Exercise B

Locate the position of the centers and determine the orientations of a number of identical permanent magnets hidden in the black painted block. A diagram of one such magnet is given in Figure 1. The coordinates x, y and z should be measured from the red corner point, as indicated in Figure 2.

Determine the z component of the magnetic induction vector $\vec{B}$ in the (x, y) plane at $z = 0$ by calibrating the measuring system beforehand.

Find the greatest magnetic induction B obtainable from the magnet supplied.

Instrumentation

1. Permanent magnet given is identical to the hidden magnets in the block.
2. Induction coil; 1400 turns, $R = 230\ \Omega$

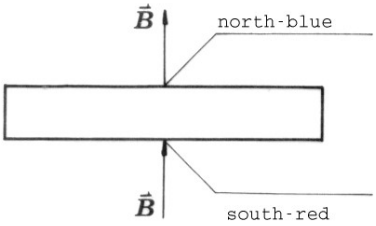

Fig. 1

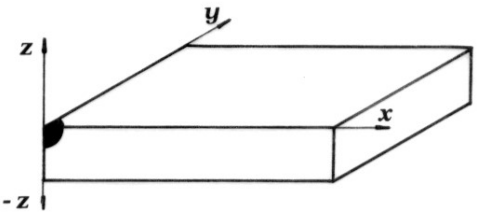

Fig. 2

3. Field generating coils, 8800 turns, $R = 990\ \Omega$, 2 pieces
4. Black painted block with hidden magnets
5. Voltmeter (ranges 1 V, 3 V and 10 V recommended)
6. Electronic circuit (recommended supply voltage 24 V)
7. Ammeter
8. Variable resistor 3.3 kΩ
9. Variable stabilized power supply 0 – 25 V, with current limiter
10. Four connecting wires
11. Supporting plate with fixing holes
12. Rubber bands, multipurpose (e. g. for coil fixing)
13. Tooth picks
14. Ruler
15. Thread

Instructions

For the magnet-search only nondestructive methods are acceptable. The final report should include results, formulae, graphs and diagrams. The diagrams should be used instead of comments on the methods used wherever possible.

The proper use of the induced voltage measuring system is shown in Figure 3.

This device is capable of responding to the magnetic field. The peak voltage is proportional to the change of the magnetic flux through the coil.

The variable stabilized power supply is switched ON (1) or OFF (0) by the lower left pushbutton. By the (U) knob the output voltage is increased through the clockwise rotation. The recommended voltage is 24 V. Therefore switch the corresponding toggle switch to the 12 V – 25 V position. With this instrument either the output voltage U or the output current I is measured, with respect to the position of the corresponding toggle switch (V,A). However, to get the output voltage the upper right switch should be in the 'Vklop' position. By the knob (I) the output current is limited bellow the preset value. When rotated clockwise the power supply can provide 1.5 A at most.

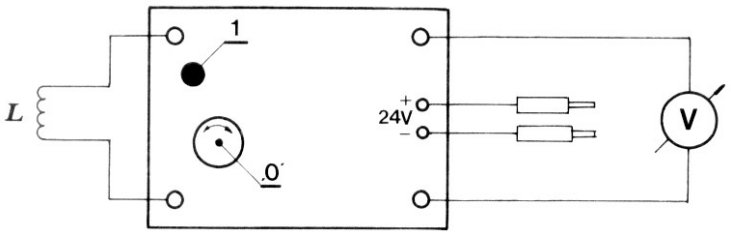

Fig. 3 '0' zero adjust dial, '1' push reset button

Note: permeability of empty space $\mu_0 = 1.2 \cdot 10^{-6}$ Vs/Am.