

## Motors and generators

## Generators

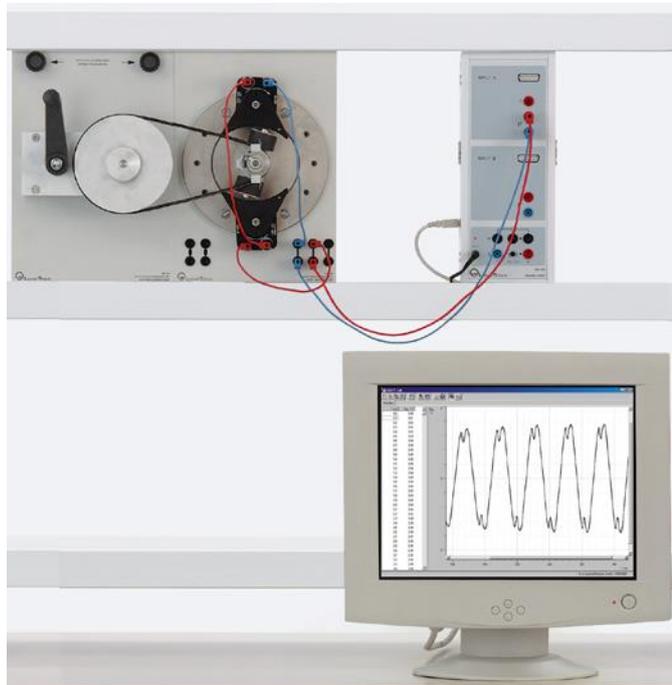
## Stationary armature generator

Recording of AC voltage by means of Sensor-CASSY

## Object of the experiment

1. Demonstrate the design and investigate the function of a stationary armature generator

## Setup



- Take note of the set-up and safety instructions in the manuals for 727 81 and 563 480.

## 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  $U_{A1}$ .
- 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 magnet rotor .....	563 19
1 ELM brush holder rack.....	563 18
2 ELM wide pole pieces for coils.....	563 101
2 ELM coils, 250 windings .....	563 11
1 ELM centring disc .....	563 17
1 Allen key .....	563 16
1 Sensor-CASSY 2 .....	524 013
1 CASSY-Lab 2.....	524 220
1 Connecting lead, 19 A, 25 cm, red.....	500 411
1 Pair of connecting leads, 19 A, 25 cm, red/blue.	501 44
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 stator which repeatedly changes polarity.

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

## Evaluation

If a magnetic field rotates between fixed induction coils, 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 amplitude and frequency of induced voltage are greater the faster the magnetic field between the induction coils turns.

A generator which features a magnetic rotor rotating between fixed induction coils is called a stationary armature generator or alternatively a rotating/revolving field or internal field generator.

With such a generator, an alternating (AC) voltage is generated which can be tapped directly from the ends of the induction coils.

One type of stationary armature generator often used in practice is a bicycle dynamo.

## Remark:

The rotor of a stationary armature generator can be formed by permanent magnets or electromagnets.