



Heating elements

Heating elements (HE) are made of heat-resistant polymer film with resistive tracks applied on its surface. The ability to give them nearly any shape and size, flexibility of HE and ease of their installation thank to the adhesive layer, allow efficient heating of specific elements of the devices that need it.

HE can be used to heat chips, displays, optical systems, pipelines and any other elements whose temperature does not exceed 150°C.

The wide variety of possible HE designs makes it possible to create exactly the product that will fulfill your needs.

Benefits of HE:

- heater thinness and light weight
- uniform heating throughout the entire area
- resistance to vibration
- ease of installation
- ability to mount on curved surfaces
- high efficiency due to efficient heat transfer

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Device and its functioning

Heating elements (HE) are made of heat-resistant polymer film with resistive tracks applied on its surface. HE can be connected by flexible mounting wires (wires with fluoroplast insulation are recommended). The wires are mounted onto contact pads of an HE by soldering. A general scheme of an HE is shown in Illustration 1.

In terms of circuitry an HE is a film constant resistor with the resistance of 1-300 ohms (depending on the model).

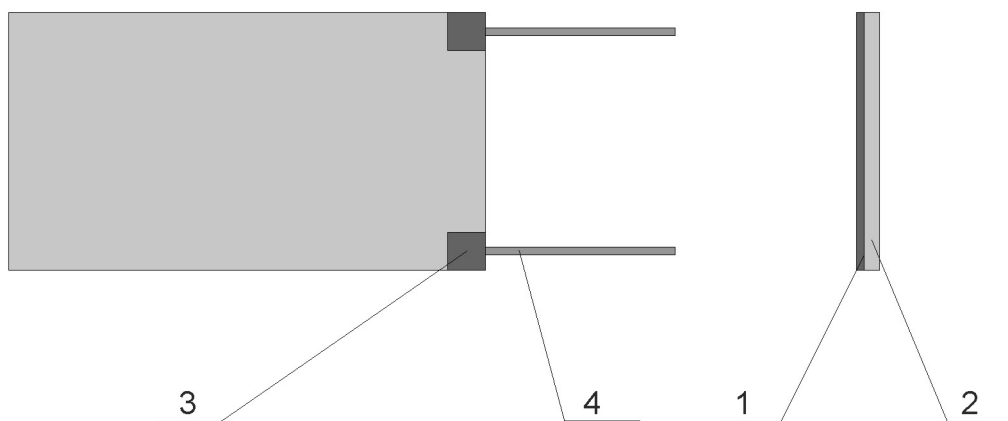


Illustration 1: General scheme of an HE.

1 – glue layer, 2 – base, 3 – contact pads, 4 – mounting wires

Basic technical characteristics and parameters

The basic parameters of HE are listed in Table 1, the requirements for resistance to environmental influences in Table 2.

Table 1: Basic parameters of HE

Parameter	Value
Overall dimensions, mm	up to 600x700
Thickness, mm	0,2 – 0,5
Mass, kg/dm ² (typical value for flexible HE)	0,004
Resistance, Ohm	4 – 300
Power supply voltage, V	3.3 – 50
Heating power, W	0.5 – 200
Heating temperature, °C	up to 70



Table 2: Requirements for resistance of HE to environmental influences

Parameter	Value
Operating temperature range, °C	-60...+70 ¹
Extreme temperature range, °C	-70...+70 ¹
High humidity - during operation - during transportation and storage	80% at 15°C 100% at 25°C
Sinusoidal vibration	1-2000 Hz, 20g
Single mechanical shocks	200 g, 0,1-2 m/s ²
Repeated mechanical shocks	15 g, 5-10 m/s ²

¹ Up to 150°C in a special version. More detailed information is available upon request.

² Stricter requirements are possible.



Information for developers

Shape and size

HE are available in different sizes and shapes. The maximum dimensions of an HE are 600x700 mm, the minimum size is 10x10 mm. HE may have openings, windows, etc. The contact pads of an HE are, as a rule, located closer to its edge, however, it is not mandatory.

Materials

HE can be produced on a flexible base (polyester, polyimide) or on a rigid one (glass fiber). An intermediate solution is also possible: the base can be made of a 0,1 mm glass fiber layer, which provides sufficient flexibility in combination with a low price. In any case, to select the best option the project has to be discussed with our engineers.

For easy installation, one or both sides of an HE is covered with a permanently adhesive layer.

The choice of adhesive (of which we have more than ten types) is made depending on the operating conditions for the HE, materials and roughness of the supporting surface. Please specify all the information when submitting an the order.

Power calculation

Thermal power of an HE substantially depends on the operating conditions and heat release. In any case it is strongly recommended to carry out preliminary experiments.

In order for you to be able to accurately determine the necessary power, we have produced HE-30 Development Kit. This heating element has been specially designed to be used as a prototype. The construction of HE-30 allows you to change its size by cutting parts off without losing its functionality. The nominal dimensions of HE-30 are 71x50 mm, its minimum size is 26x23 mm. For more information about HE-30 please see our website, section "Heating elements."

Heat release

Efficient heat release over the whole surface of the HE is essential for its reliable and continuous operation. We recommend mounting HE on a metal surface. We can deliver HE together with a metal base made of aluminum.

Temperature regulation

To avoid overheating of the HE and of the heated products, we recommend using temperature control circuits.

One of the possible solutions for a thermostat is our invention, the device called TRN-03. Detailed information about TRN-03 can be found on our website in the section "Heating elements."



Operating guidelines

1. HE should be connected to a power source with flexible mounting wires (MW). It is recommended to use MW with heat-resistant insulation. At the customer's request (the final user), can use another type of MW can be used.

2. Heat release should be provided on the whole surface of an HE. It is recommended to apply HE on metal surfaces. Do not use HE without sufficient heat release.

3. When attaching an HE to a conductive surface ensure the absence of contact between the surface and the contact pads of the HE. If necessary, apply isolation pads (e. g. strips of duct tape).

4. The gluing surface should be dry and clean from dirt, dust and grease.

5. Attaching of an HE should be done in the following sequence:

- Partially remove a part of the protective paper from the bottom of the HE on the side closest to the contact pads, and start attaching the HE;

- Proceed with attaching step by step: remove another part of the protective paper and attach the corresponding open area of the HE to the base.