Transformer

Task and equipment

Information for teachers

Additional information

This experiment presents the principles and one of the advantages of a transformer.

Notes on procedure

A sufficiently "smoothed" direct voltage is required for the first part of the procedure. Should this not be available, use a 4.5 volt flat-type battery for this experiment.

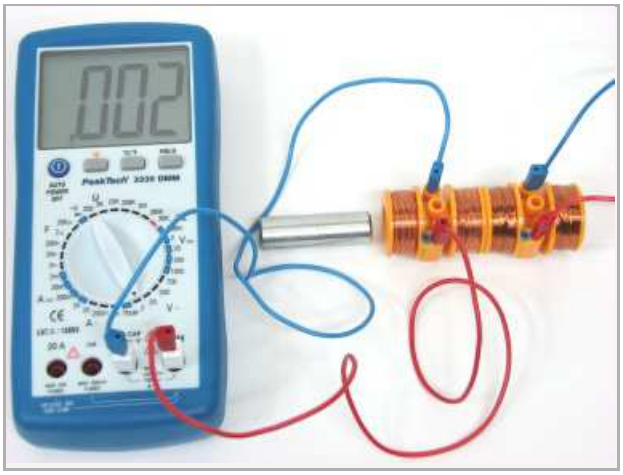
Transformer

Task and equipment

Task

Can the principle of induction and that of electromagnets be made use of together?

Set up a system with two stationary coils which are connected by an iron core (transformer).



Equipment

Position No.	Material	Order No.	Quantity
1	TESS advanced Physics set Electric motor/ Generator:	15221-88	1
	Base plate		1
	Connecting cables		2
	Connecting cables		2
	Adapter plugs		4
	Coils		2
	Iron cores		2
	Pole shoes		2
	Brass rod		1
2	DMM with NiCr-Ni thermo couple	07122-00	1
3	PHYWE power supply DC: 0...12 V, 2 A / AC: 6 V, 12 V, 5 A	13506-93	1

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Set-up and procedure

Information

You already know that a current-carrying coil can serve as a magnet. You also know the principle of induction. In this experiment you are to find out if these two effects can be combined and, if so, which benefit results from this combination.

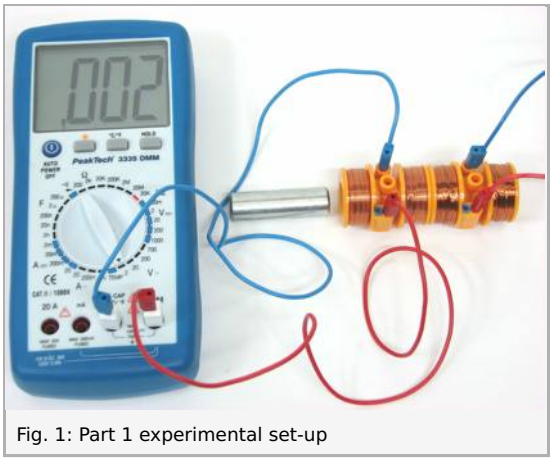

Fig. 1: Part 1 experimental set-up

First examine if the magnetic field of an electromagnet can also induce a voltage.
To do this, set the experiment up as shown in Fig. 1. Each coil has an iron core and the measuring instrument is set to the lowest possible range for alternating voltage.

Apply a voltage of 5 volts to one of the coils and quickly move it back and forth. What do you observe? What happens when the two coils are both stationary?

Now lay the coils down as shown in Fig.1 and insert an iron core in each of them. What do you observe when you apply about 5 volts to one of the coils?

Fig. 2: Part 2 experimental set-up

Now examine the characteristics of a so-called transformer.
Set the experiment up as in Fig. 2. The iron cores of the two coils are now positioned to make up a so-called ring core via the pole shoes and are held in position by the base plate thumb screw.

The connecting cables are here connected to the red coil connectors (full number of turns) of each coil. Apply an alternating voltage of 5 volts to one of the coils. Which current does the voltmeter show?

Now halve the number of winds of the coil that is connected directly to the voltage source (connection to a red and a blue socket). How does the deflection of the voltmeter change?

Now utilise the full number of turns of the coil connected to the voltage source and half of the number of turns of the other coil. What does the voltmeter now show?

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Report: Transformer

Result - Observations 1

Record your observations from the first part of the experiment here.

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Result - Observations 2

Record your observations from the second part of the experiment here.

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Student's Sheet

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Evaluation - Question 1

Sum up the results of the first measurement.

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Evaluation - Question 2

In a transformer, the coil connected to the source of current is called the primary coil and the coil that is connected to the consumer is called the secondary coil (the consumer is the measuring instrument here). Explain how you think these names came to be.

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Evaluation - Question 3

How did the transformer get this name? Consider here what the different numbers of turns have brought.

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Evaluation - Question 4

Think out what a transformer could be used for.

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