}}$ $V_{\text{---}400k\tau}$	400.0mV	0.75 + 2	720 V ---	continuous
	4.000 V	0.5 + 2		
	40.00 V			
	400.0 V			
$V_{\sim 2)}$ $V_{\sim 2)400k\tau}$	400.0mV	1,5 + 5 ²⁾	720 V \sim effective sine	continuous
	4.000 V	1 + 5 ²⁾		
	40.00 V			
	400.0 V	1 + 10 ²⁾		
$A_{\text{---}}$	40.00mA	0.8 + 2	480 mA	continuous
	400.0mA			
	10,00A ⁴⁾	1,5 + 5		
A_{\sim}	40.00mA	1 + 5 ²⁾	480 mA	continuous
	400.0mA			
	10,00A ⁴⁾	2 + 5 ²⁾		
τ	400.0 τ	0.8 + 5	420 V DC AC effective sine	10 min.
	4.000k τ	0.8 + 2		
	40.00k τ			
	400.0k τ			
	4000 k τ	1 + 5		
	40.00M τ	2 + 5		
$\tau_{\text{---}} \mu\text{j})$	400.0 τ	Sound signal for 0 ... < 40 τ		
\rightarrow	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 μ F			
	40.00 μ F	5 + 10		
Hz	100.00Hz	0.2 + 2	Ⓢ4kHz: 600 V Ⓢ10 kHz: 100 V Ⓢ400 kHz:40 V	continuous
	1.0000kHz			
	10.000kHz			
	100.00kHz			
	400.0kHz			

1) At 0 |C ... + 40 |C

2) The specified intrinsic error applies to RISHmax 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	RISHmax 12: 3 V ± 0.1 V RISHmax 14: 8 V ± 0.1 V

Ambient Conditions

Working Temperature	
Range	-10 C ... + 50 C
Storage Temperature	
Range	- 25 C ... + 70 C (without batteries)
Climate Classification	2z/-10/50/70/75% in compliance with VDI/VDE 3540
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.

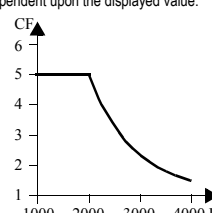
Analog

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 \geq 3999 steps
Overflow Display	"4000" with blinking "4"
Polarity Display	"-" sign is displayed when plus pole is at "{ "
Measuring Rate	2 measurements/s for V, I, and τ 1 measurement/s for capacitance and frequency

Influence Quantity and Effects

Influence Variable	Influence Range	Meas. Magnitude/ Measuring Range	Influence Effect
Temperature	0 C ... +21 C and +25 C... +40 C	V \approx	0.1 x intrinsic error/K
		V \sim	
		A \approx	
		A \sim	
		τ	
		F	
		Hz	
Waveform	Crest factor CF $\frac{1 \dots 1.4}{> 1,4 \dots 5}$	4, 40, 400 V, mA, A 2)	$\pm 1\%$ of rdg. $\pm 5\%$ 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. $\pm(\dots \% \text{ of rdg. } + \dots D)$
Frequency V_{AC}	4, 40, 400 V	20 Hz ... < 50 Hz > 50 Hz... 500 Hz	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 \approx A \approx τ F Hz	1x Inherent Error
Influence Variable	Interference Magnitude	Measuring Range	Attenuation
	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 \rightarrow display) - all ranges except AC: $\pm 5 D$
AC range: $\pm 20 D$

Power Supply

Battery

RISHmax 12:

2 x 1.5 V mignon cell
zinc-carbon cell per IEC R6
alkaline manganese cell per
IEC LR 6

RISHmax 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

RISHmax 12:

with zinc-carbon cell:
approx. 300 hr.
with alkaline manganese cell:
approx. 600 hr.

RISHmax 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:

RISHmax 12: approx. 2.3 V

RISHmax 14: approx. 7 V

Fusing

Fuse for ranges
up to 400 mA

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

Fuse for
10 A Range

FF 16 A / 500 V;
6.3 mm x 32 mm
breaking capacity 50 kA at
500 V ~ with resistive load,
cos ϕ < 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
Contamination Level	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 50081-1: 1992 EN 55022: 1987 Class B
Interference Immunity	EN 50082-1: 1992 EN 61000-4-2: 8 kV atmospheric discharge EN 61000-4-3: 3 V/m EN 61000-4-4: 0.5 kV

Mechanical Design

Protection	For meter : IP 50 For Terminals : 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 probe, a banana plug or a similar object in the direction indicated by the arrow as shown on the housing base, and remove the base.

RISHmax 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.

RISHmax 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 1.6 A / 700 V~ ; 6.3 mm x 32 mm
- for the 10 A measuring range:
type Siba FF 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 „mA”.

Plug the measurement cable into the “V, τ , \rightarrow , 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 τ , 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 τ , 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

When you need service, Please contact;

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