SUNdidactics
SolarEnergyDidactics
SolarEducation
SolarEngineering

innovative Solarsysteme für Schule und Ausbildung
innovative solar- systems for school, college, technical education

- Solardidaktik
- Solarzellen
- Solarmodule
- Photovoltaik- Experimentiergeräte
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The solar motor module SUSE 4.16

Solar motor 0.3 – 4.5 V DC with air-screw and binding posts

The solar motor SUSE 4.16

On the roof-shaped bent plexiglass base plate (153 x 80 x 3 mm) one can identify the solar motor with the blue air-screw on the right, on the left there are the two binding posts, to which 4 mm lab wires can be connected.
The device is adapted to be connected to 1 to 8 solar cells in series connection.
If the air-screw is blown or held into the wind, the motor works as a generator and produces electrical energy! **The module now is a fully functioning wind power plant!**
If the motor is now connected to an LED module 4.15 with a red LED, the LED lights up, if the air-screw is brought into fast rotation by firm blowing.
The red pole (+) of the motor has to be connected to the black pole (-) of the LED module and the black motor pole (-) to the red LED pole (+)! The induced voltage can be measured with a multimeter.

The **solar motor module SUSE 4.16** consists of a solar motor with an air-screw on a plexiglass base plate for the operation at approx. 0.3 V – 5.0 V max. DC connected to solar cells or solar modules. It is suitable for solar experiments in Elementary Schools and in Secondary Schools.
To the two binding posts on the front single solar cells or series connections of 1 to 8 solar cells can be connected, the higher the number of solar cells, the faster the motor rotates. The motor can also be connected to functioning solar cell debris, it's rotation shows the function! The motor can also be connected to batteries up to a maximum of 4.5 V (lantern battery).
If the air-screw is brought into rotation by blowing or natural wind, the motor produces „current“ as a generator, the device is a wind power plant, the generated voltage can be measured by a multimeter at the red-black socket pair, the higher the number of revolutions, the higher the generator voltage.
If two motors are connected by lab wires and the air-screw of the first motor is blown into, the second motor rotates because of the electrical energy produced in the first motor as a generator, the harder one blows, the faster the second motor rotates.
At the binding posts lab wires can be plugged in or bell wire can be clamped.

No voltage higher than 5.0 V may be applied, otherwise the motor is destroyed!

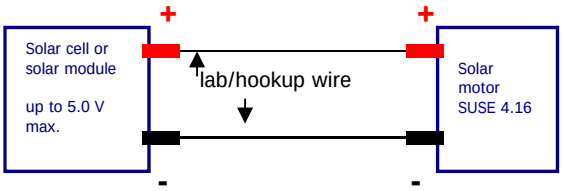
The technical data of the solar motor:

- Starting voltage: 0.3 V = 300 mV
- Starting current: 20 mA
- Voltage range: 0.3 ....5.0 V
- Diameter casing: 24.2 mm
- Diameter axis: 2 mm
- Axis length: 10 mm
- Hookup: 70 mm wire
  \+ red
  \- black

Maximum voltage 5.0 V! DC

Experiments with the solar motor SUSE 4.16

1. Connection to solar cells or solar modules:



The positive contact (red) of the solar cell/module is connected to the positive contact of the solar motor by a lab or hookup wire. Lab wires are plugged into the binding posts, hookup wires can be inserted into the post head after unscrewing it and clamped by tightening the head again. Both negative contacts are connected likewise.
Outside in the daylight the motor has to rotate fast, inside the room lighting is not enough, the solar module has to be illuminated by a lamp.
If the polarity is inverted, the solar motor is rotating backwards.

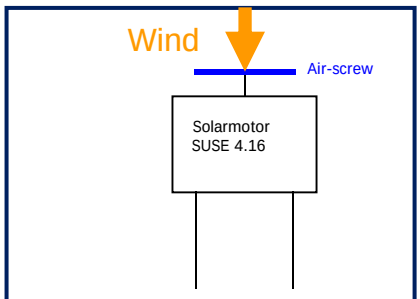
2. Connection to batteries:

The solar motor can be connected to batteries up to 5 V max. without a problem, e.g. a button cell, a mignon battery, a cell phone battery or a 4.2 V lantern battery. Connect the solar motor with the two wires to the same poles of the battery.

3. Usage as a generator:

If the solar motor is rotated mechanically, e.g. by blowing into the air-screw with the mouth or with a hair dryer (choose cold air!) or by rotation by hand, it works as a generator (dynamo) and produces electrical energy. It is an energy converter, mechanical energy is converted to electrical energy. Providing the evidence can be achieved with 3 alternatives:

- Connection to a voltmeter (voltage measurement device) in the measurement range of 20 V DC to the solar motor. By blowing into the air-screw voltages of 2...4 V can be achieved. Using the motor as a generator, the electrical poles are inverted, now the red binding post is the negative pole and the black binding post is the positive pole.
- Connection to a red glowing LED (e.g. SUSE 4.16). If the generator voltage reaches 1.8 V, the LED lights up.
- Connection of the motor used as generator to a second motor. Blowing the first motor gives rise to a rotation of the second motor, which is applied as an electric motor in inverse rotation direction, because the first motor rotates in inverse direction when blewn into and the generator then has it's negative pole at the red binding post and it's positive pole at the black binding post.



Connection to a voltmeter
or an LED
or a second solar motor

Further experiments with the solar motor

The small electric motor can be used as a generator. In this case it produces electrical energy by rotating. If we blow into the blue air-screw, it rotates the motor and electrical energy is produced. 2 Experiments can be conducted for this purpose:

Experiment 1
Unplug the connecting plug and connect a voltmeter in the measurement range 20 V DC to the binding posts of the solar motor (red and black socket).
Now blow firmly into the blue air-screw and take a reading of the voltage V. Conduct this experiment 3 times and blow harder each time.

Experiment Nr.	Voltage V reached in Volt
1 blown slightly	
2 blown firmly	
3 blown very hard	

Experiment 2
Connect two solar motors to each other with 2 lab wires, red socket to red socket and black socket to black socket.
Now blow firmly into the air-screw of the first motor and observe the second motor.
Now blow firmly into the air-screw of the second motor and observe the first motor.

What do you observe in the experiments 1 and 2? Which energy convertions take place? Explain here:

Experiments with the solar motor and a storage module

The storage module SUSE 4.11 or 4.12 can store electrical energy, which is produced by the solar cell or by the generator (motor used as generator).

Charging the storage module with the solar motor

Connect the black-red socket pair of the solar motor to the solar storage module. Because of the invertion of the poles using the motor as a generator, the red pole of the solar motor has to be connected to the black -pole of the storage module, the black pole of the solar motor to the red +pole of the storage module. Now blow firmly into the air-screw for about 1 minute and observe the effect afterwards.

You can also connect a voltmeter, measure the voltage and observe the charging development.

