

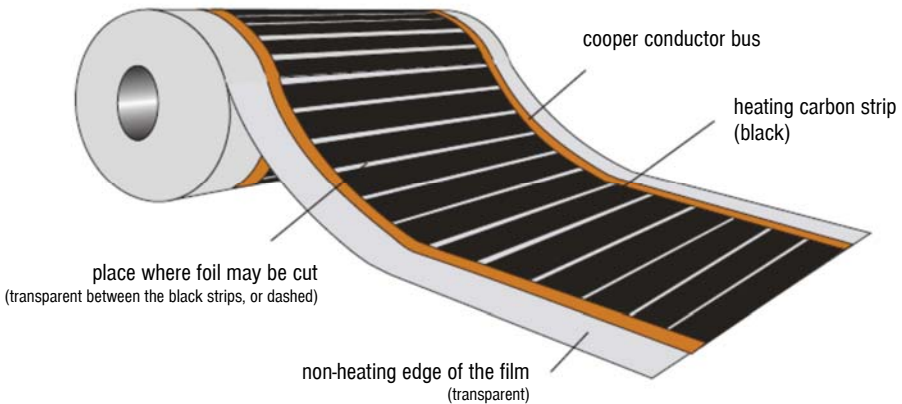
IOUB HEATING FILM



Carbon Heating Film

IOUB COMPANY
Mead in Belgium





Example of comparison of the measured value with the nominal value from the chart on the title page (two five-metre and two four-metre strips of C520 foil were installed, i.e. a total of 18 m):

- measure the installed length of the heating foil (m) and multiply it by the length output shown in the table (W/m): $P = 18 \text{ m} \times 80 \text{ W/m} = 1440 \text{ W}$;
- calculate tolerance: the lower is $-10\% = 1296 \text{ W}$ and the upper is $+5\% = 1512 \text{ W}$;
- measure the resistance of the heating foil (for example 37Ω for 18m of C 520 foil);
- the mains voltage is 230 V;
enter the values into the formula $P = U^2/R$ where P = output (W), U = voltage (V) and R is resistance (Ω).

So for example $P = 230^2 / 37 = 1430 \text{ W}$;

- the measured values of el. resistance are within the tolerance given in the table values for the foil – IT MEETS THE REQUIREMENTS

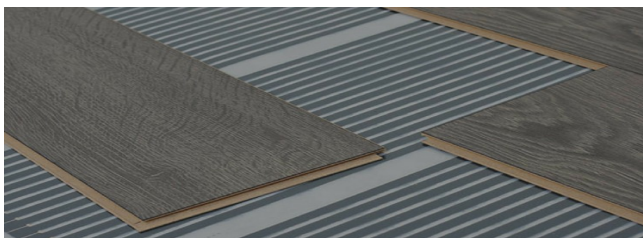
Inspection according to resistance:

- Measure the installed length of the heating foil (m). ***Divide**** the resistance stated in the table (Ω) by the measured length:
- $R = 661 / 18 \text{ m} = 36.7\Omega$;
- Calculate the tolerance: the lower one is $-5\% = 34.9 \Omega$ and the upper one is $+10\% = 40.4 \Omega$;
- Measure the resistance of the heating foil - e.g. 37Ω for 18m C 520 foil;
- The measured value of electric resistance is within tolerance - SATISFACTORY.

* total resistance decreases with increasing length

General Conditions

- Before unpacking and starting work, check whether the purchased parts are correct according to the labels and the print on the foil, and read these instructions carefully.
- The heating foil is designed for dry-process laying; it isn't glued but it must be fixed to prevent moving/slipping beyond the non-heating edges.
- There are no defined upper and lower surfaces on the heating foil.
- The supply circuits must always be equipped with a ≤ 30 mA fuse for nominal actuating current. The carrying out of installation (disconnection, protection or regulation) must enable electrical disconnection of the foil in all poles.
- The heating foil mustn't be installed on irregular surfaces.
- The non-heating edge of the film is the longitudinal transparent part, usually with print and information about the product. It is parallel to the copper conductor bus. This edge can be made narrower by cutting it to a minimum of 11 mm in thickness or may be perforated / pierced though by a nail at a distance of 11 mm from the copper conductor bus.
- The heating foil must be in close contact with the other parts of the building structure (except for in the case of those foils with a surface output of 80 W/m^2 and lower), and it must be covered completely by a ceiling or floor.
- The heating foil, including connections and supply conductors, must be protected against damage during the installation (e.g. against falling objects or damage to the insulation by the sharp edges of objects – walking etc.) You may walk on the heating foil providing your shoes have soft soles and the foil is placed on a flat and smooth surface.
- Heating foils mustn't be installed at a height of lower than 2.3 m into walls and ceilings with an incline of less than 45° from the vertical.
- Heating foils mustn't be laid in layers, overlap each other or touch other parts at any other location than at the non-heating edges. The non-heating edges may overlap. Heating films must always be secured against shifting.
- Heating films mustn't be installed at a temperature of lower than 3°C and they mustn't be exposed to temperatures of higher than 80°C on a long-term basis.
- The minimum bend radius of the heating foil is 35mm and creasing must be prevented.
- Heated surfaces must be separated from the walls and other dilatation units by a dilatation joint. The heating foil mustn't pass through the dilatation joints; the supply lead which passes over these joints must be placed in such a way that free movement of the separated units is enabled without causing damage to the cable.
- The heating films are intended for a voltage of $230 \text{ V} \sim$.
- For series connection, the value of the current which is passing through the copper conductor bus mustn't exceed 10 A. The max. lengths of heating foil which are derived from this can be found in the table on the title page.
- The heating foil can be divided only by cutting it perpendicularly to the longitudinal axis in such a way that the cut doesn't extend into the black heating carbon strip which connects the copper conductor bus.



- Open cuttable edges always need to be insulated along the whole length of the cut, except for in the case of foils which are cut along the cuttable edge, when it is enough to insulate only the copper conductor bus.
- If a cut/piercing occurs in the middle of the foil, break up the broken carbon strips by a cut which is approx. 11 mm wide and insulate all edges of the cut. If the copper conductor bus is broken, it is necessary to divide the foil into two separate heating strips, cut out the damaged spot, cut the newly created edges straight and insulate them. The heating film will be connected subsequently using the standard procedure.
- The heating foil is manufactured according to the requirements of the Czech National Standard ČSN EN 60335-2-96 and it must be installed according to the valid Czech National Standards (the laying of the heating foil is included in the ČSN 33 2000-7-753 norm).
- When installing the heating foils, the EN 50559 standard requirements must be met and must be installed in accordance with the national regulations for electrical installation.
- The covering of Ecofilm heating foil with 0.1 mm-thick polyester foil or 0.2 mm polyethylene foil fulfils the requirements of the EN 60335-1 standard for class II structures, and the EN 60335-2-96 standard for the installation of heating units in the floor or ceiling.
- Other use of the heating foil or other placement of the heating foil than is mentioned in these instructions can be hazardous to health and life or can cause material damage. Warranty conditions do not apply to such use.
- For the crimping of connectors, connectors and pliers offered by Fenix Trading s.r.o must be used exclusively. Only insulation materials offered by Fenix Trading s.r.o must be used for the insulation of connectors and cut edges of the foil.
- Heating films mustn't be covered on a long-term basis by a floor covering or other objects of which the thermal resistance (R) is higher than 0.15 m²K/W.
- The supplier must inform other suppliers, owners and if possible, also the user that no penetrating objects, such as e.g. nails, screws or drills must be used in the area where heating foils are installed.
- Heating foils must not be installed in close proximity to aluminium foils, foils containing metals or on constructions with high humidity.
- A sheet of paper with information about the heating system must be permanently kept in the switch box of the heating system and passed on to any new owner or tenant.
- The user must be instructed by the supplier regarding the installation of floor or ceiling heating.

This fact is stated on a label which comes with the product and must be glued into the switchboard: this label also informs readers that the making of openings is prohibited, as is covering the floor with furnishings or fittings without leaving at least a 4 cm gap between the floor and the bottom surface.

There must be a gap of at least 10 cm between the heated ceiling and the top surface of furnishings or fittings.



Ceiling foil – ECOFILM C

Laying into walls and ceilings

1. Installation conditions

- We do not recommend the installation of ECOFILM heating foil with an output of higher than 200 W/m^2 into the composition of the ceiling structure. In rooms where people are permanently present, the useable height of which is lower than 2.40 m, the installation of ECOFILM heating foils with an output of higher than 150 W/m^2 is not recommended.
- The foil is to be mounted in freely accessible locations where the radiation of heat won't be obstructed by cupboards, partitions etc.
- All electrical and mechanical installations which pass through the ceiling, such as electric cables, pipes and chimneys etc., must be completed before the installation of the heating foil.
- The heating foil must be laid in close contact between the thermal insulation and plasterboard or plasterfiber board. Heating foil doesn't perform the function of a vapour barrier. A vapour barrier (PE foil) must be placed between the plasterboard sheet and the heating foil. The thickness of the vapour barrier (PE foil) must be min. **0.2mm**.
- The ceiling construction in which the heating foil is installed must be of the floating type, without firm fixation to the perimeter walls of the room. Any elements which might cover the joint between the horizontal and vertical structure (e.g. polystyrene corner profiles) may be attached only to the vertical surface.
- The surface of the ceiling (so-called dilatation unit) mustn't be longer than 8 m and larger than 50 m^2 . If the surface of the ceiling exceeds the prescribed dimensions, a dilatation joint needs to be created. The dilatation joint doesn't need to divide the surface into half; it is recommended that it is placed in a suitable location (transition, corner, change of shape of cross section of the surface) in such a way that none of the surfaces are larger than the prescribed dimensions. Elements which cover the dilatation joint can be attached to only one of the surfaces which are divided by dilatation. For a ceiling sag of more than 10 mm, it is necessary to select a particular point in the connection of the suspended structure to the wall where the structure is not fixedly attached to the wall.
- All joints between the boards (transverse and vertical) must be cemented and fortified with fibreglass tape (except for dilatation joints).
- After cementing and the completion of all wet processes involving plasterboard sheets, it is necessary to follow the technological procedures for the maturing and drying of these materials. The subsequent bringing of the heating foil into operation must be carried out with a gradual temperature build-up in the room. The temperature build-up is controlled by a room thermostat with the help of which the room temperature is increased to the required value by 1°C per day. The starting point for the temperature build up is the lowest temperature reached during the day without any heating (heating and temperature change starts in the morning hours).
- If possible, it is advantageous to bring the heating foil into operation before pointing and cementing. The temperature build-up described in the previous point doesn't need to be carried out in this case. The boards and the surrounding environment will dry out and the risk of the subsequent cracking of joints will decrease. The cementing and pointing is carried out subsequently within 24 hours after reaching the room's operational temperature.

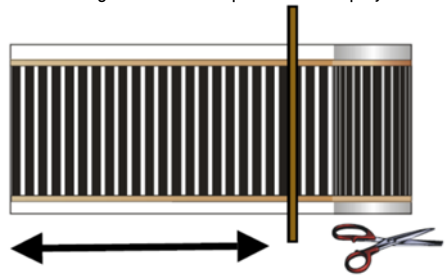
2. Checking and preparation of the ceiling space for the installation of ECOFILM C

- The spacing of the ceiling structure must be in accordance with the installation instructions of the manufacturer and according to the dimensions of the heating foil.
- The placement of the heating foil mustn't be planned in such a way that the heating part of the foil or the copper conductor bus overlap or are in contact with load-bearing beams.
- Flammable materials need to be removed from the interior ceiling space and possibly replaced by non-flammable material. The beams for the fixation of the foil can also be wooden. The execution of all installations which pass through the interior ceiling space structure needs to be checked according to valid project documentation.

3. Preparing heating foil, conductors, connectors

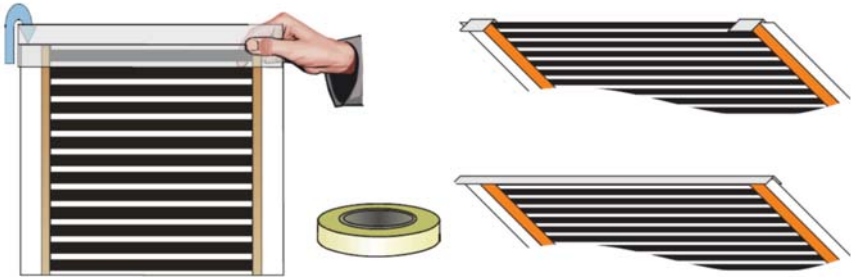
3. a) Cutting the foil

- Check the label data on the edge of the belt. Use scissors to cut the length which is required for the project in the marked cutting place. Cut along the middle of the cuttable strip.
- There are two cut length variants:
 - a) variant 1: cut length 320 mm - only foils C614, C620
 - b) variant 2: cut length 10 mm.



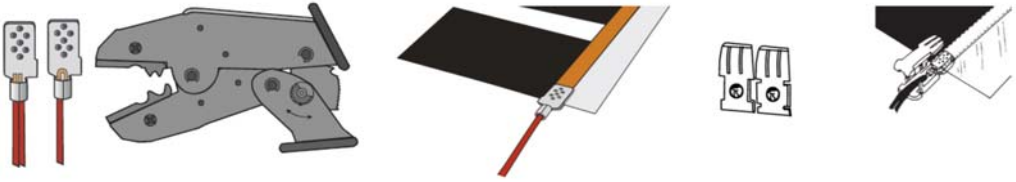
3. b) Insulating the cut edge

- In the case of cut length variant 1, it is enough to insulate both open ends of the copper tape using 28 mm wide tape.
- In the case of cut length variant 2, it is necessary to insulate the whole cut edge with 28 mm tape.



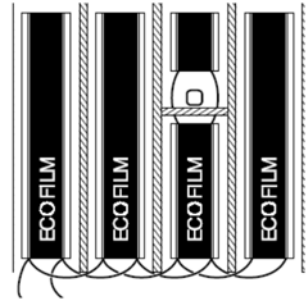
3. c) Fixing connector fasteners to the heating foil

- First, the supply cables are pressed to the connector and subsequently, the connector is pressed to the heating foil. The cross section of the connecting conductor must be at least 3 mm^2 as the connectors are dimensioned in such a way because of the need to connect two conductors.
- The connector fastener should be placed in the middle of the conductor bus and subsequently, the slanting part of the fastener is closed using pressure applied by one's fingers. Use crimping pliers to set the definitive position of the slanting part of the fastener. Crimp the connector first from the side of the fastener suspender and then from the open side to ensure that the fastener is compressed sufficiently. The ratchet on the crimping pliers prevents the opening of the jaws before the desired pressure is achieved.
- Put the plastic cover of the connector over the connector and press it shut.



4. Installation

- According to the accessibility of the ceiling space, installation can be carried out from above or from below.
- Fix the heating foil with nails or clasps in a corner formed by beams (cross bars) of the ceiling structure and unwind about 1 m of the length of foil. After unwinding, pull the foil taut, and in order to prevent crumpling, attach it to the ceiling structure by the non-heating edges along its lengthwise sides, at a distance of approx. 15 cm from the cut edge and subsequently approximately every 40 cm, using nails or clasps.
- If steel ceiling joists are used, affix the heating foil to them using either double-sided adhesive tape or countersunk head screws. The installation of the whole strip of the foil and then all the other strips of heating foil should be carried out in a similar manner. Conductors passing through the steel structure must be protected against damage from sharp edges. We strongly recommend you wholly complete installation of the ceiling heating system in one room before starting installation in another room.
- The following minimum clearance distances for the heating foil must be observed during the installation of ceiling heating:
 - a) 50 mm from air pipes, wooden beams and wires for lighting fittings,
 - b) 200 mm from lighting units and electric boxes.
 - c) The distance of the foil from cold ends and electrical subcircuits (with the exception of any connections) must be at least 25 mm.
- Nails, clasps and other fixtures can only go through the foil on the longitudinal sides, at a minimum distance of 11 mm from the copper conductor buses.



5. Testing of ceiling heating

- Testing will be carried out after the completion of wiring and before the installation of thermal insulation or the covering of the ceiling structure. A responsible person will measure the resistance of the foil circuit in each room before connecting the thermostat. The value of the heating foil output must range from +5% -10% (resistance (R) -5% to +10%) of the label output set by the manufacturer and we simultaneously recommend testing of the thermostat function during the process of putting the foil into operation.
- The data is recorded in the Certificate of Warranty.



6. Installing thermal insulation

- Insulation is laid on the heating foil without bends, folds or overlaps.
- There must be no air space between the heating foil and the thermal insulation.
- It is recommended that insulation with fibreglass or mineral wool is used without any covering foil or paper; the recommended insulation thickness is 10 cm within an interior ceiling space and 20 cm in a roof ceiling.
- The use of flammable materials as insulation is prohibited.
- All empty spaces should be filled with thermal insulation.

7. Covering the ceiling space

- The use of plasterboard with a maximum thickness of 16 mm is recommended taking into account the thermal resistance – **see General conditions**.
- The design of the thermal insulation, the attachment of covering boards and the surface finish of the covering boards are part of the design of the construction part.
- The installation of the insulation and covering boards (suspended ceiling) is provided by the supplier of the construction part.

8. Completing the installation of ceiling heating

- Remove all leftover material and fill in the installation testing certificate. The measured values must be recorded in the certificate of warranty. Draw the placement of the foil strips into the certificate of warranty.
- The measured values from the first measurement must agree; in the case of any discrepancy, do not write down the second value in the warranty certificate, as it is very likely that damage occurred during laying. Find out the fault, or call the producer or the supplier.

9. Regulation

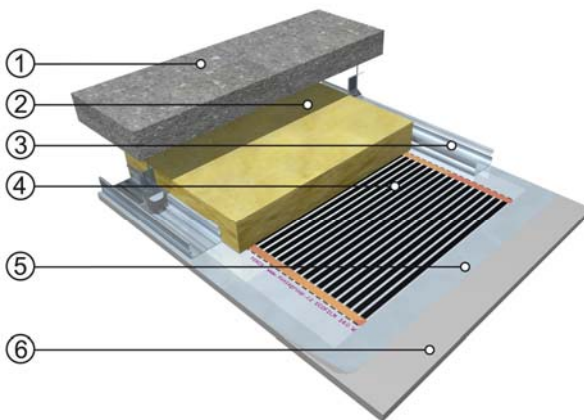
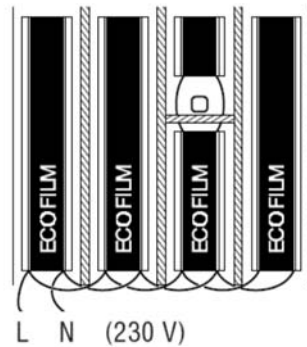
- Room thermostats can be used for the regulation of rooms heated with Ecofilm C heating foils.

10. Recommended materials

- Ceiling board:
 - KNAUF plasterboard, thickness 12 to 16 mm;
 - RIGIPS plasterboard, thickness 12 to 16 mm;
 - FERMACEL gypsum fibreboard, thickness 10/12.5/15.
- Thermal insulation:
 - ORSIL / ISOVER: Domo, RIO, Orstrop;
 - ROCKWOOL: Rockmin, Prefrock;
 - ROTAFLEX TP01

11. Interconnecting the foil

- The foil strips are interconnected via the cold ends. The cold ends are connected in the outlet box or directly into the thermostat that controls the heated room.



Sectional view of ceiling structure

- 1 - Load-bearing ceiling structure
- 2 - Thermal insulation
- 3 - CD load-bearing sections of the plasterboard structure
- 4 - Ecofilm ceiling heating foil
- 5 - PE foil covering, 0,2 mm thick
- 6 - Plasterboard ceiling (floating)

Floor heating foil – ECOFILM F

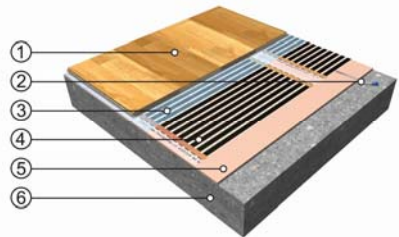
1. Installation conditions

- Hydroinsulation must be carried out under the construction of the floor which will prevent water seeping through the thermal insulation under the heating foil – we recommend that it is laid in two layers which are perpendicular to each other, with overlaps of joints.
- The heating foil is not to be laid under permanently placed room equipment and objects which prevent heat dissipation (e.g. furniture with a plinth etc.)
- As protection against dampness a vapour barrier of PE foil with a thickness of 0.2 mm must be laid on the heating foil with overlaps at least 5 cm.
- ECOFILM F is not to be installed in rooms with higher humidity (bathrooms, laundry rooms etc.)
- The maximum dilatation unit is 25 m² or with a maximum diagonal of 7 m.
- Heating foils are intended for glued laminate and wooden floors that are fitted with lining strips around their perimeter to prevent unqualified disassembly of the floor covering.

2. Selection of a base for the installation of ECOFILM F heating foil directly under a floating floor

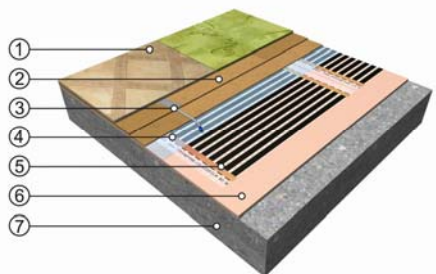
Sectional view of the floor – direct heating

- 1 - three-layer wooden or laminate floating floor
- 2 - floor (limitation) probe in a groove
- 3 - PE foil covering, 0,2 mm thick
- 4 - ECOFILM floor heating foil
- 5 - insulation underlay from extruded polystyrene
- 6 - base – concrete, anhydrite, original floor etc.



Heating foil under a carpet or PVC

- 1 - wear layer (PVC, carpet)
- 2 - HEAT-PAK 7 mm two-layer glued underlay
- 3 - floor (limitation) probe in the groove (embedded)
- 4 - PE foil covering, 0,2 mm thick
- 5 - ECOFILM floor heating foil
- 6 - insulation underlay from extruded polystyrene
- 7 - base – original floor, concrete anhydrite, etc.



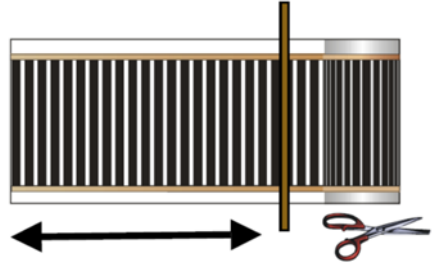
3. Quality of the base surface

- The base surface must be adequately flat, without any projections, bumps or depressions. It can be made of concrete but also other construction materials of sufficient bearing capacity.
- The base surface humidity must not exceed 2 % (approx. 60 % of relative humidity).

4. Preparation of the heating foil, conductors, connectors

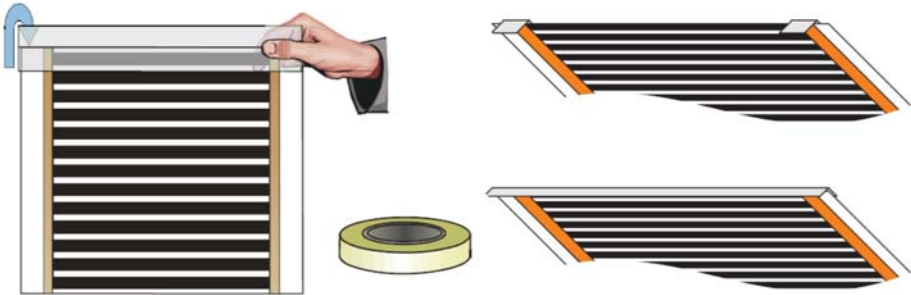
4. a) Cutting the foil

- Check the label data on the edge of the belt. Use scissors to cut the length which is required for the project in the marked cuttable place. Cut along the middle of the cutting strip.
- There are two variants of cutting lengths:
 - a) variant 1 of cutting length 320 mm or 22 mm
 - b) variant 2: cut length 10 mm



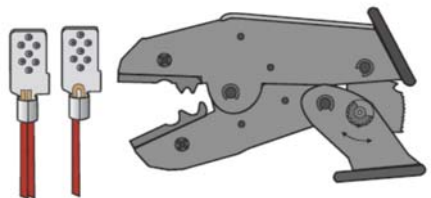
4. b) Insulation of the cut edge

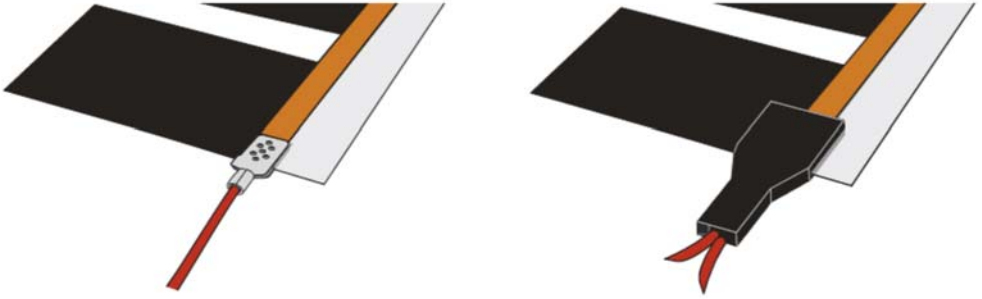
- In the case of cut length variant 1, it is enough to insulate both open edges of the copper tape using 28 mm wide tape.
- In the case of cut length variant 2, it is necessary to insulate the whole cutting edge with 28 mm tape and over that, with 38 mm tape.



4. c) Fixing connector fasteners to the heating foil

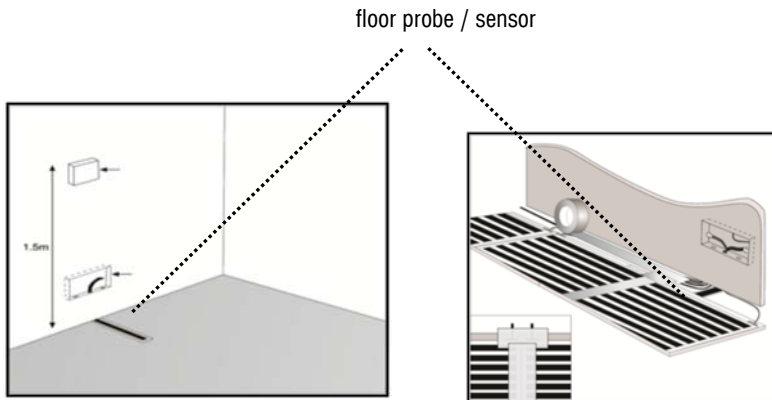
- First, the supply cables are pressed to the connector and subsequently, the connector is pressed to the heating foil. The cross section of the connecting conductor must be at least 3 mm^2 , as the connectors are dimensioned in such a way because of the need to connect two conductors. If only one conductor is connected, it is necessary to bend the conductor into the connector in such a way that the required cross section is achieved.
- The connector fastener should be placed in the middle of the conductor bus and subsequently, the slanting part of the fastener is closed using pressure applied by one's fingers. Use crimping pliers to set the definitive position of the slanting part of the fastener. Crimp the connector first from the side of the fastener suspender and then from the open side to ensure that the fastener is compressed sufficiently. The crimping pliers' ratchet prevents the opening of its jaws before the desired pressure is achieved.
- Subsequently, carry out insulation using MASTIC tape, with a minimum overlap of 11 mm from the live parts.





5. Laying and connecting the heating foil

- Clean out the room in which laying will take place and sweep up any mechanical dirt or mess.
- Measure the floor surface and based on the measurements, draw the layout of the heating foils directly on the floor, or on paper.
- Measure the heating foil according to the drawing and cut it into individual strips.
- By unwinding the foils on the floor, check that their dimensions can be laid according to the conditions of these instructions and the dimensions of the rooms.
- Roll up the heating films partially and sellotape them to prevent unwinding in order to avoid stepping on them, and draw places on the floor for cutting out the grooves for supply cables and connector covers.
- It is not necessary to cut the grooves for AV 1.5 heating cables if they are flush in the leveling base board with a thickness of 3 mm and more. The groove should be cut with a knife.
- The grooves for connector covers do not need to be made if they are embedded in a leveling base board with a thickness of 6 mm and more. The groove is to be cut by knife.
- **Before laying the levelling underlay, e.g. Starlon, please check that the floor covering you have chosen can be installed on this type of underlay.**
- **When moving on areas of the levelling underlay which are not covered by lamellas, always use weight distribution boards (e.g. polystyrene boards with a thickness of at least 3 cm).**



- Roll up the heating foil and store it in a clean environment.
- Chip away or cut the grooves for supply cables and connector covers.
- Lay the leveling base boards.
- Unwind the heating foils and secure them to prevent sliding and folding (e.g. using sellotape).
- Connect the connectors and insulate them (measure the connecting supply cables between the foils exactly, only for the length which is absolutely necessary).
- Cover with PE foil with a minimum thickness of 0.2 mm. The floor is ready for the laying of the final covering.

6. Testing the floor heating

- Measure the resistance (R) of the whole set and write it down in the Certificate of Warranty. Check the measured values with the nominal values. The measured values must be within the tolerance of the resistance $-5\% +10\%$ or within the tolerance of the output $+5\% -10\%$.
- If the values meet the requirements, it is possible to lay the final covering. If they don't, contact the manufacturer/supplier or check all the connections and repeat the measurement.

7. Final measuring (after laying of the floor covering)

- Measure the output and compare the result with previous measurement.
- The measured values from the first measurement must tally; in case of a discrepancy, do not record the second value in the Certificate of Warranty as it is most likely that damage occurred during the laying. Discover the fault, or call the manufacturer or supplier.

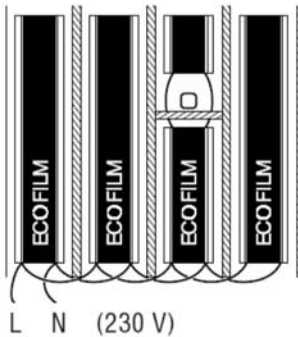
8. Start-up operation of the floor

- On the first day, set the floor temperature to be the same as the temperature in the room (maximum 18 °C),
- On the following days, increase the floor temperature gradually by 2 °C/day up to 28 °C,
- Maintain the floor temperature at 28 °C for a period of three days,
- Subsequently, decrease the floor temperature by 5 °C per day, until the starting temperature is achieved,
- Afterwards, it is possible to set the floor temperature to the required value and bring the floor into everyday operation.

9. Regulation

- Thermostats with a floor probe installed in the heating part of the floor, with at least 30 cm within the heated area, must be used for the thermal regulation of rooms heated using heating foils.
- Place a floor probe of a thermostat as near the floor surface as possible, but right under the heating foil, into a groove, when a laminated floor is installed.
- The radius of the bend of the conduit between the wall and the floor must be executed in such a way that the probe can be exchanged if needed! The recommended minimum bend radius is 6 cm.
- The thermostat must be set to the mode: Room + floor temperature limit or Floor. The maximum allowed floor temperature setting is 27°C.

10. Foil connection diagram



11. Recommended materials

- Dry floors:
 - RIGIPS: Rigiplan, Rigidur E25
 - KNAUF F 141
 - CIDEM: Cetris, 8-20 mm, flammability class A
- Thermal insulating materials:
 - ORSIL: Orsil N, Orsil T-P
 - RIGIPS: extruded polystyrene XPS (25-35 kg/m³), PSB-S- 30,33
 - ROCKWOOL: Steprock L (T), Floorrock
 - ROTAFLEX: TSPS02
- Base layer:
 - STARLON 3 - 6mm
 - EXTRUPOR
 - GUMOTEX - IZOTAN
- Laminate floating floors
 - PROFI-FLOOR HT s.r.o. Příbram - ALLOC
 - KPP Kratochvíl Moravany u Brna - KÄHRS
 - ABH DESIGN Kuřim - PERGO
 - BKS - EGGER
 - MAGNUM
- PVC
 - FATRA Napajedla - all floor coverings with a temperature limit of up to 28 °C
 - FORBO Brno - NOVILON
- Carpets
 - MODIC Jeseník - JUTAPRINT, BITUMEN

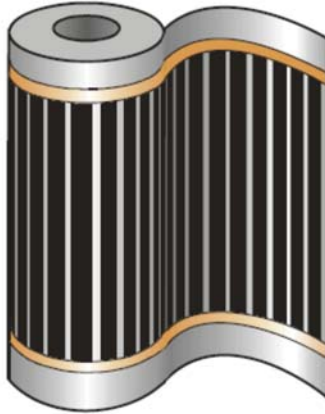
12. Warranty, complaints

The ECOFILM supplier provides a warranty for ECOFILM functionality for 15 years from installation confirmed in the Certificate of Warranty (installation must be carried out at most 6 months from the date of sale) provided:

- a duly completed Certificate of Warranty and proof of payment is submitted;
- the installation procedure in accordance with these instructions is observed;
- data on the foil situation in the floor, connections and results of measurements are submitted.

Any claim should be made in writing to the installation firm or directly to the manufacturer.

This instruction manual is intended for the suppliers, owners and users of heating foils and in the case of a change of owner/user, it has to be handed over to the successor, together with a duly completed Certificate of Warranty.



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