

# ECOFLOOR

HEATING CABLES AND MATS  
FOR FLOOR HEATING SYSTEMS

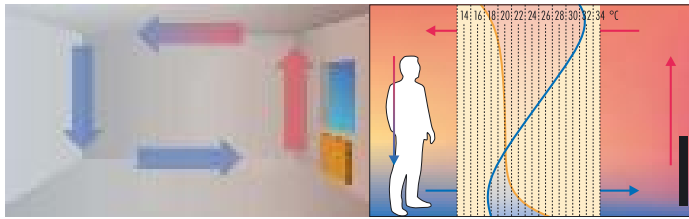
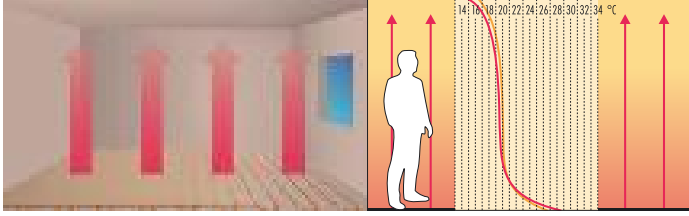
RAKO



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## Heating Principle

ECOFLOOR electric floor heating systems ensure ideal heat distribution in rooms and, by lowering undesirable air circulation, they also reduce dust levels. This heating system offers high comfort, economic and reliable operation, long life, preservation of free floor area and absence of various heating elements, radiators and heating medium distribution systems. The principal advantage of electric floor heating is easy and separate temperature control in individual rooms.



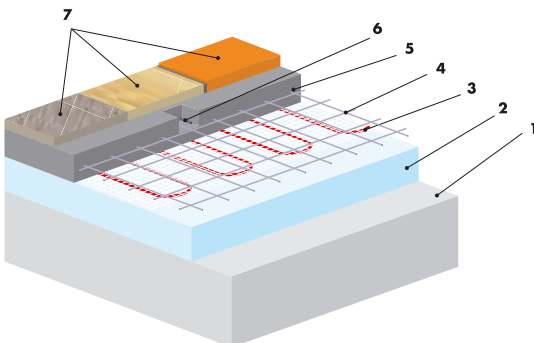
- Ideal temperature
- ECOFLOOR
- Convected heat

Just as with other heating systems, the proper design is based on calculation of building's heat loss. Hygienic regulations limit the temperature of surface layer to 27 °C (in living rooms occupied for long periods), which limits simultaneously potential output of the floor heating system. Should the floor input not suffice to cover heat losses in rooms, an additional heat source must be installed (e.g. a convector). This is a problem of older buildings with insufficient thermal insulation.

## ECOFLOOR Designs

Generally, the input 100 W/m<sup>2</sup> is designed for living rooms, in bathrooms where higher floor temperature is requested (30–33 °C) the input is designed up to 160 W/m<sup>2</sup>. However, the input depends on the floor construction, way of operation and user's requirements and its real value can range 60–200 W/m<sup>2</sup>. The heating systems may be either semi-storage (combined) or direct (thin-layer). Storage system is another option, but it is not used practically due to its high thermal lag and complicated control. In semi-storage systems, the heating element is situated in the concrete delivery layer above or right on thermal insulation. In direct heating systems, the heating element is situated in flexible bonding cement right under tiling.

### SEMI-STORAGE SYSTEM

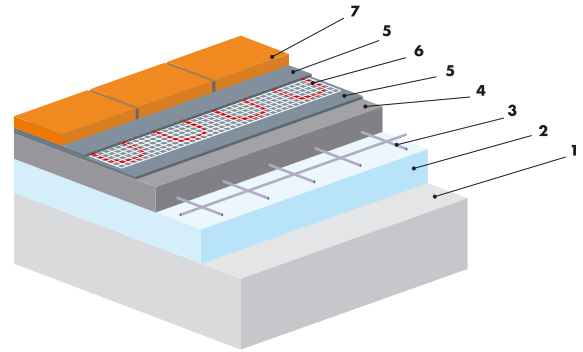


- 1) base, 2) thermal insulation 7–8 cm (extruded polystyrene), 3) ECOFLOOR heating mat, 4) steel reinforcement–KARI steel mesh, 5) concrete delivery layer 4–5 cm thick, 6) protective tube for floor probe, 7) layer that is walked upon (tiling, airy carpet, parquet floor, PVC without rubber base).

Floor probe should be installed above the heating element (between heating cable loops), as near the layer that is walked upon as possible. The probe enables to maintain the preset floor temperature and prevents its overheating. Another function of floor probe is to regulate temperature increase in a new floor with semi-storage system (see *Basic Principles of Installation*).

Thermal insulation is very important. Absence of this insulation could result in immoderately long heating period or impossibility to reach the required floor temperature. For new floors, we recommend to use extruded polystyrene (min. 25 kg/m<sup>3</sup>) at least 6 cm thick (ideally, in two layers, e.g. 2×3 cm).

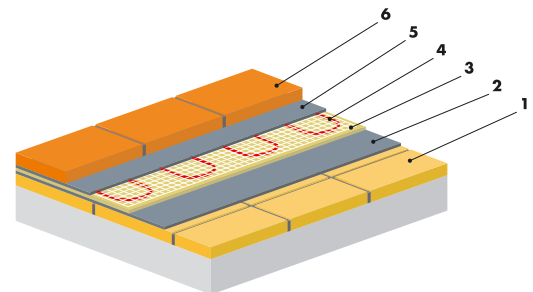
### DIRECT HEATING SYSTEM



- 1) base, 2) thermal insulation 5 cm (polystyrene at least 25 kg/m<sup>3</sup>), 3) steel reinforcement–KARI steel mesh, 4) concrete delivery layer 3–4 cm thick, 5) flexible bonding cement, 6) ECOFLOOR heating element, 7) tiling.

At reconstructions, when the heating element is to be installed on the existing floor which is not insulated thermally, we recommend to install insulated tile backer board F-BOARD developed specifically for the thermal insulation of tiled floors, then the heating element, flexible bonding cement and new tiling. This 6 or 10 mm thermal insulation will not replace the full-value thermal insulation of the floor, but it will increase its thermal resistance, reduce heat flow downwards and accelerate warming of the surface layer (tiling).

### DIRECT HEATING SYSTEM—RECONSTRUCTION



- 1) existing tiling or other base (concrete etc.), 2) flexible bonding cement, 3) F-BOARD insulation–6 or 10 mm, 4) ECOFLOOR heating element, 5) flexible bonding cement, 6) new tiling.

## ECOFLOOR Products

The ECOFLOOR heating systems are available in two basic variants—**heating cable circuits** and **heating mats**. In fact, the two systems do not differ from one another very much. In both cases, the heating system consists of the heating cable, either separate or fixed to supporting fibreglass cloth (heating mat).

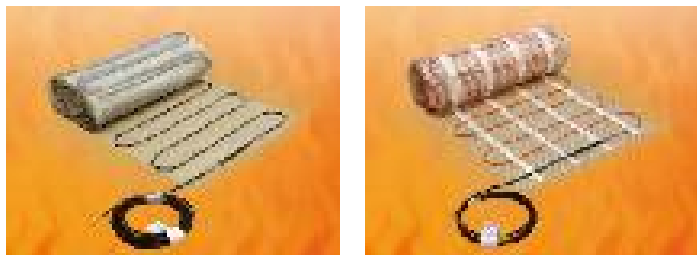
### Heating Cable Circuits

The advantage of heating cable circuits is higher flexibility at installation (in segmented or irregular rooms, to avoid fixed furnishing), variability of supply density and lower cost price. Its disadvantage is more complicated installation (manual heating cable spacing, fixing of cable to a base).



## Heating Mats

The advantage of heating mats is a very simple installation and even distribution of output throughout the floor area. Their disadvantage is a higher cost price caused by higher production costs (supporting cloth, adhesive tapes, manufacture of a mat).



Heating cable circuits and mats use different cable types:

- **Single-core cable**—has connection leads (cold cables) on both sides. Connection leads must be connected to an installation box. That means the heating cable circuit/mat must be laid in such a way that its beginning and end is approximately in the same place (which could be rather complicated in case of larger heating areas)
- **Double-core cable**—has a connection lead on one end which is connected to an installation box. An original connector is on the other end. Thus, the heating cable circuit/mat can be finished in any place because only one end is connected to an installation box
- **Cable without screen protection**—may be used exclusively in dry rooms (not in bathrooms) and, after novelization of applicable standards (i.e. since May 2003), it may be installed through a protective switch with max. 30 mA actuating value. If braided cable is used, it need not be connected through a protective switch
- **Cable with screen protection**—is designed especially for wet rooms (bathrooms, laundries, etc.). If the cable is used in dry rooms, it need not be connected through a protective switch

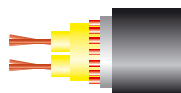
Two types of insulation of a heating conductor, which influence the final cable diameter, are used:

- **Fluoropolymer (ETFE)**—necessary electromechanical properties are reached with smaller thickness of insulation, the cable has a smaller diameter and may be installed in bonding cement under tiling (direct heating systems). However, the insulation increases the cable price
- **Cross-linked polyethylene (XLPE)**—bigger thickness of insulation is necessary to reach the required electromechanical properties. The cable has a bigger diameter and is suitable for installing in concrete (semi-storage systems). The advantage is a lower price of insulation and higher mechanical strength

Individual types of cables produced by Fenix combine the properties mentioned above. Cable composition is marked with the following letters:

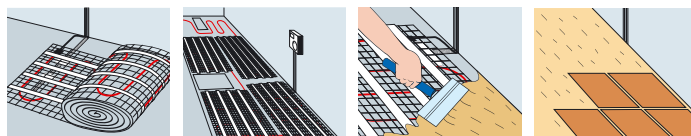
**M A D P S P**

- Plastic insulation**
- P** - XLPE - cross-linked polypropylene
- 1P** - PP-LDPE (mixed polypropylene & low density PE)
- V** - PVC (polyvinyl chloride)
- Screen protection** (for wet rooms)
- S** - full screen protection (tinned copper wires & aluminium tape)
- SL** - linear screen protection
- No letter is used for a cable without screen protection
- Plastic insulation** (for outdoor applications, higher mechanical ruggedness of cable)
- P** - XLPE - cross-linked polypropylene
- No letter is used for a cable without the second plastic insulation
- Number of heating cores**
- D** double-core cable
- No letter is used for a single-core cable
- Core insulation**
- A** - ETFE (fluoropolymer)
- P** - XLPE - cross-linked polyethylene
- Resistance (heating) wire**
- M** - multi-resistance - stranded resistance wire (to be used for higher outputs)
- No letter is used for non-stranded (simple) resistance wire



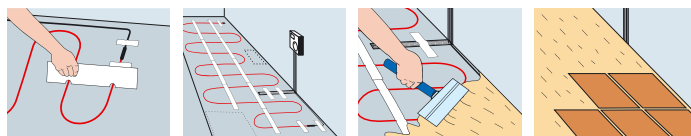
## ECOFLOOR Installation

### Heating Mat



- 1) Unwind the heating mat according to the laying drawing,
- 2) In case you need to leave a space under fixed furnishing, cut out the necessary part of cloth and span the space with the cable (see fig. 2),
- 3) Level the layer of flexible cement with a smooth spatula,
- 4) Lay tiling on small areas (up to 4 m<sup>2</sup>) immediately, on larger areas 24 hours later.

### Heating Cable Circuit



- 1) Create loops of heating meander (a template may be used),
- 2) Fix the cable to the base continuously (self-adhesive tapes, GRUFAST fixing aluminium tape),
- 3) Level the layer of flexible cement with a smooth spatula,
- 4) Lay tiling on small areas (up to 4 m<sup>2</sup>) immediately, on larger areas 24 hours later.

Detailed installation guides are delivered with products. They are also available in the electronic form on the manufacturer's web sites [www.fenixgroup.cz](http://www.fenixgroup.cz)

### ECOFLOOR Accessories — Fixtures

- GRUFAST fixing tape
- Plastic cable clip
- ECOFLOOR plastic fixing strip



## Basic Principles of Installation

The ECOFLOOR heating systems are manufactured in specified dimensions (input, length, area). The heating cable may never be shortened, only its connection leads (cold ends) may be cut.

The heating element (circuit/mat) should be laid at least 5 cm from peripheral walls and should never be installed under fixed furnishing or massive objects (bath, shower, toilet, washing machine, kitchen unit, etc.). Heating cables must not touch or cross each other. The cable spacing of manually created loops should be at least 5 cm.

Areas larger than 20 m<sup>2</sup> or when their diagonal is longer than 7 m should be divided with a dilatation joint. The dilatation joint should also be created in the place of contact with vertical construction, along the whole circumference of heating area. Heating element must never cross dilatation joints.

The heating system may be put into operation 28 days after concreting (maturing of concrete) and the floor temperature should be increased gradually—by approx. 5 °C a day (for detailed information see the installation guide).

## Kits for Self-Help Installation

Kits for self-help installation have been designed for the users who do not want a complete electrical heating system but a comfortable warm floor in the bathroom, kitchen etc. The kits include everything you need to install the floor heating system and their price is very favourable. They are sold in two variants:

### Ecofloor – Cable Kit



The kit includes

- heating cable circuit
- self-adhesive fixing tape
- electronic thermostat
- floor probe
- flexible protective tube for floor probe
- templates to measure cable loop spacing (100, 130 and 160 W/m<sup>2</sup>)

### Ecofloor – Comfort Mat



The kit includes

- heating mat (100 or 160 W/m<sup>2</sup>)
- digital thermostat
- floor probe
- flexible protective tube for floor probe

Both the kits use very thin double-core cable with screen protection (for wet rooms) thanks to which the kits may be used not only in new floors but mainly in remodelled floors—the heating element may be laid easily on the existing floor, without any necessary intervention in the original construction.

### Self adhesive cable mats LSDTS



Self adhesive cable mats are designed for thin-layer underfloor heating systems, for wet and other rooms. Fibber glass mesh of mat contains a special glue thanks to which heating mat may be laid easily

on the cleansed existing floor without any further additional accessories, what is a big advantage for quick and comfortable installation.

## Outdoor Applications

The ECOFLOOR heating systems may also be used in outdoor applications—staircases, pavements, drives, loading ledges, garage entries etc. to protect them against snow and ice.



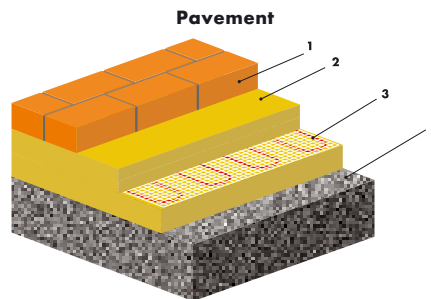
MPSV and MADPSP robust stranded resistance (multi-resistance) cables with full screen protection, double insulation and UV protection are suitable for outdoor applications. The cable construction ensures high mechanical strength and enables to load the cable with the output up to 30 W/m.

### Power Rating

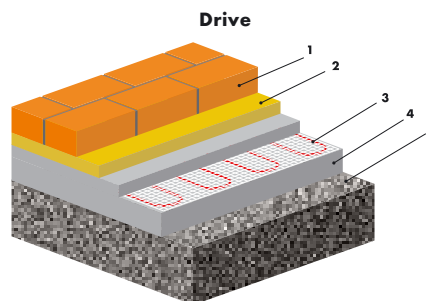
Output wattage recommended for outdoor applications ranges from 200 to 300 W/m<sup>2</sup>. For example, if you want to install the heating cable circuit having the output 300 W/m<sup>2</sup>, use the cable of 30 W/m specific input and lay it in loops with 10 cm spacing. When calculating the output, you should take into consideration the position of building, snowfall intensity, drive or pavement construction and the heating cable/mat mounting depth.

### Floor Construction

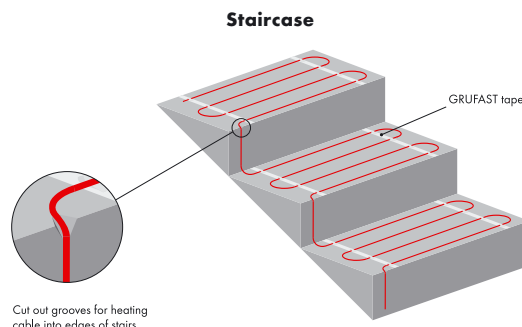
The heating cable/mat may be installed in all surface materials—concrete, asphalt, bed of sand. However, the floor construction and the installation of heating element should be adjusted to the use of drive/pavement. In pavements, the heating element may be placed in a sand bed. In drives, the heating element should be installed in concrete or asphalt.



1) granite tiles, 2) fine sand (without sharp stones), 3) ECOFLOOR, 4) base (gravel 15–30 cm).



1) granite tiles 8 cm, 2) sand bed approx. 3 cm, 3) ECOFLOOR, 4) concrete approx. 10 cm, 5) base (gravel 15–30 cm).



Cut out grooves for heating cable into edges of stairs

### Control

For the right and economic operation of outdoor applications, we recommend to use a suitable controller, e.g. EBERLE EM 524 87 with a temperature probe (TFF 524 002) and a humidity probe (ESF 524 001) offered by Fenix.



**FENIX Trading s.r.o.**  
Slezská 2  
CZ - 790 01 Jeseník  
Czech republic

phone:  
+420 584 495 111  
+420 584 495 304  
+420 584 495 441

fax:  
+420 584 495 303  
+420 584 495 431

[fenix@fenixgroup.cz](mailto:fenix@fenixgroup.cz)