Electricity with the Modular System

Current transformation

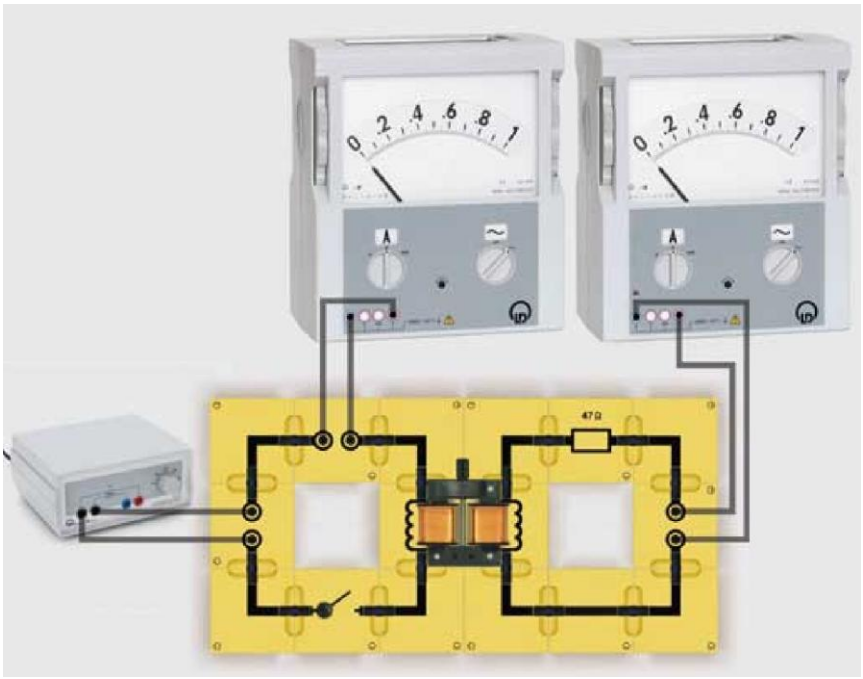
Electromagnetism and Induction

Transformers

Objective of the experiment

To investigate the relationship between the currents *I* and the number of turns *N* in the primary and secondary circuits of a loaded transformer.

Setup



Apparatus

2	539 052	Coil holder, BST
1	590 83	Coil, STE, 500 turns
1	590 84	Coil, STE, 1000 turns
1	593 21	Transformer core, demountable
1	539 025	Toggle switch, BST
1	539 008	Resistor 47 Ω, BST
1	539 001	Connector block BST, straight
3	539 003	Connector blocks BST, straight, 2 sockets
8	539 004	Connector blocks BST, 90° angle
16	539 000	Bridging plug, BST
2	531 906	Demo multimeter, passive
1	521 230	Power supply, 3 V - 12 V, AC, 230 V
6	500 644	Safety connection lead, 100 cm
1	301 300	Demonstration experiment frame
1	301 301	Adhesive magnetic board

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Carrying out the experiment

- Set up the circuit. To do this, first insert the coil with 500 turns (N_1) in the primary circuit and the coil with 1000 turns (N_2) in the secondary circuit.
- Adjust successively voltages of 3 V, 6 V and 9 V at the power supply.
- Read the currents I_1 and I_2 from the demo multimeter in each case.
- Calculate quotients $\frac{I_2}{I_1}$ and enter them into the table.
- Now insert the coil with 1000 turns (N_1) into the primary circuit and the coil with 500 turns (N_2) into the secondary circuit and repeat the experiment.

Measuring example

$$\frac{N_1}{N_2} = \frac{500}{1000} = 0.5$$

Voltage step	Current I_1 / mA	Current I_2 / mA	$\frac{I_1}{I_2}$
3 V	2.8	5.2	0.53
6 V	6.0	11.0	0.54
9 V	9.0	17.5	0.51

$$\frac{N_1}{N_2} = \frac{1000}{500} = 2$$

Voltage step	Current I_1 / mA	Current I_2 / mA	$\frac{I_1}{I_2}$
3 V	2.8	1.2	2.3
6 V	6.0	2.6	2.3
9 V	9.0	4.1	2.2

Evaluation

In a loaded transformer, the numbers of turns $\frac{N_1}{N_2}$ relate to each other as the currents do.

$$\frac{N_1}{N_2} = \frac{I_1}{I_2}$$.