

Experiment: DC Permanent Magnet motor

1. Objectives

The aim of this experiment is to resemble students magnetic field and current interaction, DC PM motor principle and electro-optic principle of rotary speed measurements.

This experiment students perform individually !

2. Components and instrumentation.

Figure 1 shows the general principle of motor that should be constructed and assembled. It consist of 1,5V battery type R22 (student should bring his/her own battery), neodymium magnet, two paper clips, rotor self-made of insulated wire (diameter of 1.6mm is available), rubber band, a piece of plasticine.

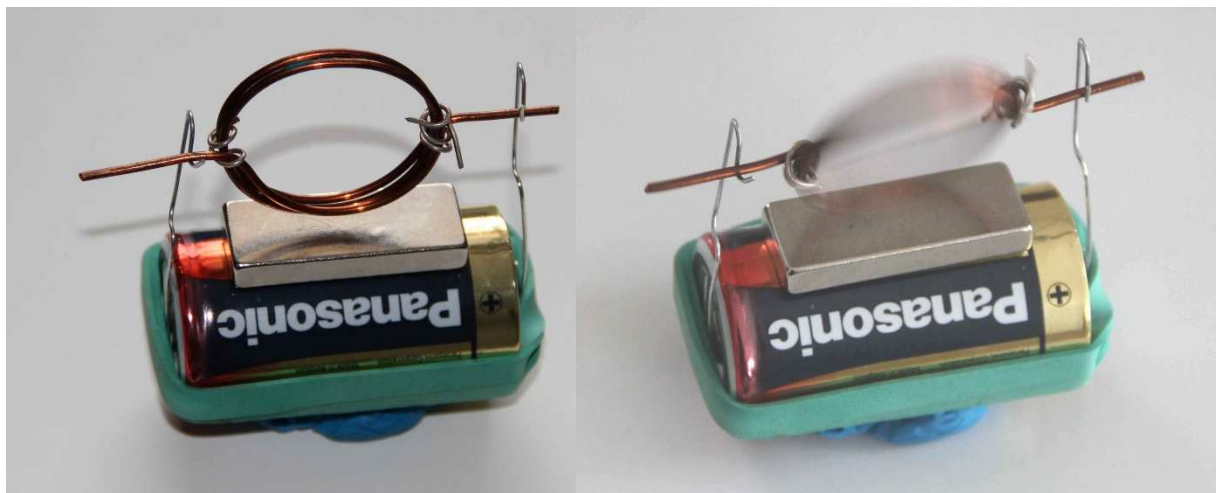


Fig.1. View of the motor.

Subject to choose for student is the number of windings, wire diameter and shape, commutator realization and other own ideas. The commutator, in general, is implemented by removing part of insulation on the ends of the coil wire that slides on the paper clips. Insulation can be removed using sandpaper other sharp tools.



THE DEVELOPMENT OF THE POTENTIAL AND ACADEMIC PROGRAMMES OF WROCLAW UNIVERSITY OF TECHNOLOGY

To measure rotary speed student should propose his/her own circuit using photoresistor (LDR07) or photodiode (BPYP30) and laser pointer. Reading should be made with the oscilloscope. .

3. Preparation.

The time to prepare for classes is estimated at 3 hours.

3.1. *Readings*

- [1] Lecture notes (“actuators”),
- [2] E. M. Purcel, Electricity and Magnetism, McGraw-Hill, (look for Lorentz force),
- [3] W. Tietze, Ch. Schenk, Electronic circuits – Handbook for Design and Applications, Springer, 2008. Chapters 23.1 to 23.6
- [4] Data sheets of photoresistor and photodiode .

3.2. *Problems*

1. What is the Lorentz force (write and interpret vector equation) ?
2. What is the operation principle of a DC PM motor ?
3. What are the principles of operation of photodiode, phototransistor and photoresistor ?

3.3. *Detailed preparation*

1. Propose Your own circuit (draw a schematic diagram) using photoresistor or photodiode and laser pointer to measure the rotary speed of the motor.

4. Contest of report

1. Photo of the working motor.
2. Design and implementation of a rotary speed circuit,
3. Rotary speed measurement (include oscilloscope screen shot).
 - Explain relationship of the screen shot and rotary speed.