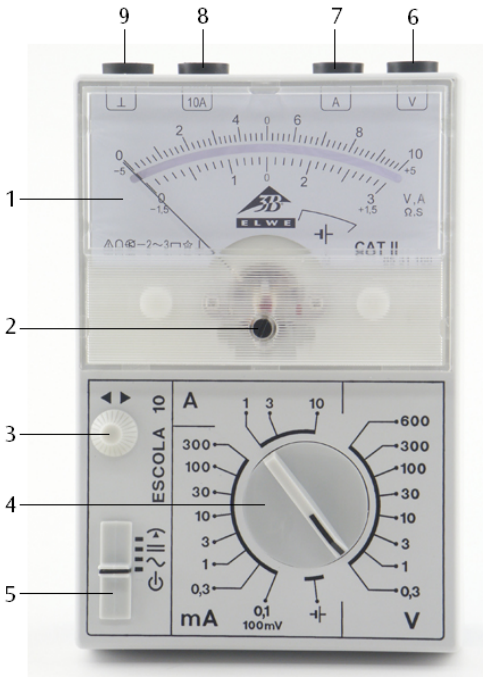
Multimeter Escola 10 1006810

Instruction sheet

01/13 ALF



1 Meter display with mirror scale
2 Slotted screw for zero calibration
3 Adjustment knob for zero calibration
4 Measurement range dial
5 Operating mode switch
6 Voltage measurement socket
7 Current measurement socket for up to 3 A
8 Current measurement socket for up to 10 A
9 Safety ground socket

⚠ 1. Safety instructions

The Escola 10 multimeter conforms to the safety requirements for electrical equipment for measurement, control and laboratory use in DIN EN 61010 part 1. Safe operation of the apparatus is guaranteed with correct handling. However, safety is not guaranteed if the apparatus is handled improperly or carelessly.

- Read this manual carefully before using the multimeter and follow the instructions!

The multimeter may only be used by people who are aware of the dangers of electric shock and are able to take the necessary safety pürecautions.

- Whenever measurements are being made, in which there is a danger of electric shock, a second person should always be informed.
- Before using the meter, check the case and test leads for any damage. In the event of any malfunction/operational defect or visible damage, do not use the meter. Pay particular attention to the insulation surrounding the measurement sockets.
- Use with caution when working above 30 V AC rms, or 60 V DC. Such voltages pose a shock hazard.
- The limit of the measurement range must not be exceeded. If the values of the measurand are unknown, always switch from a higher measurement range to a lower one.
- Do not conduct measurements in a humid environment. Work area, hands, shoes and floor must be dry.
- When measuring current, turn off circuit power before connecting the meter in the circuit.

- Connect the common test lead before you connect the live test lead. When you disconnect test leads, disconnect the live test lead first.
- Before the case is opened, the meter has to be switched off and the leads must be disconnected from the meter.
- When disposing empty batteries follow the local regulations. Never dispose of them in the regular household garbage.

2. Symbol legend

 Read instruction sheet

V Voltage

A Current

 Moving coil galvanometer

 Apparatus with electronic amplifier

 DC quantities accuracy class 2

 AC quantities accuracy class 3

 Use in horizontal position

 Test voltage

 Use in vertical position

 DC quantities

 AC quantities

 Needle position zero centre

 "OFF" position

CAT II Measuring category II is intended for making measurements on circuits directly connected to low-voltage üpwer supplies (EN 61010-1)

3. Description

The ESCOLA 10 multimeter enables precision measurements by analogue means in education, training and practical applications. It measures AC and DC voltage or current and provides for measurements with the needle centred on the dial for DC quantities. Resistance (R) and conductance (G) or impedance (Z) aund admittance (Y) can be obtained by division.

All measurement ranges are selected by means of a rotary dial. Two linearised mirror scales, graded in a 1:3 ratio, guarantee easy readability of the measured values.

The trimmer for setting the zero point in the centre allows the zero point to be set precisely when it drifts electrically.

Isolation of the sockets for voltage and current measurement allow both to be measured in succession simply by turning the range selector switch, without any need for reconnecting or changing the measuring leads.

Use of a robust core-magnet measuring instrument set-up and an impact resistant casing allows the instrument to withstand rough handling in awkward conditions.

The ESCOLA 10 is protected in such a way that over-loads in the selectable current ranges automatically cause the power to be limited.

4. Technical data

Measuring category	CAT II
Voltage ranges:	0.1; 0.3, 1; 3; 10; 30, 100, 300, 600 V; AC/DC
Current ranges:	0.1; 0.3; 1; 3; 10; 30; 100; 300 mA; 1; 3; 10 A AC/DC
Input resistance:	1 MΩ AC/DC
Voltage drop for current measurements:	100 mV AC/DC approx.
Accuracy:	DC class 2; AC class 3
Electrical zero calibration:	For all DC ranges
Accuracy for zero centre:	Class 5
Frequency ranges:	
1 V – 600 V:	20 Hz…50 Hz…20 kHz
0.3 V:	20 Hz…50 Hz…9 kHz
Current ranges:	20 Hz…50 Hz…43 kHz
Scale length:	80 mm
Power supply:	1x 1.5 V, IEC R6 with test function
Voltage overload ranges:	600 V load in those voltage ranges for a lengthy period
Current overload protection ranges (except for 10 A range):	
Integral limiting load:	450 A^2s
Surge current limit I_{FMS}:	300 A
Long-term current limit I_{FAV}:	35 A
Dimensions:	98 x 148 x 49 mm^3
Weight:	300 g approx.

5. Operation

- Switch the device on by select the desired operating mode, ⎓, ∿ or ⏚.
- To turn off the multimeter, set the mode switch to the off position ⏻.
- To test the battery, set the measurement range dial to the position ⎓.

5.1 Current measurement

- Before making any current measurements, set the mode switch to ⎓ or ∿ as appropriate.
- Connect the terminal at the lower potential to the earth socket.
- Currents of less than 3 A can be measured between the earth socket and measuring socket "A".
- Currents of less than 3 A can be measured between the earth socket and measuring socket "A".Currents higher than 3 A should be measured between the earth socket and measuring socket "10A".
- Set the switch to **A** mode and select the desired measuring range. If the current to be measured is unknown beforehand, set the measurement range dial to the highest range and work down.

The fact that measurements can be made without disconnecting the instrument and using overload protection without fuses means that converters may also be connected into the circuit.

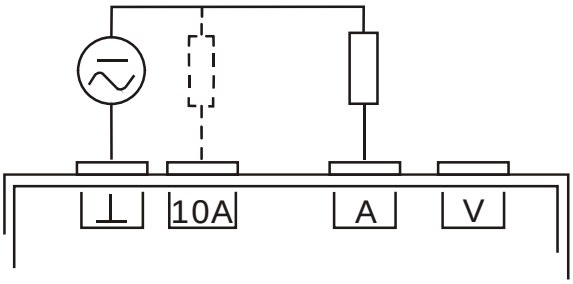


Fig. 1 Current measurement

5.2 Voltage measurement

- Before making any voltage measurements, set the mode switch to ⎓ or ∿ as appropriate.
- Use the "V" socket on the right for voltage measurements.
- Set the switch to **V** mode and select the desired measuring range. If the voltage to be measured is unknown beforehand, set the measurement range dial to the highest range and work down.The 100 mV voltage range is associated with a current range of 0.1 mA.

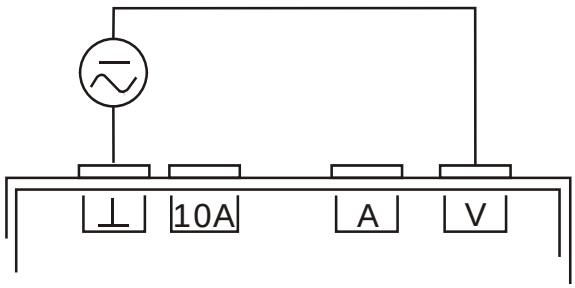


Fig. 2 Voltage measurement

5.3 Simultaneous current and voltage measurement

Isolated current and voltage sockets allow measure-ments of both current and voltage to be made in sequence without disconnecting the measuring leads. That means that in both AC and DC modes, resistance, conductance, impedance and admittance can all be calculated forming the appropriate quotients.

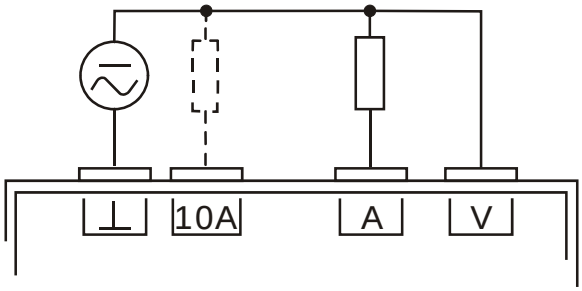


Fig. 3 Simultaneous current and voltage measurement

5.4 Resistance and conductance

According to the defining equation for a linear resistance, $R = U/I$, or conductance $G = I/U$, the Escola 10 can be connected in circuit as in Fig. 3 so that current and voltage can be measured one after the other, allowing for resistance measurements to be made over a range from mΩ up to several MΩ.

´Therefore conductances in a range from under1 µS up to 30 S can be measured by taking the reciprocal of the resistance.

One very key advantage of the Escola 10 is that the instrument, when connected as in Fig. 3, can measure both current and voltage ranges without having to disconnect it.

5.5 Impedance and admittance

If the circuit in Fig. 3 is powered by a sinusoidal AC voltage source instead of a DC source, us-

ing the definitions for impedance $Z = U/I$ and admittance $Y = I/U$ means that AC measurements can also be measured in a variety of ranges in a similar way to the DC quantities in 5.4.

The Escola 10 is particularly useful in this respect because it allows for measurements to be made not only at 50 Hz, but right across the low-frequency range.

5.6 Measurements with the zero point of the needle centred

This kind of measurement can only be made in DC ranges.

- To make a measurement with the zero point in the centre, push the mode switch to ⏜.
- Before measuring the external quantity, calibrate the zero point using the trimmer to set the point in the direct centre of the scale.

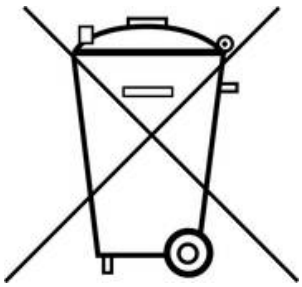
The full extent of the measuring remains available so there is no separate labelling for the range selector switch.

For a range 0 V ... 10 V, for example, the limits now become -5 V ... 0 V ... +5 V absolute or 0 V ... ±5 V. Positive values of voltage at the V socket or current at the A socket cause the needle to move to the right while negative values cause it to move to the left. The scales are labelled accordingly (smaller auxiliary numbering).

5.7 Changing the battery

5.7.1 General information

- From time to time, check the state of the battery.
- ⚠ Remove discharged or corroded batteries from the apparatus.
- ⚠ During prolonged periods of disuse, also remove the battery from the apparatus.
- Do not dispose of the battery in the regular household garbage. Follow the local regulations (In Germany: BattG; EU: 2006/66/EG).



5.7.2 Changing the battery

- Unscrew the back of the chassis.
- Place the negative pole of the battery on the spring.

The polarity is also marked on the board with plus and minus symbols. Additionally, a mechanical clip on the positive side prevents battery contact when polarity is reversed.

- Close chassis again.

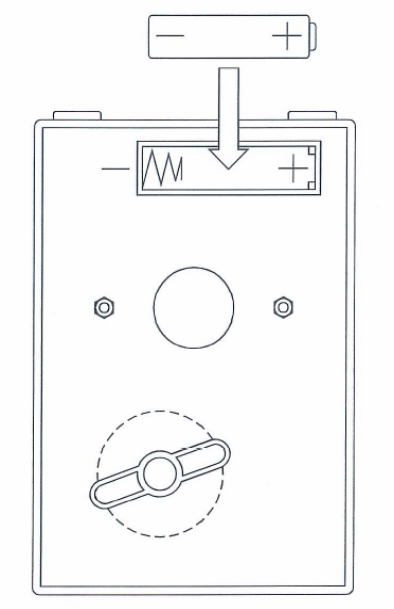


Fig. 4 Changing the battery

6. Maintenance

- This apparatus does not require special maintenance.
- For cleaning, use a soft cloth, slightly moistened with alcohol, or a brush.
- In order to remove a potential electrostatic charge from the meter display window, which can easily influence measurements, follow the instructions above.

Dirt or moisture in the measurement sockets can affect readings.

- Shake out any dirt that may be in the measurement sockets.
- Soak a new swab with isopropyl alcohol and work around the inside of each measurement socket.