

Dear Sirs,

Thank you for purchasing the TERMOFOL underfloor heating set. We are convinced that you will be satisfied with our product. We will be happy to help and advise you at any time, both during installation and the operation of our products. We invite you to visit our website termofol.pl as well as our fanpage [@termofol](https://www.facebook.com/Termofol) on Facebook - www.facebook.com/Termofol.

The installation instructions for the heating film do not replace the instructions provided by the manufacturer of the wooden, laminate or vinyl flooring. All guidelines provided in these instructions must be observed. Should there be any contradiction between the TERMOFOL heating film instructions and the flooring installation instructions, please contact us to clarify any doubts.

INSTALLATION OF THE HEATING SYSTEM IS ONLY PERMITTED AFTER READING THE INSTALLATION INSTRUCTIONS. THE ELECTRICAL CONNECTION MUST BE MADE BY AN ELECTRICIAN WITH CURRENT ELECTRICAL QUALIFICATIONS.

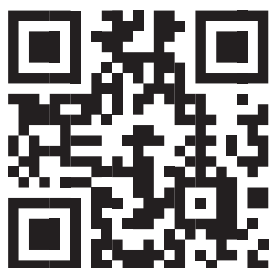


Installation of the system which does not comply with the guidelines in this manual will result in loss of warranty

Visualisation of
installation under floor
panels



downloads:
www.termofol.com



 **TERMOFOL**

Termofol Sp. z o.o.
ul. J. Marcika 4A, lok.
II/5, 30-443 Kraków
NIP: 6762485192



www.termofol.pl

TABLE OF CONTENTS

I.	INTRODUCTION	3
I.1	REFERENCES TO STANDARDS	3
I.2	IMPORTANT INFORMATION AND LIMITATIONS WHEN INSTALLING THE HEATING FILM	3
I.3	PROHIBITED ACTIVITIES	3
I.4	SECURITY	3
I.5	EXPLANATION OF SYMBOLS	4
I.6	CROSS-SECTION OF LAYERS	5
II.	DISCUSSION OF THE HEATING SYSTEM	6
II.1	SYSTEM COMPONENTS	6
II.1.1	HEATING FOIL	6
II.1.2	INSTALLATION MATERIALS	7
II.2	INSTALLATION TOOLS REQUIRED	8
II.3	SYSTEM WIRING DIAGRAM	9
II.3.1	TYPE A	9
II.3.2	TYPE B	9
II.4	SUPPLY SYSTEM REQUIREMENTS	10
II.5	ELECTRICAL DIAGRAM OF THE MAIN SWITCHBOARD FOR ONE HEATING ZONE	10
II.6	RESTRICTIONS ON USE	12
II.7	INTERIOR DESIGN REQUIREMENTS	12
II.8	PERMISSIBLE FLOOR FINISHES	12
III.	HEATING SYSTEM DESIGN	12
IV.	INSTALLATION OF AN ELECTRIC HEATING SYSTEM	13
IV.1	TECHNICAL REQUIREMENTS OF THE INSTALLATION ENVIRONMENT	13
IV.1.1	MOISTURE CONTENT OF THE SCREED	14
IV.1.2	HUMIDITY OF ANOTHER TYPE OF INSTALLATION MEDIUM	14
IV.1.3	HUMIDITY	14
IV.1.4	AIR TEMPERATURE	14
IV.2	INSTALLATION OF THERMOREGULATOR	14
IV.2.1	FOUNDATION OF THERMOREGULATOR INSTALLATION BOX	14
IV.2.2	INSTALLATION KIT FOR EXTERNAL (FLOOR) SENSOR	15
IV.3	CLEANING THE FLOOR SURFACE	15
IV.4	INSTALLATION OF INSULATION PAD	15
IV.5	LAYING OF THE HEATING FILM	16
IV.5.1	UNAUTHORISED ACTIVITIES	16
IV.6	ELECTRICAL CONNECTIONS	17
IV.6.1	ELECTRICAL CONNECTIONS - TYPE 1 (HEATING FILM SUPPLY)	17
IV.6.2	ELECTRICAL CONNECTIONS - TYPE 2 (HEATING FILM SUPPLY)	21
IV.7	INSULATION OF ELECTRICAL CONNECTIONS	23
IV.7.1	CONNECTOR INSULATION - TYPE 1	23
IV.7.2	CONNECTOR INSULATION - TYPE 2	25
IV.8	INSULATING THE ENDS OF THE POWER STRIP POCKETS (COPPER STRIPS)	26
IV.9	ELECTRICAL WIRING	28
IV.10	STICKING THE HEATING FILM	28
IV.11	ELECTRICAL MEASUREMENT	29
IV.12	CONNECTION AND INSTALLATION OF THE THERMOREGULATOR	29
IV.13	SYSTEM TEST	30
IV.14	PHOTOGRAPHIC DOCUMENTATION OF THE ARRANGEMENT OF THE FOIL SECTIONS IN THE HEATING ZONE	30
IV.15	LAYING THE VAPOUR BARRIER MEMBRANE	30
IV.16	GROUNDING GRID INSTALLATION INSTRUCTIONS	31
IV.17	LAYING THE FINISHING LAYER - SAFETY RULES	32
V.	INSTALLATION OF WALL/CEILING HEATING	33
VI.	INSTALLATION OF HEATING FILM UNDER MIRROR	34
VII.	COMPLETION OF THE WARRANTY CARD	34
VIII.	SYSTEM START-UP	35
IX.	PROGRAMMING OF THERMOREGULATOR OPERATING PARAMETERS	35
IX.1	THERMOREGULATOR MODE SELECTION	35
IX.2	MANUAL MODE VS. MANUAL MODE	35
IX.3	HISTEREZA	35
IX.4	TEMPERATURE CALIBRATION	36
X.	THE MOST COMMON ERRORS AND HOW TO RECTIFY THEM	36
XI.	CHECKLIST OF STEPS FOR INSTALLING A HEATING SYSTEM	37

I.1 REFERENCES TO STANDARDS

To the extent covered by the provisions of this manual and as regards the parameters of materials used, technological solutions or suggested measurement techniques and methods, the system manufacturer declares compliance with the following provisions of national and European law:

- PN-EN 60335-1:2012 Electrical domestic and similar equipment - Safety in use,
- PN-EN 60335-2-96:2005+A2 2009 Household and similar electrical appliances - Safety - Particular requirements for flexible sheet heating elements for room heating - IDT EN 60335-2-96:2005+A2 2009

Conformity assessment was carried out by the Testing and Attestation Plant "ZETOM" in Katowice Sp. z o.o., documenting this with certificates:

- 80/19/Z of 30.09.2019,
- 81/19/Z of 30.09.2019,
- 90/20/Z of 22.07.2020,
- 91/20/Z of 22.07.2020.

In addition, the system components were assessed in the National Technical Assessment procedure carried out by the Building Research Institute in Warsaw. The manufacturer also declares compliance with the CE standard, which was confirmed by the issuing of a certificate of conformity with the EMC Directive 2004/108/EC on 20.11.2016.

I.2 IMPORTANT INFORMATION AND RESTRICTIONS ON THE INSTALLATION OF HEATING FILM

1. Termofol heating film is installed as a product for underfloor, wall and ceiling heating. Underfloor heating with heating film can be finished using:

- Laminated panels,
- Three-layer glued planks, other planks suitable for underfloor heating, mounted in a floating system - on click,
- Vinyl panels - only on a dedicated underlay from the flooring manufacturer.

Always check the compatibility of your floor with electric underfloor heating.

2. We install the Termofol heating film under the plasterboard. We only install the heating film between the structural frames.

3. Heating carried out with heating film can be used as a primary or secondary means of improving thermal comfort in rooms.

For the main heating system, it is recommended to control the temperature via an air temperature sensor with a floor temperature limitation to a maximum of 29 °C in the utility rooms and 31 °C in the bathrooms.

In the case of auxiliary heating, it is advisable to use a thermoregulator operating in external - floor sensor mode and to programme the heating period during room operation.

4. Each heating system (floor, wall and ceiling) requires an external sensor to limit the operating temperature of the heating film.

5. When using the heating film as the main heat source, make sure that the product power selection is appropriate.

I.3 PROHIBITED ACTIVITIES

1. It is forbidden to install the heating film under a finishing material that requires adhesive to attach it (e.g. glued parquet).

2. Installation on damp ground is prohibited.

3. Overlapping, folding or rolling of the heating film is prohibited.

4. It is forbidden to store heavy or sharp tools on the surface of the heating film.

5. Installation is prohibited when the temperature is below 5°C.

6. The installation of heating film on the outside of the building is prohibited.

7. The installation of heating film on stairs is prohibited.

8. Installation under partition walls, bathtubs, etc. is prohibited.

9. It is prohibited to install the heating film within 15cm of water pipes, fireplaces or gas cookers.

10. It is forbidden to install a three-layer glued plank floor thicker than 18mm.

11. Installation under linoleum, porcelain stoneware, epoxy resin, industrial flooring or carpeting is prohibited.

12. It is forbidden to cut the film in places other than those designated.

13. It is forbidden to install a heating film without a thermoregulator.

14. Thermoregulators without an external (underfloor) sensor are prohibited.

15. The use of an insulating underlay over the heating film is prohibited.

I.4 SECURITY

ATTENTION! Before starting the installation process, please read this manual

The correct execution of the installation of the TERMOFOL heating system in accordance with these instructions is a prerequisite for the safe use of the system and conditions the liability under the manufacturer's guarantee and warranty. In addition, a correctly installed and configured heating system will show durability and meet the expectations of the user both in terms of functional qualities and energy efficiency and performance. Due diligence is a prerequisite for the possible assertion of warranty rights:

- Unpack all materials and equipment in the system, checking for completeness and the absence of visible damage; if any is found, contact the manufacturer,
- The execution of the electrical installation feeding the system and the connection of the electrical devices that make up the system should only be commissioned to a qualified specialist with the appropriate authorisations. In Poland, this will be an electrician holding an SEP licence for electrical installation work up to 1 kV.

The manufacturer is not responsible for damage caused by errors of installation, connection or intentional or unintentional damage to system components.

- Before use, this system should be subjected to the measurements indicated by the manufacturer in this manual. If the results of the measurements show values deviating from those indicated by the manufacturer, the system shall not be used until the source of the fault has been eliminated,
- The TERMOFOL underfloor heating system must be divided into zones corresponding to the number of heated rooms in the building. Each zone must have a type B overcurrent circuit breaker and a residual current circuit breaker. The types of protection are to be selected by an electrical designer or electrician with the appropriate qualifications.
- It is forbidden to install the system in wet rooms, e.g. bathrooms,
- This system is intended for surface heating purposes only and must not be used for other applications,
- The equipment must not be subjected to any alterations or modifications and must not be installed in accordance with the installation instructions.

This appliance may be used by children over 8 years of age and persons with reduced physical, sensory or mental abilities, or lack of experience and knowledge, if they are supervised or instructed in the safe use of the appliance and understand the possible dangers associated with the appliance. Children should not play with the appliance. Cleaning and maintenance should not be carried out by children without supervision.

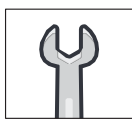
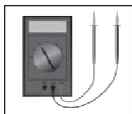
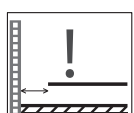
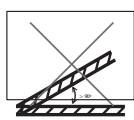
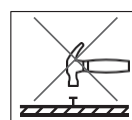
- Children under 3 years of age should be kept away from the appliance unless they are under the constant supervision of a guardian.
- Children from 3 years of age to 8 years of age may only switch the appliance on/off if it has been placed or installed in the designated work area, and provided that they are supervised or follow instructions on how to use the appliance safely and understand the risks involved. Children from the age of 3 to 8 years may not connect, adjust or clean the appliance or carry out conservation work.

In the Republic of Poland, the electrical installation of the TERMOFOL heating system devices, in particular the configuration of the power supply line and the selection of the type and class of overload and overcurrent protection should be carried out by an electrician holding an active SEP licence for electrical installation work up to 1 kV.

The installation of a TERMOFOL heating film system can be carried out by anyone with basic technical knowledge and tools, subject to the electrical connections mentioned in the preceding paragraph. Our heating systems have been designed to be as easy to install as possible. You do not need to have any experience in installing them to do it efficiently and correctly. Thanks to the enclosed instructions, our installation sets allow you to do this yourself. The kits contain everything you need to install your heating system. If, after reading the instructions, you are unable to cope with the installation, use the installation services provided by specialised installation teams serving every location in Poland.

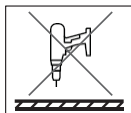
NOTE: IT IS FORBIDDEN TO USE ELEMENTS THAT BLOCK THE TRANSFER OF HEAT INTO THE ROOM. ELEMENTS THAT CAUSE HEAT BLOCKAGE IN THE HEATING SYSTEM ARE CARPETS, FURNITURE WITHOUT LEGS, DOG BEDS OR BAGS, ETC.

■ I.5 EXPLANATION OF SYMBOLS

	Symbol for ceiling heating		Live working		Installation activities
	Wall heating symbol		Cutting only after the designated line		Practical information
	Symbol for underfloor heating		Prohibition of walking directly on the working installation		Control measurements
	Read before installation		Maintain installation clearances		Prohibition of the use of cutting tools during film installation
	Protection class II device - does not require grounding		No bending of the heating film		Prohibition of piercing, drilling of film sections



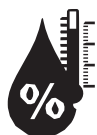
Symbol for anti-fogging mirror system



Prohibition of the use of electro-sive tools in the assembly of the film



Thoroughly clean the surface of the film before installation



Check the surface humidity of the film installation



Use measuring tools when selecting film lengths



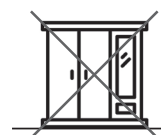
Do not trample the laid film sections



Keep the surface of the laid film sections clean



Interior design elements with clearance to the heating film installation surface



Unacceptable form of permanent installation on the surface of the heating film system

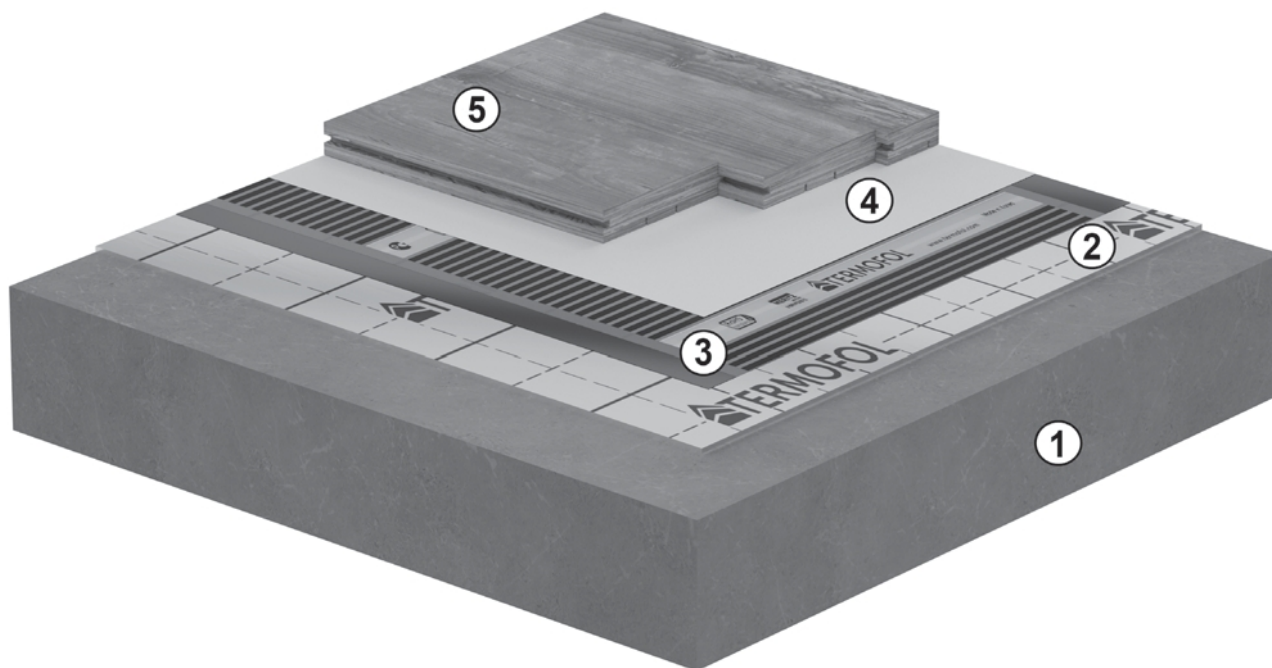


Do not place point loads on the surface of the laid film sections



If in doubt, contact the manufacturer's technical support

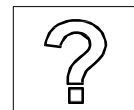
■ I.6 SECTION OF LAYERS



1. Spout - installation surface
2. TERMOFOL insulation underlay
3. TERMOFOL heating foil
4. TERMOFOL vapour barrier membrane
5. Three-ply glue-down floorboard, vinyl panel, laminate panel, etc.



DISCUSSION OF THE HEATING SYSTEM



II.1 SYSTEM COMPONENTS

II.1.1 HEATING FOIL

Heating foils are a modern solution in the area of heating systems. The heat emission process works on the principle of infrared production, making heating more efficient. The heating film is in fact a flexible radiator. It is made of the highest quality carbon with specific properties and a mass of silver. The individual materials are applied in layers using printing technology. It is these layers that are responsible for the emission of infrared rays.

The base of the heating film is PET film. It is characterised by its high resistance to mechanical damage, abrasion, isolation and fire resistance, making the entire system very safe. The carbon heating elements are powered by copper strips to which we connect the mains supply. The graphite strips emit sub-red heat over their entire surface.

You will find a wide variety of heating film models in our range, differing mainly in power - from 60 W/m² up to 400 W/m².

The table below shows the principle of matching the appropriate film strength to the insulation of the building.

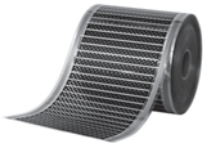
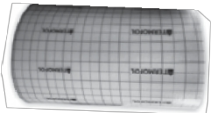


Building insulation	60W/m ²	80W/m ²	140W/m ²	220W/m ²
Weak	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED	ADVISED
Average	NOT ALLOWED	NOT PERMITTED	ADVISED	ADVISED
Good	NOT PERMITTED	ADVISED	ADVISED	ADVISED
Very good	ADVISED	ADVISED	ADVISED	ADVISED

The 12 V DC-powered foil is ideal for heating caravans, chalets where we do not have access to the mains. We can connect this system to the battery or directly to the car's mains electricity supply.

Model	Width	Thickness	Power/m. b	Power/m ²	Length on roll	Roll weight	Maximum temperature	Max. installation length of film strip	Voltage
TF-3025T	25cm	0.338mm	55W	220W	150m	19kg	55 °C	21 m.b.	AC230V
TF-305T	50cm	0.338mm	110W	220W	150m	39kg	55 °C	11 m.b.	AC230V
TF-310T	100cm	0.338mm	220W	220W	100m	49kg	55 °C	5.5 m.b.	AC230V
TF-3025TL	25cm	0.338mm	35W	140W	150m	19kg	42 °C	34 m.b.	AC230V
TF-305TL	50cm	0.338mm	70W	140W	150m	39kg	42 °C	17 m.b.	AC230V
TF-310TL	100cm	0.338mm	140W	140W	100m	49kg	42 °C	8.5 m.b.	AC230V
TF-3025TT	25cm	0.338mm	20W	80W	150m	19kg	32° C	60 m.b.	AC230V
TF-305TT	50cm	0.338mm	40W	80W	150m	39kg	32 °C	30 m.b.	AC230V
TF-310TT	100cm	0.338mm	80W	80W	100m	49kg	32 °C	16 m.b.	AC230V
TF-3025TH	25cm	0.338mm	15W	60W	150m	29kg	29 °C	80 m.b.	AC230V
TF-305TH	50cm	0.338mm	30W	60W	150m	39kg	29 °C	40 m.b.	AC230V
TF-310TH	100cm	0.338mm	60W	60W	100m	49kg	29 °C	20 m.b.	AC230V
TF-305ET	50cm	0.338mm	200W	400W	150m	38kg	75 °C	6 m.b.	AC230V
TF-303DC12V	30cm	0.338mm	67W	220W	150m	23kg	55 °C	1.5 m.b.	DC12V

II.1.2 INSTALLATION MATERIALS

N	NAME	SPECIFICATION	APPLICATION	PHOTO
1	Heating foil	Power: 60 to 400W/m ² Width: 25/50/100cm Power supply: 230V AC, 50 Hz	Surface heating	
2	Insulating underlay	Thickness: 3/5mm Width: 100cm	Thermal insulation of the substrate	
3	Vapour barrier film	Width: 200cm Thickness: +/- 0.2mm	Protection against moisture (condensation)	
4	Peszel	Diameter: 14/11mm	Protection of electrical cables and temperature sensor against mechanical damage	
5	Installation box	Size: Diameter 60mm	Installation location of the thermoregulator	
6	Crimp Connector Type 1 - Mesh	Material: Galvanised copper	The professional way to connect the heating film to the installation pipe	
7	Eyelet connector rivet	Material: Galvanised copper	The professional way to connect the heating film to the installation pipe	
8	Crocodile clip type 2 - Crocodile Clip	Material: Galvanised copper	Connection of the heating foil and the electrical cable	
9	Supply lines	Type: Lgy 450/750 V - cable Diameter: 2.5mm ²	Electrical cable for making electrical connections	
10	Mounting tape	Width: 50mm Length per roll: 66m.b.	Bonding of the insulation base, the heating film and the vapour-proof membrane	
11	Self-amalgamating tape	Width: 50mm Length per roll: 20m.b. Thickness: 0.76mm	Insulation of electrical connections of the heating film with cable and heating film end	
12	Thermoregulator	Power supply: 110/230V Load max: 16A Temperature control type: IN - Air, OUT - Floor, ALL - Air with floor limitation	Room and floor temperature control	

II.2 INSTALLATION TOOLS REQUIRED

1	Clamping pliers	Crimping of type 1 and type 2 connectors	
2	Punching machine	Making holes in the heating film - only required in Type 1 connection	
3	Stripping pliers	Isolation of electrical cables	
4	Scissors	Heating film cutting	
5	Screwdriver	Installation of the thermoregulator	
6	Hoover	Cleaning up the installation site	
7	Measuring tape	Site survey	
8	Universal meter	Voltage [V] and resistance [Ω] measurement	
9	Pyrometer	Temperature measurement of the heating surface	
10	Hygrometer	Measuring the moisture content of a screed	
11	Protective gloves		

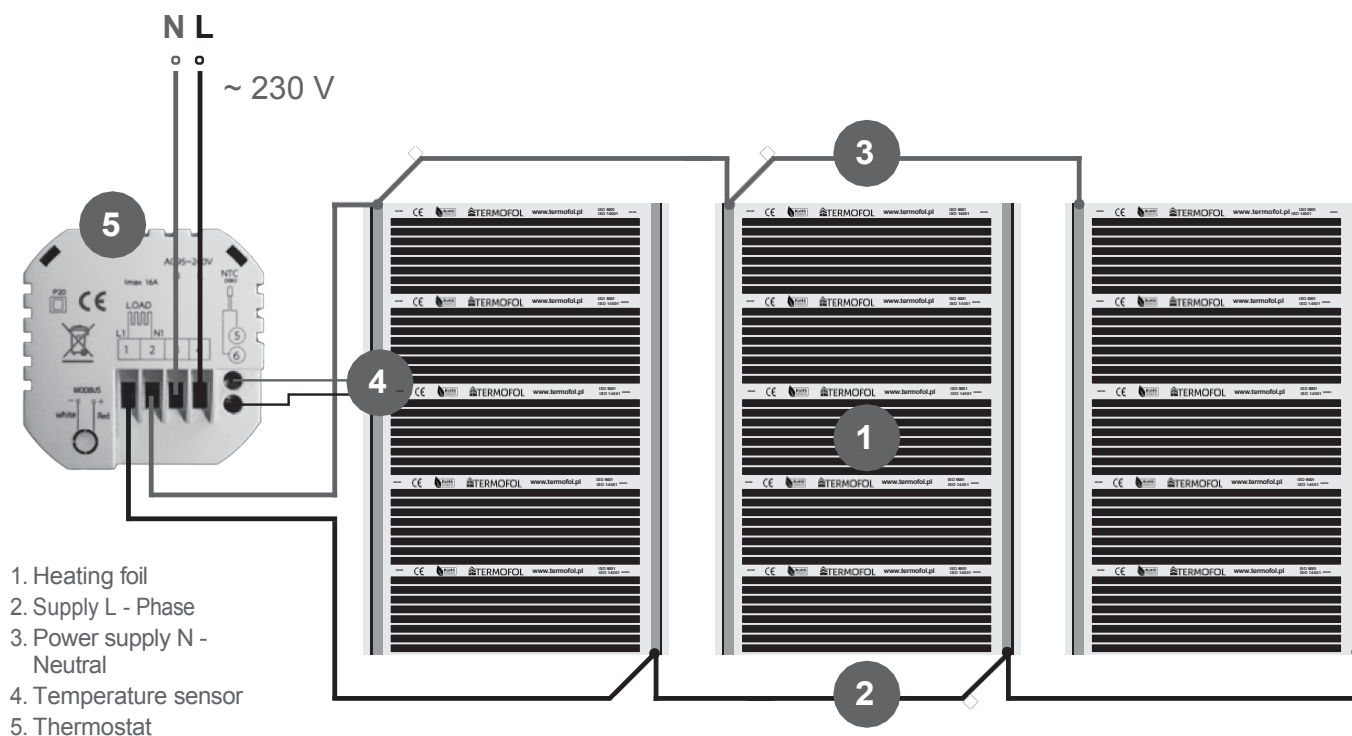
II.3 SYSTEM WIRING DIAGRAM



II.3.1 TYPE A

The installation diagram used for the installation of underfloor heating is characterised by the absence of crossing wires, which is undesirable when finishing the floor with floor panels.

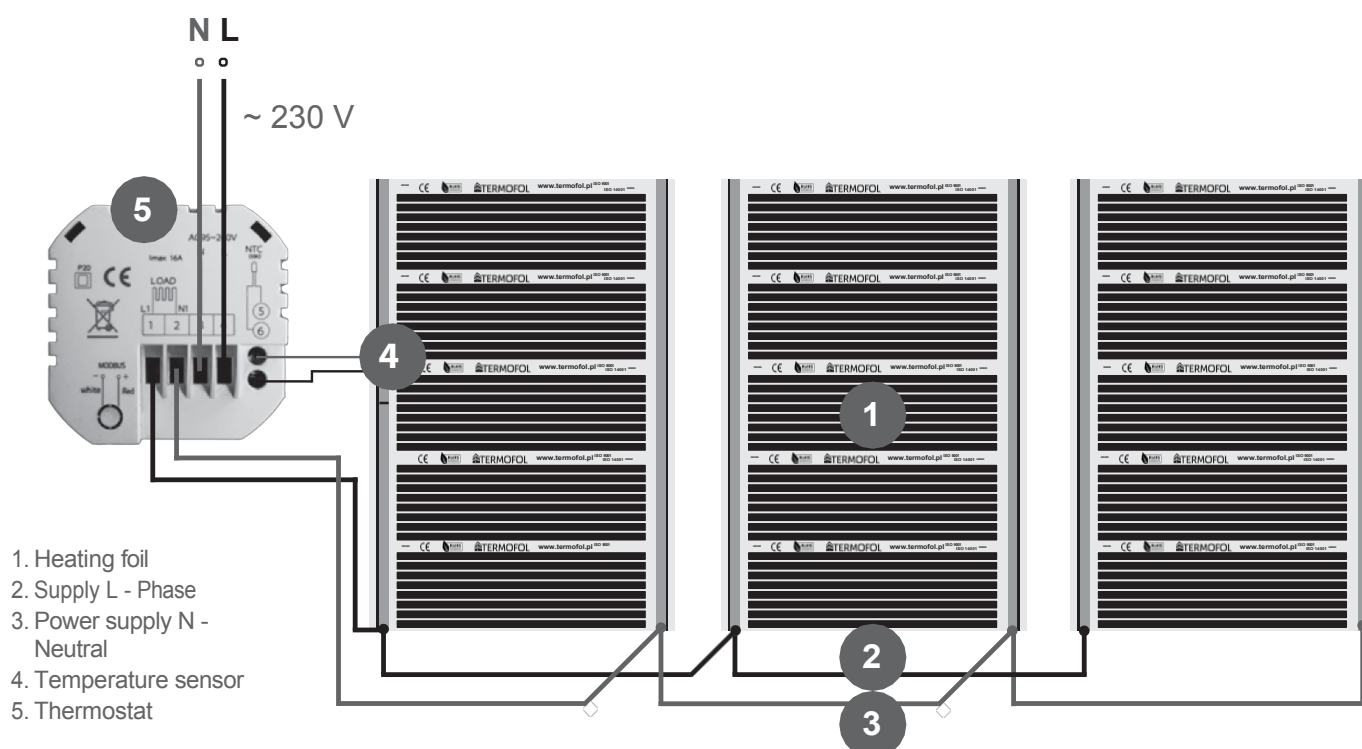
Manufacturer's suggested configuration of the heating system installed in the floor.



The wires do not cross and do not provide a point of support for the floor panels and barlinek boards. Conductors hidden in the insulation underlay layer (underlay min. 3mm). Scheme recommended for underfloor heating.

II.3.2 TYPE B

Installation diagram used for wall and ceiling heating installation.



II.4 SUPPLY SYSTEM REQUIREMENTS



The power supply to the heating system via a connection to a specific thermoregulator should be provided via a cable with adequate current-carrying capacity.

For the purpose of verifying the load capacity of the feeder cables, a calculation should be made of the planned total installed power in the zone.

-section of the heating film using the following formula:

$$P_c = P_f \times D_f$$

Where
:

P_c [W] - total electric power of the installed heating film for the given section - electric circuit P_f [W/m^2] - nominal electric power consumption of the installed heating film per m^2

D_f [m^2] - total area of the installed heating film in the given section

The maximum current in Ydy type power supply cables should not exceed, for cables laid under plaster and PVC installation ducts, a value of 10-12 Amperes per mm^2 of cable cross-section. Approximate load capacities for these types of supply cables depending on the cross-section of the cable and the maximum values of the connected heating installation are shown in the following table.

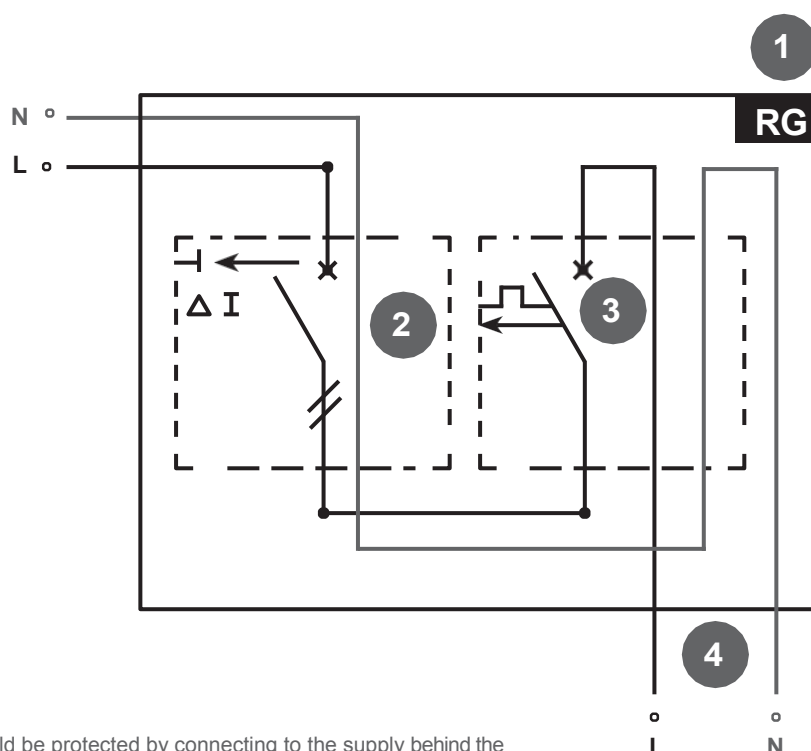
Supply conductor cross-sectional area [mm^2].	Maximum permissible current carrying capacity [A]	Maximum electrical output of the connected heating system [kW].	Comments
1,5	15÷18	4,16	*contactor
2,5	25÷30	6,90	*contactor
4,0	40÷48	11,00	*contactor

If the total power of the heating section to be connected via a single thermoregulator exceeds the value of 3kW, it is necessary to use a contactor in the control circuit.

II.5 ELECTRICAL DIAGRAM OF THE MAIN SWITCHBOARD FOR 1 HEATING ZONE

1. Main electrical installation switchboard
2. Installation earth leakage circuit breaker electric
3. Section circuit breaker heating installation
4. Heating installation section circuit feed line

A properly constructed feeder line should include dedicated overcurrent protection installed in the main switchgear that is adequate in value to the capacity of the protected section of the heating system.



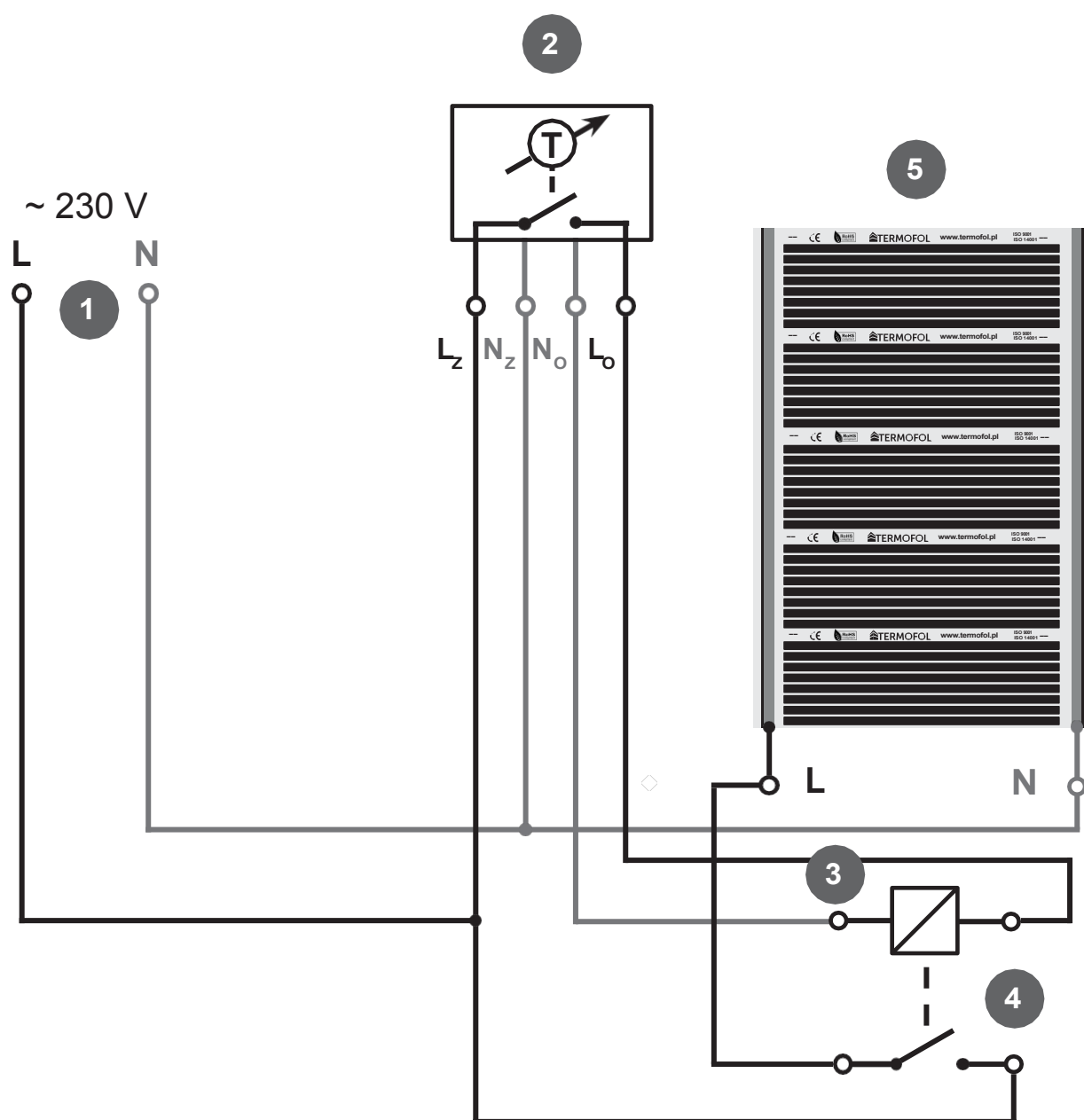
In addition, all circuits - sections of the heating system should be protected by connecting to the supply behind the via an earth leakage circuit breaker with a residual current of up to 30 mA.

With regard to heating film installations implemented as wall or ceiling heating, it is necessary to run a PE protective conductor for the purpose of earthing metal supporting structure components such as frames, crossbars, etc.

If the heating capacity to be installed exceeds the direct control capability of a single thermoregulator, indirect control using a contactor is required.

It must also be remembered that in such a situation, it is necessary to take into account changes in the electrical installation (wiring) between the place of installation of the thermoregulator controlling the given heating zone and the supply point and the heating foil itself. Of course, it is also necessary to take the higher load into account in the selection of the cross-section of the supply and connection wires and the location of the contactor itself. The contactors to be used should be single-phase AC contactors, designed for continuous operation, with adequate load-carrying capacity for the operating contacts, with silent suppression chambers and a control coil for 230V AC. Auxiliary control contacts are not required.

An example of the electrical connections of a system using indirect power supply control of a heating film system using a contactor is shown in the figure below.



1. Supply line
2. Thermoregulator (L_z/N_z - supply of thermoregulator,
 L_o/N_o - supply of receiver (heating film))
3. Contactor control coil
4. Contactor operating contacts
5. Receiver (heating film)

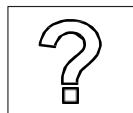
II.6 RESTRICTIONS ON USE



The Termofol heating system based on heating films is not used in the following cases:

- installation in the form of an accumulation system - under screeds, ceramic floors, etc.
- installation in rooms with high humidity, e.g. bathrooms, bathing rooms, laundry rooms, industrial rooms - regardless of the form of the heating system, whether as an accumulation system or direct system under three-layer glued board floors, laminate and vinyl panels, etc.
- installation in environments where the heating system is exposed to corrosive or oxidising chemicals.

II.7 INTERIOR DESIGN REQUIREMENTS



Surfaces under which heating films have been installed must not be:

- covered by fixed built-in elements without ensuring a minimum clearance of 35 mm between the floor surface and the lower surface of the built-in object (e.g. bottom of wardrobe, bed, etc.),
- covered with heat-insulating furnishings, e.g. thick carpets, carpets with poor air permeability, e.g. with a rubberised backing. Carpets must be suitable for underfloor heating.
- exposed to flooding from water and other electrically conductive liquids,
- exposed to mechanical impacts that deform the surface of the floor or other installation surface,
- exposed to damage to the structure as a result of drilling, installation studs,
- exposed to chemically active agents with a pronounced acidic or alkaline reaction.



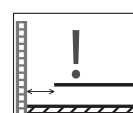
II.8 ACCEPTABLE FLOOR FINISHES

Before starting work, make sure that the finishing layer of the floor is suitable for underfloor heating. Most floors available on the market are suitable for the installation of heating films. We do not recommend the use of the following floors: laminate, vinyl, three-layer glued plank with a thickness greater than 18mm. For wooden floors, the thermal resistance should not exceed $0.15 \text{ [m}^2\text{K/W]}$.

The direct underfloor heating system relies on the location of the heating film under the floors in order to quickly reach a regulated temperature depending on the user's needs. Unproductive use of heat energy is avoided here. A major advantage of the system is the thickness of the heating film itself, which is less than one millimetre - it can therefore be easily placed under the floor without any aesthetic or spatial disadvantages. It remains invisible to the user. In doing so, the system eliminates the need for traditional, protruding radiators. To install the foil under existing panels, the panels must first be removed, the foil laid and the panels themselves reinstalled. The film can be installed under any type of panel as it is neutral in terms of its effect on the characteristics and functionality of the material under which it is installed. Such cladding is most commonly found in living spaces. The low purchase price, the variety of colours available and the simple installation are the main strengths of this solution.

Laminate panels can easily be used at the same time to implement a system working with infrared heating film. As a rule, the panels are then installed in a floating system with a so-called "locking" system. This makes it possible to practically install the heating film over the entire surface in a room (so-called surface heating). In this way, the user is able to achieve a constant and even temperature distribution in the room, which is not insignificant for improving his/her living comfort. The heating film is therefore successfully dedicated under laminate floor panels. The underfloor heating film is installed over the entire surface of the room, with the exception of the fixed construction area, which includes various types of furniture without feet, which are directly adjacent to the floor and therefore prevent the free escape of heat.

III SYSTEM DESIGN HEATING



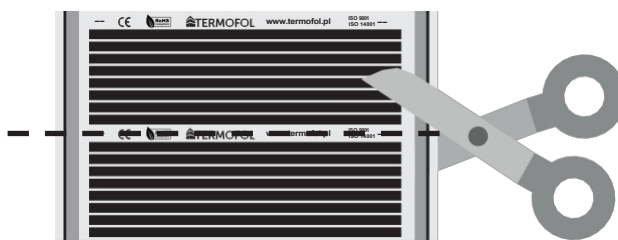
When planning the distribution of the heating film sections in a given zone-room, the following rules should be followed:

- we use a 1 m wide heating film to cover the heated area as far as possible,
- additions are made with 0.5 and 0.25 m wide sections of heating film,
- we avoid areas intended for permanent installation,
- do not install the heating film in safety zones, see section II.6 of this manual,
- along the contour of the installation surface, plan a minimum distance of 10 cm from walls, columns, joists, other structural elements and fixed building elements,
- We aim to achieve a minimum of 70% coverage of the heated area with the heating film,

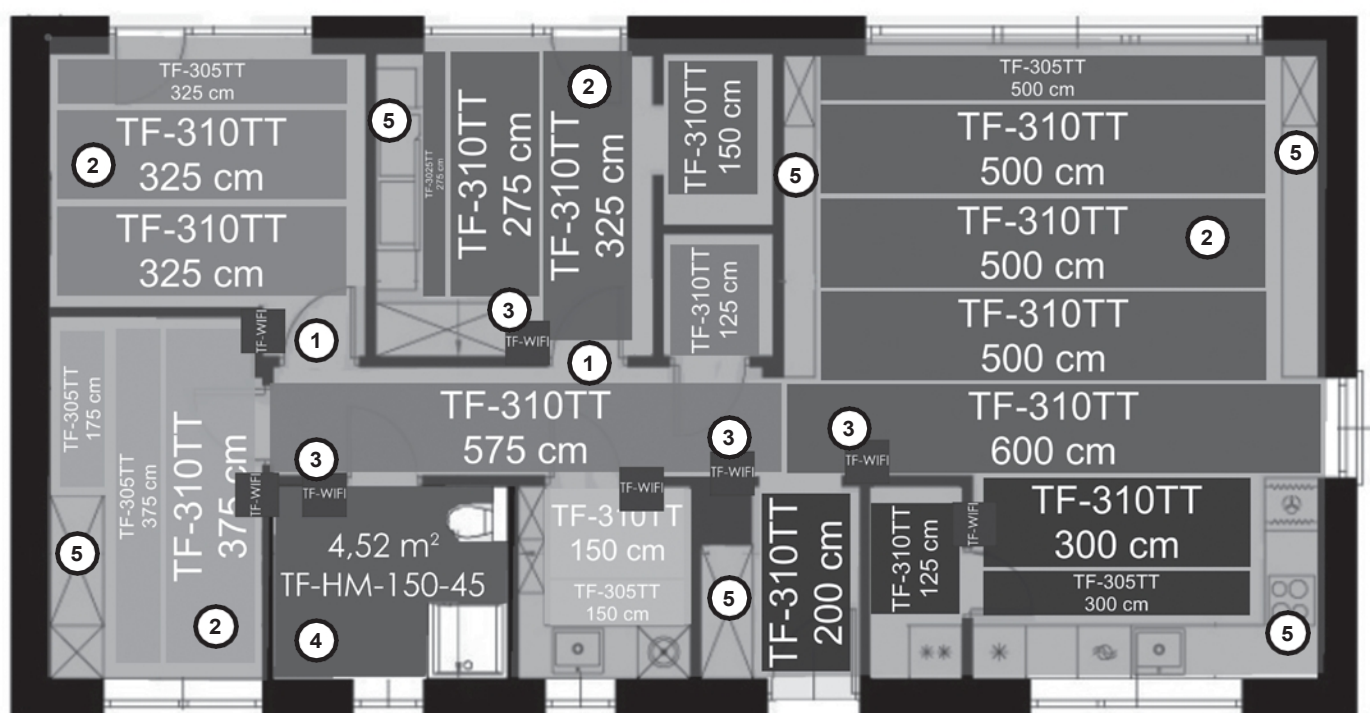
At the same time, a limitation on the maximum length of the heating film strips must be taken into account when planning the layout of the strips due to the cross-section and load capacity of the supply strips, which are a non-replaceable element of the heating film. The permissible lengths of a single heating film strip can be found in the specifications.

It is also important to take into account, when cutting the lengths, that they may only be cut along the marked cutting lines as printed on the heating film. Cut with scissors!

It is also necessary to ensure that the foil sections are parallel to each other and that there is a space between the heating foil strips themselves. The heating foil should not be laid overlapping or on top of each other. The spacing between the heating film strips should be from 1 to 3 cm.



Below are examples of the typical layout of heating film sections for an underfloor heating system.



- ① Insulating underlay installation
- ② Heating foil
- ③ Thermostat
- ④ Heating mat
- ⑤ Fixed

The design of the heating system is free of charge, if you are interested use the form available on the Termofol website: www.termofol.pl/kontakt/.

IV INSTALLATION OF AN ELECTRIC HEATING SYSTEM



■ N.1 TECHNICAL REQUIREMENTS OF THE INSTALLATION ENVIRONMENT

The Regulation of the Minister of Infrastructure and Construction on the technical conditions to be met by buildings and their location [DZ.U. of 7 June 2019, item 1065], together with reference standards, is the basic normative act that also regulates the installation process of heating systems based on heating films.

The following is a selection of the most important ambient parameters that should be met for the correct installation of a heating system based on TERMOFOL heating film. Their fulfilment also determines the possible liability under warranty and guarantee from the manufacturer.

In addition, the Building Act of 07.07.1994 applies with regard to the conditions for electric heating. - Building Law. J.t.: Journal of Laws of 2000, No. 106 item 1126 as amended, and the Act of 10.04.1997. - Energy law. Journal of Laws No. 54, item 348, as amended.

M.1.1 MOISTURE CONTENT OF THE SCREED

For the installation of wooden and laminate flooring, the moisture content of the sub-floor must be less than 2.5 % for cement-bound screed and less than 1.5 % for anhydrite-bound screed. For installation with underfloor heating, these values must be 1.5 % and 0.3 % respectively.

M.1.2 HUMIDITY OF ANOTHER TYPE OF INSTALLATION MEDIUM

When installing the TERMOFOL heating system on surfaces other than the screed, it must be assumed that the surface humidity of the installation should not exceed 2.5%. The values refer to measurements taken with an electronic hygrometer.

M.1.3 HUMIDITY

The manufacturer requires that the installation be carried out in conditions that do not lead to moisture in the system components. Particularly unfavourable is the combination of high relative air humidity and relatively low temperature, favouring condensation on system components. The recommended relative humidity at the installation site should be between 20% and 60%. An acceptable method of measurement will be the use of generally available weather stations for domestic use or an airborne hygrometer.

M.1.4 AIR TEMPERATURE

The air temperature in the room of installation of the heating system with the use of TERMOFOL heating films should be high enough so as not to lead to a significant increase in the rigidity of the construction material of the heating film, as this makes installation more difficult and may lead, when bending, to the formation of micro-damage which, during the operation of the system, may increase its area and lead to a decrease in the insulation resistance of the film section. In addition, the low temperature also reduces the viscosity properties of the self-amalgamating tape, which can also lead to a reduction in the insulation resistance parameters of the entire heating system, with an earth fault resulting in an inability to start up the system. The recommended installation temperature should be between 5 and 25 degrees C.

■ M2 INSTALLATION OF THERMOREGULATOR



When planning the location of the thermoregulator, it should be remembered that its location also defines the location of the power supply line, the connecting wires of the heating installation, the location of the box and the grooves for protective conduits. Collisions with other tele-technical installations, water and sanitary installations etc. must therefore be avoided. At the same time, it is necessary to ensure that the room air temperature can be measured by the thermoregulator without being adversely affected by naturally occurring or mechanically induced air currents. It is therefore inadvisable to plan the installation of a thermoregulator close to window or door openings, close to other heat sources in the room (e.g. fireplaces, cookers, gas fires, ventilation vents or exhausts, etc.).

M2.1 FOUNDATION OF THERMOREGULATOR INSTALLATION BOX

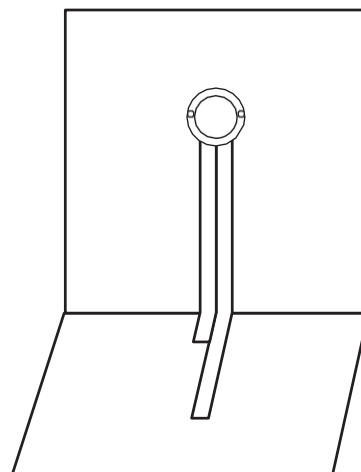
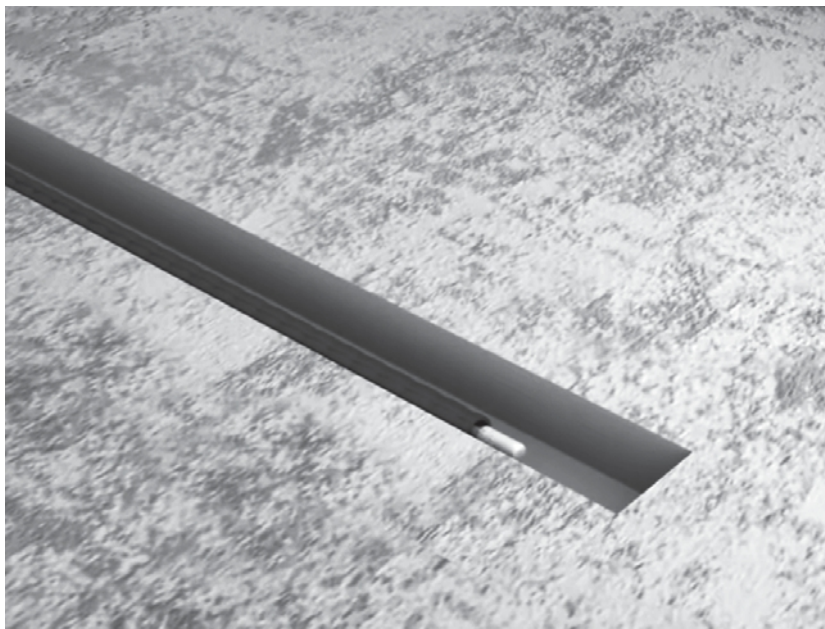
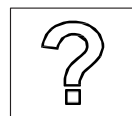
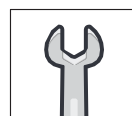
The hole for installation of a thermoregulator installation box is made with the use of a hole saw, diameter 65-67 mm, at a depth ensuring that the box is seated in such a way that its edges do not protrude from the hole above the plane of the wall, at the height of 120-140 cm from the target floor level. Into the box, there are introduced the heating system feed pipes and the external sensor pipe from below, and the heating system feed line from above. If the indirect control variant with contactor is used, an additional supply line must be provided.



V22 INSTALLATION OF THE EXTERNAL SENSOR INSTALLATION KIT

With regard to the external temperature sensor, when planning its location, we are initially limited by the length of the connection cable, the significant extension of which may affect the accuracy of the measurement (resistance sensor) no less, it should be remembered here that:

- the sensor itself is permanently positioned directly under the surface of the heating film,
- the mounting of the sensor is durable enough to ensure that it cannot be displaced, e.g. during the installation of the floor covering (laying of panels).



We make the necessary vertical furrow in the wall - the place of installation of the thermo-regulator, and the horizontal furrow at a distance of at least 30 cm from the vertical furrow for routing of the external sensor of the thermo-regulator and the introduction of the heating foil supply cables. The width and depth of the vertical groove must allow for the installation of 2 side-by-side, flush-mounted conduits, while the horizontal groove in the floor must allow for one conduit to be completely concealed in the subfloor/ floor screed material.

The protective tube must not extend above floor level, the end of the tube must be plugged.

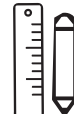
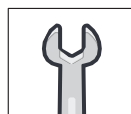
Precise and accurate positioning of the external temperature sensor is of key importance to the proper operation of the system and the protection of the external heating surface against the possible effects of overheating of the surface, especially with regard to higher wattage heating films (60, 80, 140, 220, 400 W/m²). Incorrect installation of an external temperature sensor may lead to damage (overheating) of both the foil itself and the heating surface (e.g. laminate panels) and, as a result, expose the user to the possibility of asserting warranty rights with regard to these heating system components.

■ V3 CLEANING THE FLOOR SURFACE



Clean the surface of the installation that, all elements that could damage the insulation base, the heating film or the insulation of the supply and connection pipes - connecting sections of the heating film. The substrate should be even, flat and dry. If there are any irregularities, they should be levelled. If levelling is not possible or very labour-intensive, use cement-based levelling compounds or ready-made self-levelling screeds to level the surface. Bear in mind the moisture content. For cement screed, the moisture content of the substrate must be less than 1.5% and for anhydrite screed less than 0.3%. After all operations to adjust the surface for installation have been completed, the entire surface should be vacuumed very thoroughly.

■ V4 INSTALLATION OF INSULATION PAD



Roll out the insulation underlay with the silver side down, covering the entire floor surface in the room. Try to use as many sections as possible while maintaining the full width of the insulation underlay. Cut the insulation underlay along the cutting lines. Glue the individual strips of underlay together. Glue them together butt jointly (not overlapping), ensuring that the neighbouring pieces of underlay are parallel. Avoid any gaps between the insulation pads. At the site of the installed outdoor sensor, make a cut and groove. The insulation pad must not cover the outer sensor.



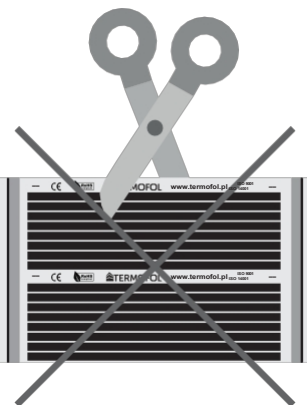
■ V.5 LAYING OF THE HEATING FILM

Lay the heating film strips on the plane of the insulation underlay. Remember to ensure that adjacent strips of heating film are spaced and parallel. Use 1 metre wide film sections as far as possible, supplementing with 0.5 or 0.25 metre wide sections. Remember to keep a minimum 10 cm distance from walls of excluded spaces, columns and other structural elements. Do not install the foil under fixed building elements or in exclusion zones.

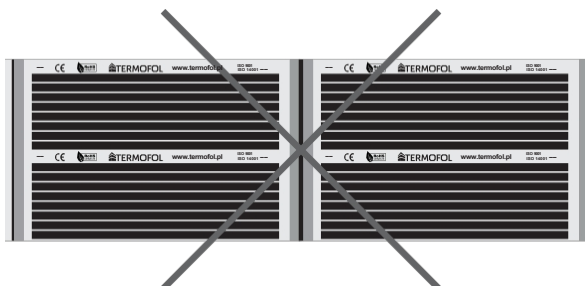


V.5.1 UNAUTHORISED ACTIVITIES

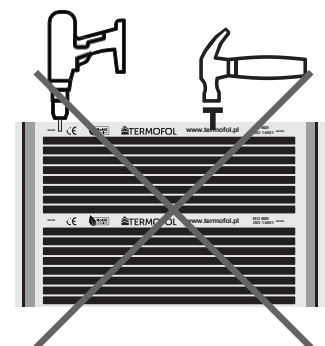
Prohibition of slitting



No overlapping of the film



Prohibition of punctures



■ IV.6 ELECTRICAL CONNECTIONS

IV.6.1 EXECUTION OF ELECTRICAL CONNECTIONS - TYPE 1



1

To make the electrical connections of the heating film sections, prepare a type 1 coil connection kit.



2

Slide the eyelet connector onto the stripped end of the LGy cable so that the cable insulation touches the end of the connector.



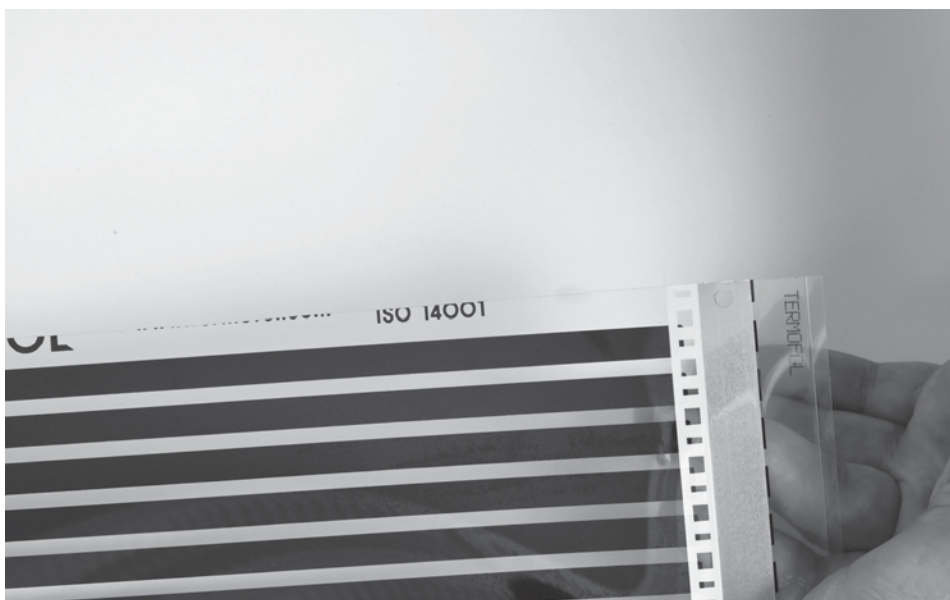
3

Use the crimping pliers to crimp the end of the connector onto the cable.



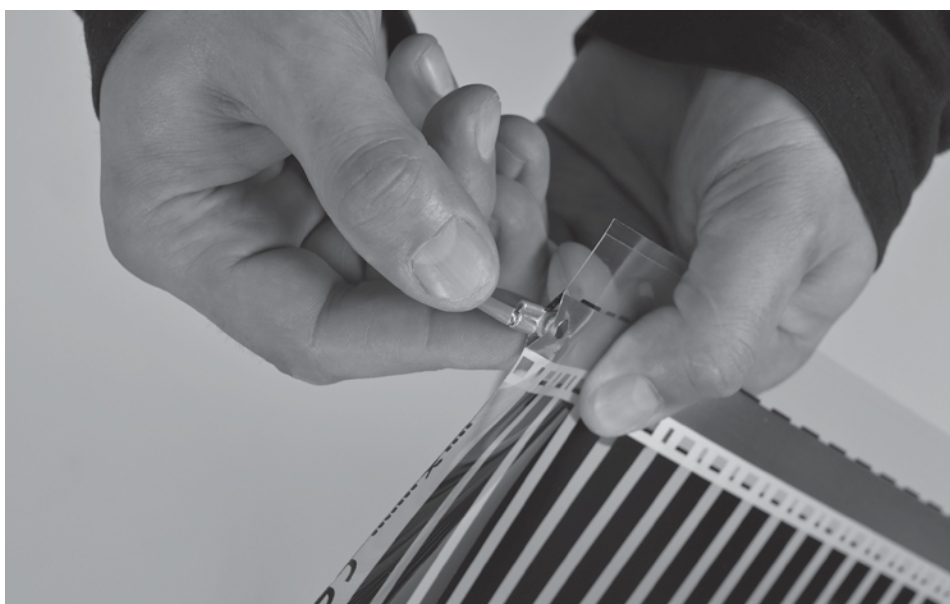
4

Make a hole in the power strip using a hole punch.



5

The hole should be positioned in the middle of the width of the feed lane and at least 2-3mm from its edge.



6

Slide the eyelet end of the connector under the copper power strip in the heating film pocket.



7

Place the connector so that the hole in the foil and the connector are in a coaxial position.



8

Prepare the head of the eye rivet.



9

Insert the head of the rivet into the hole from the bottom plane of the film.



10

Prepare the rivet ring and place it on the tip of the rivet head protruding above the hole.



11

Tighten the rivet with crimping pliers.



12

A proper connection should sit flush with the film feed strip and be tight enough to prevent the connector from rotating in the axis of the hole.

IV.6.2 MAKING ELECTRICAL CONNECTIONS - TYPE 2



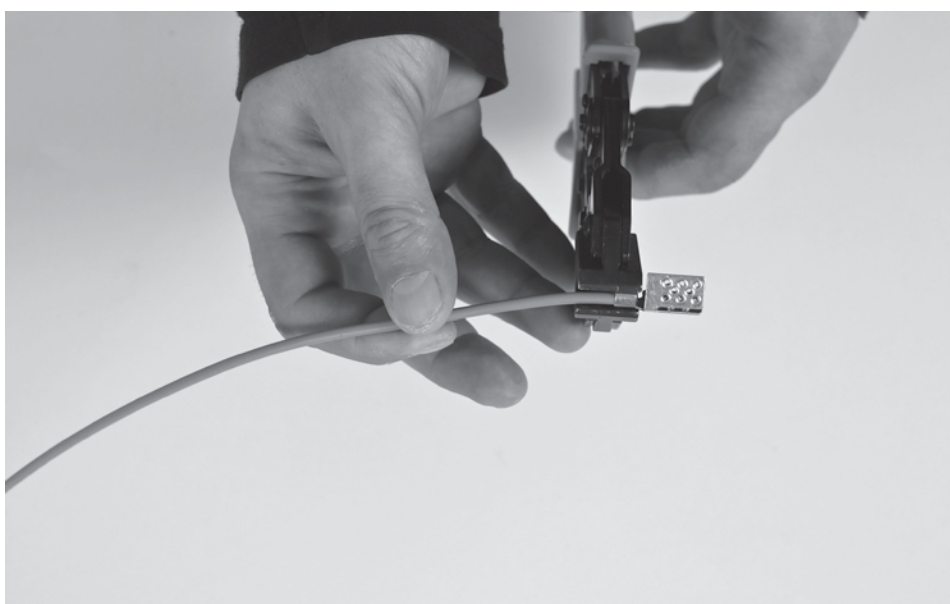
1

To make the electrical connections of the film sections, prepare a type 2 connector connection kit.



2

Slide the eyelet connector onto the stripped end of the LGy cable so that the cable insulation touches the end of the connector.



3

Use the crimping pliers to crimp the end of the connector onto the cable.



4

Slide the lower connector sheet into the foil pocket under the plane of the power strip.



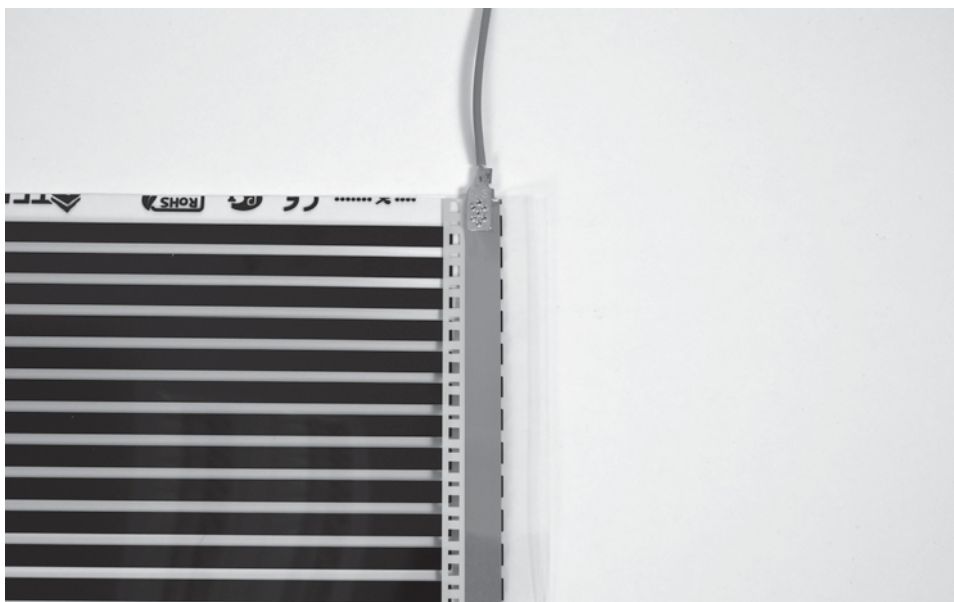
5

The depth of insertion of the connector into the pocket is limited by the connector notch.



6

Crimp the connector using crimping pliers.



7

A correctly made connection should have the full width of the connector in contact with the plane of the feed lane and show no play.

■ IV.7 INSULATION OF ELECTRICAL CONNECTIONS

IV.7.1 CONNECTOR INSULATION - TYPE 1



1

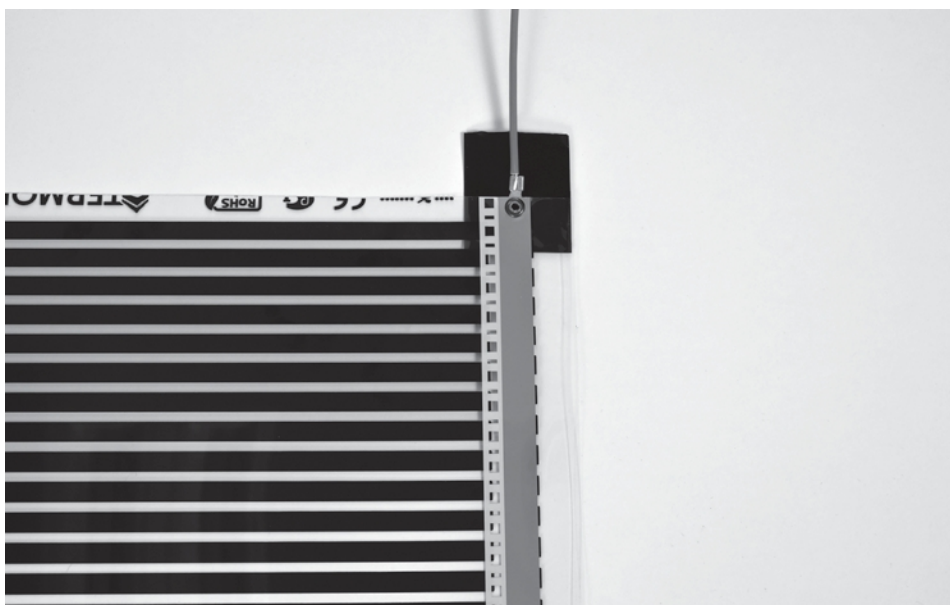
To insulate the electrical connections of the film sections, prepare a strip of self-vulcanising tape.

Cut two equal lengths of self-amalgamating tape for each insulated connection. Select the length of the strips so that there is at least a 10 mm allowance above the crimp point of the Type 1 connector and the crimped end of the connector.



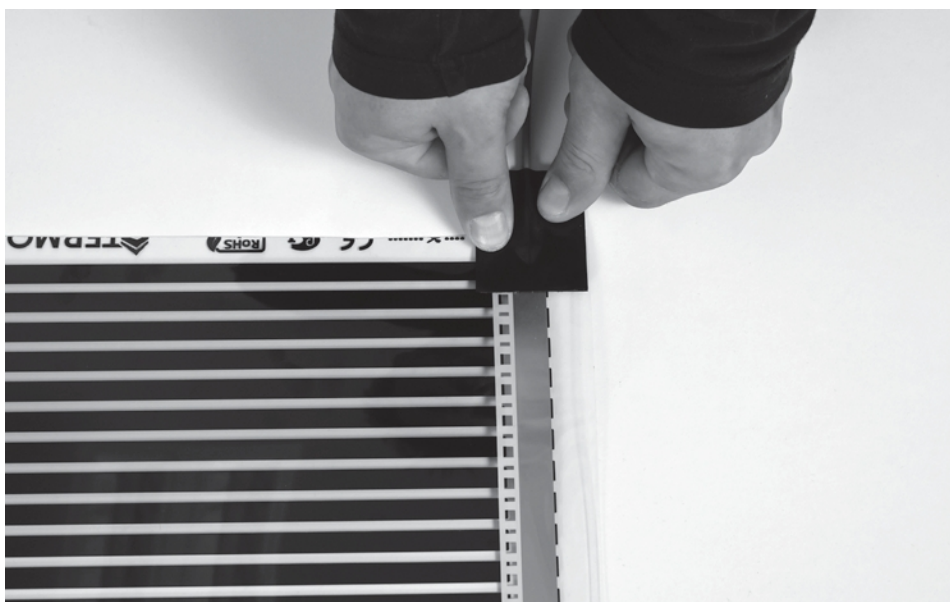
2

Peel off the protective paper from the self-amalgamating tape. Try not to touch the adhesive layer, in order to avoid contamination of the self-amalgamating tape, which may weaken its insulating properties. Also ensure that the adhesive area on the surface of the heating film and the cable and connector is clean and degreased. If necessary, use extraction gasoline to degrease the contact area of foil, connector and cable with self-amalgamating tape.



3

Place the self-amalgamating tape strip under the heating film in such a way that the symmetry axis of the film pocket is aligned with the symmetry axis of the self-amalgamating tape strip to ensure sufficient overlap beyond the pocket width to guarantee a tight connection. Push the foil, connector and cable onto the self-amalgamating tape section in such a way that it cannot move when the top strip of self-amalgamating foil is laid.



4

Place the self-amalgamating tape strip on the upper surface of the heating film in such a way that the contours of the two strips of self-amalgamating tape (upper and lower) overlap as much as possible. Press the two sections against the foil, the connector and the cable and carefully glue the overlaps of the foil, the connector and the cable together.



5

Properly applied insulation must not contain any air bubbles between the self-amalgamating tape strips, and the edges of the self-amalgamating tape sections must be carefully glued to each other and to the heating film around their entire circumference. In the case of low ambient temperature and high tape stiffness, heat up the bonding area, e.g. with a hairdryer, to achieve a tape temperature of 20-30 degrees Celsius, and apply pressure again.

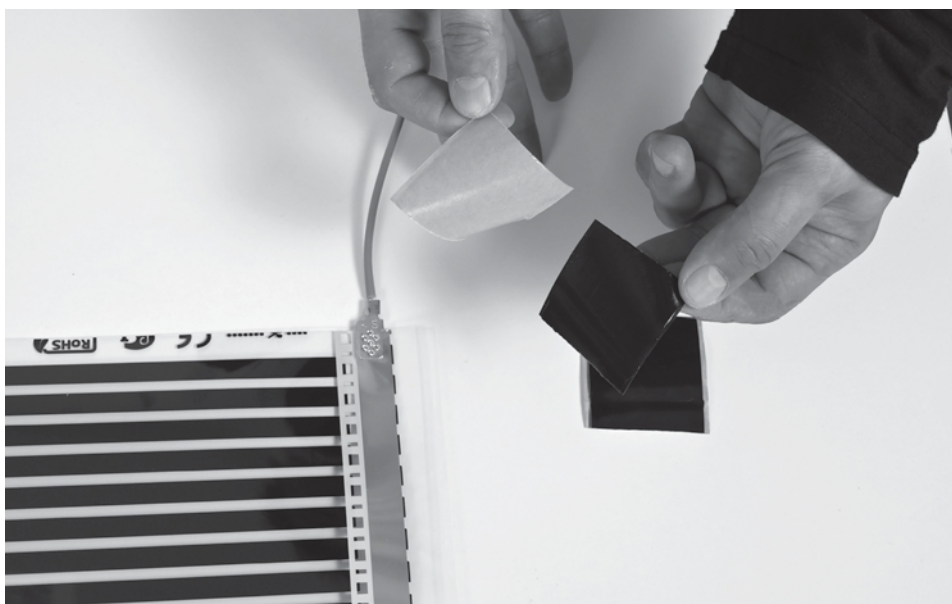
V.7.2 CONNECTOR INSULATION - TYPE 2



1

To insulate the electrical connections of the film sections, prepare a strip of self-vulcanising tape.

Cut two equal lengths of self-amalgamating tape for each insulated connection. Select the length of the strips so that there is at least a 10 mm allowance above the crimp point of the Type 2 connector and the crimped end of the connector.



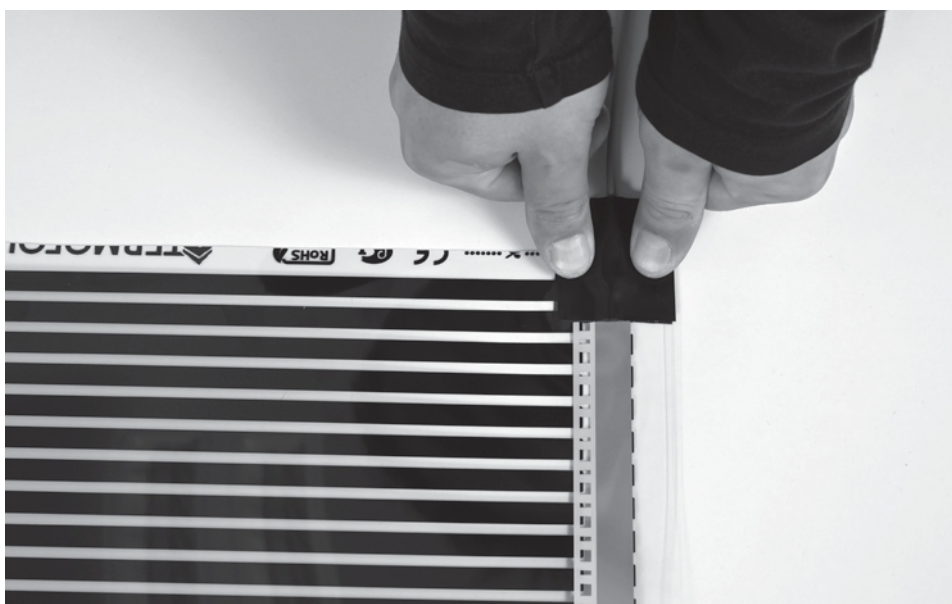
2

Peel off the protective paper from the self-amalgamating tape. Try not to touch the adhesive layer, in order to avoid contamination of the self-amalgamating tape, which may weaken its insulating properties. Also ensure that the adhesive area on the surface of the heating film and the cable and connector is clean and degreased. If necessary, use extraction gasoline to degrease the contact area of foil, connector and cable with self-amalgamating tape.



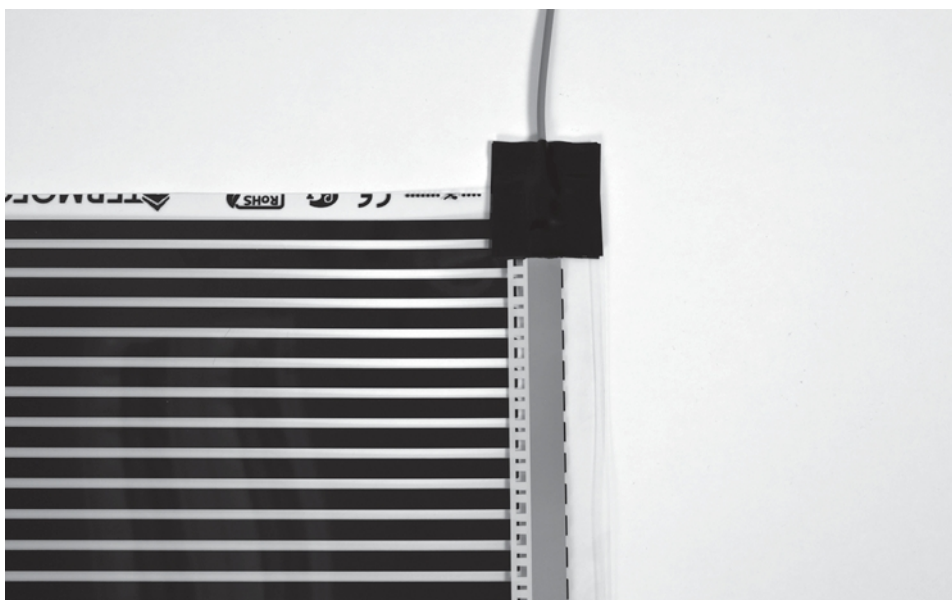
3

Place the self-amalgamating tape strip under the heating film in such a way that the symmetry axis of the film pocket is aligned with the symmetry axis of the self-amalgamating tape strip to ensure sufficient overlap beyond the pocket width to guarantee a tight connection. Push the foil, connector and cable onto the self-amalgamating tape section in such a way that it cannot move when the top strip of self-amalgamating foil is laid.



4

Place the self-amalgamating tape strip on the upper surface of the heating film in such a way that the contours of the two strips of self-amalgamating tape (upper and lower) overlap as much as possible. Press the two sections against the foil, the connector and the cable and carefully glue the overlaps of the foil, the connector and the cable together.



5

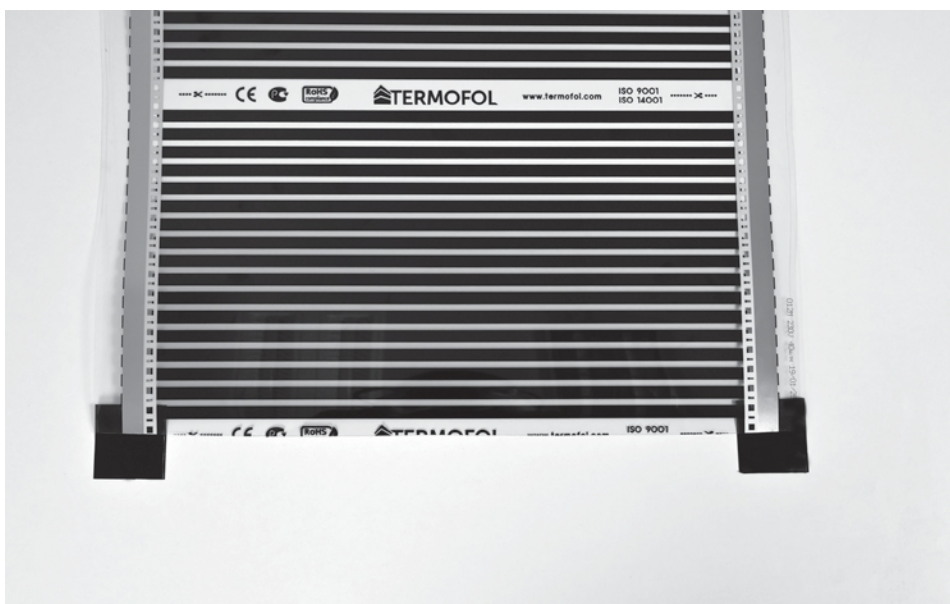
Properly applied insulation must not contain any air bubbles between the self-amalgamating tape strips, and the edges of the self-amalgamating tape sections must be carefully glued to each other and to the heating film around their entire circumference. In the case of low ambient temperature and high tape stiffness, heat up the bonding area, e.g. with a hairdryer, to achieve a tape temperature of 20-30 degrees Celsius and repeat the pressing.

IV.8 INSULATING THE ENDS OF THE POWER STRIP POCKETS



1

To insulate the pocket ends of the feed-through strips, which are not connection points for power cables or electrical connections, prepare 1 strip of self-amalgamating tape for each pocket end to be insulated. Peel off the protective paper from the self-amalgamating tape. Try not to touch the adhesive layer, in order to avoid contamination of the self-amalgamating tape, which can weaken its insulating properties. Also ensure that the adhesive area on the surface of the heating film is clean and degreased. If necessary, use extraction benzene to degrease the contact area between the foil and the self-amalgamating tape.



2

Place the self-amalgamating tape strip under the heating film in such a way that the symmetry axis of the film pocket is aligned with the symmetry axis of the self-amalgamating tape strip in order to ensure sufficient overlap beyond the pocket width to guarantee a tight joint. The length of the strip should be such as to provide a minimum of 10 mm of insulation on the film surface both on its bottom and top surfaces. Press the foil against the self-amalgamating tape section enough so that it cannot move during wrapping and sticking to the upper surface of the heating foil.



3

Wrap a strip of self-amalgamating tape and glue it to the upper surface of the heating film, keeping the glued section of the self-amalgamating tape as symmetrical as possible on the lower and upper surface of the heating film. Press the self-amalgamating tape onto the heating film and glue the overlaps of the self-amalgamating tape carefully outside the plane of the heating film with each other.

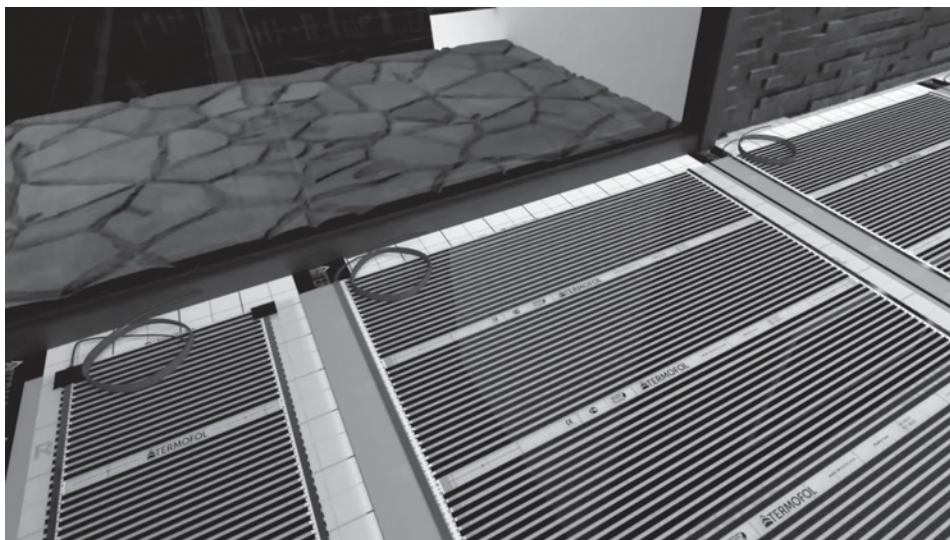


4

Properly applied insulation must not contain any air bubbles between the self-amalgamating tape strips, and the edges of the self-amalgamating tape sections must be carefully glued to each other and to the heating film around their entire circumference. In the case of low ambient temperature and high tape stiffness, heat up the bonding area, e.g. with a hairdryer, to achieve a tape temperature of 20-30 degrees Celsius, and apply pressure again.

■ IV.9 ELECTRICAL CABLE ROUTING

The connection wires (connecting the supply strips of the individual heating film sections) and the power supply wires (connecting the set of heating film sections installed in the heating zone to the thermoregulator or contactor) are led along the perimeter in the space left from the walls, fixed installation elements, etc. We always start running electrical cables from the last heating film strip.

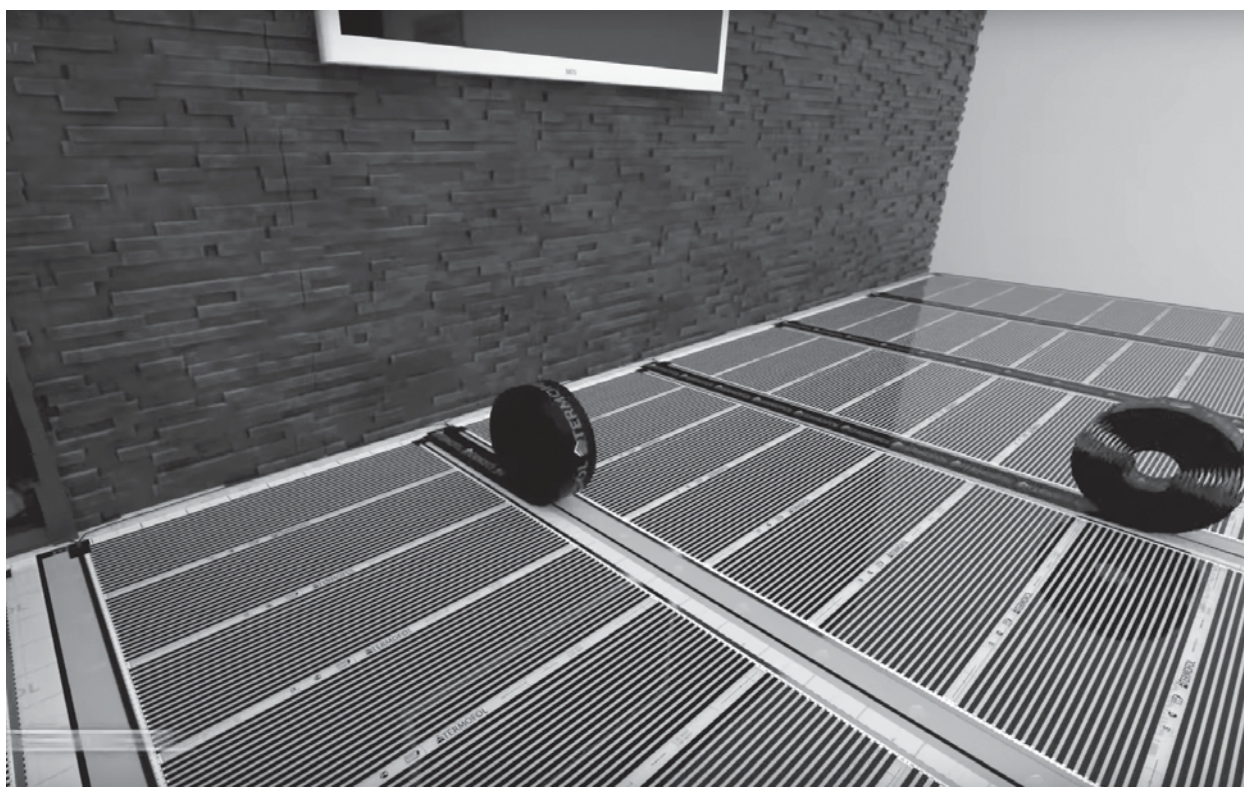


We try to avoid crossing them. After the connection has been made, we cut the insulation base and hide the conductors in the gap thus created by gluing. The conductors must not protrude above the surface of the insulating underlay. Secure the whole with TERMOFOL installation tape.

■ IV.10 STICKING THE HEATING FILM



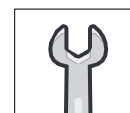
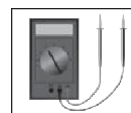
In order to fix the heating film sections to the surface of the insulation subfloor, clean the surface of the heating film thoroughly and the exposed spaces of the insulation subfloor to which they will be fixed with TERMOFOL installation tape. Lay the connection and supply lines of the foil in such a way that they do not cross and run on the underlay, make cuts in the insulation underlay and hide the lines in the cuts. Make any possible corrections in the arrangement of the foil sections so as to ensure their parallelism with respect to each other as well as the required distances between the heating foil sections and the edges of the heating foil from the walls and fixed installation elements, observing the principles described in Chapter (III.3.1 to be checked) of this Manual. Fastening of adjacent sections of the heating film is carried out by connecting the edges of the heating film sections with TERMOFOL installation tape at the width of at least 10 mm at the same time sticking them to the insulation base. The same applies to the edges of the heating film.



■ IV.11 ELECTRICAL MEASUREMENTS

Before covering the surface of the heating system with the vapour barrier foil, it is necessary to carry out test measurements and a working test of the system. The basic po- measures to be taken at this stage are:

- measuring the resistance of the heating system,
- measuring the resistance of the floor sensor.



The resistance of the heating system is measured with a universal meter set to measure resistances from 2 kΩ and, if necessary, for larger installations from 200 Ω. The table below gives approximate resistance values for 1 m² of installed heating film in the offered power variants, i.e. 80 W/m², 140 W/m² and 220 W/m². Der Widerstand wird berechnet, indem der in der Tabelle angegebene Wert für eine bestimmte Folienleistung durch die Folienoberfläche in m² dividiert wird.

Heating film power W/m ²	Operating voltage V	Resistance of 1 m ² Ω
60	230	881
80	230	661
140	230	377
220	230	240
400	230	132
220	12	0,65

The resistance of the NTC sensor is measured with a universal meter set to measure resistance from 20 kΩ. Measuring the resistance of the floor sensor is a control and informative measurement, and is intended, similarly to the measurement of the resistance of the heating system, to exclude any damage to the connection cable (e.g. its tearing when drawing it into a cable duct) or to the NTC sensor itself. Approximate values for the resistance, depending on the temperature of the system substrate, are given in the following table. Measured value tolerance of +/- 10%.

Installation surface temperature °C	Resistance kΩ
5	22
10	18
15	15
20	12
25	10

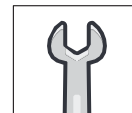
The resistance of the sensor is measured when its connection ends are clipped to the meter. It is not advisable to carry out the measurement by holding both ends with fingers, as even slightly moistened skin in particular has an insulation resistance close to or lower than that of the sensor, and the measurement will be falsified as a result of the so-called parallel resistance system.

■ IV.12 CONNECTION AND INSTALLATION OF THE THERMOREGULATOR

The thermoregulator is installed in the installation box. The connection of the thermoregulator should be made, like the other electrical connections, including the supply line, load selection and overcurrent protection, by a qualified specialist. In the Republic of Poland, this will be an electrician with an SEP licence for electrical installation work up to 1 kV.

Connect the thermoregulator terminals to the individual electrical circuits in strict accordance with the installation instructions enclosed with the type of thermoregulator installed.

Similarly, following the provisions of the thermoregulator's operating instructions, we configure the initial operating parameters of the system, paying particular attention to limiting the operating temperature of the heating system to the requirements indicated by the manufacturer of the surface layer of the heating surface (floorboard, vinyl or laminate panel, etc.), and limiting the set temperature of the air as recommended by the manufacturer of the heating system.



■ N.13 SYSTEM TEST

After verifying the correctness of the measured resistance values and the installation of the thermoregulator, we perform a system test to verify the legal and even heating of the heating film sections.

Verification is carried out by taking random measurements with an electronic pyrometer, a non-contact thermometer, of selected heating strips in the structure of each heating film section, or, if we have a thermal imaging camera, we take infrared photos of the entire heating film sections that are components of the heating system in the heating zone in question.

Once we have ensured that all sections of the foil are heated evenly along their entire length, we connect the voltage to the heating system in order to proceed to the next stage of the heating system installation.



■ N.14 PHOTOGRAPHIC DOCUMENTATION OF THE ARRANGEMENT OF THE FOIL SECTIONS IN THE HEATING ZONE

In order to provide users of the system with proper technical documentation of the system, which should consist of:

- electrical measurement sheet,
- technical documentation of the components of the heating system,
- photographic documentation of the heating installation before it is covered,
- infrared photo documentation of the heating system in operation (optional for self-assembly)
- thermoregulator setting chart,
- warranty card.

The heating system must be photographed as accurately as possible before it is covered with the vapour barrier foil and/or the top layer of the heating surface. The photographic documentation must be kept in printed or electronic form so that it can be made available to the manufacturer in the event of warranty or guarantee claims.

■ N.15 INSTALLATION OF VAPOUR BARRIER MEMBRANE

Before laying the vapour barrier membrane, check once again that there are no solid objects on the surface of the heating membrane which could damage it under pressure, such as plaster particles, cable ends or other material cuttings.

The vapour barrier membrane is unrolled from the roll, flush with the heating membrane sections, making sure that the sections are parallel. Overlap adjacent sections of the heating membrane by at least a few centimetres until the entire installation area is covered, ensuring that the membrane adheres well to the surface (no wrinkles or folds). The vapour-barrier membrane sections are bonded to each other and to the edges using TERMOFOL installation tape. Care should be taken and accuracy maintained so that the joints remain tight. If it is necessary to correct the line of gluing, do not remove the already applied assembly tape, but possibly add an additional parallel line of gluing. If, as a result of gluing, the adhesion is disturbed (folds, wrinkles), cut the glued assembly tape with scissors, taking care not to damage the heating film or connection wires, and make appropriate corrections and gluing again.



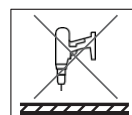
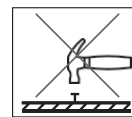
IV.16 INSTALLATION INSTRUCTIONS FOR GROUNDING GRID

In the context of infrared heating film, the grounding grid refers to an additional element installed in the installation that ensures the safe operation of the heating system in an area exposed to flooding or moisture.

The earthing mesh in the case of heating film serves primarily as a preventive measure. When installing the heating film, it must be ensured that the mesh

The earthing grid was correctly connected to the building earthing system. The main purposes of the earthing grid for the heating film include:

- User safety: Earthing ensures that excess current is safely dissipated in the event of potential current leakage.
- Protection of the heating system: Through proper earthing, the risk of damage to the heating film and other system components is minimised



Installation instructions for grounding grid for infrared heating film:

1. Preparation of tools and materials:

- Grounding grid
- Protective conductor
- Insulating tape
- Cutting tools (scissors)
- Connector connector
- Crimping tool / pliers

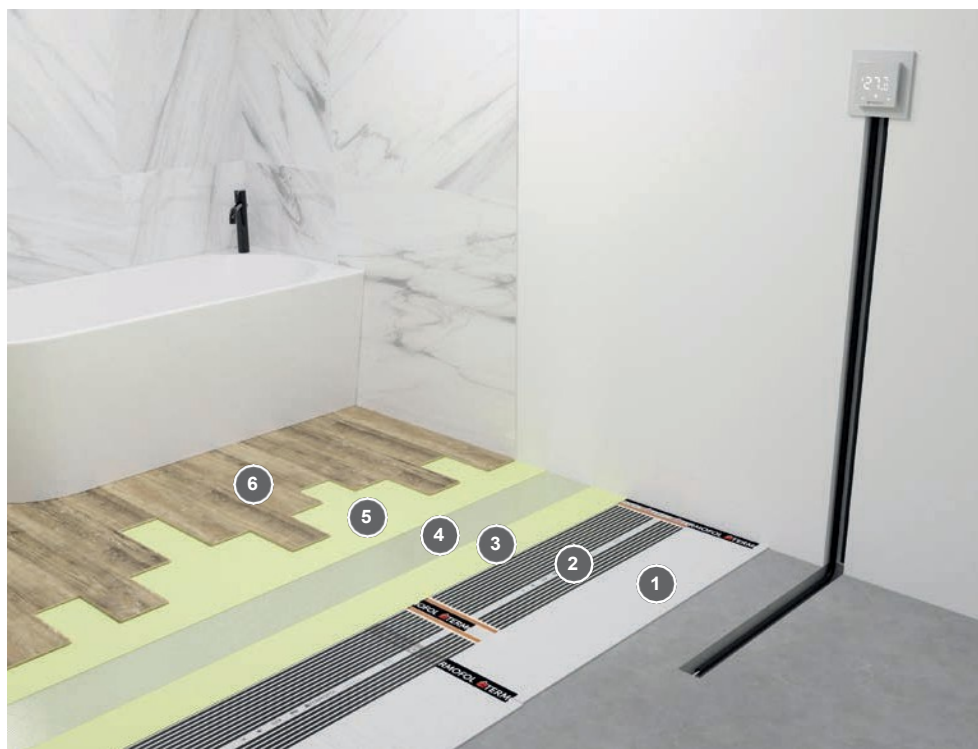
2. Surface preparation:

- Ensure that the surface on which the mesh will be installed is clean and dry.
- Locate the grounding point in the building's electrical system (thermostat location)

3. Installation of an earthing grid:

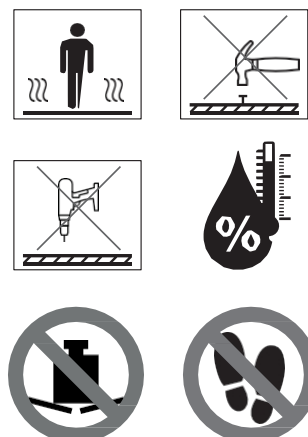
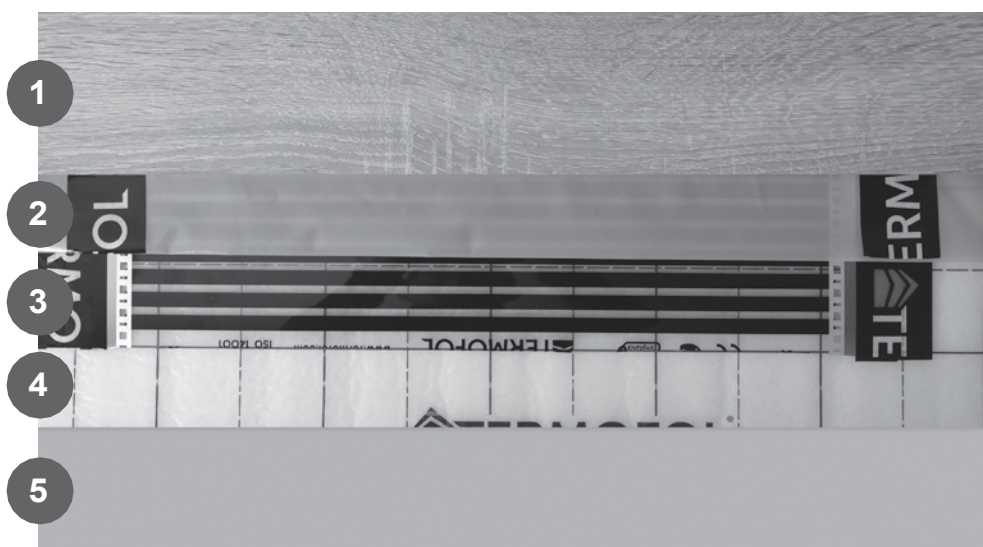
- Spread the earthing mesh over the entire area of the room in which the heating film and the vapour barrier foil are installed.
- If the mesh is too large, you can cut it to size using cutting tools.
- The mesh should be laid overlapping, i.e. each strip should overlap the previous one by a few centimetres.
- The sections of the earthing mesh should be connected together using connection connectors. Particular care must be taken to ensure that the connecting connector is not above the heating foil.
- Use the connection connector to connect the grid to the earth wire that has been fed to the thermostat power point. (Fig. 1)
- Make sure the connection is stable and secure, insulate the connection with insulation tape. (Fig. 2, 3)
- After spreading the earthing mesh, spread another layer of vapour-proof membrane.

1. Insulating underlay
2. Heating foil
3. Vapour barrier film
4. Steel mesh
5. Vapour barrier film
6. Vinyl panel



Once you have completed these steps, you can continue with the finishing installation of the floor according to the manufacturer's recommendations. Make sure that the entire installation process is carried out in accordance with the manufacturer's recommendations and local electrical and safety regulations.

IV.17 LAYING THE FINISHING COAT - SAFETY RULES



1. Three-layer glued wood plank, vinyl panel, laminated panel, etc.
2. TERMOFOL vapour barrier membrane
3. TERMOFOL heating foil
4. TERMOFOL insulation underlay
5. Spout - installation surface

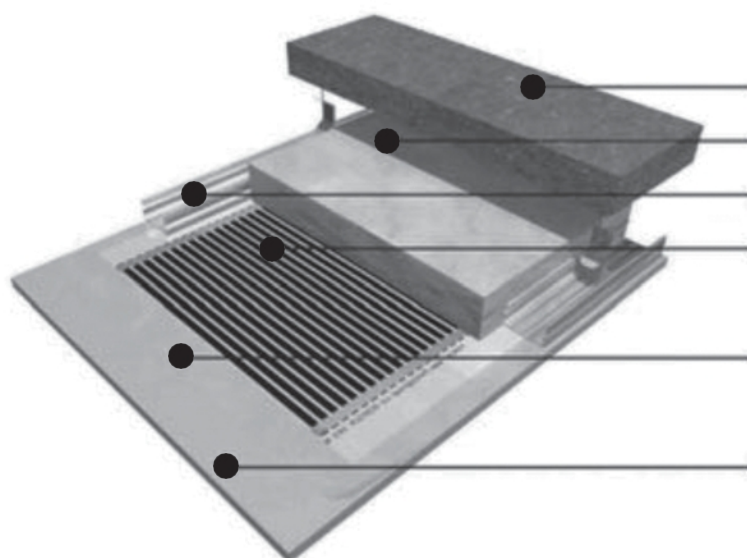
Before laying the top layer of the floor, the cleanliness of the surface must be verified and, if necessary, vacuumed with a soft suction brush so as not to damage the surface of the vapour barrier film and the installation tapes.

Any installation work associated with the laying of the floor must be carried out in clean footwear with a soft sole. The tread of the footwear should be inspected to ensure that no hard plaster chippings, pebbles, etc. are embedded in the tread.

When installing the floor, it is not permitted to drive any nails, drill any holes or use any pneumatic tools with high impact force to jam the locks of individual pieces of flooring, parquet, etc.

Where power cables are routed, the laying of edging and trimming should be carried out with great care to avoid damage to the power cables, e.g. with mounting nails, etc.

V INSTALLATION OF WALL / CEILING HEATING



1. Wall proper
2. Thermal insulation - mineral wool
3. Plasterboard frame
4. Heating foil
5. Protective film
6. Plasterboard

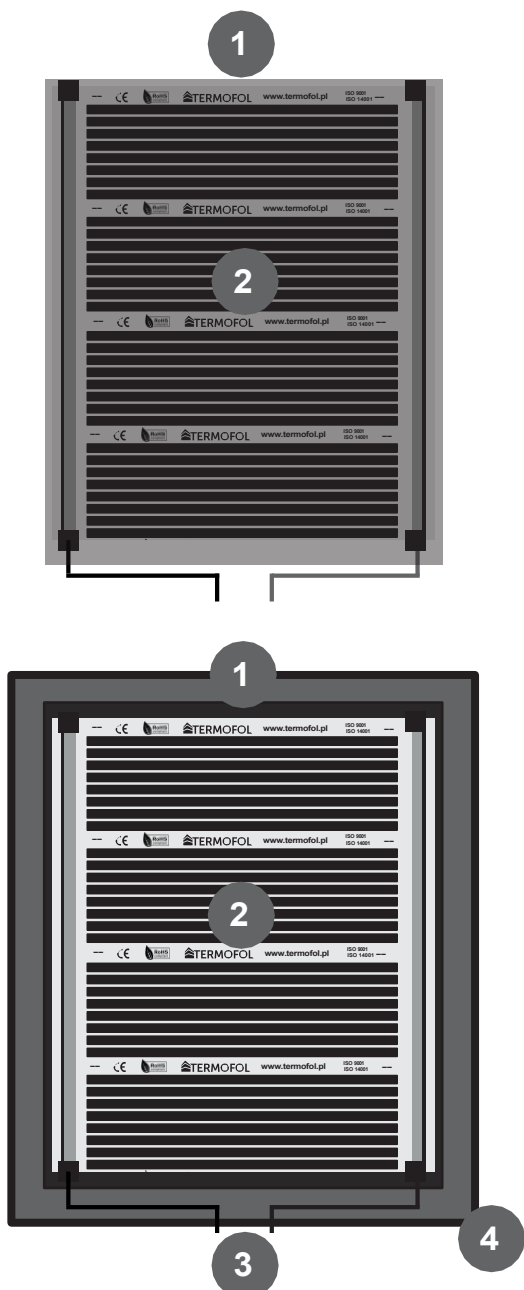
In order to lay a heating system based on TERMOFOL heating film in a wall or on a ceiling made of cardboard panels, the -gypsum should:

- fix the construction frame to the wall/ceiling.
- fill the spaces between the frames with an insulating layer, mineral wool.
- the insulation filling should ensure maximum filling of the space between the plasterboards so that the heating film adheres tightly to the parallel plasterboard and the mineral wool over its entire surface.
- We attach the heating film to the structural frame using TERMOFOL mounting tape,
- We make the electrical connections between the heating film sections and ground the rack by connecting it to the PE conductor of the heating system supply line in the heating zone in question,
- We install the NTC sensor so that the sensor head is directly adjacent to the heating film.
- Unfold the vapour barrier membrane and stick it to the already fixed heating membrane with TERMOFOL installation tape,
- Further steps are carried out in the same way as for floor installation.

When installing the heating film to the structural steelwork, special attention must be paid to leaving space for the screws which fasten the plasterboard to the steelwork in question. Similarly, when planning to finish the plasterboard edges, for example with skirting boards fixed with screws or nails, appropriate spaces must be left when installing the heating film on the wall/ceiling surface. With wall and ceiling heating, the external finish of the walls is very important. As with underfloor heating, it is forbidden to cover the walls with materials which are insulators. Therefore, it is not permitted to hang pictures on the walls, install wainscoting or cover the walls with furniture. This could cause heat to accumulate in the wall, which would result in overheating of the heating film. The installation of the foil in the wall itself must be carried out in accordance with the instructions. Meeting the installation requirements set by the manufacturer is a guarantee of correct and effective operation of the system.

VI INSTALLATION OF HEATING FILM UNDER MIRROR

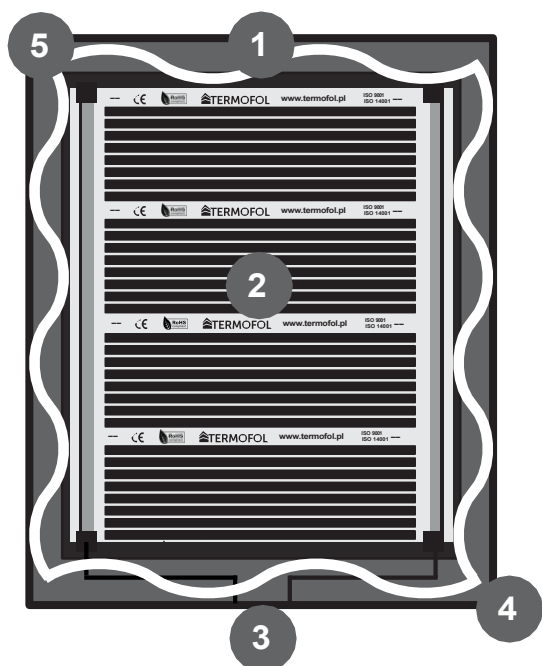
To install the heating film, under the surface of the mirror, glued to the wall:



- chisel out slots for routing conduits for power and connection cables,
- Ensure cleanliness and evenness of the surface on which the mirror with attached heating film adheres to the wall by removing any unevenness of the substrate or old construction elements, dowels, nails,
- make the electrical connections of the foil sections and the supply to the heating system,

- insulate the electrical connections and the pockets of the heating film supply strips,
- cover the entire surface of the heating film installed in the heating system with double-sided adhesive tape,
- stick the sections of heating film prepared in this way to the rear surface of the mirror,

1. Double-sided adhesive tape
2. Heating foil
3. Supply lines
4. Mirror back panel



- perform measurements and test the system,
- Apply mounting glue to the rear surface of the mirror and stick it to the wall,
- the system should be commissioned when the adhesive has reached full adhesion as indicated by its manufacturer,

1. Double-sided adhesive tape
2. Heating foil
3. Supply lines
4. Mirror back panel
5. Assembly adhesive

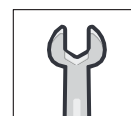


COMPLETION OF THE WARRANTY CARD

Before commissioning the system, the final electrical measurements of the system parameters must be carried out again after laying the upper heating layer (floor, ceiling, wall, mirror, etc.) and the results recorded in the relevant sections of the guarantee card. The guarantee card must be signed by the electrician carrying out the measurements and electrical connections. The electrician must hold a valid SEP licence.



LAUNCHING SYSTEM



We only commission the system if the electrical measurements taken after the installation of the top layer of the heating surface are correct and do not show any faults.

The thermoregulator should be switched to external sensor-only operation, the so-called heating surface temperature control mode, for the start-up of the system.

Carry out the commissioning of the system gradually, especially in rooms that are heavily cooled. Irrespective of the requirements outlined in this manual, the recommendations of the manufacturers of the heated surfaces, especially of wooden and panelled floors, should also be followed. The table below shows the approximate heating surface temperature settings for the first 7-8 days of system start-up.

Day	Temperature
1	15 °C
2	18 °C
3-5	20 °C
6-8	25 °C

If any abnormalities in the operation of the heating system are noticed, commissioning must be stopped and the system rechecked.



PROGRAMMING OF OPERATING PARAMETERS THERMOREGULATOR

When programming the basic system parameters, refer to the technical documentation in the order indicated below:

- installation and operating instructions for the thermoregulator,
- instructions for installation and use of the heating surface (wooden floor, panels, etc.),
- this installation manual.

IX.1 SELECTION OF THERMOREGULATOR OPERATING MODE



The heating control of a foil-based heating system is only carried out in external sensor or dual sensor control mode. The use of air temperature control mode is prohibited.

When starting to program advanced parameters, start by establishing the basic purpose of the system; we distinguish between two types of purpose:

- A basic heating system that is designed to heat a room independently.
- An additional heating system whose sole purpose is to increase comfort - to achieve a warm floor effect.

Basic heating system: set the operating mode ALL - two temperature sensors. The heating system's task is to achieve the air temperature while limiting the temperature of the external sensor (floor) to the set temperature. The maximum temperature of the external sensor in the living areas is 29 °C and in the bathroom 31 °C. Never set the floor temperature higher than that permitted by the floor manufacturer.

The system is then operated in such a way that reaching the set air temperature, within the limits set by the hysteresis, takes place at heating intervals limited by the overheating temperature of the heating surface.

Additional heating system: set to OUT mode - external temperature sensor. The heating system's task is to maintain the underfloor temperature at the desired level. The maximum temperature of the external sensor in the living areas is 29 °C and in the bathroom 31 °C. Never set the floor temperature higher than that permitted by the floor manufacturer.

Operation of the system is then carried out in such a way that a constant desired heating surface temperature is maintained within the limits set by the hysteresis, while it is not possible to reach the desired temperature above the overheating temperature.

IX.2 MANUAL MODE VS. MANUAL MODE

During the initial period of operation of the heating system, especially during the start-up period, it is recommended to use the manual mode of the thermo-controller. It allows the air or heating surface temperature to remain stable throughout the day and week.

Later, after commissioning, it is more economical and user-friendly to use the possibility of programming daily and weekly operation schedules for the heating system (for TERMOFOL thermoregulators type TF-H1, TF-H5, TF-WIFI).

Programming is carried out directly from the control panel or, for the TF-WIFI model, also from the TERMOFOL SMART application.

IX.3 HISTEREZA

Defining the correct level of temperature hysteresis in the thermoregulator, affects user comfort and extends the life of the thermoregulator itself. Defining low hysteresis levels of 0.5 °C should be avoided. This results in frequent switching on and off of the heating system. Unless there are circumstances that require the air or heating surface temperature to be kept stable at the

+/- 1 °C, the manufacturer's recommended hysteresis level for the air temperature sensor should be 2 °C and the hysteresis value for the outdoor sensor should be 3 °C.

IX.4 TEMPERATURE CALIBRATION

In order for the thermoregulator to operate correctly, it must be calibrated in accordance with the installation and operating instructions of the thermoregulator model installed in the heating system area. The air temperature indicated by the thermoregulator should be verified using another reference device measuring the air temperature in the immediate vicinity of the thermoregulator installation site. Differences in indications should be corrected by calibrating the thermoregulator.

N	INSTALLATION STAGE	DESCRIPTION OF THE FAILURE OF THE HEATING SYSTEM	PROPOSED CORRECTIVE MEASURES
1	System test	Thermoregulator does not switch on	Check the power supply to the thermoregulator. If correct, claim thermoregulator
2	System test	Thermoregulator does not supply heating film	Check the power supply to the thermoregulator and the correctness of the connections. If correct, claim thermoregulator
3	System test	Thermoregulator indicates incorrect temperature value	Calibrate the temperature in the thermoregulator settings. Verify the correctness of the resistance value of the external temp. sensor.
4	System test	The thermoregulator indicates -Err-	Verify the correctness of the resistance value of the external temp sensor.
5	System test	The thermoregulator does not indicate the temperature value measured by the external temperature sensor	Verify the correctness of the resistance value of the external temp sensor. Check the the selected method of temperature control in the thermoregulator settings.
6	System test	The thermoregulator does not indicate the temperature value measured by the internal temperature sensor	Check the selected method of temp control in the thermoregulator settings.
7	System test	The system supply is switched off by the residual current circuit breaker	Perform insulation resistance measurements of the heating system and the supply line
8	System test	The power supply to the system is switched off by the redundant switch	Perform resistance measurements of the heating system
9	System test	The heating surface heats only locally	Check that the heating film sections are connected correctly
10	System start-up	Frequent switching on and off of the system occurs	Increase hysteresis value in the thermoregulator settings
11	System start-up	The room temperature does not correspond to the user's set temperature	Check the selected operating mode of the thermoregulator (manual/schedule). Switch off eco mode (applies to selected thermoregulator models)
12	System start-up	Electricity consumption of the system appears to be too high	Check the selected operating mode of the thermoregulator (manual/schedule). Adjust the thermoregulator schedule settings. Switch on eco mode



XI. CHECKLIST OF STEPS FOR INSTALLING A HEATING SYSTEM

N.	INSTALLATION STAGE	✓
1.	Familiarisation with the installation instructions	
2.	Verification of the completeness of the system components to be installed	
3.	Verification of the completeness of the tools required for installation	
4.	Construction of power circuits with dedicated protection in the electrical switchboard	
5.	Planning of heating film sections and location of thermoregulator for zone	
6.	Chasing the hole for the thermoregulator installation box	
7.	Fitting the thermoregulator installation box	
8.	Introduction of the heating zone supply line into the thermoregulator installation box	
9.	Vertical wall chases for the protective conduit for the heating film supply line	
10.	Vertical wall and horizontal wall chases for protective conduit for the installation of an external temperature sensor (floor sensor)	
11.	Insertion of conductors feeding the heating film into the protective conduit	
12.	Insertion of an external temperature sensor (floor sensor) into the protective tube	
13.	Levelling of installation surfaces, screed surfaces, wall surfaces, etc.	
14.	Cleaning of installation surfaces - vacuuming	
15.	Laying insulation underlay	
16.	Bonding the insulation underlay with TERMOFOL installation tape	
17.	Cutting out cable routes in the insulation substrate to feed the foil sections and for the installation of an external temperature sensor (floor sensor)	
18.	Laying the heating film sections	
19.	Connection of supply lines to sections of heating film	
20.	Insulating the connections of the heating film sections with self-vulcanising tape	
21.	Insulating the pocket ends of the heating film sections with self-amalgamating tape	
22.	Sticking the foil sections to the insulation substrate with TERMOFOL installation tape	
23.	System measurements	
24.	Assembly and connection of the thermoregulator	
25.	Heating system tests	
26.	Photographic documentation of the system layout	
27.	Laying the vapour barrier membrane	
28.	Sticking the vapour barrier membrane	
29.	Laying the floor proper	
30.	Re-measurement of the system	
31.	Re-testing the system	
32.	Target programming of the thermoregulator	
33.	Completion of the warranty card	