

# Installation Instructions



## Heating Cable TWIN Series 61 Flexible Installation In Complex Room Shapes

### Product Information

The TWIN series heating cables are supplied ready for connection, including a 3 m long connection cable (cold conductor). They are available with a rated power of 15 W and 20 W per metre.

The cables are manufactured to VDE standards DIN EN60335-2-96, DIN EN60335-1, and DIN EN 50366. Approval: VDE (heating conductor).

The application areas detailed below are indoor floor temperature control and outdoor surface heating.

Type	Voltage	Power	Diameter	Rated temperature limit	Connection cable	Insulation	Minimum installation spacing
61xx-15	230 V	15 W / rm	3 mm	80° C	3x1.0 mm <sup>2</sup>	FEP(Teflon®) / Polyester / PVC	5 cm
61xx-20	230 V	20 W / rm	5 mm	80° C	3x1.0 mm <sup>2</sup>	FEP(Teflon®) / Polyester / PVC	6 cm

### Heating Cable Type 61xx-15, 15 W / rm, 3 mm *for indoor floor temperature control*

This is used everywhere a heating matt cannot be used due to unconventional room shapes, e.g. niches, corners, gaps, steps, pedestals, narrow passages, semicircular rooms and similar places. Because of its low profile, the heating cable is particularly suited for modernisation projects as well as newly built houses, where it can be installed immediately below floor coverings. Depending on individual requirements, the heating performance range is 90 to 220 W/m<sup>2</sup>. For tiled floors up to 200 W/m<sup>2</sup> can be used. For other flooring materials such as parquet, laminate, carpet or linoleum 160 W/m<sup>2</sup> should not be exceeded. Please always ensure that the chosen flooring material is suitable for under-floor heating.

### Heating Cable Type 61xx-20, 20 W / rm, 5 mm *for indoor floor temperature control and outdoor surface heating*

This heating cable can be embedded directly into the screed (min. 20 mm screed above the heating cable) and is therefore especially suited for newly built properties in which the flooring has not been finished yet. Depending on individual requirements, the heating performance range is 140 to 350 W/m<sup>2</sup>. For tiled floors up to 200 W/m<sup>2</sup> can be used and for other flooring materials such as parquet, laminate, carpet or linoleum 160 W/m<sup>2</sup> should not be exceeded.

The heating cable is also used for outdoor surface heating, for example, for heating external stairs, entrance areas, patios and driveways and for keeping them free of snow when required. Use as a roof or gutter heating system is also possible.

The cable is not intended for embedding in bituminous mastic or reinforced concrete.

## Important Information

*Please be sure to observe the following precautions when installing the heating cable:*

- ü Carefully read these instructions before commencing installation work.
  - ü When work is carried out on this heating system, this instruction must be available in accordance with applicable VDE regulations and handed over to the installer.
  - ü The installation must be carried out by an approved installer in accordance with the applicable standards and regulations.
  - ü Observe the specifications on the attached warranty card. The required metrics must be entered on the warranty card in order to validate any warranty claims.
  - ü The manufacturer grants a 10-year warranty. This does not cover preparatory work such as fault finding or flooring replacement.
  - ü The manufacturer cannot be held responsible for errors that are attributable to the omission of or erroneous measurements.
  - ü To ensure electrical safety, the heating cable's power supply must be via a residual current circuit breaker (RCB) with a trigger current of up to 30 mA.
  - ü To ensure that all poles of the heating system can be safely disconnected, a circuit breaker, e.g. a 2-pole RCB with a 3 mm contact opening, must be installed.
  - ü A sign indicating the installation and configuration of the heating cable must be attached in the vicinity of the junction box. This sign is provided in the form of a warranty card which is supplied with every heating cable and is to be completed with a location diagram of the heating cable – a sketch is sufficient.
  - ü Always use a control thermostat with a floor sensor.
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- ⊗ During installation the heating cable must be protected against damage by falling, sharp or heavy objects.
  - ⊗ The heating cable must not be shortened, lengthened, folded or crossed.
  - ⊗ Care must be taken that the heating cable cannot be stepped on during installation.
  - ⊗ Installation across screed expansion joints is not permitted.
  - ⊗ Do not install the heating cables in temperatures below +5° C.
  - ⊗ Do not install the heating cable under bathtubs or shower trays or under surfaces directly covered by furniture or built-in objects.
  - ⊗ Do not start laying the floor covering prior to the functional test of the heating system.
  - ⊗ Do not operate the heating system until the floor construction is completely dried out.

# A. Indoor Installation of the Floor Temperature Control System

## A. 1. Floor construction notes

We recommend to always follow the manufacturer's instructions for the materials used (adhesive, levelling material, insulation material, etc.). Generally, only flexible tile adhesives, levelling material, etc. suitable for under-floor heating are to be used.

The heat transmission resistance of the floor construction above the heating cable should be as low as possible.

In order to prevent heat and energy loss to the sub-floor and, therefore, to ensure optimum heating of the floor covering, the under-floor design must incorporate state-of-the-art technology.

For optimum contact with the sub-floor we recommend applying a priming layer before installing the heating cable.

### **Recommended products:**

By way of providing typical examples, we offer below suggestions for the use of products supplied by the manufacturers PCI Augsburg GmbH, Piccardstraße 11, 86159 Augsburg. Naturally, similar products supplied by other manufacturers (e.g. Ardex, Knauf, etc) are equally suitable. However, please follow the instructions provided by the individual suppliers.

#### § **Laying tiles and other ceramic floor products on a screed**

Apply the adhesive (e.g. "PCI-FlexMortel") onto the screed using a 6-mm-toothed spatula. Embed the heating element into the mortar with the heating cable underneath.. Apply more adhesive using a 10-mm-toothed spatula. Place the tiles or other ceramic floor material in position.

#### § **Laying natural stone products on the screed:**

Proceed as described above but use, e.g. "PCI-Carraflex" as the adhesive.

#### § **Laying soft materials such as carpets, PVC, parquet blocks, etc. on the screed:**

Apply the adhesive (e.g. "PCI-FlexMortel") onto the screed using a 6-mm-toothed spatula. Embed the heating element into the mortar with the heating cable underneath. When this has hardened, apply a universal filler mass such as PCI-USP32 in a layer which is at least 5 mm thick. When this has hardened, the particular soft floor covering can be put in place using an adhesive (typically Textil-Belagskleber(Textile-covering material adhesive) PCI-TKL315, PVC-Belagskleber (Covering material adhesive) PCI-PKL324, Linoliumkleber (Linolium adhesive) PCI-LKL334, Korkkontaktkleber (Cork contact adhesive) PCI-KKL347, Parkettkleber (Parquet Block adhesive) PCI-PAR354, etc.) - i.e. adhesives specially prepared for the floor covering being used.

#### § **If it is necessary to level the floor because of surface irregularities:**

we recommend the readily-flowing screed levelling material "PCI-Periplan" applied as a layer 4 - 5 mm thick. This can be followed by the laying activity using PCI-Flexmortel as described above.

#### § **For filling joints between tiles or other ceramic floor materials we recommend:**

"PCI-Flexfuge". Finally, wall gaps and expansion joints can be filled with the elastic material "PCI-Silcoferm-S"

#### § **For filling joints between natural stones we recommend:**

"PCI-Carrafug" or "PCI-Carrafern"

#### § **Preliminary treatment required when laying upon a solid wooden floor base:**

Remove all dust and other forms of soiling, close the cracks in the floor with "PCI-Adaptol" and apply an adhesive primer such as "PCI-Flächengrund-404". When this has dried out apply a levelling compound such as "PCI-Periplan". After this, too, has dried out the covering material may be applied as described above. Under no circumstances may the heating elements be laid over movement joints.

#### § **Preliminary treatment required when laying upon a chipboard base:**

Remove all dust and other contamination, prime with "PCI-Wadian" and allow to dry. Then proceed to lay the selected floor covering as described above. The chipboard slabs must be at least 25 mm thick and must be secured to the sub-floor by screws spaced no more than 40 cm apart. Under no circumstances may the heating elements be laid over movement joints.

## A. 2. Installation

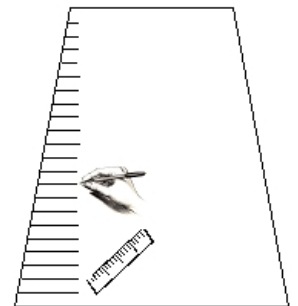
The base surface must be solid, undeformable, clean, free from cracks and any materials which impede adhesion. It must also be able to carry superimposed loads. If a new screed is to be applied (cement or anhydrite) the nature of its surface must be examined. If in poor condition the surface must be ground down, vacuum cleaned and then primed. In this event pay careful attention to the recommendations of the suppliers of the materials used.

### 1. Priming (optional)

- a) The surface to be primed must be completely dry, level and free of grease.
- b) Do not step on the floor after applying the primer and allow the primer to dry out completely.

### 2. Measuring

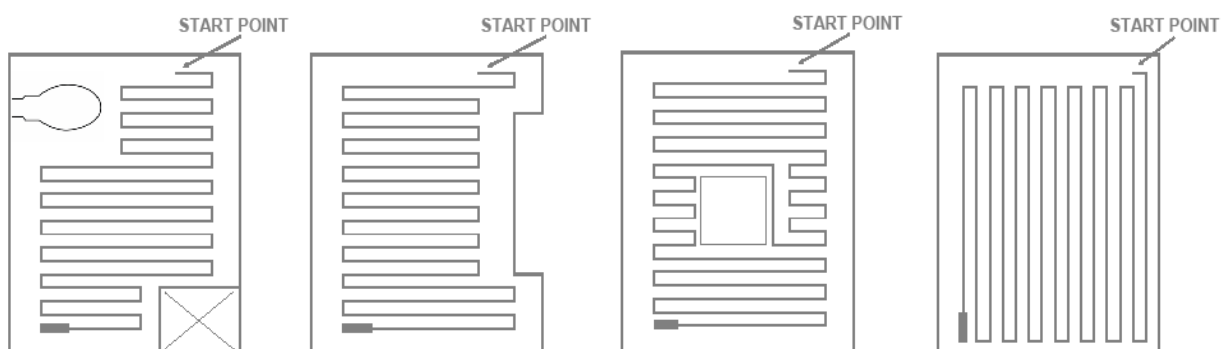
- a) Calculate the size, in square metres, of the surface to be heated.
- b) Use the following measurement tables to establish the required spacing of the heating cable.
- c) Mark the start point (connection socket between connection cable and heating cable). The distance to the power outlet should be no more than 2.5 m.
- d) Mark the outer corners of the surface to be heated. Maintain a minimum distance of 50 mm to the wall. The minimum distance to conductive components (e.g. water pipes) must be 30 mm. Once you have connected the corners, you can see the outline of the surface to be heated.
- e) Now mark out the spacing of the heating cable according to the values from the measurement table, observing the minimum distance.
- f) Remember: Sketch the layout of the heating cable on the attached warranty card.



### 3. Installing the heating cable

- a) Once the marking is completed, you can start installing the heating cable. The cable is fixed in place with double-sided adhesive tape (e.g. tesafix®, item no.04934, cloth adhesive tape, 25 mm wide).
- b) Attach the connection socket at the marked start point. Fix the adhesive tape along all the marked points.
- c) Now lay out the heating cable in parallel meanders until it reaches the end point in the room. Use the marked points as turning points and affix the heating cable there by gently pressing it against the adhesive tape.
- d) Please note: The heating cables must be spaced at least 5 cm apart and must not be crossed.
- e) Once the heating cable is laid out as desired, fix it to the sub-floor with adhesive tape along its entire length.
- f) Route the connection cable alongside the heating cable to the connection socket or directly to the thermostat controller. Several heating cables can be jointly connected to the thermostat controller (electrically parallel like several light bulbs in a lamp). We recommend using a junction box for this. The connection cables must not be crossed.
- g) It may be necessary to chase a recess into the sub-floor to accommodate the connection cable and to achieve a floor-level connection.

Installation examples:

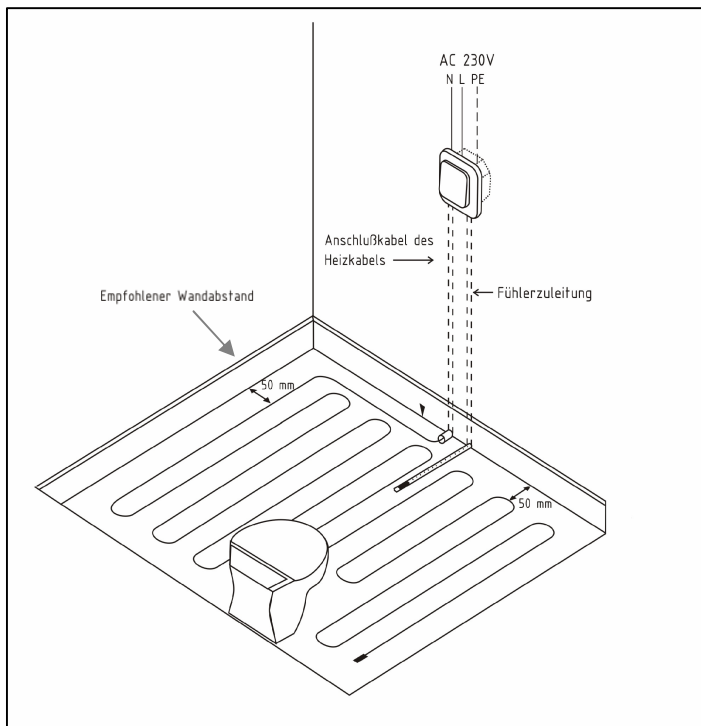


#### 4. Connecting the thermostat

Our heating cables are available with the following control devices:

Standard (Thermostat, lower layer of filler) or Digital (4-Event Clock-Thermostat, lower layer of filler).

##### Thermostat controller and floor sensor:

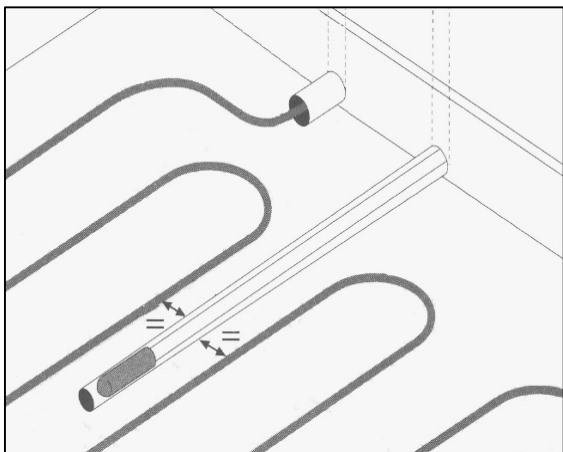


**Anschlusskabel des Heizelementes =  
Connecting cable for heating element**

**Empfohlener Wandabstand =  
Recommended minimum distance to the Wall**

**Fühlerzuleitung = Sensor cable**

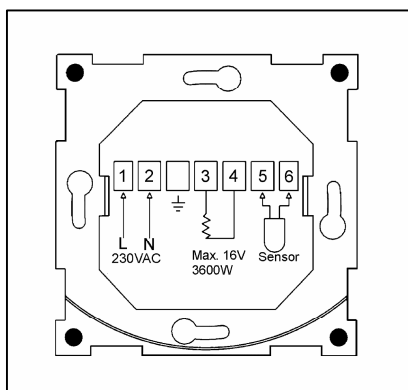
**Position of the floor sensor between the heating cables. Here you can also see the two protective ducts for the connection cable and the floor sensor:**



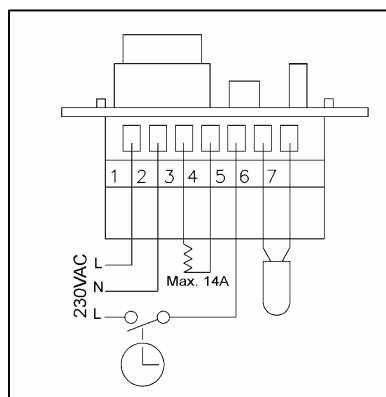
- The sensor must be installed in a protective duct. This ensures that the sensor can be replaced in case of a future malfunction. The sensor must be positioned close to the surface between two heating cables.
- It may be necessary to chase a groove into the sub-floor to accommodate the protective duct.
- Please follow the installation instructions for your thermostat. Only a correct connection ensures the proper performance of the under-floor heating system.

**Attention must be given to the relevant Controller Connection Diagram:**

##### Digital



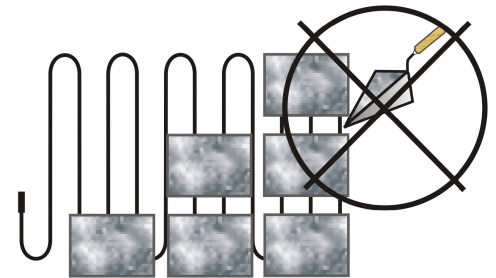
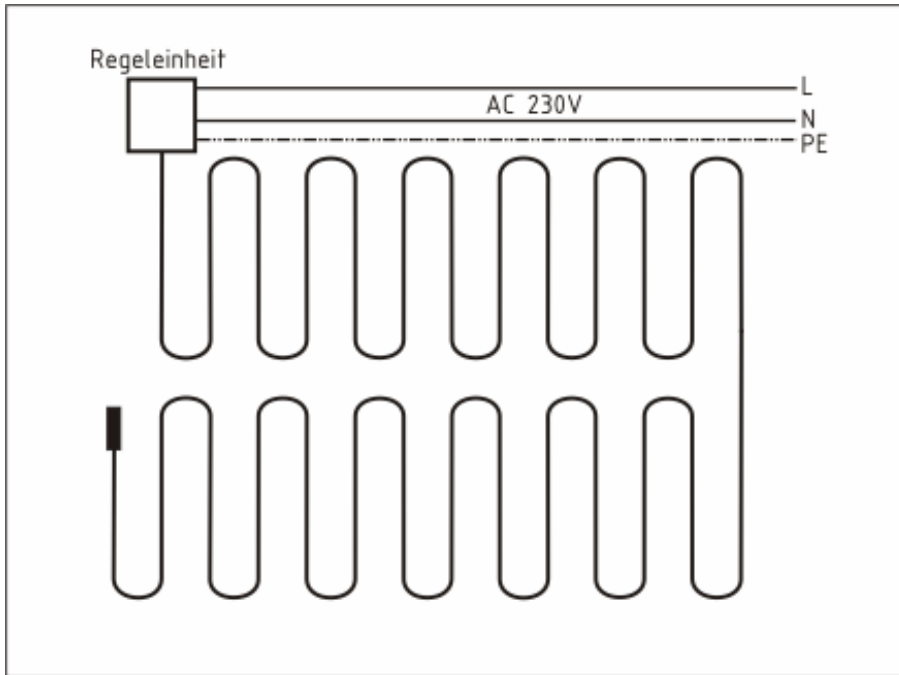
##### Standard



## 5. Installing the floor covering

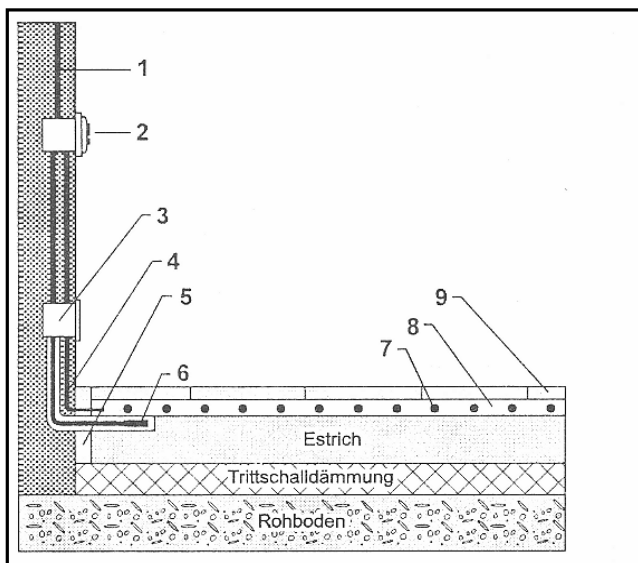
- Check that the heating cable is completely fixed and secured.
- Check the function of the heating element with an Ohmmeter. Compare the resistance and insulation values with the values specified on the warranty card and enter them in the corresponding spaces on the card.
- The entire heating cable must be embedded in the adhesive or grouting paste. Avoid air pockets.
- Take care not to damage the heating cable when installing the floor covering.
- Only switch on the heating element when the tile adhesive/grouting is completely hardened.

### Diagrammatic Information - Connection to the mains



**Regeleinheit** = Control Unit

### Diagrammatic Information - Installation example



**Estrich** = Screed

**Trittschalldämmung** = Footfall noise insulation

**Rohboden** = Rough floor surface

- Mains connection AC 230 Volt
- Thermostat-Controller
- In-Wall-Distributor Socket
- Connection cable to the heating element
- Edge insulation strip
- Floor-temperature sensor for the thermostat control unit
- Heating element
- Adhesive
- Floor covering material (e.g. tiles)

Between 8 and 9 a barrier layer (e.g. insulating mass) can be provided. (This is optional for damp areas)

## B. Outdoor Surface Heating

### *Using the heating cable type 61xx-20, 20 W /rm, 5 mm*

To avoid hazards and obstructions caused by snow, sleet and ice in outdoor areas such as stairs, entrances, walkways, garage driveways, ramps, etc. during the winter months, these areas can be heated with the heating cable type 61xx-20. Slipping hazards are prevented from even occurring because snow is removed, as far as possible, while it is falling.

Therefore, the outdoor surface heating is not only a labour-saving device but, most of all, ensures safety in the immediate vicinity of your home.

The heating cable is suitable for installation in screed, lean concrete, cement or sand. The surface covering, e.g. ceramic, sandstone paving, etc., is the user's choice.

For optimum thawing results a heating power of between 250 and 350 W/m<sup>2</sup> should be chosen, depending on the location and type of the area to be heated. As a guideline, a heating power of 300 W/m<sup>2</sup> is used.

The heating cable should be installed as close as possible below the surface covering.

A professional execution of the installation work is a prerequisite of the proper function of the heating system.

### B.1. Installation options

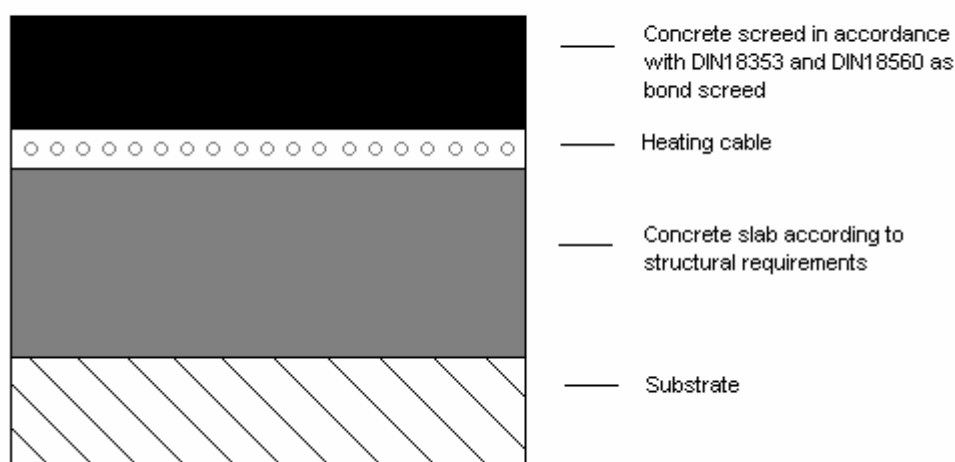
The sub-surface must meet all structural and static requirements, and must be constructed in accordance with the applicable building regulations and DIN standards. To ensure that the thermostat sensors can be replaced at a later stage, it is important that protective ducts for their insertion are provided.

#### a) Construction of an outdoor surface heating system with screed cover

The heating cable is laid out on the hardened concrete slab according to the installation plan and affixed to the surface. The connection cable is routed to the connection point alongside the heating cable. For improved bonding of the screed, it is recommended to brush the concrete slab with cement slurry before covering the heating cable with a 3-5 cm screed layer.

If structural considerations necessitate a thicker screed layer, the base screed layer should be applied first and the heating cable should then be installed on top of it. The second screed layer should be applied immediately after this so that the heating cable is covered by at least 3 cm (wet-on-wet method).

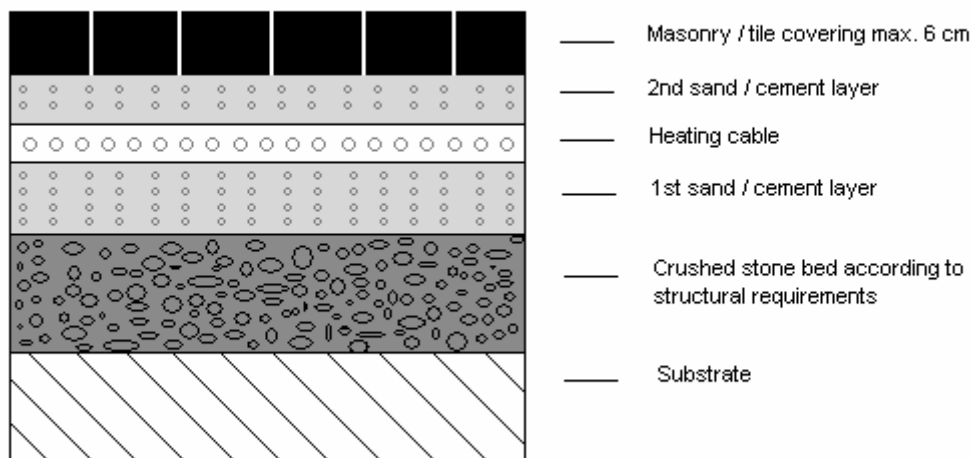
Structural expansion joints must be transferred to the screed to ensure that the heating cable is not routed across expansion joints.



## b) Construction of an outdoor surface heating system with masonry or tile covering

The load-bearing layer on top of the substrate should be made from crushed stone according to the structural and static requirements. On top of this, a sand or lean concrete layer is applied into which the heating cable is laid according to the installation plan. The connection cable is routed to the connection point along the side. The heating cable is then evenly covered with another layer of sand or cement. Finally, the surface covering, which must be no more than 6 cm thick, is laid. In this case a specific heating power of at least 300 W/m<sup>2</sup> must be ensured.

**IMPORTANT:** Never use crushed, sharp chipping as sand substrate to prevent mechanical damage of the heating cable.



## c) Construction of an outdoor stair heating system

When used on steps the heating cable is fully embedded in the protective screed. The heating element created in this fashion is then covered with a cement layer into which the surface covering is laid.

### ***Important notes for the outdoor installation of heating cables***

1. Heating cables must not be shortened or connected directly. Only the connection cable may be shortened and connected.
2. The heating cables must not touch or cross each other.
3. Do not fold the heating cable with less than the minimum bending radius.
4. Heating cables must not cross expansion joints. In these locations, the heating cables must be protected by two moveable pipes, one inserted in the other.
5. Heating and connection cables must not be folded or routed over sharp-edged or sharp objects.
6. Do not install the heating cables in temperatures below +5° C.
7. The use of a floor or ground sensor is mandatory and a protective duct must be provided for insertion.
8. The electrical installation must be carried out in accordance with DIN-VDE regulations. Protection against indirect contact must be ensured by disconnection or signal (residual current circuit breaker).
9. Heat insulation below the heating cable is generally recommended. For example, a hard Styropor® or Styrodur® board can be used.



## B.2. Control devices

For small electrically heated outdoor areas in domestic applications it is usually sufficient to switch on the heating system only when required. A sensor, installed close below the surface, monitors the temperature to ensure that it does not exceed e.g. 2° C and to prevent unnecessary energy consumption.

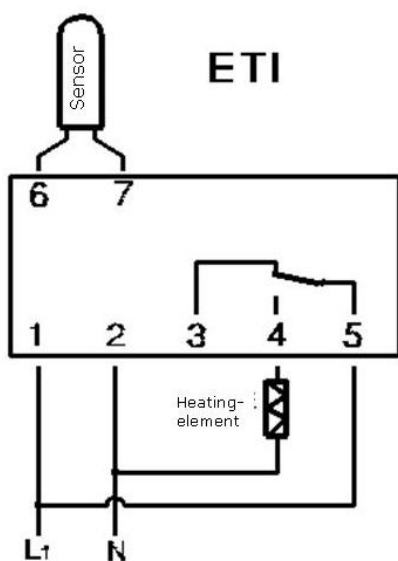
For the economic heating of larger outdoor areas an automatic controller comprising a snow and ice indicator as well as a humidity and temperature sensor is required. The area to be kept free of snow and ice is continually monitored by the controller and the system is switched on and of as required.

The following thermostat and ground sensor is available for the control of smaller outdoor areas:

### ***Electronic thermostat type ETI with ground sensor type ETF-144***

- a. Please follow the installation instructions for your thermostat. Only a correct connection ensures the proper performance of the outdoor surface heating system.
- b. The sensor must be installed in a protective duct. This ensures that the sensor can be replaced in case of a future malfunction. The sensor must be positioned close to the surface between two heating cables.

Controller connection diagram:



# Measurement and Installation Table

## Heating Cable Twin 61xx-15, 15 W / m, 3 mm

### *Indoor*

The selection of the specific power per m<sup>2</sup> results in the mandatory installation spacing and, therefore, the area to be heated:

		Area to be heated in m <sup>2</sup>												
		Resistance in Ohms	Capacity in Watts	Length m	90 W/m <sup>2</sup>	100 W/m <sup>2</sup>	110 W/m <sup>2</sup>	120 W/m <sup>2</sup>	140 W/m <sup>2</sup>	150 W/m <sup>2</sup>	160 W/m <sup>2</sup>	180 W/m <sup>2</sup>	200 W/m <sup>2</sup>	220 W/m <sup>2</sup>
1	6101-15	392	135	9	1,5 m <sup>2</sup>	1,4 m <sup>2</sup>	1,2 m <sup>2</sup>	1,1 m <sup>2</sup>	1,0 m <sup>2</sup>	0,9 m <sup>2</sup>	0,8 m <sup>2</sup>	0,75 m <sup>2</sup>	0,7 m <sup>2</sup>	0,6 m <sup>2</sup>
2	6102-15	294	180	12	2,0 m <sup>2</sup>	1,8 m <sup>2</sup>	1,6 m <sup>2</sup>	1,5 m <sup>2</sup>	1,3 m <sup>2</sup>	1,2 m <sup>2</sup>	1,1 m <sup>2</sup>	1,0 m <sup>2</sup>	0,9 m <sup>2</sup>	0,8 m <sup>2</sup>
3	6103-15	212	250	17	2,8 m <sup>2</sup>	2,5 m <sup>2</sup>	2,3 m <sup>2</sup>	2,1 m <sup>2</sup>	1,8 m <sup>2</sup>	1,7 m <sup>2</sup>	1,6 m <sup>2</sup>	1,4 m <sup>2</sup>	1,3 m <sup>2</sup>	1,1 m <sup>2</sup>
4	6104-15	151	350	23	3,9 m <sup>2</sup>	3,5 m <sup>2</sup>	3,2 m <sup>2</sup>	2,9 m <sup>2</sup>	2,5 m <sup>2</sup>	2,3 m <sup>2</sup>	2,2 m <sup>2</sup>	1,9 m <sup>2</sup>	1,8 m <sup>2</sup>	1,6 m <sup>2</sup>
5	6105-15	118	450	30	5,0 m <sup>2</sup>	4,5 m <sup>2</sup>	4,1 m <sup>2</sup>	3,8 m <sup>2</sup>	3,2 m <sup>2</sup>	3,0 m <sup>2</sup>	2,8 m <sup>2</sup>	2,5 m <sup>2</sup>	2,3 m <sup>2</sup>	2,0 m <sup>2</sup>
6	6106-15	88	600	40	6,7 m <sup>2</sup>	6,0 m <sup>2</sup>	5,5 m <sup>2</sup>	5,0 m <sup>2</sup>	4,3 m <sup>2</sup>	4,0 m <sup>2</sup>	3,8 m <sup>2</sup>	3,3 m <sup>2</sup>	3,0 m <sup>2</sup>	2,7 m <sup>2</sup>
7	6107-15	66	800	50	8,9 m <sup>2</sup>	8,0 m <sup>2</sup>	7,3 m <sup>2</sup>	6,7 m <sup>2</sup>	5,7 m <sup>2</sup>	5,3 m <sup>2</sup>	5,0 m <sup>2</sup>	4,4 m <sup>2</sup>	4,0 m <sup>2</sup>	3,6 m <sup>2</sup>
8	6108-15	53	1000	70	11,1 m <sup>2</sup>	10,0 m <sup>2</sup>	9,1 m <sup>2</sup>	8,3 m <sup>2</sup>	7,1 m <sup>2</sup>	6,7 m <sup>2</sup>	6,3 m <sup>2</sup>	5,6 m <sup>2</sup>	5,0 m <sup>2</sup>	4,5 m <sup>2</sup>
9	6109-15	44	1200	80	13,3 m <sup>2</sup>	12,0 m <sup>2</sup>	10,9 m <sup>2</sup>	10,0 m <sup>2</sup>	8,6 m <sup>2</sup>	8,0 m <sup>2</sup>	7,5 m <sup>2</sup>	6,7 m <sup>2</sup>	6,0 m <sup>2</sup>	5,5 m <sup>2</sup>
10	6110-15	38	1400	90	15,6 m <sup>2</sup>	14,0 m <sup>2</sup>	12,7 m <sup>2</sup>	11,7 m <sup>2</sup>	10,0 m <sup>2</sup>	9,3 m <sup>2</sup>	8,8 m <sup>2</sup>	7,8 m <sup>2</sup>	7,0 m <sup>2</sup>	6,4 m <sup>2</sup>
11	6111-15	33	1600	105	17,8 m <sup>2</sup>	16,0 m <sup>2</sup>	14,5 m <sup>2</sup>	13,3 m <sup>2</sup>	11,4 m <sup>2</sup>	10,7 m <sup>2</sup>	10,0 m <sup>2</sup>	8,9 m <sup>2</sup>	8,0 m <sup>2</sup>	7,3 m <sup>2</sup>
12	6112-15	29	1800	120	20,0 m <sup>2</sup>	18,0 m <sup>2</sup>	16,4 m <sup>2</sup>	15,0 m <sup>2</sup>	12,9 m <sup>2</sup>	12,0 m <sup>2</sup>	11,3 m <sup>2</sup>	10,0 m <sup>2</sup>	9,0 m <sup>2</sup>	8,2 m <sup>2</sup>
13	6113-15	26	2000	135	22,2 m <sup>2</sup>	20,0 m <sup>2</sup>	18,2 m <sup>2</sup>	16,7 m <sup>2</sup>	14,3 m <sup>2</sup>	13,3 m <sup>2</sup>	12,5 m <sup>2</sup>	11,1 m <sup>2</sup>	10,0 m <sup>2</sup>	9,1 m <sup>2</sup>
14	6114-15	24	2200	150	24,4 m <sup>2</sup>	22,0 m <sup>2</sup>	20,0 m <sup>2</sup>	18,3 m <sup>2</sup>	15,7 m <sup>2</sup>	14,7 m <sup>2</sup>	13,8 m <sup>2</sup>	12,2 m <sup>2</sup>	11,0 m <sup>2</sup>	10,0 m <sup>2</sup>
		<b>Installation spacing in cm:</b>			<b>17 cm</b>	<b>15 cm</b>	<b>14 cm</b>	<b>12 cm</b>	<b>11 cm</b>	<b>10 cm</b>	<b>9 cm</b>	<b>8 cm</b>	<b>7 cm</b>	<b>6,5 cm</b>

Resistance tolerance: +5% / -10%

# Measurement and Installation Table

## Heating Cable Twin 61xx-20, 20 W / rm, 5 mm

### *Indoor and outdoor*

The selection of the specific power per m<sup>2</sup> results in the mandatory installation spacing and, therefore, the area to be heated:

					Area to be heated in m <sup>2</sup>									
		Resistance in Ohms	Capacity in Watts	Length m	140 W/m <sup>2</sup>	150 W/m <sup>2</sup>	160 W/m <sup>2</sup>	170 W/m <sup>2</sup>	180 W/m <sup>2</sup>	200 W/m <sup>2</sup>	220 W/m <sup>2</sup>	250 W/m <sup>2</sup>	300 W/m <sup>2</sup>	350 W/m <sup>2</sup>
1	6101-20	265	200	10	1,4 m <sup>2</sup>	1,3 m <sup>2</sup>	1,25 m <sup>2</sup>	1,2 m <sup>2</sup>	1,1 m <sup>2</sup>	1,0 m <sup>2</sup>	0,9 m <sup>2</sup>	0,8 m <sup>2</sup>	0,7 m <sup>2</sup>	0,6 m <sup>2</sup>
2	6102-20	176	300	15	2,1 m <sup>2</sup>	2,0 m <sup>2</sup>	1,9m <sup>2</sup>	1,8 m <sup>2</sup>	1,7 m <sup>2</sup>	1,5 m <sup>2</sup>	1,4 m <sup>2</sup>	1,2 m <sup>2</sup>	1,0 m <sup>2</sup>	0,9 m <sup>2</sup>
3	6103-20	132	400	20	2,9 m <sup>2</sup>	2,7 m <sup>2</sup>	2,5 m <sup>2</sup>	2,4 m <sup>2</sup>	2,2 m <sup>2</sup>	2,0 m <sup>2</sup>	1,8 m <sup>2</sup>	1,6 m <sup>2</sup>	1,3 m <sup>2</sup>	1,1 m <sup>2</sup>
4	6104-20	106	500	25	3,6 m <sup>2</sup>	3,3 m <sup>2</sup>	3,1 m <sup>2</sup>	2,9 m <sup>2</sup>	2,8 m <sup>2</sup>	2,5 m <sup>2</sup>	2,3 m <sup>2</sup>	2,0 m <sup>2</sup>	1,7 m <sup>2</sup>	1,4 m <sup>2</sup>
5	6105-20	88	600	30	4,3 m <sup>2</sup>	4,0 m <sup>2</sup>	3,8 m <sup>2</sup>	3,5 m <sup>2</sup>	3,3 m <sup>2</sup>	3,0 m <sup>2</sup>	2,7 m <sup>2</sup>	2,4 m <sup>2</sup>	2,0 m <sup>2</sup>	1,7 m <sup>2</sup>
6	6106-20	66	800	40	5,7 m <sup>2</sup>	5,3 m <sup>2</sup>	5,0 m <sup>2</sup>	4,7 m <sup>2</sup>	4,4 m <sup>2</sup>	4,0 m <sup>2</sup>	3,6 m <sup>2</sup>	3,2 m <sup>2</sup>	2,7 m <sup>2</sup>	2,3 m <sup>2</sup>
7	6107-20	53	1000	50	7,1 m <sup>2</sup>	6,7 m <sup>2</sup>	6,3 m <sup>2</sup>	5,9 m <sup>2</sup>	5,6 m <sup>2</sup>	5,0 m <sup>2</sup>	4,5 m <sup>2</sup>	4,0 m <sup>2</sup>	3,3 m <sup>2</sup>	2,9 m <sup>2</sup>
8	6108-20	44	1200	60	8,6 m <sup>2</sup>	8,0 m <sup>2</sup>	7,5 m <sup>2</sup>	7,1 m <sup>2</sup>	6,7 m <sup>2</sup>	6,0 m <sup>2</sup>	5,5 m <sup>2</sup>	4,8 m <sup>2</sup>	4,0 m <sup>2</sup>	3,4 m <sup>2</sup>
9	6109-20	38	1400	70	10,0 m <sup>2</sup>	9,3 m <sup>2</sup>	8,8 m <sup>2</sup>	8,2 m <sup>2</sup>	7,8 m <sup>2</sup>	7,0 m <sup>2</sup>	6,4 m <sup>2</sup>	5,6 m <sup>2</sup>	4,7 m <sup>2</sup>	4,0 m <sup>2</sup>
10	6110-20	33	1600	80	11,4 m <sup>2</sup>	10,7 m <sup>2</sup>	10,0 m <sup>2</sup>	9,4 m <sup>2</sup>	8,9 m <sup>2</sup>	8,0 m <sup>2</sup>	7,3 m <sup>2</sup>	6,4 m <sup>2</sup>	5,3 m <sup>2</sup>	4,6 m <sup>2</sup>
11	6111-20	29	1800	90	12,9 m <sup>2</sup>	12,0 m <sup>2</sup>	11,3 m <sup>2</sup>	10,6 m <sup>2</sup>	10,0 m <sup>2</sup>	9,0 m <sup>2</sup>	8,2 m <sup>2</sup>	7,2 m <sup>2</sup>	6,0 m <sup>2</sup>	5,1 m <sup>2</sup>
12	6112-20	26	2000	100	14,3 m <sup>2</sup>	13,3 m <sup>2</sup>	12,5 m <sup>2</sup>	11,8 m <sup>2</sup>	11,1 m <sup>2</sup>	10,0 m <sup>2</sup>	9,1 m <sup>2</sup>	8,0 m <sup>2</sup>	6,7 m <sup>2</sup>	5,7 m <sup>2</sup>
13	6113-20	23	2300	115	16,4 m <sup>2</sup>	15,3 m <sup>2</sup>	14,4 m <sup>2</sup>	13,5 m <sup>2</sup>	12,8 m <sup>2</sup>	11,5 m <sup>2</sup>	10,5 m <sup>2</sup>	9,2 m <sup>2</sup>	7,7 m <sup>2</sup>	6,6 m <sup>2</sup>
14	6114-20	21	2500	125	17,9 m <sup>2</sup>	16,7 m <sup>2</sup>	15,6 m <sup>2</sup>	14,7 m <sup>2</sup>	13,9 m <sup>2</sup>	12,5 m <sup>2</sup>	11,4 m <sup>2</sup>	10,0 m <sup>2</sup>	8,3 m <sup>2</sup>	7,1 m <sup>2</sup>
15	6115-20	18	3000	150	21,4 m <sup>2</sup>	20,0 m <sup>2</sup>	18,8 m <sup>2</sup>	17,6 m <sup>2</sup>	16,7 m <sup>2</sup>	15,0 m <sup>2</sup>	13,6 m <sup>2</sup>	12,0 m <sup>2</sup>	10,0 m <sup>2</sup>	8,6 m <sup>2</sup>
<b>Installation spacing in cm:</b>					<b>15 cm</b>	<b>14 cm</b>	<b>13 cm</b>	<b>12 cm</b>	<b>11 cm</b>	<b>10 cm</b>	<b>9 cm</b>	<b>8 cm</b>	<b>7 cm</b>	<b>6 cm</b>

Resistance tolerance: +5% / -10%