

FLOORÉ UNDERFLOOR HEATING

Installation Instructions

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flooré

Dear customer!

Our aim is to offer you the best possible underfloor heating solution.

The contents of the package that you have just opened are the result of several years of research, development and practical experience.

You have the best system available on the market in terms of flexibility, economy and comfort. Its low height allows you to install the system in places where ceilings are lower than usual. Good heat transfer provides better comfort as a result of quicker response times, and better economy due to lower heat losses.

Though our goal is to deliver the best products, we are convinced that we do, we are also humble in realizing that there is space for improvement. We are also keen on that you get the service you feel you need. If you have any comments on our service or on our products, we would be grateful if you told us. Various ways of getting in contact with us are listed below.

In hope that you are satisfied thus far, and with conviction that you will be satisfied with the final result, we wish you every success with this installation and your work!

Sincerely,

Lars Edfeldt, Sales Manager



Don't hesitate to contact us

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1 General

Underfloor heating is a very pleasant way to heat a house. It is flexible, economical, comfortable and safe. Flooré underfloor heating is available as our complete Flooré Kit or as a tailored Flooré Project package.

Components and accessories that form part of the Flooré system:

Underfloor Heating Panels – these are panels that, when laid, form a channel into which the heating pipe is inserted. They have a heat transfer function, i.e. making possible efficient heat dissipation from the heating pipe to the floor and room. Choose the panel that best suits your needs:

Panels - Consists of panels with straight and return channel in the same panel.

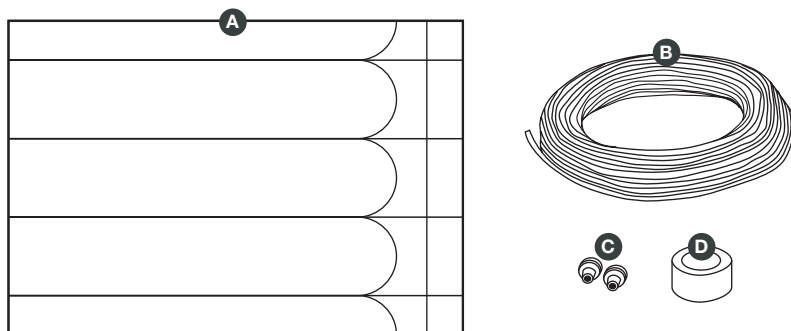
13 mm or 17 mm for lowest building height.

25 mm or 50 mm with additional insulation.

Heating Pipe – hot water is carried in the heating pipe (PEX or PEX/AL/PEX pipe) [B]. Because the room is colder than the pipe, heat is released from the water in the pipe and transported into the room through the underfloor heating panels.

Pipe Fittings – special connectors to connect the heating pipe to the manifold or the mixing unit [C]

Aluminium Tape – used to hold the pipe in place when it is being laid [D]

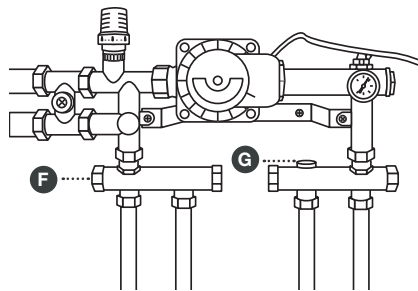


The following components are also included as accessories:

Pump and mixing unit - the purpose of the mixing unit is to lower the temperature of the water from the radiator system. Normally the temperature of the radiator system is too high to be delivered to the floor. The mixing unit lowers the water temperature to a suitable level before the water is circulated in the underfloor heating circuit by means of the pump. The mixing unit is also fitted with room temperature control and a manual air bleeder. **(E)**

Read more about our mixing units on page 14.

Manifold with return valves - a manifold is connected to the mixing unit if there are two or more circuits **(F)**. Lock-shield valves are used to adjust the flow in each circuit if they are of different lengths **(G)**.



(E) MIXING UNIT FS 36 WITH ACCESSORIES

2 Planning

As in all building projects it is important to plan the installation. The following aspects should be taken into account before starting work:

Where can the mixing unit be located?

Are the radiator system supply and return lines nearby? Is the space accessible and can the circuits be properly routed from the mixing unit to floor level? Is there a power supply for the pump in the vicinity? Where can the temperature sensor be placed so that there is no interference from other heat sources? Avoid locating the mixing unit in a bedroom as the pump can make a humming noise.

Raised floor level

Flooré panels are available for 12 mm and 16 mm heating pipes. The thinnest panel is just 1 mm higher than the pipe and the thicker panel with additional insulation can be 25 mm or 50 mm. This, plus the flooring material, will raise the floor level. Check whether door sills and skirting needs to be replaced or if doors need to be cut down. In wet rooms, it is important that plumbing is planned to be made possible at floor level, for example the toilet's sewage pipe is high enough for reuse. Remember that the height of kitchen units will be reduced. If you are building a new kitchen, underfloor heating is presumably not needed under the kitchen units. Instead you can lay gypsum- or plywood boards that have the same height as the Flooré panel.

How many circuits will be needed?

Normally a 65 m pipe will cover 12 m². It is important that the circuits all have about the same length. The layout of circuits requires careful design, examples are shown on page 8. The advantage of Flooré is that the panels are laid out loosely before being attached to the subfloor. The pipe length required for a specific area is approximately 5.2 times the area plus approximately 1 – 2 metres for connection to the mixing unit.

Laying the floor surface

After installing the Flooré system it is time to lay the flooring material. In dry rooms, wood-based products can be laid floating on the system. Ceramic tiles can be laid directly onto the Flooré system but it is important to use approved tile adhesive. Read more on page 17 "Laying the floor materials".

Uninsulated slab on ground or basement floor

Laying the thinnest panel on a slab on ground or basement floor that has no thermal

insulation has two disadvantages. One is that heat losses to ground increase, which increases heating costs. The second is that there is an increased risk of moisture transfer from the ground and into the space through the floor structure and basement walls. Both of these aspects are associated with heat loss, which means that it helps to install extra thermal insulation, or choose a floor panel with more thermal insulation. To moisture proof the design, an floor construction system that creates an air gap is recommended, such as Isola Platon, Nivell or Floor Board System (FBS) is recommended. These measures require a high ceiling. Despite the above Flooré panels can be laid if the slab is dry, but must be set onto the substrate with a cement-based adhesive such as Mapei Adesilex P4.

3 Some examples of circuits layouts

The figures in this section show some examples of circuit layouts in the various floor plans.

- Each circuit is marked with a ring in which the upper digit is the circuit number and the lower is the pipe's length.
- The direction of flow has been drawn. Note that the hottest part of the circuit is routed around the outside walls (the outside walls have been marked with dots), where the heat loss from the room is greatest. This also applies along the inside walls to prevent hotspots in the middle of the room.
- Note that the distance between the circuit and the wall can vary. This is done by cutting the edges of the Flooré panels.

Example 1 (see page 8)

A room with an area of 12.1 m².

The length of the circuit is approximately 65 m. Flooré Kit 12 m² is used for this floor plan. Note that the direction of flow has been selected so that the hotter parts of the circuit are adjacent to the external wall.

Example 2 (see page 8)

The area of the room is 14.2 m² which means that two circuits must be used. The two kits needed are 6 m² and 9 m².

Plan so that the hot parts of each circuit runs along the walls. The circuit that runs along the external wall will release more heat than the other; making it better for this to be the shorter of the two (the temperature drop in that circuit is greater because more heat is extracted from the hot water).

Example 3

The area of the kitchen is 24.9 m². There will be no underfloor heating underneath the kitchen units (1.8 m²). Instead the underfloor heating panels have been replaced by gypsum boards with the same height as the Flooré panel. The heated area is 23.1 m² which means two 12 m² Flooré Kits.

Note that the circuit adjacent to the external walls is shorter than the other (as in example 2). Because of the geometry of the kitchen the edges in the left-hand side of the kitchen will have an empty channel (the distance between the inside wall and the circuit will be more than 192 mm). The direction of flow compensates for this because circuit 1 nearest the inside wall is hottest.

Example 4

Installation in two rooms, a kitchen and a hall, will require multiple circuits. The room sensor is located in the kitchen (the zone in which a person will be most) which means that the indoor climate of the entry hall will be controlled by the temperature in the kitchen.

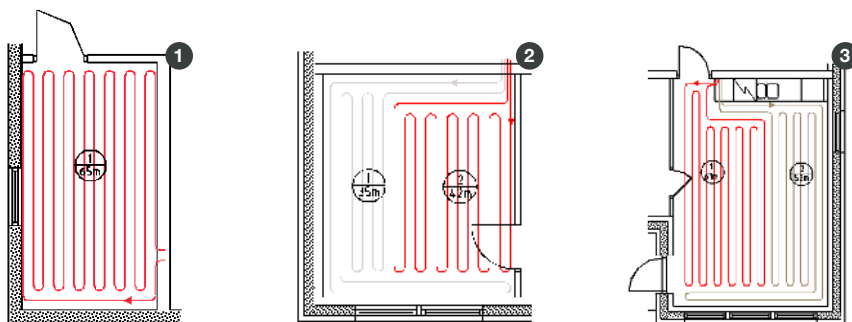
The area of the kitchen is 17.1 m², which would normally require two circuits. Because underfloor heating is not installed underneath the kitchen units, the effective heated floor area is 13.9 m² (this is a special case).

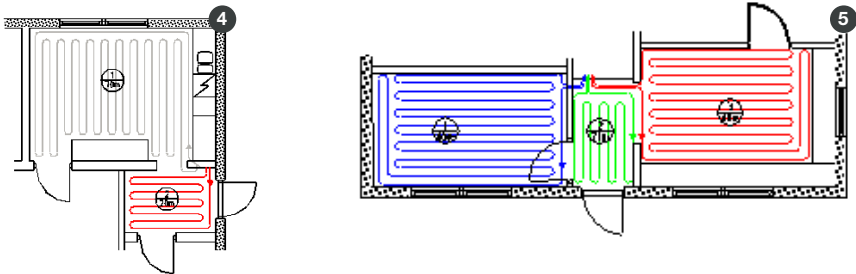
The area of the hall is 4.2 m². The area with under-floor heating is totally 18.1 m² which means 12 m² and 6 m² kits.

Example 5

Example 5 shows three zones heated by three circuits. Generally this solution works, however the temperature in individual rooms cannot be controlled with the temperature sensor of the mixing unit.

The sensor is located in one of the rooms, and the heat requirement in that room will affect the heat given off into the other two rooms.





4 Preparation

Ensure that the substrate is:

- Level, dry and clean.
- Stable in accordance to norms with regards to the chosen flooring material.

More information about design choices and the risks associated with installation in basements and on concrete slab are available at www.floore.se

Tools

The following tools are useful:

- **Stanley knife** (Craft-knife) – to cut the panels to suitable length.
- **A metal-edged ruler** – to achieve straight cuts in panels.
- **Ruler and marker pen** – to measure and mark.
- **Notched trowel** – to spread adhesive onto the substrate.
- **Gloves** – to protect your hands from sharp aluminium edges.
- **Knee pads** – to protect your knees and avoid making depressions in the panels.
- **Flat-sole shoes** – for example trainers, to avoid making depressions in the panels.

5 Laying procedure

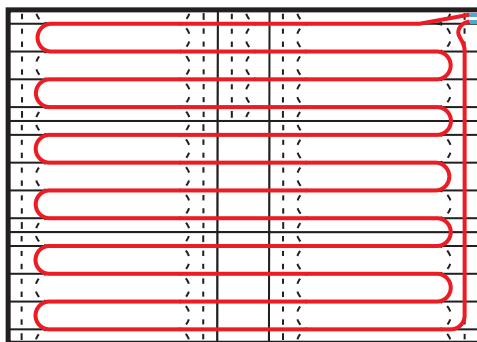
The best way to install the panels is by gluing. This works on all substrates and is a necessity if ceramic tiles or natural stone will be the flooring material. Panels can also be stapled or screwed onto chipboard if floating flooring materials will cover the system. Normally, the usage of glue is approximately 0.3 litres per m². Water-based universal floor glues for vinyl flooring or other resilient work well, for example CascoFlex, Evo-Stik Wall and Flooring adhesive, Bostik Multi Tac. Water based universal floor glues should not be used on a concrete substrate that is suspected of being damp, or that could be exposed to damp in the future. In this case, use cement-based tile adhesives, see separate product selection guidelines.

If floating flooring is going to be used, the panels do not theoretically need to be attached to the substrate. However, the panel can tend to move when the pipe is being installed. The panels can be attached by using screws, by stapling or double-sided tape.

Test installation

Installation is easiest if you have made a drawing, so that the supply and return ends of heating pipes are connected at the same location, see figure, marked with two blue dashes into the upper right-hand corner. Also, check that the warm part of the pipe runs along the external wall in order to compensate for extra heat loss, for example through windows.

Lay the entire panel system before bonding into place to the substrate. This allows you to check that the fit is good and that you have circuits that start and end at the location of the manifold/mixing unit. Inside the panels you have both straight and return channels, you just need to cut the foil in the U-turns that will be used. Press the foil into the channels using the back of the knife.



6 Bonding

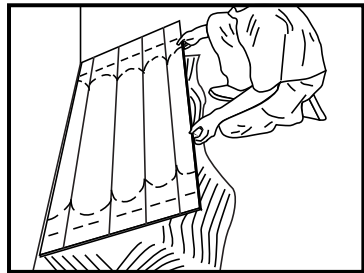
Apply **water-based glue** with a trowel (2 mm notches). The temperature should be between 15-35°C. Work in sections of the room so that you can walk on the floor without stepping in the glue. It is best to start in a remote part of the room. Spread the glue and let it dry until it is tacky. This will make the panels stick better when they are fitted in place. It may take between 10 minutes and half an hour to become tacky, depending on the substrate and room temperature.



When you have a subfloor of concrete, especially if it is a slab on the ground or a basement floor, use of **cement-based tile adhesive** is recommended. When applying it, spread it with a notched trowel (3-4 mm notches).

7 Laying

When the glue on the floor is ready, position the panel, adjust and press in place. You can carefully walk on the panels while the glue is drying. If the panels "slide" in the adhesive when they have been placed out, they have been laid too soon. If the adhesive has dried for too long apply another layer on top of the old one, otherwise the bond will be poor.



If you use cement-based tile adhesive set the panels before the adhesive dries. Remember to press down the panels in the channels, and to remove the surplus adhesive which comes up in the joints between the panels, before it dries. Do not walk on the panels while the adhesive settles.

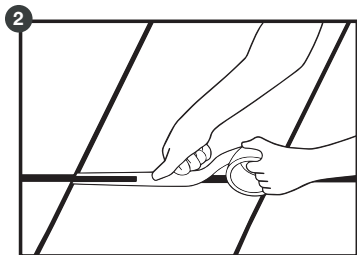
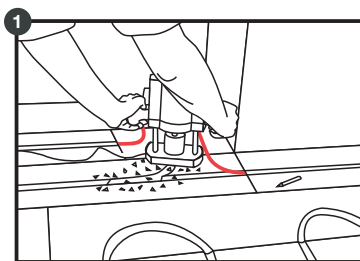
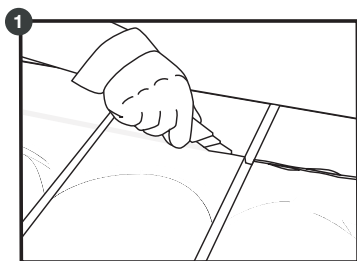
8 Cutting a new channel

It may be necessary to cut a new channel locally in order to create a complete circuit, especially where the pipes are being pulled together to meet at the manifold. The channel can be cut out using a craft knife or electric router.

Mark the route of the channel with a pen. Pipe bends must not be too sharp (the minimum bend radius for a 12 mm pipe is 60 mm, for a 16 mm pipe 90 mm).

Use a craft knife or electric router to cut a 12 mm or 16 mm channel depending on the pipe diameter **(1)**. Thoroughly remove debris.

Fold aluminium tape into the channel **(2)**.



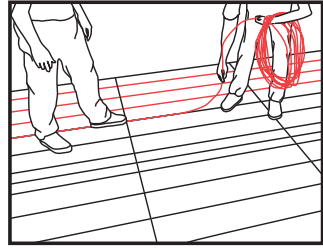
9 Laying pipe

Vacuum clean the channel. Check that the pipe reaches length is adequate.

Putting pipes through walls (1)

Before putting heating pipes through the wall or the floor, install protective tubing first.

Two persons should do this; one who "feeds" the pipe and one other who carefully pulls it from the other side. If the pipe gets stuck, it can get a kink.



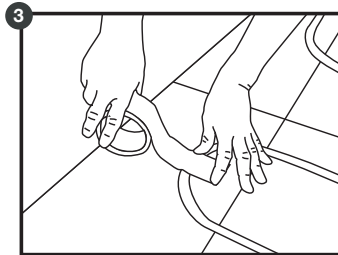
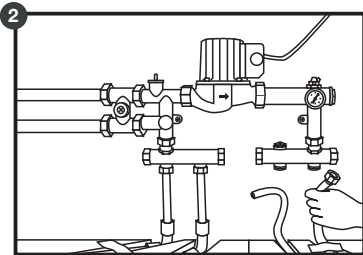
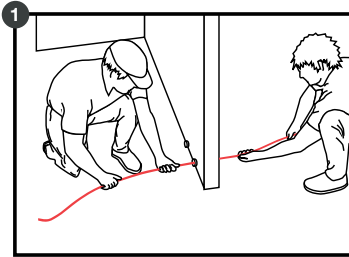
Connecting to a mixing unit/manifold (2)

The minimum bend radius for the heating pipe at 90° is 60 mm for 12 mm pipe and 90 mm for 16 mm pipe respectively. Read more about our mixing units and controls on page 14.

Taping (3)

Use tape where the pipe turns, as well as larger gaps between the floor panels.

Normally tape is not needed over the joints between floor panels. Tape the pipe down where it sticks up.



10 Finishing and pressure test

When the floor system is in place, walkways in the room should be covered with boards (such as plasterboard, hardboard, chipboard or corrugated cardboard) to protect the system until the flooring material is fitted.

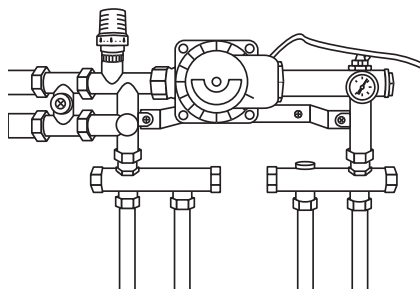
Before the flooring material is fitted the pipes must be connected and pressure tested by a plumber. The test pressure is to be 1.5 times operating pressure (normally this is 1 – 1.5 bar) and must be maintained for at least an hour. During this period, observations should be made on whether or not the system is leaking. If possible the pressure test should be maintained throughout the fitting of the flooring material.

Mixing units and controls

The controls are “brain” of an underfloor heating system. They make it possible to control the room temperature by adjusting the flow and temperature of the water in the circuits. In order for the system to deliver a comfortable heat level the controls must be adjusted to match the dimensions of the system.

The combination of product and correct design is necessary for an effective underfloor heating system. The controls consist of a number of components that are combined in such a way to correspond to your needs and preferences. The most important components are described below.

In many cases the heat source is regulated by a sensor that controls the temperature of the water in line with outdoor temperature. This is necessary for an effective heating system.



MIXING UNIT FS 36 WITH ACCESSORIES

Our mixing units

FS 36 – Mixing unit for individual rooms with the same temperature, 1-36 m².

EL-SHUNT FS 36 - Mixing unit for individual rooms heated the whole year, 1-20 m².

FS 180 – Mixing unit with controls in several rooms and totally heated floor areas of 37 m² to about 150 m².

Dimensioning

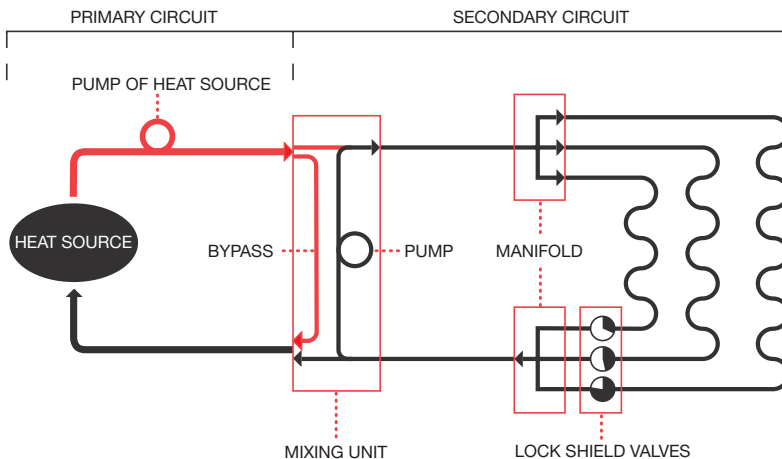
Dimensioning is a calculation that determines the temperature and flows of the heating water in different loops. This is based on the characteristics of each house. Examples of important factors governing dimensioning include the geographical location of the house in the country (the location determines the outdoor design temperature of the house), the level of thermal insulation of the house and the type of ventilation system. The more accurate the dimensioning is carried out the better the heated floor will operate.

Underfloor heating system connected to a radiator system

If the underfloor heating system has to be connected to a radiator system, a mixing unit will be required. The purpose of the mixing unit is to pump water around the circuits, and to make it possible to mix water from the circuits with water from the heat source. This makes it possible to maintain the right temperature of the water to the circuits since water used in the radiators often is too hot to be used in floors. The size and configuration of the mixing is determined by the total heated floor area.

Function of the mixing unit in the system

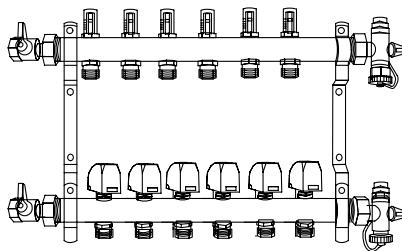
One normally differentiates between the primary circuit and secondary circuit. In this context the primary circuit is the existing radiator circuit that contains hot water. The secondary circuit is the circuit that the mixing unit supplies with reduced temperature.



Accessories to the mixing unit

Manifold

Every circuit has an inlet and an outlet through which water passes. These are connected to a pair of manifold pipes which in turn are connected to a mixing unit or directly to the heat source. In principle a manifold can have as up to 12 circuits, if needed. However, in practice it is better to use several manifolds for large areas because of the long distances the water must be transported by circuits that heat remote areas. Each circuit can have its own thermostat and its own actuator that controls the flow in the circuit. It is also possible to connect several circuits so that these are controlled by one thermostat. However, it is not possible to connect more than one thermostat to a circuit.



Zone thermostat

The sensor of the thermostat registers the temperature in the zone (room). The thermostat communicates with an actuator (or more, depending on how many circuits heat the zone) located on the manifold and regulates the flow in the circuits of that zone. When the temperature drops below the set-point value, flow is allowed through the circuits. When the temperature is above the set-point value, the flow in the circuits is constricted. There are two different ways to transmit information about the temperature in the room - wired and wireless.

Wired - Information on the temperature in the zone is transmitted through a cable that connects the thermostat to the actuator, which in turn acts on the flow of heating water in the circuit. The length of the cable has no effect on this function. With a wired connection you can position the thermostat a long way from the manifold/actuator.

Wireless - The information is transmitted using radio waves in a similar manner to a wireless inter-



net connection. In a normal house there are no restrictions regarding the location of the thermostats. Because the thermostat runs on batteries it can be moved as necessary.

Laying the flooring material

When the underfloor heating system has been installed and pressure-tested it is time to lay the flooring material. The underfloor heating system must be shut off, above all when laying tiles, because the temperature will affect the drying time of the adhesive and grout and thus their long term characteristics. **Note** that these are only general recommendations for fitting flooring materials. If there are any differences between recommendations, follow the instructions from the manufacturer of the floor products or accessories.

Ensure that the heated floor is:

- Plane, dry and clean.
- Ensure that the underfloor heating panels are well bonded to the substrate. If a panel or part of a panel, is not firmly attached or makes a noise against the substrate, use additional screws or cut out the loose-fitting area and glue it again.

Ceramic flooring – in general

The methods of laying tiles, system solutions and requirements differ depending on the type of room in which the underfloor heating system has been installed. A major difference is between dry rooms and wet rooms. Wet room refers to rooms in which the floor structure is provided with a moisture barrier (these generally have floor drains), e.g. bathrooms, utility rooms and boiler rooms. In dry rooms the ceramic tiles can be laid directly onto the system. In wet rooms, regulations require a layer of levelling compound (filler/screed) with mesh reinforcement above the system. No matter what the type of room, Flooré underfloor heating panels must be bonded to the substrate. The following describes the installation process in more detail.

Adhesive

The choice of adhesive is determined by the tile type (for example slate and marble can be sensitive), and also your experience of tiling and how quickly the floor will be in traffic after it has been laid. When choosing adhesive these words may be used about the products:

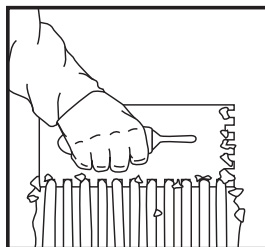
POT LIFE - The time the adhesive can be in the bucket from when it has been mixed to when it is no longer useable.

OPEN TIME - The time one has to lay the tiles when the adhesive has been spread onto the surface.

ADJUSTMENT TIME - time the tile can be adjusted counted from when it was laid in the adhesive.

The notching of the trowel depends on the size of the tile.

Ask your tile supplier for the suitable notch size. Normally an 8 mm trowel is used, but the characteristics and size of the tile will determine this. Always use a mechanical adhesive mixer attachment to mix adhesive or grout.



**SPREAD THE ADHESIVE
OVER THE SYSTEM BY
USING A NOTCHED TROWEL**

Always mix the adhesive using a mechanical adhesive mixer until the adhesive turns into a paste. Use an adhesive from the supplier of the primer; see page 19.

Ceramic floors in dry rooms

1. FLOORÉ PANEL
2. PRIMER
3. ADHESIVE



In dry rooms it is possible to lay ceramic tiles directly onto the underfloor heating system by means of tile adhesives. The floor must be stable and there must be no flexing in the structure. Movement in the floor structure can lead the cracks in the joints or tiles coming loose.

Generally the installation procedure is as follows:

- Clean dust, oil, grease etc. off the surface of the Flooré panels using methylated spirits. Do not use solvents as these can dissolve the expanded polystyrene.
- Apply a primer following the supplier's guidelines. The primer is to be applied undiluted unless otherwise indicated in the manufacturer's instructions. Only use products recommended by the manufacturer according to the table "Primers and Adhesives, dry rooms". Not all types of primer work on aluminium foil. Ensure that the primer is spread out and covers the entire surface. Do not allow the primer to form puddles. Let the primer dry according to the instructions.
- Mix the adhesive according to the manufacturer's instructions. Use an appropriate notched trowel (depending on the size, back-side pattern etc. of the tiles). Start by test laying some tiles. You should be able create ridges in the adhesive without them sinking (if they do the adhesive is too wet) or clumping (then it is too dry). Lay a couple of tiles in the adhesive and pick them up – the coverage on the backside should be 100%.

Size of the tiles

The adhesive combined with the tiles distribute point loads. However, the tiles should not be smaller than 15 x 15 cm. For smaller tiles or mosaic, a load distributing board or a layer of fibre reinforced screed needs to be laid above the panels. In this case choose the tile adhesive/primer recommended by the manufacturer/supplier for the material you have selected.

Primers and Adhesives, dry rooms

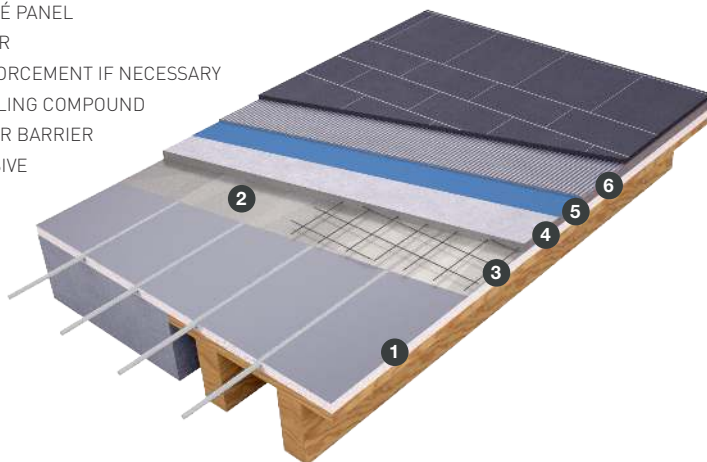
The table below shows the laying methods and products that have been tested and recommended in Scandinavia.

PRODUCER	PRIMER	ADHESIVE
Alfix A/S	Alfix 1K Sealing membrane	Alfix Normalfix mixed with Alfix Flexbinder (0,2 l/kg)
Bostik	Primer 6030	Bostik Fix Combi or Bostik Tiling adhesive
Casco	Casco Superprimer	Multifix, Multifix Premium or Floorflex
Kiilto AB	Kiilto Start Primer	Kiilto Flytfix adhesive levelling compound
Rescon Mapei AB	Eco Prim Grip or Primer ECO	Kerabond mixed with 50% Isolastic Granirapid or Adesilex P4.
Schönox	Schönox SHP	Schönox PFK, PFK Plus, TT Flex or TT Rapid
Weber	Floor 4716	Set 614 Multi Flyt Normal or Set 616 Multi Max

Note: In United Kingdom Mapei Ltd recommends that a suitable means of preparing the Flooré panels for ceramic tiles are to prime with Mapei Eco Prim Grip and to apply a 3 – 4 mm layer of Mapei Ultra-plan Renovation Screed.

Ceramic floors in wet rooms

1. FLOORÉ PANEL
2. PRIMER
3. REINFORCEMENT IF NECESSARY
4. LEVELLING COMPOUND
5. VAPOUR BARRIER
6. ADHESIVE



In order to lay ceramic tiles or natural stone in wet rooms, the floor must fulfil the Swedish Ceramic Construction Council's regulations for wet rooms regarding the rigidity of the floor structure. Detailed information about the rules for moisture barriers, floor structure, junctions, incline towards floor drains etc., can be found at the Swedish Ceramic Construction Council's home page www.bkr.se

When a Flooré system is to be installed in a wet room using ceramic tiles, a layer of levelling compound must be applied to the panels, and then covered with an approved moisture barrier for floors.

Proceed as follows:

1. Check that the floor structure fulfills regulations.
2. Install the Flooré panels. The panels must always be bonded to the substrate in wet rooms. At a floor drain leave at least 150 mm not covered with the panels. Screed must be applied there so that a hard boundary is formed in junction with the floor drain connection.
3. Pressure-test the pipe.
4. The next step is to screed the floor. Apply a material onto the walls so that the screed will not attach to the walls. This can be done with an expanded polyurethane edge band or something similar. Because all cementitious products

shrink when they harden, it is important that the floor can move away from the wall. Otherwise there is a risk of problems with cracks, adhesion and floor panels coming loose. Ensure that the supplier's guidelines for room and surface temperatures are met.

5. Clean the heated floor with methylated spirit (do not use solvents as these can dissolve the expanded polystyrene) and apply undiluted primer. Let the primer dry. NOTE! Check that the primer spreads out and forms a film covering the entire surface, because not all makes adhere to aluminium foil. See the table "Primer and levelling compound, wet rooms" for the choice of primer.
6. NOTE! For wooden substrates/subfloors, regardless of the distance between joists (but a maximum of 600 mm), bending rigidity must be reinforced and measures must be taken to prevent moisture-induced movement from being transferred to the ceramic layer. Reinforcement can be carried out using a minimum of 12 mm levelling compound at floor drains. Reinforcement is to be carried out at the bottom of the levelling compound using spot-welded steel mesh.
7. Lay the reinforcement mesh on the primed panels. Overlap joints.
8. Apply levelling compound (screed) in accordance with the manufacturer's instructions. Before working, check the floor temperature so that it satisfies the manufacturer's requirements. If the floor temperature is too low there is a risk that the compound cures before it shrinks, causing problems with cracks, adhesion and floor panels coming loose. It is also important that there is not too much liquid in the levelling compound!
9. Apply the moisture barrier onto the levelled surface according to the supplier's instructions. It is important that the screed is given time to totally dry out.
10. Use the tile adhesive/primer recommended by the manufacturer/supplier for the moisture barrier you have selected.

Primer and levelling compound, wet rooms

PRODUCER	PRIMER	ADHESIVE
Alfix A/S	Alfix Mix Primer	Alfix Plane Mix 50, min 10 mm
Bostik AB	Bostik 6030	Bostik Floor levelling compound Fiber or Fiber Quick
Casco	Casco Superprimer	Any Casco floor levelling compound
Kiilto AB	Kiilto Start Primer	Kiilto Rot and Underfloor heating filler, Multiplan or Plan Rapid, min 12 mm
Rescon Mapei AB	Primer ECO or Eco Prim Grip	Ultraplan Renovation Screed, min 4 mm or Uniplan, min 12 mm
Schönox	Schönox SHP	Any Schönox floor levelling compound
Weber	Floor 4716	Floor 4320 or Floor 644

Floating floor

1. FLOORÉ PANEL
2. PE FOIL
3. FELT



Vinyl flooring and carpets

Vinyl flooring and carpets cannot be laid directly onto the underfloor heating system. Boards must be laid on top of the system. These can be floating. It is important that the boards are thin and have good thermal conductivity so as to transmit heat upwards. For example, chip-board may have a minimum thickness of 10 mm.

The panels can also be stabilised using fibre reinforced screed (about 10 mm) prior to laying the vinyl flooring or carpet. Prior to screeding, the underfloor heating system must be primed to improve the adhesion of the screed with the aluminium foil. Because not all types of primer bond to aluminium foil it is important to check that the primer spreads out and forms a film that covers the entire surface.

Wood products

Your flooring supplier has instructions on how to lay the wood floor. When laying wood on the underfloor heating system it is particularly important to follow the instructions related to movement joints.

Underfloor heating means that the wood will dry out during that part of the year the heating is on to a greater degree than if underfloor heating had not been installed. It is therefore important to limit the rated output of the underfloor heating, and to increase the size of the movement joints by about 50% if these joints are specified for where there is no underfloor heating installed. The underfloor heating will give rise to somewhat

larger gaps between floorboards during the driest winter months.

Guidelines can be downloaded from the Swedish Flooring Trade Association home page www.golvbranschen.se in the form of a manual called "Wood flooring on underfloor heating" (edition 2005:2). Generally, durable 0.2 mm polythene foil is laid above the underfloor heating system. The polythene foil must conform to the Swedish Plastics Federation standard 2000/2001. After that comes felt underlay, airolen (expanded polyethylene) or cork underlay. Felt underlay is best from the point of view of energy as it is less insulating than the others. Insulating underlays lead to increased heat losses to the ground, less heat going upwards and higher system temperatures (water temperatures). Finally the floor covering is laid floating on top of the above layers.

Parquet laminate

Lay parquet in accordance with the supplier's instructions. Normally the Flooré panels are covered with durable polythene foil. Then felt underlay is laid on top. The parquet is laid floating on top of the felt underlay.

Laminates and snap together flooring

Some laminate flooring is coated underneath with felt and a vapour barrier. Despite this we recommended durable PE foil. Follow the floor supplier's instructions.

Solid wood (floorboards)

The floorboards must be laid perpendicular to the primary direction of the circuits direction. The thermal conductivity of the wood is almost double in the direction of the grain as across it. By using the properties of the wood in this way, more even surface temperatures are achieved. Follow the flooring supplier's instructions and in general as described in the wood products section.

flooré

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