

Installation and operating instructions

Carbontec[®] 60

Temperature regulation and renovation kit

Carbontec[®] 110

Heating kit

Carbontec[®] 220

Heating kit

Installation and operating instructions

Carbontec® 60

Temperature regulation and renovation kit

Carbontec® 110

Heating kit

Carbontec® 220

Heating kit

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1 CONFIGURATIONS AVAILABLE

1.1 Kit contents

The Carbontec® 60/110/220 starter kit and the Carbontec® 60/110/220 extension kit consist of the following:

	Starter kit	Extension kit
Carbontec® 60/110/220	<ul style="list-style-type: none">• Choice of heating film alone, needlemat or felt• Toroidal transformer• Installation instructions	<ul style="list-style-type: none">• Choice of heating film alone, needlemat or felt• Installation instructions

Optional equipment: controller package consisting of a control unit and sensor device. The figures indicated below are approximate and are based on practical experience in ideal installation conditions.

If required and to save energy, it is recommended that Carbontec® 60 is installed with an on/off switch and/or a timer.

2 INFORMATION FOR USERS

Please read these instructions through carefully before starting installation and follow the instructions during both installation and operation.

Neither the Carbontec® 60 temperature regulation and renovation kit nor the Carbontec® 110/220 heating kit is designed to be used by people (including children) who are physically, sensorily and mentally challenged or who lack experience and/or knowledge, unless they are supervised by a person responsible for their safety or have received instructions from such a person about how the heating kit is to be used.

Children should be supervised to make sure that they do not play with the heating kit.

A copy of the instructions must be kept in the circuit breaker panel box. Please inform the new owner about the systems installed if there is a change in ownership.

2.1 General

The Carbontec® 60 temperature regulation and renovation kit / Carbontec® 110/220 heating system have been tested to make sure they are safe. When work is being done on the heating system, these instructions must be given to the fitter for his information.

The Carbontec® 60/110/220 kit can be installed inconspicuously in the wall or under the floor. Before installation begins, an installation plan must be drawn to find and determine the position of the heating film(s), the electrical supply lines, the transformer in the room and the location of the power rating nameplate (see drawing 3.1).

When Carbontec® 110/220 is being installed, the position of the temperature sensor (including supply lines) must be recorded too.

After installation has been completed, the plan must be checked and kept as an appropriate documentary record. In order to take optimum advantage of the heat generated, care already needs to be taken at the planning stage to make sure that free wall space or floor space that is not

covered is chosen if at all possible.

Floor coverings or carpeting must be suitable for the use of underfloor heating and/or floor temperature regulation systems. The products need to be checked to make sure they are designed for such systems, with particular attention being paid to the information provided about thickness and heat conductivity λ [W/(mK)] and/or the heat transfer resistance $R\lambda$ [m²K/W] resulting from this. The maximum heat transfer resistance of the floor covering, including the underlay that forms part of the floor covering, must not exceed $R\lambda = 0,15$ m²K/W.

If the system is being used for underfloor heating purposes, the cover after the heating film must be at least 5 mm thick.

Material	Thickness [mm]	Heat conductivity λ [W/(mK)]	Heat transfer resistance $R\lambda$ [m ² K/W]
Ceramic tiles	13	1.05	0.012
Natural stone slabs	12	1.2	0.010
Carpeting	–	–	0.07 - 0.17
Needle mat	6.5	0.54	0.12
Linoleum	2.5	0.17	0.015
PVC	2.0	0.20	0.010
Parquet flooring	11 - 14	0.09 - 0.12	0.055 - 0.076
Laminate	9	0.17	0.44
Cork – cork laminate	3 - 10	0.12 - 0.10	0.027 - 0.102

Approximate planning figures for floor coverings with underfloor heating.

The system is designed to be a low-voltage system.

Warning: the heating element may overheat if the heating areas are covered up, e.g. by cupboards or thick carpets, and there is not enough ventilation.

Trained electricians must be deployed to connect the transformer and – in the case of Carbontec® 220 – the control unit with the temperature sensor to the mains system in the building. All the connections and screws must be checked before the equipment is started up.

2.2 Function and use

The Carbontec® 60 temperature regulation and renovation kit / Carbontec® 110/220 heating kit is a film heating system with optimised radiant heating that is designed for the drying and temperature regulation of walls, ceilings and floors and that guarantees extremely fast heating of individual areas.

It can be used in many different contexts, e.g. in seating areas, bathrooms, offices, kitchens, fitness and sauna facilities, children's rooms, workrooms, gazebos, conservatories etc. The Carbontec® heating kit is only approved for additional and direct heating purposes in accordance with the latest version of EN 70335-2-96:2002 + A1 + A2.

Special instructions for Carbontec® 110/220:

With radiant heaters in general, it is advisable to use a heating controller with a temperature sensor to regulate the actual surface temperature of the heating element.

With the controller and the external sensor, the Carbontec® heating

kit is given additional protection in the form of a self-monitoring facility, voltage interruption, short circuiting and sensor breakage. Use one controller with an external sensor per room.

It is generally possible for holes to be made in the heating film subsequently. Care needs to be taken in this context that a maximum of two holes with a maximum size of 50 mm is not exceeded and that the holes are at least 20 mm away from each other and from the copper conductors (see 3.1).

Optimum and rapid heat distribution is achieved with very thin coverings (wallpaper, plaster systems, ceramic coverings). All other coverings must be suitable for use with underfloor heating.

2.3 Operation

Simple handling in both operation and installation is one of the outstanding features of the Carbontec® kits.

Special instructions for Carbontec® 110/220:

Just set the controller to the required output range to adjust the room temperature to the level you feel happy with. After this, regulation is carried out automatically.

The settings chosen on the controller are output rather than temperature levels.

The actual surface temperature of the heating film depends on the wall or floor covering and the heat insulation in the wall and floor structure. It may differ from the perceived room temperature.

Special instructions for Carbontec® 60:

After the wall has dried out, the renovation kit can be switched on and off as required via an on/off switch.

If operation under particularly energy-economic conditions is required, installation of a timer is an effective option.

Use of a controller with an integrated timer (comfort controller) can be recommended when operation under particularly energy-economic conditions is required. Heating times and monitoring temperatures can also be set conveniently with such a timer. It is recommended that the heater is started up about 30 minutes before the room is used.

2.4 Maintenance

The Carbontec® 60 temperature regulation and renovation kit / Carbontec® 110/220 heating kit requires no maintenance.

If problems occur, the following activities may be helpful:

Special instructions for Carbontec® 60:

- Please verify the settings of the timer, if one is being used.
- Check the setting of the on/off switch, if one has been installed.
- Check the relevant fuse or circuit breaker in the building.

Special instructions for Carbontec® 110/220:

- Please check the output setting on the controller and – if a timer is installed – the time program setting too.
- Check the relevant fuse or circuit breaker in the building.

If the fault is not eliminated, inform a licensed electrician. It is in general recommended that the system is checked by a licensed electrician every five years.

3 INSTALLATION

3.1 General preparation

The Carbontec® kits are suitable for outside/ inside walls, floors and ceilings in building interiors.

The heating area chosen is determined on the basis, firstly, of where furniture and coverings are planned subsequently and, secondly, of optimum heat distribution. Attention is again drawn to point 2.1 of these instructions in this context.

Care must be taken to make sure that the wall structure has good heat insulation in the case of outside walls and floors.

Special instructions for Carbontec® 110/220:

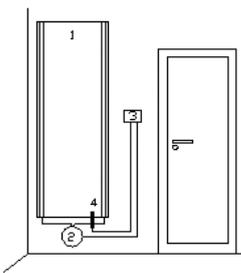
Attention needs to be paid to the floor structure too here. The felt layer on the heating film acts as minimum insulation and improves heat radiation into the room. The felt side must always face the surface that requires insulation.

The Carbontec® heating film is not designed for installation as a storage heating system and should not therefore be incorporated in screed. The closer the heating film is to the room surface, the faster the heating system responds and the faster the pleasant radiant heat reaches the room.

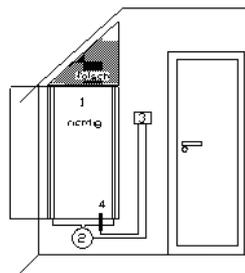
You should use the installation drawing (page 8) to facilitate your personal planning and to document the installation work.

It is recommended that the film is cut to size in accordance with the installation drawing before the film is installed. The pre-assembled contacts must always be used to establish the necessary electrical contacts.

General wall structure

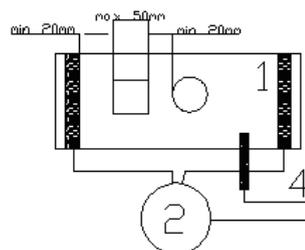


Film cutting



Film cutout

- (1) Heating film
- (2) Transformer
- (3) Controller
- (4) Sensor



3.2 Installation

This section relates to installation of the film and the transformer. Installation of the supply lines and the electrical connections is explained in Section 3.3 Electrical connection. Please note that the minimum processing temperature is +5°C.

When walls are less than 2.3 m high and ceilings slope less than 45°, the heating film should be about 15 cm shorter than the length of the installation area. If necessary, the heating film can be divided once at right angles to the copper conductors. A minimum length of 1 m (Carbontec® 110/220) or 2.25 m (Carbontec® 60) is, however, essential (see the information given in 4. TECHNICAL DATA). Make sure that cutting is always from the uncontacted side of the heating film.

All other inappropriate damage to the film, such as tears caused by sharp objects or kinks, must be avoided. It is therefore important to keep the heating film rolled up in its packaging until it is required for installation (note the minimum bending radius, see 4. TECHNICAL DATA).

After installation has been completed, holes may, however, be made in the film, as outlined in Section 2.2 Function and use.

Warning:

Note that screws may only be fitted in the heating surface if they are installed with plastic plugs for electrical insulation purposes. In addition to this, two screws may not be connected by a material that conducts electricity (e.g. metal picture frames, decorative metal trim, metal shelving system). Do not use any nails.

3.2.1 Preparation of the substructure

The heating film can be applied to any flat substructure made from inorganic materials like stone, screed, plaster etc. or organic materials like wood, cork, PVC, plastic etc. The substrate and top layer materials must resist temperatures of up to 70°C. Contact the manufacturer of these materials if you are in any doubt.

The substructure must be flat and dry. Irregular surfaces must be avoided (e.g. visible wood/stone – brickwork). Under certain circumstances, the surface may need to be evened out beforehand with plaster or a levelling compound.

Particular care must be taken to make sure that no pointed objects like stones, screw heads, nails etc. are projecting out of the substructure.

If the heating film is being installed without adhesive, e.g. between screed and laminate, we recommend the inclusion of roughly 2 mm of a cork layer or fibreglass matting underneath the heating film to compensate for this.

3.2.2 Heat insulation

Heat insulation in the floor and walls is recommended, in order to reduce the loss of heat to the walls and floor. To limit heat radiation downwards, the following minimum ratio of the heat transfer coefficient of the floor structure above the insulation layer and the heat transfer coefficient of all layers underneath the load distribution layer must be observed (according to DIN V 44576:2008-04):

- Intermediate ceiling, above heated rooms:
 $U_o \geq 4.0 U_u (R_u \geq 4.0 R_o)$
- Floor, adjacent to unheated rooms:
 $U_o \geq 6.0 U_u (R_u \geq 6.0 R_o)$

- Floor, adjacent to outside air or earth:

$$U_o \geq 6.5 U_U (R_U \geq 6.5 R_o)$$

Where U_o = heat transfer coefficient of the floor structure above the heat insulation

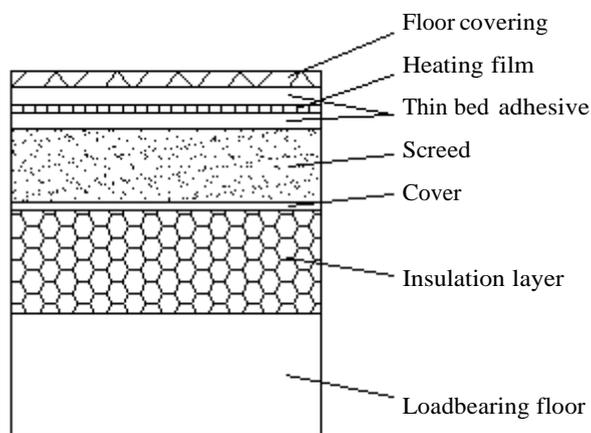
and U_U = heat transfer coefficient of the floor structure underneath the storage layer

U_U of the component layers between the heating layer and heated rooms underneath it should be $(T \geq 15^\circ\text{C}) \leq 0.85 \text{ W}/(\text{m}^2\text{K})$. The figures in brackets relate to heat transfer resistance R_U and R_o .

The insulation layers below the floor structure must be chosen in accordance with the following table. Minimum heat transfer coefficients must be observed. Standardised insulation materials that are suitable for underfloor heating must be used. The insulation layer must not be compressible by more than 5 mm. If there are several layers, the compressibility of the individual layers is added together.

	U_{\max} $\text{W}/(\text{m}^2\text{K})$	R_{\min} $\text{m}^2\text{K}/\text{W}$
Intermediate ceilings above heated rooms	1.25	0.75
Intermediate ceilings above rooms that are heated to some extent	0.75	1.25
Heating areas between outside air or earth	0.35	2.86
Cellar ceilings, walls or ceilings next to unheated rooms	0.35	2.86

Minimum heat transfer coefficient and minimum heat conductivity of the components.



Heat insulation and installation as direct heating in thin bed adhesive

3.2.3 Installation options

There are three different installation options:

- Incorporation of the film between inorganic layers with all kinds of mortars, plasters and tile adhesives, preferably a “K+B” plaster supplied by Maxit.
- Gluing of the film between inorganic and organic layers with all kinds of flexible adhesives, as outlined in (A).
- Floating installation on floors and ceilings as the uppermost layer underneath the top layer.

The film must be incorporated in the moist adhesive bed by the thin bed process without any air bubbles in the cases (A) – (B). To do this, apply the adhesive bed 1 – 2 mm thick to the substructure and then carefully press the film into the bed while it is still moist using a plastic trowel. Put a thin covering layer (1 – 2 mm) on top of the heating film afterwards using the same adhesive system and finally make the top layer as smooth as possible in preparation for the final covering.

Care must be taken to make sure that the film is not installed above joints that are meant to expand. Flexible adhesive systems are recommended in the case of minor expansion cracks, e.g. tile joints in the 1 – 2 mm range.

If several heating sections are to be installed without bonding next to each other (installation option “C”), care must be taken to make sure that the heating sections are protected against slippage by applying adhesive tape and that there is a minimum distance of 20 mm between the individual sections of film. If several different sections are installed next to each other, the individual sections and the copper contact strips must not touch or cross each other.

See Section 3.3 Electrical connection for information about installation of the controller and sensor.

3.2.4 Installation underneath tiles

Before the tiles are glued, the heating film must be installed completely by a thin bed process with flexible tile adhesive and a top layer 1 – 2 mm thick. The surface must be dried in accordance with the instructions issued by the adhesive manufacturer. When several different sections are being installed, care must be taken to make sure that the surface is flat.

3.2.5 Installation in ceilings

When Carbontec® heating film is being installed in a suspended ceiling or when the film is accessible from an attic, a warning sign “Ceiling heating – direct impact” must be attached to the access opening to the ceiling.

3.2.6 Installation in wet conditions

When installation is being carried out in wet conditions, the specifications made in DIN VDE 0100 must be observed. The transformer and the other components are basically suitable for use in wet conditions.

3.3 Electrical connection

A licensed electrician must be deployed to install the electrical components. An all-pole mains disconnection facility with a contact opening width per pole of at least 3 mm must be provided for the heating system during installation.

A circuit breaker (FI with 30 mA) is necessary as indirect contact protection.

Special instruction for Carbontec® 60:

A maximum of 2 Carbontec® 60 heating films with a maximum length of 2.25 m each may be connected to a toroidal transformer.

Special instructions for Carbontec® 110/220:

A heating film section with a maximum length of 2.25 m may be connected to a toroidal transformer.

The temperature sensor supplied as an optional extra must be installed with an empty conduit and a sensor sleeve at least 20 mm underneath the edge of the heating film and as close as possible to the heating film surface and must be connected to the control unit (see the installation instructions for the control unit).

The electrical resistance level must be measured at the contact points (crimped contacts) and documented for guarantee claim purposes before installation and after installation in the plaster system (Documentation). If the resistance levels are unchanged, the secondary conductors of the transformer must be attached to the crimped contacts.

Important to remember:

If the final levels differ more than 10% from the original level, damage to the contacts or the heating film must be expected. You must not put the heating system into operation in this case.

Note:

The electrical contact for the film must be established via the pre-assembled contacts

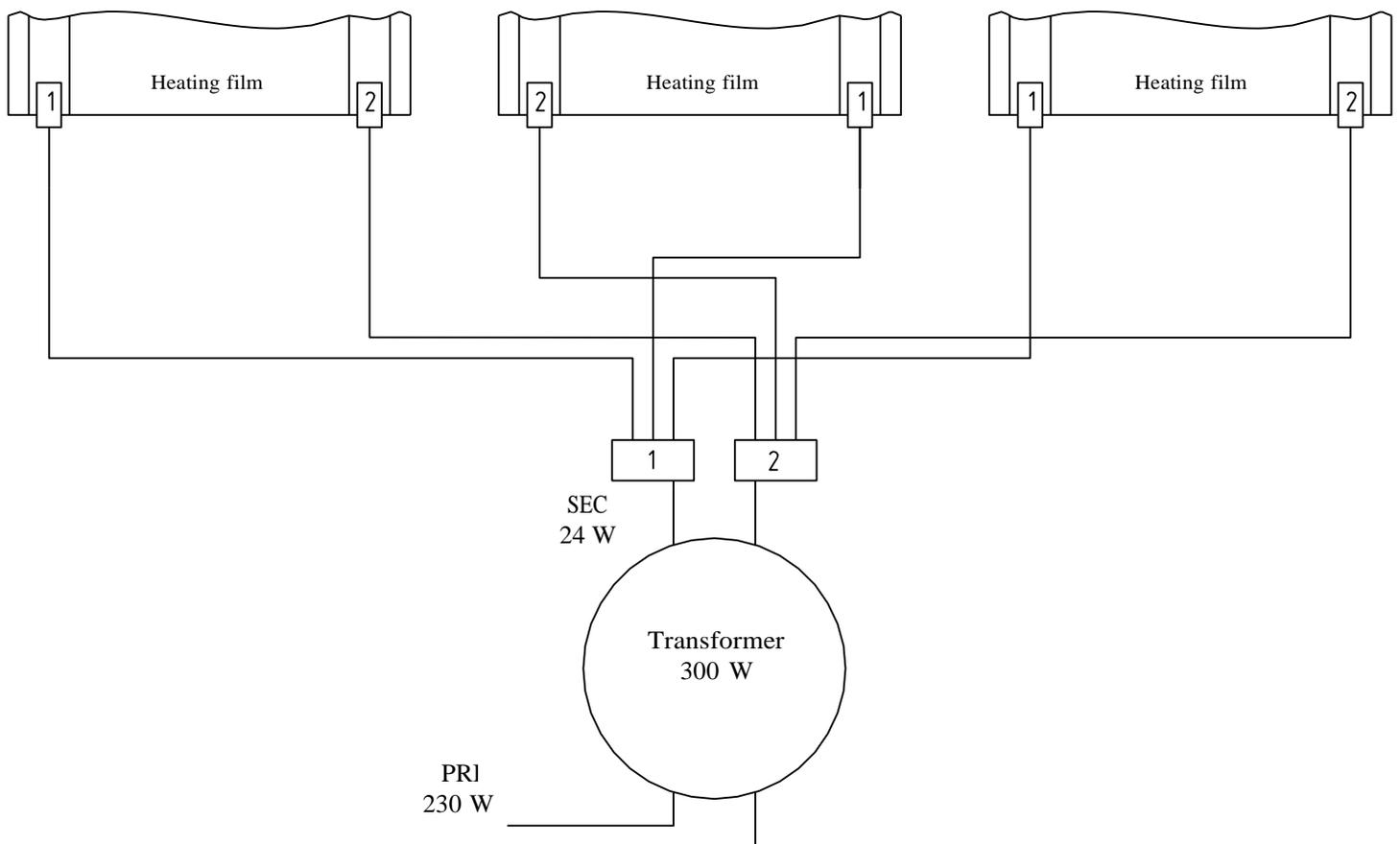
The transformer can be surface-mounted or flush-mounted (in a flush-mounted box, at least IPX4). It must be at least 50 mm away from the film. The maximum conductor length on the secondary side of the transformer is 2 000 mm.

The maximum conductor length on the mains voltage side, including all possible junctions, is 10 m.

The electrical conductors must be installed in accordance with the latest version of DIN VDE 0100 (mains conductors with double insulation, conductor cross-section at least 2.5 mm², use of the connection terminals supplied). Now connect the transformer to the control unit that is provided as an optional extra (see the installation instructions about the control unit).

3.4 Start-up

Heat the Carbontec® heating kit up for the first time for 15 minutes after a drying period of at least 24 hours. The heating system is now ready for operation. Attach the warning sign supplied with the kit now in a highly visible place in the immediate vicinity of the heating film and put the instructions in the circuit breaker panel box.



Installation configuration with up to 3 sections of heating film.

4 TECHNICAL DATA

Mains voltage:	230 V AC
Power input:	1,3 A per toroidal transformer
Output (Carbontec® heating film):	60 W/m ² (Carbontec® 60) 110 W/m ² (Carbontec® 110) 220 W/m ² (Carbontec® 220)
Output per metre:	38 W / m (Carbontec® 60) 67 W / m (Carbontec® 220) 134 W / m (Carbontec® 220)
Secondary voltage:	24 V
Max. number per power circuit:	10 sections of heating film
Fuse protection:	16 A
Protection measure: Nominal	FI circuit breaker 30 mA
temperature limit: Minimum	+ 70 °C
processing temperature: Minimum	+ 5 °C
bending radius:	R30 mm (without felt) R50 mm (with felt)
Material:	PET film with carbon fibres and fillers
Primary conductor / transformer:	1,5 mm ² (to the mains and/or controller)
Secondary conductor / transformer:	1,5 mm ² , max. 2 m length
Heating film dimensions, width:	59 cm (without felt) 70 cm (with felt) 54 cm (net heating width)
Heating film dimensions, length:	2,25 m
Minimum lengths:	1,0 m (Carbontec® 110/220) 2,25 m or 2x 1,15 m (Carbontec® 60)
Max. heat transfer resistance	
RA for floor covering:	0,15 m ² K/W

Explanation of symbols:



a)



b)



c)



d)



e)

- a) Waste disposal instructions: the product may not be disposed of in general household waste! It must be recycled via the electronics waste disposal system organised by the local authorities.
- b) Approved for installation as a ceiling heating system (direct impact)
- c) Approved for installation as an underfloor heating system (direct impact)
- d) Read and follow the instructions
- e) Protection class II

5 WARRANTY RULES

We eliminate equipment faults free of charge in accordance with the following conditions, when it can be demonstrated that these faults are attributable to a material and/or manufacturing defect that existed on delivery and when they are reported to us immediately after detection and within 24 months of delivery to the first end-user; within 12 months in the case of commercial use. We grant a warranty period of 5 years on the Carbontec® heating film. If the fault occurs within 6 months of delivery, it is presumed that a material or manufacturing defect is involved.

Faults that we acknowledge as subject to warranty are eliminated – at our discretion – either by repairing the faulty parts free of charge or by replacing them by flawless parts. For this to be possible, faults must be reported to us immediately after detection and we must be given a reasonable period of time – at least 3 weeks – to eliminate the fault. Exceptional fault elimination costs incurred due to the nature or location of the use of the equipment are not paid. Free access to the equipment must be guaranteed by the end-user. Dismantled parts that we take back become our property. The warranty period for subsequent improvements and spare parts ends on expiry of the original warranty period for the equipment. The original purchase receipt indicating the date of purchase and/or delivery must be submitted.

To maintain the warranty for the Carbontec® heating film, the test report included in the installation instructions (see documentation) must be completed and sent to the address given below within four weeks after installation of the heating film.

Warranty claims are ineffective if the relevant VDE regulations, the specifications of the local power supply companies or our installation and operating instructions have not been observed by the end-user or a third party.

No liability for the consequences is assumed if changes / work are made / done improperly, for example by the end-user or third parties.

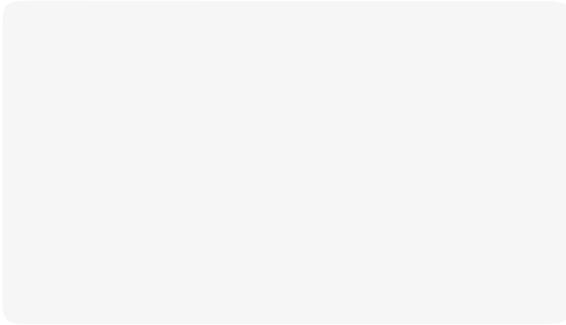
We do not provide any warranty for installation or processing mistakes made by our customer, the end-user or third parties. Warranty is restricted exclusively to equipment material and manufacturing faults for which we are responsible.

Warranty relates exclusively to the original equipment purchased from the supplier. There shall be no claims to warranty for parts not bought from us and for equipment/system faults that are attributable to parts not purchased from the supplier.

If the fault cannot be eliminated or if we refuse or delay subsequent improvement for a length of time that cannot reasonably be expected, the manufacturer will either supply a replacement free of charge or reimburse the reduction in value. If a replacement is supplied, we reserve the right to make a reasonable deduction for the period of use to date. No further or other claims, particularly claims for compensation for damage suffered outside the equipment, shall be accepted, provided that there are no legal regulations stipulating mandatory liability.

In the case of liability in accordance with § 478 of the German Civil Code (BGB), the liability of the supplier shall be limited to a maximum amounting to the flat-rate service charges of the supplier.

Return to:



DOCUMENTATION

Resistance measurement: (necessary for guarantee claims)

Resistance of the heating film before installation:

Date/signature/stamp

Resistance of the heating film after installation:

Date/signature/stamp

Project data:

Customer (name)

Address

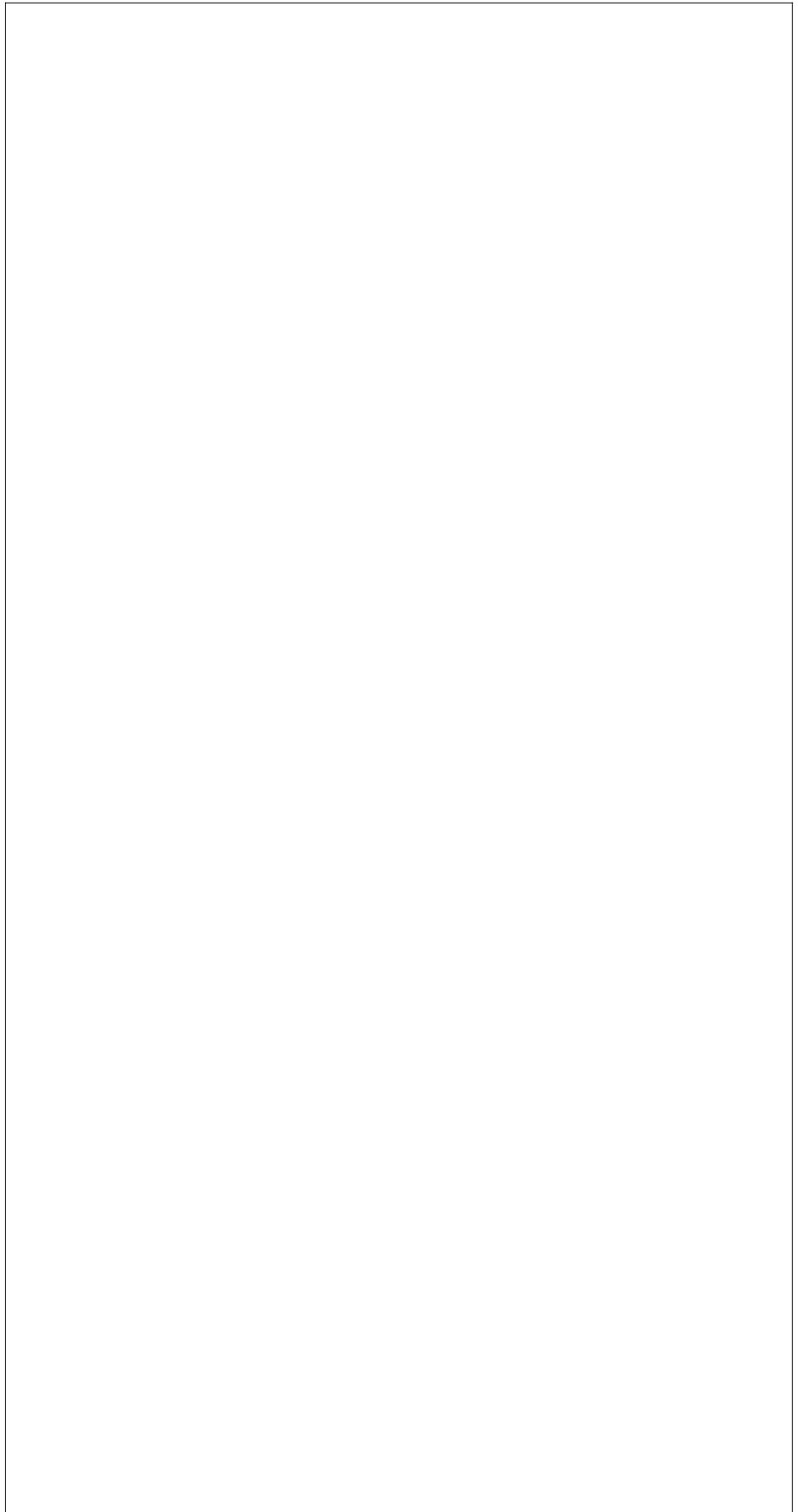
Telephone no.

Description of the room, installation (wall, floor, ceiling)

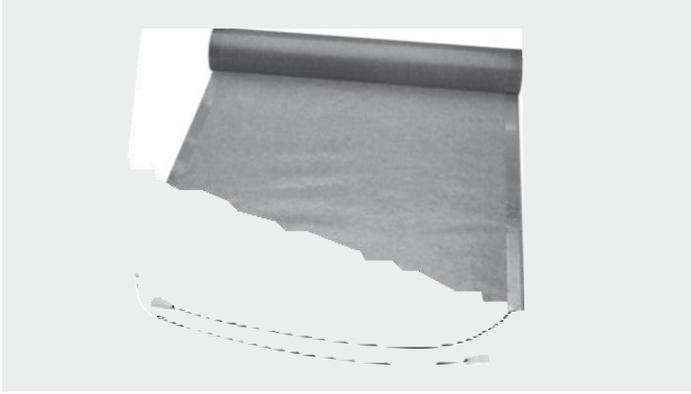
- Carbontec® 60 Type of controller:
 Carbontec® 110 External temperature sensor
 Carbontec® 220

INSTALLATION DRAWING:

Please make sure you keep this



D Heating film GI Control unit O Temperature sensor H3 Transformer



Heating package: film, ...



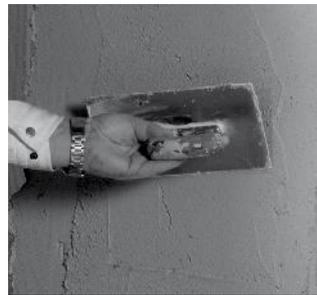
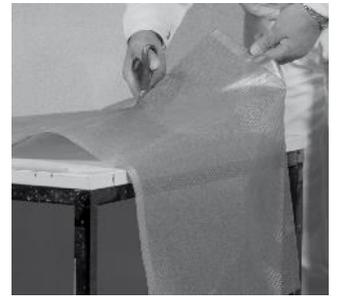
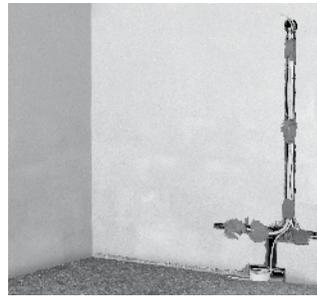
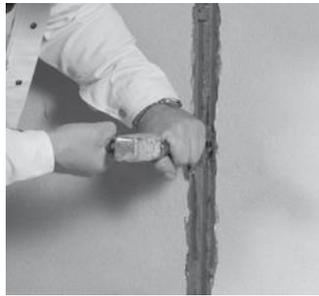
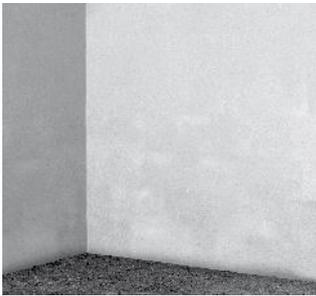
... temperature sensor, ...



... toroidal transformer 300 W (alternative 700, 1000 and 2000 W),...



... and temperature controller.



Subject to technical amendment.

HS/1/11.1/002/WY

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