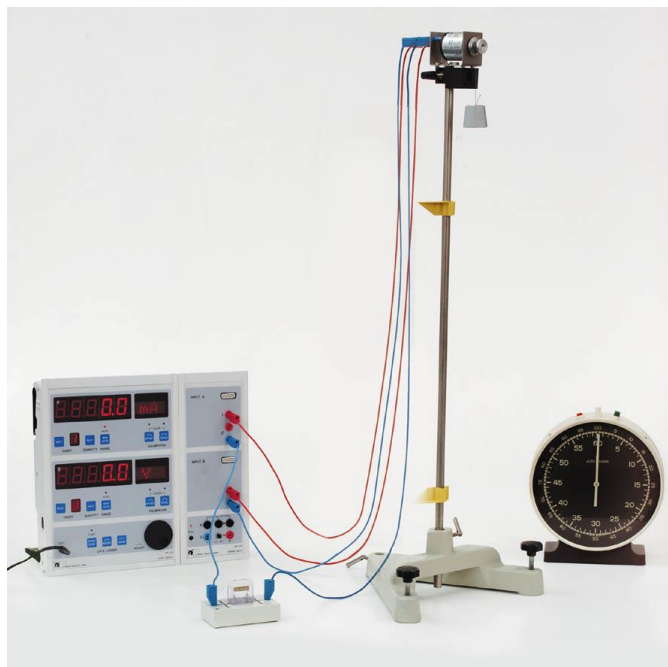


Basic electric circuits
Conversion and transfer of energyEfficiency of a tachogenerator
Motor and tachogenerator**Object of the experiment**

Determine the efficiency of a tachogenerator

Setup**Preparations for measuring current and voltage:**

- Set up the CASSY-Display connected to a Sensor-CASSY module.
- In order to measure current at input A, first select the "mA" measuring range by pressing the NEXT (QUANTITY) button. Then use the MAN/AUTO (Range) button to set the measuring range to "A".
- In order to measure voltage at input B, select the "V" measuring range with the MAN/AUTO (Range) button.

Apparatus

1 Motor and tachogenerator, STE 2/19/50.....	579 43
1 Fishing line.....	309 48ET2
1 Rubber stopper, one 7-mm hole, 28-24 mm diam.....	667 265
1 Plug-in board section, STE.....	576 71
1 Resistor, 10 Ω, STE 2/19	577 20
1 Sensor-CASSY 2	524 013
1 CASSY-Display, USB.....	524 020USB
1 Metal rule, 0.5 m	460 97
1 Table stop-clock.....	313 05
1 Single pan balance.....	315 07
1 Stand base, V-shaped, large.....	300 01
1 Stand rod, 75 cm, 12 mm diam.	300 43
1 Support block.....	301 25
1 Pair of pointers.....	301 29
2 Pairs of connecting leads, 19 A, 100 cm, red/blue	501 46
1 Connecting lead, 19 A, 50 cm, blue.....	500 422

Procedure

- Use the single pan balance to determine the mass of the load.
- Position the pointers 50 cm apart on the stand.
- Allow the stopper to descend and start measuring the time when its bottom edge passes the upper pointer.
- Stop measuring the time when the bottom edge of the stopper passes the lower pointer.
- At the same time, read off the the current I and voltage U from the CASSY-Display.

Measurement results

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

Voltage U in V	Current I in A	Time t in s	Distance s in m	Mass m in kg
0.50	0.048	2.5	0.5	0.027

Evaluation

$$E_{\text{Mec}} = m \cdot g \cdot h = 0,027 \text{ kg} \cdot 9,81 \frac{\text{m}}{\text{s}^2} \cdot 0,5 \text{ m} = 0,13 \text{ Nm} = 0,13 \text{ Ws}$$

$$E_{\text{El}} = U \cdot I \cdot t = 0,50 \text{ V} \cdot 0,048 \text{ A} \cdot 2,5 \text{ s} = 0,06 \text{ Ws}$$

$$\eta = \frac{E_{\text{El}}}{E_{\text{Mec}}} = \frac{0,06 \text{ Ws}}{0,13 \text{ Ws}} = 0,46$$

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.