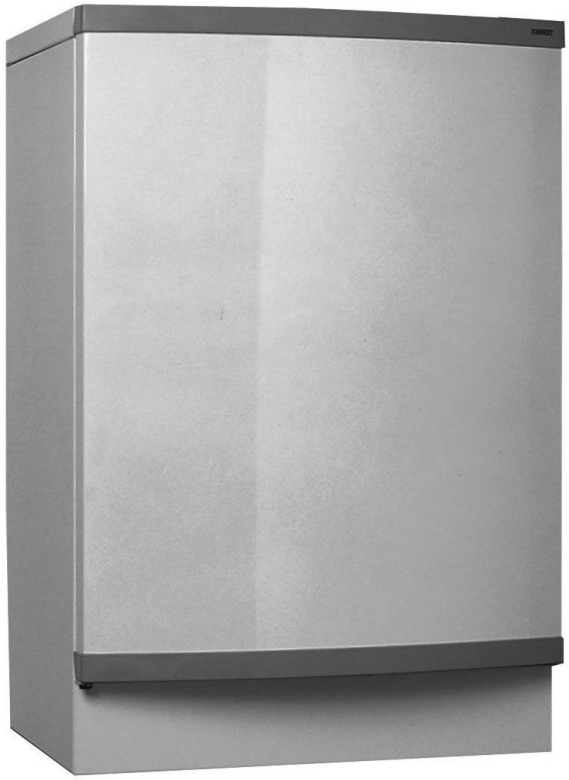
ENGINEERING
TOMORROW

Operating Guide

Termix BV



1.0 Table of Contents

2.0 Functional description

Instantaneous water heater with heat exchanger and thermostatic or automatic controls. Designed for wall-mounting.

Application
The Termix BV substation is an instantaneous water heater featuring superb heat extraction and high performance. The substation is delivered with thermostatic or automatic controls. The Termix BV is suitable for large apartment houses, sports arenas and schools, where large amounts of hot water are needed. The hot water systems are available in 7 different sizes with an output from 77-265 kW. The Termix BV unit is supplied with PU insulated heat exchangers.

Domestic hot water (DHW)
The domestic hot water is prepared in a plate heat exchanger and the temperature is regulated with thermostatic or automatic controls. The thermostatic solution is regulated with self-acting thermostatic control valves. The substations with high output are controlled with two valves connected in cascade in order to control both small and large demands for hot water in an efficient manner. The Termix BV can also be mounted with automatic controls. There is no additional pressure loss on the secondary side of the heat exchanger with a thermostatic or automatic control valve. Therefore this type of regulation can be used by low pressure in the cold water mains.

Domestic hot water circulation
The Termix BV substation is supplied with connections for DHW circulation including circulation pump and a nonreturn valve as a standard.

3.0 Safety notes

3.1 Safety Notes – general

The following instructions refer to the standard design of substation. Special versions of substations are available on request.

This operating manual should be read carefully before installation and start-up of the substation. The manufacturer accepts no liability for damage or faults that result from non-compliance with the operating manual. Please read and follow all the instructions carefully to prevent accidents, injury and damage to property. Assembly, start-up and maintenance work must be performed by qualified and authorized personnel only.
Please comply with the instructions issued by the system manufacturer or system operator.

Corrosion protection
All pipes and components are made of stainless steel and brass. The maximum chloride compounds of the flow medium should not be higher than 150 mg/l.
The risk of equipment corrosion increases considerably if the recommended level of permissible chloride compounds is exceeded.

Energy source
The substation is designed for district heating as the primary source of energy. However, also other energy sources can be used where the operating conditions allow it and always are comparable to district heating.

Application
The substation is designed to be connected to the house installation in a frost-free room, where the temperature does not exceed 50 °C and the humidity does not exceed 60%. Do not cover or wall up the substation or in any other way block the entrance to the station.

Choice of material
Choice of materials always in compliance with local legislation.

Safety valve(s)
We recommend mounting of safety valve(s), however, always in compliance with local regulations.

Connection
The substation must be equipped with features that ensure that the substation can be separated from all energy sources (also power supply).

Emergency
In case of danger or accidents - fire, leaks or other dangerous circumstances - interrupt all energy sources to the station if possible, and seek expert help.
In case of discoloured or bad-smelling domestic hot water, close all shut-off valves on the substation, inform the operating personnel and call for expert help immediately.

REACH
All Danfoss A/S products fulfill the requirements in REACH.
One of the obligations in REACH is to inform customers about presence of Candidate list substances if any, we hereby inform you about one substance on the candidate list: The product contains brass parts which contains lead (CAS no: 7439-92-1) in a concentration above 0.1% w/w.

Storage
Any storage of the substation which may be necessary prior to installation should be in conditions which are dry and heated.

Authorized personnel only
Assembly, start-up and maintenance work must be performed by qualified and authorized personnel only.

Please observe instructions carefully
To avoid injury to persons and damage to the device, it is absolutely necessary to read and observe these instructions carefully.

Warning of high pressure and temperature
Be aware of the installation's permissible system pressure and temperature.

The maximum temperature of the flow medium in the substation is 120 °C.

The maximum operating pressure of the substation is 16 bar.

The risk of persons being injured and equipment damaged increases considerably if the recommended permissible operating parameters are exceeded.
The substation installation must be equipped with safety valves, however, always in accordance with local regulations.

Warning of hot surface
The substation has got hot surfaces, which can cause skin burns. Please be extremely cautious in close proximity to the substation.
Power failure can result in the motor valves being stuck in open position. The surfaces of the substation can get hot, which can cause skin burns. The ball valves on district heating supply and return should be closed.

Warning of transport damage
Before substation installation, please make sure that the substation has not been damaged during transport.

IMPORTANT - Tightening of connections
Due to vibrations during transport all flange connections, screw joints and electrical clamp and screw connections must be checked and tightened before water is added to the system. After water has been added to the system and the system has been put into operation, re-tighten ***ALL*** connections.

4.0 Mounting

4.1 Mounting

Installation must be in compliance with local standards and regulations.
District heating (DH) - In the following sections, DH refers to the heat source which supplies the substations. A variety of energy sources, such as oil, gas or solar power, could be used as the primary supply to Danfoss substations. For the sake of simplicity, DH can be taken to mean the primary supply.

Connections:

1. District heating (DH) supply
2. District heating (DH) return
3. Hot water circulation (HWC)
4. Domestic hot water (DHW)
5. Domestic cold water (DCW)

Connection sizes:

DH + DCW + DHW:	G 1" (int. thread)
HWC:	G ¾" (int. thread)

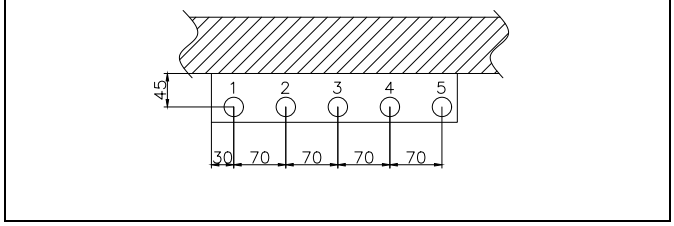
Dimensions (mm):
Type 2-5 without cover:
H 660 x W 510 x D 240
Type 2-5 with cover:
H 800 x W 540 x D 360

Type 6-8 without cover:
H 920 x W 720 x D 385
Type 6-8 with cover:
H 920 x W 800 x D 450

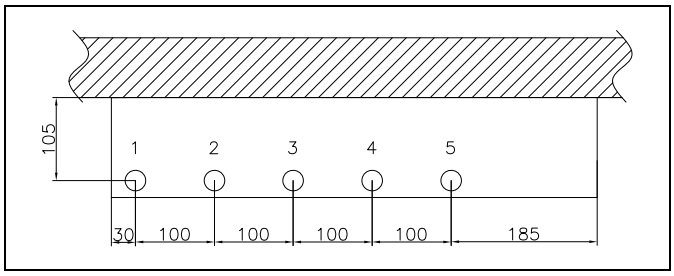
Weight (approx.): 20–40 kg

Authorized personnel only
Assembly, start-up and maintenance work must be performed by qualified and authorized personnel only.

Type 2–5



Type 6–8



The pipe placement can deviate from the shown drawing. Please note the markings on the station.

4.1.1 Installation

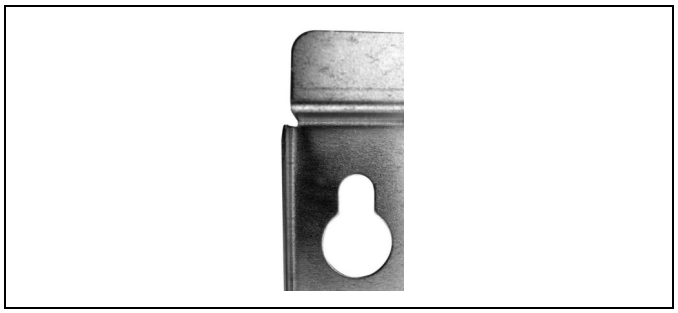
Mounting:

Adequate space
Please allow adequate space around the substation for mounting and maintenance purposes.

Orientation
The station must be mounted so that components, keyholes and labels are placed correctly. If you wish to mount the station differently please contact your supplier.

Drillings
Where substations are to be wall-mounted, drillings are provided in the back mounting plate. Floor mounted units have support.

Labelling
Each connection on the substation is labelled.



Keyhole for mounting.

Before installation:

Clean and rinse
Prior to installation, all substation pipes and connections should be cleaned and rinsed.

Tightening
Due to vibration during transport, all substation connections must be checked and tightened before installation.

Unused connections
Unused connections and shut-off valves must be sealed with a plug. Should the plugs require removal, this must only be done by an authorized service technician.

Installation:

Strainer
If a strainer is supplied with the station it must be fitted according to schematic diagram. Please note that the strainer may be supplied loose.

Connections
Internal installation and district heating pipes connections must be made using threaded, flanged or welded connections.

4.2 Electrical connections

Before making electrical connections, please note the following:

Safety notes
Please read the relevant parts of the safety notes.

230 V
The substation must be connected to 230 V AC and earth.

Potential bonding
Potential bonding should be carried out according to 60364-4-41:2007 and IEC 60364-5-54:2011.
Bonding point on the mounting plate below right corner marked with earth symbol.

Disconnection
The substation must be electrically connected so that it can be disconnected for repairs.

Outdoor temperature sensor
Outdoor sensors should be mounted so as to avoid exposure to direct sunlight. They should not be placed close to doors, windows or ventilation outlets.

The outdoor sensor must be connected to the station on the terminal block under the electronic control.

Authorized electrician
Electrical connections must be made by an authorized electrician only.

Local standards
Electrical connections must be made in accordance with current regulations and local standards.

5.0 Design

5.1 Design

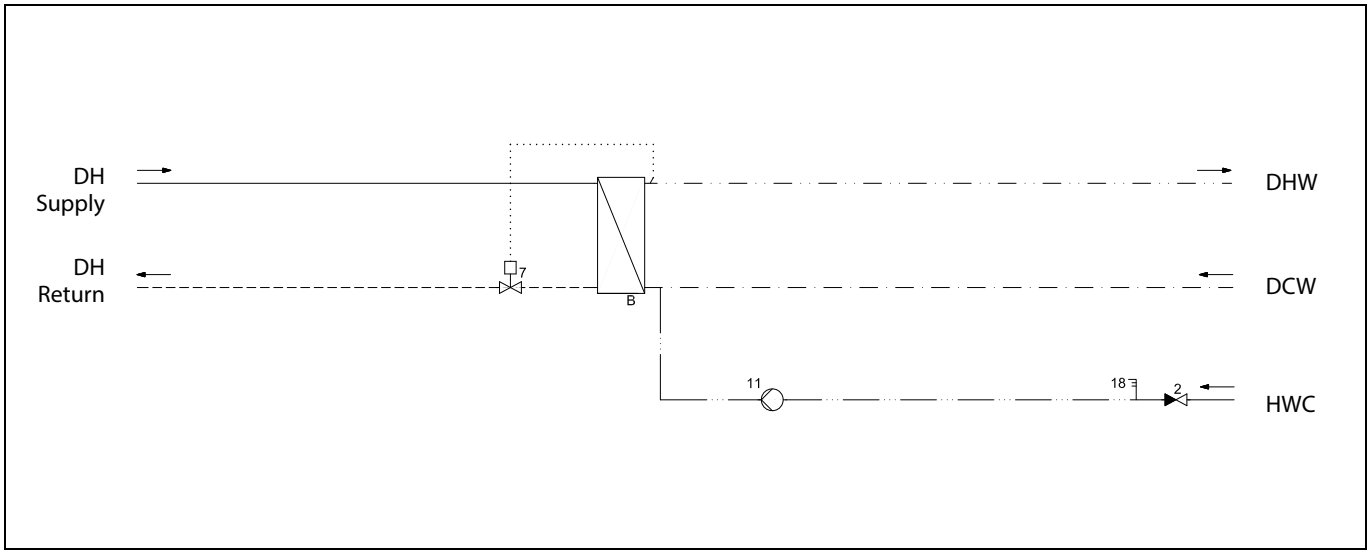
Your substation might look different than the substation shown.

Design description

B Heat exchanger, DHW
2 Single check valve
7 Thermostatic controller, DHW
11 Domestic hot water pump
18 Thermometer

5.2 Schematic diagram

Schematic diagram type 2-5 (example)



Your substation might look different than the schematic diagram shown.

Schematic description

B Heat exchanger, DHW
2 Single check valve
7 Thermostatic valve
11 Domestic hot water pump
18 Thermometer

DHW: Domestic Hot Water
DCW: Domestic Cold Water
HWC: Hot Water Circulation
DH Supply: District Heating Supply
DH Return: District Heating Return

5.2.1 Technical parameters

Technical parameters

Nominal pressure:	PN 16
Max. DH supply temperature:	120 °C
Min. DCW static pressure:	0.5 bar
Brazing material (HEX):	Copper
Heat exchangers test pressure:	30 bar
Sound level:	≤ 55 dB

5.3 Design

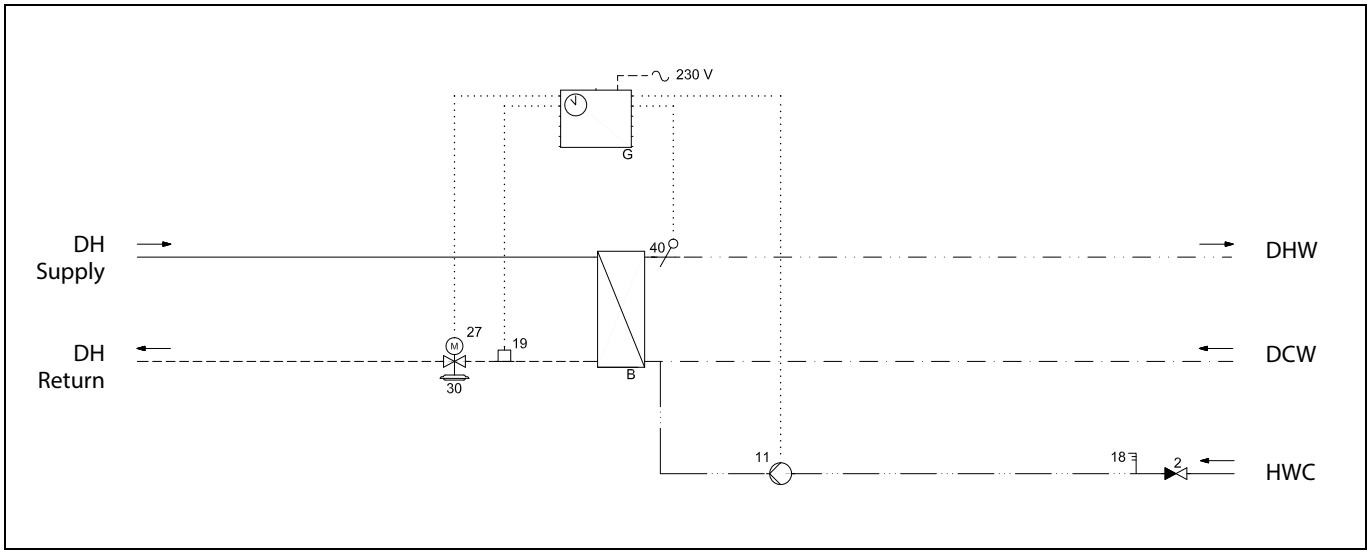
Your substation might look different than the substation shown.

Design description

B Heat exchanger, DHW
G Electronic controller, DHW
2 Single check valve
11 Domestic hot water pump
18 Thermometer
27 Actuator
30 Flow control with control valve

5.4 Schematic diagram

Schematic diagram type 2-8 with electronic controller (example)



Your substation might look different than the schematic diagram shown.

Schematic description

B Heat exchanger, DHW
G Electronic controller, DHW
2 Single check valve
11 Domestic hot water pump
18 Thermometer
19 Surface sensor
27 Actuator
30 Flow control with control valve
40 Immersion sensor

DHW: Domestic Hot Water
DCW: Domestic Cold Water
HWC: Hot Water Circulation
DH Supply: District Heating Supply
DH Return: District Heating Return

5.4.1 Technical parameters

Technical parameters

Nominal pressure:	PN 16
Max. DH supply temperature:	120 °C
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Brazing material (HEX):	Copper
Heat exchangers test pressure:	30 bar
Sound level:	≤ 55 dB

6.0 Controls

6.1 DHW temperature control

DHW temperature control
There are various types of DHW temperature control used in Danfoss substations.
DHW temperature should be adjusted to 45-50 °C, as this provides optimal utilisation of DH water. At DHW temperatures above 55 °C, the possibility of lime scale deposits increases significantly.

Two valves in cascade
If two thermostatic control valves are mounted parallel in cascade, it is important to adjust the valves according to the following: The small valve is for controlling small tapping flows and the large valve is for controlling large tapping flows.

1. The large valve is closed completely (the handle is turned all the way to the top).
2. One tap is opened.
3. The small valve is set at the desired temperature (50 °C). The set point is marked and the valve is closed completely.
4. Several taps are opened and the large valve is set 3-5 °C lower than the small valve.
5. The handle of the small valve is turned back to the marked point.

Please note
It is important that the small valve is set 3-5 °C higher than the large valve; otherwise it is not possible to control the temperature of small tapping flows correctly.

6.1.1 AVTB controller (20–60 °)

The temperature setting is as follows:
1 = 20 °C
2 = 35 °C
3 = 50 °C
4 = 60 °C
5 = 70 °C
The values are intended as a guide.

The AVTB operates at its best at DH supply temperatures of up to 90 °C.

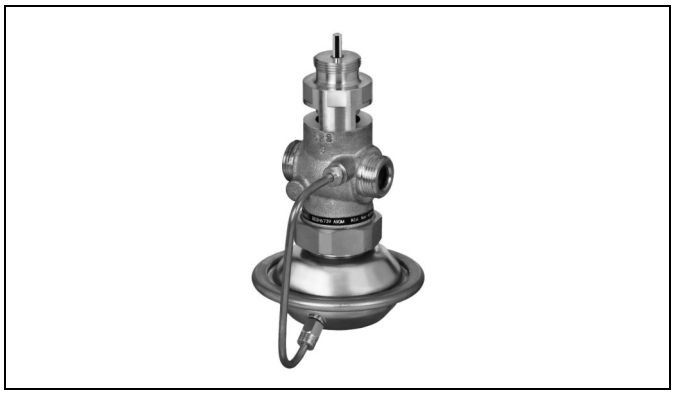
Thermostatic control
DHW temperature is adjusted as follows:
To increase temperature, turn the handle on the thermostatic controller to select a higher number.
To decrease temperature, turn the handle on the thermostatic controller to select a lower number.

6.1.2 Electronic control

Substations with electronic control must be set in accordance with manufacturer´s instructions.
Where the room temperature is controlled by radiator thermostats, it is recommended that thermostats be set for minimum temperature in each room.

6.1.3 Flow controller with integrated control valve

The controller is a self-acting flow controller with integrated control valve. The controller closes when set max. flow is exceeded and can be used in combination with Danfoss electrical actuators with or with out safety function. Spring return motor can be used as safety function by power failure.



6.1.4 Electric 2–way motorized valve

Actuators with or without safety function are available for 3-point controls. Spring-return actuators can be used to provide safety shut-off in the event of power failure.

6.1.5 Domestic hot water pump

Important!
It is necessary to mount a domestic hot water circulation pump on the water heater to avoid regulation problems.
The circulation pump can not be switched off, since this will result in regulation problems. (no flow at the sensor).

6.2 Other

6.2.1 Safety valve

The purpose of the safety valve is to protect the substation from excessive pressure.
The blow-off pipe from the safety valve must not be closed. The blow-off pipe outlet should be placed so that it discharges freely and it is possible to observe any dripping from the safety valve.
It is recommended to check the operation of safety valves at intervals of 6 months. This is done by turning the valve head in direction indicated.

6.3 Maintenance

The substation requires little monitoring, apart from routine checks. It is recommended to read the energy meter at regular intervals, and to write down the meter readings.

Regular inspections of the substation according to this Instruction are recommended, which should include:

Strainers
Cleaning of strainers.

Meters
Checking of all operating parameters such as meter readings.

Temperatures
Checking of all temperatures, such as DH supply temperature and DHW temperature.

Connections
Checking all connections for leakages.

Safety valves
The operation of the safety valves should be checked by turning the valve head in the indicated direction.

Venting
Checking that the system is thoroughly vented.

Inspections should be carried out minimum every two years.

Spare parts can be ordered from Danfoss. Please ensure that any enquiry includes the substation serial number.

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Authorized personnel only
Assembly, start-up and maintenance work must be performed by qualified and authorized personnel only.

7.0 Troubleshooting

7.1 Troubleshooting in general

In the event of operating disturbances, the following basic features should be checked before carrying out actual troubleshooting:

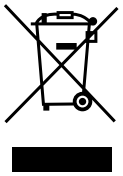
- the substation is connected to electricity,
- the strainer on the DH supply pipe is clean,
- the supply temperature of the DH is at the normal level (summer, at least 60 °C - winter, at least 70 °C),
- the differential pressure is equal to or higher than the normal (local) differential pressure in the DH network – if in doubt, ask the DH plant supervisor,
- pressure on the system - check the HE pressure gauge.

Authorized personnel only
Assembly, start-up and maintenance work must be performed by qualified and authorized personnel only.

7.2 Troubleshooting DHW

Problem	Possible cause	Solution
Too little or no DHW.	Strainer in supply or return line clogged.	Clean strainer(s).
	DHW circulation pump out of order or with too low setting.	Check circulation pump.
	Defective or clogged non-return valve.	Replace – clean.
	No electricity.	Check.
	Wrong setting of automatic controls, if any.	To adjust an electronic controller for DHW, pls. note enclosed instructions for electronic controller.
	Scaling of the plate heat exchanger.	Replace – rinse out.
	Defective motorized valve.	Check (use manual function) – replace.
	Defective temperature sensors.	Check – replace.
	Defective controller.	Check – replace.
Hot water in some taps but not in all.	DCW is being mixed with the DHW, e.g. in a defective thermostatic mixing valve.	Check – replace.
	Defective or clogged non-return valve on circulation valve.	Replace – clean.
Tap temperature too high; DHW tap load too high.	Thermostatic valve adjusted to a too high level.	Check – set.
Temperature drop during tapping.	Scaling of the plate heat exchanger.	Replace – rinse out.
	Larger DHW flow than the substation has been designed for.	Reduce DHW flow.
Thermostatic control valve does not close	Temperature difference between DH supply and DHW set point too low.	Lower the set point temperature or increase the DH supply temperature.

7.3 Disposal



Disposal note

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.

8.0 Declaration

8.1 Declaration of conformity

ENGINEERING TOMORROW

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EU DECLARATION OF CONFORMITY

Danfoss A/S

Danfoss District Energy Division

Declares under our sole responsibility that the:

Product category: Small substations

Type designations:

Ø18:	HD	BTD	VMTD mini mix	KST-I	One Solar A+/B+	
		BVX	VMTD mix	KST-M	One Solar	Mixing loop
		BV	VMTD F mix	KST-L	FLS	Measuring Unit
				VX	VVX	BL
C28:	CS 28 HD	CS 28 BV	CS 28 VMTD	CS 28 VX	CS 28 VVX	CS 28 BL
C32:	CS 32 HD	CS 32 BV	CS 32 VMTD	CS 32 VX	CS 32 VVX	CS 28 BL
C40:	CS 40 HD	CS 40 BV	CS 40 VMTD	CS 40 VX	CS 40 VVX	CS 40 BL

Covered by this declaration is in conformity with the following directives, standards or other normative documents, provided that the product is used in accordance with our instructions.

Machinery Directive 2006/42/EC

EN ISO 12100:2011
Safety of machinery – General principles for design – Risk assessment and risk reduction

EN 60204-1:2018
Safety of machinery – Electrical equipment of machines – Part 1: General requirements

RoHS Directive 2011/65/EU
Including amendment 2015/863

EN IEC 63000:2018
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.

EMC Directive – 2014/30/EU

EN 61000-6-1:2007
Electromagnetic compatibility (EMC) – Part 6-1:
Generic standards – Immunity residential, commercial and light-industrial environments

EN 61000-6-2:2005
Electromagnetic compatibility (EMC) – Part 6-2:
Generic standards – Immunity for industrial environments

EN 61000-6-3:2007 + A1:2011
Electromagnetic compatibility (EMC) – Part 6-3:
Generic standards – Emission standard for residential, commercial and light-industrial environments

Date: 2021.07.20 Place of issue: DK-7451 Sunds	Issued by: Claus G. Mortensen Signature: Name: Claus G. Mortensen Title: Quality Manager	Date: 2021.07.20 Place of issue: DK-7451 Sunds	Approved by: Karina Friis Skov. Signature: Name: Karina Friis Skov Title: Director, Engineering

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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Page 1 of 1

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