| **Exercise 0** | **Resistance measurement – derivation of measurement uncertainties** | | *Experiment results:* |
|---|---|---|---|
| Team: | **Name:** | | |
| Date: | Weeks day and hour: | Major, group: | *Remarks:* |

## Aim

*Current-voltage characteristics measurement of simple resistor – derivation of the resistance value from the measurement including its uncertainty.*

## Equipment

*Lab power supply, resistor, PC.*

## Exercise plan:

1. Connect resistor to the power supply. By pressing and releasing a knob of voltage control, enter power supply adjust mode (blinking digits of voltage display).
2. Measure I-V characteristics (current-voltage) for the voltage values given by teaching assistant (do not exceed 3 V) (approximately 6 pairs of measurement points). Type measured values (with unit) in table below.
3. Turn voltage to 0, disconnect resistor.
4. Using spreadsheet software (for example *Calc* from *Open Office*), draw current-voltage characteristics. Complete table calculations using spreadsheet formulas.
5. By using the equation for one-parameter linear regression, calculate the resistance:

   $R = \frac{\sum_{i=1}^{n} I_i \cdot V_i}{\sum_{i=1}^{n} I_i^2}$ $R$=.....
6. Draw the regression line R·I in the graph V(I) completed in the point 3,
7. Calculate the uncertainty of the resistance using the equation:

   $\Delta R = \sqrt{\frac{1}{n-1} \frac{\sum_{i=1}^{n} [(R \cdot I_i - V_i)^2]}{\sum_{i=1}^{n} I_i^2}}$, $\Delta R$=.....

| *i* | **Voltage V**[V] | **Current I**[A] | $I^2$ [$A^2$] | I·V [W] | R·I [V] | R·I-V [V] | $(R \cdot I\text{-}V)^2$ [$V^2$] |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 (n) | | | | | | | |
| **Σ** | | | | | | | |

Measured resistance (with its uncertainty, rounded): $R$ = .....± .....

Relative uncertainty: $\Delta R/R$ =.....%