



## Mounting Instructions for Elstein BSI/BST Infrared Construction Panels

### Table of contents

	Page		Page
Description, technical data	1	Temperature controlling	5
Mounting / Installation	2	Temperature limits	5
Radiation distance	3	Accessories	5
Wiring	3	Explosion protection	6
Protective earthing	4	Replacing radiation elements	6
Leakage current	4	Wiring examples	7
Safety precautions	4	Wiring, customer design	8

### Description, technical data

Elstein BSI/BST Sets are available with dimensions of 125 mm x 250 mm up to 1000 mm x 1500 mm (see Table 1). The dimensions of the radiation elements, 62,5 mm x 122 mm, 62,5 mm x 250 mm and 125 mm x 125 mm result in possible length and width increases of the Construction Panels in. This makes it possible to adapt the radiation panel to the given spatial conditions. Radiation elements HTS and HSR-Series (BSI) or rather HTSL-Series (BST) can be chosen to equip the panel. Various combinations of power stages are possible.

In contrast to BSI the construction panel BST contains additional heat insulation between the mounting sheet and the back side of the radiators as well as HTSL-Series with high socket.

Table 1: Calculation of variable dimensions of construction panel and the mounting frame for the construction panel (see Fig. 1)

Amount of radiators (n)	1	2	3	4	5	Formula
BSI/BST inner dimensions 1)	125	250	375	500	625	n x 125
BSI/BST outer dimensions 2)	136	261	386	511	636	n x 125 + 11
Frame inner dimensions 3)	146	271	396	521	646	n x 125 + 21

1) Grid size of heater dimensions 122 mm x 122 mm is 125mm x 125mm

2) Dimensions a and b according to Figure 1 page 2

3) Frame dimensions = BSI/BST outer dimension + 10 mm  $\cong$  a+10 and b+10 in Figure 1 page 2

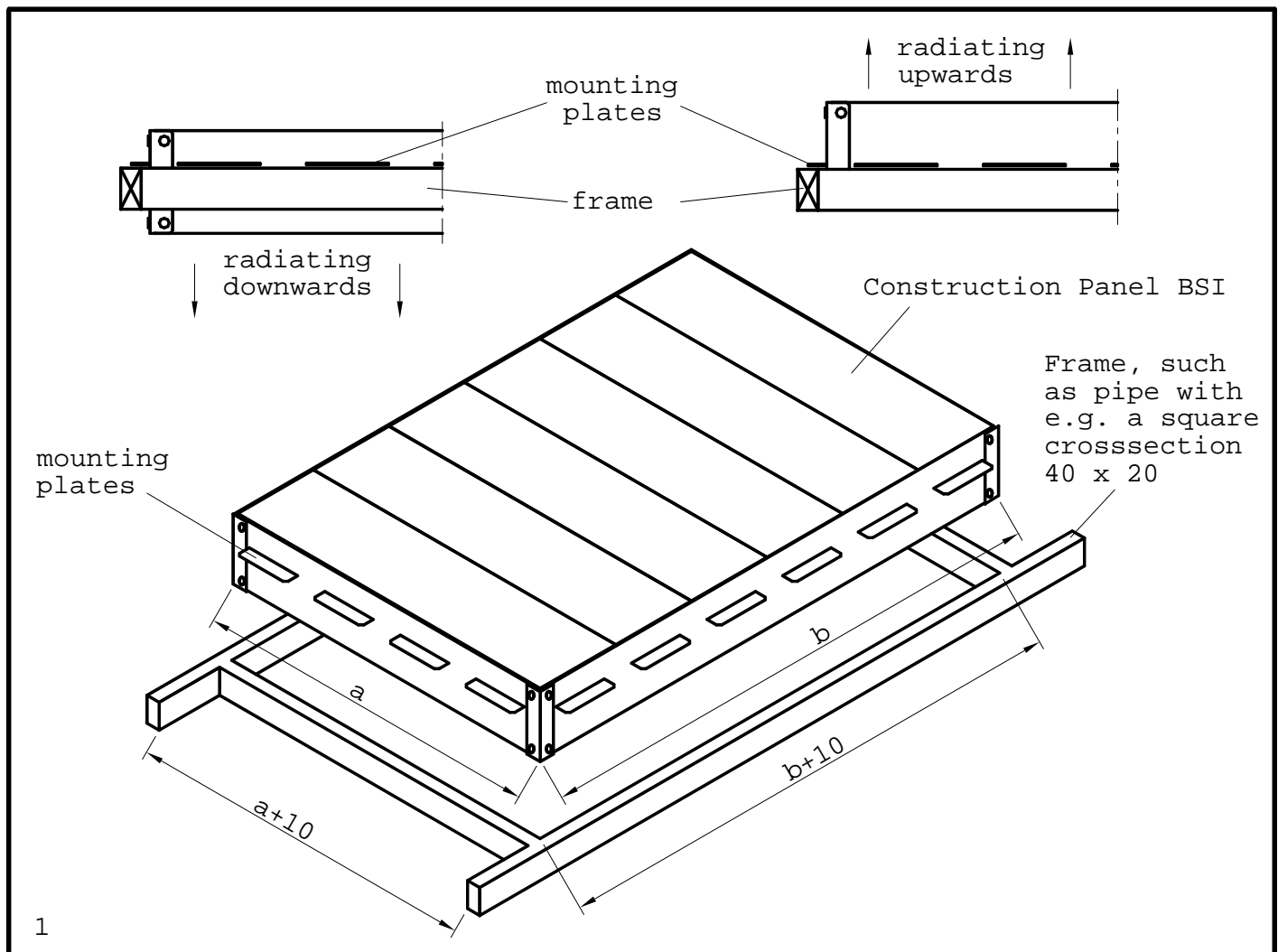
BSI/BST-Frame 5.5 mm thick, plates 20 mm wide, weight of the construction panel BSI approx. 50 kg/m<sup>2</sup> and BST approx. 60 kg/m<sup>2</sup>

The dimensions of the construction panel BSI/BST can be calculated by using the formula in Table 1. Due to thermal expansion, the inside dimensions of the frame must be approx. 10 mm larger than the outside dimensions of the construction panel (see page 2).

### Mounting / Installation

For mounting each Construction Panel has 20 mm wide mounting plates running round the outside to place the Construction pane in a frame which is built on site. Due to thermal expansion, the inside dimensions of the frame must be approx. 10 mm larger than the outside dimensions of the radiation panel (see Picture 1 and Table 1). It is of no consequence whether the panel is used to radiate downwards from above or vice versa. It is merely necessary to insert it into the frame in the corresponding direction (see Picture 1).

It is generally not necessary to fasten the panel to the frame. Otherwise for example elongated holes should be considered that the radiation panel could expand fully in all directions inside the frame.



## Radiation distance

Even at the bottom edge of the radiation panel uniform temperature distribution on the exposed goods is ensured by the radiation elements, which are installed in close proximity. The distance between the goods to be heated and the bottom edge of the Construction Panel should not be less than 15 mm. With the frame of the Construction Panel reaching 35 mm beyond the radiation elements, the distance between goods and radiation elements will then be 50 mm (see Picture 2).

Different temperature distributions within the radiation panels can be achieved by equipping them with radiation elements with different power ratings and by building several temperature control zones.

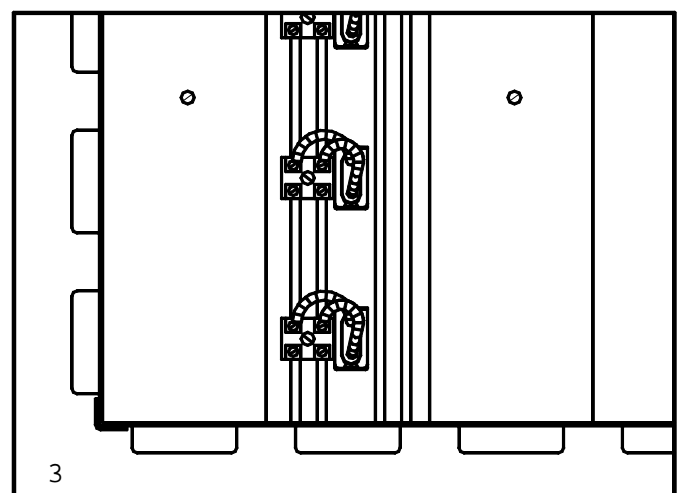
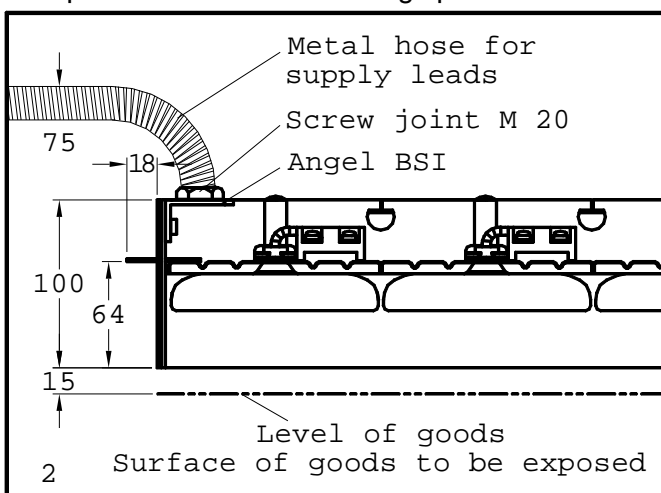
## Wiring

The standard voltage of Elstein Infrared Radiation Elements is 230 V.

In 230/400 V three-phase mains they are connected to one phase and the neutral conductor. When being connected, Elstein Infrared Radiation Elements should be distributed evenly among all phases.

The Construction Panel is completely assembled at the factory except the wiring. There is one two-pole terminal clamp for each radiation element in the easily accessible wiring space. Wiring is carried out by using stranded nickel wire with a cross-section of 2.5 mm<sup>2</sup> and with heat-resistant insulation, which is supplied together with the Construction Panel. In order to keep the loads of the individual wires low (max. 11 A) in the case of a high total power, the radiation elements must be wired in groups. If the stranded nickel wire supplied together with the Panel is used, for HTS 250 W one group consists of a maximum of 10 radiation elements; for HTS 400 W the maximum is 6 radiation elements, and for HSR 1000 W it is 2 radiation elements (see wiring examples Page 7). By separate leads the groups are then connected to a terminal box or a switching cabinet to be provided at the place of installation.

Metal hoses of 1 m length together with fixing accessories are supplied with each Construction Panel. These are used to bridge the distance between the BSI panel and the terminal box to be provided at the installation place. The hose outlets can be mounted on the frame profile at any desired position. In this area a part of the cover profile must merely be cut out (approx. 38 mm x 125 mm). In this way unimpeded access to the wiring space is maintained.



Each metal hose is used to lead 8 of the attached stranded nickel wires in. The thermal line (control line) is to be lead through a separate metal hose. In order to connect the BSI/BST panels with the terminals at the installation place 125 cm stranded nickel wire is provided. Longer metal hoses and additional wiring material are available on request.

Ensure that all electrical connections make good contact. It is advisable to retighten all terminal clamps after initial operation of the infrared equipment.

The protection of the wiring compartment is classified as IP 30.



### Protective earthing

The earthing conductor connections inside the radiation panel can be made by using the stranded nickel wire supplied together with the panel. The required clamping points are provided in the wiring compartment. Since temperature resistant coloured wiring material is not available, commonly available coding aids must be used to prevent the earthing conductor and the current carrying wires from being mixed up.

### Leakage current (fault current protection)

In the case of larger radiation panels (above 5 kW) there may in certain circumstances be leakage currents if the temperature of the radiation elements is high. These will actuate fault current breakers. In this case, the radiation panel must be hung up insulated and has to be protected against electric shock (DIN EN IEC 60519-1 and –2 point 9).

### Safety precautions

In order to protect temperature-sensitive materials from heating up excessively in the case of disturbed operation, e.g. when a web rips, the power supply of the radiation elements should be coupled with the drive mechanism. If the residual heat is not acceptable, this problem can be solved by lifting the radiation panel from the goods for a short time or by removing the goods. A cooling fan or a metal screen is often sufficient, too.

The radiation elements, especially when hot, cannot be regarded as having protective insulation. For this reason, in accordance with EN 60335-1 standards, the installation must always be provided with an allpole disconnecting device with a minimum clearance between open contacts of 3 mm per pole. If required, protection against accidental touch must be installed or a warning sign in the operator's language must be put up. **Important:** By using of HSR-radiators **ever** a protection against accidental touch is required because of the non-insulated heating wire.

Under adverse operating conditions beads can melt off if a radiation element breaks down. In the case of sensitive goods the radiation elements are to be located in a way that particles from the radiation surface cannot drop on the goods. This can be contrived by radiation from the bottom or from the side.

For security in electric heat plants and to testing methods concerning security in industrial electric heat plants give among other following standards information: DIN EN 60519-1 and -2 as well as DIN EN 60398. BSI Construction Panels become hot during operation. If required, protection devices against touching must be installed, for example by building a cover made of perforated plates.

The company installing the radiation elements is always responsible for their qualified use observing the manufacturer's specifications and all applicable regulations (such as the safety regulations in its country or the special regulations of the local power supply company).

Thermocouple radiation elements may only be operated in machines with safety extra-low voltage, if electrical isolation between the thermocouple and the SELV circuit has been provided for in the installation.

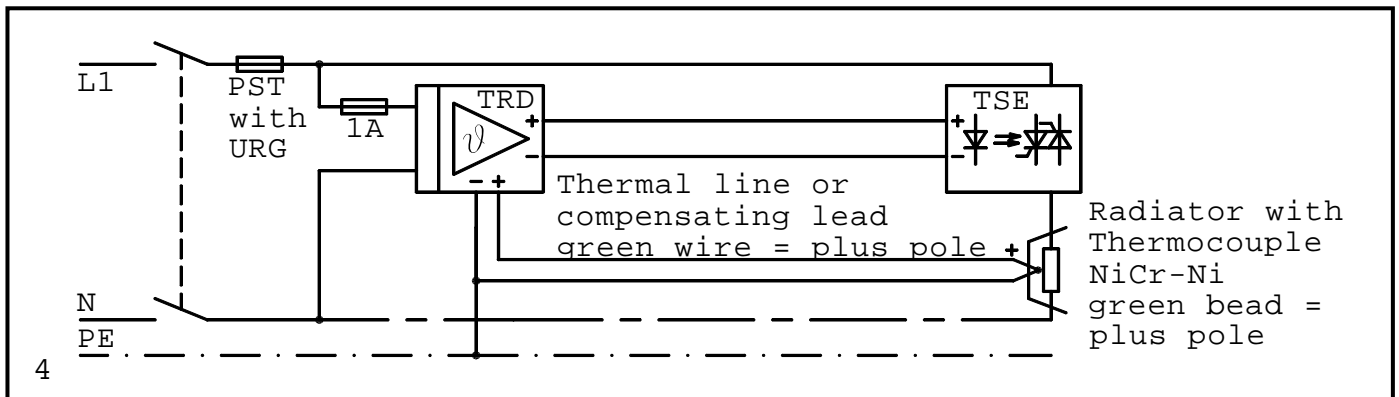
Protect radiation elements against impact, shock or damp.

Replace damaged radiation elements immediately.

## Temperature controlling

In order to achieve optimum heating results it is necessary to control Elstein Infrared Radiation Elements. For this purpose we supply infrared radiation elements with integrated NiCr-Ni thermocouple as well as electronic Temperature Control Units TRD and Thyristor Switching Units TSE. Temperature control unit inputs have to be free of potential. Wiring is carried out as shown in Picture 4. In all cases, compensating lead or thermal line must be used for the connection between control unit and thermocouple (see Picture 4).

The thermocouple leads are labelled + and -; + must be connected with + and - with - (the + pole of the thermocouple radiation element is marked with a green bead, the + wire of the compensating lead or thermal line is marked green). The thermal line must be separated from the stranded nickel wire of the load circuit; it must run through a separate metal hose.



This kind of controlling is the best method to operate the system with the lowest possible energy requirements. Moreover, it creates constant and reproducible operating conditions.

In the case of larger systems it is always recommended to install several temperature control units. One thermocouple radiation element and one control unit must be provided for each control circuit.

## Temperature limits

Exceeding maximum permissible temperatures can reduce their service life considerably. The maximum setpoint value of the control unit must always be chosen below the maximum value of the radiation elements to be controlled (see datasheet of the radiator).

## Accessories

Temperature Control Unit TRD for up to 6 Thyristor Switching Units

Thyristor Switching Units TSE 20 A. Maximum permissible current = 20 A

Thyristor Switching Units TSE 40 A. Maximum permissible current = 40 A

Fuse holder PST 10 for 20 A fuses, PST 14 for 50 A fuses

High-speed fuses URG 20 A or URG 50 A

Thermal line for the connection between thermocouple radiation element and the control unit made of NiCr-Ni, heat-resistant up to 400 °C,

2 x 1 mm<sup>2</sup>, wire resistance 1.6 ohm/m

Stranded nickel wire, 2.5 mm<sup>2</sup>, heat-resistant up to 500 °C

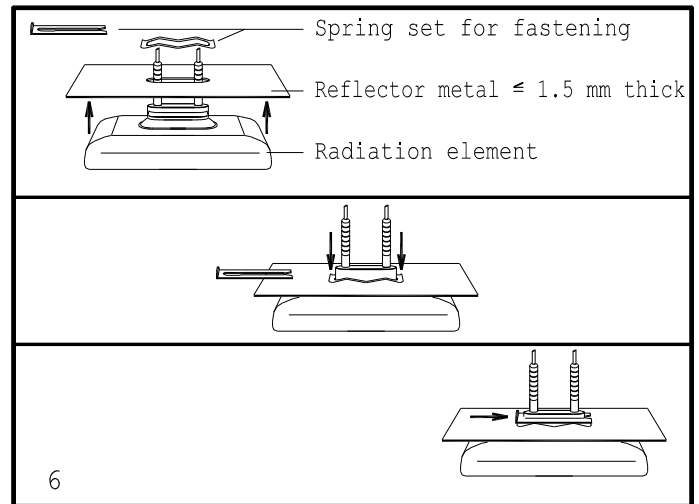
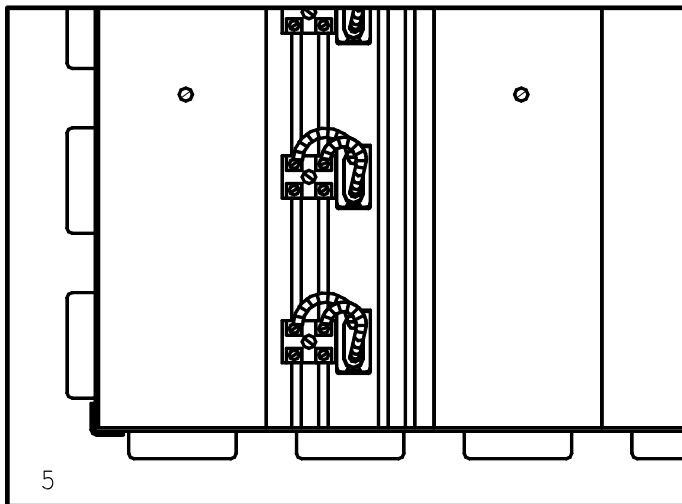
Further accessories can be found in the Elstein catalog "Ceramic Infrared Radiators".

### Explosion protection

Questions relating to explosion protection are covered in our Technical Leaflet M 1.1, which we dispatch on request.

### Replacing radiation elements

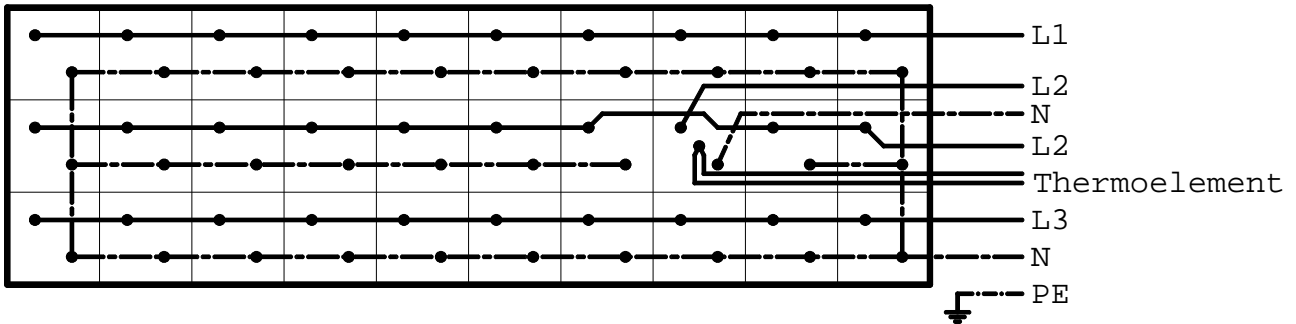
First remove the associated cover section of the wiring compartment (Picture 5). Then remove the power leads of the radiation element in question, pull the locking slider from the stud of the radiation element and remove the element from below. Insert the new radiation element, position the spring and fasten with the locking slider (Picture 6).



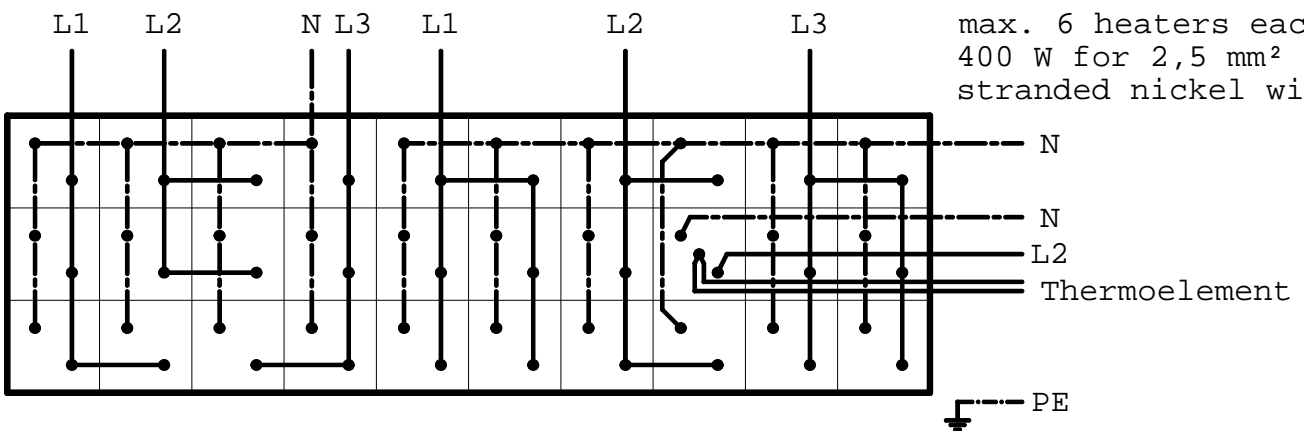
## Wiring examples

Group wiring of BSI radiation panels 1250 mm x 375 mm equipped with different radiation elements. The thermocouple radiation elements are wired individually so that their function can be checked.

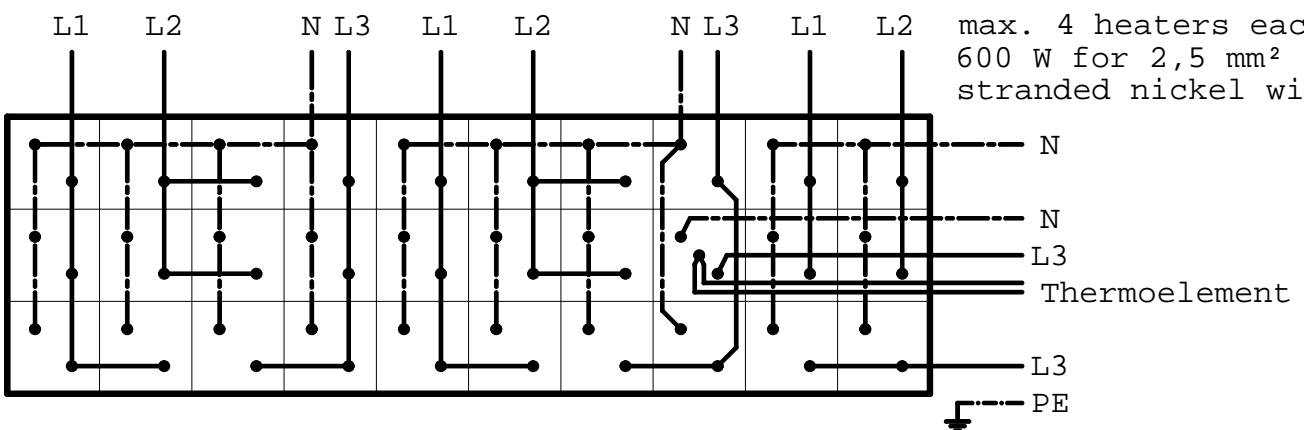
max. 10 heaters each  
250 W for 2,5 mm<sup>2</sup>  
stranded nickel wire



max. 6 heaters each  
400 W for 2,5 mm<sup>2</sup>  
stranded nickel wire



max. 4 heaters each  
600 W for 2,5 mm<sup>2</sup>  
stranded nickel wire



Wiring, customer design

Pattern for your wiring design

