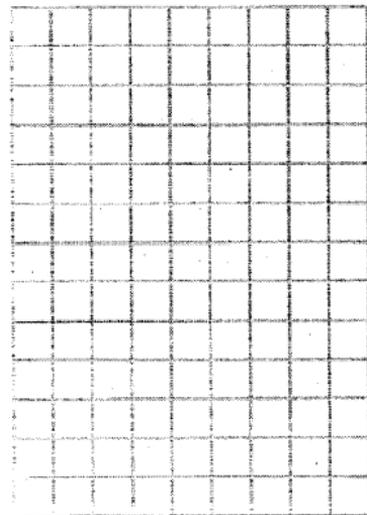


Green Digital Multimeter VC-300
Multimètre VC-300 Green DMM
Green Digital Multimeter VC-300
Green Digitale Multimeter VC-300

Order No..... 12 70 19
N° de commande 12 70 19
Best.-Nr 12 70 19
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Green Digital Multimeter VC-300

Oder-No. 12 70 19



Attention!

It is absolutely essential that you read the operating instructions very carefully and completely before using the multimeter for the first time! In the case of damage caused by non-observance of the instructions, the claims under guarantee lapse. No legal liability can be accepted for any damage from the multimeter being used for the wrong purpose or operated improperly. We cannot take any liability for consequential damage. Please read and understand the instructions before attempting to use the multimeter.

The proper operation of the measuring unit (VC-300) includes:

- measurement of D.C. voltage up to 1000 VDC max.
- measurement of alternating voltage up to 750 VACrms max.
- measurement of DC and AC up to 20 A max. (fused)
- measurement of resistance to 30 MOhm max.
- continuity check, diode test
- frequency measurement up to 3 MHz

Contents:

1. Introduction
2. Safety Rules
3. Description of the Control Elements
4. Usage of the Multimeter, Exchange of Fuse
5. Measurement Procedure
6. Maintenance and Calibration
7. Technical Data and Accuracy

1. Introduction

The VC-300 is equipped with a special feature which is ecologically beneficial. A so called High Cap is used for power supply in this multimeter instead of batteries or accumulators.

A High Cap is a capacitor with a very high capacity, but a low nominal voltage. The power-saving measuring circuit and the power-saving LC-display can be operated up to one hour with the energy it receives from the High Cap. This means there is energy to make measurements for max. one hour.

But first of all the High Cap has to be charged. This happens over an ordinary mains socket and the measuring cables. The measuring unit has a built-in "power supply" which transforms the 230 V Alternating Current into the necessary Direct Current which charges the High Cap. It is also possible to charge the High Cap directly with Direct Current, e.g. a car battery with 12 VDC. Additionally a solar cell is built in which transforms the daylight in energy for float loading.

Besides the VC-300 has some special features which supplement some measurement usefully:

In the voltage measuring range the unit switches automatically from AC voltage to DC voltage and vice versa depending which type of voltage is being measured.

It is equipped with AUTO RANGE which always sets the unit to the correct measuring range at different measurements.

With the Range-Hold key (RANGE-H) you can define the measuring range yourself = manual range selection

With the Data-Hold key you can hold the measuring value which is useful especially for quick changing measuring values.

An Auto-Power-Off function switches off the unit if the DMM is not used for 10 min, to prevent an unnecessary discharge of the High Cap.

The DMM can be used for hobby and also for industry (with restrictions, because of IEC 664) and schools, etc.

2. Safety Rules

- This unit is constructed and checked according to DIN 57 411 Part 1/VDE 0411 Part 1, protective measures for electrical measuring units.
This unit left the factory in safe and perfect condition.
To maintain this condition and to guarantee a safe operation the user has to pay attention by all means to the safety rules and warnings which are contained in this manual.
- This multimeter may only be used in fuse lines which are protected with 16 A and which have a maximal load of 4000 VA.
The voltage existing must not exceed 250 VDC/VAC.
It is not allowed to use the unit for installations in the overload range III according to IEC 664.
The unit and the measuring cables are not protected against arcing and are not intended for high energy industrial use. (IEC 1010-2-031, section 13.101.).
- Keep children away from measuring units!
- Pay attention to the rules for prevention of accidents in industrial enterprises prescribed by the Industrial Trade Associations for electrical installations and production facilities.
- When using the unit in schools and hobby-workshops the usage and the measurement has to be controlled by the responsible teachers or skilled personell.
- If covers are opened or parts are removed, except it is possible without tools, voltage-carrying components can lay open.
Terminals can also carry voltage. If it is necessary to open the unit before adjustment, maintenance, repairing or exchange of parts

or modules, the measuring unit has to be separated from all voltage sources and measuring circuits. Repairs or maintenance to the measuring unit must only be carried out by **qualified service personell** or qualified electricians who know the dangers and the respective rules (VDE 0100, 0701, VDE-0683).

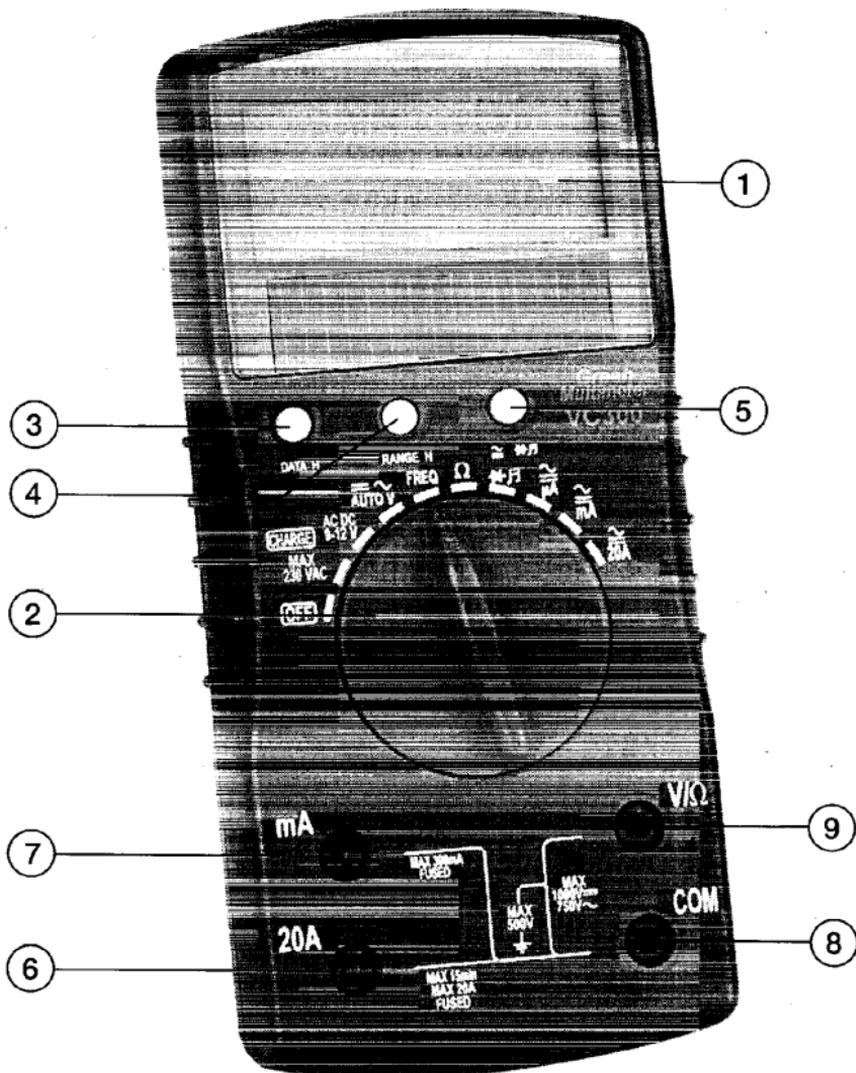
- Capacitors in the unit can still carry voltage, even if the unit has been separated from all voltage sources.
- Please make shure to use new fuses of the proper rating. Do not use repaired fuses and do not bridge the fuse holders.
To exchange the fuse separate the measuring unit from the measuring circuit and switch it off. Remove all connected cables and measuring tips. Use a suitable crosspoint screw driver and carefully open the cabinet. Remove the defective fuse(s) and replace them with a new one of the same type and nominal current 0.5 A quick blow, 250 V; usual name: FF 20 A/ 250 V or 20 A ultra rapid, 250 V; usual name FF 20 A/250 V.
After the fuse has been exchanged close the cabinet. Do not operate the unit before it has been closed and screwed safely.
- Use special caution when working with voltage above 25 V AC and above 35 V DC.
Such voltage might already cause a life-dangerous electrical shock when electrical conductors are touched.
First switch off the voltage source, connect the measuring unit with the terminals of the voltage source to be measured, set the measuring unit to the necessary voltage range and afterwards switch on the voltage source.
After measurement has been finished, switch off the voltage source and remove the measuring cables from the terminals of the voltage source.
- Make shure before each voltage measurement the unit is not set to the current measuring range.
- Control before each measurement the measuring unit and your test leads to make shure they are not damaged.

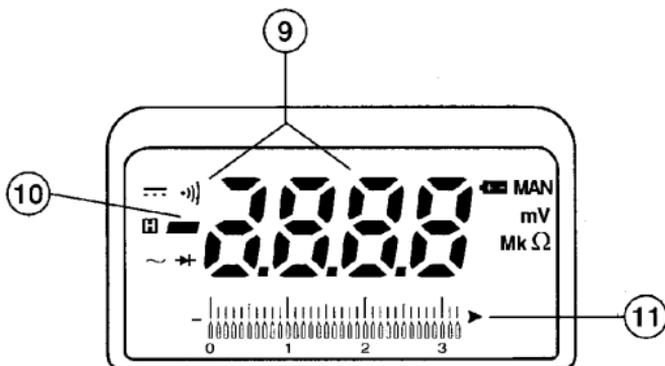
- Do not use this measuring unit in environments or rooms with adverse environmental conditions where burnable gas, vapour or dust is existing or might exist.
For your own safety avoid under all circumstances that the measuring unit or the test leads become wet.
- For measurement use only those test leads which are supplied with the measuring unit. Only these are admissible.
- To avoid an electrical shock, don't touch directly or indirectly the test probes and the test points during measurement.
- To avoid an electrical shock or damage do not apply more than 500 VDC/VAC between any terminal of the measuring unit and the earth ground.
- If there are doubts whether a safe usage is still possible the unit has to be put out of operation and be secured against unintentional use.

It must be assumed that a safe usage is not possible if

- the unit shows visible damage
 - the unit does not work and
 - after longterm storage under unfavourable conditions
- or
- after transport strain
- Don't switch on the measuring unit immediately after bringing it in from a cold to warm room. Condensed water might impair or destroy your unit. Give the unit time to warm up to room temperature without switching it on.

3. Description of the Operation Elements





1. LC-Display (Liquid Crystal Display)
2. Rotary Function Switch
3. Data-Hold key to "hold" the measuring values
4. Range-Hold key to switch off the Auto-Range function = manual range selection
5. AC/DC or "  /  "-key
With this key you can switch from DC measurement to AC measurement or from diode test to continuity check (acoustic)
6. 20 A input
This measuring input is fused with 20 A and permitted for DC and AC currents up to 20 A max.
7. mA-input (also for μA measurement)
At this input DC and AC currents up to 300 mA (=0.3A) can be measured (fused with 0.5 A quick blow/250 V)
8. COM (-)input socket (Com or negative terminal)
9. V-Ohm-(+)input socket (=plus terminal)

- 10. Analogous Bargraph
- 11. Bargraph - bar sectionalization



Attention!

Observe the max. input limits.

- 12. R-H = Range Hold
= manual range selection
- 13. D-H = Data Hold
= "freezing" (holding) of the measuring value
- 14.  = diode test
- 15. "~" = symbol for DC voltage or current
- 16.  = symbol for the acoustic continuity checker
- 17. "-" = minus sign or symbol for negative polarity
- 18.  = battery symbol
If this sign appears in the display it is time charge the High Cap.
- 19. Various units of measure

4. Usage of the Multimeter

4.1 Charging of the measuring unit or charging of the High-Cap - a high-capacitive capacitor.

To ensure a faultless functioning of the measuring unit, it must be charged from time to time. If the battery symbol appears in the display the voltage in the High-Cap dropped to a value of approx. 2.5 VDC.

To recharge at the 230 V mains socket proceed as follows:

Set rotary function switch (2) to position "CHARGE 230VAC MAX" (blue letters). Connect the measuring cables with the measuring unit: the black measuring cable with the COM-socket the red measuring cable with the V-Ohm-socket. Now connect the measuring tips of the measuring cables with a 230-V-mains-socket, observe the safety rules. Depending how long the connection with the the mainssocket is maintained you have more or less "energy" for the various measuring tasks.

The following "charging times" result in the following operation times:

1. Charging up of a totally discharged High-Cap needs 3 minutes
2. and the following recharging procedures after appearing of the battery symbol lasts approx. 1 minute for a measuring duration of up to 60 minutes.

The operation times refers to the respective permanent service, i. e. the measuring unit is continuously switched on.

If the measuring unit is operated in the mode voltage measurement or frequency measurement the available operating time is reduced by 50%. If the unit is switched off after each measurement, the available operating time is extended. This is also valid for sunny days.

The current from the solar cell is relatively low and is therefore not enough to charge the High Cap. But it is sufficient to buffer the High Cap when the measuring unit has been switched off.

To recharge with low current in the range of 9 to 20 V (typ. 12 V) DC- or AC voltage e.g. at a 12 V car battery (DC) or a transformer with 9 to 20 V (typ. 12 V) output voltage (AC) proceed as follows:

- Set the rotary function switch (2) to position "CHARGE 9-12 V AC DC" (blue letters).

Connect the test leads with the measuring unit: the black lead with the COM-socket, the red lead with the V-Ohm-socket. Now connect the test lead tips with a 12 V DC (=battery) or e.g. 12 V AC "voltage source"

(secondary side of a safety transformer), observe all safety rules. Depending on how long this connection is existing, you have more or less "energy" for the various measuring tasks.

The operating- and charging times are identical with those of the 230 V AC charging.

The operating times refer to the respective continuous operation, i.e. the measuring unit remains continuously switched on. If the measuring unit is switched off after each measurement, the operation time is extended.

In this mode the built-in solar cell can extend the operation time if sufficient sun light is available.

The operation time is also extended, because a built-in Auto-Power-Off circuit switches off the measuring unit after 10 minutes, if no measurement is made.



Attention!

Never operate the unit with open cabinet. Life danger!

4.2 Connection of the Measuring Cables

Only use the measuring cables which are supplied with this measuring unit. Pay attention before each connection that the insulation of connection plugs and the test probes is undamaged.

These measuring cables are safe for voltages up to 1000 V max. Your measuring unit, the VC-300 is constructed for voltages up to 1000 VDC or 750 VACrms. Use special caution when working with voltages over 25 V AC or 35 V DC.



Attention!

Never exceed the maximum input limits, as otherwise the measuring unit will be damaged and this is dangerous to life.

4.3 Starting Operation

4.3.1 Basic Settings

Switch on your measuring unit with the rotary function switch (2). Turn it to the desired position.

4.3.2 Key Functions

- a) With the rotary function switch the measuring unit is switched on and off. The Auto-Power-Off function prevents a quick "discharge" of the High Cap. If the rotary function switch of the DMM is not used for ten minutes the DMM switches off automatically.

Switch on the multimeter again with the keys DATA-H, RANGE-H and DC/AC.

b) **AC/DC**  /  **Key**

Press this key, if the rotary function switch is set to current measurement and you want to switch from DC measurement to AC measurement and vice versa.

Press this key as well if the rotary function switch is set to "" or continuity check "". Switch from diode measurement to acoustic continuity check and vice versa.

c) **Data-Hold-Key**

With this key you hold the current test value. This function makes it possible, that quick changing test values are held. If you want to leave this function, press this function-key again.

d) **Range-Hold-Key**

To switch from Auto-Range to manual range selection, press this key. A manual selection of the measuring range is possible. If you want to leave this special function, press this key again.



Attention!

A manual range selection is not possible in the function continuity check and diode test.

4.3.3 Socket

a) Rotary Function Switch (2)



Attention!

Never turn the rotary function switch during measurement, as otherwise the measuring unit could be destroyed and this could be dangerous to life.

The different basic measuring ranges are semicircular arranged and are selectable by turning the switch.

| | |
|---|--|
| AutoV | = Volt voltage measurement AC/DC |
| Ω | = Ohm resistance measurement |
|  /  | = Diode test (semiconductor lines / acoustic continuity check < 100 Ohm) |
| FRQ | = Frequency Measurement |
| 20A | = DC / AC measurement up to max. 20 A |
| mA | = DC / AC measurement up to 300 mA (=0.3A) |
| μ A | = DC / AC measurement up to 300 μ 2A (=0.3mA) |

b) 20 A Socket

For DC or AC measurement up to max.! 20 A the red test lead must be connected.



Attention!

The rotary function switch must never be set to voltage measurement (V) during current measurement.

c) mA-socket (also for μ A)

For DC and AC measurements up to max.! 300 mA the red test lead must be connected, but only if the rotary function switch is set to position "mA".

d) COM = Common-Socket

Connect for all measurements, except capacity measurement the black test lead (Common socket means minus or "-" or ground socket)

e) V/Ohm Socket

If you want to measure voltage-, frequency- or resistance, continuity or diodes/batteries plug in the red test-lead in this socket.

4.3.4 Display - Explanation of the Symbols

a) Digital Display

The LCD can display to "3200", whereas the polarity (-) is shown automatically (for negative voltages or reversed polarity). Furthermore there are three decimal point positions.

b) Analog Bargraph

The analog bargraph consists of 65 segments. It has a higher measuring speed than the digital display (approx. twice the speed). Therefore it is possible to recognize tendencies in the measuring value earlier, than with an analogous multimeter, but without its mechanical disadvantages (resistance of the meter mechanism)

c) Data-Hold "D-H"

With D-H the current test value is held.

d) R-H (=Range Hold)

In this function you can switch off the automatic range selection (Auto Range) and set the measuring range manually. Each time the key is pressed the decimal point is moved one position to the left or to the right, the units of measure are changed respectively.

5. Measurement Procedure

5.1 Voltage Measurement ACV or DCV



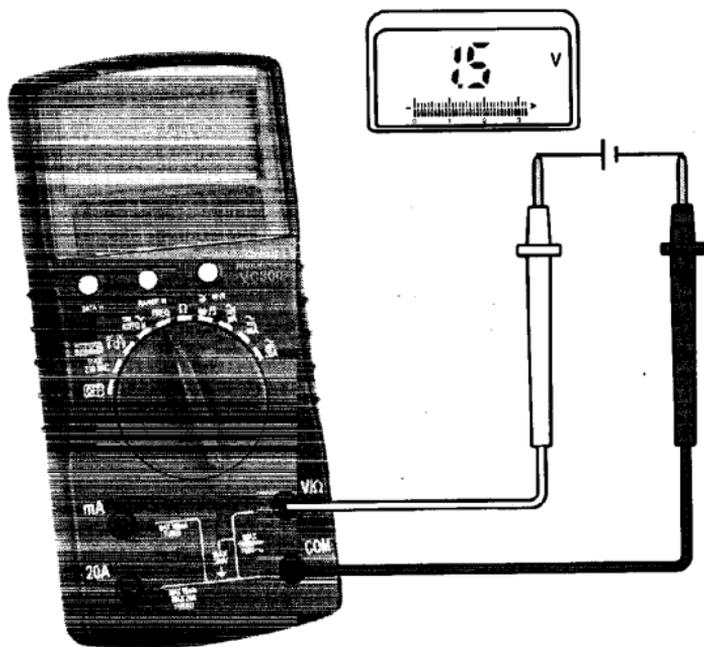
Attention!

Never exceed the maximum input limits. Max. 1000 VDC or 750 VACrms (=effective).

Do not touch circuits or parts of circuits, if you measure voltage more than 25 VACrms or 35 VDC.

To measure DC or AC voltage proceed as follows (Important! Pay attention to the following figure):

1. Connect the black measuring cable with the COM-socket and the red measuring cable with the V/Ohm socket.
2. Set the rotary switch to "AUTOV".
3. Connect the test lead tips with the object to be measured (load, circuit etc.)
4. The measuring unit has a switch which automatically displays the correct voltage type. As soon as the DC voltage is applied the polarity sign for negative voltages is displayed. As soon as you measure alternating voltage, the symbol "~" appears before the measuring value.



Voltage Measurement ACV or DCV

5.2 Direct Current Measurement

For DC measurement proceed as follows (pay attention to the following figure):

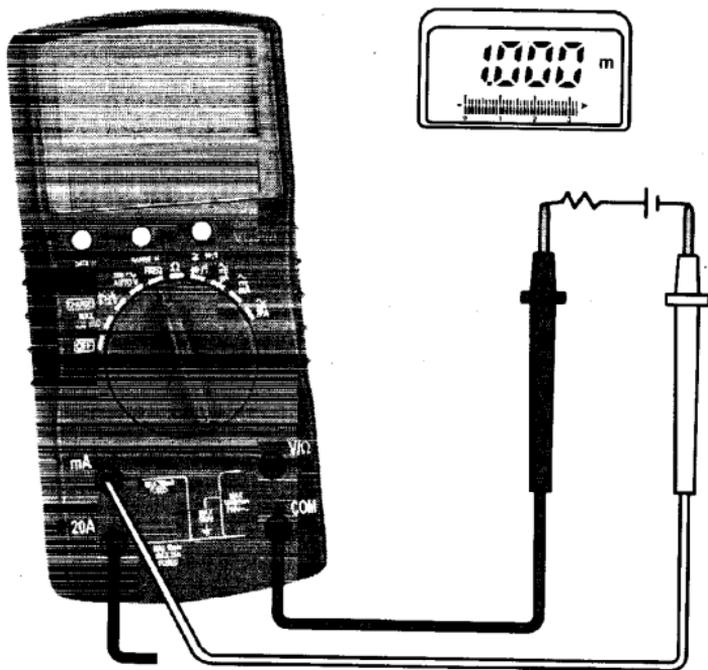
1. Connect the black test lead with the COM-socket and the red test lead with the mA-socket, if you want to measure DC below 300 mA (and below 30 μ A) and with the 20 A socket if you want to measure DC over 300 mA up to max. 20 A.
2. Set the rotary function switch to current measurement (μ A, mA or 20A).
3. After changing to current measurement (μ A-, mA- or 10A-range) the unit is always in the DC measuring range at first.

4. Connect the measuring cable in series with the object to be measured (It is important to pay attention to the following figure).



Attention!

Never measure currents in circuits in which voltages over 250 VDC/VAC could exist, this is life dangerous! Never measure currents exceeding 20 A. Only measure in circuits which are fused with 16A or in which powers exceeding 4000 VA could not exist. Current measurements of 20 A may not last more than 30 sec. and may only be executed in intervals of 15 minutes.



Direct Current Measurement

5.3 Alternating Current Measurement

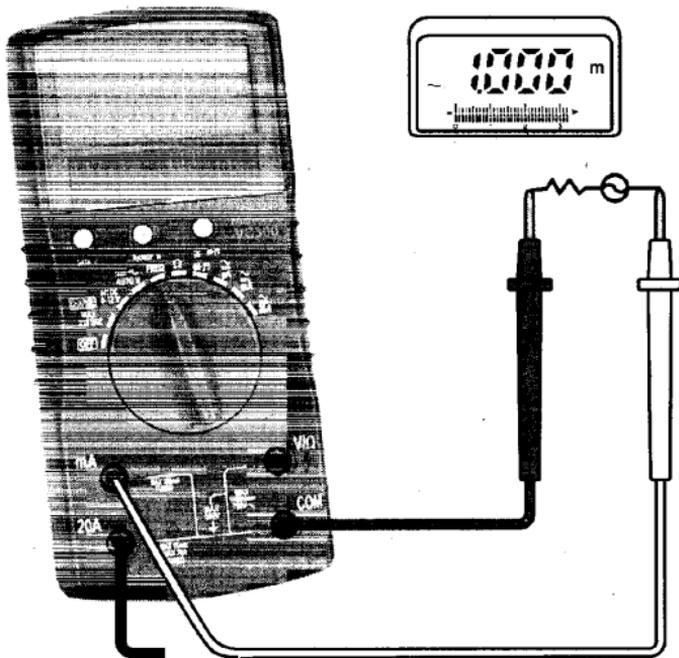
To measure alternating current proceed as follows (observe the following figure):

1. Connect the black test-lead with the COM-socket and the red test-lead with the mA-socket if you want to measure AC up to 300 mA max. or with the 20 A socket if you want to measure AC over 300 mA up to 20 A max.
2. Set the rotary function switch to current measurement (μ A, mA or 20 A).
3. If you want to measure AC now, press the key DC/AC shortly and the measuring unit switches from DC measurement to AC measurement. The symbol "-" appears before the measuring value.
4. Connect the test lead tips with the object to be measured (observe the following figure).



Attention!

Don't measure currents in circuits with voltages over 250 VDC or VACrms, this would be life dangerous. Never measure currents over 20 A. This multimeter may only be used in fuse lines which are protected with 16 A and which have a maximal load of 4000 VA. Currents of 20 A may only be measured for max. 30s and only in intervals of 15 minutes.



Alternating Current Measurement

5.4 Resistance Measurement



Attention!

Make shure all objects, circuits and components to be measured are without voltage!

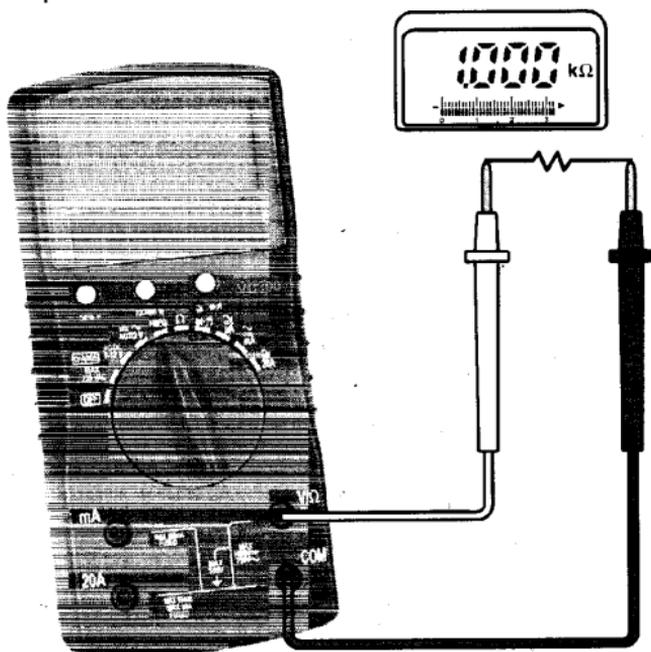
To measure resistors proceed as follows(Pay attention to the following figure):

1. Connect the black measuring cable with the COM-socket and the red measuring cable with the V/Ohm socket.
2. Set the rotary function switch to resistance measurement "Ohm".

3. Now connect the test lead tips with the object to be measured. Auto-Range always takes care of the suitable measuring range to maintain best accuracy.

During resistance test, make shure that the measuring points, which you touch with the test-lead tips are free of dirt, oil or solder varnish etc. This might influence the measuring value.

For resistors over 3 MOhm the display needs a few seconds to stabilize. As soon as "OL" is displayed and and all segments of the bargraph become visible you exceeded the measuring range or the leads are open.



Resistance Measurement

5.5 Continuity Check

With this function you can check dead leads, fuses, circuits. Proceed as follows (pay attention to the following figure):

5.6 Diode Test

To measure diodes and other semiconductors proceed as follows (pay attention to the figure below):

1. Connect the black test lead with the COM-socket and the red test lead with the V/Ohm socket.
2. Now set the measuring function switch to "  /  ". The diode symbol "  " is displayed. Manual range setting is not possible.
3. Now connect the test lead tips with the object under measurement, a dead semiconductor line, the red test lead tip to the anode, the black test lead tip to the cathode (as a rule it is marked with a coloured ring, point etc.)

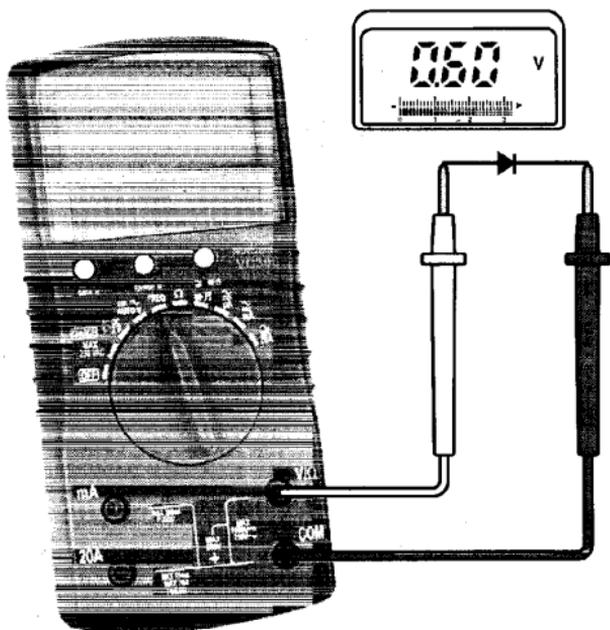
If you check a diode line in forward direction, you will measure voltage from approx. 0.25 V (Germanium) or 0.7 V (Silicium) to 1 V, if the diode line is not defective.

If you now exchange the test-lead points, this means red to the cathode and black to the anode, you check the so called reverse direction. If "OL" is displayed the diode is o.k. However, if a value between 0 V and approx. 3.5 V is displayed, you connected the object under measurement wrong or it is defective.



Attention!

During diode test, observe that the diode or the circuit in which it might be built in, must be without voltage. All existing capacities must be discharged.



Diode Test

5.7 Frequency Measurement

To measure frequencies proceed as follows (pay attention to the following figure):

1. Connect the black test lead with the COM-socket (black = "-") and the red test lead with the V/Ohm-socket (red = "+").
2. Set the rotary function switch to "FRQ".
3. Connect the test lead tips with the object to be measured (generator etc.)

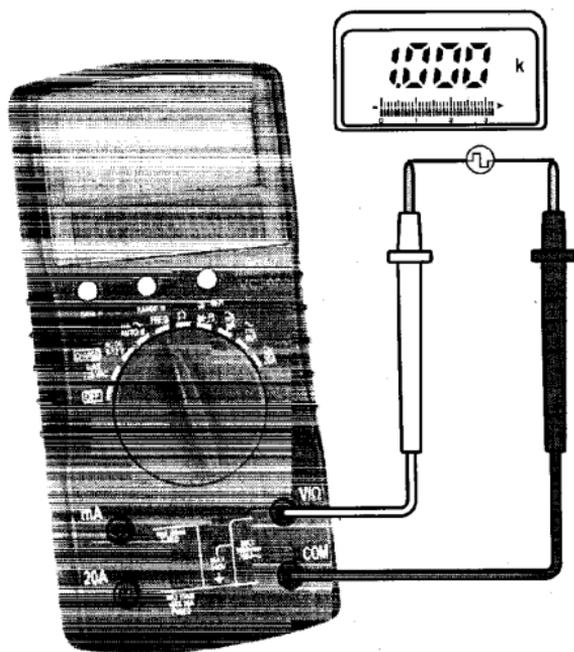


Attention!

Observe the max. input limits. Never connect voltages over 125 VDC max. or 100 VACrms (rms = eff).

It is life dangerous to touch the terminals or probe tips when measuring voltages over 25 VAC or 35 VDC.

Disconnect the test leads from the test points before changing the meter function and range. The sensitive electronic of the measuring unit might be destroyed and this can be dangerous to you.



Frequency Measurement

5.8 Usage of the Analog Bargraph

The bargraph is easy to use and to understand. It is comparable with the pointer of an analog measuring instrument, but without its disadvantages. It is especially for quick changing measuring signals, for which the digital display is too "slow". So you can quickly recognize and analyze tendencies in the measuring values.

6. Maintenance and Calibration

Calibrate the meter once a year to maintain its accuracy over a longer period of time.

Fuse replacement is described in point 2. (Safety Rules).
Charging the High Cap (capacitor) is described in point 4.1.
Clean the unit and the display with a soft, dry, antistatic cloth.



Attention!

Do not use abrasive detergents, gasoline, alcohol or similar. These detergents could damage the surface of the measuring unit. Besides solvent fumes are dangerous to your health and explosive.



7. Technical Data and Accuracy

7.1 Technical Data

Display : 3 3/4-digit LC-Display to 3200 with automatic polarity display and a bargraph display with 65 segments.

Max. Measuring Rate : 2 measurements per second

Bargraph Display : approx. 4 measurements per second

Max. Input Current

AC/DC : 20 A

Operating Temperature : 0 to +40°C, relative humidity of max. 75%, not wetting

Storage Temperature: -10°C to +50°C, rel. humidity < 75%,
not wetting

Temperature Coefficient .. : +23°C +/-5°C

Weight : 242 g (without test-leads)

Dimensions : 175 x 85 x 35 mm
(L x W x H)

7.2 Accuracy

Accuracy in complete spec is given as \pm (% of reading + number of least significant digit(s) = dgt(s)). Accuracy is specified at 23 °C \pm 5°C with a relative humidity of 75 % max. not wetting for a period of 1 year after calibration.

| Mode | Meas. Range | Accuracy | Resolution |
|--|-------------|---------------------------|-------------|
| DC Voltage | 300 mV | $\pm(0.8\%+3\text{dgts})$ | 100 μ V |
| | 3 V | $\pm(0.8\% +1\text{dgt})$ | 1 mV |
| | 30 V | ——“—— | 10 mV |
| | 300 V | ——“—— | 100 mV |
| | 1000V | $\pm(1.0\%+3\text{dgts})$ | 1 V |
| Input resistance > 10 MOhm, at 300 mV > 100 MOhm | | | |
| AC Voltage | 3 V | $\pm(1.0\%+5\text{dgts})$ | 1 mV |
| | 30 V | ——“—— | 10 mV |
| | 300 V | ——“—— | 100 mV |
| | 750 V | $\pm(1.2\%+5\text{dgts})$ | 1 V |

Input resistance > 10 MOhm, parallel to 50 pF, AC coupled.
Frequency: 40 to 400 Hz



Attention

Voltages below 40 mV cannot be measured.

| Mode | Meas. Range | Accuracy | Resolution |
|-----------------------|-------------|---------------------------|-------------|
| Direct Current | 300 μ A | $\pm(1.0\%+2\text{dgts})$ | 0.1 μ A |
| | 3 mA | ——“—— | 1 μ A |
| | 30 mA | $\pm(1.2\%+3\text{dgts})$ | 10 μ A |
| | 300 mA | ——“—— | 100 μ A |
| | 20 A | $\pm(1.5\%+5\text{dgts})$ | 10 mA |

Max. voltage in the measuring circuit: 250 VDC/VACrms (=effective)
Voltage drop over shunt: 200 mV

| | | | |
|----------------------------|-------------|---------------------------|-------------|
| Alternating Current | 300 μ A | $\pm(1.5\%+5\text{dgts})$ | 0.1 μ A |
| | 3 mA | ——“—— | 1 μ A |
| | 30 mA | $\pm(2.0\%+5\text{dgts})$ | 10 μ A |
| | 300 mA | ——“—— | 100 μ A |
| | 20 A | $\pm(2.5\%+5\text{dgts})$ | 10 mA |

Max. voltage in the measuring circuit: 250 VDC/VACrms (=effective)
Frequency of the direct current: 40 to 400 Hz
Voltage Drop over shunt: 200 mV

| | | | |
|-------------------|----------|---------------------------|---------|
| Resistance | 300 Ohm | $\pm(1.2\%+2\text{dgts})$ | 0.1 Ohm |
| | 3 KOhm | ——“—— | 1 Ohm |
| | 30 KOhm | ——“—— | 10 Ohm |
| | 300 KOhm | ——“—— | 100 Ohm |
| | 3 MOhm | $\pm(2.0\%+2\text{dgts})$ | 1 KOhm |
| | 30 MOhm | $\pm(3.0\%+5\text{dgts})$ | 10 KOhm |

Voltage at the open circuit approx. 0.7 to 1.3 V

Diode Test Test Current 1 mA max.

Continuity check acoustic signal at resistors < 100 Ohm

Frequency 3 kHz to 3 MHz $\pm 0.5\%+1\text{dgt}$
Sensitivity: > 0.4 VACrms

7.3 Max. Input Limits

Voltage Measurement : 1000 VDC or 750 VACrms (=effective)

Current Measurement : 20 A AC/DC in the A-range
300 mA AC/DC in the mA-range
300 μ A AC/DC in the μ A-range
max. input voltage 250 VDC/VACrms
(=effective)

Resistance Measurement .. : 30 MOhm overload protection: 500
VDC/VACrms except the 300 Ohm
range: 250 VDC/VACrms

Diode Test

Continuity Check : Overload protection: 250 VDC/AC

Frequency Measurement ... : 3 MHz



Attention!

The measuring mode "Frequency Measurement" is not protected against overload or too high input voltages.

Exceeding of the max. input limits will damage the measuring unit and endanger the life of the user.