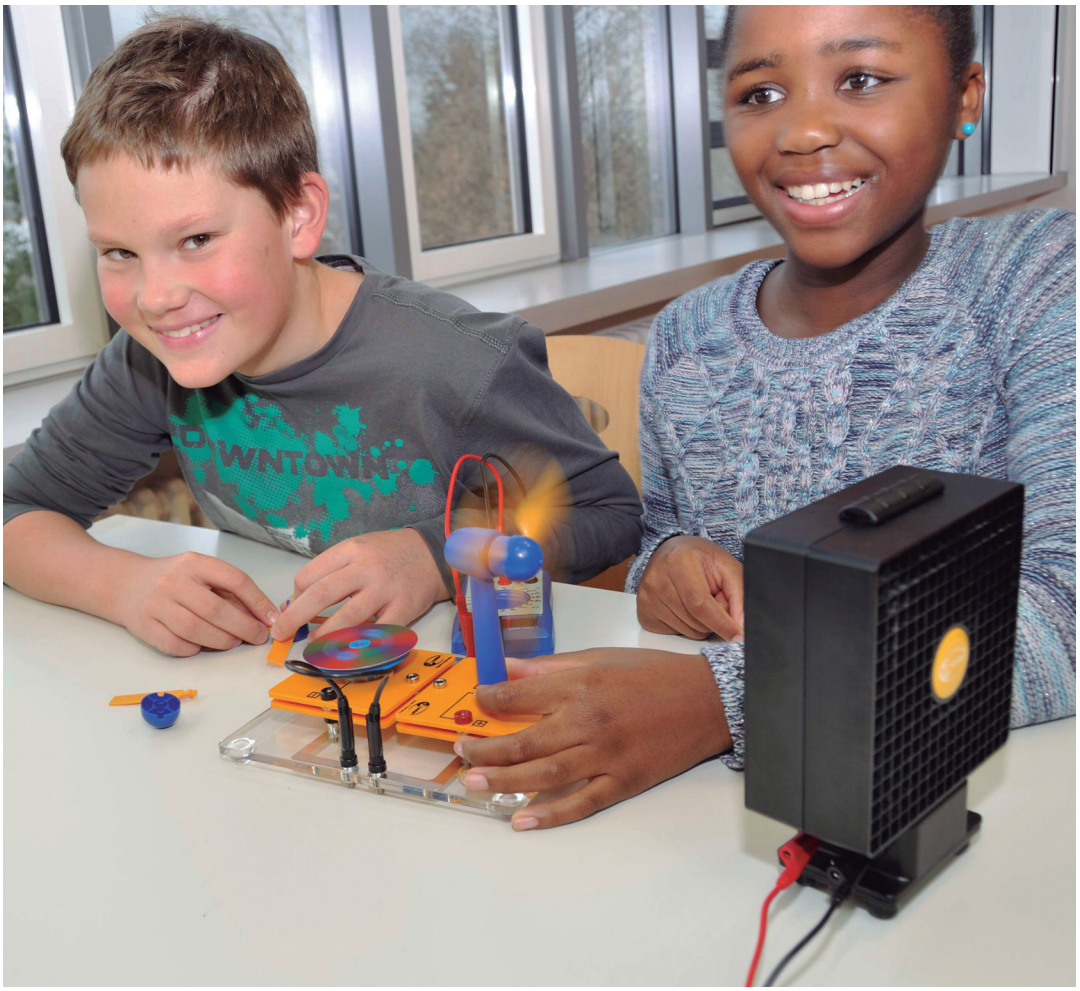
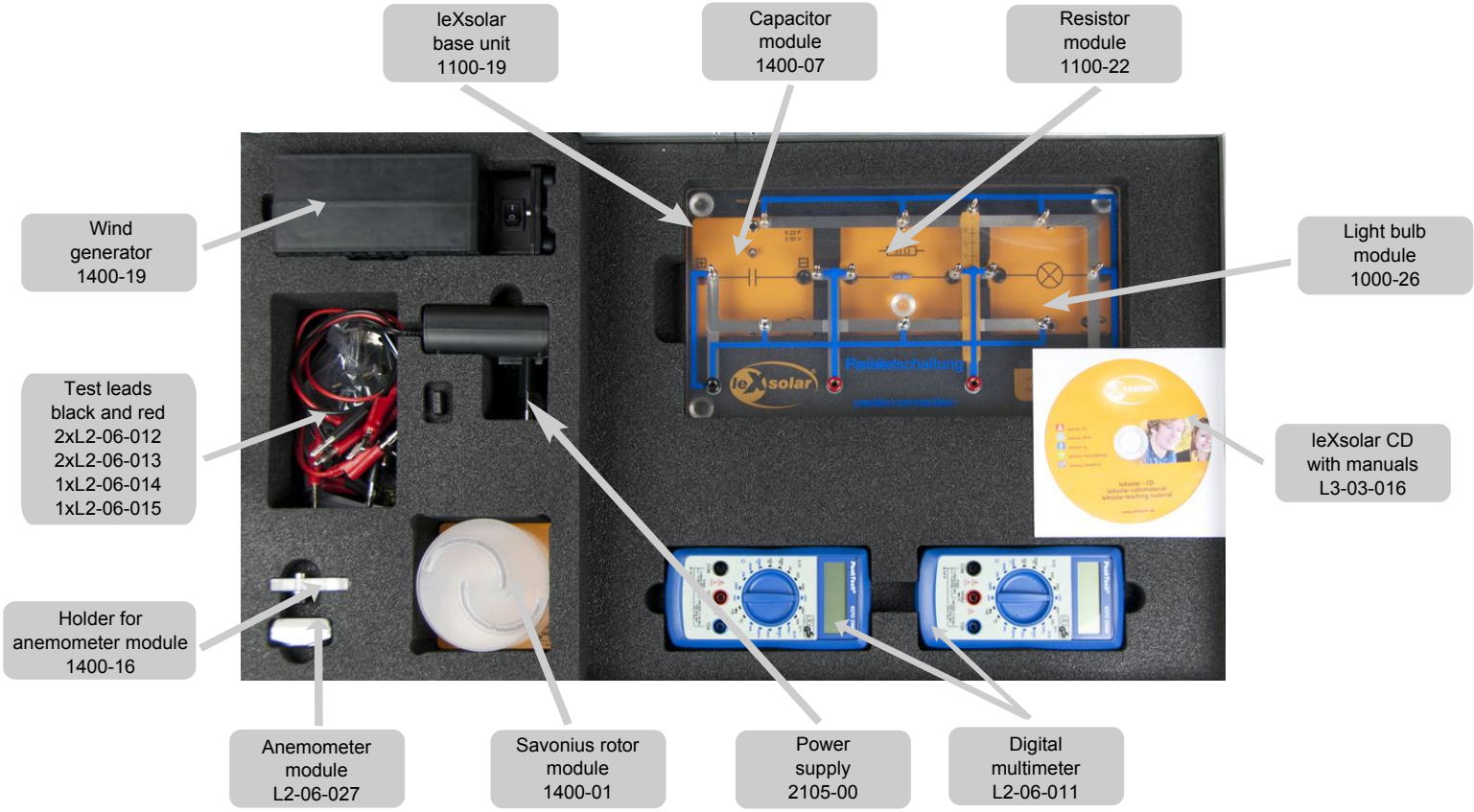
leXsolar-Wind Ready-to-go



Teacher's Manual

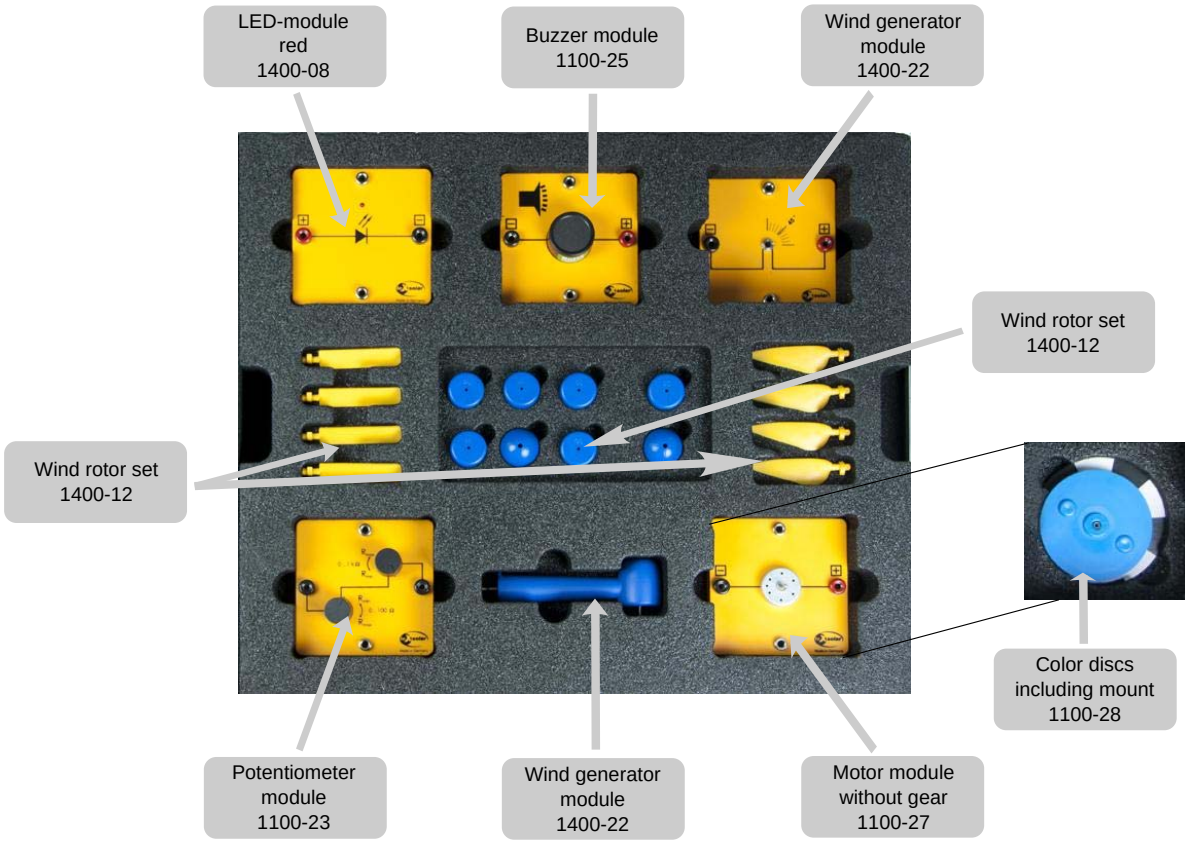
Layout diagram leXsolar-Wind Ready-to-go

Item-No.1405



Layout diagram leXsolar-Wind Ready-to-go

Item-No.1405



leXsolar-Wind Ready-to-go

Teacher`s Manual

Contents

This booklet contains instructions for experiments as well as the corresponding templates for the evaluation and sample solutions of the following experiments:

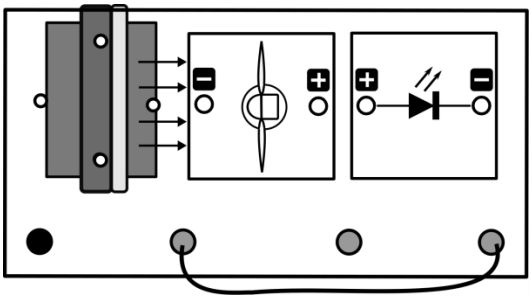
Pages 5 to 10 contain more detailed explanations of the instructions and execution of experiments.

1.1 Influence of the wind speed on a wind turbine (phenomenologically)

Exercise

Examine the brightness of a light-emitting diode, which is powered by a wind turbine.

Experimental setup



Equipment needed

- leXsolar main board
- Wind machine with power supply (variable)
- Wind turbine module (with three rotor blades, 25°, optimized profile)
- LED module
- Cable

Preliminary remark

In this experiment you can examine how electricity generated by the wind turbine changes when the wind speed changes. The variation of wind speed is done by changing the voltage at the wind machine.

Execution

1. Set the experiment up according to the experiment set-up.
2. Change the voltage at the wind machine with the variable power supply. Start with 6V.
3. Observe how the brightness of the light-emitting diode changes and enter your observations in the table. Color in the corresponding number of fields.

Evaluation

Voltage at the wind machine	Distance	6V	7,5V	9V	12V	Example
The LED lights up...	The LED lights up...					bright / weak / not at all

Now complete the sentences:

With a lower voltage at the wind machine, the LED is less bright.

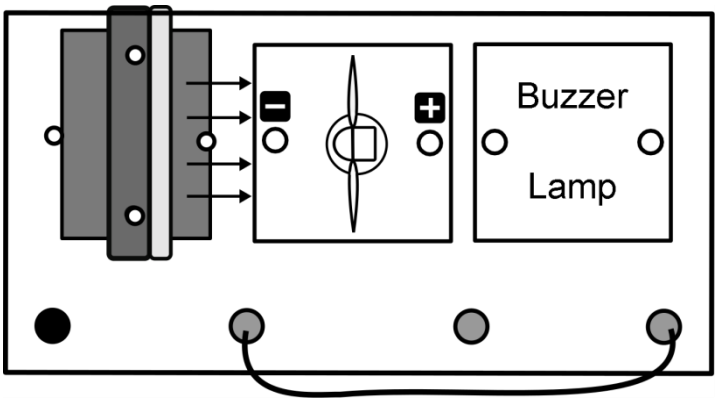
The higher the wind speed, the brighter LED.

7.1 Energy conversion in a wind turbine

Exercise

Use a wind turbine to light up a light bulb and to blow a horn.

Experimental setup



Equipment needed

- leXsolar main board
- Wind machine module with power supply
- Wind turbine module (with three rotor blades, 25°, optimized profile)
- Light bulb module
- Horn module
- Cable

Execution

1. Set the experiment up according to the experiment set-up with the horn (regarding the polarity!)
2. Set the wind machine to 12V and start the power supply.
3. Then switch off the power supply and replace the horn with the light bulb. Write down your observation.

Observation

The wind turbine can cause the horn module to blow the horn.

The light bulb is illuminated when connected to a wind turbine.

The brightness of the light bulb decreases after being plugged in and the wind rotor becomes slower.

Evaluation

Complete the following text.

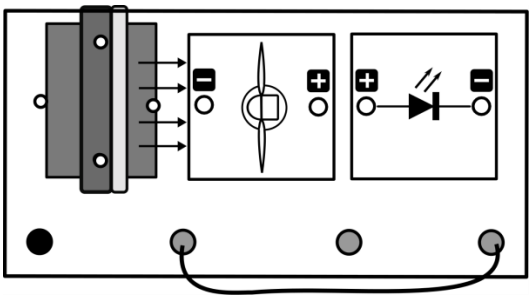
Wind is movement of air masses. Air consists of particles. The air particles have kinetic energy. It flows past the rotor blades of the wind turbine. The wind rotor extracts energy from the wind and converts it into rotational movement. This generates voltage in the turbine. This illuminates the light bulb and lets the horn make a sound.

13.1 Influence of the blade shape (phenomenologically)

Exercise

Examine the brightness of a light-emitting diode, which is powered by a wind turbine with different shaped rotor blades.

Experimental setup



Equipment needed

- leXsolar main board
- Wind machine module with power supply
- Wind turbine module (with three rotor blades, 25°, optimized and flat profile)
- LED module
- Cable

Execution

1. Set the experiment up according to the experiment set-up.
2. Put the 3-blade rotor with the optimized profile on the wind turbine and turn the wind machine on (exciter voltage 9V).
3. Observe how the brightness of the light-emitting diode changes and write down your observations.
4. Repeat the measurement with the rotor blade with flat profile.

Evaluation

1. Which blade shape illuminates the LED stronger?
2. Examine the shape of the two rotor blades closer. What are the differences?
3. Do you know any examples where the flat profile is used?

1. The optimized profile.

2. The optimized blades are sharp at the front and broad at the approach (asymmetric structure, similar to the wing of an airplane). In addition they are slightly twisted in themselves. The flat blades are rectangular and have the same thickness everywhere.

3. wind mill

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