



VOLTcraft®

Milliohmmeter R-200

Ⓧ BEDIENUNGSANLEITUNG

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F Informations /légales dans nos modes d'emploi

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- (D)** Diese Bedienungsanleitung gehört zu diesem Produkt. Sie enthält wichtige Hinweise zur Inbetriebnahme und Handhabung. Achten Sie hierauf, auch wenn Sie dieses Produkt an Dritte weitergeben.

Heben Sie deshalb diese Bedienungsanleitung zum Nachlesen auf!

Eine Auflistung der Inhalte finden Sie in dem Inhaltsverzeichnis mit Angabe der entsprechenden Seitenzahlen auf Seite 4.

- (GB)** These operating instructions belong with this product. They contain important information for putting it into service and operating it. This should be noted also when this product is passed on to a third party.

Therefore look after these operating instructions for future reference!

A list of contents with the corresponding page numbers can be found in the index on page 24.

- (F)** Ce mode d'emploi appartient à ce produit. Il contient des recommandations en ce qui concerne sa mise en service et sa maintenance. Veuillez en tenir compte et ceci également lorsque vous remettez le produit à des tiers.

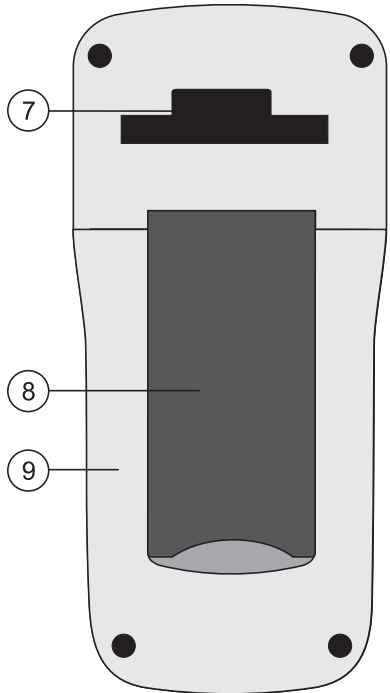
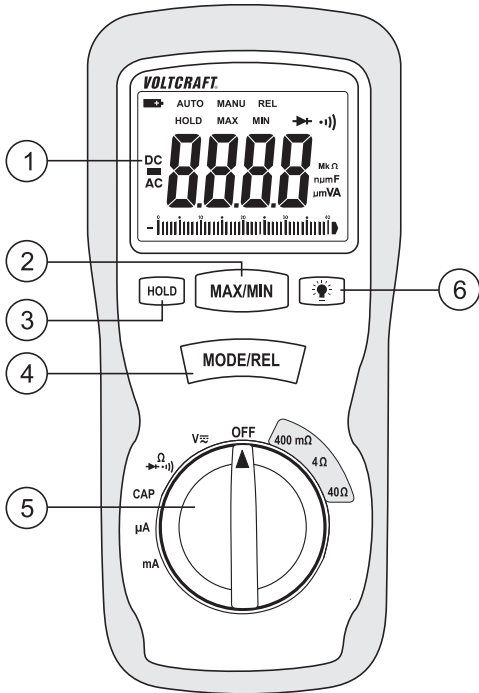
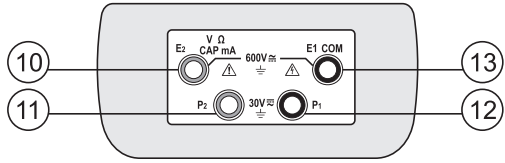
Conservez ce mode d'emploi afin de pouvoir vous documenter en temps utile.!

Vous trouverez le récapitulatif des indications du contenu à la table des matières avec mention de la page correspondante à la page 44.

- (NL)** Deze gebruiksaanwijzing hoort bij dit product. Er staan belangrijke aanwijzingen in betreffende de ingebruikname en gebruik, ook als u dit product doorgeeft aan derden.

Bewaar deze handleiding zorgvuldig, zodat u deze later nog eens kunt nalezen!

U vindt een opsomming van de inhoud in de inhoudsopgave met aanduiding van de pagina 64.



GB Introduction

Dear Customer,

Thank you for making the excellent decision to purchase this Voltcraft® product.

You have acquired a quality product from a brand family which has distinguished itself in the fields of measuring, charging and network technology thanks to its particular expertise and its permanent innovation.

With Voltcraft®, you will be able to cope even with difficult tasks as either an ambitious hobbyist or as a professional user. Voltcraft® offers you reliable technology and extremely good value for money.

Therefore, we are absolutely sure: Your starting to use Voltcraft will also be the beginning of a long, successful relationship.

We hope you will enjoy using your new Voltcraft® product!

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Delivery Content

Multimeter

2 safety measuring leads (red and black)

2 Kelvin measuring leads (red and black)

6 mignon batteries

Plastic case

Operating instructions

Intended Use

- Measuring and displaying electric parameters in the range of excess voltage category CAT III (up to max. 600V against earth potential, pursuant to EN 61010-1) and all lower categories.
- Measurement of direct and alternating voltages up to a maximum of 600V DC/AC rms (effective)
- Measurement of direct and alternating current between 0 μ A and 400 mA
- Measurement of resistances to 40 M Ω using 2-lead measurement procedure
- Measurement of resistances from 0.1 m Ω to 40 Ω using 4-lead measurement procedure (with Kelvin measuring leads)
- Acoustic continuity check (< 35 ohms) and diode test.
- Capacity measurement up to 40 mF

The measurement functions are selected using the dial switch. Automatic measurement range selection is active in all measurement ranges (apart from 4-lead low Ohm measurement and continuity test).

The two current measuring ranges are secured against overload with a ceramic high-performance fuse. The voltage in the measuring circuit may not exceed 600 V.

The measuring instrument must not be operated when it is open, i.e. with an open battery compartment or when the battery compartment cover is missing. Measurements must not be carried out under unfavourable ambient conditions.

Adverse ambient conditions include:

- Dust or combustible gases, vapours or solvents,
- Electrical storms or stormy conditions resulting in strong electrostatic fields, etc.

For safety reasons, when measuring only use measuring cables or accessories which are adjusted to the specifications of the multimeter.

Any use other than that described above will damage the product and may involve other risks, such as short-circuit, fire, electric shock. Do not change or modify any part of the product.

Read the operating instructions carefully and retain them for later reference.

The safety instructions must be observed!

Controls

(see fold-out page)

- 1 LCD display
- 2 MAX/MIN button for max/min value display
- 3 HOLD button to “freeze” the displayed values
- 4 MODE/REL button to switch to double-allocated measuring functions (AC/DC, continuity test and diode test) and relative measurement in low Ohm range
- 5 Dial switch
- 6 Light button to switch the display illumination on
- 7 Attachment fitting (for holding strap etc.)
- 8 Foldable mounting brackets
- 9 Battery compartment
- 10 Red measuring socket “E1” for all 2-lead measuring functions (V, Ohm, CAP and mA; positive potential)
- 11 Black measuring socket “E2” for all 2-lead measuring functions (COM; earth reference, negative potential)
- 12 Black Kelvin measuring socket “P1” for all 4-lead low Ohm measuring functions (negative potential)
- 13 Red Kelvin measuring socket “P2” for all 4-lead low Ohm measuring functions (positive potential)

Safety Instructions



Please read all of the operating instructions before using the product for the first time; they contain important information about the correct operation.

The warranty/guarantee is rendered void in cases of damage resulting from failure to comply with these operating instructions! We do not accept any liability for consequential damages!

Nor do we assume liability for damage to property or personal injury caused by improper use or the failure to observe the safety instructions! In such cases the warranty/guarantee is voided.

This device left the factory in perfect condition in terms of safety engineering. To maintain this condition and ensure safe operation, you, as the user, must comply with the safety instructions and warnings contained in these instructions.

The following symbols must be observed:



An exclamation mark in a triangle shows important information in this user's manual that has to be observed.



The lightning symbol in a triangle warns against an electric shock or the impairment of the electrical safety of the appliance.



The "hand" symbol indicates special information and advice on operation of the device.



This product has been CE-tested and meets the necessary European guidelines.

Class 2 insulation (double or reinforced insulation)

CAT II

Overvoltage category II for measurements on electric and electronic devices which are supplied voltage to via a mains plug. This category also covers all smaller categories (e.g. CAT I for measuring signal and control voltages).

CAT III

Overvoltage category III for measuring in building installation (e.g. outlets or sub-distribution). This category also covers all smaller categories (e.g. CAT II for measuring electronic devices).



Earth potential

For safety and licensing reasons (CE), unauthorised conversion and/or modification of the device is not permitted.

Consult an expert when in doubt about the operation, the safety or the connection of the device.

Measuring instruments and accessories are not toys and have no place in the hands of children!

On industrial sites the accident prevention regulations of the association of the industrial workers' society for electrical equipment and utilities must be followed.

In schools, training centres, computer and self-help workshops, handling of measuring instruments must be supervised by trained personnel in a responsible manner.

Before measuring voltages, always make sure that the measuring instrument is not set to a measuring range for electrical currents.

The voltage between the "E1/E2" connection points and earth must never exceed 600 V DC/AC in CAT III. The voltage between the "P1/P2" connection points and earth must never exceed 30 V DC/AC.

The test probes have to be removed from the measured object every time the measuring range is changed.

Take particular care when dealing with voltages exceeding 25 V AC or 35 V DC! Even at these voltages it is possible to receive a fatal electric shock if you touch electrical conductors.

Prior to each measurement, check your instrument, including its measuring leads, for any damage. Never carry out measurements when the protective insulation is damaged (ripped, torn off etc.).

In order to avoid an electric shock, ensure that you do not touch the connections to be measured, even indirectly, during measurements. During measuring, do not grip beyond the grip range markings (which you can feel) present on the test probes.

Do not use the multimeter just before, during or just after an electrical storm (electrical shock / high-energy overloads!). Please make sure that your hands, your shoes, your clothing, the floor, switches and switching components are dry.

Avoid operation near strong magnetic or electromagnetic fields, transmitter aerials or HF generators. These could lead to an incorrect measurement being carried out.

If you have reason to believe that the device can no longer be operated safely, disconnect it immediately and make sure it is not unintentionally operated. It can be assumed that safe operation is no longer possible if:

- the device shows visible damage
- the device no longer functions
- the device was stored under unfavourable conditions for a long period of time or
- following considerable stress during transportation.

Do not switch the measuring instrument on immediately after it has been taken from a cold to a warm environment. The condensation generated could cause serious damage to the device. Allow the device to reach room temperature before switching it on.

Do not leave packaging material unattended. It can be dangerous to children who play with it.

When measuring only use measuring cables or accessories which are adjusted to the specifications of the multimeter.

You should also heed the safety instructions in each chapter of these instructions.

Product Description

The multimeter (referred to as DMM in the following) indicates measured values along with units and symbols on the digital display. The measuring value display of the DMM comprises 4000 counts (count = smallest display value). A bargraph shows rapid changes in values.

If the DMM is not operated for approx. 30 minutes, it automatically switches off. This saves battery power and extends the period of operation.

The meter can be used for do-it-yourself or for professional applications.

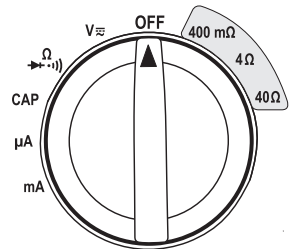
For better readability, the DMM can also be optimally mounted with the clip on the rear.

Dial switch (5)

The individual measuring functions are selected via a dial switch. The automatic range selection "Autorange" is active in the standard functions, voltage, resistance (2-lead measurement), capacity and current. The appropriate range of measurement is set for each application individually.






Some measurement functions are double assigned. With the "MODE" (4) button you switch functions within these measuring functions (e.g. switching resistance measuring - diode test and continuity test or AC/DC switching in the voltage range). Each press switches the function.

If the meter switch is set to "OFF", the meter is switched off. Always turn the device off when it is not in use.



Display Information and Symbols

This is a summary of all possible symbols and information on the DMM

AUTO	Automatic range setting is active
MANU	Symbol for manual range setting
HOLD	Data-Hold function is active
OL	Overload = the measuring range was exceeded
OFF	Off The DMM is switched off
	Symbol for battery change required
	Symbol for the diode test
	Symbol for the acoustic continuity tester
	Symbol for display illumination
	Direct/alternating current (AC/DC)?
DC	Direct current for voltage and current
AC	Alternating current for voltage and current
mV	Millivolt (exp.-3)
V	Volt (unit of electric potential difference or voltage)
A	Ampere (unit of electric current)
mA	Milliampere (exp.-3)
Ω	Ohm (unit of electric resistance)
k Ω	Kiloohm (exp.3)
M Ω	Megaohm (exp.6)
nF	Nanofarad (unit of electric capacity, exp.-9)
μ F	Microfarad (exp.-6)
mF	Millifarad (exp.-3)
MAX	Display of maximum value
MIN	Display of minimum value

Measuring Mode



Do not exceed the maximum permitted input values. Do not touch circuits or parts of circuits if there could be voltages higher than 25 V ACrms or 35 V DC present within them! Risk of fatal injury!

Before measuring, check the connected measuring leads for damage such as, for example, cuts, cracks or squeezing. Defective measuring cables must no longer be used. Risk of fatal injury!

During measuring, do not grip beyond the grip range markings (which you can feel) present on the test probes.



Measuring is only possible with the housing and battery compartment closed.

You may only connect the measuring leads that are required for measuring operation to the measuring device. Remove all measuring leads not required from the device for safety reasons.



If "OL" (overload) appears on the display, you have exceeded the measuring range.

a) Switching on the meter

The meter can be turned on using the dial switch (5). Turn the dial switch to the corresponding measurement function. To switch off turn the dial switch to "OFF". Always turn the device off when it is not in use ("OFF").



Prior to working with the meter, you have to insert the enclosed batteries. Insertion and changing of batteries is described in the "Cleaning and Maintenance" chapter.

b) Measuring Voltage "V"

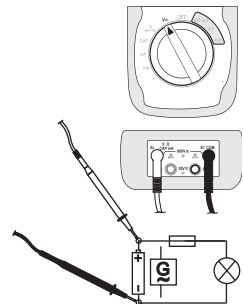
Proceed as follows to measure DC voltages "V/DC":

- Turn the DMM on and select measuring range "V".
- Plug the red single measuring lead into the V measuring socket "E2" (10) and the black measuring lead into the COM measuring socket "E1" (13).
- Now connect the two measuring probes to the object to be measured (battery, switch etc.). The red measuring tip indicates the positive pole, the black measuring tip the negative pole.
- The polarity of the respective measured value is indicated on the display together with the current measured value.



If a minus "-" appears in front of the voltage value when measuring DC, the measured voltage is negative (or the measuring tips have been mixed up).

- After measuring, remove the measuring leads from the measuring object and turn the DMM off.



Proceed as follows to measure AC voltages “V/AC”:

- Turn the DMM on and select measuring range “V”.
- Press “MODE” (4) to switch to the AC measuring range. “AC” appears in the display.
- Plug the red single measuring lead into the V measuring socket “E2” (10) and the black measuring lead into the COM measuring socket “E1” (13).
- Now connect the two measuring probes to the object to be measured (generator, switch etc.).
- The measuring value is indicated on the display
- After measuring, remove the measuring leads from the measured object and turn the DMM off.

c) Measuring Current “ μ A/mA”



The voltage in the measuring circuit may not exceed 600 V.

Never measure currents above 400 mA in the μ A/mA range, as this will cause the fuse to trip.

Before beginning to measure, ending measurements and changing the measurement range, always shut off the circuit.

Always start current measurements at the highest measurement range (mA) and switch down to lower ranges if necessary. All current measuring ranges are secured with fuses and thus protected against overload.

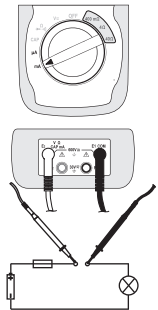
Proceed as follows to measure DC current (A/DC):

- Turn the DMM on and select measuring range “ μ A” or “mA”. For currents >4 mA select the range “mA”, for currents <4 mA choose “ μ A”.
- Plug the red single measuring lead into the mA measuring socket “E2” (10) and the black measuring lead into the COM measuring socket “E1” (13).
- Now connect the two test probes in series with the object to be measured (battery, circuit etc.); the display indicates the polarity together with the measured value.



If a minus “-” appears in front of the measured value when measuring DC, the measured voltage is negative (or the measuring leads have been mixed up).

- After measuring, remove the measuring leads from the measuring object and turn the DMM off.



Proceed as follows to measure AC currents (A/AC):

- Turn the DMM on and select measuring range “ μA ” or “mA”. For currents >4 mA select the range “mA”, for currents <4 mA choose “ μA ”.
- Press “MODE” (4) to switch to the AC measuring range. “AC” appears in the display.
- Plug the red single measuring lead into the mA measuring socket “E2” (10) and the black measuring lead into the COM measuring socket “E1” (13).
- Connect the two measuring probes in series with the object to be measured. The measured value will be displayed.
- After measuring, remove the measuring leads from the measured object and turn the DMM off.

d) Measuring Capacity “CAP”



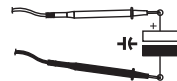
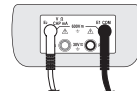
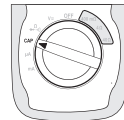
Make sure that all the circuit parts, switches and components and other objects of measurement are disconnected from the voltage and discharged. With electrolyte capacitors, ensure that you observe the polarity.

- Turn the DMM on and select measuring range “CAP”.
- Plug the red single measuring lead into the mA measuring socket “E2” (10) and the black measuring lead into the COM measuring socket “E1” (13).
- The display shows the unit “nF”.



Due to the sensitive measuring input, the display may show a value even with “open” measuring leads. This does not affect the accuracy of measurement.

- Connect the two test probes (red = positive pole/black = negative pole) with the object to be measured (capacitor). After a short while the display shows the capacity. Wait until the displayed value has stabilised. With capacities of >40 μF , this may take a few seconds.
- If “OL” (overload) appears on the display, you have exceeded the measuring range.
- After measuring, remove the measuring leads from the measuring object and turn the DMM off.

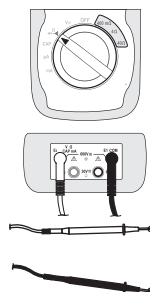


e) Continuity Check



Make sure that all the circuit parts, switches and components and other objects of measurement are disconnected from the voltage and discharged.

- Turn the DMM on and select measuring range $\bullet \Omega$
- Press "MODE" (4) to switch measurement functions. The symbol for continuity check now appears in the display. Pressing this button again takes you to the next measuring function.
- Plug the red single measuring lead into the Ω -measuring socket "E2" (10) and the black measuring lead into the COM measuring socket "E1" (13).
- A continuity value of less than 35 Ohm is identified as continuity; in this case a beep sounds.
- If "OL" (overload) appears on the display, you have exceeded the measuring range or the measuring circuit has been broken. Perform a counter-pole measurement to check.
- After measuring, remove the measuring leads from the measured object and turn the DMM off.

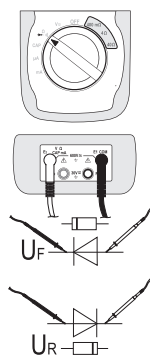


f) Diode Test



Make sure that all the circuit parts, switches and components and other objects of measurement are disconnected from the voltage and discharged.

- Turn the DMM on and select measuring range $\rightarrow \rightarrow$
- Press "MODE" (4) twice to switch measurement functions. The diode symbol appears in the display. Pressing this button again takes you to the first measuring function etc.
- Plug the red single measuring lead into the Ω -measuring socket "E2" (10) and the black measuring lead into the COM measuring socket "E1" (13).
- Check the measuring leads for continuity by connecting both measuring probes with one another. The value must be approximately 0 V.
- Now connect the two measuring probes with the object to be measured (diode).
- The display shows the continuity voltage "UF" in volt (V). If "OL" appears, the diode is measured in reverse direction (UR) or the diode is faulty (interruption). Perform a counter-pole measurement to check.
- After measuring, remove the measuring leads from the measured object and turn the DMM off.



Silicon diodes exhibit a continuity voltage (UF) of approx. 0.4 – 0.9 V.

g) Resistance measurement “ Ω ”

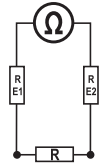


Make sure that all the circuit parts, switches and components and other objects of measurement are disconnected from the voltage and discharged.

The Milliohm meter allows you to measure resistances in normal measurement ranges from 0.1 Ω to 40 M Ω using the 2-lead measurement procedure and also allows the precise measurement of low Ohm resistances from 0.1 m Ω to 40 Ω using the 4-lead measurement procedure.

The 2-lead measurement includes the resistance of the measuring leads in the total measurement. The measurement lead resistance is approx. 0.5 Ω . This low value can be disregarded in a measurement range up to 40 M Ω . The switching diagram is illustrated on the right:

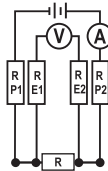
Both resistances “R E1” and “R E2” indicate the measurement leads. “R” indicates the measured object. All three resistances contribute to the measured value.



The 4-lead measurement connects a current and voltage measurement circuit. According to Ohm's law, all currents in a series circuit are equal. The current measurement in the measurement circuit is independent of the measurement location.

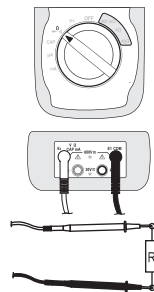
The voltage measurement is carried out at high Ohms so that the measurement circuit is not loaded and the measured values are not falsified. The additional voltage measurement then allows the resistance to be measured without loss through cables (formula: $R = U/I$). The switching diagram is illustrated on the right:

The two measurement methods are explained in the following.



Proceed as follows to measure the resistance using the 2-lead procedure:

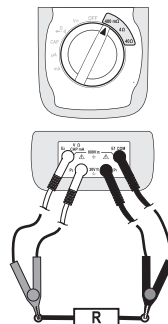
- Turn the DMM on and select measuring range “ Ω ”.
- Plug the red single measuring lead into the Ω -measuring socket “E2” (10) and the black measuring lead into the COM measuring socket “E1” (13).
- Check the measuring leads for continuity by connecting both measuring probes with one another. The resistance value must be approximately 0 - 0.5 Ohm (inherent resistance of the measuring leads).
- Connect the measuring probes to the object to be measured. As long as the object to be measured is not high-Ohm or interrupted, the measured value will be indicated on the display. Wait until the displayed value has stabilised. With resistances >1 M Ω this may take a few seconds.
- If “OL” (overload) appears on the display, you have exceeded the measuring range or the measuring circuit has been broken.
- After measuring, remove the measuring leads from the measured object and turn the DMM off.



If you carry out a resistance measurement, make sure that the measuring points which you contact with the measuring probes are free from dirt, oil, soldering paint or similar. An incorrect measurement may result under such circumstances.

Proceed as follows to measure the resistance using the 4-lead procedure:

- Turn the DMM on and select measuring range “400 m Ω , 4 Ω or 40 Ω ” depending on the measurement you are going to make.
- Plug the red double-measuring lead (Kelvin measuring lead) into the Ω measuring socket “E2” (10) and the second plug lead into the measuring socket “P2” (11).
- Plug the black double-measuring lead (Kelvin measuring lead) into the COM measuring socket “E1” (13) and the second plug into the measuring socket “P1” (12).
- Check the measuring leads for continuity by connecting both measuring probes with one another. This should produce a display value of 0 (+/- 0,1). The unit changes depending on the measurement range.
- Connect the measuring probes to the object to be measured. As long as the object to be measured is not high-Ohm or interrupted, the measured value will be indicated on the display. Wait until the displayed value has stabilised.
- If “OL” (overload) appears on the display, you have exceeded the measuring range or the measuring circuit has been broken.
- After measuring, remove the measuring leads from the measured object and turn the DMM off.



If you carry out a resistance measurement, make sure that the measuring points which you contact with the measuring probes are free from dirt, oil, soldering paint or similar. An incorrect measurement may result under such circumstances.

If no stable measurement values are shown or if the continuity check (0-display) fails, check the inbuilt fuse “F2”. Fuse replacement is described in the “Cleaning and Maintenance” chapter.

HOLD Function

The HOLD function freezes the currently indicated measured value to allow you to read it or to take the record without rushing.



If you test live wires make sure that this function is deactivated before the measurement starts. Otherwise, the measurement will be incorrect!

To switch on the Hold function, press the “HOLD” button (3); an acoustic signal confirms this command and “HOLD” appears on the display.

In order to switch off the HOLD function, press the “HOLD” button again or simply change the measurement function.

REL Function



The REL function is only active in the 4-lead resistance measurement ranges (400 m Ω , 4 Ω or 40 Ω).

The REL function allows a fast relative measurement, e.g. to display component tolerances. The reference component is measured and saved in the internal memory and then automatically deducted from subsequent measurements. This allows the easy display of the deviation from the reference component.

- Attach the object to be measured as per “Resistance measurement with 4-lead measurement procedure” to the Kelvin measuring leads. Select the fitting measurement range and wait until the displayed value has stabilised.
- Press the “REL” button (4) in operating mode. “REL” appears in the display and the display is reset to zero. The reference value is saved.
- Continue to carry out the difference measurement on the other measurement objects.
- Pressing the “REL” button again allows the control display of the saved value. The display will flash “REL”. Pressing this button again switches back to the REL measurement mode.
- To exit the function, hold down the “REL” button for approx. 1s until “REL” disappears and the meter beeps.



If the measurement range is changed or the measurement function is altered the REL memory is deleted.

MAX/MIN Function

This function shows the minimum and maximum measured values in the display. The automatic range selection (display shows “MANU”) is deactivated.

- Press the “MAX/MIN” button (2) in operating mode. “MAX” appears in the display and the highest value is displayed.
- Press the “MAX/MIN” button again to switch to “MIN”. The lowest value is shown
- Pressing the “MAX/MIN” button again cause the display to flash “MAX MIN” and the current measured value is displayed. The MIN/MAX memory continues to operate in the background.
- Every time you press the button you switch the display.
- To exit the function, hold down the “MAX/MIN” button for approx. 1s until “MAX”, “MIN” or “MAX MIN” disappears and the meter beeps.

Auto Power OFF Function

The DMM turns off automatically after 30 minutes if no button or switch is operated. This function protects the battery, saves battery power and extends the service life.

To reactivate the DMM after automatic shutdown, use the dial switch or press any function button (apart from the light button (6)).

Switching on Display Illumination

The display can be illuminated in operating mode when the light conditions are bad. Press the light button (6) to switch on the illumination. The lighting stays on for approx. 5s and then switches off automatically in order to protect the batteries.

Cleaning and Maintenance

General Information

To ensure the accuracy of the meter over an extended period of time, it should be calibrated once a year. Apart from occasional cleaning and fuse replacements, the meter requires no servicing. Information on changing the battery and fuse is provided below.



Regularly check the technical safety of the instrument and measuring leads, e.g. check for damage to the housing or squashing etc.

Cleaning

Always observe the following safety instructions before cleaning the device:




Live components may be exposed if covers are opened or parts are removed (unless this can be done without tools).

The connected leads must be disconnected from the measuring device and all measuring objects prior to cleaning or repairing the device. Switch the DMM off.

Do not use cleaning agents which contain carbon, petrol, alcohol or similar substances for cleaning purposes. These could corrode the surface of the measuring instrument. The vapours are also detrimental to health and are explosive. Sharp-edged tools such as screwdrivers or metal brushes should not be used for cleaning purposes.

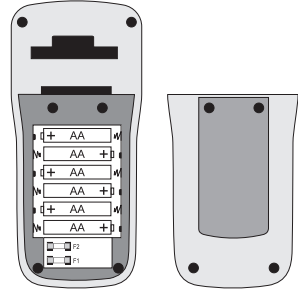
When cleaning the device or the display and the measuring leads, use a clean, lint-free, antistatic, slightly damp cloth. Allow the product to dry completely before you use it again to conduct measurements.

Inserting and Changing the Batteries

Operation of the meter requires six mignon batteries (AA). You need to insert new, charged batteries prior to initial operation or when the battery change symbol  appears on the display.

Proceed as follows to insert or change the batteries:

- Disconnect all measuring leads from the meter and switch it off.
- Fold out the mounting bracket (8) and unscrew the four screws securing the battery compartment (9).
- Remove the cover of the battery compartment from the meter. The batteries can be accessed now.
- Replace all the batteries with new ones of the same type.
- Close and secure the battery compartment in reverse order.
- The meter is ready for use once again.



Never operate the meter when it is open.

!RISK OF FATAL INJURY!

Do not leave flat batteries in the device. Even batteries protected against leaking can corrode and thus release chemicals which may be detrimental to your health or destroy the device.

Do not leave batteries lying around carelessly. They could be swallowed by children or pets. If swallowed, consult a doctor immediately.

If the device is not used for longer periods of time, remove the batteries in order to prevent leaking.

Leaking or damaged batteries may cause alkali burns if they come into contact with the skin. It is therefore advisable to use suitable protective gloves.

Make sure that the batteries are not short-circuited. Do not throw batteries into the fire.

Always replace all batteries at once. The use of new and discharged or old batteries together affects the battery life. Always use batteries of the same type and from the same manufacturer in a set of batteries. The batteries can be damaged by equalizing currents and may leak.

Batteries must not be recharged or dismantled. There is danger of explosion.



You can order suitable alkaline batteries stating the following order no.:

Item no. 65 25 09 (please order six).

Only use alkaline batteries, as they are powerful and have a long service life.

Replacing the Fuse

The current measuring ranges “ $\mu\text{A}/\text{mA}$ ” and the 4 leads resistance measurement ranges (connections “P1/P2”) are secured with high performance fuses. If measuring in this range is no longer possible, you have to change the fuse.

Proceed as follows for fuse replacement:

- Disconnect all measuring leads from the meter and switch it off.
- Open the battery compartment as described in the chapter "Inserting and Changing the Batteries".
- The fuses can be accessed now.
- Replace the defective fuse(s) with a new fuse of the same type and nominal voltage. The fuses have the following values:

Fuse	F1	F2
Measuring range	Current $\mu\text{A}/\text{mA}$	400 m Ω , 4/40 Ω
Characteristic	FF 500 mA/660V	FF 500 mA/660V
Dimensions	5 x 20 mm	5 x 20 mm
Type example	SIBA® Fuse L-no. 70 180 40	SIBA® Fuse L-no. 70 180 40

- Close the housing again carefully by proceeding in reverse order.



Using mended fuses or bridging the fuse holder is not admissible for safety reasons. This can lead to fires or to arc explosions. Never operate the measuring instrument when it is open.

Disposal



Old electronic devices are hazardous waste and should not be disposed of in the household waste. When the device has become unusable, dispose of it in accordance with the current statutory regulations at the communal collection points. Disposal in the domestic waste is not permitted.

Disposal of used batteries!

As a consumer you are required (**Battery Ordinance**) to responsibly dispose of all used batteries and rechargeable batteries; **it is forbidden to throw them away with the normal household waste!**



Batteries/rechargeable batteries containing harmful substances are marked with the following symbols, they point out that they are not allowed to be disposed of in the domestic refuse. The symbols for dangerous heavy metal constituents are: **Cd** = cadmium, **Hg** = mercury, **Pb** = lead. You can return used batteries / storage batteries free of charge to any collecting point of your local authority, to our stores or to any store where batteries / storage batteries are sold.

You thus fulfil the legal requirements and make your contribution to the protection of the environment!

Troubleshooting

In purchasing the DMM, you have acquired a product which has been designed to the state of the art and is operationally reliable.

Nevertheless, problems or faults may occur.

For this reason, the following is a description of how you can eliminate possible malfunctions yourself.



Please observe the safety instructions!

Error	Possible cause	Remedy
The multimeter doesn't function	Is the battery dead?	Check the battery status. Battery replacement
No measured value change.	Is the wrong measurement function active (AC/DC)?	Check the display (AC/DC) measurement value change and switch the function if necessary.
	Did you use the wrong measuring sockets?	Check the measuring socket setting.
	Is the fuse for the current ranges or the low Ohm range defect?	Check the fuses.
	Is the Hold function activated (display "HOLD")	Press the "HOLD" button to deactivate this function.



Repairs other than those described should only be carried out by an authorised specialist. If you have queries about handling the measuring device, our technical support is available under the following telephone number:

Voltcraft®, 92242 Hirschau, Lindenweg 15, Tel.-No. 0180 / 586 582 7.

Technical Data

Display	LCD, 4000 Counts (digits) with bargraph
Measuring rate	approx. 2 measuring operations/second
Measuring lead length	approx. 80 cm each
Measuring impedance	>10MΩ (V range)
Automatic Power-Off	approx. 30 minutes
Voltage supply	6 x mignon batteries (AA)
Working conditions	0 - 40°C (<80%rF)
Operating altitude	max. 2,000 m
Storage temperature	-10°C to +60°C (<70%rF)
Earth DMM	approx. 550 g
Dimensions (LxWxH)	200 x 92 x 50 (mm)
Over-voltage category	CAT III 600 V, Impurity level 2

Measurement tolerances

Statement of accuracy in \pm (% of reading + display error in counts (= number of smallest points)). The accuracy is valid for one year at a temperature of $+23^{\circ}\text{C} \pm 5^{\circ}\text{C}$, and at a relative humidity of less than 80 %rF, non-condensing.

DC Voltage

Range	Resolution	Accuracy
400 mV	0.1 mV	$\pm(1,0\% + 5)$
4 V	0.001 V	
40 V	0.01 V	
400 V	0.1 V	
600 V	1 V	$\pm(1,2\% + 52)$
Overload protection: 600 V; Impedance approx. 10 MOhm		

AC Voltage

Range	Resolution	Accuracy 50-60 Hz	Accuracy 400 Hz
400 mV	0.1 mV	$\pm(1,2\% + 10)$	$\pm(2,5\% + 10)$
4 V	0.001 V	$\pm(1,0\% + 10)$	$\pm(1,2\% + 10)$
40 V	0.01 V		
400 V	0.1 V		
600 V	1 V		
Frequency range 50 – 400 Hz; effective average at sinusoidal voltage; overload protection 600 V; Impedance approx. 10 MOhm			

DC Current

Range	Resolution	Accuracy
400 μA	0.1 μA	$\pm(1,5\% + 5)$
4000 μA	1 μA	
40 mA	0.01 mA	
400 mA	0.1 mA	
Overload protection: 600 V, fuse FF500 mA		

AC Current

Range	Resolution	Accuracy
400 μA	0.1 μA	$\pm(1,5\% + 5)$
4000 μA	1 μA	
40 mA	0.01 mA	
400 mA	0.1 mA	
Overload protection: 600 V, fuse FF500 mA; frequency range 50-400 Hz		

Resistance 2-lead measurement

Range	Resolution	Accuracy
400 Ω	0.1 Ω	$\pm(1.0\% + 4)$
4 k Ω	0.001 k Ω	
40 k Ω	0.01 k $\Omega \pm(1.5\% + 2)$	
400 k Ω	0.1 k Ω	
4 M Ω	0.001 M Ω	$\pm(2.5\% + 3)$
40 M Ω	0.01 M Ω	$\pm(3.5\% + 5)$
Overload protection 600 V		

Resistance 4-lead measurement

Range	Resolution	Accuracy	Test current
400 m Ω	0.1 m Ω	$\pm(1.0\% + 10)$	200 mA
4 Ω	0.001 Ω	$\pm(1.0\% + 5)$	20 mA
40 Ω	0.01 Ω		2 mA
Overload protection 30 V			

Capacity

Range	Resolution	Accuracy
4 nF	0.001 nF	not specified
40 nF	0.01 nF	$\pm(5.0\% + 20)$
400 nF	0.1 nF	$\pm(3.0\% + 10)$
4 μ F	0.001 μ F	
40 μ F	0.01 μ F	
400 μ F	0.1 μ F	$\pm(4.0\% + 10)$
4 mF	0.001 mF	$\pm(10.0\% + 10)$
40 mF	0.01 mF	not specified
Overload protection 600 V		

Diode Test

Test voltage	Resolution	Test current
2.8 V	0.001 V	1 mA (typical)
Overload protection 600 V		

Acoustic continuity checker

<35 Ω continuous sound, test current 1 mA typical,
overload protection 600 V



Do not exceed the maximum permitted input values. Do not touch circuits or parts of circuits if there could be voltages higher than 25 V ACrms or 35 V DC present within them! Risk of fatal injury!