Hydronic floor heating

Easy, proven and profitable

Easy selection saves time and increases your turnover.
Danfoss has been pioneering heating control systems for more than 80 years and we have 20 years of experience in advanced wireless solutions. Throughout the years, it has been our goal to simplify both installation and operation to ensure maximum end user value and energy savings.

Being the first to introduce **wireless floor heating control** is only one part of our long life within comfort control.

Danfoss has been pioneering heating control systems for more than 80 years and we have 20 years of experience in advanced wireless solutions. Throughout the years, it has been our goal to simplify both installation and operation to ensure maximum end user value and energy savings.
The most advanced test center

In Vejle, Denmark we are testing floor heating in combination with other heat emitters and heat sources while simulating outdoor temperatures.

**Thermal mass (Cell 1, 2 and 4)**
Houses around the world are constructed differently. Each room in the Test Center is therefore constructed with different materials and different thermal mass. The amount of thermal mass determines the heat absorbing ability of the room and thereby how fast the floor heating can heat up the room.

**Outdoor temperature simulation (Cell 6)**
The test rooms are surrounded by a cooling zone. This enables the engineers to simulate different outdoor temperatures conditions and test how floor heating reacts under different conditions.

**Floor heating reaction time (Cell 1, 2 and 4)**
Floor heating reacts slower than radiators. Temperature sensors are embedded in the concrete at multiple levels and vertically in the cell from floor surface to ceiling for every 0.5 m. This enables the engineers to register the reaction time of the floor heating system.

**Impact on the entire system (Cell 5)**
The floor heating can be connected to different heat sources such as gas boilers and district energy stations. Also, multiple heat emitters (floor heating and radiator) in the same room can be tested. This enables the engineers to assess the impact of any change on the entire system and not just on the floor heating.

**Thermal radiation (Cell 1, 2 and 4)**
A special sensor not only measures the air temperature but also the thermal radiation from e.g. windows when it is cold outside. Thermal radiation affects comfort, which means that an air temperature of 21 °C may not feel like 21 °C.

**Multiple rooms for testing (Cell 1, 2 and 4)**
Most test facilities use only one room. The Danfoss test facility has three rooms. This enables the engineers to test in a multi-room-system approach that is similar to a normal house.

The Test Center enables the engineers to measure the performance of the heat control system in different building constructions without any uncontrolled disturbances.
From specification to after-sales service

We have you covered

Before...

• Danfoss can provide all necessary components for balancing the entire system and can advise you on the optimum solution
• Danfoss offers radiator, hydronic and electrical floor heating control and can advise you about the ideal heat emitter
• Danfoss can provide written system specifications to help you with the tendering process
• Danfoss offer specialist training to ensure optimum installation results

...during...

• If applications change during the project, we can advise on any necessary changes
• Danfoss can help you with your first installation, thereby minimizing the risk of mistakes
• Danfoss offer full technical support. Simply call us

...after installation

• With over 80 years of experience, you can rely on our ongoing support
• Danfoss offer cost-free help with balancing the floor heating system correctly
• During handover, we provide all relevant material, e.g. operating instructions. This minimizes call-backs

All products from one supplier ensures better systems and makes your life easier.
WE PROVIDE CONTROL EXPERTISE

Our advanced knowledge of **hydronic control** means that you get the best products on the market.

Our knowledge of hydronic control and balancing provides you with:
- Comfort in terms of accurate temperature control
- Comfort and energy savings due to easy and accurate balancing of the heating system

Hydronic Balancing Controls  District Heating Controls  Hydronic Floor Heating Controls
6 product areas
where hydronic control engineering results in comfort and energy saving products.

Heat Pump Controls
Radiator Controls
Cooling Controls
Flow control
for any application

Danfoss offers an extensive range of high-performance and versatile floor heating solutions for any type of application – from single rooms in private homes to office complexes or public buildings.

Whatever your project demands, we have the products and tools to make it happen and the service and logistics backup to ensure that you meet your deadlines and budget.

On the following pages, you will find an overview of some of our most popular systems and solutions. If you have any specific questions or queries, please feel free to get in touch.

Compact Mixing Shunt + FHF-F Manifold with flow indicators and unique presetting valves that ensure quick and easy hydronic balancing.
Room control for any ambition

Danfoss Link wireless system

Danfoss Link can control floor heating, radiator thermostats, electric on/off relays and more. The controller has an intuitive touch screen and provides a single access point for all of your heating system. An agile and flexible solution that is also ideal for retrofit projects.

CF2+ wireless system

The Danfoss CF2+ is a unique floor heating control system for all heating and cooling applications – specially designed to reduce installation time. CF2+ offers advanced functionality for every need, e.g. four different thermostats, including the infrared floor sensor for optimal comfort, low energy optimizer function and more.

Hardwired systems

The FH-Wx is a standard hardwired system available as both 24V and 230V.

The BasicPlus (FH-CWx) and the uniquely designed BasicPlus2 (WT-x) are available as 230V. They can be connected directly with an actuator or via a connection box.

Danfoss Link wireless system

CF2+ wireless system

FH-Wx hardwired system

BasicPlus room thermostats

Enjoy the benefits of the CF2+ intelligent infrared floor sensor.

BasicPlus2 room thermostats

The classic FHV

A well-proven solution for single room control with the original Danfoss thermostat.
Product highlight: **Danfoss Link**

Danfoss Link™ CC – intuitive touch screen and access point:

- Controls floor heating, radiators and electric on/off relays from a single central point
- Makes temperature scheduling easy. Save 5% energy for every degree the room temperature can be lowered
- Adaptive learning ensures the right temperature at the right time
- Put entire heating system in ‘away’, ‘economy’ or ‘comfort’ mode from a single central point
- Wireless for easy installation
- Very accurate control with e.g. PID-controlled *living connect®* for more comfort

**TIP!** Ask your customers if they are interested in a smart home solution.

---

**Easy wireless temperature control from one access point – all around the house:**

1. **Danfoss Link™ PR**
   - Plug-in relay for electric on/off control

2. **living connect®**
   - Electronic radiator thermostat

3. **Danfoss Link™ RS**
   - Room sensor for radiator and floor heating control

4. **Danfoss Link™ HR**
   - Hidden relay for electric on/off control

5. **Danfoss Link™ HC**
   - Hydronic controller for floor heating

6. **Danfoss Link™ App**
   - Easy temperature control from your smartphone (cannot control Danfoss Link™ PR/HR relays)
A simple smart home solution
Product highlight: 
**CF2⁺ wireless floor heating system**

**CF2⁺ offers easy installation and saves time:**

- No need to plan embedding of wires in concrete and wall
- No need to involve an electrician
- Saves time as no wiring is necessary
- 2-way wireless communication link test ensures that you can confidently hand over a fully functioning system
- Can be used in cooling systems

**TIP!** Ask your customers if they would like to know more about increased comfort from using infrared temperature control.

---

**Infrared floor sensor**

makes installation easy and provides accurate floor temperature.

---

**Wireless infrared floor sensor CF-RF thermostat advantages:**

- Infrared can be installed any time – a floor sensor embedded in concrete cannot
- No wires from thermostat to floor
- Controlled on the basis of floor surface temperature for more accurate control (as opposed to sensor embedded in concrete)
- Perfect for tiles in e.g. bathrooms where comfortable floors are desired
- Max. temperature option for protection of valuable wooden or quarry-tiled floors
- Optional switch from floor surface temperature to room temperature control
Product highlight: **Hardwired WT-x BasicPlus² 230V**

Scandinavian design with multiple features:

- Unique Scandinavian design
- Available with week scheduling
- Wired floor sensor with maximum temperature option for protection of valuable wooden or quarry-tiled floors
- Can be connected to the boiler or pump. This way the boiler or pump will switch off when there is no heat demand

---

**Room control**

- **Direct**
- **via connection box**
- **incl. Auxiliary Switch**

---

Push one button for energy savings:

- Press “M” to activate away mode
- Save 5% energy for every degree you lower the room temperature

**TIP!** Ask your customers if they are interested in temperature setbacks that can save energy
Installing CF2⁺

1. When all actuators are connected, connect the CF-MC Master Controller to the main supply.

2. 1. Press ^ button and the Install LED flashes. 2. Press OK button and the Install LED lights up.

3. Press center button of room thermostat once.

4. First available output is flashing. Push > until you reach the desired output.

5. Press OK button to add the room thermostat to CF-MC. Repeat the steps for each room thermostat you wish to add.

6. Place the room thermostat in the room and press center button for link test. LED flashes once: Link is established. LED flashes 5 times: Link has failed.
Installing *Danfoss Link™ CC*

1. When all actuators are connected, connect the *Danfoss Link™ HC* to the main supply.

2. Add the master controller to *Danfoss Link™ CC*.

3. Add the room thermostat to *Danfoss Link™ CC*.

4. Pair the room thermostat with the output via *Danfoss Link™ CC*.

5. Install the *Danfoss Link™ CC* in its final position.

6. Perform a network test via *Danfoss Link™ CC*. 
Selling system controls is good for your business and provides comfort and savings for your customers.

Danfoss control solutions makes it easier for you to boost your business.

The example below is for a home where six room controls are needed.

In both cases, the manifold is a FHF and pipes are PE-RT. Room controls are CF2+ wireless system with room thermostat CF-RS.

TIP! Inform your customers about the comfort and energy saving benefits from using room controls.

Typical installation without controls

Typical installation with controls

Double your turnover and provide comfort and energy savings for your customers.
Selling system controls is good for your business and provides comfort and savings for your customers.
ROOM CONTROLS
WHAT TO CONSIDER

1. BUILDING SIZE
   Is the house or individual apartment larger than 300 m²? (Wireless range)
   - NO
   - YES

   CHOOSE HARDWIRED

2. FLEXIBILITY
   Are short installation time and flexibility of placing thermostat important?
   - NO
   - YES

   CHOOSE WIRELESS

3. COOLING
   Will floor heating system be used for floor cooling?
   - NO
   - YES

   CHOOSE WIRELESS CF2+

WIRELESS SOLUTIONS

Danfoss Link »
The full “Smart house” solution. Use the intuitive touch screen to control both radiators and floor heating. NB: no floor sensor or cooling option is available.

CF2+ »
The simple, state-of-the-art floor heating system, with the option of choosing infrared floor sensor and cooling.
4. BATTERIES
Is it ok that batteries need to be changed every 2 years?

NO

YES

CHOOSE WIRELESS

5. MILLING
Can wiring be established in a satisfactory way (milling and drilling in the wall)

YES

CHOOSE HARDWIRED

NO

CHOOSE WIRELESS

HARDWIRED SOLUTIONS

FH-CWx 230V (BasicPlus)
The price-optimized choice for weekly scheduling.

WT-x 230V (BasicPlus²)
Design thermostats with weekly scheduling and boiler switch.

FH-Wx 24V
No electrician needed (low voltage). However also available as 230V.
## ROOM CONTROLS

### OVERVIEW

<table>
<thead>
<tr>
<th>Control solutions</th>
<th>Master controller</th>
<th>Pump relay</th>
<th>Input relay for external signal</th>
<th>Boiler relay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wireless</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CF2⁺</td>
<td>Required</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Danfoss Link</td>
<td>Required</td>
<td></td>
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<tr>
<td>Hardwired</td>
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<td>FH-Wx 230V</td>
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<td>FHV</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

1. Radiator thermostats and floor heating controlled via the same controller (*Danfoss Link™ CC*).
2. Requires remote controller 088U0221
3. Requires separate scheduling on each room thermostat – i.e. no central controller for easy scheduling
4. Combined with dew point sensor 088U0251 for moist prevention
5. Requires connection box 088H0016
6. Hardwired (as opposed to CF2⁺ which is infrared)
7. Also available as wireless relay (014G0272 for Danfoss Link and 088U0252 for CF2⁺)
8. 088U0624 and 088U0626 both have one output for either boiler or pump. Add connection box 088H0016 for more relays.
9. FHV-A (003L1001) for RA thermostatic room sensor (sensor not included) and FHV-R (003L1000 and 003L1015) for FVJR return temperature sensor (FVJR sensor not included).

---

**Danfoss Link wireless system**

**CF2⁺ system**

**The classic FHV**
<table>
<thead>
<tr>
<th>Central control interface</th>
<th>Radiator thermostat compatible</th>
<th>Week schedule option</th>
<th>Adaptive learning</th>
<th>Floor sensor option</th>
<th>Output voltage</th>
<th>Optimized for cooling application</th>
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<tr>
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</table>

**BasicPlus**
FH-CWx hardwired system

**BasicPlus²**
WT-x hardwired system

**FH-Wx hardwired system**
CF2⁺ WIRELESS

### Master controllers

<table>
<thead>
<tr>
<th>Code no.</th>
<th>Master Controller, CF-MC 5 channels</th>
<th>Master Controller, CF-MC 10 channels</th>
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<td>088U0245</td>
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### CF2⁺, Room thermostats

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<th>Code no.</th>
<th>Room thermostat, CF-RS</th>
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<th>Room thermostat, CF-RD</th>
<th>Room thermostat, CF-RF</th>
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<td>088U0215</td>
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### Accessories

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</table>
# ROOM CONTROLS

## Features

<table>
<thead>
<tr>
<th>Pump relay</th>
<th>Input relay for external signal</th>
<th>Boiler relay</th>
<th>Input relay for heating/cooling</th>
<th>Adaptive learning</th>
<th>Week schedule option (via CF-RC)</th>
</tr>
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<tbody>
<tr>
<td>✓</td>
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## Features

<table>
<thead>
<tr>
<th>Temperature limitation</th>
<th>Display</th>
<th>Dial</th>
<th>Floor sensor, infrared</th>
<th>Flush mounted</th>
<th>Wall mounted</th>
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<tbody>
<tr>
<td>✓</td>
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</tbody>
</table>

*Tamperproof

## Description

- **For central control incl. scheduling**
- **To extend wireless signal range**
- **To extend wireless signal range. Incl. 2 meter cable**
- **Extension cable, 5 meters**
- **To prevent condensation in cooling application. Mounted on manifold**
- **Connected to boiler, pump or chiller. Receives wireless signal from CF-MC when there is a cooling need. CF-RC required**
- **RA manifold connection. Connect wire to master controller**
- **RA manifold connection. Connect wire to master controller**
- **M30×1.5 manifold connection. Connect wire to master controller**
- **M30×1.5 manifold connection. Connect wire to hydronic controller**
**Danfoss Link™ CC wireless**

### Master controllers

<table>
<thead>
<tr>
<th>Code no.</th>
<th>Master controllers</th>
</tr>
</thead>
<tbody>
<tr>
<td>014G0103</td>
<td>Hydronic Controller, HC, 5 channels</td>
</tr>
<tr>
<td>014G0100</td>
<td>Hydronic Controller, HC, 10 channels</td>
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</tbody>
</table>

*Note: All products require Danfoss Link™ CC (Central Controller)*

### Room thermostats

<table>
<thead>
<tr>
<th>Code no.</th>
<th>Room thermostat</th>
</tr>
</thead>
<tbody>
<tr>
<td>014G0158</td>
<td>Room thermostat, RS</td>
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</tbody>
</table>

*Note: All products require Danfoss Link™ CC (Central Controller)*

### Accessories

<table>
<thead>
<tr>
<th>Code no.</th>
<th>Accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>014G0287 / 014G0289</td>
<td>Central Controller, Danfoss Link™ CC With NSU</td>
</tr>
<tr>
<td>014G0286 / 014G0288</td>
<td>Central Controller, Danfoss Link™ CC With PSU</td>
</tr>
<tr>
<td>088U0230</td>
<td>Repeater Unit, CF-RU</td>
</tr>
<tr>
<td>088U0250</td>
<td>External Antenna, CF-EA</td>
</tr>
<tr>
<td>088U0255</td>
<td>Cable for CF-EA</td>
</tr>
<tr>
<td>088H3110</td>
<td>Thermal Actuator, TWA-A, NC 24V</td>
</tr>
<tr>
<td>088H3111</td>
<td>Thermal Actuator, TWA-A, NO 24V</td>
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<td>088H3140</td>
<td>Thermal Actuator, TWA-K, NC 24V</td>
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<td>088H3141</td>
<td>Thermal Actuator, TWA-K, NO 24V</td>
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### Other products...

<table>
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<tr>
<th>Code no.</th>
<th>Other products</th>
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<tbody>
<tr>
<td>014G0270</td>
<td>Wireless relay, PR (Plug-in Relay)</td>
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<td>014G0271</td>
<td>Wireless relay, HR (Hidden Relay)</td>
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<tr>
<td>014G0272</td>
<td>Wireless relay, FT (Floor Thermostat)</td>
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<tr>
<td>014G0001</td>
<td>Radiator thermostat, living connect*</td>
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<tr>
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<td>Radiator thermostat, living connect*</td>
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</table>
## ROOM CONTROLS

<table>
<thead>
<tr>
<th>Features</th>
<th>Pump relay</th>
<th>Input relay for external signal</th>
<th>Boiler relay</th>
<th>Adaptive learning</th>
<th>Week schedule (via Danfoss Link™ CC)</th>
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<th>Features</th>
<th>Temperature limitation</th>
<th>Display</th>
<th>Radiator thermostat compatible</th>
<th>Floor sensor</th>
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<th>Wall mounted</th>
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<th>Description</th>
<th>Controller with user friendly screen. With NSU (wall mounted). Required</th>
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<td>Controller with user friendly screen. With PSU (flush-mounted). Required</td>
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<td>To extend wireless signal range</td>
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<td>To extend wireless signal range. Incl. 2 meter cable</td>
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<td>Extension cable, 5 meters</td>
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<td>M30×1.5 manifold connection. Connect wire to hydronic controller</td>
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<td>M30×1.5 manifold connection. Connect wire to hydronic controller</td>
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...that can be controlled by Danfoss Link™ CC

- Plug-in on/off relay
- Hidden on/off relay
- For on/off temperature control of electric heating.
- Can be connected with floor sensor (included) or room thermostat RS
- With RA adapter
- With RA + K (M30x1.5) adapter

Note: All products require Danfoss Link™ CC (Central Controller)
### HARDWIRED

#### FH-Wx
- **24V room controls**
- **Room thermostat, FH-WT**
  - 088H0022
- **Room thermostat, FH-WP**
  - 088H0023
- **Room thermostat, FH-WS**
  - 088H0024

All 24V room controls require FH-WC 24V 088H0017 connection box to operate

#### FH-CWx BasicPlus
- **230V room controls**
- **Room thermostat, FH-CWT**
  - 088U0601
- **Room thermostat, FH-CWD**
  - 088U0602
- **Room thermostat, FH-CWP**
  - 088U0603

#### WT-x BasicPlus
- **230V room controls**
- **Room thermostat, WT-T**
  - 088U0620
- **Room thermostat, WT-D**
  - 088U0622
- **Room thermostat, WT-DR**
  - 088U0624
- **Room thermostat, WT-P**
  - 088U0625
- **Room thermostat, WT-PR**
  - 088U0626

*Requires an inner socket box size of minimum 46.2 x 62.3 mm (WxH)*

#### Connection Boxes
- **Master Controller, FH-WC 24V – 10 outputs**
  - 088H0017
- **Master Controller, FH-WC 230V – 8 outputs**
  - 088H0016

*Note! If a Normally Open (NO) actuator is connected, the pump or boiler relay cannot be used as the relay function is inverted.*

#### Accessories
- **Thermal actuators for 24V**
  - 088H3110 (NC) + 088H3111 (NO)
- **Thermal actuators for 230V**
  - 088H3112 (NC) + 088H3113 (NO)
- **Floor sensor, for FH-Wx – 24V**
  - 088H0025
- **Floor sensor, for FH-CWx and WT-x**
  - 088U0610
- **Floor sensor, for FH-WP – 230V**
  - 088H0025

---

**Master Controller:**
- FH-WT 088H0022
- FH-WP 088H0023
- FH-WS 088H0024
- FH-CWT 088U0601
- FH-CWD 088U0602
- FH-CWP 088U0603
- WT-D/DR 088U0622 / 088U0624
- WT-T 088U0620
- WT-P/PR 088U0625 / 088U0626

**Thermal Actuator**
- 088H3110 - 088H3113
- 088H3140 - 088H3143

**Floor sensor**
- 088H0025

---

**Accessories**
- **Thermal actuators for 24V**
  - 088H3110 (NC) + 088H3111 (NO)
- **Thermal actuators for 230V**
  - 088H3112 (NC) + 088H3113 (NO)
- **Floor sensor, for FH-Wx – 24V**
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---

**Connection Boxes**
- **Master Controller, FH-WC 24V – 10 outputs**
  - 088H0017
- **Master Controller, FH-WC 230V – 8 outputs**
  - 088H0016

*Note! If a Normally Open (NO) actuator is connected, the pump or boiler relay cannot be used as the relay function is inverted.*
## ROOM CONTROLS

### Temperature limitation

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<th>Feature</th>
<th>Display</th>
<th>Dial</th>
<th>*Floor sensor, hardwired option</th>
<th>Temperature set-back button</th>
<th>Soundless (no relay/bi-metal)</th>
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* Tamperproof

### Week schedule option (per room)

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* See accessories

### Auxiliary switch

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* See accessories

### Pump relay

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<td>Cooling</td>
<td>Required for all 24V room controls</td>
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<td>Standby relay</td>
<td>230V controls can be connected directly to connection box</td>
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### Boiler/pump on/off

### For system

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### Features

- RA manifold connection. Connected via connection box 088H0017
- RA manifold connection. Connected directly with 230V room thermostats or conn. box 088H0016
- M30 manifold connection. Connected via connection box 088H0017
- M30 manifold connection. Connected directly with 230V room thermostats or conn. box 088H0016
- For setting either minimum or maximum floor temperature
- FH-CWx: For setting max. floor temperature. WT-x: For setting min., max. or fixed floor temperature.
MANIFOLDS AND MIXING SHUNTS
Combine a mixing shunt … with the ball valves

Mixing shunt

Mounting the mixing shunt is extremely easy, as it is very compact from only 110 mm in installation dimension. The mixing shunt is mounted directly on the manifold on either the left or right-hand side, it can also be angle mounted with angle fittings as accessories.

Product highlights:
» Prefabricated for quick and easy mounting
» Very compact - fits into cabinets
» Capillary tube which measures the temperature directly in the water instead of the temperature on the pipe
... then the **manifolds** and then an **air vent type**

**FHF**
With pre-setting but without flow meter. FHF with flow meter (FHF-F) is shown on the above picture.

**FH-ME (BasicPlus)**
No flow meter and no pre-setting.

**SSM-F**
With pre-setting and flow meter.
We have minimized failure rates so you can maximize your business.

During production and development, all components are subjected to various tests to maximize their efficiency and working life.

**Pressure test**

In a pressure test, the manifolds, fittings and pipes are assembled and placed under pressure. In this way, the manifold, fittings and pipes can be tested to withstand even unrealistic pressures.

**Temperature test**

In a temperature test, the floor heating system is exposed to different heat levels. These variations make the components expand and contract, allowing us to test the sustainability of the different components.

**Capacity test**

In a capacity test, the flow through the valves is tested, enabling us to find the kvs-value. This allows us to calculate how much energy each circuit can provide to the room.
The purity and quality of the brass used in Danfoss manifolds minimizes the risk of corrosion and leakages.

FHF and FHF-F manifolds are all produced according to the CW617N standard, which ensures a very high brass quality.
A study with 537 plumbers from seven countries shows that installers are called back to approx. 20% of installations. The saving potential for leaving behind a well-functioning system is enormous.

**TIP!** Make sure to explain the importance of perfect hydronic balancing to your customers.

**Manifolds with pre-setting**

**Reduce call-backs and provide comfort and savings for your customers**

**Typical installation with pre-setting**

With pre-setting, the right amount of water can be distributed to the right rooms.

**Typical installation without pre-setting**

Without pre-setting valves, you risk the scenario of very uneven heat distribution which decreases comfort.
More than just pre-setting

We give you the best solutions on the market

A Danfoss manifold with pre-setting offers better distribution of water and energy, which ensures the right temperatures in different rooms.

Danfoss throttle pre-setting

- No tools required. Can be done quickly and easily
- Precise pre-setting scale visible on valve
- Easy to use pre-setting guide
- Pre-setting can be checked after installation (visible setting)
- Spindle and valve seat produced as 1 piece – provides extreme accuracy

Typical non-Danfoss pre-setting

- Tools required. Time consuming
- Normally not visible on valve
- More complex pre-setting
- Pre-setting cannot be checked without a visible scale
- Spindle uses manifold as seat. Difficult to set accurately
Accurate pre-setting example

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</table>
Our online QuickPlanner dimensioning program enables you to calculate the correct pre-setting values in just minutes. Go online and have the following information ready:

- Room sizes
- Heat requirement (W/m²)
- Supply temperature
- Desired room temperature
- Floor type

...or with our online tool

Our online QuickPlanner dimensioning program enables you to calculate the correct pre-setting values in just minutes. Go online and have the following information ready:

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- Heat requirement (W/m²)
- Supply temperature
- Desired room temperature
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→ quickplanner.danfoss.com
WHAT TO CONSIDER

1. TEMPERATURE
   IS THERE A HIGH TEMPERATURE HEAT SOURCE?
   (e.g. boiler or district energy)
   - YES
   - NO
   NO NEED FOR MIXING SHUNT

2. VARIABLE SPEED
   USE A MIXING SHUNT
   Should it be with a variable speed pump for extra energy saving?
   - YES
   - NO
   CHOOSE VARIABLE SPEED
   FHM-C8  » 15-60
   FHM-C9  » 15-40
   CHOOSE FIXED SPEED
   FHM-C6  » 15-60
   MIDI-SHUNTS Solution with 1-3 circuits CF2 master and actuators. Just add room controls
MANIFOLDS
WHAT TO CONSIDER

1. BALANCED SYSTEM
Is balancing via pre-setting or flow meters required?

- YES
- NO

2. FLOW METER
Are flow meters required?

- YES
- NO

3. CHOOSE
FH-F or SSM-F with both pre-setting and flow meter

FH-ME (BasicPlus)
No flow meter and no pre-setting

FHF
With pre-setting

FHF-F
With pre-setting and flow meter

SSM-F
With presetting and flow meter Premounted components
MANIFOLD OVERVIEW

**Manifolds**

<table>
<thead>
<tr>
<th>Code no.</th>
<th>Description</th>
<th>Code no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>088U0522-32</td>
<td>FHF-F</td>
<td>088U0522-32</td>
</tr>
<tr>
<td>088U0502-12</td>
<td>FHF</td>
<td>088U0502-12</td>
</tr>
<tr>
<td>088U0612-18</td>
<td>FH-ME (BasicPlus)</td>
<td>088U0612-18</td>
</tr>
<tr>
<td>088U0752-62</td>
<td>SSM-F</td>
<td>088U0752-62</td>
</tr>
</tbody>
</table>

**Only manifold:** You will need to order end-piece (1 pcs. 088U0582 or 2 pcs. end section 088U0785 or 088U0786, mounting brackets (088U0585) and ball valves (088U0586).

**Assembled:** You will only need to order mounting brackets (088U0585).

**Accessories**

<table>
<thead>
<tr>
<th>Code no.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>088U0582</td>
<td>End caps (2 pieces)</td>
</tr>
<tr>
<td>088U0785</td>
<td>End section – automatic air vent</td>
</tr>
<tr>
<td>088U0786</td>
<td>End section – manual air vent</td>
</tr>
<tr>
<td>088U0585</td>
<td>Mounting brackets (2 pieces)</td>
</tr>
<tr>
<td>088U0584</td>
<td>Reduction bushes</td>
</tr>
<tr>
<td>088U0583</td>
<td>Connection piece</td>
</tr>
<tr>
<td>088U0586</td>
<td>Ball valves (2 pieces)</td>
</tr>
</tbody>
</table>
### Number of outputs

<table>
<thead>
<tr>
<th>Number of outputs</th>
<th>Flow meter</th>
<th>Pre-setting</th>
<th>Control valves for actuators</th>
<th>Solution</th>
<th>Material</th>
<th>Working Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>From 2+2 (088U0522) – To 12+12 (088U0532)</td>
<td>✓</td>
<td>✓</td>
<td>✓ (TWA-A)</td>
<td>Only manifold</td>
<td>Brass</td>
<td>6 bar</td>
</tr>
<tr>
<td>From 2+2 (088U0502) – To 12+12 (088U0512)</td>
<td></td>
<td>✓</td>
<td>✓ (TWA-A)</td>
<td>Only manifold</td>
<td>Brass</td>
<td>10 bar</td>
</tr>
<tr>
<td>From 2+2 (088U0612) – To 8+8 (088U0618)</td>
<td></td>
<td></td>
<td>✓ (TWA-A)</td>
<td>Only manifold</td>
<td>Brass</td>
<td>10 bar</td>
</tr>
<tr>
<td>From 2+2 (088U0542) – To 12+12 (088U0552)</td>
<td></td>
<td></td>
<td></td>
<td>Only manifold</td>
<td>Brass</td>
<td>10 bar</td>
</tr>
<tr>
<td>From 2+2 (088U0752) – To 12+12 (088U0762)</td>
<td>✓</td>
<td>✓</td>
<td>✓ (TWA-A)</td>
<td>Assembled</td>
<td>Stainless steel</td>
<td>6 bar</td>
</tr>
</tbody>
</table>

### Description

- Used where air vents are not used
- Includes automatic air vent and drain valve
- Includes manual air vent and drain valve
- Used to mount manifold
- Enables connection between ¾” pipe and 1” manifold
- For combining two or more manifolds
- To shut off water to entire manifold
MIDI SHUNT
OVERVIEW

---

**Midi shunt**
- for small floor heating systems

<table>
<thead>
<tr>
<th>Midi shunt</th>
<th>Code no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midishunt with 1 circuit</td>
<td>088U0181</td>
</tr>
<tr>
<td>Midishunt with 2 circuits</td>
<td>088U0182</td>
</tr>
<tr>
<td>Midishunt with 3 circuits</td>
<td>088U0183</td>
</tr>
</tbody>
</table>

---

**Just add...**
CF2+ room thermostats

<table>
<thead>
<tr>
<th>Room thermostat</th>
<th>Code no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room thermostat, CF-RS</td>
<td>088U0210</td>
</tr>
<tr>
<td>Room thermostat, CF-RP</td>
<td>088U0211</td>
</tr>
<tr>
<td>Room thermostat, CF-RD</td>
<td>088U0214</td>
</tr>
<tr>
<td>Room thermostat, CF-RF</td>
<td>088U0215</td>
</tr>
</tbody>
</table>
### Midi shunt – for small floor heating systems

**Code no.**

<table>
<thead>
<tr>
<th>Measurement mm (H x W x D)</th>
<th>Pre-mounted components</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pump type</td>
</tr>
<tr>
<td>425 x 325 x 165</td>
<td>Alpha 2, 15-40</td>
</tr>
<tr>
<td>425 x 325 x 165</td>
<td>Alpha 2, 15-40</td>
</tr>
<tr>
<td>425 x 369 x 165</td>
<td>Alpha 2, 15-40</td>
</tr>
</tbody>
</table>

### Features

<table>
<thead>
<tr>
<th>Temperature limitation</th>
<th>Display</th>
<th>Dial</th>
<th>Floor sensor, infrared</th>
<th>Adaptive learning</th>
<th>Week schedule option (via CF-RC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td></td>
<td>✔</td>
<td></td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>✔</td>
<td></td>
<td>✔</td>
<td></td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>✔</td>
<td></td>
<td>✔</td>
<td></td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>✔</td>
<td></td>
<td>✔</td>
<td></td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>
FHM-C5 (088U0095)
» 3-speed UPS 15-40 pump
» Internal non-return valve
» FHD-T thermometer
» FH-TC self-acting thermostatic controller
» FH-ST55 safety thermostat prewired to pump

FHM-C6 (088U0096)
» 3-speed UPS-15-60 pump
» Internal non-return valve
» FHD-T thermometer
» FH-TC self-acting thermostatic controller

FHM-C8 (088U0098)
» Speed-controlled Alpha2 15-60 pump
» Internal non-return valve
» FHD-T thermometer
» FH-TC self-acting thermostatic controller

FHM-C9 (088U0099)
» Speed-controlled Alpha2 15-40 pump
» Internal non-return valve
» FHD-T thermometer
» FH-TC self-acting thermostatic controller

### Mixing shunt

<table>
<thead>
<tr>
<th>Mixing shunt</th>
<th>Code no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FHM-C5</td>
<td>088U0095</td>
</tr>
<tr>
<td>FHM-C6</td>
<td>088U0096</td>
</tr>
<tr>
<td>FHM-C8</td>
<td>088U0098</td>
</tr>
<tr>
<td>FHM-C9</td>
<td>088U0099</td>
</tr>
</tbody>
</table>

### Accessories for mixing shunt

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Code no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety thermostat</td>
<td>088U0301</td>
</tr>
<tr>
<td>Measurement set</td>
<td>088U0304</td>
</tr>
<tr>
<td>Manual flow limiter</td>
<td>088U0303</td>
</tr>
<tr>
<td>Angle fittings</td>
<td>088U0305</td>
</tr>
<tr>
<td>Upgrade Kit – ECL</td>
<td>088U0090</td>
</tr>
</tbody>
</table>
### Features

<table>
<thead>
<tr>
<th>Pump type</th>
<th>Pump speed</th>
<th>Additional accessories included</th>
<th>Pump energy class</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPS 15-40</td>
<td>Fixed, non-adaptive</td>
<td>Safety thermostat</td>
<td>C</td>
</tr>
<tr>
<td>UPS 15-60</td>
<td>Fixed, non-adaptive</td>
<td>-</td>
<td>C</td>
</tr>
<tr>
<td>Alpha 2, 15-60</td>
<td>Variable</td>
<td>-</td>
<td>A</td>
</tr>
<tr>
<td>Alpha 2, 15-40</td>
<td>Variable</td>
<td>-</td>
<td>A</td>
</tr>
</tbody>
</table>

### Description

- Stops pump if supply temperature is above 55 °C
- Output for measuring flow
- Spindle valve for limiting mixing shunt flow
- For mounting mixing shunt at a different angle
- For controlling supply temperature based on outdoor temperature

### Accessories

<table>
<thead>
<tr>
<th>Code no.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>088U0301</td>
<td>Safety thermostat</td>
</tr>
<tr>
<td>088U0304</td>
<td>Measurement set</td>
</tr>
<tr>
<td>088U0303</td>
<td>Manual flow limiter</td>
</tr>
<tr>
<td>088U0305</td>
<td>Angle fittings</td>
</tr>
<tr>
<td>088U0090</td>
<td>Upgrade Kit – ECL (088U0090)</td>
</tr>
<tr>
<td>087B1261</td>
<td>Weather Compensator ECL 110 (087B1261)</td>
</tr>
<tr>
<td>082F0051</td>
<td>Electric actuator ABV-NC (082F0051)</td>
</tr>
<tr>
<td>084N1012</td>
<td>Temperature sensor ESM (084N1012)</td>
</tr>
<tr>
<td>087B1184</td>
<td>Universal sensor ESMB-12 (087B1184)</td>
</tr>
<tr>
<td></td>
<td>Sensor pocket and valve insert</td>
</tr>
</tbody>
</table>

### Safety thermostat

- Code no: 088U0301

### Upgrade Kit – ECL (088U0090)

- Includes:
  - Weather Compensator ECL 110 (087B1261)
  - Electric actuator ABV-NC (082F0051)
  - Temperature sensor ESM (084N1012)
  - Universal sensor ESMB-12 (087B1184)
  - Sensor pocket and valve insert
FLOOR HEATING
PANELS
Basic™ screed systems

Using tools and laying pipes at the same time is difficult. No tools are required for BasicRail™ and BasicGrip™. This means that one person can lay the pipes alone when using BasicRail™ and BasicGrip™.

For BasicRail™ the rails need to be installed first. The BasicGrip™ panel, on the other hand, contains both insulation and knobs that hold the pipes in place. That means fewer work processes with BasicGrip™.

Panels

What to consider

1. INSTALLATION
   Is 1-person installation important?
   - YES
   - NO
   - CHOOSE BasicClip™

2. WORK PROCES
   Is few work processes important?
   - YES
   - NO
   - CHOOSE BasicRail™

   - NO
   - CHOOSE BasicGrip™
# Floor Heating Panel Overview

## System Overview

<table>
<thead>
<tr>
<th>System</th>
<th>Installation time (min./m² at c/c 300 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BasicGrip™</td>
<td>7.5</td>
</tr>
<tr>
<td>BasicClip™</td>
<td>8</td>
</tr>
<tr>
<td>BasicRail™</td>
<td>6.5</td>
</tr>
</tbody>
</table>

## BasicRail™

<table>
<thead>
<tr>
<th>Code no.</th>
<th>Code no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FH-BRA – Rails, 2 meters for 16x2 pipe</td>
<td>088X0040</td>
</tr>
<tr>
<td>FH-BRC – Rails, 3 meter, for 20x2,25 pipe</td>
<td>088X0042</td>
</tr>
<tr>
<td>FH-BRD – Clips for BasicRail™, 500 pcs</td>
<td>088X0043</td>
</tr>
<tr>
<td>FH-BCC – Clips for foil, 200 pcs.</td>
<td>088X0060</td>
</tr>
</tbody>
</table>

## BasicClip™

<table>
<thead>
<tr>
<th>Code no.</th>
<th>Code no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FH-BCB – Clips for BasicClip™, 300 pcs</td>
<td>088X0062</td>
</tr>
<tr>
<td>FH-BCC – Clips for foil, 200 pcs.</td>
<td>088X0060</td>
</tr>
</tbody>
</table>

## BasicGrip™ Panels and Rolls

<table>
<thead>
<tr>
<th>Code no.</th>
<th>Code no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FH-BGA – Standard panel</td>
<td>088X0050</td>
</tr>
<tr>
<td>FH-BGB – Standard panel</td>
<td>088X0051</td>
</tr>
<tr>
<td>FH-BGC – Standard panel</td>
<td>088X0052</td>
</tr>
<tr>
<td>FH-BGD – Connection panel</td>
<td>088X0053</td>
</tr>
<tr>
<td>Manifold/multi-panel</td>
<td>088X0054</td>
</tr>
<tr>
<td>Manifold/multi-panel</td>
<td>088X0055</td>
</tr>
<tr>
<td>Manifold/multi-panel</td>
<td>088X0056</td>
</tr>
</tbody>
</table>

## BasicClip™ and BasicRail™ Rolls

<table>
<thead>
<tr>
<th>Code no.</th>
<th>Code no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FH-SL – Foil</td>
<td>088X0130</td>
</tr>
<tr>
<td>Basic insulation roll</td>
<td>088X0072</td>
</tr>
<tr>
<td>Basic insulation roll</td>
<td>088X0073</td>
</tr>
</tbody>
</table>

## Other Accessories

<table>
<thead>
<tr>
<th>Code no.</th>
<th>Code no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FH-BCA – BasicClip™ Tool</td>
<td>088X0061</td>
</tr>
<tr>
<td>FH-BGI – Conduit elbow</td>
<td>088X0058</td>
</tr>
<tr>
<td>FH-BK – Perimeter insulation</td>
<td>088X0065</td>
</tr>
<tr>
<td>FH-ACA – Basic movement gap strip</td>
<td>088X0066</td>
</tr>
<tr>
<td>FH-ACB – Basic pipe sleeve</td>
<td>088X0067</td>
</tr>
</tbody>
</table>
### System overview

<table>
<thead>
<tr>
<th>Available insulation thickness (mm)</th>
<th>Installation tools needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>0, 11, 35</td>
<td>None</td>
</tr>
<tr>
<td>0, 20, 35 (panels) / 30 (10 m² rolls)</td>
<td>BasicClip Tool</td>
</tr>
<tr>
<td>0, 20, 35</td>
<td>None</td>
</tr>
</tbody>
</table>

### Consumption (m/m²)

- 1.2
- 1.2

### Consumption, pcs./m² with c/c 300 mm | Consumption, pcs./m² with c/c 250 mm | Consumption, pcs./m² with c/c 200 mm | Consumption, pcs./m² with c/c 150 mm | Consumption, pcs./m² with c/c 100 mm

<table>
<thead>
<tr>
<th>Form</th>
<th>Insulation thickness (mm)</th>
<th>Size (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel</td>
<td>35</td>
<td>1</td>
</tr>
<tr>
<td>Panel</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Panel</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Panel</td>
<td>0</td>
<td>0.1</td>
</tr>
<tr>
<td>Panel</td>
<td>35</td>
<td>0.5</td>
</tr>
<tr>
<td>Panel</td>
<td>11</td>
<td>0.5</td>
</tr>
<tr>
<td>Panel</td>
<td>0</td>
<td>0.5</td>
</tr>
</tbody>
</table>

### For which system

<table>
<thead>
<tr>
<th>BasicGrip™</th>
<th>BasicClip™</th>
<th>BasicRail™</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>For mounting clips</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>For 16-20 mm pipe</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>2 meters</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>For 16 mm pipe and pipe length 40 cm</td>
</tr>
</tbody>
</table>
Pipes
What to consider

1. LOW TEMPERATURE
   Is the pipe installed in temperatures below -10 °C?
   - NO
   - YES
   USE COMPOSITE PIPES WITH ALUMINIUM

2. PIPE EXPANSION
   Is it important that the pipe does not expand?
   - NO
   - YES
   USE COMPOSITE PIPES WITH ALUMINIUM

3. PRESSURE AND TEMPERATURE
   Is pressure higher than 6 bars or does temperature exceed 60 °C?
   - NO
   - YES
   USE COMPOSITE PIPES WITH ALUMINIUM

COMPOSITE PIPES WITH ALUMINIUM

Composite pipes with aluminium are manufactured in such a way that the aluminum layer prevents the pipe from going back to its original form. This makes installation much easier.

Because of the firm bonding of the synthetic layers with the aluminum, linear expansion is determined by the expansion coefficient of the aluminum and is therefore similar to the expansion of a metal pipe, i.e. only 1/7 that of a purely synthetic pipe. This is important in e.g. dry systems where pipes are not cast into concrete.

COMPOSITE PIPE WITH ALUMINIUM

- PE-RT inner pipe, stabilized for high temperatures
- Homogeneous, longitudinally, butt-welded and totally circular aluminium pipe
- PE-RT pipe wall
- Adhesive layer
- Oxygen (O₂) diffusion barrier layer
- Protective PE-RT layer
- Adhesive layer
- Polymer outer pipe stabilized for high temperatures. Grey and UV stabilized

ITALIAN

<table>
<thead>
<tr>
<th>COMPOSITA</th>
<th>ITA</th>
<th>COMPOSITA</th>
<th>ITA</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIPE</td>
<td>ITA</td>
<td>PIPE</td>
<td>ITA</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TESTING OUR PIPES TO THE MAX

All pipes are thoroughly tested to meet the highest quality standards.

Danfoss pipes are subjected to a range of different tests to ensure optimum product quality and working life. During production, the pipes undergo real life simulation tests and quality inspections to meet our precise tolerances.

Layer and wall thickness
The thickness of each layer is measured. Thickness needs to be kept within narrow tolerances to ensure that the fittings precisely match the pipes, enabling them to withstand high pressures.

Long-term pressure test
The pipes undergo a thermal cycle test. The test simulates the conditions that pipes are exposed to during their lifetime. The test is based on the ISO 22391 standard.

Outer diameter test
During production, random tests are carried out on the outer diameter of our pipes to ensure that tolerances are met.
**Adhesion test**

The pipes consist of several layers that are “glued” together. In the lab, their durability is thoroughly tested to prevent the layers from dissolving over time.

**Bending relaxation test**

The extent to which the pipe changes shape when bent is important for the resistance in the pipe. An oval pipe will increase resistance, which may affect pump requirements.
### Most popular pipes

<table>
<thead>
<tr>
<th>Pipe Type</th>
<th>Code no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FH Composite pipe</td>
<td>088X0001</td>
</tr>
<tr>
<td>FH Composite pipe</td>
<td>088X0003</td>
</tr>
<tr>
<td>FH PE-RT pipe</td>
<td>088X0004</td>
</tr>
<tr>
<td>FH PE-RT pipe</td>
<td>088X0006</td>
</tr>
<tr>
<td>FH PE-RT pipe</td>
<td>088X0005</td>
</tr>
</tbody>
</table>

### Accessories for pipes

<table>
<thead>
<tr>
<th>Accessory Type</th>
<th>Code no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fitting for composite 16 x 2 mm</td>
<td>013G4186</td>
</tr>
<tr>
<td>Fitting for composite 20 x 2.25/3 mm</td>
<td>013G4093</td>
</tr>
<tr>
<td>Press fitting 16 x 2 mm</td>
<td>088X0020</td>
</tr>
<tr>
<td>Press fitting 20 x 2.25 mm</td>
<td>088X0021</td>
</tr>
<tr>
<td>Screw coupling 16 x 2 mm</td>
<td>088X0025</td>
</tr>
<tr>
<td>Screw coupling 20 x 2.25 mm</td>
<td>088X0026</td>
</tr>
<tr>
<td>Dimension</td>
<td>Material type</td>
</tr>
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<td>-----------------</td>
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</tr>
<tr>
<td>16 x 2.0 mm</td>
<td>PE-RT/Alu/PE-HD</td>
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<tr>
<td>16 x 2.0 mm</td>
<td>PE-RT/Alu/PE-HD</td>
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<tr>
<td>16 x 2.0 mm</td>
<td>PE-RT</td>
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<tr>
<td>16 x 2.0 mm</td>
<td>PE-RT</td>
</tr>
<tr>
<td>20 x 2.25 mm</td>
<td>PE-RT</td>
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</tbody>
</table>

**Description**

- Fitting for connecting pipes to manifolds or valves with ¾” thread
- Fitting for connecting pipes to manifolds or valves with ¾” thread
- Connection fitting for joining two pipes e.g. for repairs (press tool required)
- Connection fitting for joining two pipes e.g. for repairs (press tool required)
- Connection fitting for joining two pipes e.g. for repairs (fittings incl. insulator ring for use with AluPex/Composite pipes)
- Connection fitting for joining two pipes e.g. for repairs (fittings incl. insulator ring for use with AluPex/Composite pipes)
Renovating a private house
A stone’s throw from Frankfurt-am-Main, Germany, the house was built in 1984 and boasted what was then state-of-the-art insulation. When the current owners took over the house, in addition to inadequate roof insulation by today’s standards, the underfloor heating was not sufficiently controllable and drove up energy consumption.

Meeting the challenge
The existing underfloor heating system was slow to heat up, virtually unregulated and worked continuously at too high a flow rate. This meant excessive room temperatures and a high level of energy waste. In addition, the manifold’s control valves were extremely calcified by old leaks and the actuators were completely disconnected and disabled.

Comprehensive renovation
Looking for suitable products, the contractor identified the Danfoss CF2+ system. This wireless solution offers individual room control and excellent regulation and management features. For the twin heating circuits, two CF-MC Master Controllers were installed along with an external CF-EA antenna to ensure good wireless contact. Once the old system had been fully overhauled, the valve flow settings were defined to ensure correct hydronic balance.

Room-by-room heating control
A CF-RF thermostat with infrared floor sensor was fitted in the reception room to ensure an adequate base temperature. This device also regulates floor temperature when secondary heat sources are in use, such as a fireplace. Other rooms were equipped with CF-RD thermostats. A CF-RC remote control was fitted to look after timing and the old manifold was replaced for a FHF-F equipped with new TWA-A actuators.

Increased comfort and energy savings
The biggest advantage over the old solution was the achievement of genuine heating comfort. Temperature can now be individually set and regulated in each room, which offers excellent cost savings in a household with children and working adults.

Country: Germany
Building type: 1-family house
Renovation year: 2013
Size: 220 m²
Heat emitter: Floor Heating
Control type: CF2+, FHF-F and TWA-A
Heat source: Gas, with water-based floor heating
Company name: Braun Haustechnik, Dreieich
Company industry: Plumbing
Private consumer name: Klaus Gerlach, Wehrheim

“

The wireless CF2+ system removes the need for expensive cable laying and almost all the restoration work was carried out in the control cabinet. The work caused no mess and both installation and commissioning were very straightforward.

D. Braun, Braun Haustechnik

”
A sustainable solution

In the Dutch city of Rotterdam, an office building from the 60’s was completely stripped to its core and re-built. The project involved creating new offices and adding a further nine floors of luxury apartments on top. The developer wanted a highly sustainable climate system with both heating and comfort cooling. Heat is supplied to the building via the city’s district heating system. To achieve the desired cooling effect, a customized solution was developed that involved drawing water from the river Maas, which flows right alongside the building. The water is then fed into heat exchangers to provide the cooling.

Floor heating and cooling

To ensure that residents in the apartments could enjoy the most comfortable possible living experience, the decision was taken to use floor heating. During the warm months of the year, this system is also able to contribute to cooling the apartments. A manual switch to change from heating to cooling operation ensures that heating and cooling cannot work simultaneously and avoids wasting energy.

Flexibility required

Throughout the apartments, non-structural stud walls were used to give future owners the flexibility to arrange the room layout to suit their personal preferences. This design choice meant that the temperature controls in each of the rooms needed to be easy to relocate.

Wireless controls

A Danfoss solution using the CF2 wireless control system was chosen to accommodate the demands of the innovative design concept. This allowed temperatures to be set individually in each room. In addition, the wireless CF-R thermostats provided the necessary flexibility for possible future changes to the room layout in the apartments. Thanks to 2-way communication between room thermostats and the central master controller on a frequency of 868.42 MHz, the wireless system is extremely reliable.

Underfloor heating and cooling

For year round comfort

The apartment cabinet

Heating and cooling supplies enter the apartment and are connected to the manifold. A manual switch allows the apartment occupants to determine between heating or cooling control. CF2 contains several features to optimize control in floor-cooling applications and the CF-MC Master Controller automatically opens or closes the electric actuators. Each is controlled by one of the CF-R room thermostats.

With the Danfoss CF2 system we are able to control the underfloor heating and cooling, and can also ensure future flexibility for repositioning of the thermostats at the same time.

Bas Linsen
Underfloor heating constructor

Country: The Netherlands
Building type: Apartments
Building year: 2012
Size: 36 x 210 m²
Heat emitter: Underfloor heating
Cool emitter: Underfloor cooling
Control type: CF2 (CF-MC, CF-RD, CF-RS, CF-EA)
Heat source: District heating
Cooling source: River water
Company name: Jupiter Vloerverwarming Benelux BV
Company industry: Underfloor heating construction
Private consumer name: Mr. and Mrs. Schoneveld
Ensuring comfortable heating

The “Taiyang Gongyuan” project in Beijing, China, includes 17 residential buildings with a total of 2,154 apartments. All buildings are heated via district heating. Due to the large size of the buildings, each with up to 29 floors, establishing proper hydronic balancing was a priority. This would eliminate complaints from residents about uneven heating while providing the desired high level of indoor comfort. To meet both requirements, Danfoss proposed a thoughtfully configured system that included automatic balancing valves, floor heating and individual room temperature control.

Hydronic balancing

To establish the necessary hydronic balance, Danfoss ASV automatic balancing valves were installed for each apartment. These valves prevent pressure fluctuations and ensure even heat distribution throughout the entire building.

Different temperatures in each room

In the larger apartments, room temperature can be individually controlled via Danfoss CWD thermostats. The temperature can be separately set for each room, ensuring superb levels of indoor comfort while also saving energy by not heating rooms unnecessarily.

In the smaller apartments, temperature is controlled via one central CWD thermostat. A total of 6,090 thermostats were installed to provide the 2,154 apartments with optimum temperature and comfort control.

“

We wanted to avoid typical complaints related to poor hydronic balancing while also offering residents optimal comfort. With the help of Danfoss, we fully achieved both these goals.

Mr. Shengguo Zhu
Xinyuan real estate

”

Country: China
Building type: 17 multi family houses
Building year: 2010
Size: 500,000 m²
Heat emitter: Floor heating and hydronic balancing
Floor heating control type: Danfoss CWD and FHF-F manifolds
Heat source: District heating
Company name: Xinyuan
Company industry: Real estate company
Private consumer name: Ms. Chen
Optimal indoor climate
The task was to build 18 houses in Denmark with the best possible indoor climate and zero energy consumption. A tough challenge, but very achievable.

Designing a total solution
The contractor and the manager of the building project put their heads together to work out a solution. A photovoltaic system was chosen as the primary energy source, transforming the sun’s rays into electric power. The electric power is then used to operate a heat pump and a heat recovery and ventilation unit. The heat pump provides warm water for the floor heating in the houses.

Floor heating helps to eliminate heating costs
Energy consumption for heating and ventilating the houses is estimated to be less than 4,000 kWh per year per house, while the photovoltaic system produces around 6,000 kWh. This means that more energy is produced than is required to operate the heat pump and ventilation unit. Using floor heating in combination with the heat pump is very energy efficient. This is because floor heating requires a lower supply temperature than radiators. For every 1 degree centigrade that the supply temperature can be lowered, heat pump efficiency (COP) improves by 2%.

The advantage of working with a single solution provider

Country: Denmark
Building type: 18 family houses
Building year: 2013-2014
Size: 104-125 m²
Heat emitter: Floor heating
Floor heating type: CF2⁺
Heat source: Danfoss heat pump, DHP-AQ
Company name: Salling Entreprise
Company industry: Constructor
Private consumer name: Dorthe Pedersen

Floor heating with low-energy optimizer
The CF2⁺ floor heating system uses a technique called "low energy optimizer" for heat pumps. The technique optimizes floor heating duty cycles so that the heat pump runs more efficiently.
Individual room controls save energy

Optimizing living space
What do you do when you want to offer apartment owners maximum living space, valuable energy savings and high heating comfort at the same time? The architects and engineers working on the ‘Vadistanbul’ project in Istanbul, Turkey, agreed that they could meet all these requirements by using Danfoss floor heating. Floor heating would save precious space in the development’s many small apartments while increasing comfort and reducing energy consumption at the same time.

A prestigious project
The ‘Vadistanbul’ project is one of Turkey’s most prestigious projects. An entire new district will be added to the Istanbul metropolis in three stages. In the first phase, called ‘Vadistanbul Teras’, 1,111 apartments are being constructed in eight buildings. Subsequent phases will see the construction of a shopping mall, restaurants, a 5-star hotel and a further 1,200 apartments.

Individual temperature control
The key to long-term energy savings is the provision of individual temperature control for each room. Heating is provided only when and where it is needed. In addition, floor heating provides such a high level of comfort that the desired temperature can be set 1 or 2 degrees centigrade lower than a comparable radiator heating system. 5% energy is saved for every degree the room temperature is lowered.

Hydronic balancing
To maximize both energy savings and living comfort, the floor heating system is hydronically balanced. Each group in the floor heating system is pre-set to allow only the required flow to pass through.

A complete floor heating portfolio
Danfoss provided all necessary floor heating products. In addition, the innovative Danfoss floor panels make the installation of FH PE-RT pipes a simple job.

Individual room temperature controls will provide future occupants energy savings and a high comfort level.

Mr. Kerim Akıncı
Mechanical engineer

**Country:** Turkey  
**Building type:** 8 apartment buildings  
**Building year:** 2014  
**Size:** 1+1 rooms (70 m²) up to 5+1 rooms (400 m²)  
**Heat emitter:** Floor heating  
**Floor heating type:** BasicPlus for 600 km of PE-RT pipe  
**Floor heating controls:** 6,342 FH-WT thermostats + 1,179 FH-WC connection boxes control 8,226 TWA-A actuators on FHF-F manifolds  
**Heat source:** Central heating with a sub-station per apartment  
**Company name:** Artas-Aydinli-Kelesoglu construction consortium  
**Company industry:** Construction

Manifolds with both flow meter and pre-setting
The high-quality FHF-F manifolds with flow meter and pre-setting valves create a well-balanced system. TWA-A actuators will be installed to enable the room thermostats to control the temperature in each room.
Pioneering heating controls for decades

Danfoss has been designing and developing heating control systems for more than 80 years. Throughout that time, it has been our goal to continuously innovate, perfect and refine cutting-edge heating and cooling solutions.

Mads Clausen designs the world's first radiator thermostat

World's first wireless room control for floor heating introduced

Danfoss acquires PentaCom floor heating and launches its own TWA

Devilink™ is introduced (platform for Danfoss Link™ CC)

Launch of Danfoss Link floor heating and radiator thermostat