Current balance

11081.88

Operating instructions

Current balance held by the tripod base 02002.55

1 PURPOSE AND DESCRIPTION

The current balance enables the force exerted by a homogenous magnetic field on a conductor through current flows to be determined as a function of the current intensity through the conductor, the length of the conductor and the magnetic flux.

2 HANDLING

Hang a conductor loop on the hook of the sliding weight balance held by a tripod, and position it so that it hangs freely in the air gap between the pole pieces of an electromagnet. Set the positioning pins of the pole pieces in the U-core holes so that only a small air gap results. After taring the balance, ensure that the horizontal part of the conductor loop is in the middle of the air gap.

For the power supply to the conductor loop, either a metal strip with plugs (see section 5, List of equipment) or connecting wires can be used, but they should only sag slightly to avoid an uncontrollable force on the conductor loop.

3 EXPERIMENT

When a conductor of length l, through which a current of strength I flows, is positioned vertically to the direction of current of a magnetic field of flux density B_n, then the force F exerted on the conductor is:

$F = I \times l \times B_n$

Two weighings of the conductor loop are necessary for each determination of the force exerted, either upwards or downwards according to the direction of the current. The loop must be weighed when not carrying, and when carrying, current. The difference in the two weighings gives the force, for conversion into the unit N (Newton). The vertical conducting paths on the conductor loop do not contribute any force to the weighing.

When the two 50 mm long conductor loops, n = 1 and n = 2 are used, it can be shown that the force F is proportional to the number of winds n.

When the pole pieces are positioned on the U-shaped core to give a wide air gap, and the position of the conductor loop is maintained unchanged, the electromagnet can be turned to give an angle other than 90° between the direction of the field and the conducting loop. In this way it can be shown that only the normal component of the magnetic flux intensity is responsible for the force exerted on the conducting loop.

4 LITERATURE

Versuchseinheiten Physik:
Das magnetische Feld 1 (The magnetic field) 16100.31
Physik in Demonstrationsversuchen:
Ausgabe A/B, Elektrik 01141.31
Hochschulpraktikum Physik: Versuch 4.2.17 16502.01

5 LIST OF EQUIPMENT

Current balance	11081.88
Tripod base -PASS-	02002.55
Metal strip, with plugs	06410.00