

Data Sheet

Danfoss Icon™ 24V Master Controller

Description



Danfoss Icon™ is a modular heating system for individual room control.

It can be configured as a wired or wireless system or as a combination, if required.

The center of the system is the Danfoss Icon™ Master Controller 24 V, which configures and ties the system together.

Installation and set-up of the Danfoss Icon™ Master Controller 24 V is made easy by using the pre-defined application and intuitive touch user interface.

The system offer following features (some require Expansion Module):

- Automatic balancing (PWM+), which ensure that the hydraulic balancing of the system is done by the master controller based on the actual room demand.
- Requires no pre-setting on the manifold.
- On/Off control possibility.
- NC/NO actuator functionality.
- Cooling change over (require an Expansion Module).

- Supports 2, 3 or 4 pipe applications in various configurations (please see Expansion Module application guide for all configurations).
- Supply temperature control (require an Expansion Module), can be set to either a fixed temperature or demand based supply temperature control.
- 230 V power output with protected earth for circulation pump.
- 230 V power output (for e.g. always on).
- Heat demand signal output (for e.g. potential free relay).
- Can be made wireless by adding a Radio Module (required for wireless installations).
- Powerline communication (for 24 V wired thermostats).
- Possibility to combine wired and wireless thermostats in same installation.
- APP functionality, for iOS and Android devices (require APP Module).

Ordering

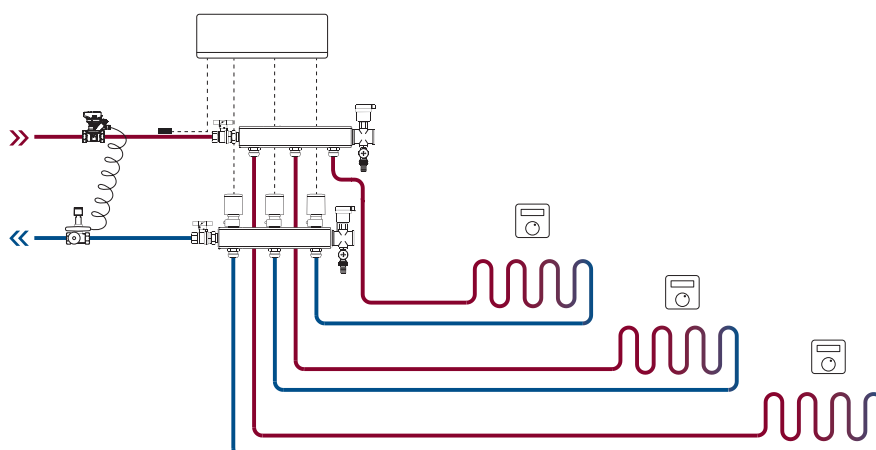
Product	Code number
Danfoss Icon™ Master, 24 V, 10 ch.	088U1071
Danfoss Icon™ Master, 24 V, 15 ch.	088U1072
Danfoss Icon™ Master, 24 V, 10 ch., CH	088U1074
Danfoss Icon™ Master, 24 V, 15 ch., CH	088U1075
Danfoss Icon™ Master, 24 V, 10 ch., NP	088U1077
Danfoss Icon™ Master, 24 V, 15 ch., NP	088U1078

Accessories

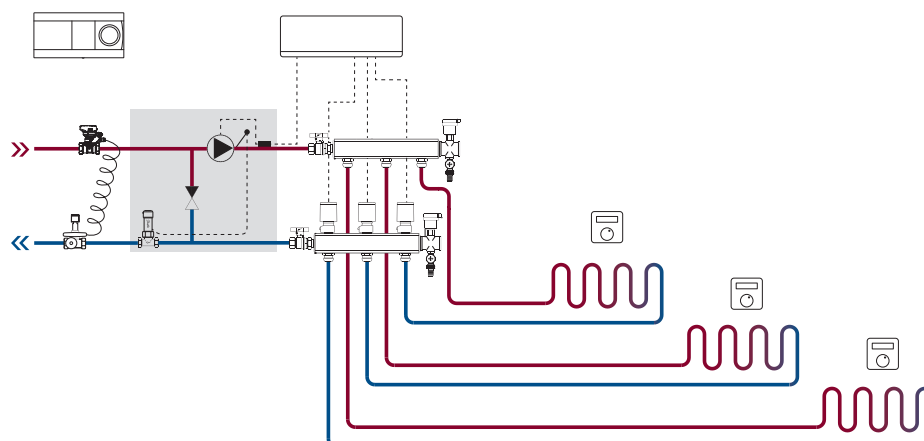
Product	Code number
Danfoss Icon™ Expansion Module	088U1100
Danfoss Icon™ App Module	088U1101
Danfoss Icon™ and Danfoss Link™ Repeater	088U1102
Danfoss Icon™ Radio Module	088U1103

Application drawings

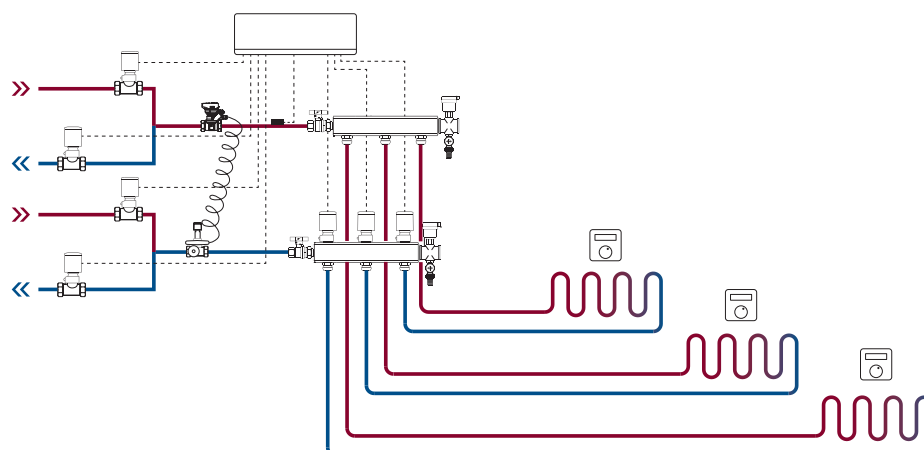
Example 1: 2-pipe system (optional cooling)



Example 2: 2-pipe system with mixing shunt (optional supply temperature control)



Example 3: 4-pipe cooling



Technical data

Common characteristics,
all Danfoss Icon™ products

For all applications please see Installation guide for Expansion Module.

Temperature for the ball pressure test	75 °C
Control pollution degree	Degree 2, normal household environment
Software class	Class A
Rated impulse voltage	4 kV
Operating time	Permanently connected
Temperature range, storage and transportation	-20 °C to +65 °C
Disposal instructions	The product must be disposed as electronic waste

Master Controller 24V and
Expansion Module (optional)

Supply voltage	220-240 V AC
Supply frequency	50/60 Hz
Output voltage, actuators	24 V DC
Max. power consumption per actuator output	2 W
Number of actuator outputs (1 actuator per output terminal)	10 or 15 depending on type of Master Controller
Output voltage, thermostats	24 V DC
Stand-by consumption per thermostat	0,2 W
Max. number of thermostats	10 or 15 depending on type of Master Controller
Max. length of wire from master controller to a 24 V thermostat (depends on cable type used)	If $2 \times 2 \times 0,6 \text{ mm}^2$ STP/UTP: 100 m If $2 \times 0,5 \text{ mm}^2$: 150 m If $> 2 \times 0,75 \text{ mm}^2$: 200 m
Stand-by consumption, Master Controller	< 2 W
Max. power consumption, excluding use of PWR 1 and PWR 2 outputs	< 50 W
Internal protection (fuse, non-replacable)	2,5 A
Output "Relay"	Potential free relay, Max. 2 A load
Actuator outputs, type	Type 1C (Micro interruption)
Output "PWR 1", type and rated max. output	Type 1B (Micro disconnection)
Output "PWR 2", type and rated max. output	Type: Permanent output, 230 V, max. 50 W
Output "PWR 3" (optional, on Expansion Module - used for dew point sensor)	24 V DC, max. 1 W
Input "1" (optional, on Expansion Module - use varies acc. to application chosen)	Ext. switch input (internal 24 V pull-up)
Input "2" (optional, on Expansion Module - use varies acc. to application chosen)	Ext. switch input (internal 24 V pull-up)
Input "3", sensor input (optional, on Expansion Module)	External sensor, PT 1000 (Danfoss ESM 11)
Dimensions	W: 370 mm, H: 100 mm, D: 53 mm
Conformity declared acc. to following directives	LVD, EMC, RoHS and WEEE
Purpose of control	Individual electronic room temperature control
Method of providing earthing	Factory fitted power cord, incl. PE-conductor
Encapsulation (IP Class)	IP 20
Protection class	Class II Construction with earthing terminal
Ambient temperature range, continuous use	0 °C to 50 °C

Technical data

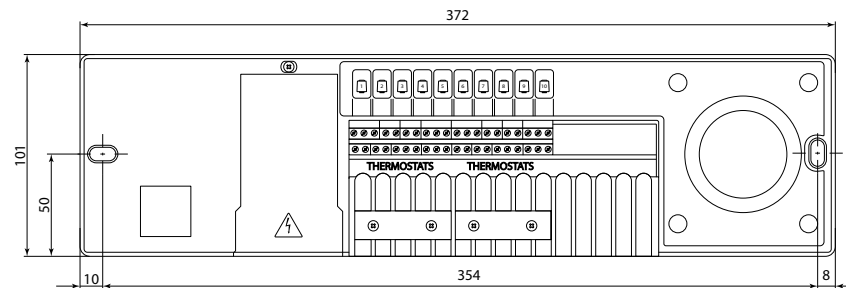
Radio Module & Repeater

Purpose of control	Transmitting and receiving device
Ambient temperature range, continuous use	0 °C to 40 °C
Frequency	868,4–869,85 MHz
Transmission power	< 2,5 mW
Encapsulation (IP Class)	IP 20
Conformity declared acc. to following directives	RED, RoHS, WEEE
Protection class	Radio: Class III Construction; Repeater: Class II Construction
Supply voltage	Radio: 5 V DC; Repeater: 230 V AC 50/60 Hz

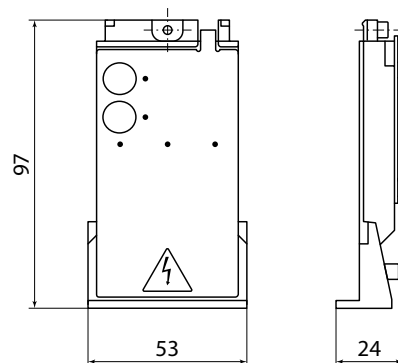
App Module

Purpose of control	Wi-Fi transmitting and receiving device, incl. Bluetooth
Ambient temperature range, continuous use	0 °C to 40 °C
Frequency	2,4 GHz
Encapsulation (IP Class)	IP 20
Conformity declared acc. to following directives	RED, RoHS, WEEE
Protection class	Radio: Class III
Supply voltage	5 V DC

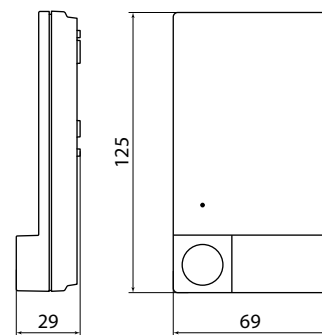
Drawings



Danfoss Icon™ 24V Master Controller



Danfoss Icon™ Expansion Module



Danfoss Icon™ Radio Module

Danfoss A/S

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Installation Guide

Danfoss Icon™ Master Controller 24V



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Introduction

Danfoss Icon™ is a modular heating system for individual room control. It can be configured as a wired or wireless system or as a combination, if required.

The center of the system is the Danfoss Icon™ Master Controller 24V, which configures and ties the system together.

Installation and set-up of the Danfoss Icon™ Master Controller 24V is easy and described in the included materials:

- The **Quick Guide** shows the most common installation with step-by-step illustrations, wired installation on one side and wireless on the other.
- The **Installation Guide** describes the User Interface, installation in details and set-up in more complex systems.

The Danfoss Icon™ family

- Wireless system components** (pic. 1):
- Wireless Display Thermostat, 088U1081 (pic. 1.1)
 - Wireless Display Thermostat (Infrared), 088U1082 (pic. 1.2)
 - Wireless Dial Thermostat, 088U1080 (pic. 1.3)
 - Radio Module, 088U1103 (pic. 1.4)
 - Repeater, 088U1102 (pic. 1.5)

- Common system components** (pic. 2):
- Expansion Module, 088U1100 (pic. 2.1)
 - Master Controller 24V, 088U114x (multiple versions) (pic. 2.2)
 - App Module, 088U1101 (pic. 2.3)
 - Dew Point Sensor, 088U0251 (pic. 2.4)

- 24V system components** (pic. 3):
- 24V Display Thermostat, 088U105x (multiple versions) (pic. 3.1)
 - 47 kΩ Floor Sensor, 088U1110 (pic. 3.2)

Application

Upon first installation the system is configured as a standard floor heating system. In this application the circulation pump output (PWR1) and the potential free relay (RELAY) are both activated when there is a heat demand.

Both the boiler relay (RELAY) and the pump output (PWR1) has a delay of 180 seconds in this application to ensure there is flow through the circuits before the boiler and the pump are activated.

The use of mixing shunt, connection of circulation pump to Danfoss Icon™ Master Controller 24V and use of boiler relay is optional, depending on application and available components.

To configure the Danfoss Icon™ Master Controller 24V system for other applications an Expansion Module (code no. 088U1100) is required.

- Application, Basic** (pic. 4.1-4.2):
- 2-pipe system
 - Mixing shunt (optional)








Pic. 4.2, A: **RISK OF ELECTRIC SHOCK!** Removing lid and installing 230 V wires should only be performed by a trained professional.



Parts list (pic. 4.1-4.2):

1.	1 pc. Danfoss FHM-Cx mixing shunt (optional)	Part no. 088U0093/0094/0096
2.	1 set Danfoss Manifold	Part no. 088U05xx (FHF), 088U06xx/0092 (BasicPlus) or 088U07xx (SSM)
3.	× pcs. TWA-A 24V thermal actuators	Part no. 088H3110 (NC), 088H3111 (NO)

Keys:

	<p>1. Installer key</p> <p>Used by the installer when setting up the system (used during installation).</p> <ul style="list-style-type: none">Select INSTALL for assigning thermostats and configuring the system.Select UNINSTALL for replacing or removing a system component, e.g. a thermostat.Select TEST for finalizing the installation and to run one of three test types, either: Network test, Application test or Flow test (i.e. flushing the system for 20 minutes).Select RUN when all system devices are installed and a TEST is finished.
	<p>2. Mode key</p> <p>Used for choosing the desired control behavior of the entire system (set once for the entire system).</p> <ul style="list-style-type: none">PWM+: Type of regulation designed to minimize overheating by dividing the heat demand into smaller bits (= duty cycles). The length of a duty cycle varies depending on the chosen heat emitter. PWM+ also features auto balancing of flow to the different rooms, which improves the heating comfort.On/Off: A simple hysteresis control, which turns on the heat when the temperature is below the desired room temperature. The heat will not be turned off until the desired room temperature is reached.
	<p>3. Heat emitter key</p> <p>Defines which heat emitter is used on the output (optimized control performance for each heat emitter type).</p> <ul style="list-style-type: none">Select SLOW for floor construction with >50 mm concrete over pipes (typically no heat distribution panels used).Select MEDIUM for floor or wall construction (typically pipes installed in heat distribution panels).Select FAST for radiator or convector (supplied from a manifold).
	<p>4. Actuator type selector key</p> <p>Used to define which kind of 24V actuator is used (set once for the entire system).</p> <ul style="list-style-type: none">Select NC for normally closed (typically used).Select NO for normally open (rarely used).
	<p>5. Main user interface</p> <ul style="list-style-type: none">Press OK to confirm a setting.Press  or  to change a parameter value or toggle through menus.Use  to go one step backwards in a menu.

6.	Output selector keys Used for assigning actuator outputs to a thermostat. <ul style="list-style-type: none">• Connect only one actuator wire per output terminal.• Assign as many outputs as you want to a thermostat. Depending on Danfoss Icon™ Master Controller model, you will have 10 or 15 outputs available.
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Cable terminals:

7.	Upper terminal row For connection of 24V thermal actuators max. one actuator per output terminal.
8.	Lower terminal row For connection of 24V thermostats in a wired system, or for additional 24V wired thermostats in a wireless system.
9.	Upper cable strain relief bar Installed as final step of wiring, tighten screws to ensure wire retention.
10.	Lower cable strain relief bar Clicks over thermostat cables to hold them in place. Top of this part also acts as cable holder for actuator cables.
11.	Removable lid Covers access to the 230 V section of Danfoss Icon™ Master Controller 24V. Remove the screw and slide out to access 230 V terminals. This part can be replaced with the Expansion Module, if special applications are necessary.

Connectors:

12.	Radio Module connector (RJ 45) Connect the Radio Module to this connector via cat. 5 patch cable (supplied with the Radio Module).
13.	App Module connector (RJ 45) Connect the App Module to this connector via cat. 5 patch cable (supplied with the APP Module).
14.	Multilink 3-pole connector – for linking together multiple Master Controllers in a 24V system. Only used in wired systems! Loose 3-pole male connector supplied with the product.

Installation

If wired installation

Note! Disconnect power before wiring!

For wiring of wired thermostats and actuators, please refer to the Quick Guide sections B and C. 24V Thermostats can be wired either in BUS or Star configuration (pic. 5-6). The system is not polarity sensitive.

If BUS wiring (serial) (pic. 5):

- A. Thermostat
- B. max. 0,75 mm²
- C. To Master Controller
- D. Thermostat

If Star wiring (parallel) (pic. 6):

- A. Thermostat
- B. max. 1,5 mm²

If wireless installation

Note! Disconnect power before wiring!

Connect a Radio Module, code no. 088U1103.

The Radio Module is required, when wireless thermostats are installed. The radio module is supplied with a 2 m patch cable. A longer cable (max. 15 m) can be used if necessary.

One Radio Module must be fitted (pic. 7) to each Danfoss Icon™ Master Controller 24V in systems with more Master Controllers (pic. 11).

As a special feature, it is possible to include wired thermostats in a wireless system.

For installation of wireless thermostats and actuators, please refer to the Wireless Quick Guide sections B2, B3, B4 and C1.

Optional installations

Installation of App Module, code no. 088U1101 (pic. 15)

The App Module is required, when app functionality is wanted. For inclusion (pic. 15) in a wireless network (Wi-Fi), please refer to the App Module installation guide. In systems with more Danfoss Icon™ Master Controllers only one App Module is required, and it can be added to any of the Master Controllers.

Scheduling done via the App module will utilize adaptive learning as default. Adaptive learning calculates the optimal heating startup time to ensure that the desired room temperature is reached at the scheduled time.

Wiring a pump

PWR1 output is intended for usage in installations where a circulation pump is present in the system. The PWR1 output has a live 230 V output (max. 100 W), which is activated when heat is demanded by at least one thermostat. When no heat is demanded from any thermostats the PWR1 output will be turned off to save energy. When heat is demanded the output will be activated with a delay of 180 sec. to prevent the pump from running without being able to generate flow due to the delay on the actuators in the heating circuits.

Wiring a potential free relay (RELAY)

The potential free relay can be used e.g. to activate heat demand/production from a boiler.

It is recommended to use the potential free relay as heat demand signal for all boilers with appropriate inputs available.

For boilers with 0-10 V modulation it is not possible to use the heat demand signal from the Danfoss Icon™ Master Controller 24V.

Please note that some combi-boilers may have hot water prioritization, which can cause heat production of the system to be delayed.

Installation of Expansion Module, code no. 088U1100 (pic. 2.1)

Adding an Expansion module will add additional functionality such as supply temperature control or cooling applications.

Note! Disconnect power before inserting the Expansion Module.

Slide of the cover and insert the Expansion Module. Follow the supplied instructions.

*Note! If an Expansion Module is added to a system with multiple Master Controllers, it **must** be installed on the System Master.*

Installation of a Floor Sensor for 24V thermostat, code no. 088U1110

For installation of a floor sensor, please refer to instructions supplied with the thermostat.

Repeater, code no. 088U1102 (pic. 16)

Add a repeater in large buildings where added wireless range is needed. Set Master Controller to INSTALL mode to add a repeater.

For more information, see the installation guide supplied with the Repeater.



Setting up the system

Common settings for entire system (set once)

- Use the key to choose INSTALL mode.
- Choose actuator type, press to choose NC (normally closed is default) or NO (normally open). The type will be marked on the actuator.
- Choose regulation type, either PWM+ or ON/OFF, by pressing the Mode key .

Choose INSTALL mode

Use the key to toggle to Install and confirm with **OK**. The Master Controller is now ready to include thermostats.

Include thermostats and assign outputs

1. Touch the screen of the thermostat to make it search for the master controller and include the thermostat into the system.
2. When the available outputs are flashing choose the output(s) on the master controller, which the thermostat must control (Quick Guide D5). The available outputs will have a flashing LED. Once output is assigned to a thermostat, it will be permanently lit. Confirm with **OK**.
*Note! **Do not turn off** Master Controller while assigning RT to outputs.*
3. Repeat step 1–2 for all rooms until all thermostats and outputs are paired.

Final test and starting system in normal run mode

Choose “test” mode by pressing key. In the test menu you can choose 3 different tests using keys:

1. **Net Test.** Performs a full network test. The thermostats must be mounted in their final position when starting the test. We recommend that you always perform this test in a wireless system, to make sure that all thermostats can still communicate with the Master Controller, when in their final position. (Quick Guide E7). This test can run for up to 90 minutes, but you can accelerate the test by touching each thermostat (to wake it up).
During the network test the connection to Master controllers, Repeaters and Room thermostats will be tested. During the test the display will inform which device it currently being tested.
rt = Room thermostat
MAS = Master controllers
rEP = Repeaters
While testing the connection to the room thermostats (Rt) the actuator outputs will be flashing until the connection to the thermostat connected to the output(s) have been tested.
When successful the outputs LED will light up permanently. When the network test is successfully completed the display will show Net Test Done.
2. **App Test.** Performs an application specific test if the expansion module is fitted. Tests all sub-components and allows installer to verify correct functionality visually – step by step.
3. **Flo Test.** Force opens all outputs and activates circulation pump. Run for 30 minutes, but can be stopped at any time. Use to bleed air from system before going into normal operation.
4. When you have conducted the needed tests, choose “run” mode by pressing key and confirm with **OK** – the system is now fully operational.

Connecting more Danfoss Icon™ Master Controllers in a system

If wired system

Connect up to three Danfoss Icon™ Master Controller 24V to each other with a 4-wire twisted pairs cable and the supplied connector (pic. 10: A – 4 (2 x twisted pairs), B – Max. 3 x Master Controllers in one system). See data table in the back of installation guide for wiring recommendations.

If wireless system

Wireless connection of up to three Danfoss Icon™ Master Controllers 24V requires a Radio Module with each Master / Slave (pic. 11).

Pairing System Master and Slave in both wired and wireless systems

Note! Slave Controllers must be assigned as System Slaves before assigning outputs and thermostats to them.

1. On the selected system master, press to select **INSTALL** mode and press **OK**.
2. On the system slave, press and hold for 1,5 sec. The display now toggles between **SLA TYPA** and **SLA TYPB**.
3. Press to choose between the two slave types and confirm with **OK**. See “Slave type definition” section for explanation.
4. Repeat step 1–3 to assign a second Slave Controller to the system (max. two slaves are permitted).

Test procedures for multiple Danfoss Icon™ Controllers in a system

NET TEST on System Slave (after connecting slave to master)

1. Install all thermostats and actuators as described in the Quick Guide D2 to D6.
2. Perform Network test. Press to select **TEST** and press to choose **NET TEST**. Confirm with **OK** (Quick Guide E7 and E8).
3. After completing the TEST press to select **RUN** mode and press **OK** (Quick Guide E9).

APP TEST on System Master

1. Perform application test. Press to select **TEST** and press to choose **APP TEST**. Confirm with **OK** (Quick Guide E7 and E8).
2. After completing the TEST press to select **RUN** mode and press **OK** (Quick Guide E9).

Changing Slave type

1. On Danfoss Icon™ Slave Controller press and hold for 1,5 sec. The display now toggles between **SLA TYPA** and **SLA TYPB**.
2. Press to choose between the two slave types and confirm with **OK**. See “Slave type definition” for more information.

LINK test on Slave (between Master and Slave)

Press for 1,5 sec. The display shows inclusion pattern while making the LINK test. When done, the display shows the strength of the connection in percentage.

Note! If an Expansion Module is added to the system, it must be installed on the Master Controller.

Slave type definition

The potential free relay is activated on all Master Controllers when heat is demanded on either Master Controller. **SLA TYPA:** Pump is activated on Danfoss Icon™ Master Controller 24V when heat is demanded on either Master or Slave(s).

SLA TYPB: Pump relay is only activated on the Danfoss Icon™ Master Controller 24V to which the thermostat with heat demand is assigned.

Operation modes

Cooling (expansion module required).

In order for the cooling mode to be activated the following conditions must be fulfilled.

1. No heat demand must be present for the last 3 or 6 hours depending on setting*.
2. Room temperature must be 2 °C or 4 °C above the room setpoint depending on setting*.
3. Dew point sensor must not be activated (relative humidity must be below 90 %). Only relevant if dew point sensor is installed.
4. Cooling is only activated when the system is in comfort/home mode. During away mode the system will not cool in order to save energy.

**only relevant for reference room applications.*

Cooling can be deactivated from selected rooms on display room thermostats in ME.7.

Dual Mode – Radiator and floor heating in the same room (floor sensor required).

In applications where both floor heating and radiators are present in the same room it is possible to control both using only one thermostat if the following conditions are fulfilled:






1. The room thermostat must have a floor sensor installed.
2. Min. 2 outputs have to be assigned to the room thermostat, of which min. one output must be connected to the radiator. Max. 10/15 outputs can be controlled depending on the master controllers number of outputs.
3. The radiator must be controlled by an actuator connected to the Icon™ Master Controller.

Setup:

Thermostat:

1. In ME.4 on the thermostat select DU and confirm with ✓.

On the Master controller:

1. Press  to put the system in Install mode.
2. Select the actuator outputs  assigned to the room you are setting up.
3. Select the actuator output  that is connected to the radiator, LEDs will lid permanently.
4. Press  and toggle to the Fast option.
5. Press , toggle to the RUN option and press OK to finish setup.

During operation the system will maintain room and the min. floor temperature setting using only floor heating. Only in periods where the floor heating system on its own and with the defined max. floor temperature is insufficient will the radiator be activated to help achieve the desired room temperature.



Identifying an output from a room thermostat

Using ME.3 on the room thermostat will trigger a Ping message in the Master controllers display and the actuator output(s) the thermostat is assigned to will light up.

Removing units from a Danfoss Icon™ Master Controller 24V system

Removing a thermostat

Note! The Master Controller must be powered on when uninstalling RT.

1. On the thermostat, press and hold  and  for 3 seconds until the display says dE L RL L (pic. 8).
2. Press ✓. The thermostat is now removed from the system.

Removing an unresponsive Radio module

Find the defective Radio Module and replace it with a new one.


Note! Replacing a Radio Module require a system reset please see section on “Removing a thermostat” and “Reset or replace a Danfoss Icon™ Master Controller 24V”.

Removing an unresponsive APP module

If an APP module becomes unresponsive simply unplug the module and replace it with a new one.

Uninstalling a defective thermostat



If a unit in the system becomes defective, it might be required to uninstall it from the system.

1. Press  to select UNINSTALL mode.
2. Select the output assigned to the unresponsive thermostat on the Master Controller.
3. All LED's on outputs connected to the unresponsive thermostat will light up and be selected automatically when a single output is selected. dE L RL L flashes on the display (pic. 9).
4. Press ✓ to remove the thermostat from the system.

Reset or replace a Danfoss Icon™ Master Controller 24V

Factory resetting of Danfoss Icon™ Master Controller 24V

Note! Thermostats must be reset seperately. Press and hold  and  for 5 seconds until display says dE L RL L and confirm with ✓.

1. On the Danfoss Icon™ Master Controller 24V, press and hold  and  for 3 seconds until the display says dE L RL L (pic. 12).
2. Press OK. All settings on Master Controller are reset to factory settings.

Replacing a defective Danfoss Icon™ Master Controller 24V


Note! If possible please note which thermostats and outputs are connected before resetting the system. Use ME.3 on thermostat to identify outputs.

1. Remove all thermostats and other units from the system by following the procedure for factory resetting.
2. Make a note of how all wires are connected to the Danfoss Icon™ Master Controller 24V.
3. Remove wiring to Danfoss Icon™ Master Controller 24V.
4. Mount the new Danfoss Icon™ Master Controller 24V and reconnect all wires to the same position as on the replaced Master Controller.
5. Set up system again as described in chapter “Setting up the system”.

Note! Individual room thermostats must be reset locally, see chapter “Removing a thermostat”.

Trouble shooting

If an error is detected, an alarm code will be displayed either on the Danfoss Icon™ Master Controller 24V or on the thermostat.

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 ON 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. Failing 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 ON .
Er11	Communication lost to Expansion Module.	Check that Expansion Module is slidded 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").
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>

Hydraulic balance

When using the Danfoss Icon™ Master Controller 24V with PWM+ regulation, the system will automatically balance the circuits.

In heating systems with extreme differences in circuit lengths, the automatic balancing might not be adequate. In these cases the Danfoss Icon™ Master Controller 24V can help you determine which circuits that are struggling to get enough flow:

1. Press  to select RUN mode.
2. Press an  button to see the average duty cycle in percentage for the selected circuit (pic. 13).

When pressing the output button the average duty cycle is shown in the display of the Danfoss Icon™ Master Controller 24V.

The duty cycle is shown as the amount of time in % that the actuator is open during active heating periods and only when in heating mode as an average over time.

This feature can help determine if one or more rooms have difficulty receiving enough flow or effect to reach optimal comfort.

The room with the highest duty cycles is the one that calls for the highest flow. If this room has problems reaching the desired room setpoint temperature, the following steps can help give this room more flow/heating capacity:

1. Increase the flow for the room with the highest duty cycle, using the pre-setting valve on the manifold -> set to maximum flow on pre-setting valves for this room's outputs.
2. If the room with the highest duty cycle is already at maximum flow, instead reduce the flow for the outputs that show the lowest duty cycle (these do not need as much flow).
3. If none of the above is enough to reach the desired room temperature, increase the total flow, by setting a higher flow on the circulation pump.
4. As a last resort increase the supply temperature into the system.

Note! By installing an Expansion Module in the Danfoss Icon™ Master Controller 24V the system will be able to automatically adjust the supply temperature according to heat demand in the rooms.

Updating Firmware on Danfoss Icon™ 24V Master Controller

When a new firmware version becomes available for the Danfoss Icon™ 24V Master Controller a notification will be shown on the Danfoss Icon™ App if you are using a Danfoss Icon™ App Module. In case you are accessing the Danfoss Icon™ system via a Zigbee module the notification will be shown on a 3rd party app.

When accepting the firmware update on the app the new firmware will be downloaded to the App or Zigbee module. Once downloaded the update will be initiated and the display on the Master Controller will show update and a counter will follow to show progress. Once the update has completed the Master Controller will return to Run mode.

In installations with multiple Master Controllers (Slaves) the App will have to be attached directly to each Master Controller in the system (pic. 18.1-18.3) in order to update.

Technical data

Common characteristics, all Danfoss Icon™-products

Temperature for the ball pressure test	75 °C
Control pollution degree	Degree 2, normal household environment
Software class	Class A
Rated impulse voltage	4 kV
Operating time	Permanently connected
Temperature range, storage and transportation	-20 °C to +65 °C
Disposal instructions	The product must be disposed as electronic waste.

Full data sheet available at www.danfoss.com

Radio Module & Repeater

Purpose of control	Transmitting and receiving device
Ambient temperature range, continuous use	0 °C to 40 °C
Frequency	868,4–869,85 MHz
Transmission power	<2,5 mW
Encapsulation (IP Class)	IP 20
Conformity declared acc. to following directives	RED, RoHS, WEEE
Protection class	Radio: Class III Construction, Repeater: Class II Construction
Supply voltage	Radio: 5 V DC, Repeater: 230 V AC 50/60 Hz

App Module

Purpose of control	Wi-Fi transmitting and receiving device, incl. Bluetooth
Ambient temperature range, continuous use	0 °C to 40 °C
Frequency	2,4 GHz
Encapsulation (IP Class)	IP 20
Conformity declared acc. to following directives	RED, RoHS, WEEE
Protection class	Radio: Class III
Supply voltage	5 V DC

Master Controller 24V and Expansion Module (optional)

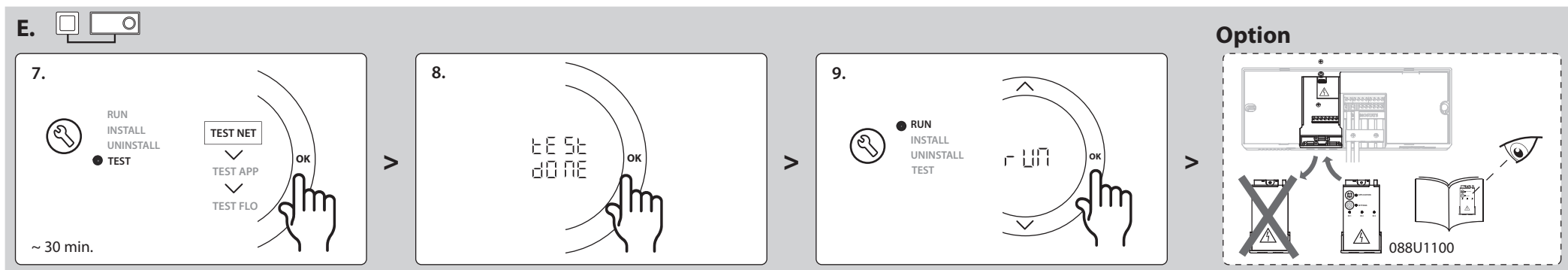
Supply voltage	220-240 V AC
Supply frequency	50/60 Hz
Output voltage, actuators	24 V DC
Max. power consumption per actuator output	2 W
Number of actuator outputs (1 actuator per output terminal)	10 or 15 depending on type
Output voltage, thermostats	24 V DC
Stand-by consumption per thermostat	0,2 W
Max. number of thermostats	10 or 15 depending on type
Max. length of wire from master controller to a 24 V thermostat (depends on cable type used)	If 2 × 2 × 0,6 mm ² STP/UTP: 100 m If 2 × 0,5 mm ² : 150 m If > 2 × 0,75 mm ² : 200 m
Stand-by consumption, Master Controller	< 2 W
Max. power consumption, excluding use of PWR 1 and PWR 2 outputs	< 50 W
Internal protection (fuse, non-replacable)	2,5 A
Output "Relay"	Micro-disconnection (Type 1.B action), Max. 2 A load
Actuator outputs, type	Electronic disconnection (Type 1.Y action)
Output "PWR 1", type and rated max. output	Micro-interruption (Type 1.C action)
Output "PWR 2", type and rated max. output	Type: Permanent output, Always live 230 V, Max. 50 W
Output "PWR 3" (optional, on Expansion module – used for dew point sensor)	24 V DC, max. 1 W
Input "1" (optional, on Expansion module – use varies acc. to application chosen)	Ext. switch input (internal 24 V pull-up)
Input "2" (optional, on Expansion module – use varies acc. to application chosen)	Ext. switch input (internal 24 V pull-up)
Input "3", sensor input (optional, on Expansion module)	External sensor, PT 1000 (Danfoss ESM 11)
Dimensions	W: 370 mm, H: 100 mm, D: 53 mm
Conformity declared acc. to following directives	LVD, EMC, RoHS and WEEE
Purpose of control	Individual electronic room temperature control
Method of providing earthing	Factory fitted power cord, incl. PE-conductor
Encapsulation (IP Class)	IP 20
Protection class	Class I
Ambient temperature range, continuous use	0 °C to 50 °C

Wireless Thermostat

Purpose of control	Room thermostat for room temperature control
Ambient temperature range, continuous use	0 °C to 40 °C
Frequency	869 MHz
Transmission power	<2,5 mW
Encapsulation (IP Class)	IP 21
Supply voltage	2 × 1,5 V AA-Alkaline batteries
Conformity declared acc. to following directives	RED, RoHS, WEEE
Protection class	Class III

24V Wired Thermostat

Purpose of control	Room thermostat for room temperature control
Ambient temperature range, continuous use	0 °C to 40 °C
Encapsulation (IP Class)	IP 21
Supply voltage	24 V DC
Conformity declared acc. to following directives	EMC, RoHS, WEEE
Protection class	Class III
External sensor	NTC type, 47 kΩ @ 25 °C (Optional, 088U1110)



Cable/wiring

24V

2 x 2 x Ø 0,6 PDS cable (UTP or STP)	😊
H03VV-F 0,50 mm², flexible H03VV-F 0,75 mm², flexible 3 x 1,0 mm², solid core 3 x 1,5 mm², solid core	😊
5 x 1,5 mm² > 1,5 mm² < 24 AWG	😞

230V (3A fuse in Danfoss Icon™ Master, 24 V)

H03VV-F 0,50 mm², flexible H03VV-F 0,75 mm², flexible	😊
3 x 1,0 or 3 x 1,5 mm², solid core	😊
5 x 1,5 mm², solid core > 1,5 mm²	😞

Danfoss Icon™ Master Controller 24 V

The diagram illustrates the internal wiring and components of the Danfoss Icon Master Controller 24V. Key features include:

- Terminal Block (6):** A 15-position terminal block for connecting various inputs and outputs.
- Rotary Switch (3):** A switch with positions for SLOW, MEDIUM, and FAST.
- Mode Button (1):** A button for RUN, INSTALL, UNINSTALL, and TEST functions.
- Mode Button (2):** A button for PWM+ ON/OFF and MODE functions.
- NC/NO Switch (4):** A switch for normally closed (NC) or normally open (NO) connections.
- OK Button (5):** A button for confirming settings.
- Thermostat Inputs (9, 10, 11):** Three inputs for connecting thermostats.
- Input Ports (12, 13, 14):** Ports for RADIO, APP, and MASTER inputs.
- Power Input (7, 8):** Two points for 24V power input.