

ENGINEERING  
TOMORROW

*Danfoss*

Application Guide

# Heating Control Danfoss Ally™



 **zigbee**  
certified  
product

[www.ally.danfoss.com](http://www.ally.danfoss.com)

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## 1. Introduction

### 1.1 Segment

This application guide covers the use Danfoss Ally™.

### 1.2 Overview of the units in a Danfoss Ally™ system

#### Danfoss Ally™ Gateway

The Danfoss Ally™ Gateway is a programmable, wireless control system that connects all the Danfoss Ally™ devices to the internet and intelligently controls your heating via a free app downloadable from Google Play and App Store.

#### Danfoss Ally™ Radiator Thermostat

Danfoss Ally™ Radiator Thermostat is a connected radiator thermostat for residential use. It is a Zigbee 3.0 certified product, compatible with Danfoss Ally™ Gateway and with third party systems using Zigbee protocol.

#### Danfoss Ally™ Room Sensor

Danfoss Ally™ Room Sensor measures the temperature and humidity in the room and makes sure each radiator delivers the exact amount of heat needed for temperature perfection.

#### Danfoss Ally™ Zigbee repeater

Is used for extending the wireless transmission range between Danfoss Ally™ Gateway and other units in a system.

#### Danfoss Icon™/Icon2™

Advanced room controls for hydronic floor heating and other applications with actuators. Designed like a light switch to complement the interior.

**1.3 Number of units in a Danfoss Ally™ system**

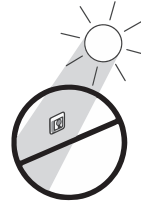
When building a Danfoss Ally™ system it is important to remember that the total number of units for the one Danfoss Ally™ Gateway must not exceed 199 mains and battery-powered devices:

Danfoss Ally™ Radiator Thermostat	32 units
Danfoss Ally™ Room Sensor	
Danfoss Ally™ Zigbee Repeater	199 units
Danfoss Ally™ Boiler Relay	
Danfoss Icon™ Zigbee Module / Danfoss Icon™ Master Controller (floor heating)	
Danfoss Icon2™ Main Controller (floor heating)	
Danfoss Icon™ Room Thermostat	
Danfoss Icon2™ Room Thermostat	
Number of devices per room	50 units
Number of rooms per Home/Family	20 pcs.
Number of Homes/Families per one account	20 pcs.
Number of devices per account <i>(20 homes/families and 200 units per each)</i>	4000 units
Number of Home/Family members per one account	20 pcs.
Number of devices per one Home/Family	200 units

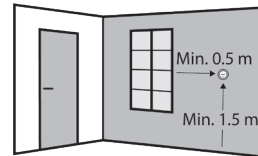
### 1.4 Best practices

Danfoss Ally™ Radiator Thermostats are masters in temperature regulation, but if your radiator is hidden behind a curtain or a piece of furniture, it is recommended to install Danfoss Ally™ Room Sensor to your set-up. Doing this you will achieve a perfect indoor climate. The small and discrete room sensor measures both temperature and humidity, and communicates back to the Danfoss Ally™ Gateway.

Do not install Danfoss Ally™ Room Sensor on outer walls or where it will be subject to direct sunlight.



The installation height should be 1,5 m minimum from the floor surface. The room sensor needs to be at least 0,5m away from doors and windows.



In wet rooms Danfoss Ally™ Room Sensor RS shall be installed according to local building regulations.



#### Danfoss Ally™ Radiator Thermostat

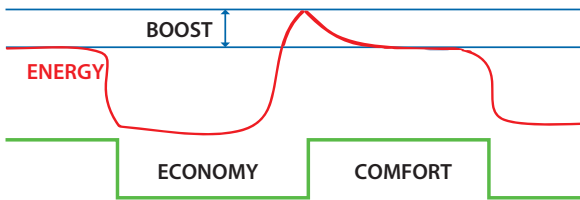
The batteries on the Danfoss Ally™ Radiator Thermostat last up to two years. A month before the battery is completely discharged, a low battery symbol appears on the thermostat's display and PUSH notifications inform you that it is time to replace the batteries. A good tip is to set a calendar reminder for 2 years in the future, where you change all the batteries at once – even if they have not necessarily run out yet.

If you do not change the batteries before they run completely dry, the thermostat will open slightly and thus ensure that heat constantly flows through the radiator. This is a safety mode to ensure that frost damage does not occur if the thermostat is placed in an otherwise cold room.

## 2. General Guidelines

### 2.1 Heat supply

If the heating system has been optimized for constant set temperature around the clock, you may need to adjust the settings when working with setback periods. When changing the temperature from a low economy setting to a comfort temperature, the system must be able to supply enough heat to raise the room temperature at least 1 °C per hour to perform well. Compared to a steady temperature the heating system must typically be able to supply 25% more heat, but only for a short period of time during heat up.

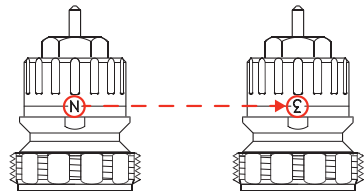


How to achieve 25% extra capacity in a system that should run boost:

Limitations	Action
Max. $\Delta P$ and temperature reached:	Increase valve presetting
Max. temperature and preset reached:	Increase pump pressure
Max. preset and $\Delta P$ reached:	Increase water temperature

*NOTE: Maximum acceptable presetting, water temperature and pump differential pressure settings are different from system to system and depend on the application.*

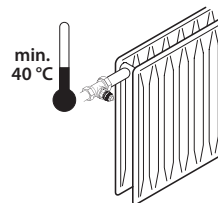
For radiator valves with pre-setting, balance the system to allow for enough flow.



The supply line temperature at the radiator valves should be above 40 °C to ensure optimal control.

Make sure that the supply water temperature and flow is adequate to provide enough energy.

Increase the temperature or the pump level, if necessary.



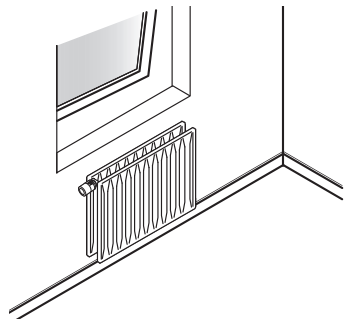
## 2.2 Functions

Danfoss Ally™ Radiator Thermostat has a built in function that senses if a window has been opened. It will automatically shut off the heat for 30 minutes, after which the heating in the room will automatically be restarted. If you have more than one radiator in the same room, only one of the thermostats has to register an open window, after which all the radiators in the same room will shut off.

### **Please note:**

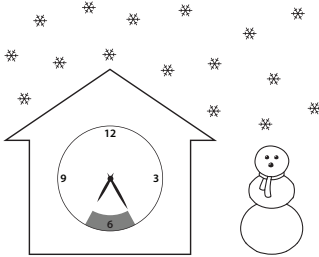
- The radiator must be located in the immediate vicinity of the window (which it most often will). If the radiator is located e.g. 10 meters from the window, it may be difficult for the thermostat to sense a clear drop in temperature, which is needed for it to turn off the heat.
- Between the finish of the “open window” period and the start of a new one there must be at least 45 minutes.
- The first activation of the “open window” feature is 75 minutes after the battery insert.
- If you live in a home without a ventilation system, we recommend that you ventilate the entire house twice daily for a minimum of 5 minutes by opening windows in opposite ends of the house.
- If you have a Danfoss Ally™ Room Sensor installed, the open window function will be disabled. The Room Sensor cannot detect that a window is open and the system will continue the heating process

The pre-heat function ensures that the comfort temperature is reached at set time. The warm up time is continuously adjusted according to seasonal temperature changes.

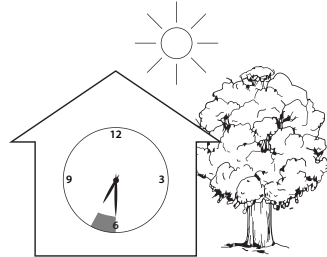


- Pre-heat function ensures that the wanted temperature is reached at the wanted time (here 20 °C at 07:00).
- Pre-heat uses data from the previous 7 days to be able to reach the correct temperature at the right time.

- Pre-heat is sensitive to large, rapid temperature changes.



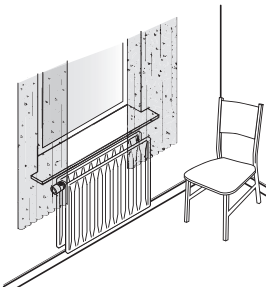
Winter: Long warm up time.



Spring/fall: Short warm up time.

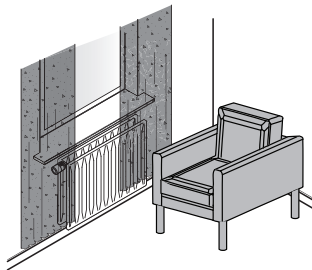
### 2.3 Rooms

Covering the radiator – e.g. with furniture, curtains or a radiator cover – might cause heat to be accumulated around the thermostat.



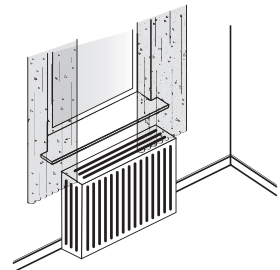
Light curtain/furniture:

You can use Radiator Thermostat, but function is improved by using a Danfoss Ally™ Room Sensor.



Medium curtain/furniture:

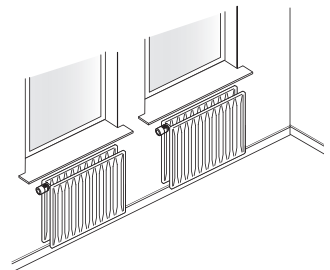
Use with Danfoss Ally™ Room Sensor.



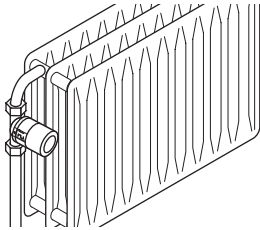
Radiator cover:

Use with Danfoss Ally™ Room Sensor.

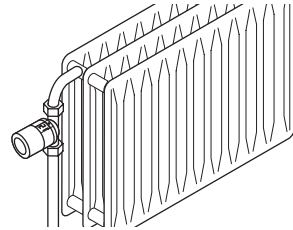
If two radiators are placed within 40 cm of each other, the heat emission from one radiator can affect the thermostat on the other radiator. In such cases it is recommended to install Danfoss Ally™ Room Sensor.







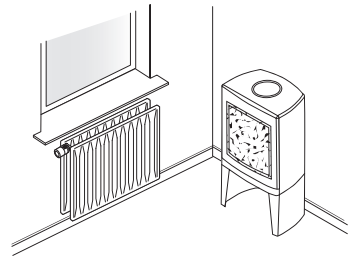
Direct heat radiation from large radiators may disturb the Radiator Thermostats ability to measure the room temperature correctly.



To avoid this, mount the thermostat pointing away from the radiator. The optimal solution is a Radiator Thermostat with a Danfoss Ally™ Room Sensor.

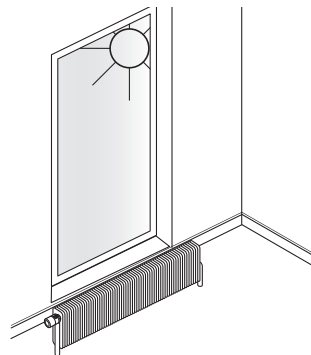
**Danfoss do not recommend to use an angle adapter, instead the valve should be turned or replaced.**

A fireplace in the room can affect the pre heat function of the Radiator Thermostat and disturb the heating control. If you use your fireplace regularly it is recommended to deactivate the Pre-Heat function. By deactivating this function, Radiator Thermostat will work as a traditional thermostat, but with a delay in heating up the room after the fire has burned out.



*NOTE: If the valve has been closed for a longer period there may be a delay in heating up the room.*

Sunlight from large windows in the room can affect the Pre-Heat function of the Radiator Thermostat and disturb the heating control. Then it is recommended to deactivate this function. By deactivating it, Danfoss Ally™ Radiator Thermostat will work as a traditional thermostat, but with a delay in heating up the room after the heating from the sunlight has stopped.



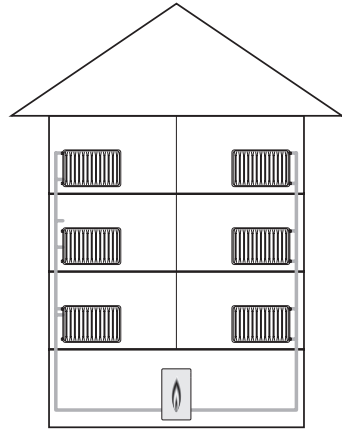
### 3. Applications

#### 3.1 Heating System with Central Boiler

A large gas, oil or pallet boiler which provides hot water to several households.

**Recommendations:**

- min. 40 °C supply temperature at the valve.
- sufficient heating capacity to increase the room temperature with 1 °C per hour.
- only radiator valves approved for Danfoss adapters.



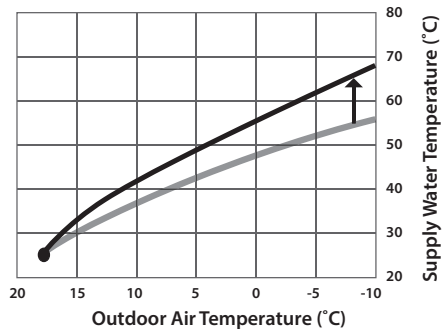
**Boiler turned off at night**

If the boiler is turned off or has reduced temperature during the night, then make sure that it is active when the Radiator Thermostat is programmed to warm.

**Weather compensation**

If the boiler's heating curve is set to have the Radiator Thermostats on comfort temperature constantly, the curve must be increased in order to be able to raise the room temperature after a setback period.

- If the setback periods are long, further increase might be necessary.
- If the economy periods are short, less increase can be sufficient.

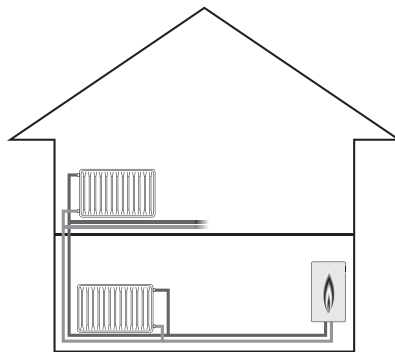


## 3.2 Heating System with Boiler

A boiler with build-in or external domestic hot water tank can provide instant heat for the heating system, as well as for the domestic hot water.

### Recommendations:

- min. 40 °C supply temperature at the valve.
- sufficient heating capacity to increase the room temperature with 1 °C per hour.
- only radiator valves approved for Danfoss adapters.



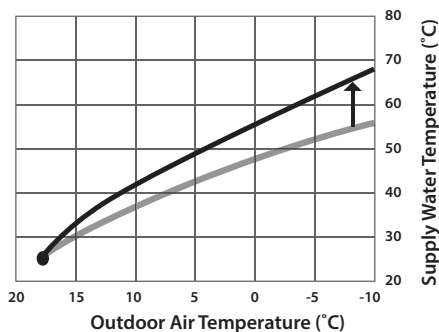
### Boiler turned off at night

If the boiler is turned off or has reduced temperature during the night, then make sure that it is active when the Radiator Thermostat is programmed to warm.

### Weather compensation

If the boiler's heating curve is set to have the radiator thermostats on comfort temperature constantly, the curve must be increased in order to be able to raise the room temperature after a setback period.

- If the setback periods are long, further increase might be necessary.
- If the economy periods are short, less increase can be sufficient.

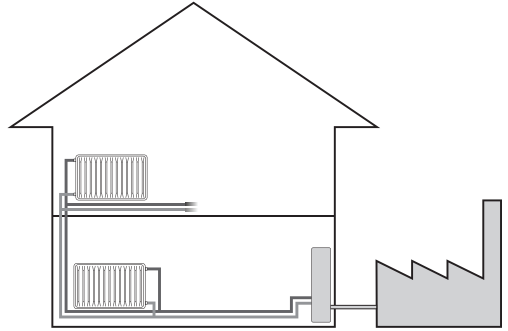


### 3.3 District Heating

District heating is generated in a centralized location and distributed to residential and commercial use.

#### Recommendations:

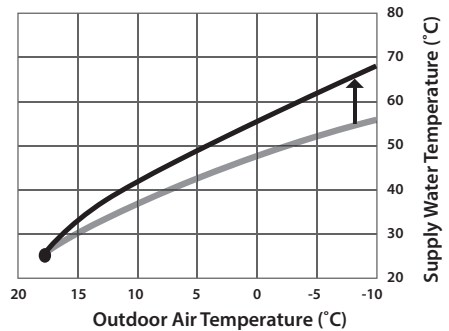
- min. 40 °C supply temperature at the valve.
- sufficient heating capacity to increase the room temperature with 1 °C per hour.
- only radiator valves approved for Danfoss adapters.



#### Weather compensation / ECL

If the boiler's heating curve is set to have the radiator thermostats on comfort temperature constantly, the curve must be increased in order to be able to raise the room temperature after a setback period.

- If the setback periods are long, further increase might be necessary.
- If the economy periods are short, less increase can be sufficient.



## 3.4 Heat Pump

A heat pump is generating heating by transferring heat from a relatively low-temperature reservoir, such as air or ground, to one at a higher temperature.

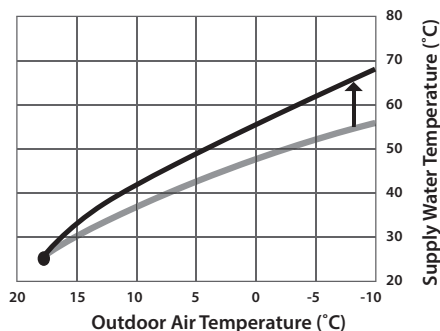
### Recommendations:

- min. 40 °C supply temperature at the valve.
- sufficient heating capacity to increase the room temperature with 1 °C per hour.
- only radiator valves approved for Danfoss adapters.

### Weather compensation

If the heat pump's heating curve is set to have the radiator thermostats on comfort temperature constantly, the curve must be increased in order to be able to raise the room temperature after a setback period.

- If the setback periods are long, further increase might be necessary.
- If the economy periods are short, less increase can be sufficient.



*NOTE: If system is installed during period with outside temperature > 10°C opening point will not be found until temperature drops below 7-8°C.0*


### 3.5 Danfoss Icon™/Icon 2™ – room thermostats for floor heating

Danfoss Icon™ comes in 3 modular concepts to cover every application – Wireless, 24V and 230V



	Wireless	24V	230V
<b>Thermostat models</b>	Display + Display infrared + Dial	Display	Programmable + Display + Dial
<b>Thermostat versions</b>	On-wall	On-wall + In-wall	On-wall + In-wall
<b>Exchangeable frame</b>	<b>X</b>	In-wall	In-wall
<b>Icon App</b>	✓	✓	<b>X</b>
<b>Cooling options</b>	Automatic + Manual	Automatic + Manual	Manual
<b>Automatic balancing</b>	✓	✓	<b>X</b>
<b>Supply temp. control</b>	✓	✓	<b>X</b>
<b>Commissioning test</b>	✓	✓	<b>X</b>
<b>Communication</b>	Wireless 2-way	Star / daisy chain bus	Wired 230V
<b>Zones</b>	Up to 3x 15 = 45	Up to 3x 15 = 45	Up to 1x 8 = 8

### Danfoss Icon™ E-error codes description

Alarm code	Problem	Solution
Er03	You have set-up a cooling application that requires a reference room thermostat to be appointed.	Please go to the thermostat in the desired reference room and enter the thermostat installer menu. Set thermostat to <b>ON</b> in ME.6 “reference room thermostat”.
Er05	Communication lost to Radio Module.	Please check that the cable is properly connected in the Radio Module and Danfoss Icon™ Master Controller 24V.
Er06	Communication lost to room thermostat.	Identify the room thermostat by looking at the flashing outputs on the Danfoss Icon™ Master Controller 24V, or look at the thermostats. Wake up thermostat, then press  on the thermostat. Faling thermostat will say “NET ERR”. In some cases it is necessary to add a repeater to establish a better wireless communication between the Master Controller and Thermostat. Replace batteries on room thermostat and perform a network test (activate NET TEST in menu ME.3 on room thermostat).
Er07	Communication lost to Slave Controller.	If wireless, check Radio Module connection to Danfoss Icon™ Master Controller 24V. If wired system, check the wire connecting the controllers.
Er08	Communication lost from Slave to Master Controller.	If wireless, check Radio Module connection to Danfoss Icon™ Master Controller 24V. If wired system, check the wire connecting the controllers.
Er10	Communication lost to Repeater.	Check that the repeater is plugged into outlet / has not been removed and outlet is <b>ON</b> .
Er11	Communication lost to Expansion Module.	Check that Expansion Module is slided fully into place. <i>Note! The Master controller must be turn off and on again in order to register the expansion module.</i>
Er12	Actuator defective. The defective actuator output is flashing.	Replace actuator.
Er14	A Danfoss Icon™ Master Controller cannot be included as (become) a Slave Controller because one or more room thermostats, repeaters or Danfoss Icon™ Master Controller 24V have already been included.	This Danfoss Icon™ Master Controller 24V has to be factory reset to become a Slave Controller. (See description in chapter “Reset or replace a Danfoss Icon™ Master Controller”).

Alarm code	Problem	Solution
Er16	This application requires a specific actuator output to be available.	You have already assigned this output to a room thermostat, or the output has not yet had an actuator fitted. Please uninstall RT from TWA, it must be available to the application chosen (or fit actuator – if this was not yet done).
Er17	External PT1000 sensor not fitted, or defective.	Check sensor and replace if necessary <i>Note! Remember to ensure that the Master Controller is connected due to risk of electric shock.</i>

### How to install Danfoss Icon™

Danfoss Icon™ Display is a room thermostat especially designed for floor heating systems. It comes in four different designs to suit markets worldwide. Danfoss Icon™ Display is very intuitive and easy to use. Just set your desired comfort temperature, and the thermostat will control the room temperature in accordance with your setting.

#### Wake up the thermostat

Touch the screen to wake up Danfoss Icon™ Display. The actual room temperature is displayed. Touch ↶ to return to the previous screen. The screen turns off after 10 seconds without any action.



#### Set the temperature

Touch ▲ or ▼ to set the desired room temperature. The temperature flashes to indicate setting is in progress. Confirm your setting by touching ✓



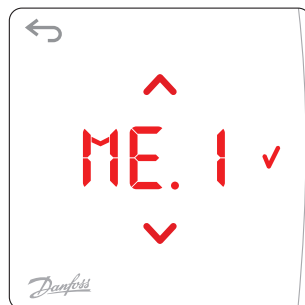


## Reset to default factory settings

Press **▲** and **▼** simultaneously for at least 3 seconds to reset **Danfoss Icon™ Display** to the default factory settings. The display toggles between **dE L** and **AL L**. Confirm by touching **✓**

## Menus

Wake up the thermostat. Press **↶** for 3 seconds to open the User menus **ME. 1** and **ME. 2**. Toggle the menus with **▲** or **▼**. Choose menu with **✓**. (To open the Installer menus **ME. 3** and **ME. 4**, press **↶** again for 3 seconds)



### ME. 1 Temperature limitation

**SE t** and **HI** toggles with the temperature on the screen. Set highest temperature with **▲** or **▼**.

**SE t** and **LO** toggles with the temperature on the screen. Set lowest temperature with **▲** or **▼**.

Confirm your choice with **✓**.

*Default temperature range: 5 to 35°C.*

### ME. 2 Product ID

Production code.

## Menu 3 and 4 are only relevant for the installer

### ME. 3 Set actuator type

Choose between **Normally Closed NC** or **Normally Open NO** with **▲** or **▼**.

Confirm with **✓**.

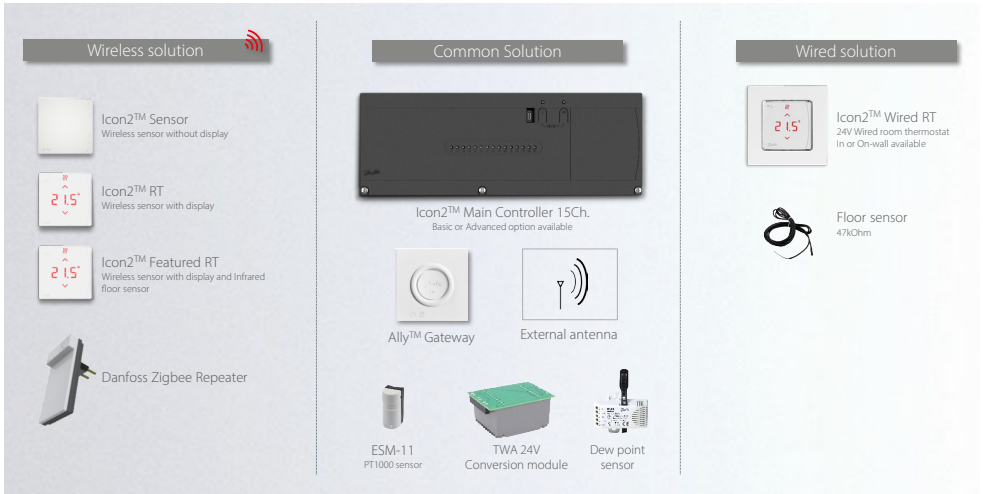
### ME. 4 Set heat emission characteristics of the floor

Choose Fast **FA S** Medium **ME d** or Slow **SL O** heat emission characteristics with **▲** or **▼**.

Confirm with **✓**.

### Danfoss Icon2™ specifications

Danfoss Icon2™ comes in 3 modular concepts to cover every application – Wireless, common and wired solution.



With Danfoss Icon2™ you can chose between 3 different Wireless Thermostats.



Danfoss Icon2™ Sensor



Danfoss Icon2™ RT Display



Danfoss Icon2™ RT Featured

Code number	Version	Display	Humidity sensor	Floor sensor	Tool-free mounting	Open Zigbee
088U2120	Danfoss Icon2™ Sensor	÷	+	÷	+	+
088U2121	Danfoss Icon2™ RT	+	+	÷	+	+
088U2122	Danfoss Icon2™ Featured RT	+	+	+	+	+

Available +

Optional (+)

Not available ÷

For the Danfoss Icon2™ Wired Thermostat you can choose between 4 different versions.



Icon™ 24V RT

Code number	Version	Display	Humidity sensor	Floor sensor	In-wall mounting	Switchable frames
088U2125	Danfoss Icon2™ 24V RT, In-wall 80x80	+	÷	(+)	+	+
088U2126	Danfoss Icon2™ 24V RT, In-wall 86x86	+	÷	(+)	+	+
088U2127	Danfoss Icon2™ 24V RT, In-wall (Feller)	+	÷	(+)	+	+
088U2128	Danfoss Icon2™ 24V RT, On-wall	+	÷	(+)	÷	÷

Available +      Optional (+)      Not available ÷

### Danfoss Icon2™ Main Controller Basic and Advanced features

Feature	Icon2™ MC Basic	Icon2™ MC Advanced
“Ease of installation” features	+	+
Wireless and Wired thermostats	+	+
Floor temperature control	+	+
Multiple heat emitter control	+	+
Zigbee compatibility to Ally and 3rd parties	+	+
Setup and commissioning via Commissioning App	+	+
Handover report via commissioning app	+	+
Multiple Main Controllers connected	+	+
Automatic Hydronic Balancing	+	+
HP optimizer function	+	+
Manual floor cooling	+	+
Advanced floor cooling applications	÷	+
Flow temperature control applications	÷	+

NOTE: To get more information about how to install Danfoss Icon2™ MC and powerline diagrams please, use the installer app as a guideline for installation. Please find “Installer app” from Danfoss on Google Play and App store.



### Danfoss A/S

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