

PeakTech[®]

Prüf- und Messtechnik

 **Spitzentechnologie, die überzeugt**



PeakTech[®] 4090

**Bedienungsanleitung /
Operation manual**

Digital-Multimeter

1. Safety Precautions

This product complies with the requirements of the following European Community Directives: 2004/108/EC (Electromagnetic Compatibility) and 2006/95/EC (Low Voltage) as amended by 200/22/EC (CE-Marking). Overvoltage category I 600V; pollution degree 2.

- CAT I: For signal level, telecommunication, electronic with small transient over voltage
CAT II: For local level, appliances, main wall outlets, portable equipment
CAT III: Supplied from a cable under earth; fixed installed switches, automatic cut-off or main plugs.
CAT IV: Units and installations, which are supplied over aerial line, which are stand in a risk of persuade of a lightning, i.e. main-switches on current input, overvoltage-diverter, current use counter.

Warning! Do not use this instrument for high-energy industrial installation measurement. To ensure safe operation of the equipment and eliminate the danger of serious injury due to short-circuits (arcing), the following safety precautions must be observed.

The meter is designed to withstand the stated max voltages. If it is not possible to exclude without doubts that impulses, transients, disturbance or for other reasons, these voltages are exceeded a suitable prescale (10:1) must be used.

- * Do not exceed the maximum permissible input ratings (danger of serious injury and/or destruction of the equipment).
- * The meter is designed to withstand the stated max voltages. If it is not possible to exclude without that impulses, transients, disturbance or for other reasons, these voltages are exceeded a suitable prescale (10:1) must be used.
- * Replace a defective fuse only with a fuse of the original rating. Never short-circuit fuse or fuse holding.
- * Disconnect test leads or probe from the measuring circuit before switching modes or functions.
- * Do not conduct voltage measurements with the test leads connected to the mA/A- and COM-terminal of the equipment.
- * To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking any resistance measurements.
- * Do not conduct current measurements with the leads connected to the V/ Ω -terminals of the equipment.
- * Check test leads and probes for faulty insulation or bare wires before connection to the equipment.
- * To avoid electric shock, do not operate this product in wet or damp conditions. Conduct measuring works only in dry clothing and rubber shoes, i. e. on isolating mats.
- * Never touch the tips of the test leads or probe.
- * Comply with the warning labels and other info on the equipment.
- * Always start with the highest measuring range when measuring unknown values.
- * Do not subject the equipment to direct sunlight or extreme temperatures, humidity or dampness.
- * Do not subject the equipment to shocks or strong vibrations.
- * Do not operate the equipment near strong magnetic fields (motors, transformers etc.).
- * Keep hot soldering irons or guns away from the equipment.
- * Allow the equipment to stabilize at room temperature before taking up measurement (important for exact measurements).


- * Do not input values over the maximum range of each measurement to avoid damages of the meter.
- * Do not turn the rotary function switch during voltage or current measurement, otherwise the meter could be damaged.
- * Use caution when working with voltages above 35V DC or 25V AC. These Voltages pose shock hazard.
- * Replace the battery as soon as the battery indicator “BAT” appears. With a low battery, the meter might produce false reading that can lead to electric shock and personal injury.
- * Fetch out the battery when the meter will not be used for long period.
- * Periodically wipe the cabinet with a damp cloth and mild detergent. Do not use abrasives or solvents.
- * The meter is suitable for indoor use only
- * The measurement instrument is not to be unattended.
- * Do not operate the meter before the cabinet has been closed and screwed safely as terminal can carry voltage.
- * Do not store the meter in a place of explosive, inflammable substances.
- * **-Measuring instruments don't belong to children hands-**

Cleaning the cabinet

Prior to cleaning the cabinet, withdraw the mains plug from the power outlet.

Clean only with a damp, soft cloth and a commercially available mild household cleanser. Ensure that no water gets inside the equipment to prevent possible shorts and damage to the equipment.

1.1. Table 1; Line inputs

Function	Terminal	Input Limits
V DC	V/ Ω + COM	600 V DC
V AC	V/ Ω + COM	600 V AC
Ohm	V/ Ω + COM	250 V DC/AC
μ A/mA DC/AC	μ A/mA + COM	250 mA / 250 V
10 A DC/AC	10 A + COM	10 A / 250 V
 / ((:))	V/ Ω + COM	250 V DC/AC
LOGIC	V/ Ω + COM	250 V DC/AC

1.2. Safety Symbols

The following symbols are imprinted on the meter's front panel to remind you of measurement limitations and safety:

10 A The maximum current that you can measure at this terminal is 10 amps DC/AC. This terminal is fuse protected by 10 A/690 V fuse. When using this range with high current, keep the duty cycle to 30 seconds on load and 15 minutes off load.

mA The max. current, that you can measure at this terminal is 220 mA DC/AC. This terminal is fuse protected by 250 mA/690 V fuse.



To avoid electric shock or instrument damage, do not connect the common input COM and V/ Ω terminal to any source of more than 600 V with respect to earth ground.



The max. voltage this meter can measure is 600 V DC/AC.



Be exceptionally careful when measuring high voltages. Do not touch the terminals or test leads ends. Refer to the complete operating instructions.



Both direct and alternating current



Indicates protection class II; Double insulation

CAT I

Overvoltage category I

2. Preparation for Operation

2.1. Power Cable

The detachable supply cable, comprising of 3 core PVC cable permanently molded to fully shrouded 3-pin socket, fits in the power input plug recess and should be fitted fully. The supply lead should be connected to a grounded AC power receptacle ensuring, that the ground lead is connected, to avoid electrical shock.

2.2. Line voltages

Your instrument is operative within the line voltage ranges of 230 V \pm 10% at 50 Hz; max. power consumption 10 W.

Disconnect all test cables, probes and power cord while changing the line voltage you desired.

2.3. Bench Mounting

This instrument is fitted for rubber feet. It is intended to stand on a bench located at least 30 cm free space at the rear. In addition, plastic tilt-stand is provided to facilitate the viewing angle of the instrument from the bench-level.

2.4. Using the test leads

Use only the type of test leads supplied with your meter. These test leads are rated for 1000 volts.

Warning!

- * If you try to measure voltages above 1000 V DC/AC, you might damage your instrument and expose yourself to a serious shock hazard. Use extreme care when you measure high voltages.
- * Never connect the test leads plug into the COM – terminal to a source of voltage greater than 1000 V with respect to earth ground. This creates a serious shock.

3. Specifications

3.1. General Specifications

Max. Display	22000 counts 4 1/2-digit LCD-Display
Operating temperature	0° ... +50°C; < 75% RH
Temperature of guaranteed accuracy	+23°C ± 5°C
Max. relative humidity	75%
Altitude	up to 2000 m
Storage temperature	-20°C ... + 60°C (14°F ... 122°F); < 75% RH
Size	268 x 108 x 322 mm
Weight	2,8 kg

For indoor-use only.

Accuracy is specified for a period of one year after calibration and at 18°C to 28°C, with relative humidity < 60%.

Accuracy specifications take the form of:

± ([% of Reading] + [number of Least Significant Digits])

3.2. AC Voltage/DC Voltage + AC Voltage

Range	Resolution	Accuracy		
		40 Hz - 100 Hz	100 Hz – 10 kHz	10 kHz – 30 kHz
220 mV	0,01 mV	± (0,5%+ 30 dgt.)	± (1,5%+ 30 dgt.)	± (2,5%+ 30 dgt.)
2,2 V	0,1 mV			
22 V	1 mV			
220 V	10 mV	± (0,8%+ 30 dgt.)	± (2,0%+ 30 dgt.)	unspecified
600 V	0,1 V			

Input Impedance:

Range 220mV: > 1000MΩ

other Ranges: 10MΩ

All AC voltage ranges are specified from 10% to 100% of range except that the 600V range is specified from 30% to 100% of range.

When the input terminals are shorted, the display may show a number between 0 and 30 counts; and when the input terminals are open, the reading may fluctuate due to interference. This is normal and will not affect measurements.

3.3. DC Voltage

Range	Resolution	Accuracy
220 mV	0,01 mV	± (0,05% + 6 dgt.)
2,2 V	0,1 mV	
22 V	1 mV	
220 V	10 mV	
600 V	0,1 V	

Input Impedance:

Range 220mV: > 1000MΩ

other Ranges: 10MΩ

The above accuracies are specified from 0% to 100% of range.

3.4. AC Current

Range	Resolution	Accuracy		
		40 Hz ~ 100 Hz	100 Hz ~ 1 kHz	1 kHz ~ 5 kHz
220 μA	0,01 μA	± (0,8% + 30 dgt.)	± (1% + 30 dgt.)	± (1,2% + 30 dgt.)
2200 μA	0,1 μA	± (0,8% + 30 dgt.)	± (1% + 30 dgt.)	± (1,2% + 30 dgt.)
22 mA	1 μA	± (0,8% + 30 dgt.)	± (1% + 30 dgt.)	± (1,2% + 30 dgt.)
220 mA	10 μA	± (0,8% + 30 dgt.)	± (1% + 30 dgt.)	± (1,2% + 30 dgt.)
10 A	10 mA	± (1,0% + 30 dgt.)	± (1,5% + 30 dgt.)	± (2,0% + 30 dgt.)

Max. Allowable Input Current: 10A

(For measurements > 2A: measurement duration <10 seconds, and interval >15 minutes)

All AC current ranges are specified from 10% to 100% of range except the 10A range, which is specified from 20% to 100% of range.

3.5. DC Current

Range	Resolution	Accuracy
220 μA	0,01 μA	± (0,2% + 15 dgt.)
2200 μA	0,1 μA	
22 mA	1 μA	
220 mA	10 μA	
10 A	1 mA	± (0,8% + 1 dgt.)

Max. Allowable Input Current: 10A

(For measurements > 2A: measurement duration <10 seconds, and interval >15 minutes)

All AC current ranges are specified from 10% to 100% of range except the 10A range, which is specified from 20% to 100% of range.

3.6. Resistance

Range	Resolution	Accuracy
220 Ω	0,01 Ω	± (0,1% + 10 dgt.)
2,2 KΩ	0,1 Ω	
22 KΩ	1 Ω	
220 KΩ	10 Ω	
2,2 MΩ	100 Ω	
22 MΩ	1 kΩ	± (1,5% + 10 dgt.)
220 MΩ	100 kΩ	± (2,5% + 5 dgt.)

The above accuracies are specified from 0% to 100% of range.

For measurements in 220Ω and 2,2kΩ-range, use Relative mode to subtract the resistance of the test leads.

The accuracy of continuity-test and diode-test are not specified.

Continuity tests:

- When the resistance is <30Ω, the buzzer will sound.
- When the resistance is > 50Ω, the buzzer will not sound.

3.7. Capacitance

Range	Resolution	Accuracy
22 nF	0,01 nF	± (2% + 5 dgt.)
220 nF	0,1 nF	
2,2 μF	1 nF	
22 μF	10 nF	± (2,5% + 5 dgt.)
220 μF	0,1 μF	
2,2 mF	1 μF	± (5% + 5 dgt.)
22 mF	10 μF	
220 mF	100 μF	unspecified

Note:

1. For film capacitors (or better), accuracy is guaranteed from 0% to 100% of range.
2. For measurements < 2pF, accuracy is guaranteed, if Relative mode (REL) is used to subtract residual from measurements.

3.8. Logic-Frequency

Frequency Range	Sensitivity	Resolution	Accuracy
20 Hz ~ 220 MHz	$3 V_{pp}$ square wave	10 (20 Hz-Range)	± (0,06% + 10 St.)

Note:

Measurement can be up to 220MHz, but please pay attention to the signal attenuation caused by the test leads and probes when measuring high frequency signals above 2,2MHz.

3.9. Linear Frequency

Range	AC Sensitivity (TRMS, sine wave)	
	5 Hz- 10 kHz	10 kHz-100 kHz
220 mV	> 10 mV	> 20 mV
2.2 V	> 100 mV	> 200 mV
22 V	> 1 V	> 2 V
220 V	> 10 V	> 20 V
600 V	>100 V*	Not specified
220 μ A	> 10 μ A*	
2200 mA	> 100 μ A*	
22 mA	> 1 mA*	
220 mA	> 10 mA*	
10 A	> 1 A*	

* Frequency Response: 50 Hz – 10 kHz


3.10. Duty Ratio

Frequency range	Duty ratio range	Resolution	Accuracy
20 Hz ~ 10 kHz	5% ~ 95%	0,01%	\pm (10%)

3.11. Continuity Test

Range	Audible Threshold	Response Time	Test current
220 Ω	Less than 30 Ω	approx. 100 ms	< 0,7 mA

3.12. Diode Test

Range	Description
	The approximate forward voltage drop of the diode will be displayed. If the voltage drop is more than 2V, the display shows "OL"

3.13. Temperature Measurement

	Temperature Range	Resolution	Accuracy
$^{\circ}$ C	-20 $^{\circ}$ C - 0 $^{\circ}$ C	0,1 $^{\circ}$ C	\pm (6.0% + 3 $^{\circ}$ C)
	0 $^{\circ}$ C - 400 $^{\circ}$ C		\pm (1.5% + 3 $^{\circ}$ C)
	400 $^{\circ}$ C - 1000 $^{\circ}$ C		\pm (1.8% + 3 $^{\circ}$ C)
$^{\circ}$ F	-4 $^{\circ}$ F - 32 $^{\circ}$ F	0,1 $^{\circ}$ F	\pm (6.0% + 6 $^{\circ}$ F)
	32 $^{\circ}$ F - 752 $^{\circ}$ F		\pm (1.5% + 6 $^{\circ}$ F)
	752 $^{\circ}$ F - 1832 $^{\circ}$ F		\pm (1.8% + 6 $^{\circ}$ F)

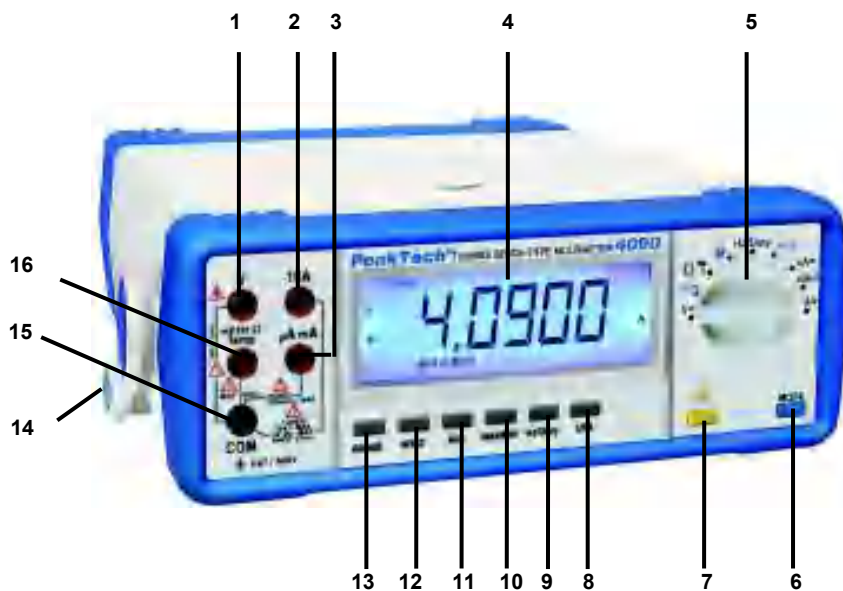
Using of e K type thermocouple

Note:

1. The accuracy does not include error of the thermocouple probe.
2. Accuracies apply after 1.5 hours if ambient temperature changes

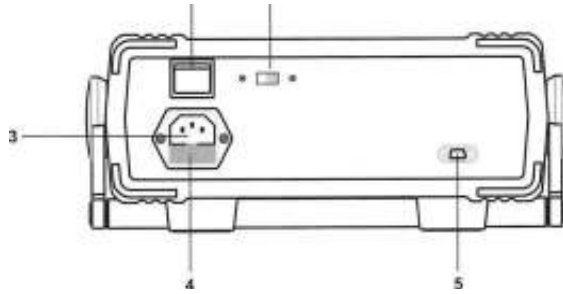
4. Front Panel Description

Front Side View



1. V-input socket
2. 10A- input socket: for measurements of $>220\text{mA}$ up to 10A
3. $\mu\text{A}/\text{mA}$ -input socket: for measurements up to 220mA
4. LCD-display
5. Function-/Range-selector
6. MODE-button
7. Button for backlight
8. USB-button
9. Hz/Duty-button
10. MIN/MAX-button
11. REL-button
12. DATA-HOLD
13. RANGE-button
14. Handle bail
15. CAO-input socket
16. mV/ Ω /CAP/Temp-input socket

Rear Side View



1. Power-Switch
2. Power Supply Selector Switch (AC/DC-switch):
 - AC: mains operation
 - DC: battery operation
3. Power socket
4. Fuse holder (250mA/250V)

5. How to use the instrument

This section describes the instrument and how to use it. For easy reference, each description is numbered and keyed to the illustration inside the front cover.

5.1. Input Terminals

The following items describe the input terminals.

10 A:

For current measurement (AC or DC) up to 10 A. Set the Function-Switch to A $\overline{\text{=}}$ and press the MODE-button to select AC or DC.

μ A/mA-input:

For current measurements (AC or DC) up to 220 mA. Set the Function-Switch to μ A or mA and press the MODE-button to select AC or DC.

COM:

Ground terminal for all measurements (black test lead).

mV/ Ω /Hz/Temp:

For measurements of voltage up to 220 mV and Resistance, Frequency, Temperature and also Diode-Test and continuity-test.

V:

Volt-test terminal (red test lead). For measurement >220 mV.

5.2. Digital LCD-Display

Digital Display

Digital readings are displayed on a 22.000 counts display with automatic polarity indication and decimal point placement.

5.3. Function-/Range-Selector Switch

Used to select the desired function or range. Before to connect the signal to be measured to terminals, you must set this function/range switch to the correct position.

5.4. Special Function Keys

Automatic and manual range selection

Range-button RANGE

- * Select your function to measure
- * Press the RANGE-button to activate the manual range-selection.
- * Press the RANGE-buttons to choose the range for measurement
- * To release this function and hold RANGE-Button for 2 seconds-

5.4.1. Data Hold


The Data Hold feature lets you hold a reading on the display. To turn on the hold feature, press HOLD-button. "HOLD" appears on the display. To release this function, press HOLD button again.

5.4.2. Relative Measurement (REL)

The relative measurement feature lets you measure values relative to a reference value and then measure the difference between the actual value and the reference value. Follow the steps to set a reference value:

1. Take a reading of your reference value
2. Press the REL-button to activate the REL-Mode, REL appears on the display
3. The measured reference value will be shown in the left secondary display
4. Take your further measurements and see the differences between the reference and the actual values in the primary display.

5.4.3. Instruction for Buttons

FUNC	Used to switch between different measurement functions.
	Press this button to turn on or off the backlight. Press this button to arouse the meter from Sleep after the meter turns off automatically.
MAX/MIN	Press the button, the display will show the symbol" MAX" and the maximum reading. Press the button again, the display will show the symbol" MIN " and the minimum reading. Press the button once more, the display will show the flickering " MAX" and " MIN " along with the present reading. Press and hold for more than 1 second to exit the MAX MIN mode, the meter will return to normal operation.
Hz/Duty	In AC voltage (or AC current) measurement mode, press this button to switch among AC voltage (or AC current), frequency and duty cycle measurements. When the Function/Range switch is in the" Hz/Duty" position, press this button to switch between frequency and duty cycle measurements.
USB	Press this button to enable the data transmission from meter to PC, the symbol" USB " will appear on the display and auto power off will be disabled.

Power Supply Selector Switch

- When the switch is in " AC " position, the meter is powered by AC 230V / 50Hz.
- When the switch is in " DC" position, the meter is powered by six 1.5V batteries (UM-3) located in the battery compartment of the meter.

Power Switch

Used to turn on or off the meter.

Power Socket

Used to connect the meter to a 230V / 50Hz power source via power cord.

Line-Power Fuse Holder

Line-power fuse: F 250mA/250V; 5x20mm

USB Connector

This USB connector is internally optically isolated and is used to connect the meter to USB port of computer for data transmission.

6. Making Measurements

This section describes some common applications for your instrument and alert you to some considerations to keep in mind when making measurements.

6.1. Measuring DC Voltages



Warning !!

- * Do not try to measure a voltage greater than 600 Volts DC since it may damage your instrument and expose yourself to a severe to shock hazard.
- * Do not touch circuits or a part of circuits when measuring voltage above 35 V DC.

Follow these steps to measure DC Voltage:

1. Set Function-Switch to the mV or V position.
2. Press MODE-button to select "DC"
3. Press RANGE – Switch to select the range as required to the voltage level to be measured. If you do not know the voltage level, start with the range selection to the highest voltage position and reduce the range position as needed to get a reading.
4. Plug the black test lead into the COM terminal and the red test lead into mV/ Ω /Hz- or V-terminal.
5. Connect the test leads to the DC Voltage source you want to measure.

Notes:

- * Input impedance: 10 MOhm

6.2. Measuring AC Voltage



Warning !!

- * Do not try to measure a voltage greater than 600 volts AC since it may damage your instrument and expose yourself to a severe shock hazard.
- * Do not touch the circuits or a part of circuits when measuring high voltages above 25 V AC_{rms}.

Follow these steps to measure AC Voltage:

1. Set Function-Switch to the mV or V position.
2. Press MODE-button to select "AC".
3. Press RANGE-Switch to select the range as required for the voltage level to be measured. If you do not know the voltage level, start with the range selection to the highest voltage position and reduce the range position as needed to get a reading.
4. Plug the black test lead into the COM – terminal and the red test lead into mV/ Ω /Hz- or V-terminal.
5. Connect the test lead to the AC voltage source you want to measure.

Notes:

- * Input impedance: 10 MOhm in parallel with less than 100 pF.
- * The meters high input sensitivity produces a wandering effect, when the test leads are not connected to any circuit. This is normal and an accurate reading will appear, when you connect the test leads to a circuit to be measured.

6.3. Measuring DC/AC Currents

Warning !!

Never attempt to measure currents in circuits with voltages over 250 volts DC/AC. It may damage the instrument and expose yourself to a severe shock hazard. A severe fire hazard and short circuit danger exists if you apply a voltage with high current capability to this terminal. The 10 A-terminal is fuse protected. Never measure currents exceeding 10 A. When using this range with high currents, keep the duty cycle to 10 seconds on load and 15 minutes off load.

Follow these steps to measure AC/DC current:

1. Disconnect all power sources from the measurement circuit.
2. Set Function-Switch to the desired position (μ A, mA or A)
3. Press MODE and AC appears for AC current measurement. Press again to change to "DC".
4. Plug the black test lead into the COM-terminal and the red test lead into the μ A/mA or 10 A-terminal depending on the range you selected.
5. Connect the test leads in series with the load or circuits.
6. Power on measurement circuit and read the measuring value from the LCD-display.

Notes:

- * If you do not know what the current is, connect the circuit to 10 A input-terminals first to see, if you have safe level for the mA input terminal. Use A terminal for current up to 220 mA.
- * When measuring current, the meter's internal shunt resistors develop a voltage across the instrument's terminals so called "burden voltage". This voltage is very low, but it may affect precision circuits and measurements.
- * If you set the function DC current, the Symbol "-" appears or disappears to indicate the polarity of the measured value.

6.4. Logic Frequency/Duty Ratio Measurement

The frequency range is of 20 Hz ~ 220 MHz ($V_{pp} < 3V$), while the duty ratio measurement range being of 5% ~ 95%. And the measurement methods are as follows:


1. Set Function-switch to the "Hz/duty" position.
2. Insert the red testing line into the mV/ Ω /Hz end and the black testing line into the COM end.
3. Press "Hz/duty" until "Hz" appears in the display.
4. Read the measured value from the display screen. If the frequency of the measured signal is lower or higher than the meter's measurement range, the reading will be displayed as "OL". If the amplitude of signal is too low or the low level is larger than 1 volt, the reading will be displayed as zero.
5. This measurement is of automatic range. Manual range-selection is deactivated.

6.5. Checking Diodes

This function lets you check diodes and other semiconductors for opens and shorts. It also lets you determine the forward voltage for diodes. You can use this function, when you need to match diode.

Before test, disconnect all power to the circuit to be tested and discharge all capacitors thoroughly.

Follow these steps to measure the frequency of a signal:

1. Set Function-Switch to Ω -position.
2. Press MODE-button to select the diode-test-function 
3. Plug the black test lead into the COM-terminal and the red test lead into the mV/ Ω -terminal.
4. Connect the test lead to the diode to be checked and read the display.

Notes:

- * If you check a diode's forward voltage, you will measure voltage of approx. 1,25 V (Germanium) or 0,7 V (Silicon) if the diode is not defective.
- * If "OL" is displayed, it means the diode is open or above 2,0 V forward voltage. However, if the display shows a value between 0 V and approx. 2.0 V, it means a forward drop voltage. The instrument supplies enough forward voltage to light most LED's. However, if the LED's forward voltage is greater than 2.0 volts, the instrument incorrectly indicates, that the device is open.

6.6. Checking Continuity


Continuity testing verifies that circuit connections are intact.

Warning!

Never perform a continuity checking on a circuit, that has power connected.

Follow these steps to perform audible continuity test:

1. Set Function-Switch to Ω -position.

2. Press MODE-button to select continuity-function ()
3. Plug the black test lead into the COM-terminal and the red test lead into the mV/ Ω -terminal.
3. Remove power from the circuit.
4. Connect the test lead tips to the object to be measured.

Note:

1. The buzzer will sound, if the measured resistance from the components is below about 30 ohms.
2. When you perform continuity test, the displayed resistance value of a resistor in a circuit may be different from the actual value of the resistor because the meter's test current flows through all possible paths between the probe tips.
3. In continuity test mode, the RANGE button is disabled.

6.7. Measuring Resistance



Warning !!

Never connect the test leads to a source of voltage, when you have selected the ohms function and plugged the test lead jack into V/ Ω terminal.

Be sure, that the circuit under test has all power removed and any associated capacitors are fully discharged before you make a resistance measurement.

Follow these steps to measure resistance.

1. Set Function-Switch to the Ω -position
2. Press MODE-button to select resistance-measurement-function (Ω)
3. Plug the black test lead into the COM-terminal and the red test lead into the mV/ Ω -terminal
4. Connect the test leads to the object to be measured.

Notes:

- * The resistance in the test leads can diminish the accuracy on the lowest 220 Ohm range. The error is usually 1 to 0,2 ohms for a standard pair of test leads. To determine the error, short the test leads together and read the resistance of the test leads.
- * When measuring resistance, be sure, that the contact between the test leads and the object is good. Dirt, oil, solder flux or other foreign matters can cause incorrect readings.
- * If the measured resistance value exceeds the max. value, "OL" will be displayed indicating overload.
- * For resistance of approx. 2 MOhm and above, the display might take a few seconds to stabilise. This is normal for high resistance readings.
- * During resistance measurements, the present value is in the main display, the measured value taken 1 second earlier in the upper secondary display, the measured value taken 2 seconds earlier in the middle secondary display and the measured value taken 3 seconds earlier in the lower secondary display.

6.8. Capacitance measurements

Caution!

Turn off power and discharge the capacitor before attempting a capacitance measurement. Use the DCV function to confirm that the capacitor is discharged.

1. Set Function-Switch to the $\text{-}|\text{-}$ position.
2. Insert red test lead to mV/ Ω /Hz-input and black test lead to the COM-input.
3. Connect the test leads to the capacitor. Observe polarity when measuring polarized capacitors.
4. Read the capacitance directly from the display. A shorted capacitor will indicate an over range. An open capacitor will indicate near zero on all ranges.

Note:

1. To avoid large error, don't measure a capacitor if this capacitor is connected in parallel with a circuit.
2. When measuring capacitance between 220 μ F and 20mF, to ensure accuracy, the meter takes a relative long time to discharge the capacitor so that it is relatively slow in refreshing the measured value.

6.9. Measuring Linear Frequency



Warning !!

Do not try to measure the frequency of a signal that exceeds 250 volts AC_{rms}. It may damage your instrument and expose yourself to a severe shock hazard. Follow these steps to measure the frequency of a signal.

1. Set Function-Switch to the Hz/Duty-position.
2. Press "Hz/Duty"-button to the select frequency-measurement.
3. Plug the black test lead into the COM-terminal and the red test lead into the mV/ Ω -terminal.
4. Connect the test lead to the frequency source.

Warning:

When the test leads are connected to an AC outlet, do not select other ranges. It might damage the internal components or cause bodily injury.

1. When you make voltage or current measurement, you can press the Hz/Duty button to change to frequency measurement (" Hz" appears on the display) and measure the frequency if the measured signal is an ac signal or contains AC component.

Note:

The amplitude of the AC signal must meet the meter's requirement. For different ranges, the required signal amplitudes are different.

2. Press the Hz/Duty button again to select duty cycle measurement (" % " appears on the display) and measure the duty cycle.

7. How to use the instrument with a PC

7.1. Connection of the instrument with a computer

Follow these steps to connect the instrument to a computer:

1. Connect the supplied USB Interface cable with the USB Port on the back side of the device.
2. Start your computer and connect the interface-cable with a USB-Port.
3. Turn on the computer.
4. Proceed driver installation as described in chapter 8.2.

7.2. Installation of the supplied software

We have included a software program to log and display data collected with your instrument. The Software can be used with Windows XP/VISTA/7 and 8.

Follow these steps to install and run the software:

1. Start your computer and run Windows.
2. Insert the supplied CD in your computers drive.
3. Open the CD-folder manual with "Computer".
4. Execute the "setup.exe" in the folder "Software".
5. Follow ON-Screen prompts to complete the installation.
6. To run the program, double click the icon on your desktop.
7. Activate the Interface of your device by pressing the "USB"-key. "USB" lights up in the display.

To install the USB-driver of the device proceed as described:

1. CD / DVD drive, open "My Computer" or "Computer".
2. For the operating systems Windows XP / VISTA driver installation is started with the "driver.bat".
3. If using the operating system Windows 7 start the driver installation with the "driver_windows_7.bat".
4. Turn on the Multimeter and connect the USB interface cable to the PC.
5. Windows starts the automatic detection of the new device.
6. After successful installation of the driver, the unit can be used in connection with the protocol software.

8. Care and Maintenance

Your instrument is a precise electronic device. Do not tamper with the circuit. To prevent electric shock hazard, turn off the power and disconnect the probes or connectors from the mains before removing the cabinet, if needed.

8.1. General Maintenance

Any adjustments, maintenance or repair of the instruments, except fuse replacement should be done only by qualified service personal.

1. Use and store your meter only in normal temperature environments. Extreme temperatures can shorten the life of electronic devices and distort or melt plastic parts.
2. Keep your instrument dry. If it does get wet, wipe it dry immediately. Liquids might contain minerals, that can corrode the electronic circuit.
3. Handle your instrument gently and carefully. Dropping it can damage circuit boards and cases and cause the instrument to work improperly.
4. Keep your instrument away from dust and dirt, which can cause premature wear of parts.
5. Prior to cleaning the cabinet, disconnect the mains plug from the power outlet. Clean only with a damp, soft cloth and a commercially available mild household cleaner. Ensure, that no water gets inside the instrument to prevent possible shorts and damage to the instrument.

Modifying or tampering with your instrument's internal components can cause a malfunction and might invalidate its warranty.

8.2. Replacing the fuse

Caution !

For continued protection against fire or other hazard, replace only with fuse of the specified voltage and current ratings.

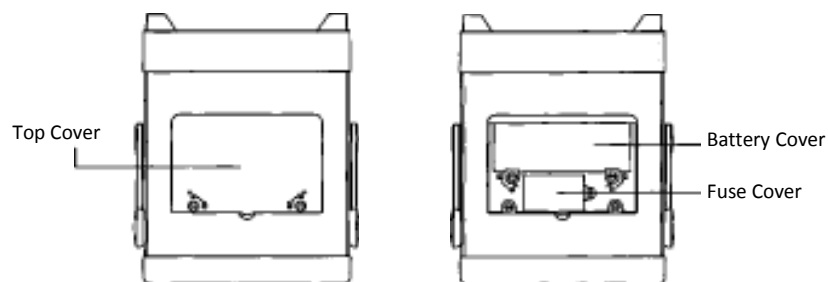
Power line fuse: (230 V, 50 Hz); F250 mA; 5 x 20 mm

10 A-terminal fuse: 10 A/690 V; 10 x 38 mm

mA-terminal fuse: 250 mA/690 V; 10 x 38 mm

To replace a defective fuse, proceed as described:

1. Turn off multimeter with the on / off switch and disconnect test leads from the inputs.
2. Open the fuse cover and remove the defective fuse from the fuse holder.
3. Insert a new fuse of the same type and dimensions in the fuse holder.
4. Replace the fuse cover back and fix it.
5. Replace the case cover back and fix it, too.



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This manual is according the latest technical knowing. Technical changings which are in the interest of progress, reserved.

We herewith confirm that the units are calibrated by the factory according to the specifications as per the technical specifications.

We recommend to calibrate the unit again, after 1 year.

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