

Installation guide

SonoMeter 40

Ultrasonic energy meter for heating and cooling applications



ENGINEERING
TOMORROW



EU DECLARATION OF CONFORMITY

Danfoss A/S

Danfoss Energy Metering

6430 Nordborg, Denmark | CVR nr.: 20 16 57 15 | Telephone: +45 7488 2222 | Fax: +45 7449 0949

declares under our sole responsibility that the

Product category: Energy Meters

Type designation(s): SonoMeter 40

Covered by this declaration is in conformity with the following directive(s), standard(s) or other normative document(s), provided that the product is used in accordance with our instructions.

[RED] - Radio Equipment Directive 2014/53/EU

Article 3.1a (LVD)

- EN 61010-1:2010+A1:2019
- EN 62368-1:2014
- EN 62311:2008

Article 3.1b (EMC)

- EN 301 489-3 V2.1.1
- EN 301 489-1 V1.9.2

Article 3.2 (Radio)

- EN 300 220-1 V3.1.1
- EN 300 220-2 V3.1.1

[EMC] - Electromagnetic Compatibility Directive 2014/30/EU¹

- EN 55032:2015+A11:2020

[LVD] - Low Voltage Directive 2014/35/EU^{1,3}

- EN 61010-1:2010+A1:2019
- EN 62368-1:2014
- EN 62311:2008

[MID] - Measuring Instruments Directive 2014/32/EU

- EN 1434-1:2015+A1:2018
- EN 1434-2:2015+A1:2018
- EN 1434-3:2015
- EN 1434-4:2015+A1:2018⁴
- EN 1434-5:2015+A1:2019
- EN 1434-6:2015+A1:2019
- WELMEC 7.2:2015 - Software Guide

Notified Body: Lithuanian Energy Institute, 1621, performed type approval and issued certificate LT-1621-MI004-047.

[RoHS] - Restriction of Hazardous Substances Directive 2011/65/EU+A:2015/863

- EN IEC 63000:2018

¹ For variants with Radio Module the declaration for EMC & LVD shall be ignored

² For variants without Radio Module the declaration for RED shall be ignored.

³ For variants without Radio Module and without Mains power supply (24V AC/DC) the declaration for RED and LVD shall be ignored.

⁴ Not within MID - National Type Approval Certificate for cooling energy DE-21-M-PTB-0069 is issued by "Physikalisch-Technische Bundesanstalt".

<p>Date: 2021.09.22</p> <p>Place of issue: 8811 Scheffling Austria</p>	<p>Issued by</p> <p>Signature: </p> <p>Name: Norbert Spreitzer Title: Product Portfolio Manager</p>	<p>Date: 2021.09.22</p> <p>Place of issue: 1210 Ljubljana, Slovenia</p>	<p>Approved by</p> <p>Signature: </p> <p>Name: Gasper Benedik Title: Energy Meters Director</p>
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Danfoss only vouches for the correctness of the English version of this declaration. In the event of the declaration being translated into any other language, the translator concerned shall be liable for the correctness of the translation

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Revision No: 01

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UK DECLARATION OF CONFORMITY

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Radio Equipment Regulations 2017²

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Electromagnetic Compatibility Regulations 2016¹

- BS EN 55032:2015+A11:2020

Electrical Equipment (Safety) Regulations 2016^{1,3}

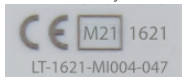
- BS EN 61010-1:2010+A1:2019
- BS EN 62368-1:2014
- BS EN 62311:2008

The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (as amended)

- BS EN IEC 63000:2018

Heat Metering and Billing Regulations 2014

Heat meter accuracy cl. 7.9:



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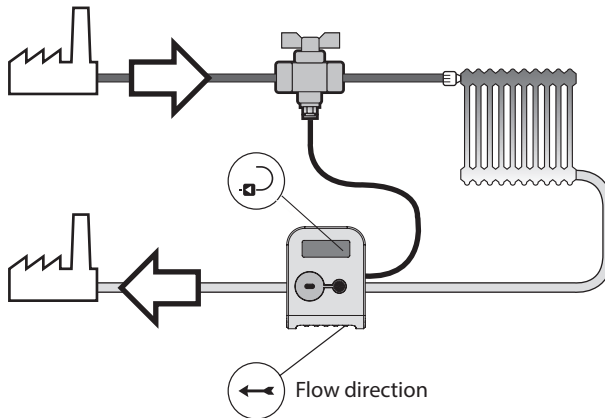
1. Installation

1.1. Preparation

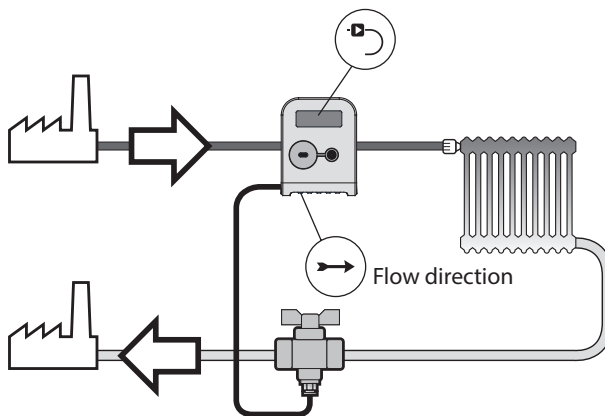
Only qualified personnel may install the equipment, following the requirements listed in this document. More detailed instruction can be found on www.heating.danfoss.com.

Note! This product is approved for ambient temperature between 5-55° C, but to ensure optimal conditions for battery it is recommended to install Calculator at max. 45° C. Avoid installation stress from pipes and fittings. Flush the system.

1.2. Identification of installation: Return/Supply pipe installation and flow direction

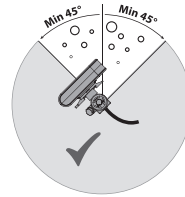
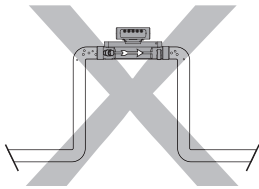


Return pipe installation



Supply pipe installation

1.3. Mounting of flow sensor

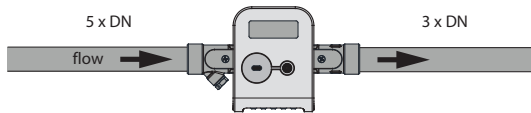


Pipe position: No limitations but avoid positions where air can be collected.

Rotation in pipe axis: Flow sensor should be angled in 45 to 315° to avoid air collection in flow sensor.

Inlet/outlet conditions (only for DN 65-DN 100)

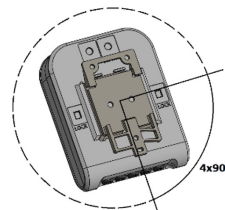
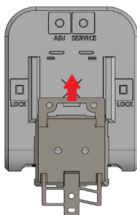
In order to maximize performance it is necessary to have straight inlet and outlet flow conditions before and after the flow sensor: 5 × DN on inlet and 3 × DN on outlet of flow sensor.



1.4. Mounting and sealing of calculator

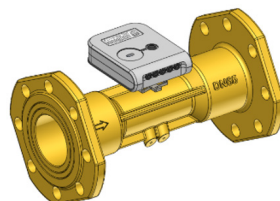
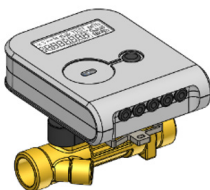
Heat meter calculator may be installed in heated premises, working ambient temperature shall be not more than 55 °C. It may not be exposed to direct sunlight.

The calculator is mounted on an auxiliary holder (it can be oriented in the required direction at an angle of each 90 °):

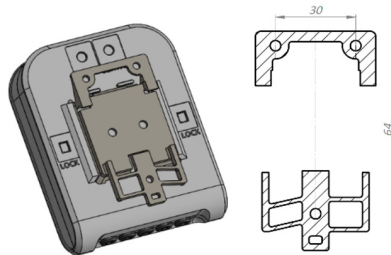


The possible ways of the mounting of the calculator (auxiliary holder):

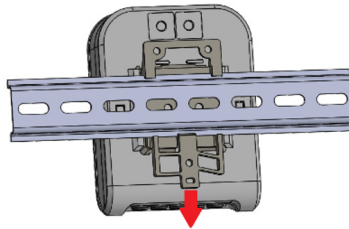
- Direct mounting on the housing of the flow sensor, by turning each 90 ° (only when the flow temperature does not exceed 90 °C):



- On the wall:



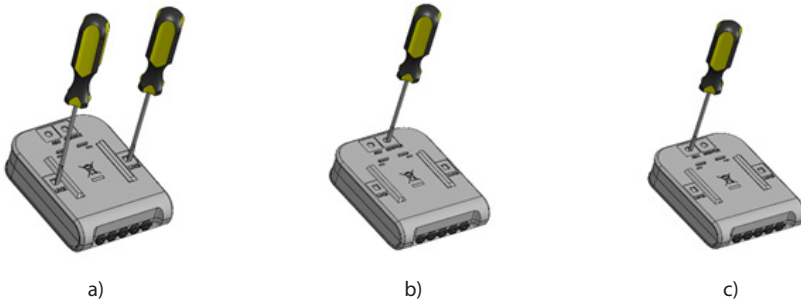
- Panel mounting on standard DIN-rail.



⚠ Important: It is prohibited to attach the electronic unit directly on the wall because there is a risk that moisture may condense on the walls of the room or the temperature of the surface of the wall may drop below 5 °C. In this case, it is recommended to mount the electronic unit so that to provide for an air space of at least 5 cm between the unit and the wall surface.

Calculator seals

For design with permanently connected temperature sensors no additional sealing applies to the electronic unit of a newly manufactured heat meter. Access to elements fixing the opening of the box, configuration change activation contacts, and adjustment data change activation contacts is protected by special easily breakable partitions.

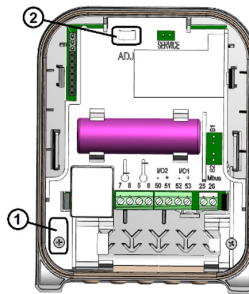


Access to elements fixing the opening of the box (a), configuration change activation contacts (b) and adjustment data change activation contacts (c) (partitions easily breakable with a tool)

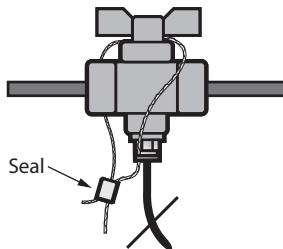
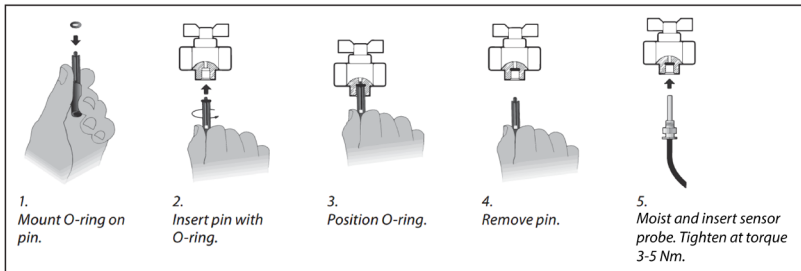
After the opening of the box, change of the configuration, or adjustment of the meter (when the special partitions were broken out for this purpose), the opened slots must be additionally sealed with sticker seals:

- the two slots marked LOCK for access to the elements fixing the opening of the box are sealed with test sticker seals (Fig. a),
- the slot marked SERVICE for access to the configuration change activation contacts is sealed with the supplier's sticker seal (Fig. b),
- the slot marked ADJ for access to the adjustment data change activation contacts is sealed with the supplier's sticker seal (Fig. c).

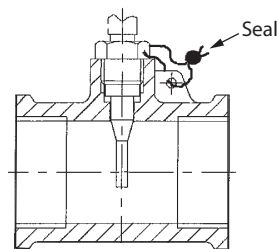
For design with changeable temperature sensors (**IP65 protection class of the calculator only!**) the inspection seals /adhesive seals protect the access to protective cap mounting bolt (1) and to adjustment data change activation contacts ADJ (2), if breakable partition is broken out.



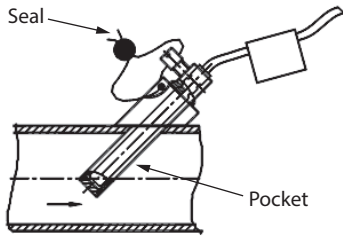
1.5. Mounting and sealing of temperature sensors



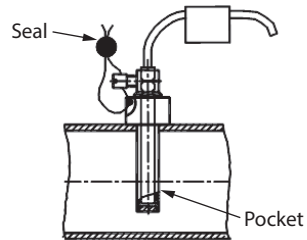
Installation recommendations for ball valve mounting and sealing



Installation recommendations for direct short temperature sensors



a) angled 45°



b) perpendicular

Installation recommendations for pocket temperature sensors with permanently connected signal leads.

2. Electrical wiring

2.1 Connection of a meter with permanently connected temperature sensors (IP 68)

The meter version with permanently connected temperature sensors is fully ready for installation, complete with the necessary cables for connection (no need to open the meter).

If the meter is equipped with wired interfaces or a pulse input / output function, appropriate and marked cables to connect the relevant external device are provided.

If the meter is intended to be powered by an external source of 230V AC or 24V AC / DC, the dedicated and marked cable of the meter shall be connected to the appropriate source.

2.2 Connection of the meter with changeable temperature sensors (IP65)

If the meter is fully assembled (temperature sensors are connected, communication interface cables are in place) - follow the installation procedure in 2.1 (the meter does not need to be opened). Otherwise, it is necessary to open the electronic unit box.

Opening of electronic unit box

Before opening the electronic box, make sure that the meter version is with changeable temperature sensors:



Check!

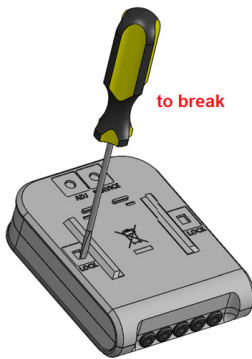
IP65 = Openable Version (with exchangeable temperature sensors)

IP68 = Not openable

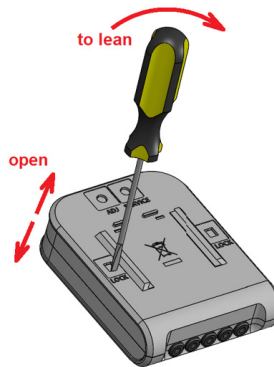
REMARK: After opening the box it will be necessary to renew meter metrological verification and to seal open holes LOCK with seals.

Open the electronic unit by help of universal tool (for example a universal flat screwdriver): by breaking two protective partitions marked LOCK (a), or by removing sealing stickers, if the partitions have already been broken.

In the opened cavity, use a flat screwdriver to tilt the latch to the outside and open the box (b). Do this one after the other on both sides.



a) Break the protective LOCK



b) Lean locking catches to the outside and open the box

Connection of temperature sensors

Only platinum resistive temperature sensors Pt500 in accordance with EN60751, paired and labeled in accordance with EN1434 and MI004, are suitable for use with the meter and are connected by a two-wire cable with an external diameter of 4.0 ... 4.2 mm and up to 10 m length.

If the meter is supplied with a second battery (located in the temperature sensor connection area), remove it from the socket, if needed (it is allowed to disconnect from the meter if necessary).

Install the wires of the temperature sensors through their respective holes, connect them to the marked terminals and fix the cable into the slots. It is important that the temperature sensor for working in the higher temperature pipe (usually marked in red) is connected to terminals 5 and 6, the temperature sensor for working in the lower temperature pipe (usually marked in blue) is connected to terminals 7 and 8.

Install a second battery into the slot (if any) and verify that it is plugged in (if disconnected).

The electronic unit box is closed by twisting it and squeezing it until it snaps into place. Check if it is locked firmly (by trying to open).

The LOCK holes must be sealed with the supplier's seal-sticker.

Connecting additional interface modules

The meter has integrated wireless (RF) and cabled M-bus interfaces and two pulse inputs / outputs. The meter can be equipped with an optional interface module additionally.

The integrated Mbus interface and the pulse inputs / outputs cables are connected in the same way as the temperature sensors (see above), only the cable leads are connected to the dedicated terminals.

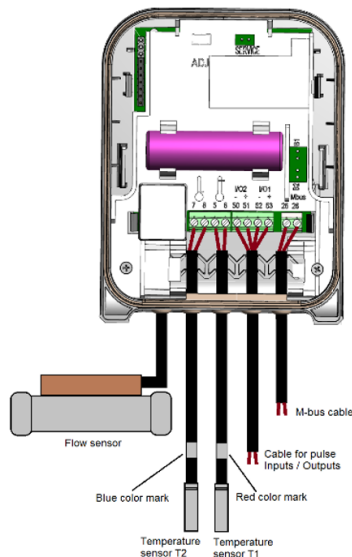
The power supply module is connected to meter connector B1, the backup battery is connected to the module connector BAT, the power cable is connected to the module terminals "24V". This should be done before attaching the module (because the connectors and terminals are on the other side of the module). The module is mounted on the battery holder.

The optional interface module is connected in the following order:

- open the box and install additional/extra interface cable in the same way as the temperature sensors (see above)
- the additional interface cable is connected to the terminals of the interface module
- the module is inserted into the appropriate slot on the meter and the side-brackets, the module cable is firmly slipped into the meter and locked in place by finger-pinching it into the fixture)
- plug in and connect the second battery to connector B2
- when the meter is equipped with an external power supply module - the LoRa module is connected to the power supply module with an additional connection cable.
- the electronic unit box is closed by twisting and squeezing it until it locks into place. Check for firm locking (when opening).
- the LOCK holes must be sealed with the supplier's seal.

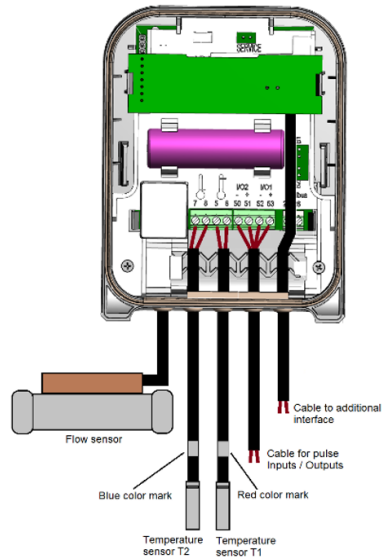
Wiring diagram 1

Design with changeable temperature sensors, Mbus1 interface. Meter power supply from a battery.



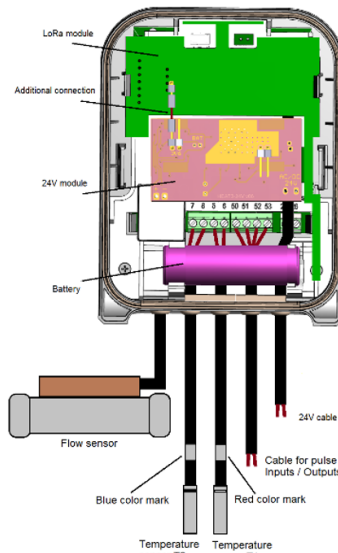
Wiring diagram 2

Design with changeable temperature sensors, additional interface module (additional interface module mounting bracket under the module). Meter power supply from a battery.



Wiring diagram 3

Design with changeable temperature sensors, LoRa interface and 24V power supply module. The 24V power supply module is mounted on the battery holder and connected to the B1 connector of the meter. A backup battery is connected to the BAT connector of the module. The 24V power cable is connected to the "24V" terminals of the module (connections are made before mounting the module, as the connectors and terminals are on the other side of the module). The LoRa interface module is connected to the 24V power supply module connector by an additional connection cable.

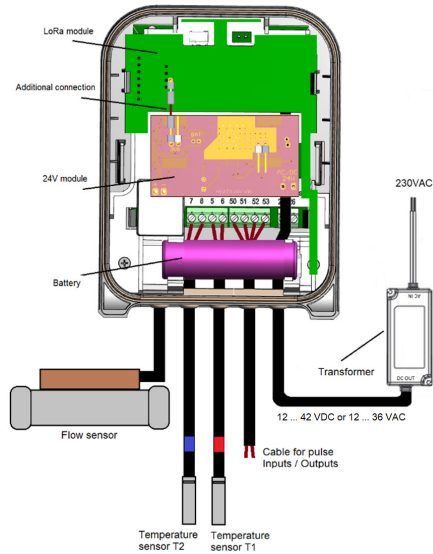


Wiring diagram 4

Design with changeable temperature sensors and 230V power supply. An external transformer is used to connect 230V on the input and to provide 12-24V on the output, which must be connected to the power supply cable from the meter.

The 24V power supply module is mounted on the battery holder and connected to the B1 connector of the meter.

A backup battery is connected to the BAT connector of the module. The 24V power cable is connected to the "24V" terminals of the module (connections are made before mounting the module, as the connectors and terminals are on the other side of the module)



- The transformer is powered from life-dangerous 230 V voltage. Maintain only when voltage is switched off. Installation can be done only by qualified personnel.
- Module and transformer can only be used for energy meter power supply, in accordance with the user manual. The energy meter must be intact and fully complete.
- Lithium battery is prohibited to charge, short circuit or kept above the 80 °C temperature.

Technical specification of "230 VAC transformer":

Output	DC voltage	12 V
	Rated current	0.7 A
	Rated power	6 W
Input	Voltage range	120...240 VAC
	Frequency range	50/60 Hz
	AC current	0.044 A
Protection	Short circuit	Hiccup mode, recovers automatically after fault condition is removed
	Overload	
Environment	Working temperature	-20...+45 °C
Other	IP class	IP66, fully isolated plastic case

Numbering of M-bus communication module terminals

Terminal N.	Description
24, 25	M-bus module (bipolar)

Numbering of MODBUS and BACnet communication module terminals

Terminal N.	Description
60, 61	12-24 V DC power supply voltage for MODBUS and BACnet (bipolar)
90	MODBUS or BACnet Line +
91	MODBUS or BACnet Line -

3. Commissioning

3.1. Bleeding

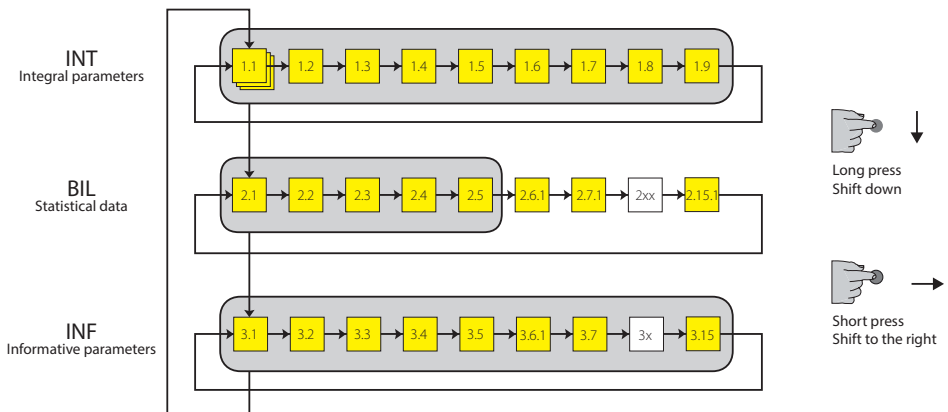
1. Bleed the system until the flow rate display is steady.
2. Make sure no error codes are displayed.
3. Check the display for a plausible indication of flow rate and temperatures.

3.2. IP class

Calculator	IP65 (IP68 on special request)
Flow sensor	IP68

4. Display function overview

4.1. Menu structure



4.2. Display symbols



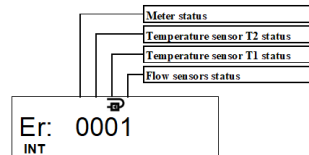
Explanation of special symbols:

→	flow is flowing forward (right direction)
←	flow is flowing backwards (wrong direction)
no arrow	no flow

Explanation of other symbols are described in detailed instruction on www.heating.danfoss.com.

4.3. Error codes

Errors are encoded by a 4-digit code.



Code	Description
Status of calculator 	0 - normal operation 1 - battery service life has expired (or the meter was not power supplied – if it is externally power supplied) 2 - temperature differential is higher than permissible limits 4 - temperature differential is lower than permissible limits 8 - electronic unit hardware failure *
Status of the return heat carrier temperature sensor (T2) 	0 - normal operation 4 - the sensor is short-circuited * 8 - the sensor is disconnected or short-circuited *
Status of the supply heat carrier temperature sensor (T1) 	0 - normal operation 4 - the sensor is short-circuited * 8 - the sensor is disconnected or short-circuited *
Status of flow sensor 	0 - normal operation 1 – no signal; the flow sensor is not filled with water 2 – reverse flow 4 – the flow is greater than 1.2·q _s (indicated q=1.2·q _s) 8 – hardware failure *

* - only in case of these serious errors will be stopped the summation of energy and normal working time, the error code will be displayed on the LCD first page, additionally the error date will be displayed.


Error codes sum up if there are more than one error. Then the summary indicated error code will be as follows:

- 3 – corresponds to error codes 2 + 1
- 5 – corresponds to error codes 4 + 1
- 7 – corresponds to error codes 4 + 2 + 1
- 9 – corresponds to error codes 8 + 1
- A – corresponds to error codes 8 + 2
- B – corresponds to error codes 8 + 2 + 1
- C – corresponds to error codes 8 + 4
- D – corresponds to error codes 8 + 4 + 1
- E – corresponds to error codes 8 + 4 + 2
- F – corresponds to error codes 8 + 4 + 2 + 1

If at least one digit value of an error code is ≥ 8 , the summing-up of energy, water quantity, and trouble-free operation time is stopped.

In case of the flow sensor error 4, the time “when the flow $q > 1.2 \cdot q_0$ ” is recorded additionally.

5. Disposal



This symbol on the product indicates that it may not be disposed of as household waste. It must be handed over to the applicable take-back scheme for the recycling of electrical and electronic equipment.

- Dispose of the product through channels provided for this purpose.
- Comply with all local and currently applicable laws and regulations.

Item	Material	Disposal
Battery	AA-cell lithium/thionyl chloride 700 mg lithium	Approved deposit for lithium batteries
PCBA with display	Coppered epoxy laminate components soldered on, PC, TPE	Electronic waste
Cables	Copper with PUR or PVC jackets	Cable recovery
Flow sensor (incl. transducer and liner)	Brass, stainless steel, PPS	Metal recovery
Transducer	PZT, stainless steel, PEI	Approved deposit for PZT
Other plastic parts	PC, PPS, PEI, TPE	Plastic recovery

6. Local Importer name and address

For goods delivered to UK, importer name and address is:

Danfoss Ltd.
 22 Wycombe End
 HP9 1NB
 GB

ENGINEERING
TOMORROW

Danfoss

Danfoss A/S

Climate Solutions • danfoss.com • +45 7488 2222

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