



VOLTCRAFT®

Digital Multimeter AT-200

Ⓧ BEDIENUNGSANLEITUNG

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Digital Multimeter AT-200

Ⓒ OPERATING INSTRUCTIONS

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Multimètre numérique

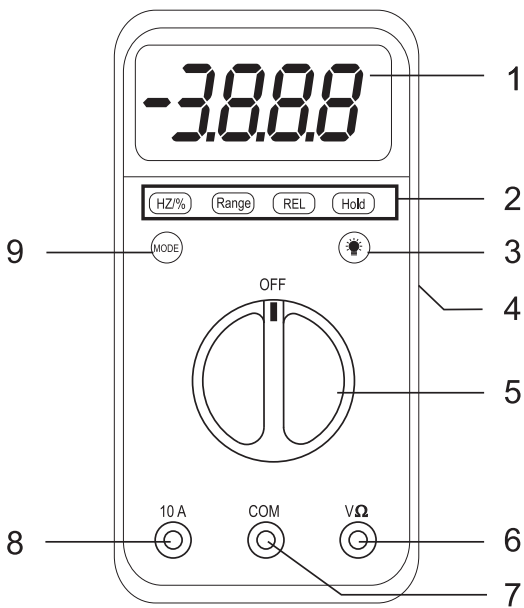
Ⓕ NOTICE D'EMPOI

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Version 08/12



GB Introduction

Dear Customer,

In purchasing this Voltcraft® product, you have made a very good decision for which we should like to thank you.

You have acquired an above-average quality product from a brand family which has distinguished itself in the field of measuring, charging and network technology by particular competence and permanent innovation.

With Voltcraft® you will be equal to difficult tasks as an ambitious hobbyist just as much as a professional user. **Voltcraft®** offers you reliable technology at an extraordinarily favourable cost-performance ratio.

We are certain: your start with Voltcraft will at the same time be the commencement of a long and profitable co-operation.

We wish you much enjoyment with your new **Voltcraft®** product!

Intended Use

- Measurement of direct and alternating voltages up to a maximum of 600V DC/AC rms (effective)
- Measurement of direct and alternating voltages in 3 ranges from 0 to 400µA, 0 to 400mA and 0 to 10A (max. period of 30s with pauses of 15min between the single measurements)
- Measurement of frequencies of up to 10MHz and duty cycle (pulse/pause ratio in %)
- Measurement of resistance values of up to 40MΩ
- Continuity check (< 150 ohms acoustic) and diode test.
- Measurement of capacities of up to 100µF
- Measurement of temperatures from -20°C up to +200 °C (with supplied K-type thermosensor)
- Revolution counters of 2 - and 4-stroke engines with and without an inductive ignition using recording tachometer
- Dwell angle measurement for engines provided with 2 to 10 cylinders

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. Any measurement in moist rooms or outdoors or under adverse ambient conditions is not permitted.

The multimeter may only be used in ranges up to the overvoltage category CATIII to 600V. The voltage difference against earth may be only be 500V AC/DC here

Unfavourable ambient conditions are:

- excessive dampness or humidity
- dust or combustible gases, vapours or solvents
- electrical storms or stormy conditions and strong electrostatic fields, etc.

Use other than that described above will damage the product and may involve other risks, such as short circuit, fire and electric shock etc. Do not change or modify any part of the product. The safety instructions should be observed without fail!

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Operating Elements (see fold-out page)

- 1 $3\frac{3}{4}$ -digit liquid crystal display (LCD) with function and measurement unit indication
- 2 Function button pad with:
 - Hz/% = Switch-over from the frequency measurement to the indication of the duty cycle (pulse/pause ratio in %)
 - Range = manual measurement range setting
 - REL = reference value measurement
 - HOLD = "freezing" of the value displayed
- 3 Key for display illumination
- 4 Battery compartment at rear
- 5 Rotary switch for setting the measuring functions, provided with OFF position
- 6 Test socket for voltage, resistance, frequency, temperature, number of revolutions $\mu\text{A}/\text{mA}$ and capacity (+)
- 7 COM (ground) socket (-)
- 8 Measuring socket for current measurement 10A
- 9 Selection of subfunctions in the relevant rotary switch ranges (e.g. AC/DC switch-over)

Safety Instructions



Please read the complete instructions carefully before starting operation. The information contained is important for correct operation.

The warranty will lapse in case of damage caused by failure to comply with these operating instructions! We shall not be held liable for any consequential damage or loss!

We do not accept any liability for personal injury or damage to property caused by incorrect handling or non-observance of the safety instructions! In such cases the guarantee will lapse.

This device left the factory in perfect condition in terms of safety engineering. To maintain this status and ensure safe operation, the user must comply with the safety instructions and warnings ("Caution!" and "Note!") contained in these instructions for use. The following symbols and notices must be observed:



Note! Read the instructions for use!



This product is CE-tested and meets the necessary directives.



Only for use in dry interior environments



Insulation class 2 (double insulated)

CAT II

Overvoltage category II for measurements at electric devices.

CAT III

Overvoltage category III for measurements of the building installation.



Earth potential

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

Consult suitably qualified staff, if you have doubts about how the equipment operates or about how to connect it safely.

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

In commercial institutions, the accident prevention regulations of the Employer's Liability Insurance Association for Electrical Systems and Operating Materials are to be observed.

In schools, training centres, computer and self-help workshops, handling of measuring instruments must be supervised by trained personnel in a responsible manner. Always make sure before measuring voltages that the measuring instrument is not set to a current measuring range.

The voltage between any socket of the measuring instrument and the ground may not be higher than 500V DC/AC.

Before changing the measuring range, the test prods have to be removed from the measured object.

Take particular care when dealing with voltages exceeding 25V AC or 35V DC! Even with voltages as low as these, it is possible to receive a life-threatening electric shock if you touch electric conductors.

Prior to each measurement, check your instrument including its measuring lines for 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.

Do not use the clamp-on ammeter just before, during or just after an electrical storm (electrical shock! / high-energy over-voltages!). Please make certain that your hands, shoes, clothing, the floor, the measuring instrument or the measurement lines switches and switching parts are absolutely dry.

Do not operate the measuring instrument in areas or unfavourable conditions where combustible gases, vapours or dust are or may be present. Avoid operation in the immediate vicinity of:

- strong magnetic or electromagnetic fields
- transmitting aerials or HF generators.

These could falsify the measured value.

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

If you have reasons to assume that safe operation is no longer possible, then disconnect the appliance immediately and secure it against inadvertent operation.

It must be assumed that the safe operation is no longer possible, if:

- the appliance is visibly damaged
- it does not function any longer and
- the appliance has been stored for long periods of time under unfavourable conditions or
- the appliance has been subject to considerable stress in transit.

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

Do not leave the packaging material lying around carelessly. Plastic film and/or bags, polystyrene parts, etc. can be dangerous in the hands of children.

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

Product Description

The Digital Multimeter (hereinafter referred to as DMM) has a high-contrast, 3 ³/₄-digit liquid crystal display (LCD) with function and measurement unit display.

The individual measuring ranges are selected via the rotary switch in which "auto range", the automatic range selection, is active. The appropriate range of measurement is set for each application individually.

Further additional functions include:

- "HZ/%" - for indicating the pulse/pause ratio of a signal in %,
- "RANGE" - manual measurement range setting,
- "HOLD" for "freezing" a measuring value,
- "REL" to perform a reference measurement,
- An automatic power-off function (auto power off) switches the DMM off, if it has not been used for approximately 35 minutes. This makes the batteries last longer.

The measuring instrument can be used universally both at the hobby level and at the installation or school level.


A compound 9V alkaline battery, e.g. a 6LR61 or MN1604 or 6F22 or 006P type, are required / used for supplying the power.

A fold-out stand is installed on the rear side of the protection rubber frame. You can use this to move the measuring instrument into a diagonal position, which makes it easier to read the display.

Scope of Delivery

Multimeter with protection rubber frame
Compound 9V battery
K-type thermosensor (up to max. 200°C)
Multipurpose plug for the K-type thermosensor
Safety measuring wires red and black
Safety alligator clips
Inductive speed meter
Operating Instructions

Display Indications and Symbols

HOLD	stands for data hold; the measuring value is kept (e.g. for the record) until the "HOLD" button is pressed anew or the multimeter is switched off.
REL	stands for the relative value measurement (=reference measurement)
Auto	stands for "automatic measuring range selection"
OL	stands for overload = overload, the measuring range has been exceeded
BAT	battery replacement symbol; please replace the batteries immediately to avoid measuring errors!
	symbol for the diode test
•))	symbol for the acoustic continuity tester
AC	alternating size for voltage and current
DC	direct size for voltage and current
V	volt (unit of electric potential)
A	ampere (unit of electric current)
Hz	hertz (unit of frequency)
Ω	ohm (unit of electric resistance)
F	farad (unit of capacity)
°C	grade centigree (unit of temperature)
%	indication of the duty cycle of a signal in %
n	nano (exp.-9)
μ	micro (exp.-6)
m	mill (exp.-3)
k	kilo (exp.3)
M	mega (exp.6)

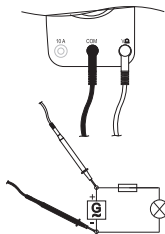
Carrying out Measurements



In no event exceed the max. permitted input values within the over-voltage category III. The frequency of the alternating volumes may not exceed 400Hz! Do not contact circuits or parts of circuits if there could be higher voltages than 25V ACrms or 35V DC pending within them ! Danger! Before measuring, check the connected measuring lines for damage such as, for example, cuts, cracks or squeezing. Replace defective measuring lines immediately by new ones, defective measuring lines may not be used any longer! Danger!

a) Voltage measurement

Proceed as follows to measure AC/DC voltages:



- Connect the black measuring line with the COM socket (7) and the red measuring line with the V Ω -socket (6) till they are plane at the measuring instrument .
- Set the range selection switch (5) to position "V".
- Press the "MODE" button (9) additionally for measuring AC voltages.
- Now connect the two measuring prods to the object to be measured (battery, switching etc.).
- In the display (1), the polarity of the measuring value concerned will be indicated together with the current measuring value.

The voltage range "V" shows an input resistance of approx. 10M Ω . As soon as a minus "-" appears for the direct voltage in front of the measuring value, the measured voltage is negative (or the measuring prods have been mixed up).

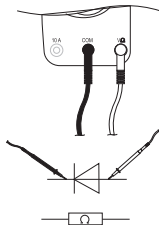
Note: Due to the fact that the measuring input is very sensitive, it is possible that any measuring values ("phantom measuring values") will be indicated if the measuring wires are free (not connected to an object to be measured). This "phenomenon" is normal and disappears as soon as you perform your measurement.

b) Resistance measurement, diode test, acoustic continuity check and capacity measurement



Make sure that all the circuit parts, switches and components and other objects to be measured are disconnected from the voltage and currentless at all times.

Proceed as follows for the measurement:



- Connect the black measuring line with the COM socket (7) and the red measuring line with the $V\Omega$ -socket (6) till they are plane at the measuring instrument.
- Set the range selection switch (5) to position $\Omega \bullet \text{||}$ CAP.
- You are in the resistance measurement range. You can select the other measuring functions by pressing the "MODE" button (9).
- Check the measuring lines for continuity by connecting both measuring prods to one another. After that the resistance value must be approx. 0 ohm.
- Now connect the measuring prods to the object to be measured. As long as the object to be measured is not high-resistive or is interrupted, the measured value will be displayed on the display (1).



If you carry out a resistance measurement, make sure that the measuring points which you contact with the measuring prods are free from dirt, oil, solderable lacquer or similar. Such circumstances can falsify the measured result.

Make sure that the polarity of unipolar capacitors (polarised) is correct ("+" and "-").

The supplied multipurpose plug can be used for an easier handling. As soon as "OL" (overload) appears on the display, you have exceeded the measuring range or the measuring circuit has been broken.

c) Frequency measurement



In no event exceed the max. permitted input values. Do not contact circuits or parts of circuits if you measure voltages higher than 25V ACrms or 35V DC pending within them.

Proceed as follows to measure the frequency:

- Connect the black measuring line with the COM socket (7) and the red measuring line with the $V\Omega$ -socket (6) till they are plane at the measuring instrument.
- Set the range selection switch (5) to position "Hz".
- Now connect the two measuring prods to the object to be measured (generator, switching etc.).
- The current measuring value is shown on the display (1).

Proceed as follows to measure the pulse-pause ratio (duty cycle):

- Press the "Hz/%" button (2). You switch over these two measuring functions. The measurement unit "%" appears on the display.
- Now connect the two measuring prods to the object to be measured (generator, switching etc.). The current measuring value is shown on the display (1).

d) Temperature measurement



In no event exceed the max. permitted input values. Do not contact circuits or parts of circuits if there could be voltages higher than 25V ACrms or 35V DC pending within them !

The temperature measurement can be performed only at the connection sockets (6) = + and (7) = - and only by means of K-type thermosensors. Use the multipurpose plug with the correct polarity for connecting the thermosensor.

The temperatures may only be applied at the sensor. The measuring instrument is only specified (guaranteed precision) for an ambient temperature of 23°C (+/-5°C).

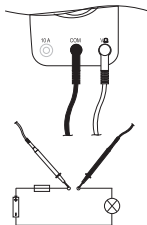
Proceed as follows to measure temperatures:

- Remove all measuring lines from the multimeter and set the range selection switch (5) to position "C" or "F" (Fahrenheit).
- Insert the enclosed multipurpose plug with the correct polarity into the sockets (6) and (7).
- Now, insert the plug of the K-type thermosensor with the right polarity (narrow contact stud = +) into the multipurpose plug. Then, the temperature is indicated in "°C" (Celsius) or "°F" (Fahrenheit) on the display.

e) Current measurement in the μA - and mA ranges

You can measure currents of up to $400\mu\text{A}$ in the μA range and currents of up to 400mA in the mA range. Both current measuring ranges are provided with fuses and thus protected against overload.

Proceed as follows to measure dc voltages:



- Connect the black measuring line with the COM socket (7) and the red measuring line with the V-mA socket (6).
- If you want to measure currents of up to $400\mu\text{A}$ or up to 400mA , set the range selection switch (5) to position " μA " or to position " mA ", respectively.
- Now connect the two test prods in series with the object to be measured (battery, switching etc.); the polarity of the measuring figure concerned will be indicated together with the current measuring value on the display (1).

Proceed as follows to measure alternating currents:

- Connect the black measuring line with the COM socket (7) and the red measuring line with the V-mA socket (6).
- If you want to measure currents of up to max. 4mA or up to 400mA , set the range selection switch (5) to position " μA " or to position " mA ", respectively.
- Press the "MODE" button to change into the AC range; if you press it again you return to the DC range.
- Now connect the two test prods in series with the object to be measured (generator, switching etc.); the polarity of the measuring figure concerned will be indicated together with the current measuring value on the display (1).

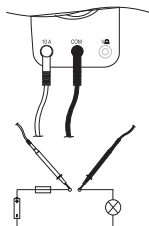


Never measure currents higher than 400mA in the mA range.

f) Current measurement in the 10A range

In this range, currents of up to 10A DC/AC can be measured. The current measurement range is provided with a fuse and thus protected against overload.

Proceed as follows to measure direct currents:



- Connect the black measuring line with the COM socket (7) and the red measuring line with the 10A socket (8).
- Set the range selection switch (5) to position "A".
- Now connect the two test prods in series with the object to be measured (battery, switching etc.); the polarity of the measuring figure concerned will be indicated together with the current measuring value on the display (1).

Proceed as follows to measure alternating currents:

- Connect the black measuring line with the COM socket (7) and the red measuring line with the 10A socket (8).
- Set the range selection switch (5) to position "A".
- Press the "MODE" button to change into the AC range; if you press it again you return to the DC range.
- Now connect the two test prods in series with the object to be measured (generator, switching etc.); the current measuring value will be indicated on the display (1).



Never measure currents higher than 10A.

Measurements within the 10A range may not last longer than 30s and may only be performed in intervals of 15 minutes (cooling-down phase for the shunt (measuring resistor)).

g) Speed measurement

The speed can be measured at petrol engines with and without ignition distributors. The speed is measured in an inductive manner at an ignition cable by means of a clamp-on meter.



Use this function only for insulated cables to avoid possible contacts!

When connecting make sure that wires or clothes, hair etc. cannot get into the rotating parts of the engine unit. Do not touch live parts!

Proceed as follows to measure the speed:

- Connect the black measuring line of the speed meter with the COM socket (7) and the red measuring line with the V-RPM socket (6).
- Turn on the meter and turn the knob (5) at 4-stroke engines in position "RPM". "RPM" appears on the display.
- Switch off the engine to be measured and connect the speed meter with an ignition cable.
- Start the engine and read the speed.
- If "OL" appears on the display, the measuring range is exceeded. Switch the rotary switch to the next measuring range "X10RPM". Now, the measuring value indicated is to be multiplied by 10.
- Measurements on engines without ignition distribution and 2-stroke engines are performed in the "DIS RPM" or "DIS X10RPM" range.

h) Dwell angle measurement "DWELL"

The dwell angle measurement can be performed at engines with 2, 3, 4, 5, 6, 8 and 10 cylinders.

Proceed as follows to measure the dwell angle:

- Set the range selection switch (5) to position "DWELL" and the relevant number of cylinders.
- Connect the black measuring line with the COM socket (7) and the red measuring line with the V-mA socket (6).
- Switch off the engine to be measured.
- Connect the black measuring prod with the negative pole (vehicle mass) of the battery and the red measuring prod with the contact breaker point.
- Start the engine and read the dwell angle indicated by the measuring instrument.



When connecting make sure that wires or clothes, hair etc. cannot get into the rotating parts of the engine unit. Do not touch live parts!

Special Functions

Auto power OFF function

In order to avoid that the operating life of the battery is shortened unnecessarily, an automatic switch-off function has been implemented. If a button has not been pressed or the rotary switch has not been activated for more than 35 minutes, the measuring instrument will be switched off.

To switch on the measuring instrument again, first switch it off and then switch it on again in the appropriate measuring range.

HOLD function

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



If you test live wires make sure that this function is deactivated before the measurement starts. Otherwise, a false measuring result is simulated!

To switch on the HOLD function press the "HOLD" button; an acoustic signal confirms this action and "HOLD" appears on the display.

To deactivate the "HOLD" function again, press this button anew or activate the rotary switch.

REL function

The REL function allows a reference value measurement to avoid possible line losses which may caused e.g. during resistance measurements. For this purpose, the current indicated value is set to zero. A new reference value is set.

Press the "REL" button to activate this measuring function. "REL" appears on the display. The automatic measuring range selection is deactivated now.

To switch off this function, the "REL" button is to be pressed once more.

Maintenance, Disposal, Battery and Fuse Replacement

Apart from occasional cleaning and fuse replacements, the multimeter requires no servicing.

To clean the device or the display and measurement lines, use a clean lint-free anti-static and dry cleaning cloth.

Note!

Do not use cleaning agents which contain carbon, petrol, alcohol or similar substances for cleaning purposes. The surface of the measuring instrument will be cor-

Moreover the vapours are detrimental to health and explosive. Nor should sharp-edged tools such as screwdrivers, metal brushes etc. be used for cleaning purposes.

Periodically check the technical safety of the instrument and measuring lines, e.g. check for damage to the housing or squeezing etc.

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).

All connected lines must be disconnected from the instrument before servicing or repair works are performed.

Repair work must always be carried out by qualified experts familiar with the hazards involved and with the relevant regulations.

If the multimeter fails to function with the proper supply voltage (9V compound battery) and fuses or it cannot be repaired, it must be disposed of in accordance with the applicable legal provisions.

Replacing the battery

A 9V compound battery is required to operate the measuring instrument. If the battery replacement symbol (BAT) appears on the display, the battery is to be replaced.

Proceed as follows to replace the battery:

- Disconnect your measuring instrument from the measurement circuit.
- Disconnect all the measuring lines from the measuring instrument.
- Turn it off.
- Loose the rear screws of the battery compartment cover and remove the cover by drawing it slightly.
- Insert a new battery with the correct polarity.
- Close the battery compartment carefully again.



CAUTION! Never operate the measuring instrument when it is open. !Danger to life!

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 battery compartment.

Disposal of flat batteries/accumulators!

You as the ultimate consumer are legally obliged (**Regulation on Spent Batteries**) to return all dead batteries and accumulators. **Disposal in the household waste is prohibited!**



Batteries/accumulators containing hazardous substances are marked by the opposite symbols. These symbols also indicate that it is prohibited to dispose of these batteries in the household waste.

The heavy metals concerned are: **Cd** = cadmium, **Hg** = mercury, **Pb** = lead.



You can return dead batteries/accumulators free of charge to the collection points in your community, our branches or anywhere else where batteries or accumulators are sold.

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

Replacing the fuse



Always adhere carefully to the safety instructions, if you replace fuses!

Make sure that only fuses of the type stated and of the rated current specified are used as a replacement. Using repaired fuses or bridging the fuse bracket is not permitted.

To replace the fuses disconnect the measuring instrument from the measurement circuit, remove all measuring lines and switch off the measuring instrument.

Unscrew the two rear housing screws and open the housing carefully. The fuses can be accessed now.

Remove the defective fuse(s) and replace it (them) by a fuse of the same type and rated current.

F1 for the protection of the $\mu\text{A}/\text{mA}$ range: 0.5A 250 V quick-acting 5x20 mm (F0,5A 250V)

F2 for the protection of the 10A range: 10A 250 V quick-acting 5x20 mm (F10A 250V)



Close the housing carefully after having completed the fuse replacement. Only operate the measuring instrument if the housing is reliably closed and screwed down.

Troubleshooting

By purchasing the Digital Multimeter AT-200, you have acquired a product which has been designed to the state of the art and is operationally reliable.

Problems and malfunctions may, however, arise.

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



Always adhere carefully to the safety instructions!

Fault	Possible cause
The multimeter does not function.	Is the batteries flat? Check the charge condition of the battery.
No measurement of current possible.	Is the fuse for the 400mA or 10A current range defect? Check the fuse (fuse replacement)
No change of measuring value	Is the HOLD function active? Press the HOLD button.



Repairs other than those just described should only be performed by an authorised electrician.

If you have queries about handling the measuring device, our technical support is available under the following telephone number:

Voltcraft, 92242 Hirschau, Tel. no. 0180 / 586 582 723 8

Technical Data and Measurement Tolerances

Technical data

Display	: 3 ³ / ₄ -digit LCD
Speed of measurement	: 2 measurements / sec.
Input resistance	: approx. 10M Ω
Battery replacement symbol	: <7.5V +/- 0,5V
Acoustic signal	: for each button activation
Battery required	: 9V compound battery, NEDA 1604 or 006P type
Operating temperature	: 0°C to 50°C
Storage temperature	: -20°C to 60°C
Rel. air humidity	: < 70% (non-condensing)
Operating height	: up to a max. 2,000 m above MSL
Temp. for guaranteed accuracy	: +18°C to +28°C
Weight (incl. battery)	: approx. 220 g
Dimensions (LxWxH)	: 146 x 66 x 41 (mm)

Measurement tolerances

Statement of accuracy in \pm (% of reading (= reading = rdg) + display error in digits (= dgt = no. of the smallest points)). The accuracy is valid for 1 year at a temperature of +23°C +/5°C, and at a relative humidity of less than 75 %, non-condensing.

Type of operation	Measuring range	Accuracy	Resolution
DC volt	400mV	+/- (0.8%+3dgt)	0.1 mV
	4 V	+/- (1.5%+3dgt)	0.001 V
	40 V	+/- (1.5%+3dgt)	0.01 V
	400 V	+/- (1.5%+3dgt)	0.1 V
	600 V	+/- (2.0%+5dgt)	1 V
Overload protection: 600 V; input resistance: 10 M Ω			
AC volt	400 mV	+/- (1.8%+40dgt)	0.1 mV
	4 V	+/- (1.3%+3dgt)	0.001 V
	40 V	+/- (1.8%+3dgt)	0.01 V
	400 V	+/- (1.8%+3dgt)	0.1 V
	600 V	+/- (2.5%+6dgt)	1 V
Overload protection: 600 V; input resistance: 10 M Ω			
No auto range in the 400mV range			
Frequency of the alternating voltage: 50 Hz to 400 Hz			
DC ampere	400 μ A	+/- (1.0%+3dgt)	0.1 μ A
	4000 μ A	+/- (1.5%+3dgt)	1 μ A
	40 mA	+/- (1.5%+3dgt)	0.01 mA

	400 mA	+/- (1.8%+3dgt)	0.1 mA
	4 A	+/- (2.5%+5dgt)	0.001 A
	10 A	+/- (2.5%+5dgt)	0.01 A
Overload protection:	$\mu\text{A}/\text{mA}$ 0.5A 250V	quick-acting fuse	
	10 A 250 V	quick-acting fuse	
Duration of measurement in the 10A range:	0 up to ≤ 5 A permanent measurement > 5A max. 30 sec with a pause of 15 min		
AC ampere	400 μA	+/- (1.5%+3dgt)	0.1 μA
	4000 μA	+/- (1.8%+5dgt)	1 μA
	40 mA	+/- (1.8%+5dgt)	0.01 mA
	400 mA	+/- (2.0%+5dgt)	0.1 mA
	4 A	+/- (3.0%+7dgt)	0.001 A
	10 A	+/- (3.0%+7dgt)	0.01 A
Overload protection:	$\mu\text{A}/\text{mA}$ 0.5A 250V	quick-acting fuse	
	10 A 10A 250 V	quick-acting fuse	
Duration of measurement in the 10A range:	0 up to ≤ 5 A permanent measurement > 5A max. 30 sec with a pause of 15 min		
Frequency of the alternating voltage:	50 Hz to 400 Hz		
Resistance	400 Ω	+/- (1.5%+5dgt)	0.1 k Ω
	4 k Ω	+/- (1.3%+3dgt)	0.001 k Ω
	40 k Ω	+/- (1.5%+3dgt)	0.01 k Ω
	400 k Ω	+/- (1.5%+3dgt)	0.1 k Ω
	4 M Ω	+/- (1.5%+3dgt)	0.001 M Ω
	40 M Ω	+/- (2.5%+4dgt)	0.01 M Ω
Overload protection:	250 V		
Continuity tester:	acoustic signal for resistances $< 150 \Omega$, test current: $< 0.3\text{mA}$		
Diode test	Test voltage, max. 1.5 V (max. 0.3mA)		
Capacity	40 nF	+/- (6%+12dgt)	0.01 nF
	400 nF	+/- (3.5%+7dgt)	0.1 nF
	4 μF	+/- (3.5%+7dgt)	0.001 μF
	40 μF	+/- (3.5%+7dgt)	0.01 μF
	100 μF	+/- (6%+7dgt)	0.1 μF
Overload protection:	250 V		
Frequency	5 Hz	+/- (1.8+6dgt)	0.001 Hz
	50 Hz	+/- (1.8+6dgt)	0.01 Hz
	500 Hz	+/- (1.5+4dgt)	0.1 Hz
	5 kHz	+/- (1.5+4dgt)	1 Hz
	50 kHz	+/- (1.5+4dgt)	10 Hz
	500 kHz	+/- (1.5+4dgt)	100 Hz
	10 MHz	+/- (2.0+5dgt)	1 kHz
Overload protection:	250 V		
Measuring sensitivity up to 1MHz:	500 mV		
	> 1 MHz 3V		

Temperature	-20°C to +200°C	+/- (3%+4dgt)	1°C
	-4°F to +1400°F	+/- (3%+4dgt)	1°F
K-type thermosensor			
Specification of the measuring precision without sensor			
Speed RPM	600 to 4000	+/- (2%+4dgt)	1 RPM
X10RPM	600 to 12000	+/- (2%+4dgt)	10 RPM
Speed RPM DIS	300 to 4000	+/- (2%+4dgt)	1 RPM
X10RPM DIS	300 to 6000	+/- (2.5%+5dgt)	10 RPM
Overload protection: 250V			
Dwell angle	2 cyl. 0-180°	+/- (2.5%+4dgt)	0,1°
	3 cyl. 0-120°	+/- (2.5%+4dgt)	0,1°
	4 cyl. 0-90°	+/- (2.5%+4dgt)	0,1°
	5 cyl. 0-72°	+/- (2.5%+4dgt)	0,1°
	6 cyl. 0-60°	+/- (2.5%+4dgt)	0,1°
	8 cyl. 0-45°	+/- (2.5%+4dgt)	0,1°
	10 cyl. 0-36°	+/- (3%+5dgt)	0,1°
Overload protection: 250V			



In no event exceed the max. permitted input values. Do not contact circuits or parts of circuits if there could be higher voltages pending within them than 25V ACrms or 35V DC! Danger!