

Electronics with the Modular System

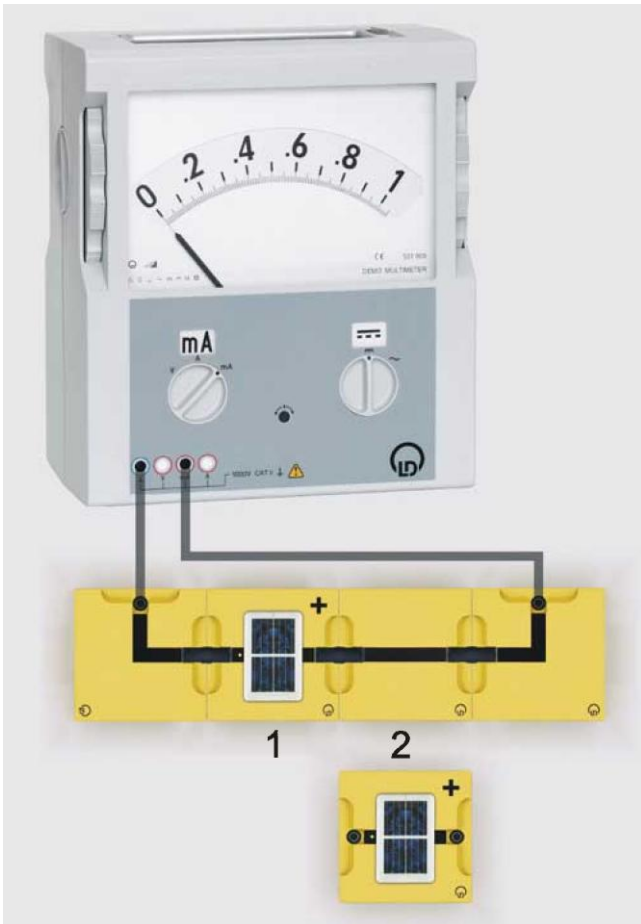
Basic Electronic Circuits
Solar cells

Connecting solar cells in series

Objectives of the experiment

1. To investigate the short-circuit current I_0 in a series connection of solar cells.
2. To investigate the open-circuit voltage U_0 in a series connection of solar cells.

Setup



Apparatus

2	539 042	Solar cells, BST
1	539 001	Connector block BST, straight
2	539 004	Connector blocks BST, 90° angle
3	539 000	Bridging plug, BST
1	531 906	Demo multimeter, passive
2	500 644	Safety connection lead, 100 cm
1	301 300	Demonstration experiment frame
1	301 301	Adhesive magnetic board

Carrying out the experiment

Note

This experiment can be performed during normal daylight. Direct solar radiation is not necessary.

1. Short-circuit current

- Set up the circuit.
- Measure the short-circuit current I_{01} through solar cell 1 and enter the measured value into the table.
- Replace solar cell 1 with solar cell 2 and repeat the measurement (I_{02}).
- Connect solar cells 1 and 2 in series, measure the short-circuit current I_{03} through solar cells 1 and 2, and enter the measured values into the table as well.

2. Open-circuit voltage

- Adjust a measuring range of 1 V (DC) on the measuring instrument.
- Measure the open-circuit voltage U_{01} on solar cell 1 and enter the measured value into the table.
- Replace solar cell 1 with solar cell 2 and repeat the measurement (U_{02}).
- Connect solar cells 1 and 2 in series, measure the open-circuit voltage U_{03} on solar cells 1 and 2, and enter the measured value into the table as well.

Measuring example

Solar cell	Short-circuit current I_0/mA
1	0.6
2	0.6
1 and 2	0.6

Solar cell	Open-circuit voltage U_0/V
1	0.5
2	0.5
1 and 2	1.0

Evaluation

The short-circuit current I_{03} through the series-connected solar cells is equivalent to the short-circuit currents I_{01} and I_{02} through each individual solar cell: $I_{03} = I_{01} = I_{02}$

The open-circuit voltage U_{03} on the series-connected solar cells is equal to the sum of the open-circuit voltages U_{01} and U_{02} on each individual solar cell: $U_{03} = U_{01} + U_{02}$.