

Motors and generators

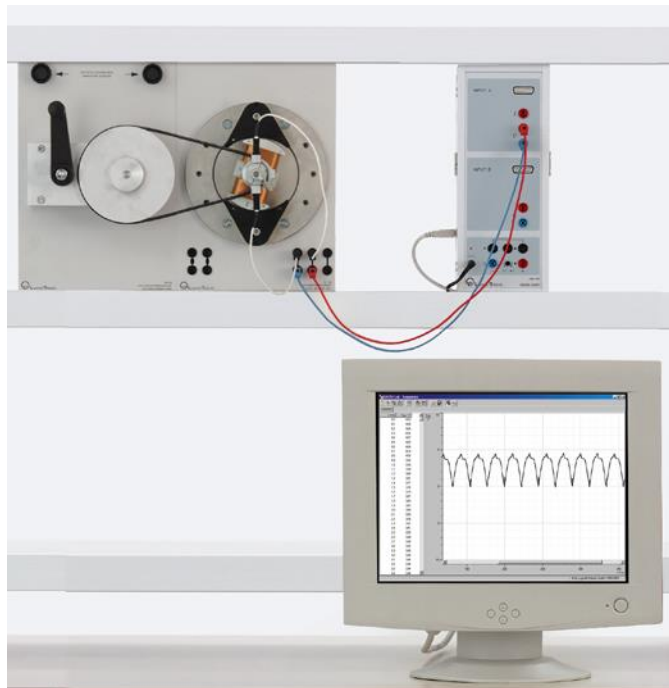
Generators

Rotating armature generator for generating DC voltage
Recording of pulsating DC voltage by means of Sensor-CASSY

Object of the experiment

1. Demonstration of the design and investigation of the function of a rotating armature generator for generating DC voltage

Setup



- Take note of the set-up and safety instructions in the manuals for 727 81 and 563 480.
- Put the magnets on the pole pieces in such a way that the poles are unlike. Screw one magnet to the pole pieces with the red marking facing forwards and other one with the red marking facing toward the rear.
- Place the brushes in contact with the commutator of the rotor.

Preparation of Sensor-CASSY:

- Connect the Sensor-CASSY module to the serial port or a USB port of your computer.
- Run the CASSY Lab software.
- Click with the left mouse button in the "Settings" window of the CASSY module to activate channel V_{out1} .
- Configure the following settings in the "Measurement parameters" window.

Automatic recording: On

Interval: 100 μ s

Time for measurement: 400 ms

Trigger: On

Trigger level: 1 V, rising edge

Repeat measurement: On

Apparatus

1 Basic machine unit.....	727 81
1 ELM hand-cranked gear	563 303
1 ELM two-pole rotor.....	563 22
1 ELM brush holder rack.....	563 18
2 ELM brushes.....	563 13
2 ELM pole pieces for magnets.....	563 091
1 Pair of magnets, 35 mm diam.	510 48
1 ELM centring disc	563 17
1 Allen key	563 16
1 Sensor-CASSY 2	524 013
1 CASSY Lab 2.....	524 220
1 Pair of connecting leads, 19 A, 50 cm.....	501 45
1 Demonstration panel frame.....	301 300
2 Bench clamps with pin	301 05
Additionally required:	
1 PC with Windows XP or higher	

Procedure

- Start measuring by pressing the F9 key.
- Turn the crank handle to make the rotor turn faster and faster, observe how the voltage changes with time on the screen and compare the traces.

Observation

A pulsating DC voltage is tapped from the commutator of the rotor coil.

Evaluation

If an induction coil rotates in a magnetic field, the direction and the magnitude of the magnetic field through the induction coils continually change. This causes a voltage to be induced in the induction coils, which repeatedly changes polarity (alternating voltage).

With a commutator, it is possible to tap pulsating DC voltage from the generator.

The commutator consists of a metal ring which is split into two halves. It is mounted on the rotor shaft. The two halves of the metal ring are isolated from one another and are connected to the ends of the induction coils.

The voltage at the ends of the induction coils is tapped by means of fixed carbon brushes.

As the rotor turns, each brush is alternately in contact with one of the two halves of the commutator.

At the moment when the voltage at the ends of the coils changes polarity, the two halves of the commutator swap positions. For this reason, the voltage tapped from the rotor coils does not change polarity.

A pulsating DC voltage is generated.

Remark:

The waveform for the pulsating DC voltage is dependent on the geometry of the generator.