



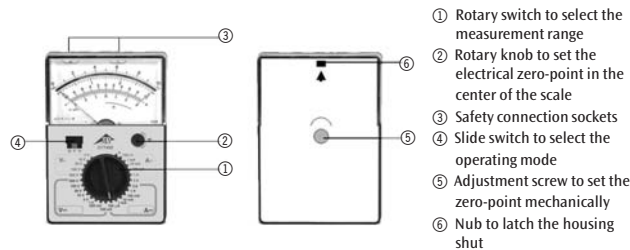
3B SCIENTIFIC® PHYSICS



U17450 Analog Multimeter with Zero-point Center/Left

Instruction Sheet

10/04 MC/ALF



Handheld meter for current and voltage measurement.

1. Safety instructions

- Before using the analog multimeter, make sure you read the operating instructions carefully and that you comply with them completely.
- The safety of the multimeter and the person operating it can only be guaranteed if it is used in accordance with the instructions. Do not operate or handle this unit incorrectly or inappropriately.
- The device may only be used by persons, who are aware of the hazards of contact (for voltages over 30 V rms) and can undertake the appropriate safety precautions. This also includes the appearance of unforeseen voltages e.g. in defective units or charged capacitors.
- In the case of voltage and current measurements the nominal voltage between the phase and neutral conductor may not exceed 300 V according to CAT II (in circuits that are directly connected to the mains) and CAT III (in building wiring installations) 300 V.
- The analog multimeter may be used for measurements in circuits with corona discharge (high voltage).
- In measurements involving RF circuits special care must be taken due to the existence of dangerous hybrid voltages.
- The appropriate permissible measurement range may not be exceeded. Always change from a higher measurement range to a





lower measurement range.

- Before using the device, check the housing and the measurement cables for any damage.
- Do not conduct measurements in a damp environment. Workplace, hands, shoes and floor must be dry.
- Before opening the housing all measurement leads are disconnected from the device.

2. Description, technical data

Active analog multimeter with a slide switch for selection of the operating mode and a rotary switch to select the measurement range as well as a scale with the mirrored background for parallax-free readings with a zero-point adjustable to the center or the left of the scale. By adjusting the electrical zero-point to the center of the scale bipolar DC voltage and current measurements can be conducted without worrying about polarity. The device is extremely robust in terms of load capacity and is equipped with excellent overload protection due to its two anti-parallel diodes as well as moving coil movement which is not sensitive to external electromagnetic fields. The safety connection sockets offer protection against accidental touch contact. After approx. 45 mins the battery is automatically switched off. The power can be re-established by turning off and on using the slide switch for the operating mode. The robust plastic housing and the spring-connected bearing jewels of the movement guarantee protection against damage

caused by mechanical stress.

Measurement ranges:

Voltage measurement:

DC	
Meas. range	Internal resistance
100 mV	10 MΩ
300 mV	10 MΩ
1 V	10 MΩ
3 V	10 MΩ
10 V	10 MΩ
100 V	10 MΩ
300 V	10 MΩ

AC	
Meas. range	Internal resistance
3 V	1 MΩ
10 V	1 MΩ
30 V	1 MΩ
100 V	1 MΩ
300 V	1 MΩ

Current measurement AC/DC:

Meas. range	Voltage drop
0.1 mA	55 mV
1 mA	55 mV
10 mA	55 mV
100 mA	55 mV
1 A	53 mV
3 A	51 mV

Accuracy: DC class 2; AC class 3

Effective variables and nominal operating ranges:

Temperature 0 – 40° C: ± 2% / K

Frequency for all measurement

ranges: ±2.5% at 30 Hz up to

1.5 kHz ± 5% at 1.5 kHz

up to 3 kHz

Reference conditions:

Ambient temperature: +23° C ± 2 K

Frequency: 50 to 60 Hz

Waveform: Sinusoidal





Overload protection:
F3 fuse, 15 H/250 V in accordance with DIN VDE 0820 Section 22/EN 60 127-2 as circuit protection in the case of overload; movement protected by 2 antiparallel-connected diodes

Protection class:
IEC 1010-1/EN 61010-1/VDE 0411-1
Overvoltage category: CAT III
Nominal voltage: 300 V
Degree of pollution: 2
Test voltage: 3.7 kV~
EMV: Electromagnetic compatibility
Jamming: EN 50081-1:1992
Interference immunity: EN 50082-1:1992
Power supply: 1 x 9 V flat cell battery, IEC 6F22
Dimensions: 98 x 138 x 35 mm
Weight: approx. 0.3 kg

- Check the electrical zero-point. Set the slide switch (4) into the “↑” position. Select the measurement range, the needle must be set to zero-point in the center of the scale, otherwise correct using the rotary knob (2).
- Check the battery. To do this set the slide switch (4) to “∞”, and then adjust the rotary switch (1) to “-|”. If the needle does not deflect into the battery test zone designated “-|” the battery must be replaced.



3. Operation

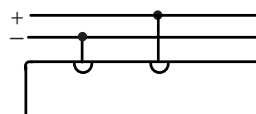
3.1 Ready for use

- Insert battery into the battery compartment. To do this remove the section of housing by pressing in the nub (6), e.g. using a screwdriver. Then insert the battery and connected it to the battery clip. Replace the housing section and snap it into place.
- Check the mechanical zero-point. The measuring instrument may not be connected at this time. Set the sliding switch (4) to the “0” position. The needle must be located in the “-| OFF” position when the multimeter is in a horizontal position. If necessary make the corresponding adjustments with the adjustment screw (5).

3.2 General instructions

- When performing measurements always set the rotary switch (1) to the highest measurement range. Then turn the switch to lower ranges until you obtain optimum needle deflection.
- When the power supply is interrupted by the automatic battery switch-off (after approx. 45 min.) switch the slide switch (4) on and off again.
- When the multimeter is not in use, disconnect all measurement leads from the meter, reset the rotary switch (1) to the highest range, set the slide switch (4) to the “0” setting and, if necessary, remove the battery.


3.3 DC voltage measurement



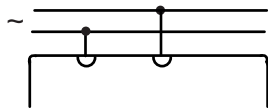



3.3.1 Operating mode: electrical

3.3.2 Operating mode: electrical zero-point center

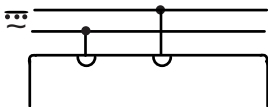
- Set the slide switch (4) to the “” setting.
- Using the rotary switch (1) select the corresponding measurement range “V $\overline{\dots}$ ”.
- The needle should now be positioned in the center of the scale.
- Connect the multimeter and take a reading from the lower scale.

3.4 Measuring alternating voltage, directly up to 300 V



- Set the slide switch (4) to “” setting.
- Using the rotary switch (1) select the corresponding measurement range “V \sim ”.
- Connect the multimeter and take a reading from the upper scale.
- To reduce the effects of the frequency, connect the socket “1” directly to ground or to the point with the lowest potential with respect to ground.

3.5 Measuring AC voltage with superimposed DC voltage



- With the aid of a capacitor (recommended: 4.7 μ F/630 V) it is possible

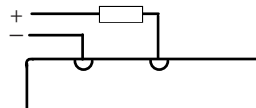
to isolate DC-voltage components in an amplifier output stage, for example. The resultant measurement error is less than 0.2% at a measurement frequency of 50 Hz.

- Proceed with the measurement as stated in point 3.4.
- Measurement of the DC voltage components is performed as described under 3.3.
- To avoid overloading, the set measurement range must be greater than the initially determined DC voltage components.
- Caution: before switching to a lower measurement range both voltage components must be checked.


3.6 Current measurement

- When performing current measurements the multimeter must be connected in series with the load in the circuit, which has the lowest potential with respect to ground.

3.6.1 DC measurement, directly



3.6.1.1 Operating mode: electrical zero-point left

- Switch the slide switch (4) to the “” setting.
- Using the rotary switch (1), select the corresponding measurement range “A $\overline{\dots}$ ”.
- Connect the multimeter take a reading from the upper scale.

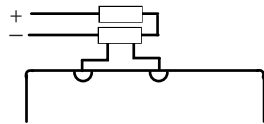




3.6.1.2 Operating mode: electrical zero-point center

- Adjust the slide switch (4) to the “↕” setting.
- Using the rotary switch (1), select the corresponding measurement range “A ∞”.
- The needle should be located in the center of the scale.
- Connect the multimeter and take a reading from the lower scale.

3.6.2 Measuring DC current using shunts



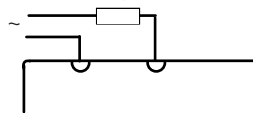
3.6.2.1 Operating mode: Zero-point left

- Set the slide switch (4) to the “↘”.
- Set the rotary switch (1) to the “V ∞ 100 mV” setting.
- Connect the multimeter and the take a reading from the upper scale.

3.6.2.2 Operating mode: Zero-point center

- Set the slide switch (4) to the “↕” setting.
- Set the rotary switch (1) to the “V ∞ 100 mV” position.
- The needle should now point to the center of the scale.
- Connect the multimeter and take a reading from the lower scale.

3.6.3 Measuring AC current



- Set the slide switch (4) to the “↗” setting.
- Use the rotary switch (1) to select the corresponding measurement range “A_”.
- Connect the multimeter and take a reading from the upper scale.

4 Maintenance

4.1 Cleaning

- Only use a paintbrush or soft towel to clean the multimeter. If static electrical charge builds up on the view window, this can be eliminated using a damp rag or an antistatic agent.

4.2 Replacing the battery

- If during the battery test the needle no longer deflects to the battery test zone depicted with “-|—”, the battery must be replaced (see 3.1).

4.3 Replacing the fuse

- The multimeter is equipped with a safety fuse F3,15/250. The fuse holder is located on the printed circuit board. To replace the fuse the device must be opened as described in section 3.1.

