

## Motors and generators

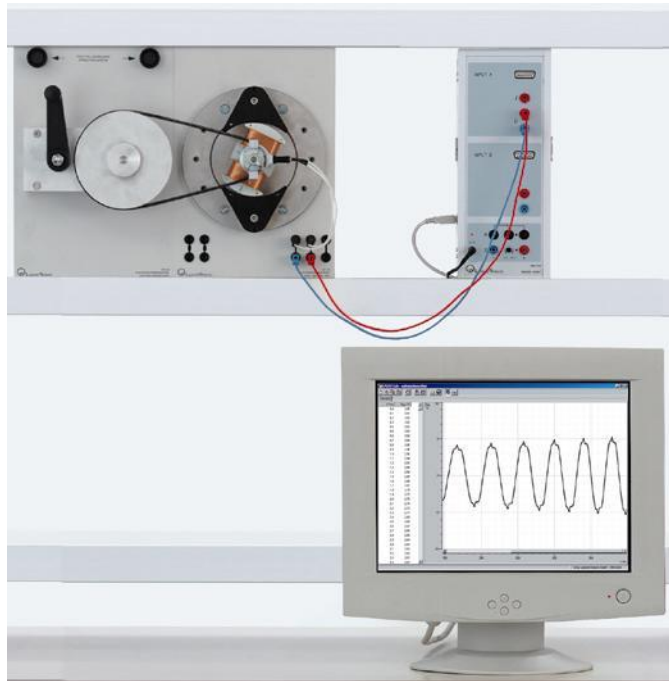
## Generators

Rotating armature generator for generating AC voltage  
Recording of AC 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 AC 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 slip ring 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  $\mu$ 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, red/blue.	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

When the rotor is rotated, a voltage is induced in the coils of the rotor which repeatedly changes polarity.

The amplitude and frequency of the induced voltage both increase with the speed of the rotor.

## 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).

The faster the induction coil turns within the magnetic field, the greater the amplitude and frequency of the induced voltage become.

A generator in which the induction coils (rotor) rotate inside the magnetic field of the stator is called a rotating/revolving armature generator or a stationary field generator.

With such a generator, an alternating (AC) voltage is generated which can be tapped from the rotating induction coils via slip rings.

In practice, rotating armature motors are of little importance for generating alternating voltages, since all of the power needs to be tapped via the brushes. The power is therefore limited by the maximum current capacity of the brushes.

Remark:

The stator of a rotating armature generator can be formed by permanent magnets or electromagnets.