e:nergycarbon
Efficient low carbon heating systems

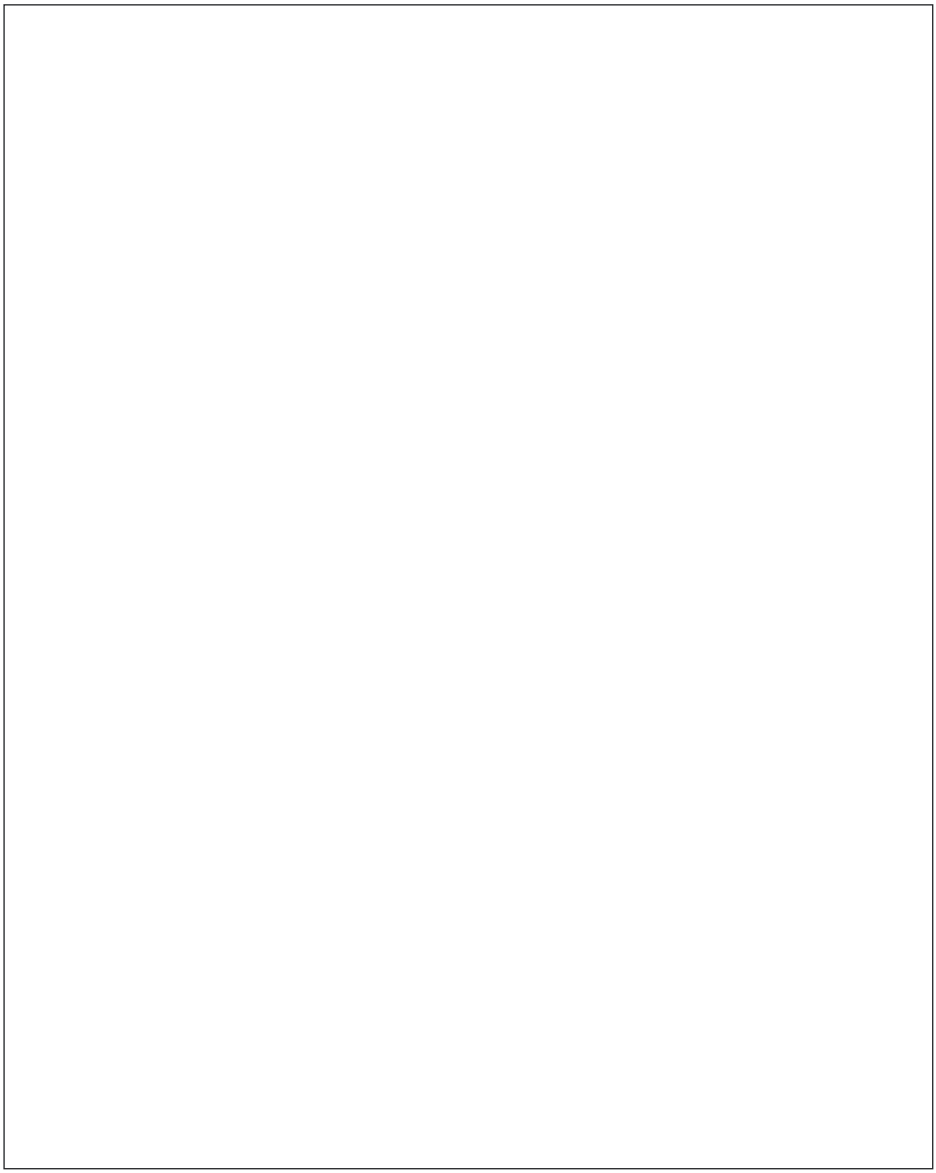
E-NERGY CARBON

Electric panel heating system

Installation and operating manual

Bathroom set 01 | 2,7 m^2 – 300 W

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

Table of contents

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

The **E-NERGY CARBON** system consists of the following scope of delivery:

- Prefabricated FLEECE heating foil 36 V (66 W/lfm or 110 W/m²) with connection on both sides
- Power supply BASIC EI 300 W
- Room thermostat EN 01
- Connection cable and connector
- Sensor connection set
- Installation and operating manual

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 to a control unit, e.g. room thermostat, by a qualified electrician.
- The control unit / room thermostat must be adequately rated for the switching current.
- 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.
- Never open the device. There is a danger to life and connected components can be destroyed.

2.1.1 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 the highest level of electrical safety. The connection of the power supply unit to the house mains, 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 chapter 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 chapter 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.
The EN 01 room thermostat complies 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:

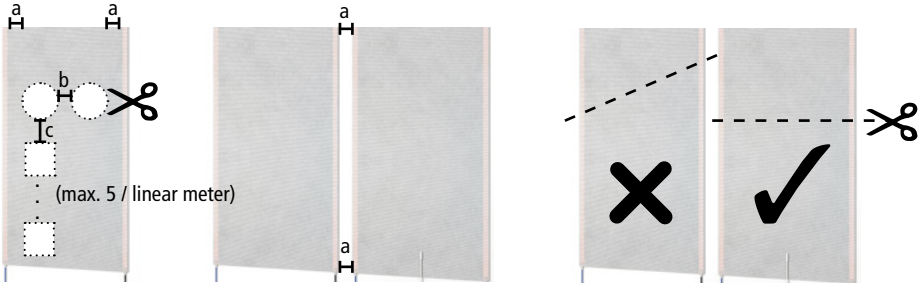
- Please check the temperature controller, e.g. the fault indication on the display.
- Check the fuse(s) on the power supply.
- Check the fuse of the power supply and the in-house fuses or the earth-leakage circuit breaker.

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

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.

3.2.2. Thermal insulation

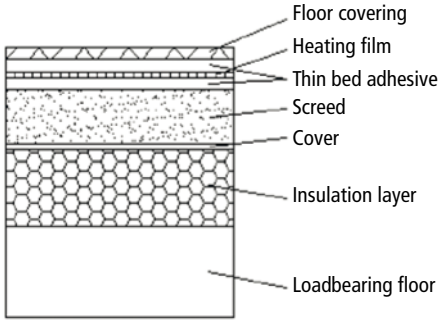
Thermal insulation in the floor and wall area is recommended to reduce the heat emission into the masonry and the floor. In order to limit the downward heat flow, the following minimum ratio of the heat transfer coefficient of the floor structure above the insulation layer and the heat transfer coefficient 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*L)	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).

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.

For installation of the controller and sensor, see chapter **Electrical connection**.

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.

Notice	**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. 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.

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 can be surface-mounted or flush-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 with 2.5 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.

A total of max. 300 W may be connected to the quick-pressure terminals of the BASIC EI 300 W power supply unit. Even if both pairs of terminals are used, the rated power of 300 W must not be exceeded.

The maximum lengths of the individual heating tracks can be determined in the chapter "Resistance values and power as a function of length".

4.1. Overview E-NERGY CARBON Power Supply BASIC EI 300 W

- **A** Connection cable approx. 2.0 m long with Euro flat plug
- **B** Quick release terminals 1.0 mm² to 4.0 mm²
- **C** Internal transformer fuse (replaceable fine-wire fuse T 2.0 A)

Figure 1

4.2. Mounting power supply unit BASIC EI 300 W

The **E-NERGY CARBON** power supply BASIC EI 300 W is referred to as a device in the instructions.
The unit may only be installed in closed rooms. It is suitable for surface and flush mounting and must be protected from moisture, heavy dust, aggressive liquids and vapours. 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 invalidate the guarantee or warranty and may destroy the system! The warranty is void if the fault is due to an accident, use of force, incorrect connection, penetration of liquids, poor maintenance or misuse. The warranty is also void for damage caused by thunderstorms or other voltage variations.

Select the installation site carefully, taking into account the safety instructions as well as the following carefully, taking into account the following points:

- The maximum cable length between the heating track and the unit is 10 m (2.5 mm^2).
  Place the unit 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 product can be safely supported.
- Do not mount the unit upside down.
- The circuit must not be overloaded by the rated current in heating mode.
- When mounting, leave a space of at least 50 mm in all directions around the transformer.
  Never cover the transformer and always ensure sufficient ventilation.
- The transformer fuse (fine-wire fuse) must be accessible.

4.3. Mains voltage and room thermostat 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.

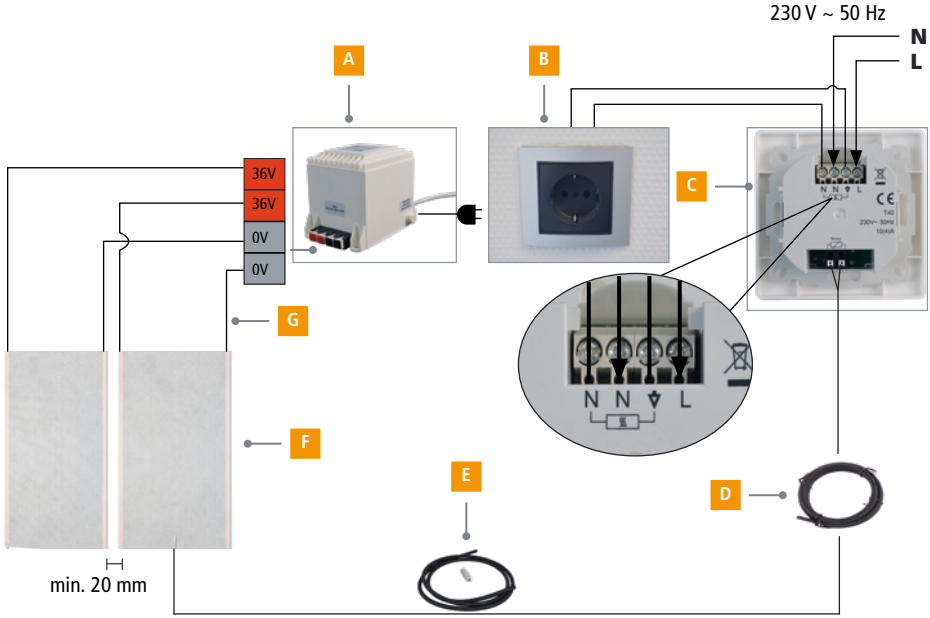
The primary side is fused with 2 A.
The following specifications must be observed for the connection to the supply voltage: Supply voltage 230 VAC, 50/60 Hz

- 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 total load of the circuit. A separate supply line is recommended).
- The unit is not ready for operation when delivered and must first be connected to a control unit, e.g. room thermostat, by a qualified electrician. The unit is not ready for operation when delivered and must first be connected to a control unit, e.g. room thermostat, by a qualified electrician.
- The room thermostat or the switching relay must be sufficiently dimensioned and suitable for the switching current.

Variant 1: Connection to a room thermostat by means of a power socket

With this variant, the room thermostat (e.g. **E-NERGY CARBON** room thermostat EN 01) must be sufficiently dimensioned for the inductive switching current of the unit.

- A **E-NERGY CARBON** power supply BASIC EI 300 W
- B Socket
- C **E-NERGY CARBON** room thermostat EN 01
- D External temperature sensor from room thermostat EN 01
- E Sensor connection set (contains empty tube and metal end cap)
- F **E-NERGY CARBON** heating foils max. 300 W
- G PUR twin cable 2 x 2.5 mm² (max. 10 m)



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

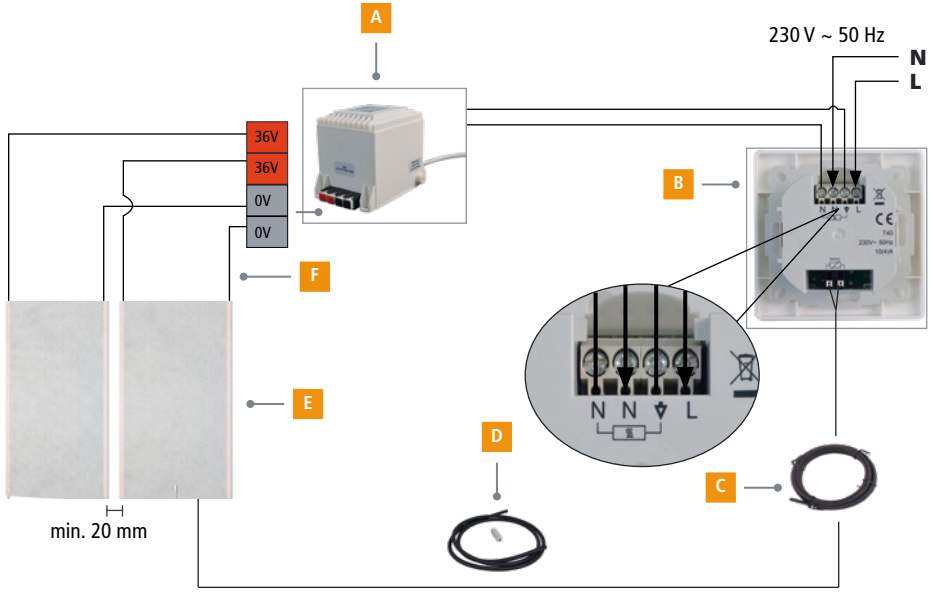
By means of the sensor connection set (E), the external temperature sensor (D) must be installed as close as possible under the heating foil surface. The metal end cap of the sensor connection set must be taped with insulating tape to avoid fault currents. The external temperature sensor is connected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

Notice	The installation of the external temperature sensor (D) is only permitted in the sensor connection set (E) so that the external temperature sensor is protected against damage and can be replaced in the event of a fault.

Variant 2: Fixed connection to a room thermostat

With this variant, the room thermostat (e.g. **E-NERGY CARBON** room thermostat EN 01) must be sufficiently rated for the inductive switching current of the unit. The unit is firmly connected to a room thermostat without a plug (cut off the plug).

- A **E-NERGY CARBON** power supply BASIC EI 300 W
- B **E-NERGY CARBON** room thermostat EN 01
- C External temperature sensor from room thermostat EN 01
- D Sensor connection set (contains empty tube and metal end cap)
- E **E-NERGY CARBON** heating foils max. 300 W
- F PUR twin cable 2 x 2.5 mm² (max. 10 m)



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

Notice	The installation of the external temperature sensor (C) is only permitted in the sensor connection set (D) so that the external temperature sensor is protected against damage and can be replaced in the event of a fault.

4.4. Connection of heating circuits to power supply unit BASIC EI 300 W

Please note the following: After the heating tracks have been laid, the connection lines can be connected to the secondary side of the unit. To do this, connect the quick release terminals (Figure 1, letter B) to the connection lines of the heating tracks.
A maximum of 300 W heating power may be connected to the power supply unit. The maximum power of 300 W can either be connected to one terminal pair or divided between both terminal pairs.

Caution!	**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.**

4.5. Electrical commissioning

The electrical installation work on the unit is now complete. Carefully check the installation work again and check the resistance values of the heating foils.

Caution!	**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.**

For commissioning, switch the supply circuit on again. After activating the power circuit and if the installation is correct, the room thermostat is activated.
If the room thermostat gives the signal to heat, the unit switches on. When the heating cycle is finished, the unit 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 stops 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.

5. 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.

6. 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 unit does not function or malfunctions, the following possible causes should help to solve the problem. If the listed causes do not resolve the malfunction, contact your contractor.

Possible cause	Remedy
Heating mode not activated	Check the settings on the room thermostat
Power supply interrupted	Check all cable connections and terminals. Check the circuit breaker of the circuit
Triggering the appliance fuse	Check the fuse of the unit and replace it if necessary. If necessary, replace it with an identical T 2.0 A fine-wire fuse.
Tripping of the safety temperature switch due to heat accumulation	Check the temperature of the power supply unit and ensure sufficient ventilation

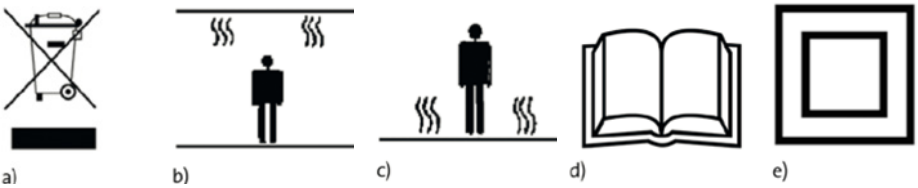
7. Technical data

E-NERGY CARBON power supply BASIC EI 300 W	
Nominal power	300 W
Nominal voltage primary	230 V AC 50/60 Hz
Nominal voltage secondary	36 V AC (SELV, Safety Extra Low Voltage)
Secondary amperage	8.33 A
Connection primary	Connection cable approx. 2.0 m long with Euro flat plug
Connection secondary	Quick release terminals 1.0 mm² to 4.0 mm²
Internal safety temperature switch	110°C automatic resetting
Internal transformer fuse	Replaceable fine-wire fuse T 2.0 A
Protection measure	Ground fault circuit interrupter 30 mA (on-site)
Ambient temperature	Max. 40°C
Insulation material class	E
Housing protection class	IP 40
Dimensions (L x W x H)	approx. 134/101 x 91 x 100 mm³ (without connecting cable)
Weight	approx. 3.4 kg
Type	EI core, encapsulated in a plastic housing
Protection class IEC/EN	II reinforced insulation
EU Conformity	CE mark, according to EN 61558-2-6 and European Low voltage directive 2014/35/EU, RoHS 2011/65/EU
Waste management	 WEEE Reg. No.: DE 97703783

E-NERGY CARBON room thermostat EN 01
see instructions room thermostat EN 01

E-NERGY CARBON heating foils	
Voltage	36 V
Specific performance	66 W/lfm (110 W/m²)
Heating foil dimension, width	FLEECE: 59 cm, 54 cm (net heating width)
Nominal limit temperature	+ 70 °C
Minimum limit temperature	+ 5 °C
Minimum beding 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
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
e) Protection class II

Only a maximum of 300 W may be connected to the quick-pressure terminals of the BASIC EI 300 W power supply unit.
The maximum power of 300 W can either be connected to one terminal pair or divided between both terminal pairs.
The power supply unit can be surface-mounted or flush-mounted. 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.

8. Resistance values and power as a function of length

E-NERGY CARBON FLEECE 66 W/lfm (110 W/m²)

Length	Resistance	Power
0,1 m	199,06 Ω	7 W
0,2 m	99,53 Ω	13 W
0,3 m	66,35 Ω	20 W
0,4 m	49,77 Ω	26 W
0,5 m	39,81 Ω	33 W
0,6 m	33,18 Ω	39 W
0,7 m	28,44 Ω	46 W
0,8 m	24,88 Ω	52 W
0,9 m	22,12 Ω	59 W
1,0 m	19,91 Ω	65 W
1,1 m	18,10 Ω	72 W
1,2 m	16,59 Ω	78 W
1,3 m	15,31 Ω	85 W
1,4 m	14,22 Ω	91 W
1,5 m	13,27 Ω	98 W
1,6 m	12,44 Ω	104 W
1,7 m	11,71 Ω	111 W
1,8 m	11,06 Ω	117 W
1,9 m	10,48 Ω	124 W
2,0 m	9,95 Ω	130 W
2,1 m	9,48 Ω	137 W
2,2 m	9,05 Ω	143 W
2,3 m	8,65 Ω	150 W
2,4 m	8,29 Ω	156 W
2,5 m	7,96 Ω	163 W
2,6 m	7,66 Ω	169 W
2,7 m	7,37 Ω	176 W

Length	Resistance	Power
2,8 m	7,11 Ω	182 W
2,9 m	6,86 Ω	189 W
3,0 m	6,64 Ω	195 W
3,1 m	6,42 Ω	202 W
3,2 m	6,22 Ω	208 W
3,3 m	6,03 Ω	215 W
3,4 m	5,85 Ω	221 W
3,5 m	5,69 Ω	228 W
3,6 m	5,53 Ω	234 W
3,7 m	5,38 Ω	241 W
3,8 m	5,24 Ω	247 W
3,9 m	5,10 Ω	254 W
4,0 m	4,98 Ω	260 W
4,1 m	4,86 Ω	267 W
4,2 m	4,74 Ω	273 W
4,3 m	4,63 Ω	280 W
4,4 m	4,52 Ω	286 W
4,5 m	4,42 Ω	293 W

Caution!	**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.**

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 | **Test report**

Kunde

Name
Name _____

Straße
Address _____

PLZ/Ort
Postcode/town/city _____

Telefon
Telephone no. _____

Auftragsgeber
Contact name _____

Elektroinstallateur
Electrician _____

Verlegedatum
Fitting date _____

Installationsdatum
Installation date _____

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 BASIC EI 300 W AP/UP,
E-NERGY CARBON FLEECE – 66 W/lfm (110 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 61558-1 (2005) | EN 61558-1/A1 (2009) | EN 61558-2-6 (2009)
IEC 61558-1 (2005) | IEC 61558-1/AMD1 (2009) | IEC 61558-2-6 (2009)
DIN EN 61558-1(2006) | DIN EN 61558-1/A1 (2009) | DIN EN 61558-2-6 (2010)

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 mm²).

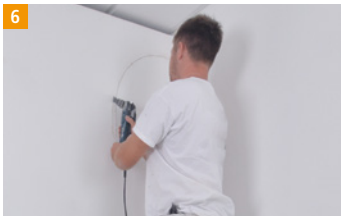
Mark cable routing and recesses for the heating foil contacts.

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.

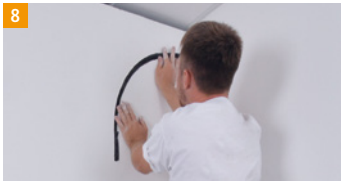
Use of an external temperature sensor:
An external temperature sensor is not mandatory for ceiling and wall heaters. However, the use of an external temperature sensor can increase comfort and application possibilities (e.g. wall heating for drying towels or wall heating in the shower).



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).

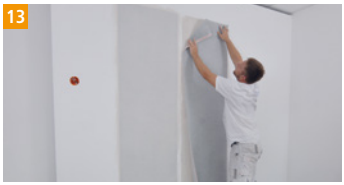
Check resistance according to the resistance tables and document values in the test report and in the installation sketch.

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.

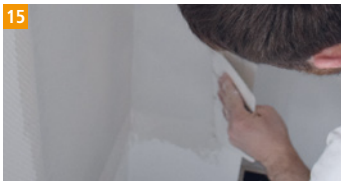


Place the heating foils in the adhesive bed and align them with each other.

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.

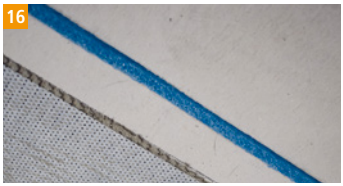
Press in heating foil with plastic spatula and smooth out.

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 heating foil over expansion joints and allow it to end at a distance of at least 2 cm away from the expansion joint.

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

Notice: When installing in the shower area/wet area, the sealing must be placed above the heating foil. Penetration of the sealing (e.g. drill holes) is not permitted.

18

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

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

19

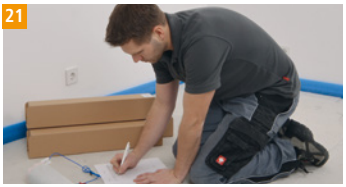
Extend the connection cable and lead it to the power supply unit.

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

20

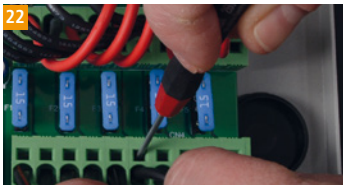
Blue connector (2.5 mm² | cable length max. 10 m)
Universal connector (parallel connection of several heating foils).

21



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

22



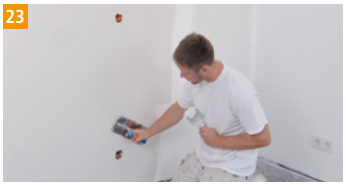
Connect the supply cables to the power supply unit.

DANGER

Risk of electric current injury!

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

23

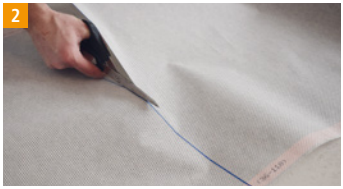


Apply covering and top coat according to manufacturer's instructions.

Notice: Minimum cover 2 mm.

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 resistance tables 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).

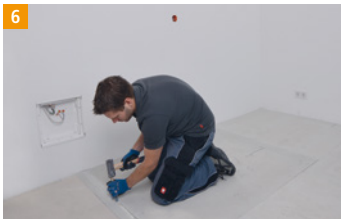
Mark cable routing and recesses for the heating foil contacts.

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.

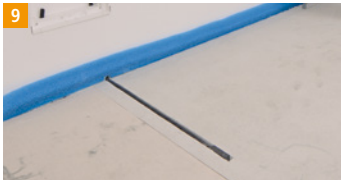


Provide a recess for the sensor connection set. Position the sensor sleeve centrally under the heating foil and at least 60 cm from the wall in the room.

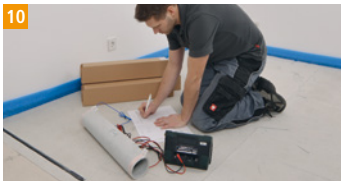
Notice: The installation of the external temperature sensor is only allowed in the sensor connection set, so that the external temperature sensor can be protected against damage and can be replaced in case of malfunction.

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.

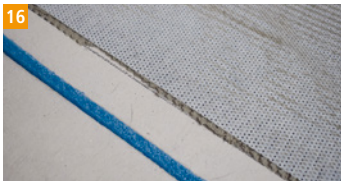
Apply adhesive mortar for bonding the heating foils according to the manufacturer's instructions.

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

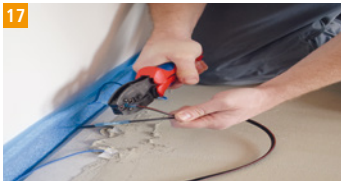
Notice: The copper strip faces the ground. The distance between the foils must be at least 20 mm. Overlapping of the foils is not permitted.

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.

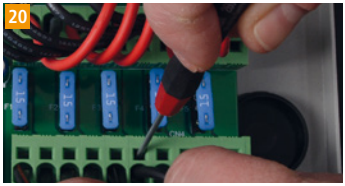
18

Blue connector (2.5 mm² | cable length max. 10 m)
Universal connector (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



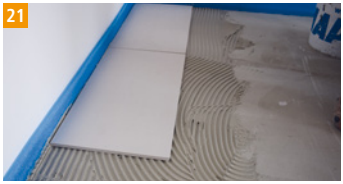
Connect the supply cables to the power supply unit.

DANGER

Risk of electric current injury!

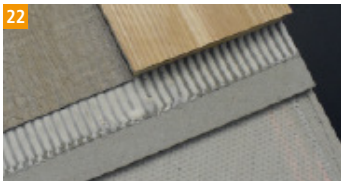
- Before carrying out electrical work, the power supply must be disconnected and secured against reconnection.

21



Notice: Tiles can be laid directly on the smooth adhesive mortar using suitable tile adhesive in accordance with the manufacturer's instructions. When installing in the shower area/wet area, the sealing must be placed above the heating foil. Penetration of the sealing (e.g. drill holes) is not permitted.

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 resistance tables for the nominal values.

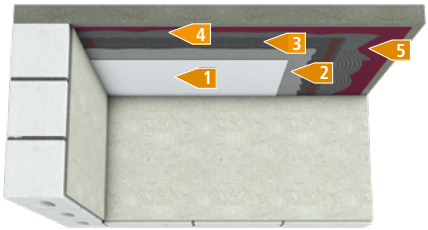
For cut-to-size foils, record measured resistances on enclosed labels and affix to heating foil.

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

13. Constructions

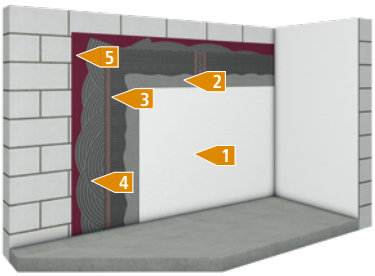
Construction ceiling heating E-NERGY CARBON FLEECE

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



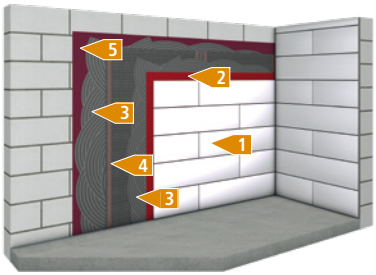
Constructions wall heating E-NERGY CARBON FLEECE

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

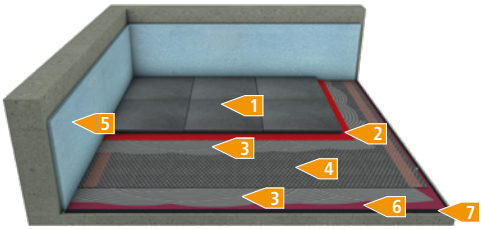
1. Tiles | Natural stone
2. If necessary, sealing in damp rooms
3. Tile adhesive approx. 2 mm per layer
4. Heating foil **E-NERGY CARBON FLEECE**
5. Primer



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)

Heating foil assembled, ...

E-NERGY CARBON room thermostat EN 01 including external temperature sensor,

E-NERGY CARBON power supply BASIC EI 300 W

Energy Carbon Ltd
Kemp House,
152 - 160 City Road,
London EC1V 2NX

Tel+44203 507 1659

hello@energycarbon.co.uk

Status 04 | 2020 - Observe all manufacturer's specifications and installation instructions!