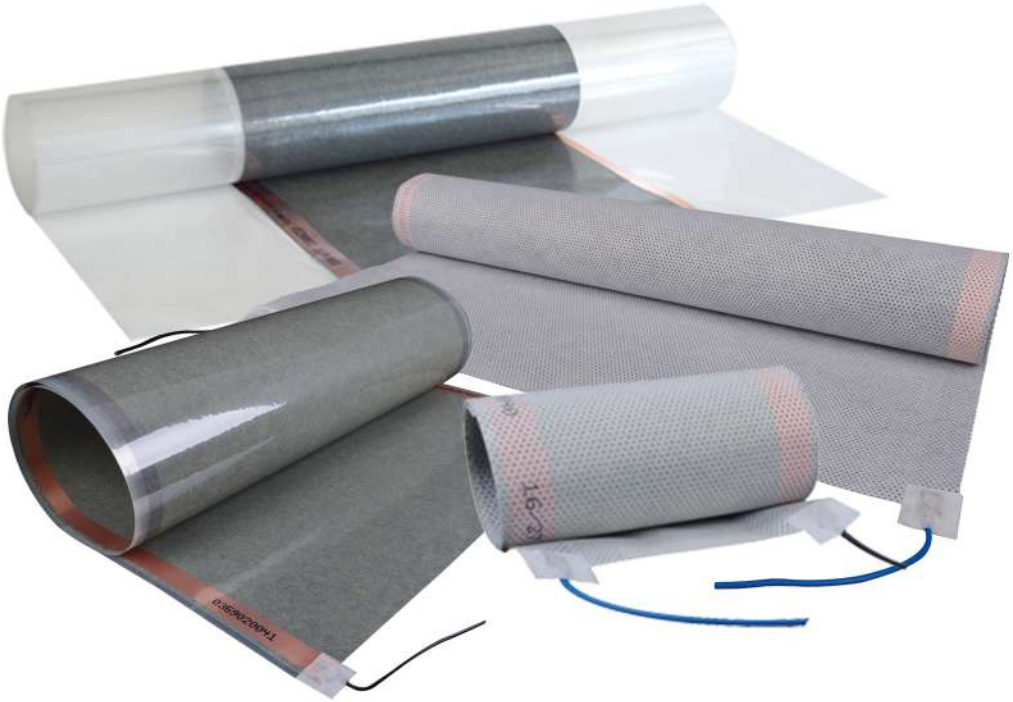
e:nergycarbon
energy efficient ceiling heating

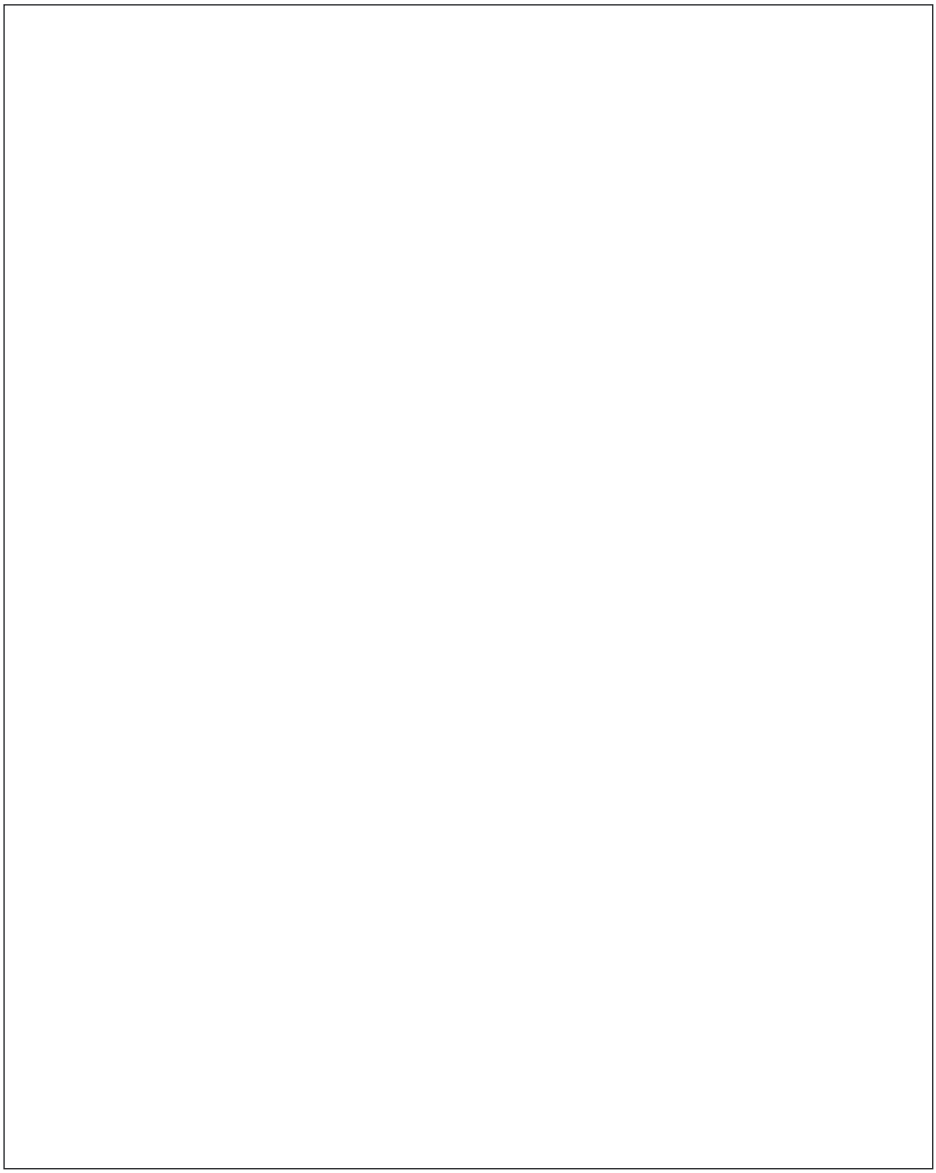
E-NERGY CARBON

Electric panel heating system



Installation and operating manual

INSTALLATION SKETCH: **Please keep this document in a safe place**



☐ Heating foil ⦸ Control unit ◉ Thermo sensor ⊞ Power supply unit

Installation and operating manual **E-NERGY CARBON**

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1. Delivery condition

The **E-NERGY CARBON** surface heating system can be used as a full heating system, supplementary heating or for surface temperature control in renovation (e.g. mold prevention).

1.1 Scope of delivery

- **E-NERGY CARBON Power Supply PRO TT**
- Installation and operating manual
- Resistance tables **E-NERGY CARBON** heating foils

The following products are also required for the overall **E-NERGY CARBON** system:

- Prefabricated heating foils from 60 to 290 W/m²
- **E-NERGY CARBON** room thermostat

2. Information for users

Please read this instruction manual carefully and follow the instructions before installation.
The **E-NERGY CARBON** system can be used by children aged 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children must not play with the appliance. Cleaning and user maintenance must not be carried out by children without supervision. A copy of the operating instructions must be kept in the circuit distributor. In case of change of ownership, please inform the new owner about the installation. In damp/wet rooms, DIN VDE 0100 Part 701 must be taken into account. If the **E-NERGY CARBON** heating foil is installed e.g. under a tile covering (preferably underneath the sealing) in a damp/wet area (e.g. shower), this area does not count as protection areas 0, 1 or 2 according to DIN VDE 0100 Part 701. Installation is permitted under these conditions.

2.1 Safety and warning instructions

- Please read this manual carefully and completely before you start the installation.
- Transport: To protect all parts from damage, they should remain in their original packaging until they reach the installation site. Vibration as well as falling can damage internal parts.
- Damaged devices or parts must not be put into operation.
- Do not remove the safety labels and type plates.
- The individual components may only be mounted in closed rooms.
- All assembly and installation work must always be carried out in a de-energized state.
- The circuit for connecting the power supply unit must be sufficiently dimensioned and fused for installation. When operating the heating system, this circuit must not be overloaded.

- The device is not ready for operation when delivered and must first be connected by a qualified electrician.
- Screw heads / washers must have a minimum diameter of 15 mm so that the fixing holes are sufficiently covered.
- Protect the device from moisture, heavy dust, aggressive liquids and vapours.
- Always ensure sufficient heat dissipation (distance to thermal insulation) and ventilation.
- Never connect several devices in parallel on the output side.
- Compare all technical data of the products used. These must match or be within the specified range. The power specified on the transformer must not be exceeded.
- Not suitable for children and persons with physically and/or psychologically limited abilities.

2.1.1 Intended use

The **E-NERGY CARBON power supply PRO TT** is a power supply unit for the **E-NERGY CARBON** heating foils. Up to a maximum of 10 room thermostats can be connected to the **E-NERGY CARBON power supply PRO TT**. The **E-NERGY CARBON Power Supply PRO TT** may only be used within the power limits specified in the technical data and only in closed rooms. Any use beyond the intended use is considered improper use.

2.1.2 Symbols and notations

A warning is composed of a signal word and a warning symbol as well as text describing the extent of the hazard:

SIGNAL WORD



Type and source of hazard
Consequences of not observing the warning.
- Countermeasure that must be taken to avoid the hazard.
- further countermeasures, if necessary ...

The following hazard levels are present:

DANGER indicates an immediate hazard that will result in death or serious injury if not avoided.

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION indicates a hazard that may result in minor or moderate injury if not avoided.

2.2 General

The **E-NERGY CARBON** system has been tested for safety. When working on the heating system, the operating instructions must be handed over to the installer for their information. The **E-NERGY CARBON** can be installed discreetly in the ceiling, wall or floor. For installation, an installation plan must be drawn up for locating and determining the position of the heating foils, power supply units, electrical supply lines and, if necessary, the temperature sensor (see figure chap. 3.1). In order to ensure the optimal functioning of the system, a qualified dimensioning and planning is required (e.g. heating load calculation DIN EN 12831) is recommended. In the case of wall or floor surfaces, care must be taken to ensure that the heating surfaces are not displaced. Here, appropriate labeling of the products (manufacturer approval for electric panel heating) must be checked and the thickness and thermal conductivity **λ** [W/(mK)] or the resulting thermal resistance R [m^2K/W] must be observed. The maximum thermal resistance of the floor covering, including the underlay belonging to the floor covering, must not exceed the value of R = 0.15 m^2K/W. Optimal and fast heat distribution is achieved with very thin coverings (wallpaper, plaster systems, ceramic coverings).

Material	Thickness [mm]	Thermal conductivity λ [W/(mk)]	Thermal resistance R [m^2K/W]
Ceramic tiles	13	1,05	0,012
Natural stone tiles	12	1,2	0,010
Carpet	–	–	0,07 - 0,17
Needled carpet	6,5	0,54	0,12
Linoleum	2,5	0,17	0,015
PVC flooring	2,0	0,20	0,010
Real wood parquet	11 - 14	0,09 - 0,12	0,055 - 0,076
Laminate	9	0,17	0,05
Cork-cork laminate	3 - 10	0,12 - 0,10	0,027 - 0,102

Planning guide values for floor coverings on underfloor heating.

The system is operated with safety extra-low voltage 36V and thus offers a maximum electrical safety. The connection of the power supply unit to the house mains, as well as the installation of the temperature controller and the electrical connection of the heating foils may only be carried out by a qualified electrician.

2.3 Function and application

The **E-NERGY CARBON** system is a foil heating system optimized for radiant heat for walls, ceilings and floors, which is characterized by a very low installation height and ensures an extremely fast heating of individual surface areas directly on the surface. It is used in the most diverse areas, e.g. in living rooms, loft conversions, fitness and sauna areas, conservatories, seating areas or in mold prevention.
In general, for radiant heating systems, it is advisable to control the actual surface temperature of the heating element using a temperature controller with a thermal sensor. Use one controller per room and, for floor installation, an additional temperature sensor to detect and limit the surface temperature at the heating surface. The heating foil is generally suitable for subsequent drilling of holes with a maximum size of 70 mm (see figure chap. 3.1).
Also note the minimum distance of 50 mm between the holes (max. 5 recesses per 1 m) and 20 mm to the copper conductors (see figure chap. 3.1). The copper strip on the heating track must not be damaged or cut.

2.4 Operation

The **E-NERGY CARBON** system impresses with its easy installation and operation.
To achieve the comfort temperature, the controller is set to the desired value. The room temperature control then takes place automatically. The actual surface temperature or heating speed of the heating surfaces depend on the respective covering and the thermal insulation of the substrate and may deviate from the set room temperature.
When selecting the room temperature controller, the requirements of the Ecodesign Directive 2009/125/EC must be observed.

All **E-NERGY CARBON** room thermostats comply with the Ecodesign Directive 2009/125/EC.

2.5 Maintenance

The **E-NERGY CARBON** heating system is maintenance-free. In the event of a malfunction, the following steps can help:

- Please check the temperature controller, e.g. the fault indication on the display.
- Check the fuse(s) on the power supply.
- Check the fuse of the power supply and the in-house fuses or the earth-leakage circuit breaker.

If the fault remains unchanged, notify an authorized electrician or your specialist dealer.
In general, it is recommended to have the system checked by an authorized electrician after five years.

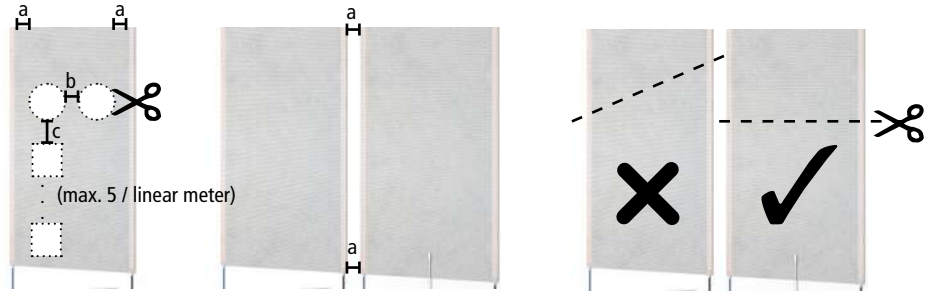
3. Installation of heating foils

3.1 Preparation

The **E-NERGY CARBON** systems are suitable for indoor use on ceilings, walls and floors. The selection of the heating surface to be used depends on the later intended placement areas for furniture and coverings as well as an optimal heat input (see chapter 2.2).

The **E-NERGY CARBON** heating foil is not designed for installation as a storage heating system and therefore cannot be used for installation within the floor screed. The closer the heating foil is installed to the surface of the room, the faster the heating system reacts and emits the pleasant heat radiation into the room.

To facilitate your personal planning and documentation of the installation work, you should use the installation sketch (page 2). Heating foils contacted on both sides can be subsequently shortened into two individual foils. If heating foils contacted on both sides are to be used in their entire length, the contacts at one end of the foil must be removed. The foil must always be electrically connected to the pre-assembled cable connections. A maximum of 5 foil cut-outs per 1m is permissible.



a min. 20 mm
b min. 50 mm
c min. 50 mm
Ø max. 70 mm
max. 70 x 70 mm

Notice: For the „floor heating" application, a floor sensor (external temperature sensor) is mandatory according to EN 50559:2013-12.

Notice: Note that screws may only be inserted into the heating surface if they are installed with plastic dowels for electrical insulation. In addition, do not connect two screws to an electrically conductive material (e.g. metal picture frame, metal trim, metal shelving system). Do not use nails.

3.2 Installation

This section refers to the laying of the foil. The laying of the cables and the electrical connections is explained in the section **Electrical connection**. Take into account the minimum processing temperature of +5 °C.
For walls below 2.3 m in height and in ceilings inclined less than 45 ° to the vertical, the heating foil should be approx. 15 cm shorter than the length of the mounting surface. If necessary, the heating foil can be divided once perpendicular to the copper tracks. The resulting resistance values can be taken from the resistance values as a function of length. Always trim only from the unconnected side of the heating foil.
Any other improper damage to the foil, such as tears caused by sharp objects or kinks, is not permitted. Therefore, keep the heating foil in its rolled state in the packaging until installation (observe minimum bending radius, see chapter **Technical data**). However, holes can be made after installation (see section **Function and application**).

3.2.1 Pretreatment of the substrate

The heating foil can be applied to any load-bearing, clean and level surface made of inorganic materials such as stone, screed, plaster, etc. or organic materials such as wood, cork, plastic (possibly with surface primer / adhesion promoter), etc. The substrate and top layer materials must be suitable for the use of an electric panel heating system. If in doubt, contact the manufacturer of these materials.

Irregular surfaces are to be avoided (e.g. visible wood/stone - brickwork). Under certain circumstances, the surface must be levelled in advance with levelling plaster or levelling compound. Special care must be taken to ensure that no sharp projections such as stones, screw heads, nails or similar protrude from the substrate.

On walls and ceilings, drywall panels and wood-based panels must be installed to bridge cracks in the joint area. When installing on the floor, dry screeds and wood-based panels must always be laid in two layers and offset.

For a floating installation without gluing, e.g. between screed and laminate, we recommend approx. 2 mm of levelling cork layer or glass fibre fleece should be laid under the heating foil.

3.2.2 Thermal insulation

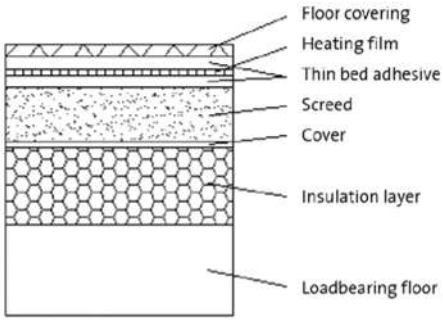
Thermal insulation in the floor and wall area is recommended to reduce the heat emission into the masonry and the floor. In order to limit the downward heat flow, the following minimum ratio of the heat transfer coefficient of the floor structure above the insulation layer and the heat transfer coefficient for all layers below the load distribution layer must be maintained (according to EN 50559:2013-12):

- Mezzanine floor, above heated rooms: U max: 1.25 W/(m^2*K)
- Mezzanine floors above partially heated rooms: U max: 0.75 W/(m^2*K)
- Basement ceilings, walls and ceilings against unheated rooms as well as ceilings and walls that are connected to the ground border: U max: 0.35 W/(m^2*K)

The insulation layers under the floor construction should be selected according to the following table. Minimum heat transfer coefficients must be observed. Only standardised insulation materials suitable for underfloor heating may be used. The compressibility of the insulation layer must not exceed 5 mm. If several layers are used, the compressibility of the individual layers must be added together.

	U_{max} W/(m^2*K)	R_{min} m^2*K/W
Mezzanine floors above heated rooms	1,25	0,75
Mezzanine floors above partially heated rooms	0,75	1,25
Heating surfaces between outside air or ground	0,35	2,86
Basement ceilings, walls or ceilings against unheated rooms	0,35	2,86

Minimum heat transfer coefficient and minimum thermal resistance of components.



Thermal insulation and laying as direct heating in thin-bed adhesive.

3.2.3 Installation methods

There are three different types of installation:

(A) Embedding the film between inorganic layers with dispersion fillers or dispersion plaster systems such as Schönox FS, Brillux PM1881 or Maxit K+B.

(B) Bonding of the film between inorganic and organic layers with all types of flexible adhesives as described under (A).

(C) Floating installation on floor and ceiling as top layer under the top layer.

In cases (A) - (B), the foil is to be worked in the thin-bed method in a moist adhesive bed without air bubbles. To do this, apply the adhesive bed 1-2 mm thick to the substrate, then carefully press the foil into the still damp bed with a plastic trowel. The copper contact strips always face the wall. After the heating foil has been glued in, a complete covering layer (filler, plaster system, tile, etc.) of at least 2 mm must be applied. If several heating foils are to be laid next to each other, it must be ensured that a minimum distance of 20 mm is maintained between the individual foils.

It must be ensured that the foil is not laid over expansion joints.

If several heating strips are to be laid floating next to each other according to installation method (C), it must be ensured that the heating strips are secured against slipping with adhesive tape and that a minimum distance of 20 mm is maintained between the individual foils. The heating tracks and copper contact strips must not touch or cross each other when laid in multiple tracks. The ends/joints of the foil must always be taped with insulating adhesive tape (even with uncut strips). For the installation of the controller and sensor, see section **Electrical connection**.

Notice	**Further information can be found in the QR code on the back**

3.2.4 Installation under tiles

Before the tiles are bonded, the heating foil must be completely laid with flexible tile adhesive using a thin-bed method and a 1-2 mm thick top layer. The surface must be dried according to the instructions of the adhesive manufacturer. When laying several strips, ensure that the surface is level.

Sealings in wet areas are applied above the heating foil.

3.2.5 Ceiling installation

When installing the **E-NERGY CARBON** heating foil in a suspended ceiling or if it is accessible from a roof space, a warning sign "Ceiling heating direct acting" must be attached to the ceiling access opening.

3.2.6 Use in humid/wet rooms

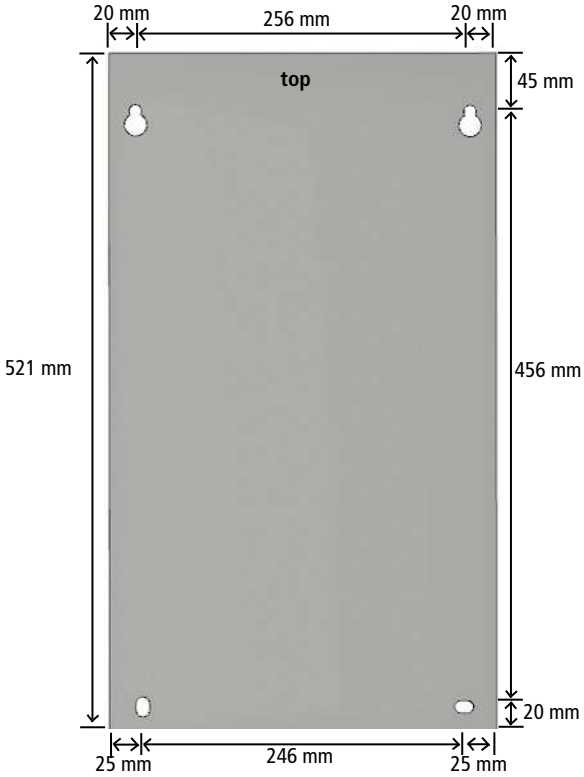
When used in humid/wet rooms, the requirements of DIN VDE 0100 Part 701 must be observed. The transformer and the other components are basically suitable for use in damp and wet rooms, but may only be installed outside protection area 2.

4. Mounting power supply PRO TT

The **E-NERGY CARBON power supply PRO TT** is referred to as a device in the manual.
The device may only be installed in closed rooms. It is only suitable for surface mounting and must be protected from moisture, heavy dust, aggressive liquids and vapors.
Always ensure sufficient heat dissipation (distance to thermal insulation) and ventilation.
An ambient temperature of max. 40 °C must not be exceeded.
Any tampering with or changes to the power supply will void the warranty or guarantee and may destroy the system! The warranty is void if the fault is due to misfortune, use of force, incorrect connection, penetration of liquids, poor maintenance or misuse. The warranty is also void if damage is caused by thunderstorms or other voltage variations. Choose the installation site carefully, taking into account the safety instructions as well as the following carefully:

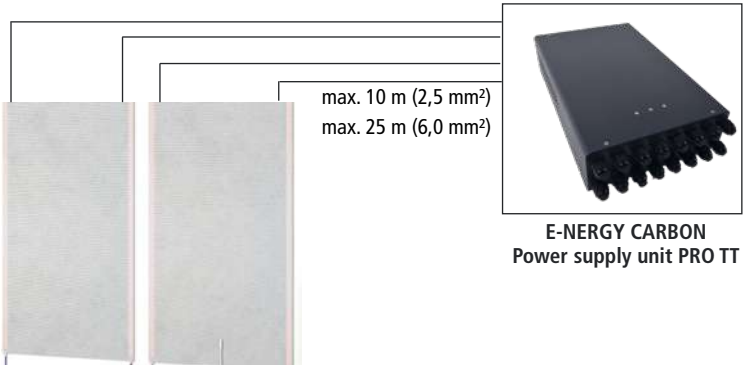
- The maximum cable length between the heating track and the device is 10 m (2.5 mm^2) or 25 m (6 mm^2). Place the device so that all heating tracks can be reached with the available cable length.
- Fix the product to a firm, secure surface using the 4 fixing holes.
  The surface must be such that the weight of the device can be safely supported.
- Screw heads / washers must have a minimum diameter of 15 mm so that the fixing holes are adequately covered.
- Do not mount the device upside down. Always mount the device vertically so that the ventilation openings point upwards and downwards.
- The circuit must not be overloaded by the rated current in heating operation.
- Never cover the power supply unit and always ensure sufficient ventilation. A distance of at least 200 mm below and above as well as 100 mm each next to the power supply unit is recommended.
- The power supply unit must be accessible and openable for maintenance purposes.

Dimensioning of the mounting holes



Notice: For sufficient ventilation, a distance of 200 mm below and above as well as 100 mm each next to the power supply unit is recommended.

Maximum cable length between heating track and power supply unit



E-NERGY CARBON
Power supply unit PRO TT

5. Electrical connection

DANGER



Risk of electric current injury!
There is a risk of injury from electric current.

- Before carrying out electrical work, the power supply must be disconnected and secured against reconnection.
- The electrical installation may only be carried out by competent persons in accordance with the applicable legal requirements.
- The installation must comply with national and/or local electrical regulations.
- A residual current switch (rated residual current ≤ 30 mA) is required for each circuit.

The following specifications must be observed for the connection to the supply voltage:
Supply voltage 230 VAC, 50/60 Hz

- The circuit for the connection must be sufficiently dimensioned and fused. When operating the heating system, this circuit must not be overloaded.
- Automatic circuit breaker: 16 A (Check the total load of the circuit. A separate supply line with a 16 A circuit breaker with C characteristic is recommended).

For the heating system, an all-pole disconnecting device from the mains with at least 3 mm contact opening width per pole must be provided in the fixed installation. Before commissioning the application, all connections and screws must be checked.
The power supply unit may only be installed surface-mounted. Sufficient ventilation must always be provided. The ambient temperature must not exceed the maximum value of +40 °C. A minimum distance of 50 mm between the power supply unit and the foil must be maintained. The maximum cable length on the secondary side of the power supply unit must not exceed 10 m for 2.5 mm^2 cable and 25 m for 6 mm^2 cable.

We recommend the use of our PUR twin cable for surface-mounted and flush-mounted installation.
The electrical cables must be laid in accordance with the currently valid DIN VDE 0100.

Notice	**A maximum of 400 W may be connected per connection (output terminal pair 36 V). The total connected power must not exceed the rated power of the power supply unit.**

Notice: For the "floor heating" application, a floor sensor (external temperature sensor) is mandatory according to EN 50559:2013-12.

By means of the sensor connection set, the external temperature sensor must be installed as close as possible under the heating foil surface. The metal end cap of the connection set must be taped with insulating tape to avoid fault currents. The temperature sensor is connected to the room thermostat (see operating instructions). Connection and commissioning must be carried out by a qualified electrician.

Notice: The installation of the external temperature sensor is only allowed in the sensor connection set, so that the external temperature sensor is protected against damage and can be replaced in case of malfunction.

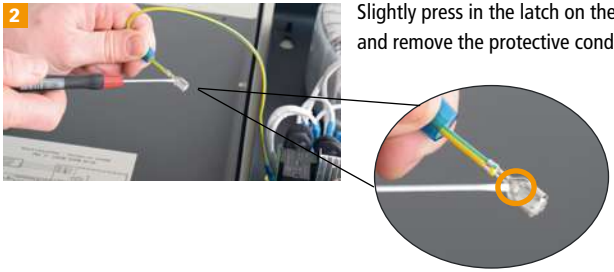
The maximum lengths of the individual heating tracks can be determined from the separate document "Resistances and powers as a function of length".

Opening the housing cover:



Loosen the screws on the housing cover and carefully open the housing cover.

Notice: Before removing the housing cover, disconnect the cable connections between the cover and the device.



Slightly press in the latch on the cable lug of the protective conductor and remove the protective conductor from the housing cover.



Bend the plugs of the LED connectors (green, red, yellow) slightly forward with a fine screwdriver and carefully pull off the plug connections.

5.1 Overview power supply of E-NERGY CARBON

- **A** Input terminals primary side 230 V (L, N, ⏚)
- **B** Output terminals secondary side 36 V (10 heating circuits, CH 1-10)
- **C** Connection room thermostat 230 V (MS, SK, ⏚, N, L) (10 Room thermostats, CH 1-10)
- **D** Heating circuit fuses, 15 A each
- **E** Connection of protective conductor for housing cover
- **F** EVU contact
- **G** Fuse room thermostats (fine-wire fuse T 4.0 A)
- **H** LED display control electronics:
  Off = Intact heating circuit fuse
  Red = Defective heating circuit fuse
- **I** Connections LED display Housing cover
- **J** LED display housing cover:
  Green = Ready for use
  Green (flashing) = EVU contact open
  Yellow = System is heating
  Red = Malfunction

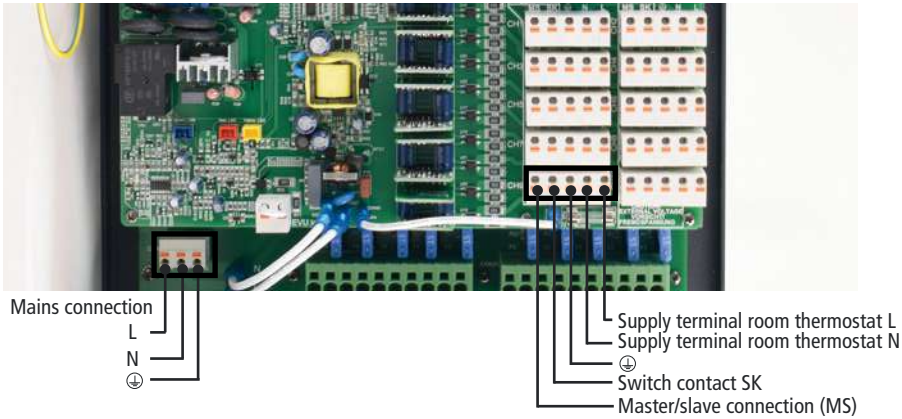
Power supply PRO TT 2400/3200 W



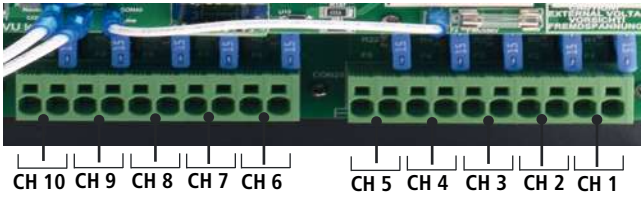




Connections 230 V



Connections 36 V



Notice	**A maximum of 400 W may be connected per connection (output terminal pair 36 V).** **The total connected power must not exceed the rated power of the power supply unit.**

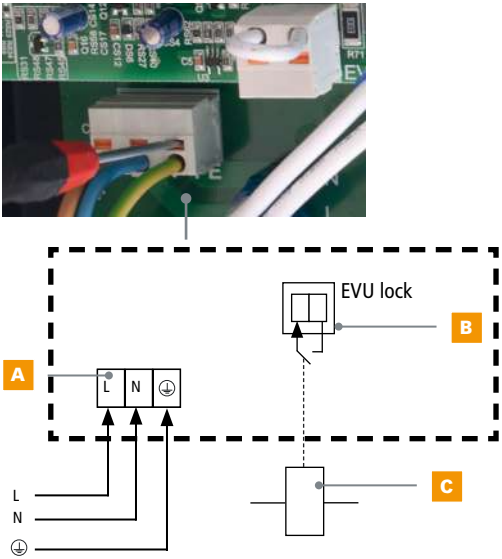
5.2 Connecting mains voltage and EVU contact

The mains voltage is connected to the input terminals primary side 230 V (L, N, ⏚).
The EVU contact is potential-bound (230 V) and is used for higher-level activation and deactivation of the device, e.g. by the energy supplier (blocking times). The EVU contact is closed by a cable bridge at the factory and can be opened or closed by a potential-free switching contact.

Contact opened = device deactivated, green LED flashes
Contact closed = device activated , green LED lights up

Connection of mains voltage and EVU contact

- **A** Terminals power supply 230 V ~ 50 Hz
- **B** EVU contact (switchable via potential-free contact e.g. relay)
- **C** Relay



5.3 Connecting room thermostats

The electronics of the **PRO TT power supply** unit is designed for the connection of up to 10 room thermostats with 230 V AC. The room thermostats are connected to the 10 channels via the supply terminals room thermostat **L** / **N** / ⏚ (supply room thermostat 230 V AC) and to the switching contact **SK** (switching contact for switching signal 230 V AC).



Connect room thermostat, cable 5x1.5 mm²

Each channel (CH 1-10) is assigned to a heating circuit (CH 1-10). A voltage (switching signal) of 230 V at the switching contact **SK** activates the assigned heating circuit. A switching signal of 0 V deactivates the assigned heating circuit again. If all heating circuits are deactivated, the secondary side power supply of the power supply unit (the transformer in the power supply unit) is switched off. The secondary power supply of the power supply unit is only switched on again after a heating circuit has been activated. The switching on of the secondary side power supply and the individual channels takes place in each case with a switch-on delay of approx. 60 seconds.

Notice	**If a room thermostat is not supplied with voltage via the power supply unit, the switching signal SK 230 V can also be provided individually for each channel via the conductors L1, L2, L3.**

DANGER

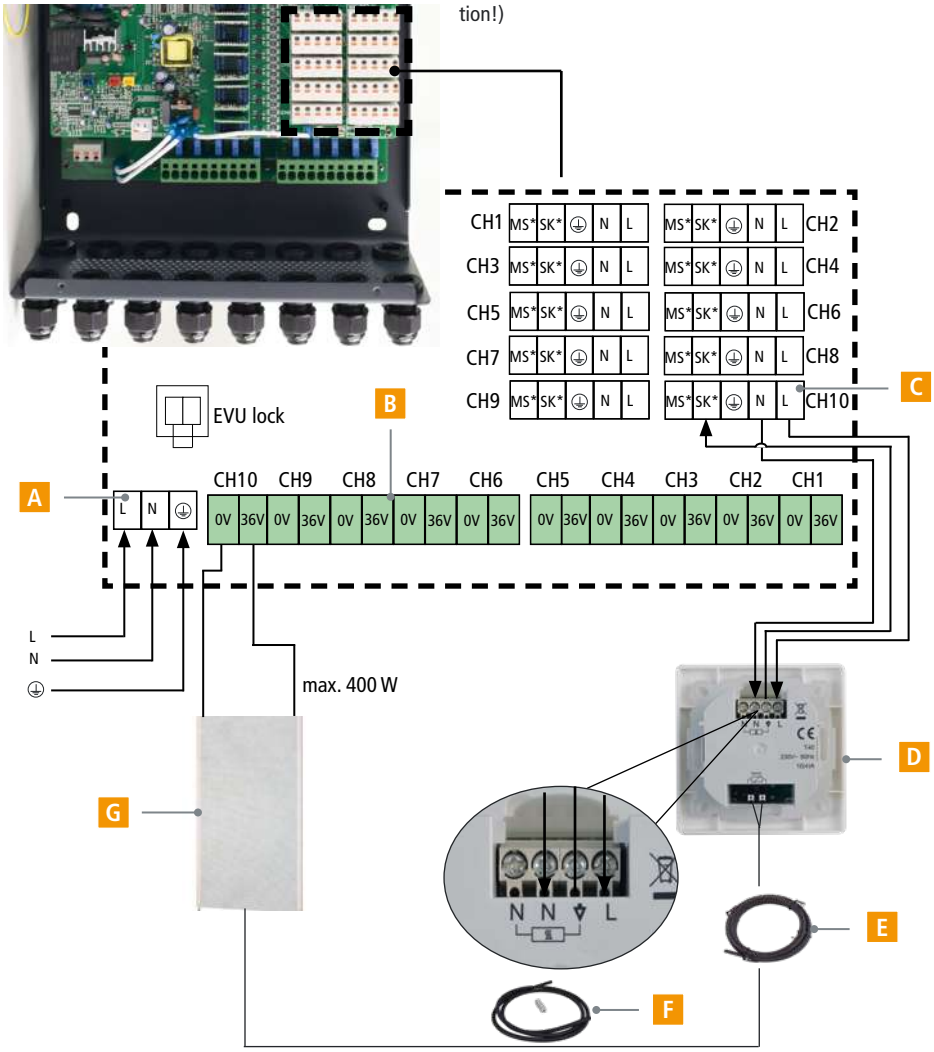
Risk of electric current injury!
The use of separate fuses / phases for the room thermostat can lead to a possible risk from external voltage at the connection points **SK*** input and the **MS*** output.

If several channels/heating circuits are controlled via a room thermostat, the room thermostat is connected to one channel as described in variant 3 „Cascading". The next channel is connected via the Master / Slave (**MS**) connection as follows: First, the Master / Slave (**MS**) terminal of the channel which is connected to a room thermostat (Master) is connected to the **SK** terminal of the channel which is to receive the Master's commands (Slave). This principle is followed for each additional channel, so that up to 10 heating circuits can be controlled by one room thermostat.

Attention: The supply terminal room thermostat **L** and supply terminal room thermostat **N** remain unassigned for the other channels.

Variant 1: Connection room thermostat EN 01

- **A** Terminals power supply 230 V ~ 50 Hz
- **B** Terminals secondary side 36 V (CH 1-10)
- **C** Terminals room thermostat (CH 1-10)
- **D** E-NERGY CARBON room thermostat EN 01
- **E** External temperature sensor room thermostat EN 01
- **F** Sensor connection set
- **G** E-NERGY CARBON heating foils (max. 400 W per connection!)

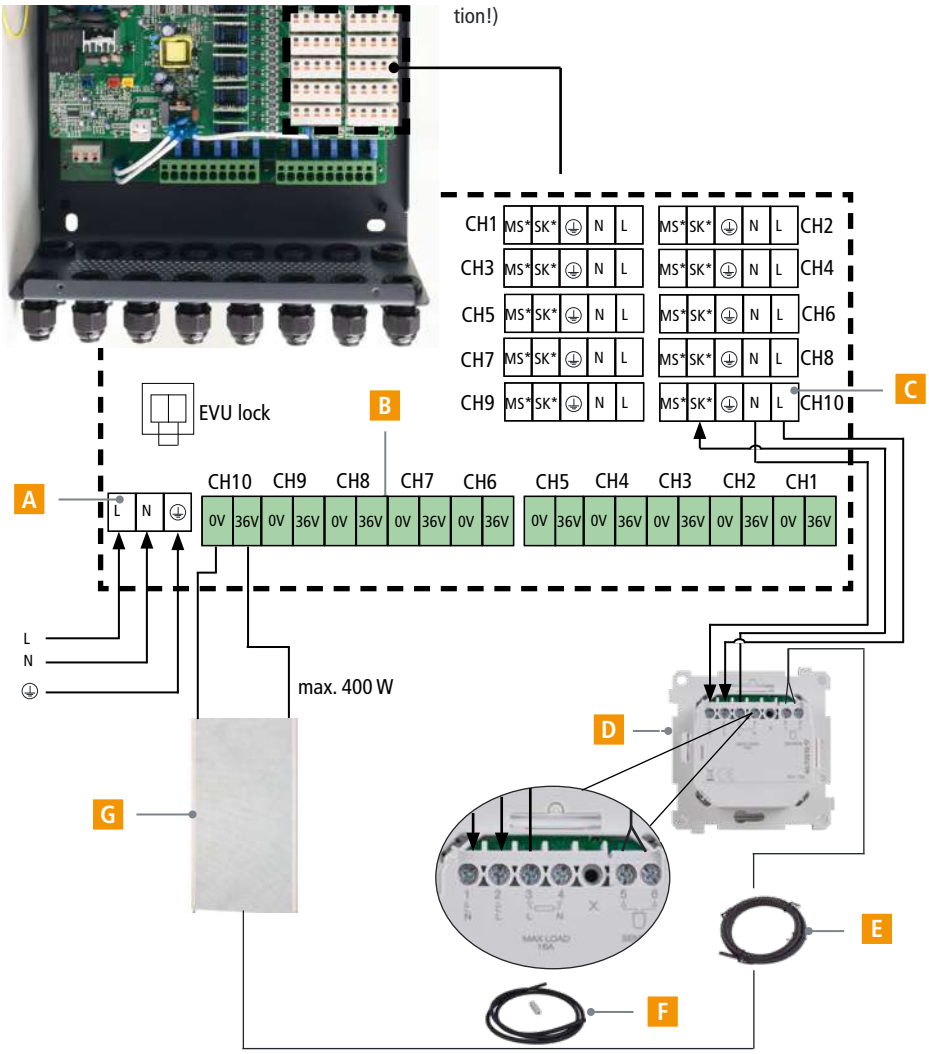


DANGER

Risk of electric current injury!
The use of separate fuses / phases for the room thermostat can lead to a possible risk from external voltage at the connection points **SK*** input and the **MS*** output.

Variant 2: Connection room thermostat WIFI

- **A** Terminals power supply 230 V ~ 50 Hz
- **B** Terminals secondary side 36 V (CH 1-10)
- **C** Terminals room thermostat (CH 1-10)
- **D** E-NERGY CARBON room thermostat WIFI
- **E** External temperature sensor room thermostat WIFI
- **F** Sensor connection set
- **G** E-NERGY CARBON heating foils (max. 400 W per connection!)

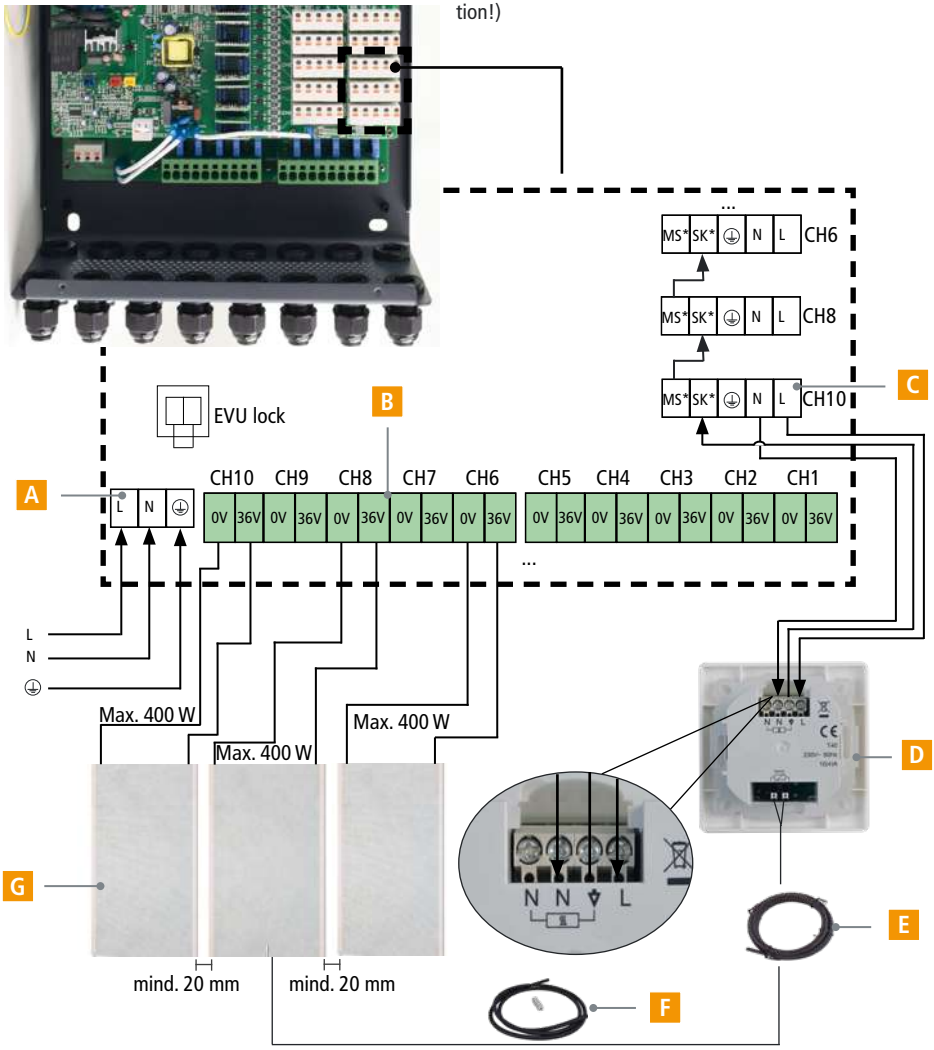


DANGER

Risk of electric current injury!
The use of separate fuses / phases for the room thermostat can lead to a possible risk from external voltage at the connection points **SK*** input and the **MS*** output.

Variant 3: Cascading - Exemplary connection of room thermostat EN 01 to several channels

- **A** Terminals power supply 230 V ~ 50 Hz
- **B** Terminals secondary side 36 V (CH 1-10)
- **C** Cascaded terminals room thermostat (exemplary for channel 6, 8, 10)
- **D** E-NERGY CARBON room thermostat EN 01
- **E** External temperature sensor room thermostat EN 01
- **F** Sensor connection set
- **G** E-NERGY CARBON heating foils (max. 400 W per connection!)



DANGER

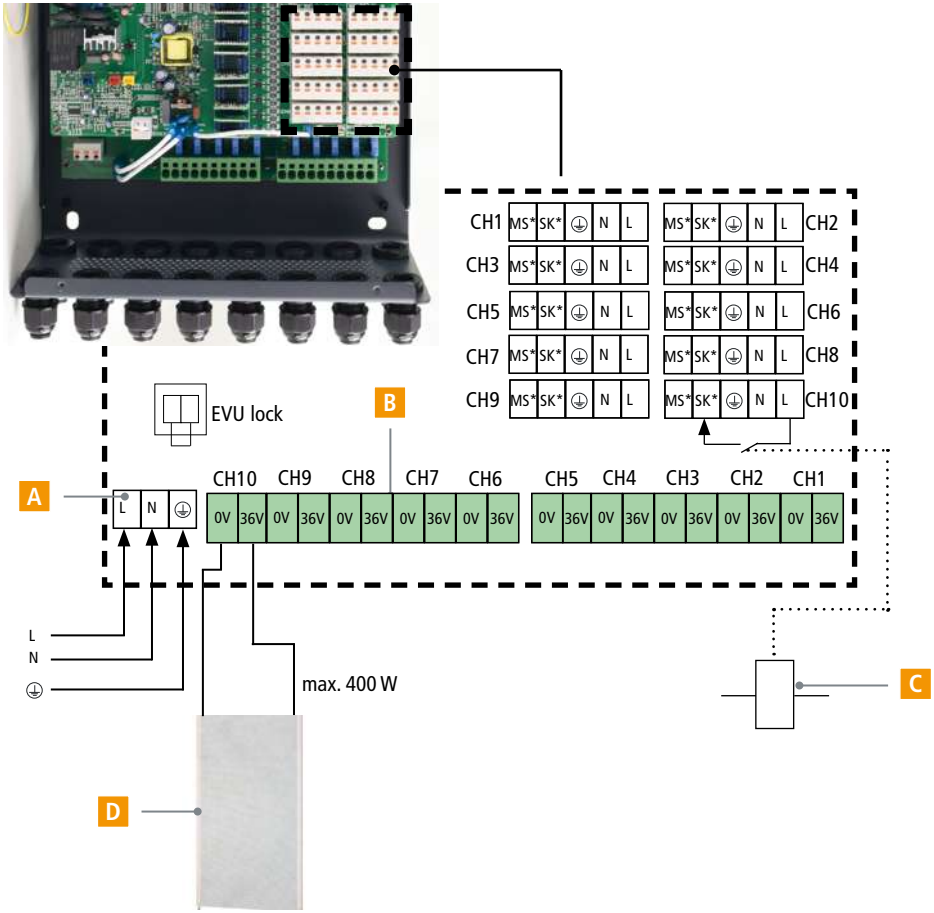
Risk of electric current injury!

The use of separate fuses / phases for the room thermostat can lead to a possible risk from external voltage at the connection points **SK*** input and the **MS*** output.

Variant 4: Connection of a potential-free switching contact

When using a potential-free switching contact, the supply terminal room thermostat **L** (230 V) is connected to the switching contact **SK** via the potential-free contact.

- **A** Terminals power supply 230 V ~ 50 Hz
- **B** Terminals secondary side 36 V (CH 1-10)
- **C** Potential-free switching contact, e.g. relay
- **D** E-NERGY CARBON heating foils (max. 400 W per connection!)



DANGER

Risk of electric current injury!

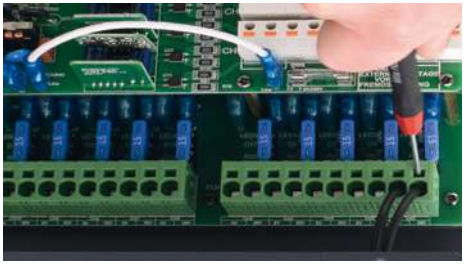
The use of separate fuses / phases for the room thermostat can lead to a possible risk from external voltage at the connection points **SK*** input and the **MS*** output.

5.4 Connecting heating circuits

After installing the heating foils and supply lines, check the resistances again and document the values in the test report and in the installation sketch.

Attention: If the measured resistance values deviate more than 15 % from the initial value, damage to the contacts or the heating foil must be expected. In this case, you must not put the heating system into operation.

After the successful control measurement, the connecting leads of the heating tracks can be connected to the 36 V output terminals.



Output terminals 36 V (2.5 mm²-6.0 mm²)

Notice	**The order of the heating circuits (channel 1-10) and the respective assignment of the room thermostats (channel 1-10) must be observed.**

Notice	**A maximum of 400 W may be connected per connection (output terminal pair 36 V). The total connected power must not exceed the rated power of the power supply unit.**

5.5 Electrical commissioning

The electrical installation work on the device is now complete. Carefully check the execution of the installation work again. Reconnect the protective earth conductor to the housing cover and connect the plug connections of the LED display.



Connect the protective earth conductor to the housing cover.



Connect the plug connections of the LED display (green, red, yellow) with the correct LED connection.

Notice: Observe the labeling on the circuit board (**Green_LED**, **Red_LED**, **Yellow_LED**)



Replace the housing cover and close the device with the device screws.

For commissioning, switch on the supply circuit again.
After activating the circuit and if the installation is correct, the room thermostat is activated.

If the room thermostat gives the signal for heating, first the device and then the channel/heating circuit switches on. When the heating cycle is finished, the channel/heating circuit switches off again. After all heating circuits are deactivated, the device also switches off again.

Test function: To start a test run of the heating system, increase the temperature at the room thermostat until heating operation is started. Reducing the temperature ends the heating operation again. After successful commissioning, set the room thermostat properly. For details on setting the temperature, refer to the respective instructions for the room thermostat.

6. Commissioning

After a minimum drying time of the adhesive (see manufacturer's recommendation) and after successful electrical commissioning, the **E-NERGY CARBON** heating system can be heated up for the first time. Now attach the supplied warning sign in the immediate vicinity of the heating foil so that it is clearly visible and deposit the operating instructions in the distribution box or a suitable location.

7. Fault diagnosis

DANGER



Risk of electric current injury!
There is a risk of injury from electric current.

- Before carrying out electrical work, the power supply must be disconnected and secured against reconnection.
- The electrical installation may only be carried out by competent persons in accordance with the applicable legal requirements.
- The installation must comply with national and/or local electrical regulations.
- A residual current switch (rated residual current ≤ 30 mA) is required for each circuit.

If the device does not function or malfunctions, the following possible causes should help to solve the problem. If the listed causes do not eliminate the malfunction, contact your contracting party.

Possible cause	Remedy
Heating mode not activated	Check the settings on the room thermostat. When cascading several heating circuits, check all cable connections between terminals **SK** and **MS**. Check the EVU contact (closed = device activated and green LED constantly lit, open = device deactivated and green LED flashing).
Power supply interrupted	Check all cable connections and terminals. Check the circuit breaker of the electric circuit. Check the fuse of the room thermostats (fine-wire fuse T 4.0 A)
Triggering the heating circuit fuse	Check the heating circuit fuse(s) and, if necessary, replace it with an identical 15 A blade-type fuse (see illustration). A defective heating circuit fuse is indicated by the red LED in the housing cover and by a red LED of the corresponding heating circuit on the control electronics.
Triggering of the safety temperature switch by heat accumulation	Check the temperature of the transformer and ensure that there is sufficient ventilation



Replace the fuse

8. Technical data

E-NERGY CARBON Power supply PRO TT 2400 W / 3200 W	
Nominal power	2.400 W | 3.200 W
Nominal voltage primary	230 V AC 50/60 Hz
Nominal voltage secondary	36 V AC (SELV, Safety Extra Low Voltage)
Power supply 230 V (primary)	Spring clamp terminals 1.5 mm² - 2.5 mm²
Connection room thermostat 230 V	Spring clamp terminals 1.5 mm² - 2.5 mm²
Connection heating foils 36 V (secondary)	Spring clamp terminals 2.5 mm² to 6.0 mm²
Number of connections heating foil / room thermostats	10 each
Fuse protection per connection heating foil	15 A
Ambient temperature	Max. 40°C
Internal safety temperature switch	130°C automatic resetting
Insulation material class	B
Housing protection class	IP20
Dimensions (L x W x H)	2.400 W: 555 x 300 x 140 mm 3.200 W: 555 x 300 x 140 mm
Weight	2.400 W: ca. 28,0 kg | 3.200 W: ca. 34,0 kg
Type	Toroidal core
Protection class IEC/EN	I
EU Conformity	CE mark, according to EN 61558-2-6, European Low Voltage Directive 2014/35/EU, EMC Directive 2014/30/EU and RoHS 2011/65/EU
Waste management	 WEEE-Reg.-No. : DE 97703783

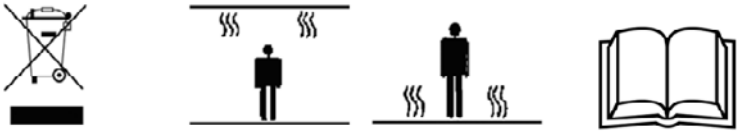
Notice	**A maximum of 400 W may be connected per connection (output terminal pair 36 V). The total connected power must not exceed the rated power of the power supply unit.**

The maximum lengths of the individual heating tracks can be determined from the separate document „Resistances and powers as a function of length".
The power supply unit is to be mounted exclusively on the surface. Sufficient ventilation must always be provided.
The ambient temperature must not exceed the maximum value of +40 °C.
The secondary cable between the power supply unit and the heating foil must not exceed 10 m with a cable cross-section of 2.5 mm² and a maximum of 25 m with a cable cross-section of 6.0 mm².

E-NERGY CARBON room thermostat
see mounting and operating instructions room thermostat

E-NERGY CARBON heating foils	
Voltage	36 V
Heating foil dimension, width	FLEECE & PET: 59 cm, 54 cm (net heating width) FLEECE S: 17 cm, 12 cm (net heating width) DRYTEC: 60 cm, 38 cm (net heating width)
Specific performances	E-NERGY CARBON FLEECE – 36 W/lfm (60 W/m²) E-NERGY CARBON FLEECE – 66 W/lfm (110 W/m²) E-NERGY CARBON FLEECE – 132 W/lfm (220 W/m²) E-NERGY CARBON FLEECE S – 25 W/lfm (145 W/m²) E-NERGY CARBON FLEECE S – 50 W/lfm (290 W/m2) E-NERGY CARBON DRYTEC – 45 W/lfm (112 W/m²) E-NERGY CARBON PET – 36 W/lfm (60 W/m²) E-NERGY CARBON PET – 69 W/lfm (115 W/m²)
Nominal limit temperature	+ 70 °C (60°C for E-NERGY CARBON DRYTEC)
Minimum processing temperature	+ 5 °C
Minimum bending radius	R10 mm
Material	PET film with carbon fibres and fillers
Connection cable	2,5 mm²
Secondary line between power supply unit and heating foil	2,5 mm², max. 10 m length 6,0 mm², max. 25 m length
Max. thermal resistance	R-value for floor covering: 0.15 m² K/W

Explanation of symbols:



a) Disposal note: The product must not be disposed of in general household waste! Recycling via electronic-disposal of the municipal collection points.
b) Permissible installation as ceiling heating (direct acting)
c) Permitted installation as underfloor heating (direct acting)
d) Read the operating instructions, follow the instructions

9. Warranty and guarantee

1.) We provide a warranty for our **E-NERGY CARBON** panel heating system in accordance with the provisions of the German Civil Code. For private end customers, the statutory warranty period is 2 years. We grant a warranty period of 5 years for system components that are permanently connected to the building, such as the **E-NERGY CARBON** heating foils. For companies, the following amounts deviate from this the warranty period is one year.

2.) In addition, we give a 5-year guarantee on our **E-NERGY CARBON** surface heating foils, which follows the statutory warranty period. This guarantee applies to end customers who use our **E-NERGY CARBON** system as a new product and refers to the surface heating foils. In addition, it is a prerequisite for making a claim under the warranty that the system installation and electrical connection has been carried out by a specialist technician. In order to make a claim under the warranty, the customer must submit the warranty card completed and signed by the specialist technician, which is issued during installation, and the installation plan with a copy of the invoice. If these documents are not submitted, the warranty cannot be claimed. The warranty period starts from the date of the end customer invoice.

The warranty service of mfh systems first of all includes a check whether a warranty claim exists. Should a warranty claim exist, mfh systems can determine the way in which the fault is to be remedied. mfh systems is at liberty to refund the proven invoice amount for the heating foil, to repair the **E-NERGY CARBON** surface heating foils itself, or to have them repaired by a third party and to bear the costs incurred. Furthermore, mfh systems is entitled to deliver a comparable system from mfh systems or from a third-party supplier as a replacement. Further claims of the customer in the event of a warranty case do not exist. mfh systems does not assume, for example, the costs for installation and removal, costs for additional craftsmanship or costs and expenses incurred by the customer through the removal of the malfunction during the warranty period. In addition, mfh systems will not assume the costs for the services of a possibly required emergency service within the scope of the guarantee. The warranty does not cover damage to the **E-NERGY CARBON** heating foil that is not caused by a defect in the **E-NERGY CARBON** heating foil. The warranty therefore does not cover damage or defects that have occurred due to incorrect laying or installation, incorrect operation or improper use or due to wear and tear. Claims under the warranty are also only valid if only system components approved by mfh systems for use with the **E-NERGY CARBON** system, such as power supplies, control systems, etc., are used. The warranty also does not cover the remedying of defects or damage caused by faulty further processing and/or maintenance, weather conditions or other natural phenomena. Claims of the customer for compensation for indirect or consequential damages are not covered by the warranty. As long and as far as warranty services are provided by mfh systems or third parties initiated by mfh systems, this does not lead to an extension of the granted warranty period of 5 years.

3.) The warranty claim with regard to **E-NERGY CARBON** films can only be made within
11 years from the date of production of the **E-NERGY CARBON** surface heating foils. After this period, claims under the warranty are excluded. Also excluded are claims for warranty services as long as and to the extent that these would have to be provided outside the European Union.

10. Test report

1. Please measure the resistance of all tracks before installation and compare it with the label. For cut heating foils, the resistance values can be taken from the technical data. This measured value in the installation plan for each make a note of the heating track and write it down on the test report. Maximum deviation 15 %.
2. Please measure the resistance of all tracks after installation and compare it with the measured value before. Note the second measured value in the installation plan for each heating track and record it on the test report.

PRÜFPROTOKOLL

Kunde

Name
Name _____

Straße
Address _____

PLZ/Ort
Postcode/town/city _____

Telefon
Telephone no. _____

Auftragsgeber
Contact name _____

Elektroinstallateur
Electrician _____

Verlegedatum
Fitting date _____

Installationsdatum
Installation date _____

TEST REPORT

Customer

Einbauort (Raum)
Fitting (Room) _____

☐ Decke / Ceiling ☐ Wand / Wall ☐ Boden / Floor

Firmenstempel + Unterschrift des Elektroinstallateur
Company stamp + electrician's signature

Test report resistance values

Room	Lane no.	Length	Performance	Resistance before mounting	Resistance after mounting
	1	cm	W/m²	Ω	Ω
	2	cm	W/m²	Ω	Ω
	3	cm	W/m²	Ω	Ω
	4	cm	W/m²	Ω	Ω
	5	cm	W/m²	Ω	Ω
	6	cm	W/m²	Ω	Ω
	7	cm	W/m²	Ω	Ω
	8	cm	W/m²	Ω	Ω
	9	cm	W/m²	Ω	Ω
	10	cm	W/m²	Ω	Ω
	11	cm	W/m²	Ω	Ω
	12	cm	W/m²	Ω	Ω
	13	cm	W/m²	Ω	Ω
	14	cm	W/m²	Ω	Ω
	15	cm	W/m²	Ω	Ω
	16	cm	W/m²	Ω	Ω

Date _____ Signature _____

11. EC declaration of conformity

Products:
E-NERGY CARBON Power supply PRO TT 2400
E-NERGY CARBON Power supply PRO TT 3200
E-NERGY CARBON FLEECE – 36 W/lfm (60 W/m²),
E-NERGY CARBON FLEECE – 66 W/lfm (110 W/m²),
E-NERGY CARBON FLEECE – 132 W/lfm (220 W/m²),
E-NERGY CARBON FLEECE S – 25 W/lfm (145 W/m²),
E-NERGY CARBON FLEECE S – 50 W/lfm (290 W/m²),
E-NERGY CARBON DRYTEC – 45 W/lfm (112 W/m²),
E-NERGY CARBON PET – 36 W/lfm (60 W/m²),
E-NERGY CARBON PET – 69 W/lfm (115 W/m²)

It is hereby confirmed that the above mentioned products comply with the essential requirements laid down in the Council Directive on the approximation of the laws of the Member States

on electromagnetic compatibility (2014/30/EU)

EN 55014-1:2014-05	EN 61000-3-2:2010
EN 55014-2:2009-06	EN 61000-3-3:2014-03

and on the Low Voltage Directive (2014/35/EU)
EN 61558-2-6:2010-04

and are defined by RL RoHS2011 11/65 / EG.

Belm-Vehrte, April 15th 2021



Daniel Schuschan
Industrial Engineer | M. Eng.
Managing Partner

12. Illustrated assembly instructions

12.1 E-NERGY CARBON FLEECE Ceiling and Wall Heating



Prepare a level, clean, load-bearing substrate.
Dry construction boards and wood-based panels must be crack-bridged in the joint area.



Mark the position of the heating foils and determine the location of the power supply unit. Create an installation sketch.

Notice: Observe the cable routing and the maximum distance between the heating foil and the power supply unit (max. 10 m with 2.5 mm^2 / max. 25 m with 6.0 mm^2).



Mark cable routing and recesses for the heating foil contacts.



Make recesses for the supply lines and contacts of the heating foils.



Make the recess for foil contacting sufficiently large.

Notice: Flush mounting of the contact must be ensured.

Use of an external temperature sensor:
An external temperature sensor is not mandatory for ceiling and wall heaters. However, the use of an external temperature sensor can increase comfort and application possibilities (e.g. wall heating for drying towels or wall heating in the shower).



Provide a recess for the sensor connection set. Position the sensor sleeve centrally under the heating foil.

Notice: The installation of the external temperature sensor is only allowed in the sensor connection set, so that the external temperature sensor can be protected against damage and can be replaced in case of malfunction.



Cover the metal end cap of the sensor connection set with insulating tape to avoid fault currents.



Route the sensor connection set in the recess. Guide the external temperature sensor to the end cap (measuring point).



Check resistance according to the resistance tables and document values in the test report and in the installation sketch.



The heating foil can be shortened individually in advance.

Notice: Observe right-angled cutting edges to the copper tracks.



Re-measure resistances of cut foils and document on label, in test report and installation sketch - Take nominal values from resistance tables.



Apply adhesive mortar for bonding the heating foils according to the manufacturer's instructions.



Place the heating foils in the adhesive bed and align them with each other.

Notice: The copper strip faces the wall / ceiling. The distance between the foils must be at least 20 mm. Overlapping of the foils is not permitted.



Press in heating foil with plastic spatula and smooth out.

Notice: Kinks and folds are not permitted. Tools made of metal can damage the heating foil.



The heating foil can be mounted around corners. Heating foil with plastic spatula without sharp bend.

Notice: The corner must be load-bearing and crack-bridging. Movements are not permitted.



Do not lay the heating foil over expansion joints and allow it to end at a distance of at least 2 cm in front of the expansion joint.



Cover heating foil with adhesive mortar using plastic spatula according to manufacturer's instructions.

Notice: Sealants in the wet area are then applied above the heating foil.

18



Fixtures can be retrofitted up to a diameter of 70 mm.

Notice: Copper strips must not be damaged in the process.

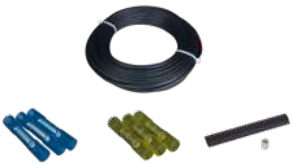
19



Extend the connection cable and lead it to the power supply unit.

Notice: Always press connectors with suitable pressing pliers and shrink them with a hot air gun.

20



Blue connector (2.5 mm² | cable length max. 10 m)
Yellow connector (6.0 mm² | cable length max. 25 m)
Universal connector (transition 2.5 mm² to 6.0 mm² | parallel connection of several heating foils.

21



Check the resistance again after connecting the cables and document the values in the test report and in the installation sketch.

22



Connect the supply cables to the power supply unit.

DANGER

Risk of electric current injury!

- Before carrying out electrical work, the power supply must be disconnected and secured against reconnection.

23



Apply pavement and top coat according to manufacturer's instructions.

Note for heating foils with contact on both sides



Heating foils contacted on both sides can be cut individually into two single foils.



The heating foil can be shortened as desired.

Notice: Observe right-angled cutting edges to the copper tracks.



Measure the resistances again and document them in the test report and the installation sketch. Refer to the installation instructions for the nominal values.



For cut-to-size foils, record measured resistances on enclosed labels and affix to heating foil.



If the complete film is to be processed without individual cutting, a contact must be cut vertically along the film.

12.2 E-NERGY CARBON FLEECE underfloor heating



Prepare a level, clean and stable substrate.

Notice: Dry screeds and wood-based panels must always be executed in two layers and offset.



Mark the position of the heating foils and determine the location of the power supply unit. Create an installation sketch.

Notice: Observe the cable routing and the maximum distance between the heating foil and the power supply unit (max. 10 m with 2.5 mm^2 / max. 25 m with 6.0 mm^2).



Mark cable routing and recesses for the heating foil contacts.



Make recesses for the supply lines and contacts of the heating foils.



Make the recess for foil contacting sufficiently large.

Notice: Flush mounting of the contact must be ensured.

Use of an external temperature sensor:
For the "floor heating" application, a floor sensor (external temperature sensor) is mandatory according to EN 50559:2013-12.



Provide a recess for the sensor connection set. Position the sensor sleeve centrally under the heating foil and at least 60 cm from the wall in the room.

Notice: The installation of the external temperature sensor is only allowed in the sensor connection set, so that the external temperature sensor can be protected against damage and can be replaced in case of malfunction.



Cover the metal end cap of the sensor connection set with insulating tape to avoid fault currents.



Route the sensor connection set in the recess. Guide the external temperature sensor to the end cap (measuring point).



For ideal readings, have the metal end cap flush with the top.



Check resistance according to the resistance tables and document values in the test report and in the installation sketch.



The heating foil can be shortened individually in advance.

Notice: Observe right-angled cutting edges to the copper tracks.



Re-measure resistances of cut films and document on the label, in the test report and in the installation sketch - Take nominal values from the resistance tables.



Apply adhesive mortar for bonding the heating foils according to the manufacturer's instructions.



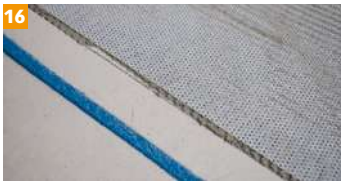
Place the heating foils in the adhesive bed and align them with each other.

Notice: The copper strip faces the ground. The distance between the foils must be at least 20 mm. Overlapping of the foils is not permitted.



Press in heating foil with plastic spatula and smooth out.

Notice: Kinks and folds are not permitted. Tools made of metal can damage the heating foil. Sealants in the wet area are then applied above the heating foil.



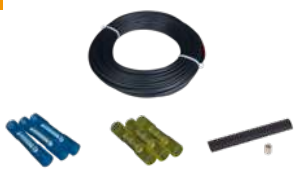
Do not lay the heating foil over expansion joints and allow it to end at a distance of at least 20 mm from rising structural components (e.g. walls).



Extend the connection cable and lead it to the power supply unit.

Notice: Always press connectors with suitable pressing pliers and shrink them with a hot air gun.

18



Blue connector (2.5 mm² | cable length max. 10 m)
Yellow connector (6.0 mm² | cable length max. 25 m)
Universal connector (transition 2.5 mm² to 6.0 mm² | parallel connection of several heating foils.

19



Check the resistance again after connecting the cables and document the values in the test report and in the installation sketch.

20



Connect the supply cables to the power supply unit.

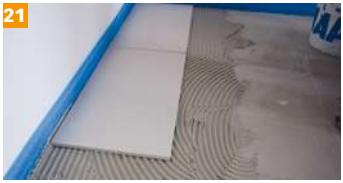
DANGER



Risk of electric current injury!

- Before carrying out electrical work, the power supply must be disconnected and secured against reconnection.

21



Notice: Tiles can be laid directly on the smooth adhesive mortar using suitable tile adhesive in accordance with the manufacturer's instructions.

22



Notice: For other floor coverings, a leveling layer must be applied to the heating foils prior to installation in accordance with the manufacturer's instructions.

Note for heating foils with contact on both sides



Heating foils contacted on both sides can be cut individually into two single foils.



The heating foil can be shortened as desired.

Notice: Observe right-angled cutting edges to the copper tracks.



Measure the resistances again and document them in the test report and the installation sketch. Refer to the installation instructions for the nominal values.



For cut-to-size foils, record measured resistances on enclosed labels and affix to heating foil.



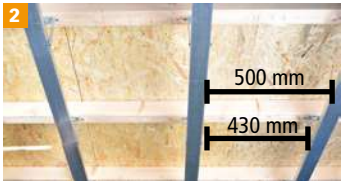
If the complete film is to be processed without individual cutting, a contact must be cut vertically along the film.

12.3 E-NERGY CARBON DRYTEC ceiling heating



Prepare a level, clean, load-bearing substructure.

Notice: Substrates made of wood-based panels must be crack-bridged in the joint area.



Center distance 500 mm (min. 430 mm distance between profiles). Observe manufacturer's instructions and generally accepted technical rules.



Mark the position of the heating foils and determine the location of the power supply unit. Create an installation sketch.

Notice: Observe the cable routing and the maximum distance between the heating foil and the power supply unit (max. 10 m with 2.5 mm^2 / max. 25 m with 6.0 mm^2).



Apply insulation, e.g. mineral wool.

Notice: Only use insulation materials without aluminum lamination.



Check resistance according to the resistance tables and document values in the test report and in the installation sketch.



The heating foil can be shortened individually in advance.

Notice: Observe right-angled cutting edges to the copper tracks.



Re-measure resistances of cut foils and document on label, in test report and installation sketch - take nominal values from resistance tables.



Make marks perpendicular to the profiles to align heating foils parallel.



Prepare profiles with double-sided adhesive tape.



Attach the heating foil to the mounting strip.

Notice: In the case of wooden substructures, the wood foil can be fastened in the mounting strip with staples. The transparent PET coating faces upwards towards the profile. Creases and folds are not permitted.

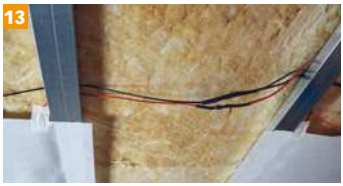


Always align the electrically active heating area (410 mm) with a distance of 10 mm to each side between the drywall profiles.



Fixtures can be retrofitted up to a diameter of 70 mm.

Notice: Copper strips must not be damaged in the process.



Extend the connection cable and lead it to the power supply unit.

Notice: Always press connectors with suitable pressing pliers and shrink them with a hot air gun.



Blue connector (2.5 mm² | cable length max. 10 m)
Yellow connector (6.0 mm² | cable length max. 25 m)
Universal connector (transition 2.5 mm² to 6.0 mm² | parallel connection of several heating foils.



Check the resistance again after connecting the cables and document the values in the test report and in the installation sketch.



Connect the supply cables to the power supply unit.

DANGER

Risk of electric current injury!

- Before carrying out electrical work, the power supply must be disconnected and secured against reconnection.



Install drywall board (max. thickness 12.5 mm) according to manufacturer's instructions.

Note for installation with lower deck plate



Mark the area of the heating foil contacts on the lower deck plate.



Create a recess for the foil contact and lay the supply lines.

Notice: Flush mounting of the contact must be ensured.



Attach the heating foil to the mounting strip, e.g. with double-sided adhesive tape or staples to the lower deck plate.



Connect the connection cable with the supply line.

Notice: Note details of the crimp connector/universal connector.



Insert cable and connection contact flush.

Notice: If necessary, close the recess so that it is vapor-tight.



Fasten drywall panels (max. thickness 12, 5 mm) outside the electrically active heating area (410 mm) according to the manufacturer's instructions.

12.4 E-NERGY CARBON PET underfloor heating



Prepare a level, clean, load-bearing substrate. Dry screeds and wood-based panels must always be applied in two layers and offset.



Mark the position of the heating foils and determine the location of the power supply unit. Create an installation sketch.

Notice: Observe the cable routing and the maximum distance between the heating foil and the power supply unit (max. 10 m with 2.5 mm^2 / max. 25 m with 6.0 mm^2).



Mark cable routing and recesses for the heating foil contacts.



Make recesses for the supply lines and contacts of the heating foils.

Use of an external temperature sensor:
For the "floor heating" application, a floor sensor (external temperature sensor) is mandatory according to EN 50559:2013-12.



Provide a recess for the sensor connection set. Position the sensor sleeve centrally under the heating foil and at least 60 cm from the wall in the room.

Notice: The installation of the external temperature sensor is only allowed in the sensor connection set, so that the external temperature sensor can be protected against damage and can be replaced in case of malfunction.



Cover the metal end cap of the sensor connection set with insulating tape to avoid fault currents.



Route the sensor connection set in the recess. Guide the external temperature sensor to the end cap (measuring point).



Lay out impact sound insulation according to manufacturer's instructions.
Notice: Representation of **E-NERGY CARBON PET** on the impact sound insulation membrane (usual for floating parquet/laminate). For other floating floor coverings (e.g. design coverings), it may be necessary to install the heating foil underneath the impact sound insulation membrane. Always follow the manufacturer's instructions!



Leave out the impact sound insulation membrane and, for ideal measurement values, have the floor sensor sleeve flush with the top of the impact sound insulation membrane (e.g. **CF DIRECT 1.5**).



Check resistance according to the resistance tables and document values in the test report and in the installation sketch.



The heating foil can be shortened individually in advance.

Notice: Observe right-angled cutting edges to the copper tracks.



Re-measure resistances of cut films and document on the label, in the test report and in the installation sketch - Take nominal values from the resistance tables.



Make recesses for the supply lines and contacts of the heating foils.

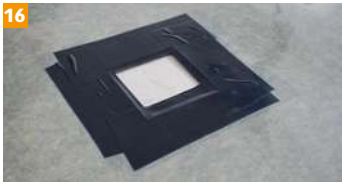


Apply insulating tape to the full width of the head and foot ends under the cut edge of the heating foil.

Notice: In the case of metallic substrates, residual currents can occur at the cut edge of the heating foil without insulating adhesive tape.



In addition, mask the cut edges from above at the head and foot ends with insulating tape.



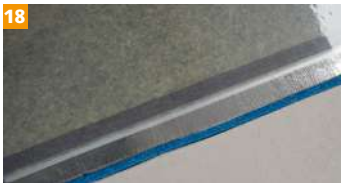
Recesses up to max. 70 x 70 mm are to be masked accordingly above and below the heating foil. Copper strips must not be damaged.

Notice: In the case of metallic substrates, residual currents can occur at the cut edge of the heating foil without insulating adhesive tape.



Align **E-NERGY CARBON PET** heating foils with each other and fix them laterally with insulating tape.

Notice: The distance between the foils must be at least 20 mm. Overlapping of the foils is not permitted. Creases and folds are not permitted.



Do not lay the heating foil over expansion joints and allow it to end at a distance of at least 20 mm and in front of rising structural components (e.g. walls).



Extend the connection cable and lead it to the power supply unit.

Notice: Always press connectors with suitable pressing pliers and shrink them with a hot air gun.



Blue connector (2.5 mm² | cable length max. 10 m)
Yellow connector (6.0 mm² | cable length max. 25 m)
Universal connector (transition 2.5 mm² to 6.0 mm² | parallel connection of several heating foils.



Check the resistance again after connecting the cables and document the values in the test report and in the installation sketch.



Connect the supply cables to the power supply unit.

DANGER

Risk of electric current injury!

- Before carrying out electrical work, the power supply must be disconnected and secured against reconnection.



Laminate and parquet can be laid floating directly on the heating foil.

Notice: For other floating floor coverings (e.g. design coverings), it may be necessary to install the heating foil underneath the impact sound insulation membrane. Always follow the manufacturer's instructions!

Note for heating foils with contact on both sides



Heating foils contacted on both sides can be cut individually into two single foils.



The heating foil can be shortened as desired.

Notice: Observe right-angled cutting edges to the copper tracks.



Measure the resistances again and document them in the test report and the installation sketch. Refer to the installation instructions for the nominal values.



For cut-to-size foils, record measured resistances on enclosed labels and affix to heating foil.

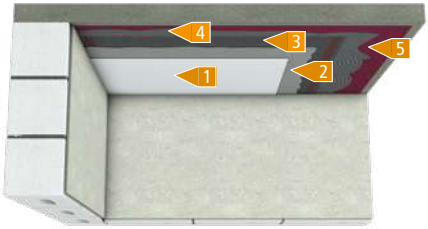


If the complete film is to be processed without individual cutting, a contact must be cut vertically along the film.

13. Constructions E-NERGY CARBON FLEECE, DRYTEC, PET

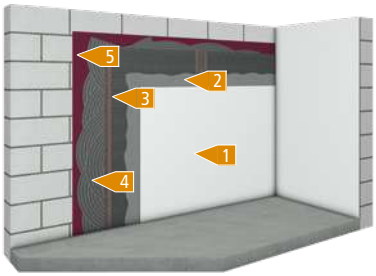
Construction ceiling heating E-NERGY CARBON FLEECE

1. Ceiling covering
2. Filler / plaster system min. 2 mm
3. Heating foil **E-NERGY CARBON FLEECE**
4. Filler / Adhesive
5. Primer



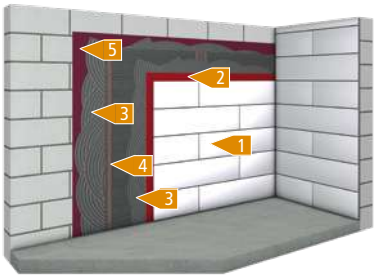
Constructions wall heating E-NERGY CARBON FLEECE

1. Wall covering
2. Filler / plaster system min. 2 mm
3. Heating foil **E-NERGY CARBON FLEECE**
4. Filler / Adhesive
5. Primer



Wall heating with filler

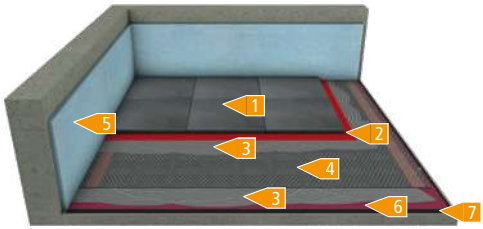
1. Tiles | Natural stone
2. If necessary, sealing in damp rooms
3. Tile adhesive approx. 2 mm per layer
4. Heating foil **E-NERGY CARBON FLEECE**
5. Primer



Wall heating with tiles

Construction underfloor heating E-NERGY CARBON FLEECE

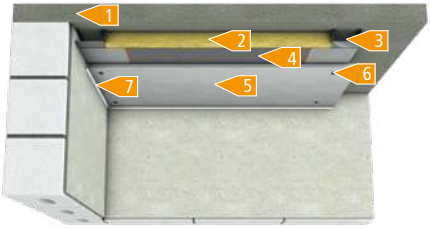
1. Tiles | Natural stone
2. If necessary, sealing in damp rooms
3. Tile adhesive approx. 2 mm per layer
4. Heating foil **E-NERGY CARBON FLEECE**
5. Edge insulation strip EPS | NEO
6. Primer
7. If necessary, moisture barrier (bond to substrate)



Underfloor heating (glued)

Construction ceiling heating E-NERGY CARBON DRYTEC

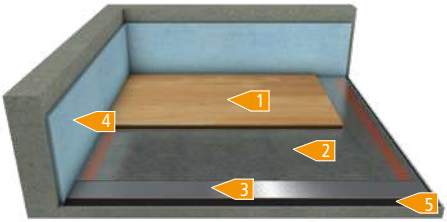
1. Raw ceiling
2. Additional insulation mineral wool 032 (25 mm)
3. Drywall profile e.g. CD 60/27
4. Heating foil **E-NERGY CARBON DRYTEC**
5. Drywall board
6. Fixing screw
7. Movement joint



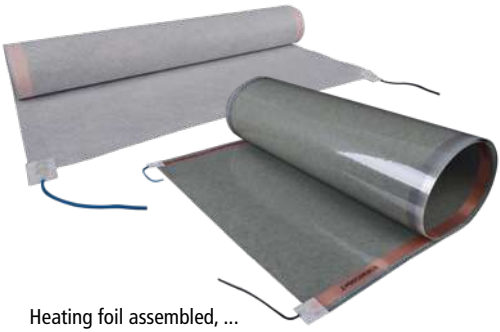
With drywall profiles

Construction underfloor heating E-NERGY CARBON PET

1. Parquet / laminate (floating installation)
2. Heating foil **E-NERGY CARBON PET**
3. Impact sound insulation e.g. CF DIRECT 1.5
4. Edge insulation strip EPS | NEO
5. Moisture barrier if necessary



Underfloor heating (floating installation)



Heating foil assembled, ...



... **E-NERGY CARBON** room thermostats including external temperature sensor,



... and **E-NERGY-CARBON power supply PRO TT**

Watch an installation videos

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