

Influence of wind direction

Task and equipment

Information for teachers

Notes on the Setup and Procedure

It is important to ensure that the students always stand behind the blower or behind the wind wheel and do not reach into the space between blower and wind wheel, when voltage is applied to the blower and it turns the wind wheel.

The adjusting knob for the current intensity must be completely turned to the right, so that the blower can reach a supply voltage of 12 V.

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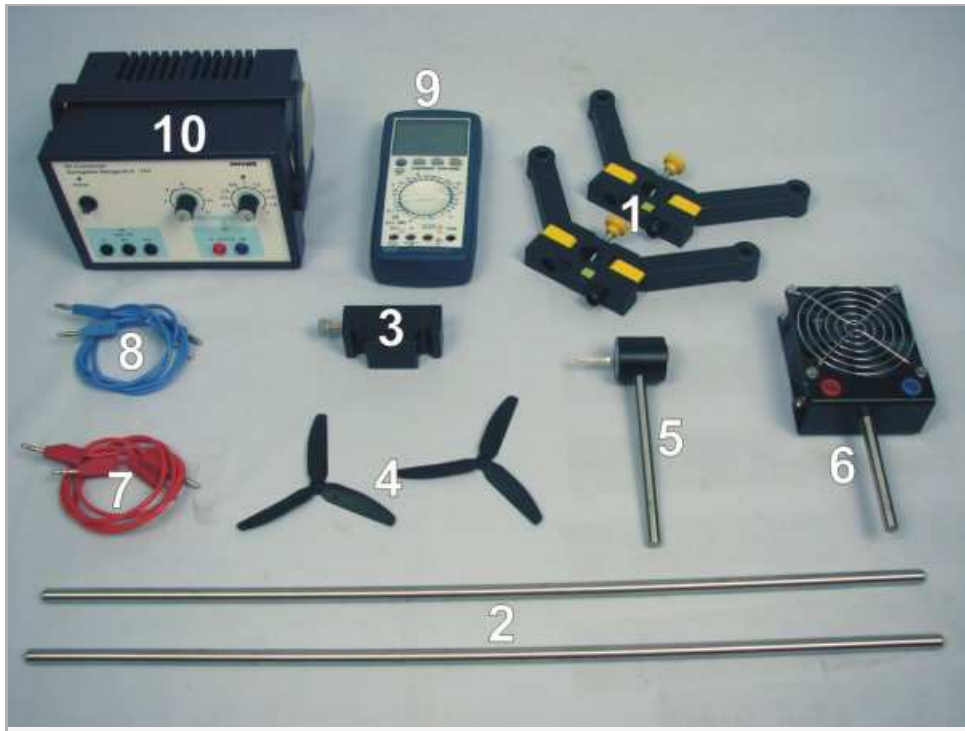
Task

Does the wind direction have an influence on the voltage that produces a wind wheel?

The blower (fan) produces wind of constant strength and the wind wheel is located in a fixed distance from the blower. The wind direction is changed by turning the wind wheel. Examine how the voltage generated by the wind wheel behaves in response to different wind directions. Carry out the measurement for two wind speeds (voltages on the blower).



Equipment



Position No.	Material	Order No.	Quantity
1	Support base, variable	02001-00	1
2	Support rod, stainless steel, l = 600 mm, d = 10 mm	02037-00	2
3	Slide mount for optical bench	09822-00	1
4	Rotor, 2 pieces	05752-01	1
5	Generator with metrical thread axis and nut	05751-01	1
6	Blower, 12V	05750-00	1
7	Connecting cord, 32 A, 500 mm, red	07361-01	2
8	Connecting cord, 32 A, 500 mm, blue	07361-04	2
9	DMM with NiCr-Ni thermo couple	07122-00	1
10	PHYWE power supply DC: 0...12 V, 2 A / AC: 6 V, 12 V, 5 A	13506-93	1

Set-up and procedure

Set-up

Set up the optical bench with the variable tripod foot and both support rods (Fig. 1 and Fig. 2).



Abb. 1



Abb. 2

Fix the blower in the left part of the tripod-foot so that the side with the connection sockets face away from both tripod support rods (Fig. 3).



Fig. 3

Put both rotors one after another on the axis of the generator (Fig. 4). The six blades should be equidistant from each other (Fig. 5).



Fig. 4



Fig. 5

Fasten the generator to the rider and put it on the optical bench (Fig. 6).



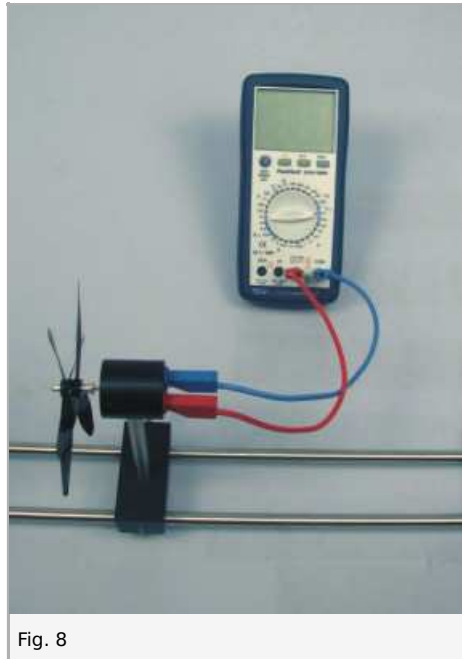
Fig. 6

Connect the blower with the AC adapter. The blower has to be connected to the outputs for direct current DC (Fig. 7).



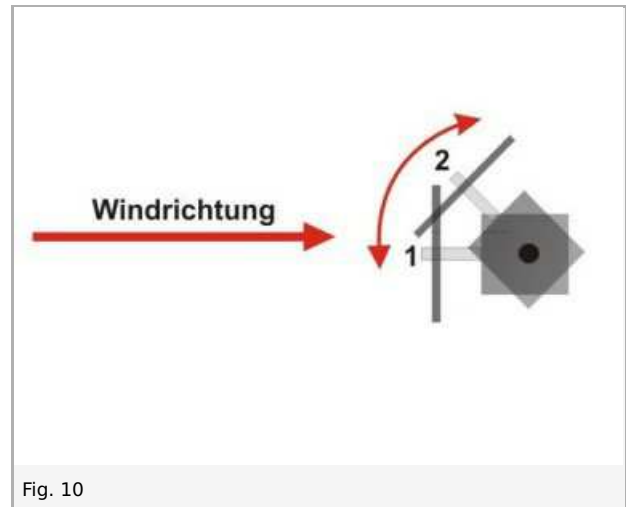
Fig. 7

Connect the generator to the voltage input of the multimeter (Fig. 8). Set the measuring range of the multimeter to 20 V.



Procedure

Move the generator in such a way that the distance between the front of the fan and the tip of the generator is about 10 cm (Fig. 9). Make sure that the rotors of the wind wheel are in position 1 (Fig. 10) and that the axis of the generator points parallel to the wind direction.



Switch on the power supply and turn the adjusting knob for the intensity of current completely to the right. Adjust the voltage to 8 V (Fig. 11).



Fig. 11

Measure the voltage generated by the wind and write down the results in Table 1.

Turn off the power supply and wait until the wind wheel has stopped turning.

Remove the wind wheel from the rider for the tripod bank, but keep the rider in the same position.

Hold the wind wheel (around 45 ° rotatedly) directly behind the rider (position 2 in figure 10), so that the rotor blades are fully blown by the wind. In addition, set the rod of the wind wheel into the corner built by the support rod and the rider.

Hold a finger between the end of the wind wheel pole and the table, so that the height is correct (Fig. 12).

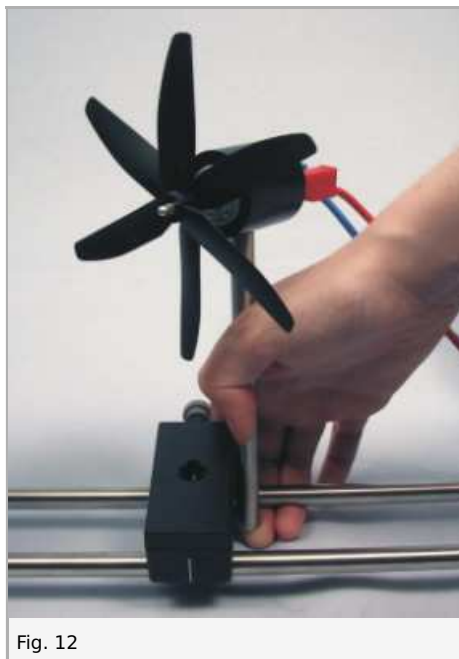


Fig. 12

Attention! Hold the wind wheel firmly and pay attention that you do not to touch your rotor with the fingers.

Switch on the power supply (Fig. 13). Pay attention that your hand does not go between the blower and the wind wheel. Measure the voltage generated by the wind wheel and write down the result in Table 1.

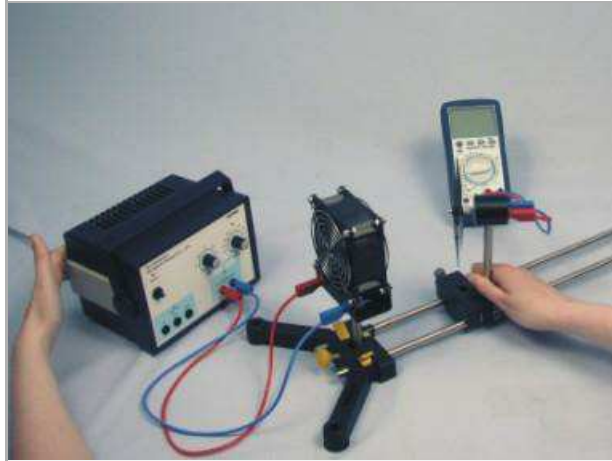


Fig. 13

Now repeat the experiment for a supply voltage of 12 V and take down the results in Table 1.

Report: Influence of wind direction

Result - Table 1

Record your measured values.

Supply voltage:	8 V	12 V
Position	Voltage in V	Voltage in V
1	1 ± 0	1 ± 0
2	1 ± 0	1 ± 0

Evaluation - Question 1

What do you observe when you turn the wind wheel away from the wind stream?

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Evaluation - Question 2

In which position do the rotors offer the greatest possible contact surface to the wind?

Have a look at the wind wheel from the side from which the wind blows.

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Evaluation - Question 3

In practice, how must a wind wheel be turned so that the greatest possible voltage can be generated?

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