

Basic electric circuits
Conversion and transfer of energyEfficiency of a tachogenerator
Joule and wattmeter**Object of the experiment**

Determine the efficiency of a tachogenerator

Setup**Preparation of Joule and wattmeter:**

- Use the U , I , P button to set the measured variable to be work, measured in mWs.

Apparatus

1 Motor and tachogenerator, STE 2/19/50.....	579 43
1 Set of 2 fishing lines	309 48ET2
1 Rubber stopper, one 7-mm hole, 28-24 mm diam.....	667 265
1 Resistor, 10 Ω , STE 2/19	577 20
1 Joule and wattmeter.....	531 831
1 Metal rule, 1 m	311 02
1 Single pan balance.....	315 07
1 Stand base, V-shaped, large.....	300 01
1 Stand rod, 150 cm, 12 mm diam.	300 46
1 Support block.....	301 25
1 Pair of pointers.....	301 29
2 Connecting leads, 32 A, 200 cm, blue	501 36

Procedure

- Use the single pan balance to determine the mass of the load.
- Position the pointers 1 m apart on the stand.
- Allow the stopper to descend and press the t START/STOP button when its bottom edge passes the upper pointer.
- When the bottom edge of the stopper passes the lower pointer, stop the measurement by pressing the U , I , P button.
- Read off the electrical work W from the Joule and wattmeter and enter it into the table.

Measurement results

$$g = 9,81 \frac{\text{m}}{\text{s}^2}$$

Electrical work W in Ws	Distance s in m	Mass m in kg
0.12	1	0.027

Evaluation

$$E_{\text{Mec}} = m \cdot g \cdot h = 0,027 \text{ kg} \cdot 9,81 \frac{\text{m}}{\text{s}^2} \cdot 1 \text{ m} = 0,26 \text{ Nm} = 0,26 \text{ Ws}$$

$$E_{\text{El}} = 0.12 \text{ Ws}$$

$$\eta = \frac{E_{\text{El}}}{E_{\text{Mec}}} = \frac{0,12 \text{ Ws}}{0,26 \text{ Ws}} = 0,46$$

The efficiency η of the tachogenerator used here is 0.46.

That means that only about half of the mechanical energy is converted into electrical energy.

The rest is converted into thermal energy and emitted into the surroundings in the form of heat.