

**Task**

To connect a bimetallic switch into a circuit so that it can open or close the circuit.

**Equipment**

Plug-in board	06033.00	1
On/off switch	39139.00	1
Wire building block	39120.00	1
Lamp holder E10	17049.00	1
Universal holder	39115.02	2
Bimetallic strip	13024.22	1
Connecting cable, 25 cm, red	07313.01	1
Connecting cable, 25 cm, blue	07313.04	1
Filament lamp, 12 V/0.1 A, E10, 1 pc.	07505.03	(1)
Power supply, 0...12 V~, 6 V~, 12 V~	13505.93	1

- Open the switch and reverse the clamping of the bimetallic strip (printed surface faces to the right); screw back the contact screw of the front universal holder so far that there is a distinctly visible gap between the screw and the bimetallic strip.
- Close the switch and carry out the same procedure as above; note your observations under (2).
- Set the power supply to 0 V and switch it off.

**Observations**

(1)

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(2)

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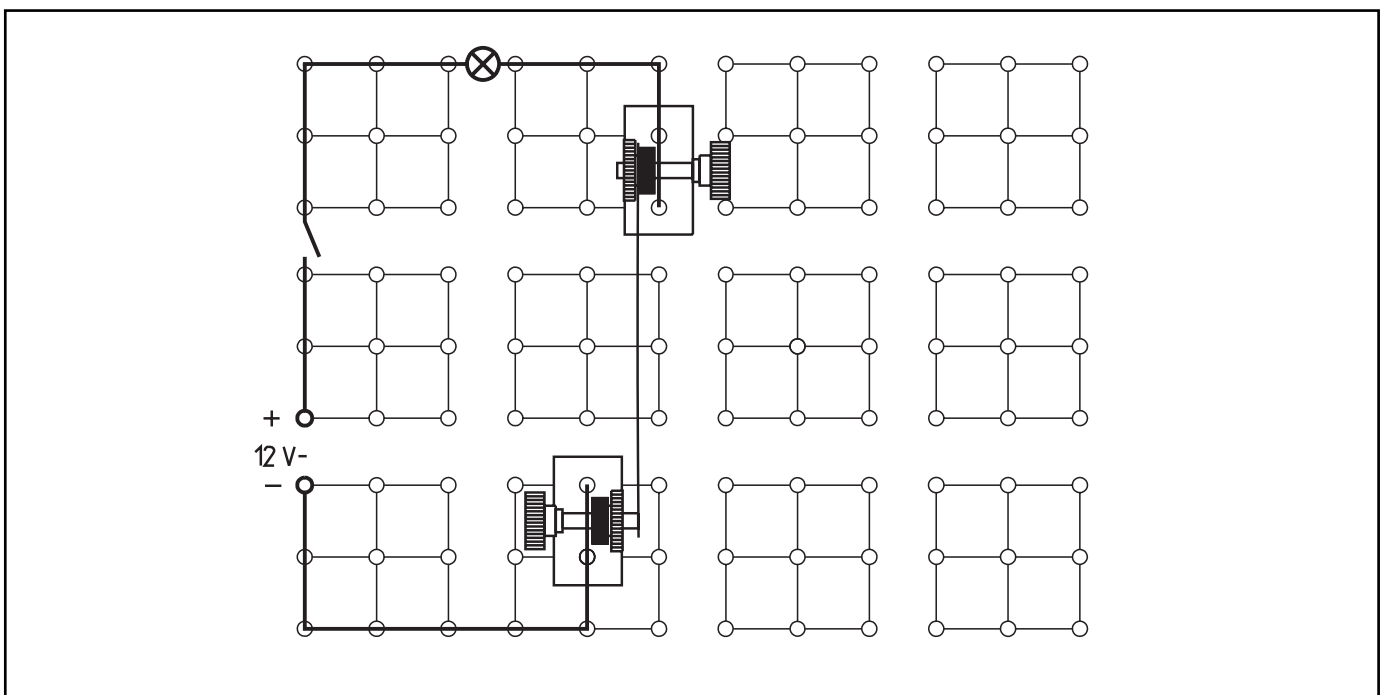
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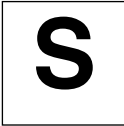
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**Set-Up and Procedure**

- Connect up the circuit as shown in Fig. 1; fit the bimetallic strip in the universal holder furthest away with its printed surface facing to the left.
- Screw in the milled screw of the front universal holder so far that it makes contact with the bimetallic strip and bends this a little.
- Switch on the power supply and increase the voltage up to the 12 V rating of the lamp.
- Close the switch.
- Use the flame of a match to carefully heat the bimetic strip in the vicinity of the clamped end, then allow it to cool. Observe the bimetallic strip and the lamp and note your observations under (1).
- If required, again heat the bimetallic strip and observe what occurs.

Fig. 1





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**How does a bimetallic switch function?**



**Evaluation**

1. The universal holders with the bimetallic strip represent a model of a bimetallic switch. What function does the bimetallic strip have in the two parts of the experiment?

a) In the first part:

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b) In the second part:

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2. Name a practical example for each of the two functions.

For a):

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For b):

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(How does a bimetallic switch function?)

A bimetallic strip, consisting of two plane metal strips of different thermal expansion coefficients which are connected together, bends on being heated in the direction of the metal which has the lower thermal expansion coefficient. The bimetallic strip is therefore suitable for opening electric circuits (e.g. in cut-outs, or as heat safety switch in electric irons or power supply equipment) or for closing them (e.g. in alarm systems) when the temperature of the surrounding air exceeds a maximum permissible value.

### Notes on Set-Up and Procedure

It is not difficult to set up the circuit.

The bimetallic strips provided are so sensitive that only gentle heating is sufficient in each of the two parts of the experiment. It is important to inform the students only to heat gently, so that despite repeated carrying out of this procedure, not too much teaching time is lost in waiting until the bimetallic strip has again straightened out.

### Observations

1. When the bimetallic strip is warmed, it bends away from the contact screw. The circuit is so opened and the lamp goes out.  
When the bimetallic strip cools, it straightens out, closes the circuit and the lamp lights up again.

2. When the position of the bimetallic strip is reversed and the strip is warmed, it bends towards the contact screw until the circuit is closed and the lamp shines. When the bimetallic strip cools, it straightens out, opens the circuit and the lamp goes out.

### Evaluation

1. a): It has the function of an off switch (opener).  
b): It has the function of an on switch (closer).
2. For a): In electric irons the bimetallic strip breaks the circuit as soon as the set temperature of the iron is exceeded. (Further examples: Cut-outs, controlled fan heaters).  
For b): In refrigerators the bimetallic strip closes the circuit for the cooling system when the refrigerator is no longer cold enough. (Further example: Fire alarm).

### Remark

The bimetallic switch is a temperature dependent switch. It is still nowadays extensively used, although temperature dependent semi-conductor sensors have taken over its function in many pieces of equipment and systems.

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## The bimetallic switch



(How does a bimetallic switch function?)

Room for notes