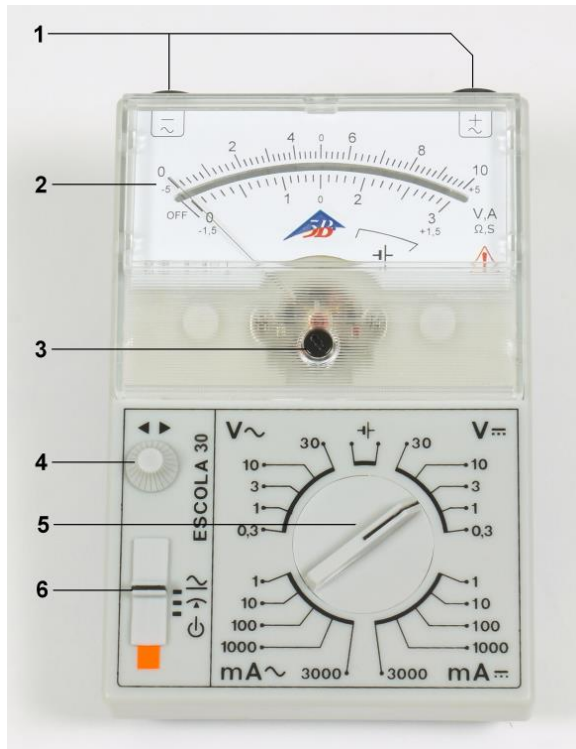


## Analogue Multimeter Escola 30 1013526

### Instruction sheet

12/16 SD/JS



- 1 Connection sockets
- 2 Display with mirror scale
- 3 Slotted screw for zero calibration
- 4 Calibration trimmer for setting centre zero point
- 5 Rotary switch to select the measurement range
- 6 Three-way switch

### 1. Description


The ESCOLA 30 is an electronic meter with a mirrored dial for measurements of current and voltage involving analogue techniques for schools and training use.

The meter allows measurements of AC and DC current and voltage values and the zero point can be set up in the centre of the scale for measurement of DC quantities. AC quantities with frequencies of up to 40 kHz can be measured. All the possible measuring ranges can be selected by means of a single rotary switch.

The excess current protection of the Escola 30 automatically limits the power when overloaded. After a brief cooling phase, the multimeter automatically switches on again.

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. This means that this equipment is suitable for use in schools by children of all years.

### 2. Initial calibration

- Set up the ESCOLA 30 meter either horizontally or vertically.
- Do not connect measuring leads to begin with.
- Set the three-way switch to .

The needle will point to the zero point of the dial. If it does not, the amount of charge of the battery should be checked.



### 3. Safety instructions

The analogue multimeter Escola 30 conforms to safety regulations for electrical measurement, control and laboratory equipment, as specified in DIN EN 61010-1, protection class 2 and to measuring category CAT I for up to 30 V. It is **not** approved for measurements on low-voltage distribution equipment, such as socket-ets, fuses, etc. The nominal voltage must not exceed 30 V.

The meter is intended for measurements within its measuring ranges and in a measuring environment as described in detail in the course of this manual. 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 assumption needs to be made that unforeseen voltages may be present in the vicinity of objects being measured (e.g. faulty equipment).



- 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.
- 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.
- Before using the analogue multimeter to check that a voltage source is not exhibiting any actual voltage, check that the meter is working properly by selecting the battery test function.
- When measuring current, make sure the electricity is turned off before the analogue multimeter is connected 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.
- When the multimeter is used by teenagers, trainees etc., a suitable person should supervise to ensure the equipment is used safely.


### 4. Operation

#### 4.1 To switch on:


- Set the three-way switch to  or .

#### 4.2 Checking battery charge:

- Set the three-way switch to .
- Disconnect all measuring leads.
- Set the rotary switch to .


If the battery is sufficiently charged, the needle will point to the following range indication, . If this is not the case, the battery will need to be replaced immediately.

#### 4.3 Zero point calibration:


- Set up the analogue multimeter either horizontally or vertically
- Set the three-way switch to .
- Turn the rotary switch to 30 V=.
- Connect the sockets together with a short connecting lead.
- Turn the zero-point trimmer screw to adjust the zero point as needed.

#### 4.4 Zero point calibration for centre zero point:

For measurements of DC current and voltage, the zero point of the scale can be moved to the centre of the dial.

- Disconnect all measuring leads.
- Set the three-way switch to  and turn the rotary switch to a DC current or voltage range,
- Use the zero-point trimmer to line up the needle precisely in the centre of the dial.

#### 4.5 To switch off:

- Set the three-way switch to .

When the meter is turned off, the needle points to OFF.



#### 4.6 If a measurement is interrupted by battery cut-out:

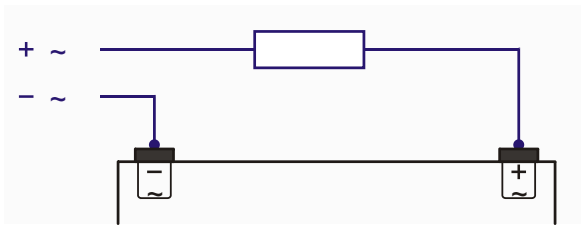
After 45 minutes of use, the multimeter is automatically shut off and the needle will then point to OFF.

To switch back on:

- Set the three-way switch of the analogue multimeter to off and then use it to turn the meter back on.



## 5. Current measurements

|   |  |
|---|--|
|  | The Escola 30 is <b>not permitted</b> to be used for measurements on low-voltage mains distribution equipment, such as mains sockets, circuit breakers and fuses etc.  |
|  | <p>The nominal voltage of the electricity source must not exceed 30 V and its nominal current must be no higher than 3 A.</p> <ul style="list-style-type: none"> <li>The multimeter is to be connected in series with the load on the side where the voltage with respect to ground is lowest!</li> <li>Turn off the circuit before the Escola 30 meter is connected into it.</li> </ul> |




- Connect the side with the lower potential to the left-hand socket.
- Connect the common/ground lead first and only then the signal lead.



### 5.1 DC currents (mA=):

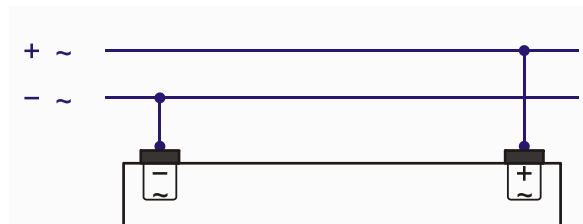
- Set the rotary switch to the desired DC current range. If measurements are made when the magnitude of the variable is unknown, always select a large measuring range before shifting down to lower ones.
- Set the three-way switch to  or, if the zero point is to be set in the centre, to .

### 5.2 AC currents (mA~):

- Set the rotary switch to the desired AC current range. If measurements are made when the magnitude of the variable is unknown, always select a large measuring range before shifting down to lower ones.
- Set the three-way switch to .



## 6. Voltage measurements

|   |   |
|---|---|
|  | The Escola 30 is <b>not permitted</b> to be used for measurements on low-voltage mains distribution equipment, such as mains sockets, circuit breakers and fuses etc. |
|  | The nominal voltage of the voltage source must not exceed 30 V.   |




- Connect the side with the lower potential to the left-hand socket.
- Connect the common/ground lead first and only then the signal lead.

### 6.1 DC voltages (V=):

- Set the rotary switch to the desired DC voltage range. If measurements are made when the magnitude of the variable is unknown, always select a large measuring range before shifting down to lower ones.
- Set the three-way switch to  or, if the zero point is to be set in the centre, to .

### 6.2 AC voltages (V~):

- Set the rotary switch to the desired AC voltage range. If measurements are made when the magnitude of the variable is unknown, always select a large measuring range before shifting down to lower ones.
- Set the three-way switch to .

### Symbols for measuring ranges

|     |                     |
|-----|---------------------|
| mA= | DC (unit mA)        |
| mA~ | AC (unit mA)        |
| V=  | DC voltage (unit V) |
| V~  | DC voltage (unit V) |

## 7. Technical data

### Display:

|                               |                                     |
|-------------------------------|-------------------------------------|
| Scales:                       | 0 ... 10, linear<br>0 ... 3, linear |
| Type:                         | Mirror scale                        |
| Scale length:                 | 80 mm                               |
| Pointer deflection:           | 0...90°                             |
| Electrical zero-point offset: | in all DC ranges                    |

### Measurements:

|                      |                                    |
|----------------------|------------------------------------|
| Voltage ranges:      | 0.3, 1, 3, 10, 30 V AC/DC          |
| Internal resistance: | 10 k $\Omega$ /V                   |
| Current ranges:      | 1, 10, 100, 1000,<br>3000 mA AC/DC |

Voltage drop when measuring current: 100 mV approx. AC/DC

### Reference conditions:

|                      |                            |
|----------------------|----------------------------|
| Ambient temperature: | 23 °C                      |
| Operating alignment: | Vertical/horizontal        |
| Signal form:         | Sine (1% max. discrepancy) |

|                  |                                  |
|------------------|----------------------------------|
| Peak factor:     | $\sqrt{2}$                       |
| Frequency range: | 40 Hz ... <u>50 Hz</u> ... 5 kHz |

### Accuracy (at reference conditions):

|                            |         |
|----------------------------|---------|
| DC quantities:             | Class 2 |
| DC with zero-point offset: | Class 5 |
| AC quantities:             | Class 3 |

### Extended frequency range (class 10):

|              |                            |
|--------------|----------------------------|
| 0.3 – 30 V:  | 40 Hz ... 50 Hz ... 40 kHz |
| 1 – 3000 mA: | 40 Hz ... 50 Hz ... 40 kHz |

### Overload protection:

Current and voltage ranges: reversible for up to  $\pm 50$  V AC/DC peak-to-peak value and max. 40 A.

### Electrical safety:

|                        |                     |
|------------------------|---------------------|
| Safety specifications: | EN 61010-1          |
| Measuring category:    | CAT I: 30 V         |
| Contamination level:   | 2                   |
| Protection type:       | IP20                |
| Connectors:            | 4-mm safety sockets |

### Power supply:

|                          |                      |
|--------------------------|----------------------|
| Battery:                 | 1x 1.5 V, AA IEC LR6 |
| Automatic cut-off after: | 45 min $\pm$ 10 min  |

### Electromagnetic compatibility:

|                          |                 |
|--------------------------|-----------------|
| Interference emission:   | EN 55011:2009   |
| Interference resistance: | EN 61326-1:2013 |

### Operating conditions:

|                      |                                |
|----------------------|--------------------------------|
| Ambient temperature: | 5 °C ... <u>23 °C</u> ... 40°C |
| Storage temperature: | -20 ... 70°C                   |
| Relative humidity:   | <85% with no condensation      |

### General data:

|             |                                    |
|-------------|------------------------------------|
| Shock test: | max. 147 m/s <sup>2</sup>          |
| Dimensions: | 100x150x50 mm <sup>3</sup> approx. |
| Weight:     | 300 g approx..                     |

### Measuring categories according to DIN EN 61010-1.

CAT I or unstipulated: Approved for measurements in circuits which are not directly connected to the low voltage mains grid (e.g. batteries).

CAT II: Approved for measurements in circuits which are directly connected, by a mains lead and plug for instance, to the low voltage mains grid (e.g. household or office appliance and lab equipment).



CAT III: Approved for measurements in circuits which are part of a building's wiring installation (e.g. stationary consumers, distribution terminals, appliances connected directly to the distribution box).

CAT IV: Approved for measurements in circuits which are directly connected to the source of the low voltage mains (e.g. electricity meters, main service feed, primary excess voltage protection).


## 10. Battery, care and maintenance

### 10.1 Battery testing:

Batteries which are discharged and have not been used for a while may leak.

|   |  |
|---|--|
|  | <ul style="list-style-type: none"> <li>• Check the amount of charge left in the battery from time to time.</li> <li>• Flat or leaking batteries should be removed from the meter.</li> </ul> |
|  | <p>If the Escola 30 goes unused for a long period:</p> <ul style="list-style-type: none"> <li>• Remove the Escola 30's battery before reusing.</li> </ul>                                    |

### 10.2 Changing the battery:

|   |  |
|---|--|
|  | <p>Before opening the casing:</p> <ul style="list-style-type: none"> <li>• Turn off the Escola 30.</li> <li>• Disconnect all measuring leads.</li> </ul> |
|---|--|

The polarity is indicated by plus and minus signs inside the fuse holder compartment. A mechanical system ensures the battery makes no contact if it is inserted the wrong way round.

- Unscrew the back of the casing.
- Replace flat batteries with 1.5-V alkaline batteries of size AA IEC LR6.
- Place the negative pole of the battery on the spring.
- Close casing again.

### 10.3 Cleaning:

- For cleaning, use a soft cloth, slightly moistened with alcohol, or a brush.

Electrostatic charging of the display window can affect the measurements under certain circumstances:

- To remove such charge, use a soft cloth slightly soaked in alcohol or a paint brush.

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.

## 11. 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. If being used in private households it can be disposed of at the local public waste disposal authority.



- Comply with the applicable regulations for the disposal of electrical equipment.
- Do not dispose of the batteries in the regular household garbage. Follow the applicable legal regulations (UK: Waste Batteries and Accumulators Regulations, EU: 2006/66/EC).

## 12. Symbol legend

|   |  |
|---|--|
|    | Hazard, read instruction sheet                                     |
|   | Moving coil galvanometer   |
|  | Apparatus with electronic amplifier                                |
| $-2$  | DC quantities accuracy class 2                                     |
| $\sim 3$  | AC quantities accuracy class 3                                     |
|  | Use in vertical position   |
|  | Use in horizontal position   |
| OFF   | Dial position when turned off                                      |
|  | Dial position for battery test when battery charge is satisfactory |
|  | Meter on for AC and DC measurements                                |
|  | Meter on for measurements with centre zero point                   |
|  | Meter switched off   |
| $- +$   | Battery test   |
|  | EU conformity mark   |
|  | Electrical safety assured by double insulation                     |
|  | Do not dispose in normal domestic waste                            |
|  | For use indoors only   |