

# Resistance measurement

## Student Group

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# Resistance measurement

Procedure for resistance measurement:

1. Set the measuring device to resistance measurement.
2. Connect the resistor to be measured to the corresponding sockets on the measuring device (the sockets labelled COM and  $\Omega$ ).
3. Read the measured value.

There are different types of resistance measurement:

- **direct** resistance measurement
- **indirect** resistance measurement

## Direct resistance measurement

Determine the nominal and measured values of the resistance for  $R_{\rm 1}$  (brown, green, orange),  $R_{\rm 2}$  (yellow, violet, red),  $R_{\rm 3}$  (red, violet, red), and the incandescent lamp  $R_{\rm L}$ . Also measure the approximate resistance  $R_{\rm K}$  of your body from your right hand to your left hand.

|                | $R_{\rm 1}$ | $R_{\rm 2}$ | $R_{\rm 3}$ | $R_{\rm L}$ | $R_{\rm K}$ |
|----------------|-------------|-------------|-------------|-------------|-------------|
| nominal value  |             |             |             |             |             |
| measured value |             |             |             |             |             |

Tab. 1: Direct resistance measurement

How do you explain the deviation between  $R_{\rm L,nominal}$  and  $R_{\rm L,meas}$ ?

What consequences can  $R_K$  have?

Now determine the series and parallel combinations of resistors  $R_1$ ,  $R_2$  and  $R_3$ .  
State the formulae used:

$R_{\text{series}} = R_a + R_b$   
 $R_{\text{parallel}} = R_a \parallel R_b = \frac{R_a \cdot R_b}{R_a + R_b}$

|            | R1+R2 | R1+R3                            | R2+R3 | R1    R2 | R1    R3 | R2    R3 |
|------------|-------|----------------------------------|-------|----------|----------|----------|
| calculated |       |                                  |       |          |          |          |
| measured   |       | Text is not SVG - cannot display |       |          |          |          |

Tab. 2: Series and parallel combinations

Indirect resistance measurement

Resistance can also be determined by measuring current and voltage.

**Ohm's law:** In an electrical circuit, the current increases with increasing voltage and decreases with increasing resistance.  
 $I = \frac{U}{R}$

Build the measurement circuit shown in [figure 1](#) for each of the three resistors and set the voltage on the power supply to  $12\text{ V}$ .

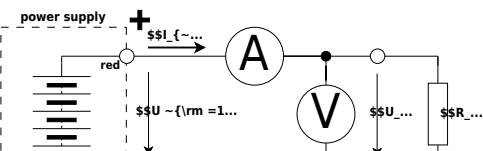


Fig. 1: Indirect resistance measurement

Measure  $U_{\rm n}$  and  $I_{\rm n}$ . Calculate  $R_{\rm n}$  from these values.

| $I_{\rm n}$ | $U_{\rm n}$ | $R_{\rm n}$ | $I_{\rm n}$ | $U_{\rm n}$ | $R_{\rm n}$ | $I_{\rm n}$ | $U_{\rm n}$ | $R_{\rm n}$ |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|             |             |             |             |             |             |             |             |             |

Tab. 3: Indirect resistance measurement

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Last update: **2026/03/16 00:59**

