

Multimeter Escola 2 1006811

Instruction sheet

11/14 SD/UD



- 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 Safety measurement socket
- 7 Safety ground socket



1. Safety instructions/using the equipment safely

The Escola 2 multimeter is designed to display electrical measurements in the ranges and measurement environments specified in its technical data.

It conforms to safety regulations for electrical measurement, control and laboratory equipment, as specified in DIN EN 61010-1, protection class 2 and to excess voltage category CAT I for up to 30 V. It is intended for measurements on experiments and laboratory apparatus. It is **not** approved for measurements on low-voltage distribution equipment, such as sockets, fuses, etc.

CAT I: Signal layer, telecommunications, electronic equipment with only minor excess voltage transients

CAT II: Domestic appliances, mains sockets, portable instruments etc.

CAT III: Supply via buried cabling, built-in switches, automatic circuit breakers, sockets or contactors

CAT IV: Equipment and installations supplied, for example, by overhead mains cables and therefore subject to greater risk of lightning strikes. This includes, for example, main switches at the building mains feed, electricity meters and ripple control receivers.

Safe operation of the multimeter is guaranteed if it is solely used as specified. Safety cannot be guaranteed, however, if the multimeter is used incorrectly or handled without due care and attention. In order to avoid serious injury due to current or voltage shocks, the following safety instructions are to be observed at all times:

- Carefully read the instruction manual before using the multimeter and obey the instructions therein.
- The multimeter may only be used by persons who are able to recognise the risks of contact and take due precautions to avoid them.

This multimeter is not a toy and must not fall into the hands of children.
















- Do not place it, keep it or use it anywhere within reach of children.
- When the multimeter is used by teenagers, trainees etc., a suitable person should supervise to ensure the equipment is used safely.
- If measurements are made where there are any risks of coming into contact with electricity, a second person is to be informed.

The assumption needs to be made that unforeseen voltages may be present in the vicinity of objects being measured (e.g. faulty equipment or capacitors).

- Before using the multimeter, check the housing and measuring leads for damage and if there should be any malfunctions or visible damage, the multimeter is not to be used. Pay specific attention to the insulation for the measuring sockets.
- Be particularly careful when measuring voltages in excess of 33 V AC (RMS) or 70 V DC.
- For voltages which are in excess of 33 V AC or 70 V DC, only use safety measurement leads conforming at least to CAT II.
- The authorised measuring range is not to be exceeded. If measurements are made when the magnitude of the variable is unknown, always select a large measuring range before shifting down to lower ones.
- The multimeter may not be used to make measurement on circuits which exhibit corona discharge (high voltage).
- Particular care is to be taken when making measurements on high-frequency circuits where dangerous voltages may arise due to superimposition of components.
- Make very sure that the voltage value between the measured contact and earth or between the ground socket and the measurement socket does not exceed 600 V.
- In order to check that the multimeter is ready to use, select the battery test function. Afterwards, it is then possible to check that the voltage source is disconnected and no voltage is present.

- The multimeter may only be used in a dry, dust-free environment with no risk of explosions occurring.
- When measuring current in a circuit, make sure to switch off the power before connecting the multimeter into the circuit.
- When making measurements, always connect the ground lead first. Disconnect the signal measurement lead before unplugging the ground.
- Turn off the multimeter before opening the casing, disconnect the power to the circuit and the measuring leads from the multimeter.

2. Symbol legend

	Hazard, 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
	Use in vertical position
	DC quantities
	AC quantities
	Needle position zero centre
	"OFF" position
	Measuring category as per IEC EN 61010-1
	Double insulated casing
CE	EU conformity mark
	Earth symbol
	Ground symbol
	Battery symbol

3. Technical data

Dimensions:	98 x 148 x 49 mm approx.
Weight:	300 g approx.
Scale length:	80 mm
Pointer deflection:	0...90°
Operating alignment:	Vertical/horizontal
Power supply:	1x 1.5 V, AA IEC LR6
Connectors:	4-mm safety sockets
Voltage ranges:	0.3, 1, 3, 10, 30 V AC/DC
Internal resistance:	10 kΩ/V
Current ranges:	1, 10, 100, 1000, 3000 mA AC/DC
Voltage drop when measuring current:	100 mV approx. AC/DC
Accuracy:	DC Class 2 AC Class 3
Electrical zero-point offset:	in all DC ranges
Accuracy with zero-point offset:	Class 5
Frequency range:	20 Hz...50Hz...20 kHz
Signal form:	Sine (1% max. discrepancy)
Peak factor:	$\sqrt{2}$
Overload protection:	Up to ± 50 V AC/DC peak value
Ambient temperature:	5°C...23°C...40°C
Storage temperature:	-20...70°C
Relative humidity:	< 85% with no condensation
Shock tests:	max. 147 m/s ²
Electrical safety:	
Safety specifications:	EN 61010-1
Excess voltage category:	CAT I: 600 V
Contamination level:	2
Protection type:	IP20
Electromagnetic compatibility:	
Interference emission:	EN 55011:2009
Interference resistance:	EN 61326-1:2013

4. Description

The Escola 2 is a meter for use by students to measure voltages and currents (both DC and AC quantities) in low voltage ranges.

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.

AC quantities are calibrated for a sinusoidal waveform. Conversion and linearisation of the measurement is achieved by half-wave rectification (positive half-wave) using an op-amp. This makes it possible to acquire qualitative readings of alternating quantities with signal frequencies up to in excess of 40 kHz.


The use of a robust moving coil galvanometer and a mechanically resilient casing make it possible to use the equipment even under highly challenging conditions.

The excess current protection of the Escola 2 automatically limits the power when overloaded. After a brief cooling phase, the multimeter automatically switches on again.

5. Operation


- Switch the multimeter 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, disconnect all leads from the multimeter, set the operating mode switch to  and the measuring range switch to . In the  range, the needle should deflect all the way to the end. If this is not the case, the battery must be replaced immediately.

5.1 Current and voltage measurements

- Conduct all normal current and voltage measurements with the operating mode switch in the position . This way, setting the measurement range with the measurement range dial automatically takes care of AC/DC switchovers.
- Connect the lower measurement potential to the left-hand socket. For DC quantities, the positive polarity should always be connected to the right-hand socket.

5.2 Measurements with the zero position of the needle centred

This mode of measurement only works for the DC current and DC voltage ranges.

- For measurements requiring the zero position of the needle position to be centred, set the operating mode switch to the position .
- Before connecting the external quantity to be measured, use the adjustment knob to accurately centre the zero position on the scale.


5.3 Selecting measuring range

- Initially set the range selection switch to the largest possible range, then work down to lower ranges until the optimum deflection of the needle is reached.
- Once all measurements have been completed, turn the selector switch back to the maximum range again.

5.4 Calibrating zero-point

- Turn on the multimeter, set the maximum voltage range of 30 V and connect the ground socket to the voltage socket using a short lead.
- Set up the multimeter in a horizontal position and correct the zero-point of the dial with the help of the adjustment knob.

5.5 Switching off

- Always set the measuring mode to  after completion of measurements to avoid unnecessary use of the battery.

- 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 casing again.

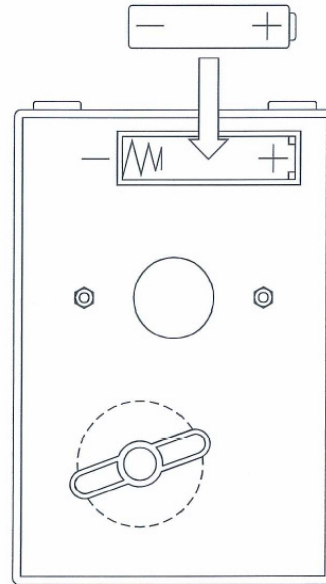
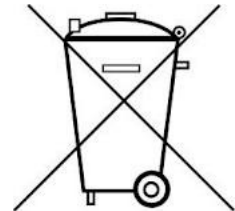


Fig. 1 Changing the battery

- Do not dispose of the battery in regular household refuse. Follow the local regulations (In Germany: BattG; EU: 2006/66/EG).



6. Maintenance

6.1 Changing the battery



All measuring leads must be disconnected from the multimeter before the casing is opened.

- From time to time, check the state of the battery (see 5. Operation).



Remove discharged or corroded batteries from the multimeter.



During prolonged periods of disuse, also remove the battery from the multimeter.

- Unscrew the back of the casing.
- Replace flat batteries with 1.5-V alkaline batteries of size AA IEC LR6.

6.2 Cleaning

- 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.

7. Disposal

- The packaging should be disposed of at local recycling points.
- Should you need to dispose of the equipment itself, never throw it away in normal domestic waste. Local regulations for the disposal of electrical equipment will apply.
- Do not dispose of the battery in regular household refuse. Follow the local regulations (In Germany: BattG; EU: 2006/66/EG).

