M8006 2415EN
12 April 2024

oilon®

Installation and commissioning manual

CUBE, ECO EasyAce

Contents

1 Introduction

1.1 Heat pumps covered in this manual

Heat pump models with EasyAce control	Item code	Refrigerant
CUBE 6 07 EasyAce	CUBEH607	R-410A
ECO 6 07 EasyAce	ECO607	R-410A
CUBE 8 07 EasyAce	CUBEH807	R-410A
ECO 8 07 EasyAce	ECO807	R-410A
CUBE 10 07 EasyAce	CUBEH1007	R-410A
ECO 10 07 EasyAce	ECO1007	R-410A
CUBE 13 07 EasyAce	CUBEH1307	R-410A
ECO 13 07 EasyAce	ECO1307	R-410A
ECO 17 07 EasyAce	ECO1707	R-410A
ECO 21 07 EasyAce	ECO2107	R-410A

1.2 Instructions and diagrams

Document	Designation (item code)
CUBE and ECO Installation and commissioning manual	M8006 (34793608*) This manual
CUBE and ECO Electric diagram	110974 (34793610)
ECO Piping diagram	(34793609)
CUBE Piping diagram	(34793607)
Heat pump quick guide	M8007 (34793602*)
Heat pump user manual	M8004 (34793603*)

*Finnish version only.

1.3 Safety notice and warnings

Read these instructions carefully before installation, commissioning, operation, or maintenance of the device. The given instructions must be followed. Throughout this manual, the following symbols are used to point out very important information:

Use special caution. The DANGER symbol indicates an immediate hazard that will result in serious injury or death.

Use special caution. The WARNING symbol indicates a hazard that may result in serious injury or death.

Use caution. The CAUTION symbol indicates a hazard that may result in an injury.

Pay attention. The NOTICE symbol indicates a risk of damage to the equipment, components, or surroundings.

The ‘i’ (info) symbol indicates important information as well as useful tips and hints.

Keep these instructions as well as the electrical diagrams available near the device.

Only trained personnel may service the heat pump’s refrigerant circuit, adhering to all local regulations and requirements.

Wear proper personal protective equipment, such as protective footwear, gloves, and safety goggles when necessary.

Electrical safety

Once powered on, some of the unit’s components carry a hazardous voltage. Always pay attention to electrical safety when working with or near electrical components.

Before any maintenance or servicing, switch off electricity using the main switch and ensure that there is no voltage present in the unit’s components.

Refrigerant

Refrigerant leaking from an open or broken circuit may cause asphyxiation, severe frost damage, arrhythmia, or neurological symptoms. If you suspect a refrigerant leak, leave the area immediately, and seek fresh air. Help and warn others.

The unit includes a hermetically sealed refrigerant circuit filled with refrigerant R-410A. Refrigerant R-410A is a mixture of two refrigerants: HFC-32 (R-32, difluoromethane) and HFC-125 (R-125, pentafluoroethane).

Refrigerant R-410A is a fluorinated greenhouse gas and, consequently, subject to the EU F-gas Regulation. Please recover the refrigerant as required by law, and transfer the refrigerant for recycling or disposal as required by applicable laws, rules and regulations.

The refrigerant is heavier than air. The refrigerant may accumulate in enclosed spaces, especially at or below the floor level (for example, in basements). Ventilate the spaces by opening the space's doors and windows from the outside. Use fans, if necessary. Do not enter any space where you suspect there to be leaked refrigerant present.

Safety devices

Do not bypass, disable, or damage any of the unit's pressure switches or other safeguards with tools, by accessing the system's software, or by any other means.

Bypassing the unit's safeguards may lead to equipment failure, damage to property or injury to people.

Lifting and handling

The weight of the unit presents a crush hazard. Use safe work methods when lifting and handling the unit.

During lifting, do not walk or work under the heat pump or any other suspended load.

Do not lift or move the unit with the domestic hot water tank filled.

Tablet

NOTICE

Use the tablet provided with the unit only for operating the heat pump.

Using the tablet for any other purpose may cause slowdowns or interference in the use of the unit's automation system, or prevent the system from being used altogether.

Other considerations

To avoid slipping, keep floor surfaces dry, and seal off or report any leaks that you detect.

NOTICE

Check the tightness of pipe connections. The connections may become loose during transit.

1.4 Decommissioning

Heat pump systems must be decommissioned in accordance with applicable laws and regulations. Heat pumps include materials and substances that require special care, including:

- Refrigerant
- Oil
- Electrical components
- Other materials

The specific considerations for each substance or material are described in the following sub-sections.

Refrigerant

At the end of life, recover the refrigerant and send it for disposal. See section *Disposal of refrigerant*.

Oil

Waste oil should be delivered to a service provider with the means for processing such materials in accordance with laws and regulations. Use appropriate precautions to prevent the oil for leaking or ending up in the environment.

Electrical components

Heat pumps include a wide range of electrical components, such as digital devices, electric circuits, and sensors. Any such items should be handled and disposed of as

indicated in the instructions given by their manufacturer or in accordance with local laws and regulations.

Other materials

In addition to the above, heat pumps have several components that are made of metals and plastics. If possible, any such components should be recycled, and if recycling is not an option, disposed of in accordance with local laws and regulations.

1.5 Disposal of refrigerant

The refrigerant used in the heat pump may be charged or recovered by qualified personnel only.

Before disposal of refrigerant, determine the refrigerant type and consult the refrigerant's Material Safety Data Sheet for safety information.

Refrigerant	Details
R410A	Mixture of difluoromethane and pentafluoroethane

Refrigerants should be recycled, or disposed if recycling is not possible, by a service provider duly authorized to do so pursuant to local laws and regulations. Certain refrigerants have a high global warming potential (GWP) if released into the atmosphere.

1.6 Transportation and storage

Storage

Store the unit upright in a warm, dry place. Protect the device against water and dust. Do not stack goods on the unit.

Transportation

Transport the unit upright and protected against water and dust. Do not stack goods on the unit. Use only safe lifting and handling methods when moving or lifting the unit. After lifting, lower the unit carefully down onto the floor. Hard impacts can cause equipment damage.

The compressor unit can be tilted up to 45 degrees from horizontal.

If the unit is tilted beyond 45 degrees, the compressor may not receive proper lubrication at startup. As a result, the compressor may become damaged.

- If the unit has been accidentally tilted beyond 45 degrees, leave the unit in vertical position for at least three hours before starting the compressor.

Lifting units equipped with a built-in DHW tank

WARNING

Do not lift or move the unit with the domestic hot water tank filled.

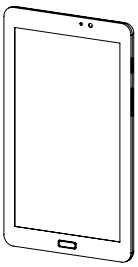
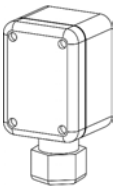
NOTICE

Do not lift the heat pump from the bottom of the compressor unit. Lift the unit by the frame.

- The unit's exterior panels may be removed to make it easier to carry and move the unit.
- The unit can be carried short distances by the side bars.
- If necessary, the compressor unit can be detached from the frame of the heat pump before carrying or tilting the unit.
- If you need to tilt the heat pump beyond 45 degrees, remove the compressor unit.

1.7 Scope of delivery

Equipment and components

Item	PCS	Item code	Description
Installation and commissioning manual	1	34793608*	This manual
Operation manual	1	34793603*	M8004
Quick guide	1	34793602*	M8007
Electrical drawing	1	34793610	Diagram 110974
PI diagrams	1	CUBE: 34793607 ECO: 34793609	EasyAce PI diagrams
Tablet	1	378810400	 For using the heat pump's EasyAce control app
Outdoor temperature sensor TE0	1	36217543	 Connect to cable TE01–W1

Item	PCS	Item code	Description
Teflon gasket, 1"	CUBE: 2 ECO: 4	34797278	 Install between the heat pump's brine hoses and shut-off valves
Shut-off valve, 1"	4	34033361	 For the heat pump's brine and heating connections
Compressor fitting, 28 mm x 1"	Cube Inverter+: 2	34245086	 CUBE: Install the parts in heating connections.
Brine pump (evaporator pump) P101	ECO 17, 21: 1	34023075	Wilo Stratos Para 25/1-12 0–10 V
Domestic hot water tank temperature TE265	ECO: 1	36217266	Already connected to switchgear
Buffer tank temperature TE255	ECO: 1	36217266	Already connected to switchgear • Replaces the condenser in sensor (TE201).
Heating circuit 1 flow temperature TE212	ECO: 1	36217266	Already connected to switchgear
Torx T25 key	1	34798044	

*Finnish version only.

Sensors and actuators

Position	Description	CUBE	ECO
BRINE CIRCUIT			
TE101	Brine inlet temperature (evaporator in)	S	S
TE102	Brine outlet temperature (evaporator out)	S	S
P101	Brine pump (evaporator pump)	S	S
HEATING			
TE201	Heating return temperature (condenser in)	S	OC
1TE202, 2TE202…	Heating supply temperature (condenser out)	S	S
P201	Heating pump (condenser pump)	S	S
EB203	Electric in-line heater	S	O

Position	Description	CUBE	ECO
TE255	Space heating buffer tank temperature	O	S
TE265	Domestic hot water tank temperature	S	S
FV202	Change-over valve (space heating/ DHW heating)	S	O
TE0	Outdoor temperature	S	S
INTEGRATED DHW TANK		S	–
HEATING CIRCUIT 1			
TE212	Heating circuit 1 supply temperature	O	O
P211	Heating circuit 1 pump	O	O
FV212	Heating circuit 1 mixing valve	O	O
TE213	Room temperature 1	OC	OC
HEATING CIRCUIT 2			
TE222	Heating circuit 2 supply temperature	OC	OC
P221	Heating circuit 2 pump	OC	OC
FV222	Heating circuit 2 mixing valve	OC	OC
TE233	Room temperature 2	OC	OC
HEATING CIRCUIT 3			
TE232	Heating circuit 3 supply temperature	OC	OC
P231	Heating circuit 3 pump	OC	OC
FV232	Heating circuit 3 mixing valve	OC	OC
TE223	Room temperature 3	OC	OC
REFRIGERANT CIRCUIT			
PS1	Low pressure switch	S	S
EXV1	Expansion valve, evaporator	S	S
COMP1	Compressor	S	S
TE2	Discharge temperature	S	S
PS2	High pressure switch	S	S
PT2	Condenser pressure	–	–
Remote connection device			
EasyAce Hub	Remote connection device	S	S
Bus			

Position	Description	CUBE	ECO
Modbus RTU		S	S
Modbus TCP/IP		S	S

S: Standard equipment
O: Optional accessory, can be connected to the heat pump's automation system and enabled without additional equipment.
OC: Optional equipment that requires an auxiliary controller (available as an option).

1.8 Accessories

For a full list of available accessories, please refer to brochures and price lists. Storage tanks are presented in a separate storage tank brochure.

Accessories

Accessory	Auxiliary controller with enclosure
Item code	32586192
Description	An enclosure containing an auxiliary controller for regulating heating circuit 2 and 3 or increasing the number of I/O slots for different functions. Installed on top of the heat pump unit (ECO) or in the upper part of the heat pump frame (CUBE). 24 V input from the heat pump, 230 V input from the building's distribution board.
Documents	Electric diagram: 34793611 (110992), manual 34793612

Accessory	Temperature sensor NTC10k 5 m
Item code	36217266
Description	Sensor with flexible cable (length: 5 m), metallic probe (diameter: 6 mm, length: 50 mm), 1xNTC 10 kOhm, 2 wires, B(25/85)=3976, $t_{0.9}$7 s
Intended use	Buffer tank temperature TE255 Heating circuit flow temperature TE212, TE222, TE232 • Buffer tank temperature • DHW tank temperature • Heating circuit supply temperature

Accessory	Sensor pocket 6x200 G1/2
Item code	34021268
Description	For 6 mm sensor probes, with cable gland, depth: 200 mm, G1/2" outer thread, brass
Intended use	Sensor pocket for buffer tanks and heating circuits
Compatible equipment	36217266

Accessory	Heating circuit control valve actuator, 3-point, 230 V
Item code	36962089
Description	Esbe ARA651 12101200, 3-point SPDT, 230 V, 3 wires, 60 s 90°
Valve	34034065, 34034067, 34034068, 34034467

Accessory	Heating circuit control valve actuator, 0–10 V 24 V
Item code	36962220
Description	Esbe ARA639 12520100 (12520117 OEM), 0–10 V, 4–20 mA, 24 V AC/DC, 3 wires, 15/30/60/120 s 90°, pre-set to 60 s (DIP switch 2 ON), pre-set to OPEN (with increasing signal) counterclockwise CCW (DIP switch 6 ON)
Valve	1154330, 1154332, 1154334

Accessory	3-way control valve for heating circuit, DN 20-6.3
Item code	34034068
Description	Esbe VRG131 11600900, DN20, Kvs 6.3, Rp 3/4"
Actuator	36962089, 36962220

Accessory	3-way control valve for heating circuit, DN25-10
Item code	34034065
Description	Esbe VRG131 11601100, DN25, Kvs 10, Rp 1"
Actuator	36962089, 36962220

Accessory	3-way control valve for heating circuit, DN25-6.3
Item code	34034067
Description	Esbe VRG131 11601100, DN25, Kvs 6.3, Rp 1"
Actuator	36962089, 36962220

Accessory	3-way control valve for heating circuit, DN20-4
Item code	34034467
Description	Esbe VRG133 11602900, DN20, Kvs 4, 22 mm crimped connection
Actuator	36962089, 36962220

Accessory	Change-over valve kit, 28 mm
Item code	GEOEXCV1
Description	Includes a change-over valve and valve actuator (item code: 34034063 and 34034064).

Accessory	Change-over valve, 28 mm
Item code	34034063
Description	LK 525 MultiZone 3V 0661109, 28 mm compression fitting, Kvs 8, B: space heating; A: domestic hot water heating
Actuator	34034064

Accessory	Change-over valve actuator, 28 mm
Item code	34034064
Description	LK EMV 110-K 066062, SPST, 230 V, 3 m. Not energized: B (space heating); energized: A (domestic hot water heating).
Valve	34034063

Accessory	Thermostatic mixing valve assembly
Item code	34034069
Description	Thermostatic mixing valve for domestic hot water LK 545-22 AquaMix 090195; domestic cold water inlet, shut-off and non-return valve LK 508 AquaNode 22 090025; fill valve LK 536 ThermoFill EA EN 1717; safety valve LK 514 MultiSafe 090116 10 bar
Intended use	Thermostatic mixing valve assembly with fill connection.

Accessory	In-line heater, 6 kW
Item code	37069089
Description	3 x 2 kW (230 V L–N), connection box, thermostat 25–85 °C, overheat protection 110 °C (manual reset), 28 mm steel pipes
Intended use	Electric in-line heater for installation in a heat pump's condenser line. Option for ECO heat pumps.

Accessory	Heating circuit pump
Item code	34023128
Description	Grundfos UPM3 AUTO 25–70 130 12h
Cable	1150078

Accessory	Supply cable for Grundfos UMP3
Item code	1150078
Compatible equipment	34023128

2 Installation

2.1 Installation site

Site planning and selection

- Install the unit and the associated equipment in a warm, dry place.
- The installation site's ambient temperature must be within +5...+40 °C (non-condensing).
- No condensate should accumulate onto the unit's components from ambient air (non-condensing atmosphere).
- The air at the installation site should be free of harmful quantities of dust or other substances that may influence the heat pump's performance, durability, or safety.

Unit base and leveling feet

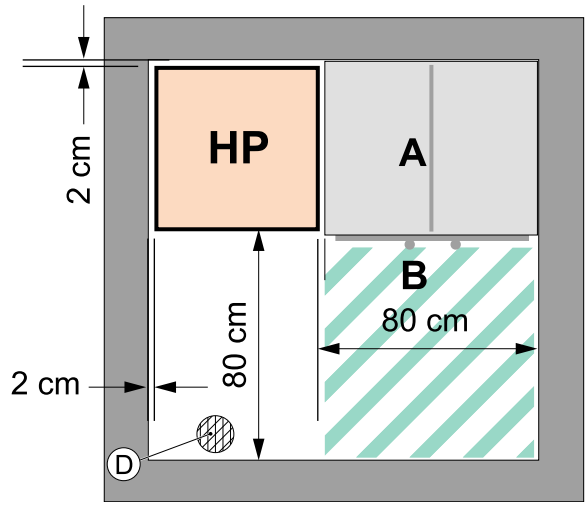
Place the unit on a stable, steady base that can carry its entire weight. Mount the unit securely in a vertical position onto its own leveling feet. Level the machine using the machine's leveling feet.

Maintenance and access clearance

Install shut-off valves that allow the unit to be isolated from the brine circuit, heating circuit, and the domestic water system.

Leave a sufficient clearance on all sides or ensure that the heat pump or that the compressor unit can be detached. Once detached, the compressor unit can be moved to a location that has enough space for servicing.

- Leave at least 80 cm of space in front of the unit.
- Leave at least 2 cm of space between the unit and any surrounding walls.



Access clearance ver. 2

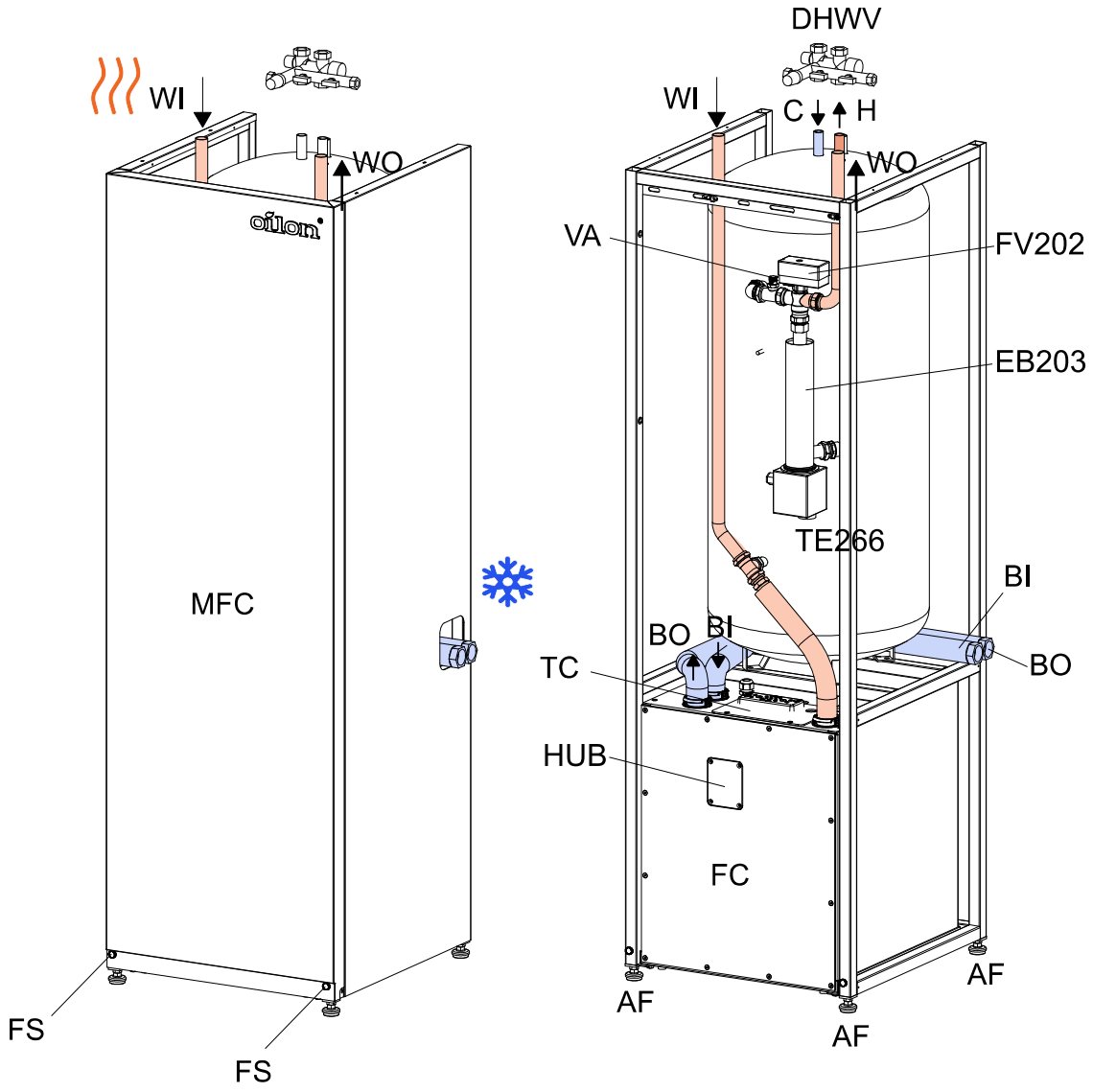
Pos.	Item
HP	Heat pump
A	Cupboard, appliance, storage tank, or other object
B	Space reserved for working on the compressor unit
D	Floor drain

Floor drain

The unit's installation site must have a floor drain. The site's floor should be inclined so that any runoff from the unit leads towards the drain.

2.2 Dimensions, connections, and components

Components, CUBE

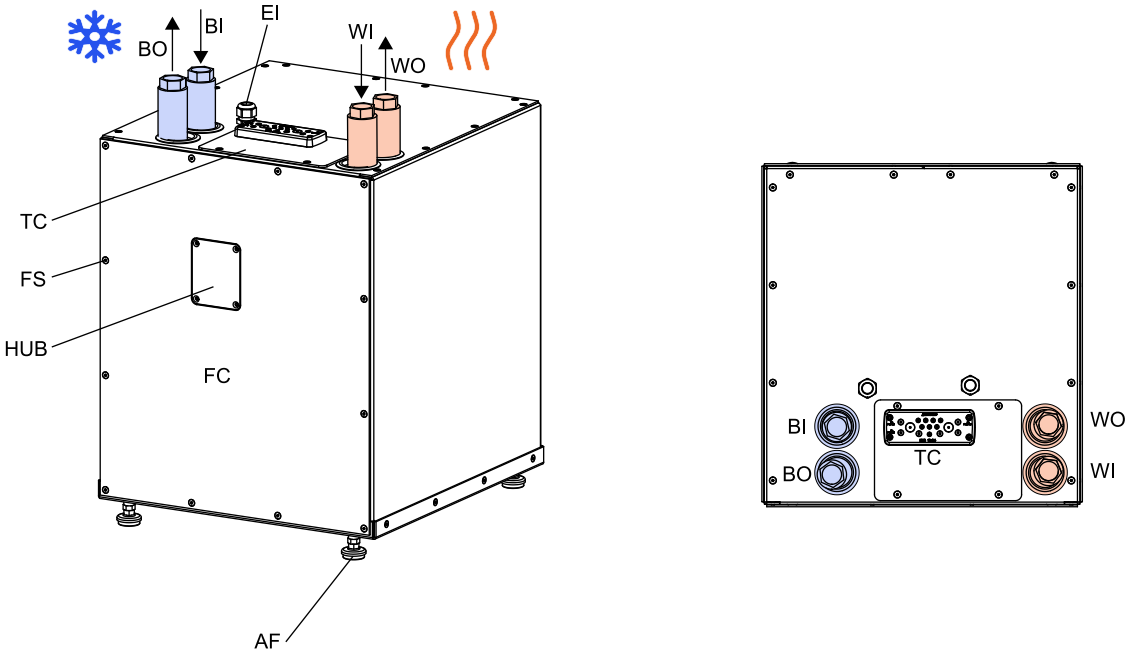


CUBE 6-13 main parts ver. 3

Pos.	Item	Description
H	Domestic hot water from storage tank	22 mm steel pipe
C	Cold domestic water to storage tank	
WI	Heating water inlet (return)	28 mm copper pipe
WO	Heating water outlet (flow)	
BI	Brine circuit in	1" inner thread and flat gasket
BO	Brine circuit out	
TE266	Domestic hot water sensor	

Pos.	Item	Description
DHWV	Thermostatic mixing valve assembly with safety valve (optional accessory)	Oilon designation: 34034069
AF	Adjustable feet	M10, DIN/ISO 17/16 mm
MFC	Front panel	
FS	Front panel mounting screws	Thumbscrews
TC	Switchboard cover panel (Torx T25)	The unit's fuses and a number of terminal blocks are located behind this cover.
FC	Compressor unit front panel (Torx T25)	The unit's switchboard is located behind this cover.
HUB	Connection device for EasyAce	Behind a transparent panel (Torx T25)

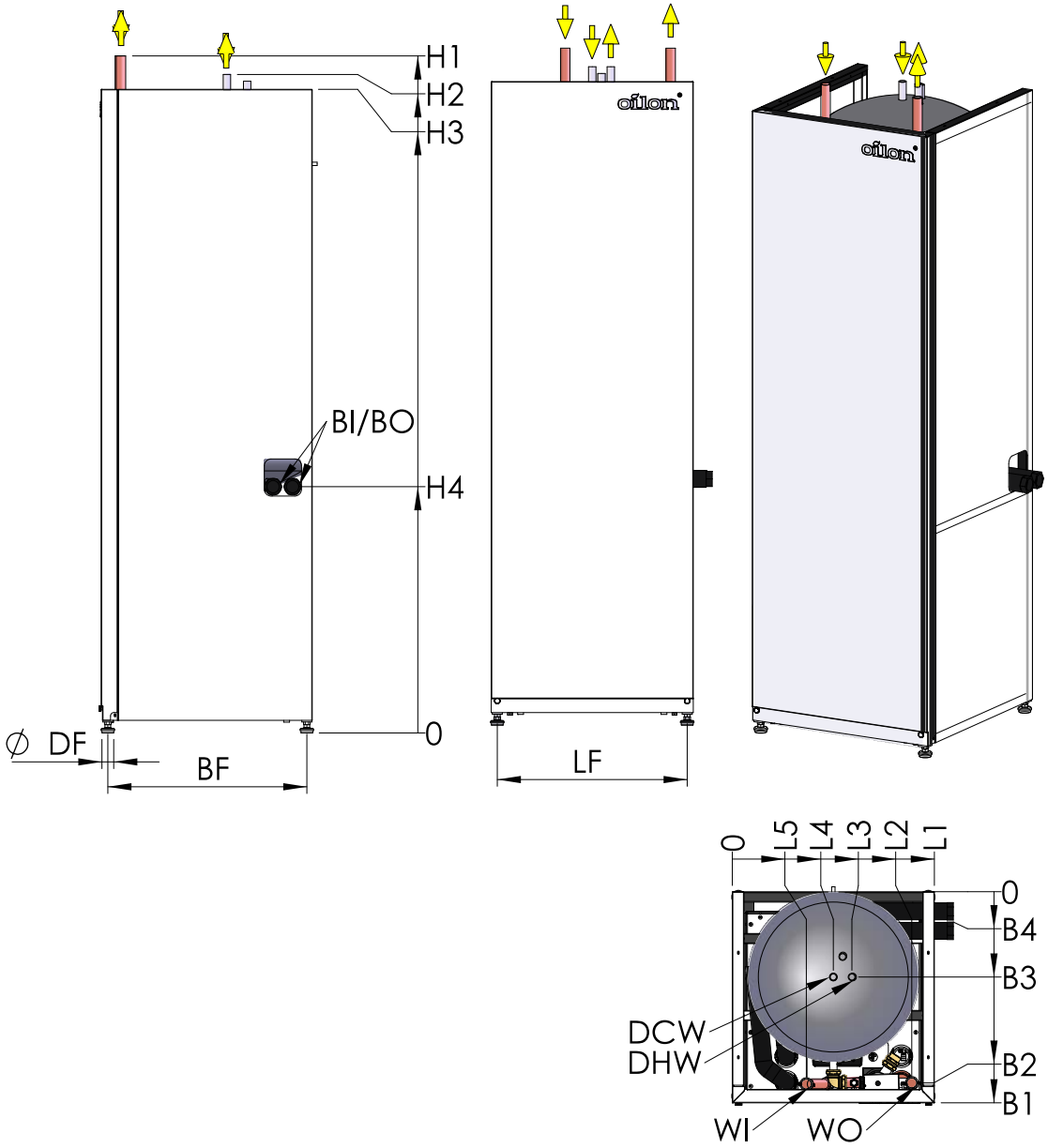
Components, ECO



ECO 6-21 main parts ver. 4

Pos.	Item	Description
WI	Heating water inlet (return)	1" inner thread and flat gasket
WO	Heating water outlet (flow)	
BI	Brine circuit in	
BO	Brine circuit out	
AF	Adjustable feet	M10, DIN/ISO 17/16 mm
TC	Switchboard cover (Torx T25)	The unit's fuses and some of its terminal blocks are located under this cover.
FC	Compressor unit front panel (Torx T25)	The unit's switchboard is located behind this cover.
HUB	Connection device for EasyAce	Behind a transparent panel (Torx T25)

Dimensions, CUBE

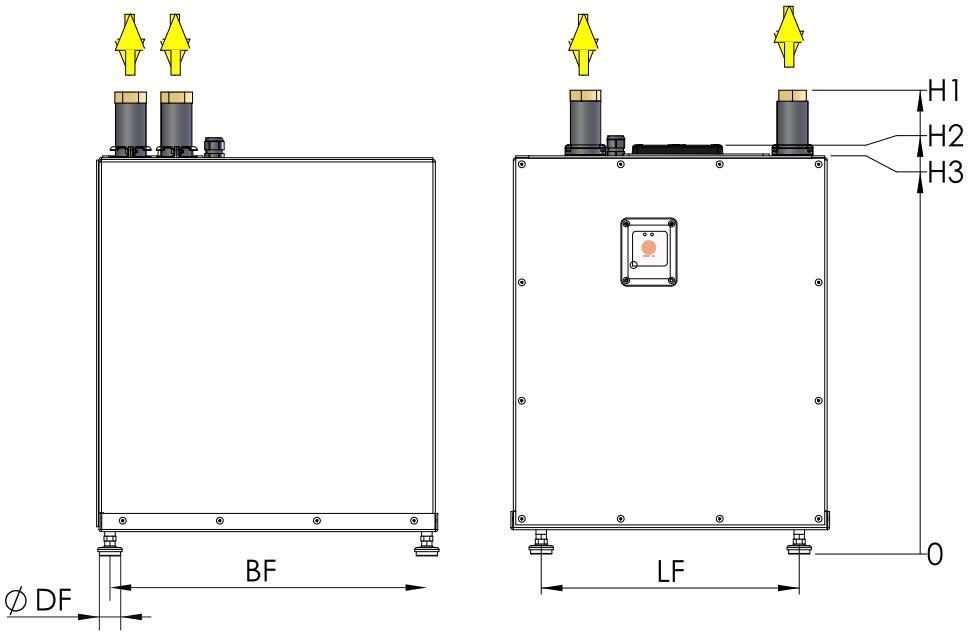


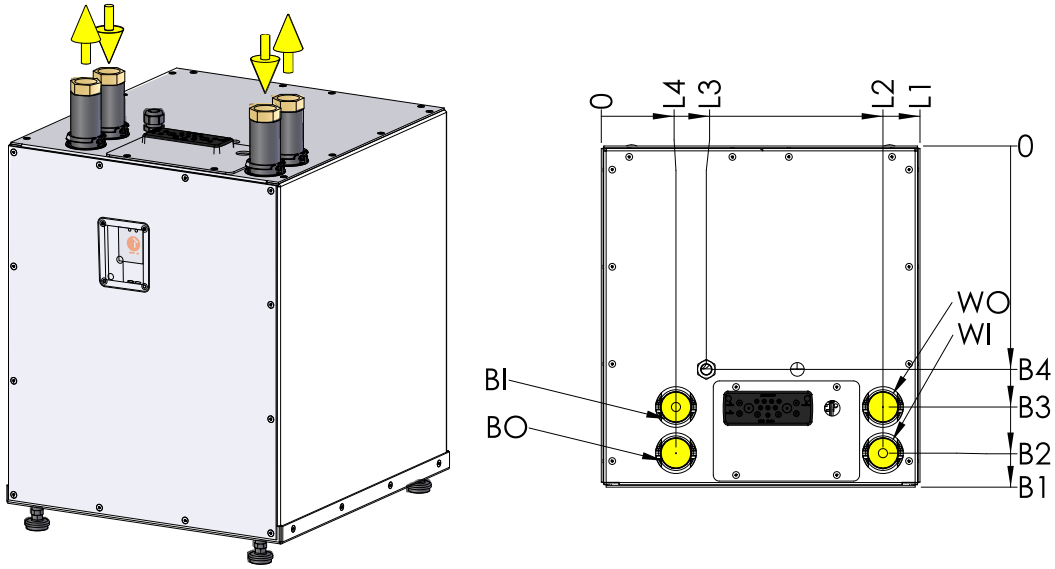
D084066 CUBE 6-13 ver. 2

Heat pump	L1	L2	L3	L4	L5	H1	H2	H3	H4	B1
CUBE 6–13	599	532	355	300	219	2010	1952	1910	726	626

Heat pump	B2	B3	B4	BI/BO	Ø DHW/ DCW	Ø WI/WO	LF	BF	Ø DF
CUBE 6–13	567	253	90	ISO 228/1-G 1	22 mm SS	28 mm Cu	563	590	35

Dimensions, ECO





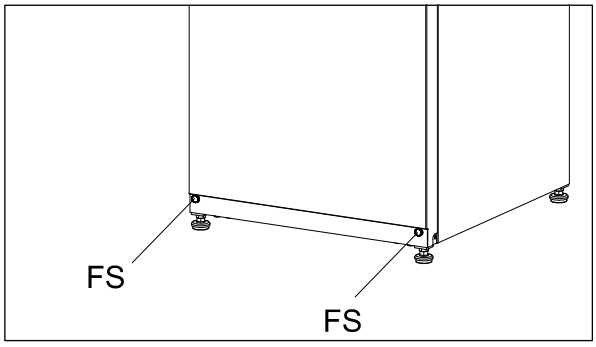
D084082 ECO 6-21 ver. 2

Heat pump	L1	L2	L3	L4	H1	H2	H3	B1	B2	B3
ECO 6-21	525	464	173	123	764	674	659	562	506	430

Heat pump	B4	BI/BO	Ø WI/WO	LF	BF	Ø DF
ECO 6-21	368	ISO 228/1-G 1	ISO 228/1-G 1	425	522	33

2.3 Electrical connections, covers, and cable management

Detaching the front panel (models with an integrated DHW tank)



1. Unscrew the fastening screws (FS) at the lower edge of the front panel (MFC).
   - The panel will hang on the top of the frame by the flange at its top edge.
2. Lift the panel upward, and pull the panel towards yourself.

Accessing electrical connections

WARNING

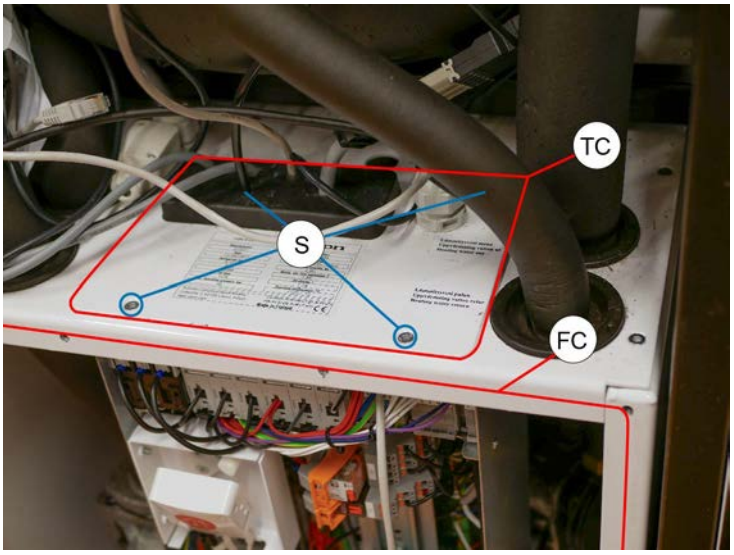
Keep the switchboard cover (TC) closed and the screws fastened at all times. Remove the cover (TC) only when performing electrical installation work or accessing fuses.

NOTICE

To avoid water damage, keep the cover closed and the screws fastened when filling or bleeding the system's circuits (brine circuit, heating circuit, or domestic water circuit).

To access the unit's switchboard, detach the cover on top of the compressor unit (TC) and the compressor unit front panel (FC).

- Most connections and the unit's fuses are under the top cover.
- See the electrical connections in the unit's electric diagrams.



Pos.	Item
TC	Top cover
FC	Front cover (removed)
S	Top cover screws, Torx T25

Compressor unit in a CUBE heat pump. The covers are in the same position in ECO heat pumps.

Cable entries

Thread the cables through the gland plate on the switchboard cover, ensuring that the glands are properly sealed.

- Ensure that no leaks or condensate can travel along cables or through or along insulation onto the switchboard behind the panel.

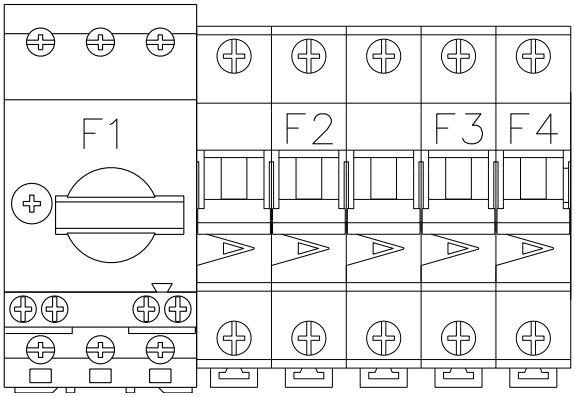
2.4 Fuses

The heat pump's fuses are under the switchboard cover (TC) on top of the compressor unit.

In CUBE heat pumps, remove the front panel of the heat pump.

1. Unscrew the fastening screws (FS) at the lower edge of the front panel (MFC). The panel will hang on the top of the frame by the flange at its top edge.
2. Lift the panel upward, and pull the panel towards yourself.

To check the fuses, remove the top cover (TC) fastening screws (Torx T25, 4 pcs.), and open the top cover.



Fuses (ECO, CUBE)

Marking	Function	ECO		CUBE	
		Default	Upon delivery	Default	Upon delivery
F1	Compressor's motor protection circuit breaker	ON	ON	ON	ON
F2	In-line heater fuse	N/A	OFF	ON	ON
F3	Control fuse (automation system fuse)	ON	ON	ON	ON
F4	Fuse shared by the unit's pumps	ON	ON	ON	ON

2.5 Outdoor temperature sensor

The outdoor temperature sensor (TE0) is supplied already connected to its sensor cable (TE0–W1). Install the sensor during the heat pump's installation.

Extend the cable if necessary.

- Use a regular insulated copper twin cable for connecting the cable and extending the cable.
- Select the cross-sectional area of the wires by consulting the table below.
- Join or splice the cable ends in a way that causes no additional electrical resistance in the wires. Protect the joint against moisture and oxidation.

Cable length (m)	40	60	80	120
Wire cross-sectional area (mm^2)	0.50	0.75	1.0	1.5

Outdoor installation

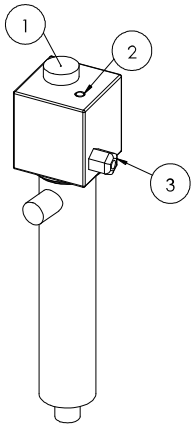
Install the sensor outside the building with the sensor cable gland pointing downwards.

- Place the sensor in a position where the prevailing outdoor temperature can be measured as accurately as possible.
- Make sure that the sensor is not exposed to solar radiation or heat from the building.

Even though the sensor housing is protected against dust and water spray (IP65, provided that the cable gland is pointed downwards), it is advisable to install the unit in a location that is covered from rain. A good place for the sensor would be, for example, under the eaves in a shady spot on the north wall of the building.

The type of the outdoor sensor is NTC 10 kΩ. The sensor's β value is 3,435 K. Any corresponding 10 kΩ NTC sensor can be used as an alternative. The sensor's β value can be changed from the unit's automation settings.

2.6 In-line heater (CUBE, ECO)



Pos.	Item
1	Thermostat
2	Overheat protection reset
3	Power connection

In-line heater

CUBE heat pumps are equipped with an in-line heater in the condenser line (label: EB203). In ECO models, the in-line heater is optional.

The electric immersion heater cartridge contains three 2-kW heating elements. The combined power rating for the heating elements is 6 kW. The heating elements are controlled in three stages. Stage 1 is connected to contactor K2. Its capacity is 2 kW.

Stage 2 is connected to contactor K3. Its capacity is 4 kW. When the third stage is active, stages 1 and 2 are energized simultaneously.

Setup (CUBE)

Reset the in-line heater's overheat protection device during installation. The device may be triggered by impacts or vibration during transport.

Installation (ECO)

Enable the heater from **Initial setup** settings (see chapter *Commissioning*).

The switchboards in ECO heat pumps have the electrical equipment necessary for connecting an additional in-line heater (EB203), which is available as an optional accessory.

1. Connect the heater to the switchboard as indicated in the unit's electrical diagram.
2. Install the heater in the heating water flow line (from the condenser) as indicated in the piping diagram.
3. Set the heater's internal thermostat to its highest setting (85 °C).
4. Reset the heater's overheat protection during installation.

The heater has either 28 mm stainless steel pipes or 1" threaded connections.

1. Before tightening any compression fittings, lubricate the inner surface of the ferrule.
2. Mount the fitting into position.
3. Tighten the fitting with your fingers until it is as tight as you can get it, then tighten another 1/2 turns with a wrench.
4. Check the connection for leaks.

If the heater has been installed and enabled in the automation system, the standard position for fuse F2 is ON. If the heater has not been installed, the fuse's standard position is OFF.

If an in-line heater has been installed and it needs to be disabled, disable the heater from the heat pump's settings. If an in-line heater has been installed and enabled in the settings, do not set the heater's fuse to the OFF position, unless there is a fault in the heater.

In units that come with the in-line heater preinstalled, the heater's internal thermostat should not be adjusted. The thermostat has been set to its highest setting (approximately 85 °C) at the factory. If you have accidentally turned the thermostat knob, turn the knob back to its highest setting. The thermostat will shut off power to the immersion heater only if there is a malfunction in the heat pump's automation system.

Overheat protection

The in-line heater is equipped with an internal overheat protection device. The device shuts the heater's power off when the internal temperature of the immersion heater cartridge exceeds 110 °C.

If the device is tripped:

1. Determine what caused the device to trip and address the issue.
    - The device may have tripped due to vibration during transport or relocation.

2. Remove the transparent plastic lid from top of the connection box (pos. 2). Use a slot-head screwdriver.
3. Press the reset button under the lid.

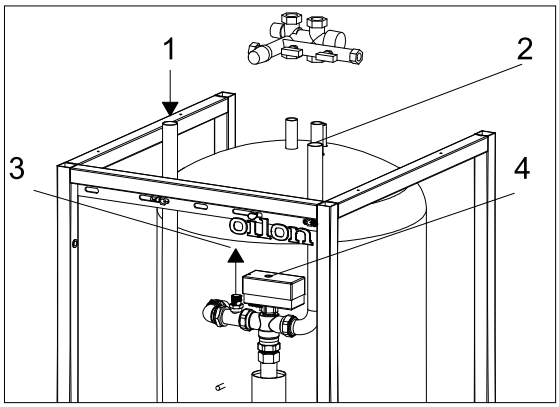
2.7 Bleeding the domestic hot water coil (CUBE)

When the unit is shipped from the factory, the change-over valve is set to position B. The valve is also in position B whenever domestic water is not being heated.

- If necessary, change the valve operation using the automation system's manual operation function.
- Alternatively, detach the valve actuator and carefully turn the valve shaft with a small wrench or similar tool.

Bleed the unit's internal coil carefully during installation.

- Set the change-over valve in position B, and close the flow line shut-off valve.
- Draw water through the return line and let the air out through the bleed screw. This way, the water flows only through the coil and into the bleed valve.



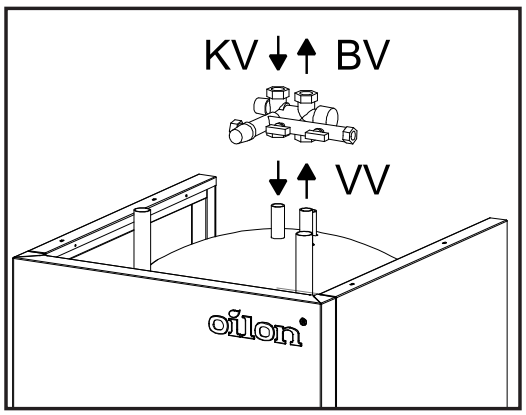
Bleeding DHW coil (EasyAce) ver. 2

Pos.	Item
1	Water to return line
2	Flow line shut-off valve closed
3	Air out
4	Change-over valve in position B

2.8 Thermostatic mixing valve assembly (CUBE, optional)

Accessory	Thermostatic mixing valve assembly
Item code	34034069
Description	Thermostatic mixing valve for domestic hot water LK 545-22 AquaMix 090195; domestic cold water inlet, shut-off and non-return valve LK 508 AquaNode 22 090025; fill valve LK 536 ThermoFill EA EN 1717; safety valve LK 514 MultiSafe 090116 10 bar
Intended use	Thermostatic mixing valve assembly with fill connection.

The thermostatic mixing valve assembly is an optional accessory for CUBE heat pumps. Install the assembly to the connections in the domestic hot water tank as shown in the image. Note the texts and directional arrows in the valve ports.



Mixing valve assembly installation ver. 1

Pos.	Item
KV	Cold water to the DHW tank
VV	Hot water from the DHW tank to the valve
BV	Domestic hot water from the valve to the DHW system

DHW tank connections

The domestic hot water tank has 22 mm stainless steel fittings for the valve assembly. The valve assembly has 22 mm brass compression fittings.

1. Lubricate the inner surface of each ferrule before installation.
2. Mount the valve assembly into position.
3. Tighten the fittings with your fingers until they are as tight as you can get them, then tighten another 3/4 of a turn with a wrench.

Pipe connections for the safety valve and the fill valve

These valves in the valve assembly have 15 mm brass compression fittings. Lubricate the inner surface of each ferrule before installation.

1. Mount the valve assembly into position.
2. Tighten the fittings with your fingers until they are as tight as you can get them, then tighten with a wrench.

Tighten copper pipe joints 1 1/4 turns and steel pipe joints 3/4 of a turn. Use pipe support sleeves in soft and half-hard copper pipes. Tighten plastic pipes using pipe support sleeves as indicated in the manufacturer’s instructions. As a general rule, plastic pipes should be tightened 1 1/4 turns.

Thermostatic mixing valve LK 545 for domestic hot water

Domestic hot water temperature can be adjusted between +38 and +65 °C. Increase the temperature by turning the knob counterclockwise (+). In most cases, it is advisable to set the valve to its highest temperature setting; this way, the valve will limit water temperature only when it exceeds +65 °C.

Domestic cold water inlet, shut-off and non-return valve LK 508

In normal operation, the valve is fully open (knob turned all the way counterclockwise). In addition to the shut-off valve, the valve unit includes a non-return valve that prevents water from the DHW tank from flowing into the domestic cold water system (the domestic cold water supply pipe is connected to the bottom of the tank).

The valve includes a free (plugged) port for installing an anti-siphon valve.

Fill valve LK 536 EA

This valve unit contains two shut-off valves, a non-return valve, and an inspection plug. The fill valve meets EN1717 requirements.

Once the system has been filled, close both shut-off valves.

Safety valve LK 514 10 bar

Opening pressure: 10 bar. Test the valve regularly:

1. Turn the valve knob 1/4 of a turn counterclockwise, and check that water starts dripping from the valve.
2. After the check, close the valve by turning the knob another 1/4 of a turn counter-clockwise. The valve should close with a click.

Route the safety valve's discharge pipe to a floor drain or a drain pan for safe discharge, ensuring that the pipe has a continuous slope.

- The discharge pipe must be self-draining (the pipe should not be immersed in a reservoir or the floor gully or allowed to freeze)
- The discharge pipe's diameter must be equal to or larger than the safety valve's nominal diameter.

It is not allowed to place a shut-off valve that can be accidentally closed (or left closed) between the safety valve and the circuit. Correspondingly, placing a shut-off valve on the safety valve's discharge side is not allowed.

2.9 Change-over valve (ECO, optional)

The change-over valve switches heating water flow between domestic hot water heating (position A; when energized) and space heating (position B; when not energized).

Pos.	Status	Flow direction
A	Energized	Domestic hot water heating
B	Not energized	Space heating

Install the change-over valve as indicated in the electric diagram and the piping diagram.

- Lubricate the inner surface of the ferrule before installation.
- Tighten the joint with your fingers until it is as tight as you can get it, then tighten with a wrench.
- Tighten copper pipe joints 1/2 of a turn and steel pipe joints 1/2 of a turn. Use pipe support sleeves in soft and half-hard copper pipes.

- Tighten plastic pipes using pipe support sleeves as indicated in the manufacturer's instructions (typically 1 1/2 turns).

2.10 DHW tank sensor (ECO)

ECO heat pumps come with the DHW storage tank temperature sensor (TE266) already connected. The sensor cable is approximately 4.5 m long. The sensor probe's diameter is 6 mm and length 50 mm.

Install the sensor in the domestic hot water tank's sensor pocket as specified in the piping diagram.

- If a dedicated tank is used, install the sensor in the lower section of the tank.
- If a combined storage tank is used, install the sensor in the upper section of the tank.
- Install the sensor probe (supplied with the unit) into a sensor pocket designed for 6 mm probes. The sensor pocket needs to extend into the interior of the tank by at least 150 mm.

Install the sensor in a way that allows it to measure the temperature of the fluid in the storage tank as accurately as possible. The sensor pocket needs to extend far enough into the interior of the tank, and the sensor pocket's internal diameter must be suitable for the sensor probe's diameter.

- Use only metallic sensor pockets that won't corrode to any significant degree (from the outside or the inside) over time.
- The air gap between the probe and the pocket wall should be as small as possible. If necessary, use thermal paste between the sensor probe and the pocket walls.
- To ensure that the sensor probe remains firmly seated at the bottom of the sensor pocket, secure the sensor cable with a cable gland.

The cable can be extended if required. Use a regular insulated copper twin cable for connecting the cable and extending the cable (0.5 mm^2, length < 40 m).

- Join or splice the cable ends in a way that causes no additional electrical resistance in the wires.
- Protect the joint against moisture and oxidation.

2.11 Pipe joints

Leaks in the brine circuit

NOTICE	Be careful not to twist or turn the unit's pipes, especially when making and disconnecting connections. This could loosen the pipe joints inside unit.

The pipe joints have 1" inner threads at the ends. Use the supplied flat gaskets to seal each joint. Equip the pipes with shut-off valves.

Ensure that in case of a brine circuit leak, no water or brine can travel along the pipes or through or along pipe insulation into the heat pump's case.

Realigning brine circuit pipe joints (models with an integrated DHW tank)

The brine circuit's piping can be realigned to a suitable direction during installation. If the pipes need to be realigned to face a new direction (for example, from left to right), straighten the original bend before making a new one. If you simply rotate or bow the pipe without making a bend, the joint at the other end of the pipe may become loose.

The minimum bend radius is 35 mm. Do not bend the pipe at the same spot more than three times.

- Start by straightening the right-facing bend.
- Create a new bend facing the desired direction.
- Do not rotate or fold the pipe without creating a new bend first, otherwise the threaded connection at the other end of the pipe may become loose.

2.12 Removing the compressor unit from the frame (CUBE)

If the heat pump has already been installed, check that its electrical supply is not live.

Be careful when moving or carrying the unit. If necessary, place lashing straps under the unit to make it easier to lift and carry.

The compressor unit can be detached for easier moving, carrying, or servicing.

Reduce the pressure of the water and brine circuits to near atmospheric pressure (gauge pressure: 0 bar). Close all external shut-off valves.

Removing covers

Remove the heat pump's front panel (MFC, fastened with thumbscrews at the bottom).

Remove the switchboard cover (TC) from top of the compressor unit. The cover is fastened with Torx T25 screws.

Open the front panel of the compressor unit (FC, fastened with Torx T25 screws).

Detaching internal connections

When unplugging connectors, grab the connector by the body, not the cable. Be careful not to pull the cables out of the connectors.

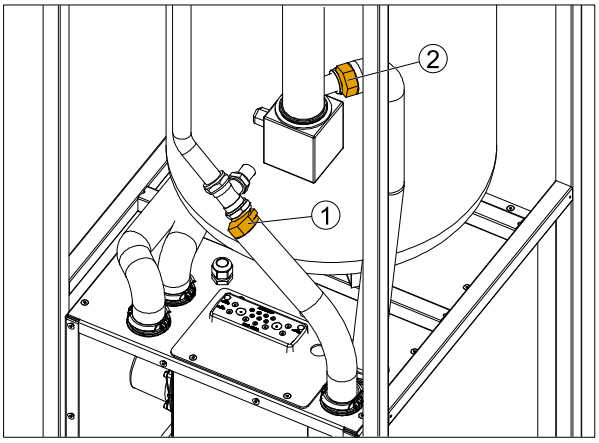
1. Disconnect the in-line heater's quick disconnect connector (EB203).
   - The connector has a locking plate that can be opened with a slot-head screwdriver.

2. Disconnect the domestic hot water sensor (TE266) from terminal block X3's terminals 1 and M. Alternatively, pull the sensor probe out of the sensor pocket in the lower section of the domestic hot water tank.
3. Remove the change-over valve's (FV202) actuator from the valve body. The actuator is held in place by a locking pin; pull the pin out.

Detaching hoses

NOTICE

Be careful not to twist or turn the unit's pipes, especially when making and disconnecting connections. This could loosen the pipe joints inside unit.



Pos.	Item
1	Heating water inlet hose connector
2	In-line heater hose connector

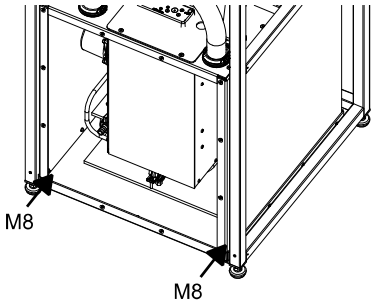
Leave the brine circuit's piping attached to the unit.

1. Detach the corrugated heating water inlet hose from its tee connector (located on the lower section of the storage tank).
2. Detach the in-line heater's (EB203) corrugated hose.

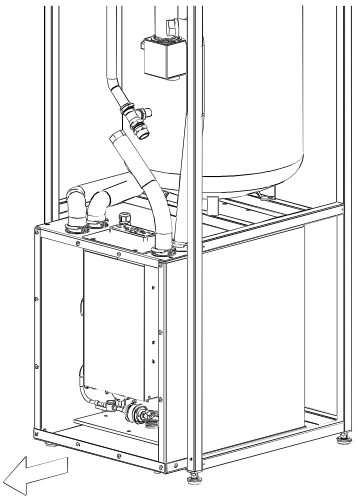
Detach the hoses by turning the freely-rotating nut while keeping the hose from rotating from the other side. Do not open the compression fitting.

Pulling the compressor unit out

Remove the compressor unit's fastening screws (M8), and pull the unit out.



M8: Compressor unit fastening screws



Re-installation

Reinstall the components and connections in reverse order. Test the flat gaskets in the water and brine connections, replace if necessary.

- Be careful when installing the domestic hot water sensor in its sensor pocket.

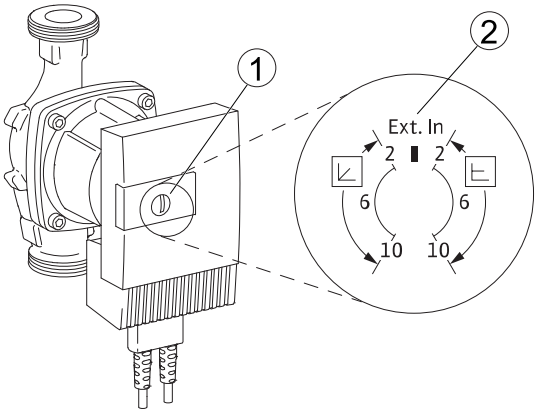
2.13 Brine pump (ECO 17, 21)

ECO 17 and 21 heat pumps have an external brine pump. Connect the brine pump as shown in the electrical diagrams and the PI diagram.

Configuration

To have the heat pump control pump speed with a 0–10 V control signal, turn the pump adjustment knob to the **Ext. In** position (middle position).

- To set the pump speed manually, turn the adjustment knob clockwise. The pump will run at the set constant pressure.



Pos.	Item
1	Adjustment knob
2	The **External in** position

3 Heating circuits

3.1 Buffer tank sensor (CUBE, ECO)

Accessory	Temperature sensor NTC10k 5 m
Item code	36217266
Description	Sensor with flexible cable (length: 5 m), metallic probe (diameter: 6 mm, length: 50 mm), 1xNTC 10 kOhm, 2 wires, B(25/85)=3976, $t_{0.9}$7 s
Intended use	Buffer tank temperature TE255 Heating circuit flow temperature TE212, TE222, TE232 • Buffer tank temperature • DHW tank temperature • Heating circuit supply temperature

Use the buffer tank temperature sensor if the heating circuit has a buffer tank regulated by the heat pump.

- ECO: the buffer tank temperature sensor (TE255) already connected to the switchboard.
- CUBE: the sensor is an optional accessory.

Sensor connections (CUBE)

The connections for the buffer tank sensor are indicated in the unit's electric diagram. To connect the buffer tank sensor:

1. Disconnect sensor TE201 from terminal block X3's terminals 2 and M.
2. Connect buffer tank sensor TE255 in terminals 2 and M (either wire in either terminal).
3. Protect the exposed wire ends of the disconnected sensor cable.

Located inside the unit, the disconnected sensor (TE201) is used to monitor the temperature of the heating water return line ('condenser in'). If there is a buffer tank in the heating circuit, the sensor is not in use.

- To enable both the buffer tank sensor (TE255) and the condenser return temperature sensor (TE201), install an auxiliary controller in the switchboard and connect the buffer tank sensor to the auxiliary controller.
- Select the terminals for the buffer tank sensor from the auxiliary controller's settings. See the instructions delivered with the auxiliary controller.

Sensor connections (ECO)

If the heating circuit has no buffer tank, disconnect the sensor from the terminal block.

Sensor installation

Install the sensor in the buffer tank as specified in the piping diagram.

- If a dedicated tank is used, install the sensor in the upper section of the tank, below the heating circuit outlets.
- If using a combined storage tank with separate sections for DHW heating and space heating, install the sensor in the lower section of the tank.

Install the sensor probe into a sensor pocket designed for 6-mm probes. The sensor pocket needs to extend into the interior of the tank by at least 150 mm. The sensor pocket is available as an accessory, see section *Accessories.*

Commissioning

See *Heating settings* in section *Commissioning*.

Considerations

Install the sensor in a way that allows it to measure the temperature of the fluid in the storage tank as accurately as possible. The sensor pocket needs to extend far enough into the interior of the tank, and the sensor pocket's internal diameter must be suitable for the sensor probe's diameter.

- Use only metallic sensor pockets that won't corrode to any significant degree (from the outside or the inside) over time.
- The air gap between the probe and the pocket wall should be as small as possible. If necessary, use thermal paste between the sensor probe and the pocket walls.
- To ensure that the sensor probe remains firmly seated at the bottom of the sensor pocket, secure the sensor cable with a cable gland.

The sensor cable is approximately 4.5 m long. The sensor probe's diameter is 6 mm and length 50 mm.

The cable can be extended if required. Use a regular insulated copper twin cable for connecting the cable and extending the cable (0.5 mm^2, length < 40 m).

- Join or splice the cable ends in a way that causes no additional electrical resistance in the wires.
- Protect the joint against moisture and oxidation.

3.2 Flow temperature sensor for heating circuit 1

ECO heat pumps come with the flow sensor for heating circuit 1 (TE212) already connected. In CUBE models, the sensor is an optional accessory.

Accessory	**Temperature sensor NTC10k 5 m**
Item code	36217266
Description	Sensor with flexible cable (length: 5 m), metallic probe (diameter: 6 mm, length: 50 mm), 1xNTC 10 kOhm, 2 wires, B(25/85)=3976, $t_{0.9}$7 s
Intended use	Buffer tank temperature TE255 Heating circuit flow temperature TE212, TE222, TE232 • Buffer tank temperature • DHW tank temperature • Heating circuit supply temperature

Connections (CUBE)

The connections for the sensor are indicated in the unit's electric diagram. Connect the sensor to terminal block X3's terminals 4 and M (either wire in either terminal).

Installation

The heating circuit 1 flow sensor (TE212) is used to control the circuit's control valve (FV222). The sensor can be installed in the heating circuit's flow line, even if there is no valve to be controlled by the heat pump; this will allow the sensor's reading to be viewed through the automation system.

- If you do not install the sensor in the flow line, disconnect the sensor's wires from the heat pump's switchboard and protect the bare wire ends.
- You can otherwise leave the sensor in place.

Install the sensor in the heating circuit flow line as indicated in the piping diagram. Place the sensor in a way that allows it to measure the temperature in the flow line as accurately as possible.

Install the sensor 0.5–2.0 m downstream from the control valve. Install the sensor preferably downstream from the circulation pump. If the sensor is too close to the valve, its readings will be inaccurate, and placing the sensor too far downstream will cause harmful control delay.

Attach the sensor to a metallic pipe surface or in a metallic sensor pocket in the pipe.

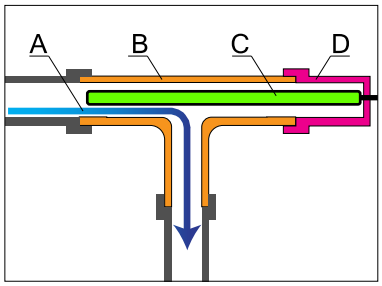
Surface installation

- Attach the sensor firmly and securely against the pipe surface along the entire length of the metal sleeve covering the sensor probe.
- Finish by adding thermal insulation to insulate the sensor from ambient air temperature.
- If necessary, use thermal paste between the sensor probe and the pipe surface.
- It is advisable to attach the sensor along the pipe surface at the 3 o'clock or 9 o'clock position.

Installation in a sensor pocket

Install the sensor in a pocket intended for 6 mm probes.

If the pipe has a small diameter, create a 90 degree turn in the line flow direction with a tee fitting. Place the sensor pocket in the outlet that is parallel to the original line. The probe itself should extend upstream from the turn. This will allow you to install even a long sensor pocket (150–200 mm) along the line. The sensor pocket is available as an accessory, see section *Accessories.*



Tee fitting with sensor pocket ver. 1

Pos.	Item
A	Flow direction
B	Tee fitting
C	Sensor probe in pocket
D	Sensor pocket connection

Using a tee connector to install a sensor pocket in a small-diameter pipe.

Sensor cable

The cable can be extended if required. Use a regular insulated copper twin cable for connecting the cable and extending the cable (0.5 mm^2, length < 40 m).

- Join or splice the cable ends in a way that causes no additional electrical resistance in the wires.
- Protect the joint against moisture and oxidation.

3.3 Heating water temperature, return to condenser (ECO)

In ECO heat pumps, the buffer tank sensor (TE255) and the heating water return sensor (TE201) share the same sensor input (B2) and terminal on the terminal block (X3:2). Only one of the sensors can be connected to the terminal block at a time. The unit comes with the buffer tank sensor connected, which means that condenser return temperature measurement is disabled by default.

The unit has a built-in condenser return temperature sensor (TE201), but the sensor is not connected to the switchboard. The sensor can be connected to the terminals occupied by the heating circuit flow sensor (TE212) or the DHW sensor (TE266), provided that one of these is not in use. Additionally, the number of free sensor inputs can be increased by installing an auxiliary controller (available as an optional accessory).

3.4 Heating circuit’s control valve

The heat pump can control both 230-V 3–point control valves and 0–10-V (24 V) control valves. See the instructions for connecting the control valve actuator to the heat pump in the unit’s electric diagram.

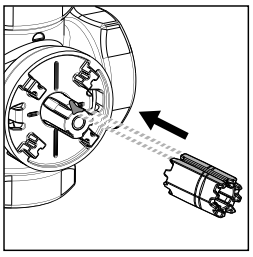
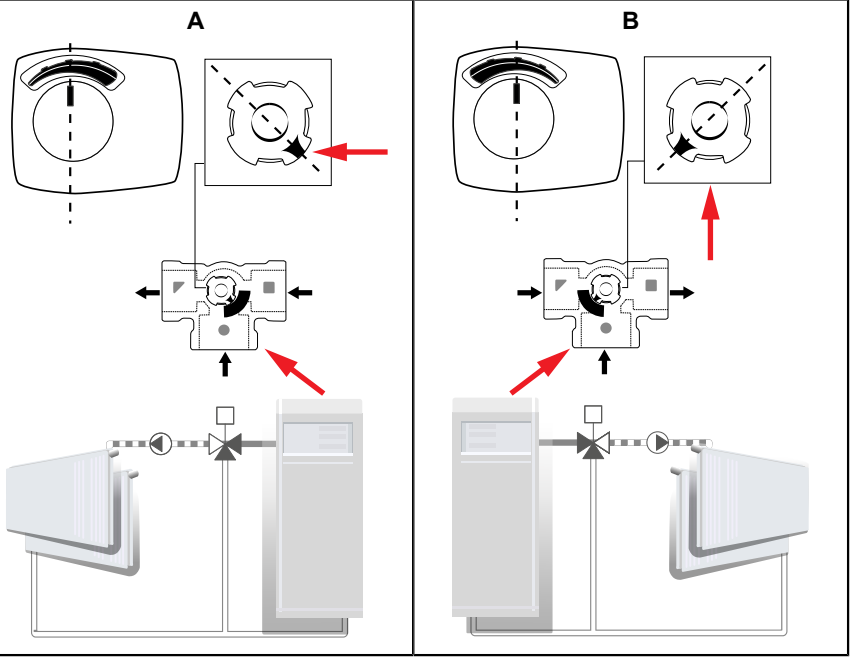
The control outputs for both valve types are enabled by default (and are simultaneously active), so there is no need to activate them. The position of the valve is indicated in the piping diagram. For the heat pump to be able to automatically regulate the valve, the heating circuit needs to be equipped with a flow temperature sensor.

Control valves are available as optional accessories (see section *Accessories*).

Valve and actuator Installation

Below is a general description of how to install an Esbe VRG130 series control valve and the associated Esbe ARA600 series actuator. Other valves are installed in a similar

way. For more detailed instructions, please refer to the guide delivered with the valve and actuator.

Align the bevel on the valve stem with the slot on the actuator shaft.	Turn the valve stem to a position corresponding to the piping connection. • Pay attention to the flow directions and the markings on the valve (triangle, circle and square). Install the scale plate at this stage as well. • Note that when installing the actuator, the actuator control knob must be in the middle position.
 ESBE valve stem ver. 2	

The installation guide delivered with the valve includes other connection options.

Enabling the control valve

Enable the valve from **Initial setup** settings (see chapter *Commissioning*) or from **Heating** settings (see the table below). Enable the valve by selecting **Valve control** as the setting for the circuit.

DEVICE SETTINGS → SERVICE → HEATING

Heating circuit 1	
Circuit in use	**No** The circuit is not in use.
	Direct connection The heat pump is connected directly to the building's heating system. The system has no circulation pump or control valve that would be controlled by the heat pump.
	Direct connection with pump (main controller) The system has a circulation pump which is controlled by the heat pump.
	3-way valve (main controller) The system has a circulation pump and a 3-way control valve, both of which are controlled by the heat pump.

Inverted control	**Off** 0–10 V When the heating circuit requires more heating, the level of the valve control signal is increased. • **0 V:** valve fully closed, **10 V:** valve fully open. 3–point The outputs for opening and closing the valve correspond to the default connection indicated in the electric diagram. • **Heating circuit 1:** Q8 closed, Q9 open.
	In use 0–10 V When the heating circuit requires more heating, the level of the valve control signal is reduced. • **0 V:** valve fully open, **10 V:** valve fully closed 3-point The outputs for opening and closing the valve are reversed. • **Heating circuit 1:** Q8 open, Q9: closed.

Connections for control valve actuator, 3-point

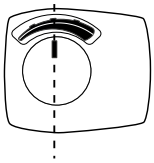
Accessory	Heating circuit control valve actuator, 3-point, 230 V
Item code	36962089
Description	Esbe ARA651 12101200, 3-point SPDT, 230 V, 3 wires, 60 s 90°
Valve	34034065, 34034067, 34034068, 34034467

When making connections, pay attention to the valve's control direction. To invert the valve's control direction, either reconnect the cables or invert the direction from settings.

Inverted control disabled

Cable	Rotation direction	Control direction	Connection
Brown	**Clockwise (CW)**	**Open (more heat)**	**X2:3 (Q8)**
Black	Counterclockwise (CCW)	Closed (less heat)	X2:4 (Q9)

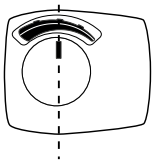
X2:3 (Q8): open



Inverted control disabled

Cable	Rotation direction	Control direction	Connection
Brown	**Clockwise (CW)**	Closed (less heat)	X2:4 (Q9)
Black	Counterclockwise (CCW)	**Open (more heat)**	**X2:3 (Q8)**

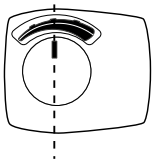
X2:3 (Q8): open



Inverted control enabled

Cable	Rotation direction	Control direction	Connection
Brown	**Clockwise (CW)**	**Open (more heat)**	**X2:4 (Q9)**
Black	Counterclockwise (CCW)	Closed (less heat)	X2:3 (Q8)

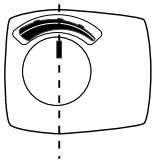
X2:4 (Q9): open



Inverted control enabled

Cable	Rotation direction	Control direction	Connection
Brown	**Clockwise (CW)**	Closed (less heat)	X2:3 (Q8)
Black	Counterclockwise (CCW)	**Open (more heat)**	**X2:4 (Q9)**

X2:4 (Q9): open



Connections for control valve actuator, 0–10 V

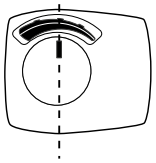
Accessory	Heating circuit control valve actuator, 0–10 V 24 V
Item code	36962220
Description	Esbe ARA639 12520100 (12520117 OEM), 0–10 V, 4–20 mA, 24 V AC/DC, 3 wires, 15/30/60/120 s 90°, pre-set to 60 s (DIP switch 2 ON), pre-set to OPEN (with increasing signal) counterclockwise CCW (DIP switch 6 ON)
Valve	1154330, 1154332, 1154334

When making connections, pay attention to the valve's control direction. To invert the valve’s control direction, either change the position of DIP switch 6 or invert the direction from settings.

Inverted control disabled, DIP switch 6 ON

Signal	Control direction	Rotation direction
Increases	Open (more heat)	Counterclockwise (CCW)
Decreases	Closed (less heat)	Clockwise (CW)

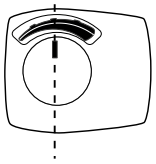
0 V closed, 10 V open



Inverted setting enabled, DIP switch 6 ON

Signal	Control direction	Rotation direction
Increases	Closed (less heat)	Counterclockwise (CCW)
Decreases	Open (more heat)	Clockwise (CW)

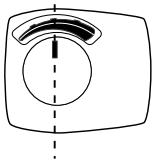
0 V open, 10 V closed



Inverted control disabled, DIP switch 6 OFF

Signal	Control direction	Rotation direction
Increases	Open (more heat)	Clockwise (CW)
Decreases	Closed (less heat)	Counterclockwise (CCW)

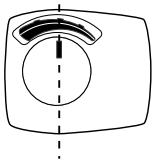
0 V closed, 10 V open



Inverted control enabled, DIP switch 6 OFF

Signal	Control direction	Rotation direction
Increases	Closed (less heat)	Clockwise (CW)
Decreases	Open (more heat)	Counterclockwise (CCW)

0 V open, 10 V closed



3.5 Condenser pump

The heat pump controls pump speed through a PWM signal. If the speed control cable has not been connected, the pump will run at full speed.

Set the speed control operating mode for the condenser pump to **Constant speed**.

- The pump will run at the speed set in the **Control high limit** parameter (factory setting: 100%).

DEVICE SETTINGS → SERVICE → PUMP → CONDENSER PUMP

Setting	Value
Mode for heating	Constant speed
Mode for hot water	Constant speed
Control high limit	Factory setting: 100%

Using temperature difference for pump speed control

Using the setting **Temperature difference** requires condenser return temperature and condenser flow temperature measurement. In standard deliveries for ECO heat pumps, condenser return temperature measurement is disabled (see *Heating water temperature, return to condenser)*. This means that **Temperature difference** control is unvailable.

- If temperature difference control is disabled, the pump will run at the speed set in the **Control high limit** parameter (Factory setting: 100%).

Setting	Value
Mode for heating	Temperature difference
Control high limit	

3.6 Heating circuit pump

The connections for the heating circuit pump are indicated in the unit's electric diagram. The location of the pump is indicated in the piping diagram.

Enable the pump from **Initial setup** settings (see chapter *Commissioning*) or from **Heating** settings (see the table below). If valve control is enabled, the pump will also be enabled automatically.

DEVICE SETTINGS → SERVICE → HEATING

Heating circuit 1	
Circuit in use	**No** The circuit is not in use.
	Direct connection The heat pump is connected directly to the building's heating system. The system has no circulation pump or control valve that would be controlled by the heat pump.
	Direct connection with pump (main controller) The system has a circulation pump which is controlled by the heat pump.

Heating circuit 1	
	3-way valve (main controller) The system has a circulation pump and a 3-way control valve, both of which are controlled by the heat pump.

The pump is available as an optional accessory.

Accessory	Heating circuit pump
Item code	34023128
Description	Grundfos UPM3 AUTO 25–70 130 12h
Cable	1150078

Accessory	Supply cable for Grundfos UMP3
Item code	1150078
Compatible equipment	34023128

Check the pump's current operating mode by pressing the pump's button briefly. To change the operating mode:

1. Press and hold the button for more than 2 seconds.
2. Scroll between operating modes by pressing the button.
3. Once you have reached the right operating mode, wait for 10 seconds, and the setting will be saved.

If you accidentally scroll past the required operating mode, press the button repeatedly until you circle around again. The button has a button lock; unlock and lock the button by pressing and holding it for 10 seconds.

The pump has several different operating modes. In most cases, it is advisable to use the constant pressure mode with AUTOADAPT function. This mode is active, when the second LED from the left is green.

Heating circuit pump operating mode ver. 1

If you do not wish to use the AUTOADAPT function, open the valves in floor heating circuits during commissioning and set the pump speed to a level that allows the flow rate in each circuit to be adjusted to a suitable level. After this, return the valves to their normal position. In radiator heating systems, remove any thermostats and set the pump speed to a level that allows the flow in each radiator to be adjusted to a suitable level. Once the adjustment is complete, reinstall the thermostats.

Constant pressure control

The pressure produced by the pump (i.e. the head of the pump) remains at a near constant level regardless of the flow (demand for heating). This control mode is suitable for systems where the bulk of the pressure loss can be attributed to the actual heating circuit or its heating emitters, and not to a shared distribution circuit. Typical examples of such systems include floor heating and radiator heating systems incorporating a manifold.

Proportional pressure control

When the flow rate (demand for heating) is reduced, the system will reduce the pressure produced by the pump (i.e. the head of the pump). This control mode is suitable for systems where most of the pressure loss can be attributed to a common trunk line (distribution line with branches) shared by two or more heating circuits.

3.7 Auxiliary controller for additional heating circuits

The circulation pump and control valve for additional heating circuits often require an auxiliary controller, see *Heating circuits 2 and 3*. The controller is available as an optional accessory.

Accessory	Auxiliary controller with enclosure
Item code	32586192
Description	An enclosure containing an auxiliary controller for regulating heating circuit 2 and 3 or increasing the number of I/O slots for different functions. Installed on top of the heat pump unit (ECO) or in the upper part of the heat pump frame (CUBE). 24 V input from the heat pump, 230 V input from the building's distribution board.
Documents	Electric diagram: 34793611 (110992), manual 34793612

The auxiliary controller is supplied with an electric diagram and the necessary installation instructions.

Install the auxiliary controller and its enclosure on top of the top cover (ECO heat pumps) or in the upper section of the frame (CUBE heat pumps).

Heating circuits 2 and 3 operate in the same way as heating circuit 1, and the available settings are identical. Once the auxiliary controller has been installed and circuits 2 and 3 have been connected, enable circuit control for these circuits from the **Initial setup** settings or **Service** settings.

Note that when connecting actuators to the auxiliary controller, the actuator for the heating circuit 2 control valve can be a 3-point or 0–10 V actuator. For heating circuit 3, only a 0–10 V actuator can be used.

4 Commissioning

4.1 General

The heat pump's automation system is operated with an app installed in a smartphone or tablet. This app is used to connect to the heat pump's built-in data hub. The unit is supplied with a wireless touch screen preinstalled with the app and with the connection already configured.

Switch on the wireless touch screen and start the commissioning process. Once the process is complete, hand the wireless touch screen over to the end customer.

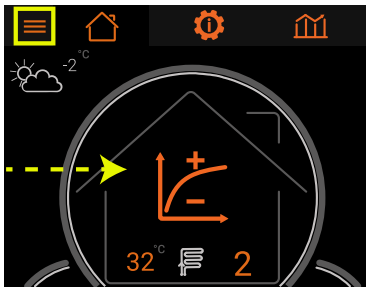
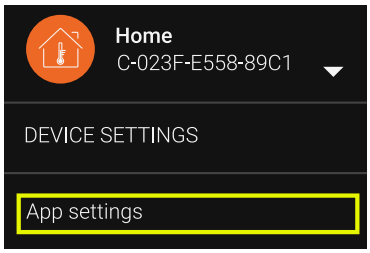
1. Switch on the wireless touch screen by pressing the power button.	2. Start the EasyAce app.
	

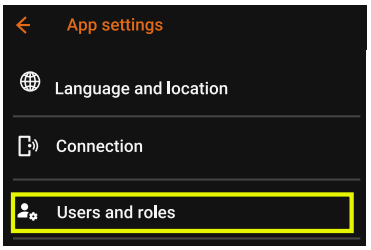
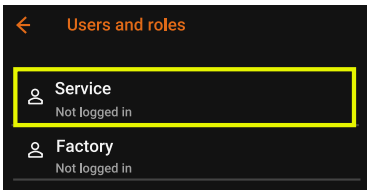
Start the commissioning process by signing in to the service level. This will give you access to the necessary settings.

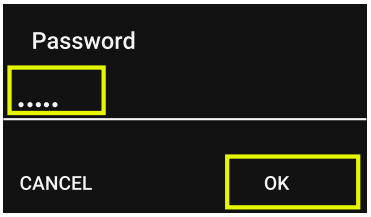
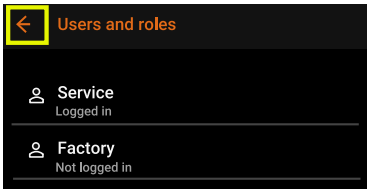
4.2 Signing in as a service level user

The Service level password is **8520**.

To gain access to all settings, sign in as a service-level user.

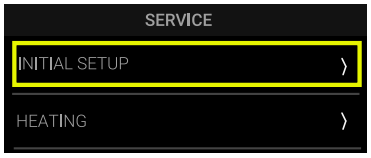
1. Open the main menu from the top left corner or by swiping right from the left edge of the screen.	**2. From the menu, select App settings.**
	

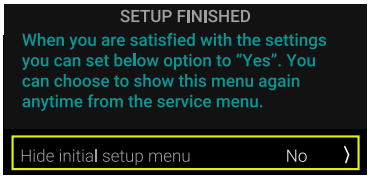
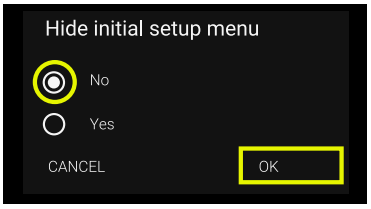
3. Select Users and roles.	4. Select Service.
	

5. Enter the password and tap OK. • The Service level password is 8520.	6. You are now signed in as a service-level user. Return from the menu by tapping the arrow in the top left corner.
	

4.3 Accessing initial setup settings

Access initial setup settings by tapping the icon with two cogwheels in the top menu row.

During first start-up, the initial setup settings icon is displayed in the top menu row.	You can also access initial setup settings from the Service settings. Device settings → Service → Initial setup
 The **Initial setup** settings menu contains the basic settings required during the commissioning process. Go through the settings during installation.	

Once the settings are complete, hide the Initial setup menu by tapping the option at the bottom of the screen.	You can choose to display this menu again anytime from the Service menu by tapping Initial setup. Device settings → Service → Initial setup
	

4.4 Clock

Clock	
If the data hub is connected to the internet, the current time is retrieved automatically. If there is no internet connection, set the time by hand.	
Time zone	The current time zone (UTC; 2 h in Finland).

4.5 Heating settings

Hot water	
Hot water heating	**In use** The heat pump is used for heating domestic hot water.

Enabling a buffer tank for the heating circuits

You can enable the buffer tank only if the buffer tank temperature sensor (TE255) has been installed (see *Buffer tank sensor* in section *Installation*).

Heating	
The **Heating buffer sensor** setting determines the heat source used by heating circuits: either the heat pump's condenser or a buffer tank. Select other circuit equipment from each circuit's settings.	
Heating buffer sensor	**Not connected** The heat pump is connected directly to the building's heating system without a buffer tank. No buffer tank sensor is connected. There can be an (unpowered) instantaneous water cylinder, but not a buffer tank regulated by the heat pump.
	Connected The heat pump is connected to a buffer tank which is regulated by the heat pump. The tank is equipped with a temperature sensor which is connected to the heat pump. Any heating circuits in the system are connected to the buffer tank.
Buffer	Buffer tank temperature.

Design outdoor temperature	This temperature is used for selecting the necessary heating capacity for the heating system. At this outdoor temperature point, flow temperature is at its highest. The **Max flow temperature** (selected for each heating circuit) and the **Design outdoor temperature** are used to calculate the circuit's heating curve. See section *Design outdoor temperature*.

4.6 Heating circuits

1. Activate a circuit by changing the **Circuit in use** setting.
   - If you select **3-way valve** as the control setting, determine if you need to change the **Inverted control** setting. See *Heating circuit's control valve*.
2. Set the **Max. flow temperature** and, if applicable, **Min. flow temperature**.
3. Select **Preset heating curve**.
4. If necessary, adjust the heating curve by selecting **Heating curve adjust**.

Heating circuit 1	
Circuit in use	**No** The circuit is not in use.

Heating circuit 1	
	Direct connection The heat pump is connected directly to the building's heating system. The system has no circulation pump or control valve that would be controlled by the heat pump.
	Direct connection with pump (main controller) The system has a circulation pump which is controlled by the heat pump.
	3-way valve (main controller) The system has a circulation pump and a 3-way control valve, both of which are controlled by the heat pump.

Inverted control	**Off** 0–10 V When the heating circuit requires more heating, the level of the valve control signal is increased. ● **0 V:** valve fully closed, **10 V:** valve fully open. 3–point The outputs for opening and closing the valve correspond to the default connection indicated in the electric diagram. ● **Heating circuit 1:** Q8 closed, Q9 open.
	In use 0–10 V When the heating circuit requires more heating, the level of the valve control signal is reduced. ● **0 V:** valve fully open, **10 V:** valve fully closed 3-point The outputs for opening and closing the valve are reversed. ● **Heating circuit 1:** Q8 open, Q9: closed.

Min. flow temperature	The system will keep the flow temperature determined by the heating curve above this temperature value. ● **Typical setting: +20...+25 °C** ● Set the minimum flow temperature slightly above the required room temperature.
Max. flow temperature	The maximum flow temperature when the outdoor temperature matches the **Design outdoor temperature** setting. The system will keep the flow temperature determined by the heating curve below this temperature value. ● **Typical setting, floor heating:** concrete floors +35 °C, wooden floors +45 °C ● Check the temperature value from the floor or floor heating supplier (or from the applicable plans and specifications).
Preset heating curve	Start by setting the minimum and maximum temperature. The flow temperature can be adjusted using a six-point heating curve. This menu allows you to adjust each point separately. See section *Adjusting the heating curve*.

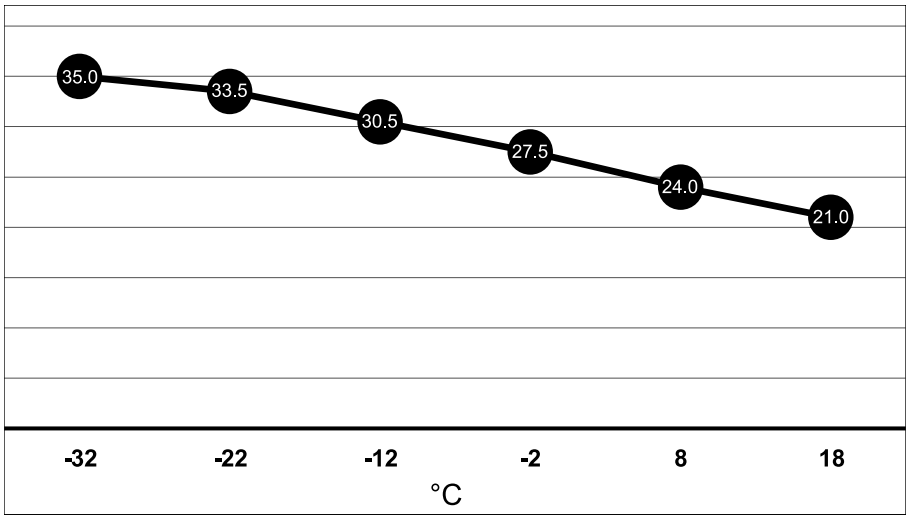
Valve	
Control high limit	The maximum speed for valve actuation. ● Typical setting: 100%
Control low limit	The minimum speed for valve actuation. ● Typical setting: 0%
Control	Manual setting for valve opening, 0–100%
Manual mode	Enable or disable manual valve control
Drive time (open/close)	Time taken to move the valve from max. to min. or vice versa.

Valve controller	
Circuit 1 flow	Currently measured flow temperature
Setpoint	Currently used setpoint (based on room temperature measurement or heating curve)
Gain	Valve control gain; determines how much the valve will react to changes in heating circuit inlet temperature.
TI	Integration time; the speed at which the valve moves until the temperature target is reached.
DBW	Deadbandwidth; the area around the setpoint where control does not move.

4.6.1 Adjusting the heating curve

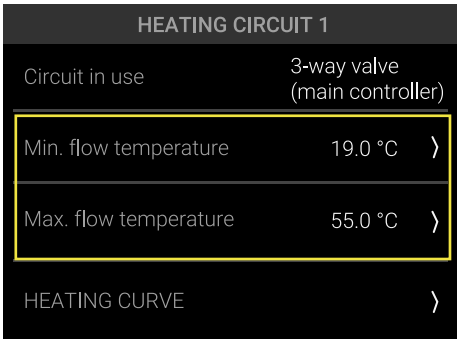
A heating curve consist of six temperature points that represent different outdoor temperatures. Each temperature point has a corresponding flow temperature target setting.

- Each heating circuit has its own heating curve.

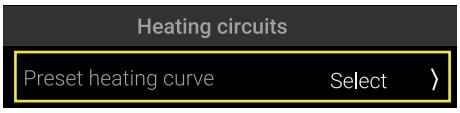


Default heating curve. X axis: outdoor temperature. The curve shows the flow temperature setpoints for each outdoor temperature point.

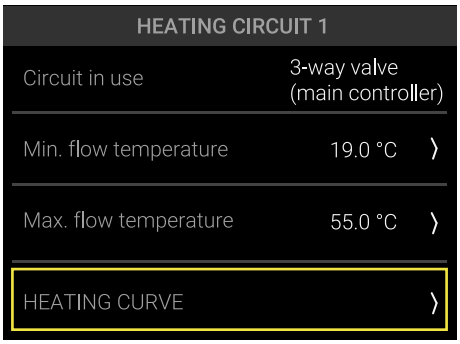
1. In the initial setup menu, set the maximum flow temperature for each heating circuit. If necessary, edit the minimum flow temperature.

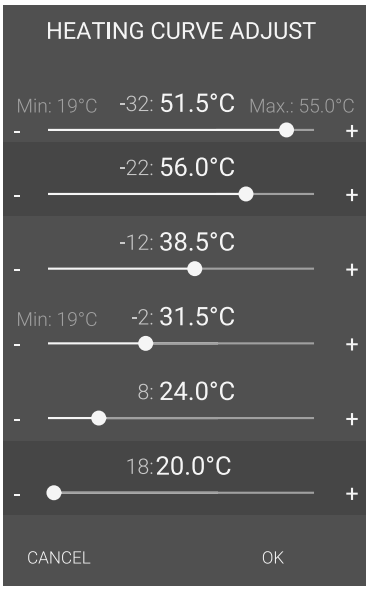


2. Tap **Preset heating curve**. The app will create a heating curve for each heating circuit, between the minimum and maximum flow temperature.



3. If necessary, tap **Heating curve** to edit the new heating curve. Change the curve points using the sliders.





If you change the maximum flow temperature, tap **Preset heating curve** again and re-adjust the heating curves.

Recommended heating curve adjustments

Curve values should be tuned in during the first few heating seasons.

1. If the room temperature is too cold when the outdoor temperature is 0 °C, slightly increase the flow setpoint at outdoor temperature points −2 °C and +8 °C.
2. Wait for at least two or three days to see if the change has made a difference.
3. Repeat if necessary.

4.6.2 Heating circuits 2 and 3

The commissioning menus for heating circuits 2 and 3 have the following options:

Circuit in use	**No** The circuit is not in use.
	Direct connection The heat pump is connected directly to the building's heating system. The system has no circulation pump or control valve that would be controlled by the heat pump.
	Direct connection with pump (main controller) The system has a circulation pump which is controlled by the heat pump.
	3-way valve (main controller) The system has a circulation pump and a 3-way control valve, both of which are controlled by the heat pump.

	Direct connection with pump (ext. controller) The system has a circulation pump which is controlled by the heat pump using an auxiliary controller.
	3-way valve (ext. controller) The system has a circulation pump and a 3-way control valve, both of which are controlled by the heat pump using an auxiliary controller.

Configuration of two or more heating circuits

The main controller can control:

- one direct connection OR
- one direct connection AND one direct connection with pump OR
- one direct connection AND one 3-way valve.

One heating circuit can be connected directly to the building's heating system. In such configuration, the main controller can control a second heating circuit, see example 1. Other configurations require an auxiliary controller.

Configuration example 1: no auxiliary controller required

- Circuit 1 is connected directly to the building's system and it is not controlled by the heat pump.
- Circuit 2 has a circulation pump and a 3-way control valve, both of which are controlled by the heat pump.

Circuit 1 setting	Direct connection
Circuit 2 setting	3-way valve (main controller)
Circuit 3 setting	No
Controllers	Main controller only

Configuration example 2: two heating circuits connected to a buffer tank

- Circuit 1 has a 3-way valve which is controlled by the main controller.
- Circuit 2 has a 3-way valve which is controlled by an auxiliary controller.

Circuit 1 setting	3-way valve (main controller)
Circuit 2 setting	3-way valve (ext. controller)
Circuit 3 setting	No
Controllers	Main controller + auxiliary controller

Configuration example 3: three heating circuits

- Circuit 1 is connected directly to the building's system and it is not controlled by the heat pump.
- Circuit 2 and 3 each have a circulation pump and a 3-way control valve, both of which are controlled by the heat pump.

Circuit 1 setting	Direct connection
Circuit 2 setting	3-way valve (main controller)
Circuit 3 setting	3-way valve (ext. controller)
Controllers	Main controller + auxiliary controller

4.6.3 Curing concrete floors with a heat pump

It is not advisable to use the heat pump to cure floor structures.

- Keep the temperature considerably lower than usual (maximum: +20 °C) before the concrete slab has cured and after the floor has been tiled.
- Increase the temperature gradually over a longer period of time.
- Keep the temperature as even as possible.
- Check the temperature values and curing times from the floor or floor heating supplier (or from plans and specifications).

4.7 Additional heating

If applicable, enable the heat pump's in-line heater from there.

Additional heating → Additional heating	
Not in use	The in-line heater is disabled.
Warm buffer	The in-line heater can heat up a heating circuit buffer.
Tap buffer	The in-line heater can heat up a domestic hot water tank.
After Condenser	The heating circuit is connected directly to a heating circuit or other heat sink, and the in-line heater can heat up the circuit directly.
Warm buffer + Tap buffer	The in-line heater can heat up both a heating circuit buffer and a domestic hot water tank.

4.7.1 Additional heating, space heating

If the fuse for the heat pump power supply is rated to run the compressor and the in-line heater at the same time, set **Mode for heating** to **With compressor**.

- When the in-line heater is enabled, the default setting is **Backup use only.**
- If the fuse for the heat pump power supply is rated to run the compressor and the in-line heater at the same time, set **Mode for heating** to **With compressor**

Additional heating, space heating	
An electric immersion heater (in-line heater) provides heating in the same way as the compressor and uses the same setpoint values. The heater switches on and off (and transitions between higher and lower power stages) with a delay.	
Additional heating → Internal electric heater	**In use** The condenser flow line includes an electric in-line heater. CUBE: standard equipment, installed at the factory ECO: optional accessory
	Not in use The condenser circuit has no in-line heater (electric immersion heater).

Additional heating, space heating	
Mode for heating: operating mode selection for space heating	**Backup use only (default setting)** Select this option, if the fuse for the heat pump power supply has an insufficient rating for running the compressor and the electric heater at the same time. The electric heater will be switched on if: 1. The outdoor temperature is below +5 °C (freezing protection). 2. An alarm prevents the compressor from starting (backup operation). In backup use, space heating has priority over domestic hot water heating.
	With compressor (parallel operation) Select this option, if the fuse for the heat pump power supply is rated for running the compressor and the electric heater at the same time. The electric heater will be switched on if: 1. The outdoor temperature is below +5 °C (freezing protection). 2. An alarm prevents the compressor from starting (backup operation). 3. The target temperature for flow water from the heat pump has not been reached, and the start delay for the electric heater has elapsed.
	Freezing protection only The electric heater will be switched on only when heating water temperature falls below +5 °C. Once the temperature exceeds +10 °C, the electric heater will be switched off. ● **If this option is selected, the electric heater won't be switched on during a fault unless the temperature falls below the Freezing protection limit.** ● The freezing protection function monitors the temperature in the condenser, buffer tank, and the heating circuits. ● In freezing protection, space heating has priority over domestic hot water heating.

4.7.2 Additional heating, hot water

If the fuse for the heat pump power supply is rated to run the compressor and the in-line heater at the same time, set **Mode for hot water** to **With compressor**.

- When the in-line heater is enabled, the default setting is **Backup use only.**

Additional heating, hot water	
Mode for hot water: operating mode selection for domestic hot water heating	If one of the settings below is selected, the system can switch on the electric heater when the compressor reaches its operating limits and switches off (or the legionella function is active). The setting influences DHW heating only.
	Backup use only (default setting) The electric heater will switch on if: 1. DHW tank temperature is below +5 °C (freezing protection). 2. An alarm prevents the compressor from starting (backup operation). In backup use, space heating has priority over domestic hot water heating. The highest setpoint for domestic hot water is lower than the setpoints for the operating modes in which the system can use the heater.
	With compressor (parallel operation) Select this option, if the fuse for the heat pump power supply is rated to run both the compressor and the heater at the same time. The electric heater will switch on if: 1. DHW tank temperature is below +5 °C (freezing protection). 2. An alarm prevents the compressor from starting (backup operation). 3. The target temperature for the DHW tank is not reached, and the compressor reaches its operating limits and switches off. 4. The target temperature for the DHW tank has not been reached, and the start delay for the electric heater has elapsed. There is a short delay between switching off the compressor and switching on the heater.

Additional heating, hot water	
	After compressor Select this option, if the fuse for the heat pump power supply has an insufficient rating to run both the compressor and the heater at the same time. The electric heater will switch on if: 1. DHW tank temperature is below +5 °C (freezing protection). 2. An alarm prevents the compressor from starting (backup operation). 3. The target temperature for the DHW tank is not reached, and the compressor reaches its operating limits and switches off. There is a short delay between switching off the compressor and switching on the heater.
	Freezing protection only The electric heater will switch on only when DHW tank temperature falls below +5 °C (freezing protection). Once the temperature in the DHW tank exceeds +10 °C, the heater will switch off. ● **If this option is selected, the electric heater won't be switched on during a fault unless the temperature falls below the Freezing protection limit.** ● In freezing protection, space heating has priority over domestic hot water heating. ● The highest setpoint for domestic hot water is lower than the setpoints for the operating modes in which the system can use the heater.

4.8 Brine circuit and brine pump settings

Brine circuit	
Freezing protection limit	The minimum permissible brine circuit temperature. ● If the temperature in the brine circuit falls below this limit, the compressor will be switched off and the unit's electric immersion heater (if available) will provide the necessary heating. ● Once the circuit's temperature increases above the setpoint, the compressor will start again.

Brine pump	
Keeps running	You can set the brine pump to keep running continuously for a few days after commissioning. The setpoint value is in days.

4.9 Final settings

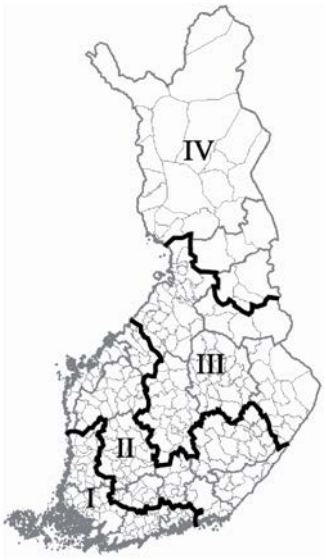
Manual control
The manual control function allows you to manually switch valve positions and, for example, turn on the brine pump or condenser pump to facilitate bleeding the corresponding circuit. The function can also be activated from the **Service** menu.

Start heat pump	
Start the heat pump either using this option or later from the **Service** menu.	
Operating mode	**Off** The heat pump is switched off.
	In use The heat pump is switched on.
	Additional heater only Only the unit's internal electric immersion heater is used for heating. The compressor and the brine circuit are not in use.

Setup finished	
Hide initial setup menu	Once the commissioning process is complete, hide the **Initial setup** menu. If necessary, display the menu again from the **Service** menu.

4.10 Design outdoor temperature

The information below applies to Finland, and is provided for reference only.



Weather Zones Finland ver. 1

Weather zone (in Finland)	Design outdoor temperature, °C
I	−26
II	−29
III	−32
IV	−38

4.11 Troubleshooting

See the alarm list in manual M8004.

Problem	Potential cause	Solution
The heat pump does not start to warm up	Brine circuit flow missing	Check the brine circuit valves. Check for leaks. Test the brine pump, see below.
A heating circuit is not receiving heating The DHW tank is not receiving heating	Heating circuit flow missing	Depending on the connection, check: • heating circuit control valve (check if normal or inverted control is active, see *Heating circuit's control valve*) • change-over valve • condenser pump • heat circuit pump From the heating circuit side, check: • room thermostats • strainers
	Sensor problem	Check the alarms. Check the wires. Check proper installation.

Problem	Potential cause	Solution
In-line heater does not operate	Heater switched off from settings	**Before changing settings, check that the heat pump (and supply fuse) has been sized so that the heat pump and the heater can operate at the same time.** Check from Device settings → Service → Additional heating.
	Wrong operating mode	Check from Device settings → Service → Additional heating. For the in-line heater to provide additional heating when the compressor is on: ● Set *Mode for heating* to *With compressor*. ● If applicable, set *Mode for hot water* to *With compressor*. See *Additional heating, space heating* and *Additional heating, hot water*.
	Incorrect *Initial setup* settings	From Device settings → Service → Initial setup, check: ● Design outdoor temperature (default: –32 °C) ● Max. flow temperature (If changed, use the *Preset heating curve* function.) ● Heating curve
	In-line heater fuse OFF	Check. See *Fuses*.
	Internal overheat protection device tripped in transit	Reset. See *In-line heater*.
	Thermostat knob in wrong position	Set to maximum.
Hot gas fault	Brine circuit problem Faulty sensor Compressor fault Faulty expansion valve	Check the brine circuit. Check evaporator flow.

Testing pump problems

- Check that the pump runs by listening. Close and open a shut-off valve to see if there is a change.
- If necessary, run the pump manually (Device settings → Service → Manual control).
- Check the fuses. See *Fuses*.

5 Operation

5.1 Heat pump operation

The system's connection diagrams are provided as a separate document.

The heat pump collects heat from the fluid in the brine circuit and releases the heat collected through a condenser and into heating water. In addition to the heat pump itself, CUBE heat pump units include an in-line heater for supplementary and backup heating. In ECO models, the in-line heater is an optional accessory.

After being pumped through the condenser and the in-line heater, the heating water is led either into a domestic hot water tank or the building's heating circuit (depending on the position of change-over valve FV202). When the change-over valve is in position A, heating water circulates inside the unit, heating up the water in the domestic hot water tank. In position B, heating water circulates through the building's heating circuit.

Condenser pump P201 circulates heating water through the heat pump. If the building's heating system does not include a buffer tank (or there is only a flow-through tank in the heating water flow line), the condenser pump also serves as the pump for the building's space heating circuit. In this direct connection configuration, the pump is always on, except for the summer season, when heating is not required. During the summer period, the system regularly starts the pump and lets it run for a while to check the heating circuit's temperature and prevent the pump from seizing up.

If the configuration includes a buffer tank, the heating water circulates only between the tank and the heat pump. If the heating system includes a buffer tank, each heating circuit has its own pump. Another case where a heating circuit has its own pump is when the system has no buffer tank but the heating circuit includes a 3-way valve for regulating the circuit's temperature. In configurations with a buffer tank, the brine pump will run only when the tank is being heated.

The unit's automation system controls the compressor and in-line heater based on the configured heating water setpoint value. This setpoint value is compared to the actual flow temperature (measured by sensor TE202). Both the domestic hot water heating and the building heating circuit have their own setpoint values. For domestic hot water heating, the setpoint value is determined by adding an offset to the desired domestic hot water temperature. The actual domestic hot water temperature is measured by sensor TE266. For space heating, the setpoint value is determined by the flow temperature provided by the heating curve configured in the system. The flow temperature value provided by the heating curve may depend either only on the outdoor temperature or, if indoor temperature measurement is enabled, the combination of both the indoor and the outdoor temperature.

If there is no buffer tank, space heating will start when the flow temperature falls below the temperature provided by the heating curve by the number of degree minutes. The unit will continue to heat the building's spaces until the flow temperature rises above the temperature provided by the heating curve by the number of degree minutes. In configurations that include a buffer tank, it is the temperature in the tank that determines when heating starts (instead of the flow water temperature). Whenever the

building’s domestic hot water needs heating, space heating will be suspended until domestic hot water has been heated to a sufficient temperature.

Domestic hot water tank heating will start when the DHW tank temperature (minus the switching difference) falls below the domestic hot water target temperature. Domestic hot water heating will stop when the DHW tank has been heated up or the maximum DHW heating time has elapsed. If the heating time elapses, the system will resume DHW heating after the minimum time for space heating has elapsed.

6 Technical data

6.1 Heat pump technical data

The performance between different units may vary. This variation is due to a wide number of factors, such as the properties of the fluids used in the circuits, fouling of the heat transfer surfaces in the condenser and evaporator circuit, flow rates, individual differences between compressors (standard EN 12900) as well as refrigerant circuit charge and adjustments made to the refrigerant circuit during installation.

NOTICE Check the fuse ratings from wiring diagrams. If necessary, take additional equipment (such as heating circuit pumps) into consideration.

ECO models

Model/rated capacity 3~, 400 V, 50 Hz, PE		**6**	**8**	**10**	**13**	**17**	**21**
Empty weight	kg	126	128	129	140	145	150
In-line heater							
Internal in-line heater as standard		no	no	no	no	no	no
Can be equipped with an in-line heater (6 kW)		yes	yes	yes	yes	yes	yes
Heater power stages	pcs.	3	3	3	3	3	3
Soft starter							
Soft starter as standard		yes	yes	yes	yes	yes	yes
Pipe connections							
Condenser and brine circuit connection (ISO 228 thread)		G 1	G 1	G 1	G 1	G 1	G 1
Maximum permissible operating pressure	bar	6	6	6	6	6	6
Noise level							
A-weighted sound pressure level At 1 m distance	dB (A)	< 40	< 40	< 40	< 40	< 40	< 40
Fuse							
Compressor heating only, in-line heater disabled or not installed	3 x	10 A	10 A	16 A	16 A	20 A	20 A

Model/rated capacity 3~, 400 V, 50 Hz, PE		6	8	10	13	17	21
Heating by either compressor or in-line heater, simultaneous use disabled	3 x	16 A	16 A	16 A	16 A	20 A	20 A
Simultaneous use of compressor and in-line heater enabled	3 x	16 A	16 A	20 A	20A	25 A	25 A

The indicated fuse rating is given for the brine pump, the condenser pump, and the circulation pump for one heating circuit.

CUBE

MODEL / RATED CAPACITY (kW) 3~ 400 V, 50 Hz, PE		6	8	10	13
Empty weight	kg	242	244	245	256
In-line heater					
Internal in-line heater as standard		yes	yes	yes	yes
Heater output	kW	6	6	6	6
Heater power stages	pcs	3	3	3	3
Output for each heater stage	kW	2	2	2	2
Soft starter					
Soft starter as standard		yes	yes	yes	yes
Pipe connections					
Condenser circuit connection (copper pipe)	mm	28	28	28	28
Brine circuit connection (copper pipe)	mm	28	28	28	28
Maximum permissible operating pressure	bar	3	3	3	3
Noise level					
A-weighted sound pressure level At 1 m distance	dB (A)	< 40	< 40	< 40	< 40
Fuse					
Heating by either compressor or in-line heater, simultaneous use disabled	3 x	16 A	16 A	16 A	16 A
Simultaneous use of compressor and in-line heater enabled	3 x	16 A	20 A	20 A	25 A

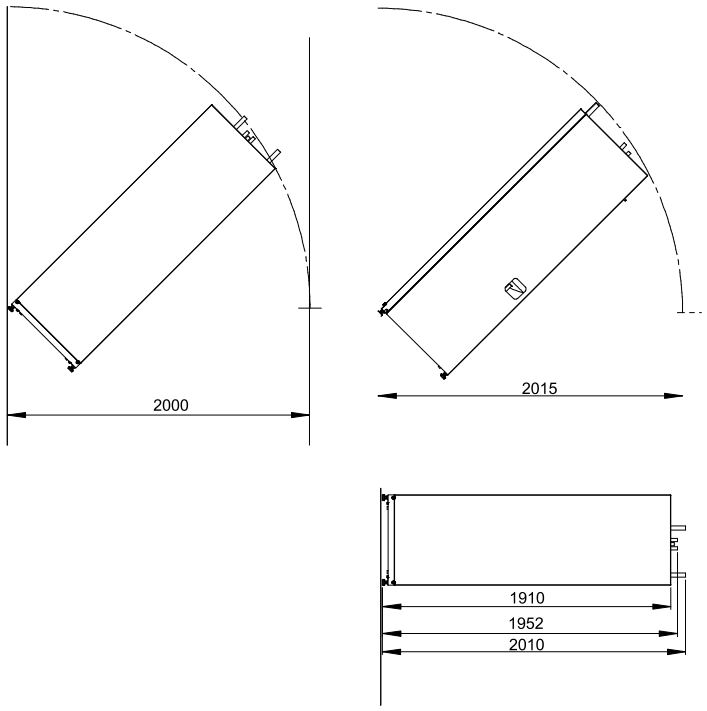
The indicated fuse rating is given for the brine pump, the condenser pump, and the circulation pump for one heating circuit.

Domestic hot water tank

Clearance required for lifting the unit upright

DHW storage tank CUBE models		
Type	Condenser water circulates in a coil, DHW is stored in and supplied from the tank	
Volume	L	185
Domestic hot water plate heat exchanger		no
Domestic hot water coil		yes
Thermostatic mixing valve assembly as standard		no
Thermostatic mixing valve assembly provided as an option		yes
Thermostatic mixing valve assembly can be directly connected to storage tank fittings		yes
Pipe connection (stainless steel)	mm	22
Maximum permissible operating pressure	bar	10
Storage tank's material (stainless/acid-proof steel)		LDX 2101 (EN 1.4162)
Coil material		AISI 316L (EN 1.4404)

CUBE



Clearance for lifting upright ver. 2

6.2 Compressor units

CUBE, ECO

MODEL / RATED CAPACITY (kW) 3~ 400 V, 50 Hz, PE			6	8	10	13	17	21
Refrigerant circuit (EU517/2014)								
Contains fluoridized greenhouse gases			yes	yes	yes	yes	yes	yes
Hermetically sealed device			yes	yes	yes	yes	yes	yes
To be checked periodically for leaks (charge limit 10 CO2-equiv. t.)			no	no	no	no	no	no
Refrigerant			R-410A	R-410A	R-410A	R-410A	R-410A	R-410A
Refrigerant's PED group (EN 378:2016)			2	2	2	2	2	2
Refrigerant's safety class (EN 378:2016)			A1	A1	A1	A1	A1	A1
Refrigerant's GWP value (global warming potential)			2088	2088	2088	2088	2088	2088
Refrigerant charge*	g		650	900	1100	1250	2000	2100
Refrigerant charge*	kg		0.65	0.90	1.10	1.25	2.00	2.10
Refrigerant charge*	CO_2-equiv. kg		1357	1879	2297	2610	4176	4385
Refrigerant charge*	CO_2-equiv. t		1.357	1.879	2.297	2.610	4.176	4.385
Maximum allowable operating pressure PS	bar g		45	45	45	45	45	45
Maximum ambient temperature	°C		140	140	140	140	140	140
Minimum ambient temperature	°C		–15	–15	–15	–15	–15	–15
Low pressure switch								
Cut-off pressure, low	bar g		3.4 ± 0.5					
Pressure reset setpoint	bar g		5.9 ± 0.5					
High pressure switch								
Cutoff-pressure, high	bar g		45 ± 1.2					
Pressure reset setpoint	bar g		34 ± 2.0					
Compressor								
Compressor type			scroll					

* Always consult the device's name plate or maintenance report first for the refrigerant charge.

6.3 Performance data

To view performance data in other conditions, please use the Oilon Selection Tool (www.oilon.com).

Design conditions of condenser and brine circuits

EN 14511.

Brine 0 °C / –3 °C and water 30 °C / 35 °C (B0/W35)

MODEL / RATED OUTPUT (kW), 3~ 400 V, 50 Hz, PE		6	8	10	13	17	21
Heating capacity	kW	5.6	7.4	10.0	12.7	17.0	21.1
Cooling capacity	kW	4.4	5.8	8.0	10.2	13.5	16.9
Coefficient of performance (COP)	-	4.4	4.6	4.8	4.8	4.7	4.8
Compressor electric power (active power)	kW	1.3	1.6	2.1	2.7	3.6	4.4
Electric current taken by the compressor	A	2.6	3.2	4.0	5.4	6.9	8.1

Brine 0 °C / –3 °C and water 47 °C / 55 °C (B0/W55)

MODEL / RATED OUTPUT (kW), 3~ 400 V, 50 Hz, PE		6	8	10	13	17	21
Heating capacity	kW	5.1	6.8	9.1	11.7	15.4	19.1
Cooling capacity	kW	3.3	4.4	6.1	7.8	10.4	13.0
Coefficient of performance (COP)	-	2.7	2.8	2.9	2.9	2.9	3.0
Compressor electric power (active power)	kW	1.9	2.5	3.2	4.1	5.4	6.4
Electric current taken by the compressor	A	3.4	4.3	5.4	6.9	9.1	10.6

Brine 0 °C / –3 °C and water 55 °C / 65 °C (B0/W65)

MODEL / RATED OUTPUT (kW), 3~ 400 V, 50 Hz, PE		6	8	10	13	17	21
Heating capacity	kW	4.9	6.5	8.7	11.2	14.8	18.1
Cooling capacity	kW	2.7	3.6	5.0	6.3	8.6	10.8
Coefficient of performance (COP)	-	2.1	2.2	2.3	2.2	2.3	2.4
Compressor electric power (active power)	kW	2.3	3.0	3.9	5.1	6.5	7.7
Electric current taken by the compressor	A	3.9	5.0	6.1	8.1	10.7	12.4

SCOP and SPF value

MODEL / RATED OUTPUT (kW), 3~ 400 V, 50 Hz, PE	6	8	10	13	17	21
Low temperature application, cold climate, brine 0 °C, flow water upper limit 35 °C (floor heating)						

MODEL / RATED OUTPUT (kW), 3~ 400 V, 50 Hz, PE	6	8	10	13	17	21
SCOP (EN 14825) SPF value (National Building Code of Finland)	5.1	5.6	5.6	5.6	5.5	5.6
High temperature application, cold climate, brine 0 °C, flow water upper limit 55 °C (radiator heating)						
SCOP (EN 14825) SPF value (National Building Code of Finland)	3.9	4.0	4.2	4.2	4.1	4.2
SPV value, domestic hot water (National Building Code of Finland)						
Brine +3 °C	3.3	3.3	3.3	3.3	3.3	3.3
Brine –3 °C	3.1	3.1	3.1	3.1	3.1	3.1

6.4 Condenser circuit flow

The unit has an internal condenser circuit pump.

MODEL / RATED OUTPUT (kW) 3~ 400 V, 50 Hz, PE CLEAN WATER		6	8	10	13	17	21
Pump		A	A	A	A	A	A
Brine 0 °C / –3 °C and water 30 °C / 35 °C (B0/W35)							
Water temperature difference	°C	5	5	5	5	5	5
Water flow rate	kg/s	0.27	0.35	0.48	0.61	0.81	1.01
Water flow rate	L/s	0.27	0.35	0.48	0.61	0.82	1.01
Water flow rate	m3/h	0.97	1.27	1.73	2.20	2.93	3.65
Pump head, standard pump	m	7.5	7.5	6.5	6.0	5.8	4.5
Internal pressure loss							
ECO	kPa	9	10	11	13	11	14
CUBE	kPa	10	12	14	17	-	-
Internal pressure loss expressed in terms of pump head							
ECO	m	0.9	1.0	1.1	1.3	1.2	1.4
CUBE	m	1.0	1.2	1.4	1.8	-	-
Standard pump's head for external pressure loss							
ECO	m	6.6	6.5	5.4	4.7	4.6	3.1
CUBE	m	6.5	6.3	5.1	4.2	-	-

6.5 Brine circuit flow

Check that the brine circuit pump has a sufficient capacity before placing an order for and installing a heat pump. If necessary, install an additional brine circuit pump (second standard pump placed outside the unit).

Pumps

MODEL / RATED OUTPUT (kW) 3~ 400 V, 50 Hz, PE WATER AND ETHANOL SOLUTION, 30 m-% OF ETHANOL		6	8	10	13	17	21
Brine pump		A	A	B	B	C	C
Pump location		internal				external	

Brine 0 °C / –3 °C and water 30 °C / 35 °C (B0/W35)

MODEL / RATED OUTPUT (kW) 3~ 400 V, 50 Hz, PE WATER AND ETHANOL SOLUTION, 30 m-% OF ETHANOL		6	8	10	13	17	21
Brine temperature difference	°C	3	3	3	3	3	3
Brine flow rate (total)	kg/s	0.35	0.47	0.64	0.81	1.08	1.35
Brine flow rate (total)	L/s	0.36	0.48	0.66	0.84	1.12	1.40
Brine flow rate (total)	m3/h	1.31	1.74	2.39	3.03	4.03	5.05
Pump head	m	7.6	6.8	7.5	5.7	11.9	11.1
Internal pressure loss							
ECO	kPa	14	16	18	21	19	29
CUBE	kPa	16	19	23	28	-	-
Internal pressure loss expressed in terms of pump head							
ECO	m	1.5	1.7	1.9	2.2	2.1	3.1
CUBE	m	1.7	2.0	2.5	3.0	-	-
Pump head for external pressure loss							
ECO	m	6.1	5.1	5.6	3.5	9.8	8.0
CUBE	m	5.9	4.8	5.0	2.7	-	-

Brine 0 °C / –4 °C and water 30 °C / 35 °C (B0/W35)

MODEL / RATED OUTPUT (kW) 3~ 400 V, 50 Hz, PE WATER AND ETHANOL SOLUTION, 30 m-% OF ETHANOL		6	8	10	13	17	21
Brine temperature difference	°C	4	4	4	4	4	4
Brine flow rate (total)	kg/s	0.26	0.35	0.48	0.61	0.81	1.02
Brine flow rate (total)	L/s	0.27	0.36	0.50	0.63	0.84	1.05
Brine flow rate (total)	m3/h	0.98	1.31	1.79	2.27	3.02	3.78
Pump head, standard pump	m	7.6	7.6	8.2	7.4	11.8	11.9
Pump head for pumps delivered on special order	m	9.2	9.3	11.4	11.7		
Internal pressure loss							
ECO	kPa	9	10	11	20	12	17
CUBE	kPa	10	12	15	17		
Internal pressure loss expressed in terms of pump head							

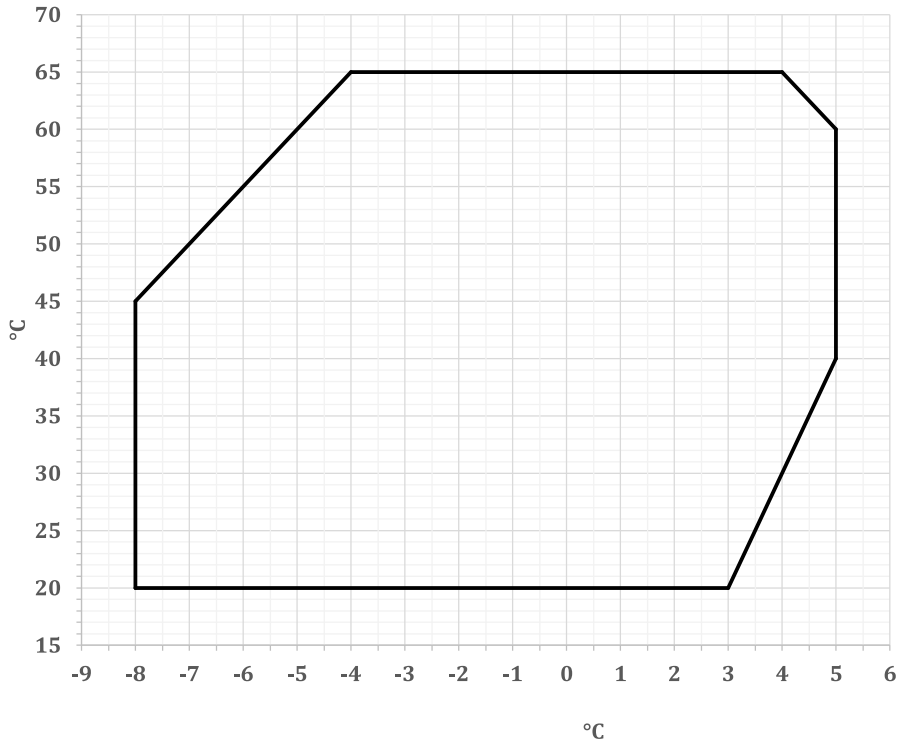
MODEL / RATED OUTPUT (kW) 3~ 400 V, 50 Hz, PE WATER AND ETHANOL SOLUTION, 30 m-% OF ETHANOL		6	8	10	13	17	21
ECO	m	1.0	1.1	1.2	2.2	1.3	1.8
CUBE	m	1.1	1.2	1.5	1.8	-	-
Pump head for external pressure loss							
ECO	m	6.6	6.5	7.0	5.2	10.5	10.1
CUBE	m	6.5	6.4	6.7	5.6	-	-

6.6 Operating conditions

The unit's operating condition range is provided below. The unit has been designed for use within the specified conditions. The unit's performance cannot be guaranteed outside the recommended conditions.

Brine temperature may exceed the maximum values momentarily during the start-up phase.

		Minimum value	Maximum value	Design value
Temperature differential of the evaporator circuit	°C	1	4	3
Brine into the evaporator	°C	−5	9	0
Brine out of the evaporator	°C	−8	5	−3
Condenser circuit's temperature difference	°C	3	15	5
Water into the condenser	°C	15	60	30
Water from condenser	°C	20	65	35



Operating envelope. X-axis: temperature, brine from evaporator (°C), Y-axis: temperature, water from condenser (°C).

Condenser circuit fluid: water

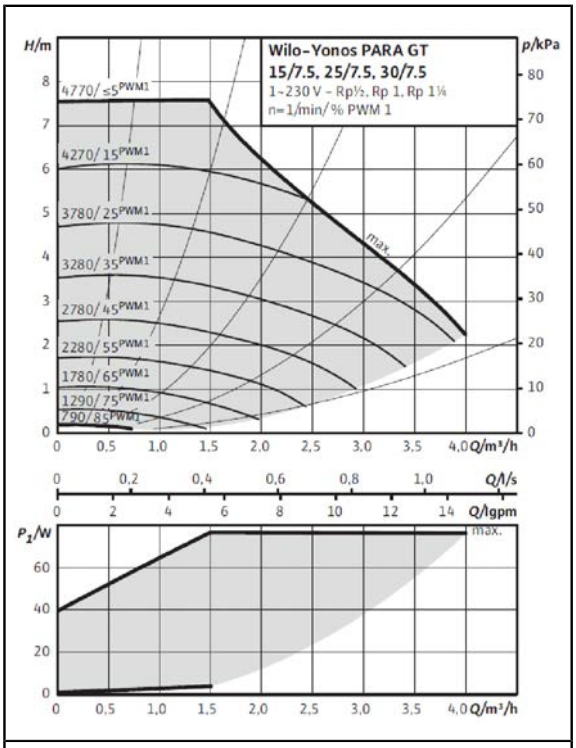
Evaporator circuit fluid: mix of water and ethanol, 30 mass-% ethanol (25 volume-%)

6.7 Pumps

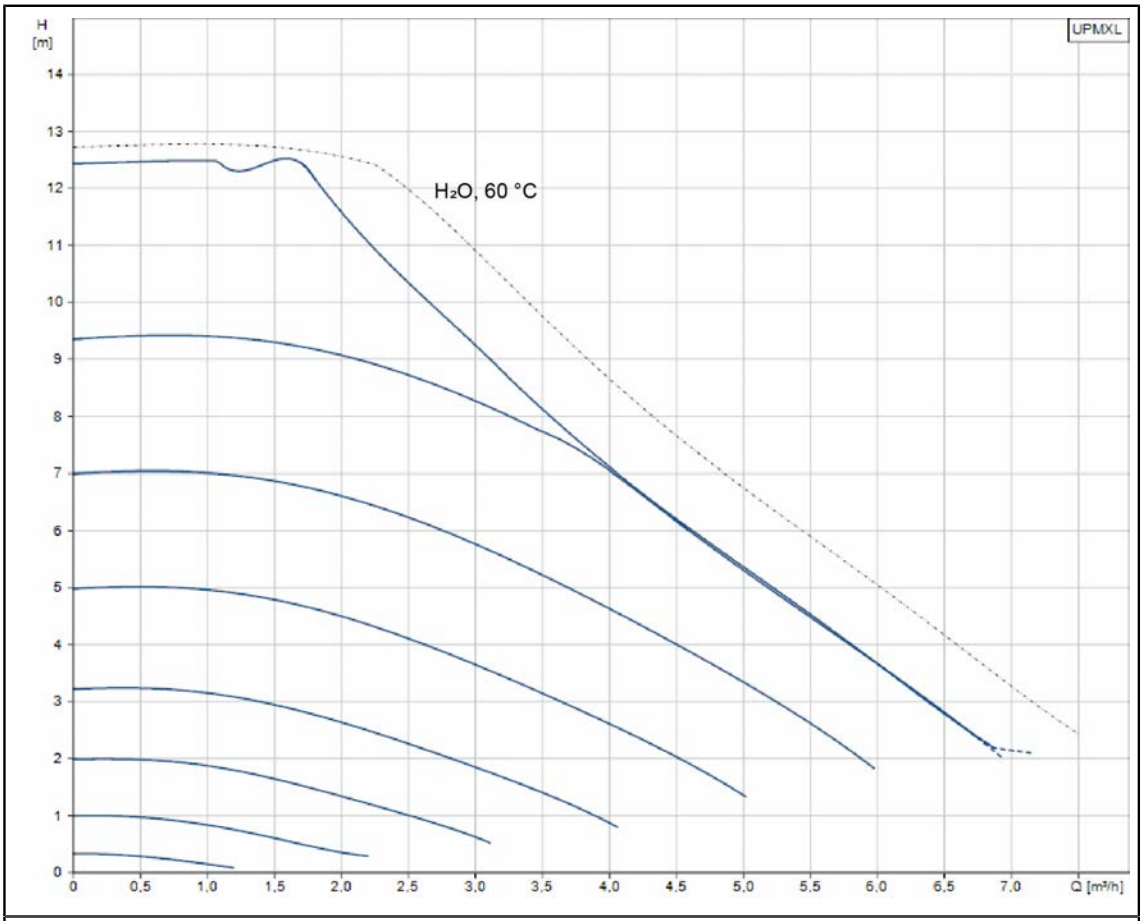
Pumps

	Oilon designation:	Pump	Information
A	34023071	Wilo-Yonos PARA GT 15/7.5 PWM1 130 mm 6h	1-phase, wet-motor, G 1 outer thread, installation dimension 130 mm, inverse PWM, 4–75 W (0.04–0.66 A)
B	34023129	Grundfos UPMXL GEO 25-125 180 PWM	1-phase, wet-motor, G 1 1/2 outer thread, installation dimension 180 mm, inverse PWM, 3–180 W (0.04–1.42 A)
C	34023075	Wilo-Stratos PARA 25/1-12 T16 180 mm 6h	1–phase, wet-motor, G 1 1/2 outer thread, installation dimension 180 mm, manual control and 0–10 V, 16–310 W (0.16–1.37 A), motor protection 1.6–2.5

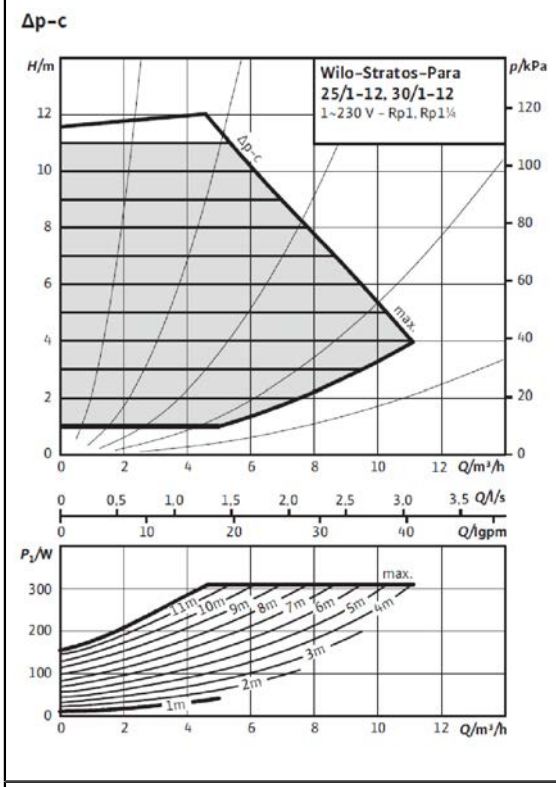
Pump curves



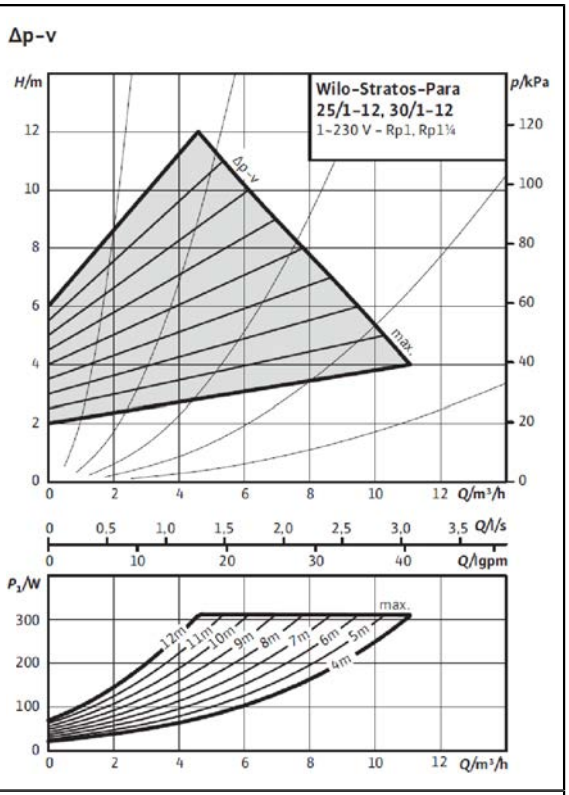
Wilo-Yonos PARA GT 7.5



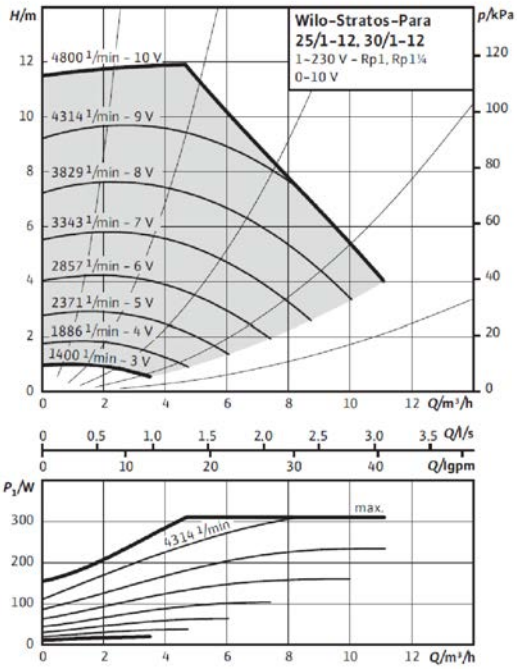
Grundfos UPMXL GEO 25-125



WILO-STRATOS PARA 1-12, ΔP-C (CONSTANT)



WILO-STRATOS PARA 1-12, ΔP-V (VARIABLE)



Fluid being pumped: ethanol, content: 28%, fluid temperature during operation: –1.5 °C, viscosity: 7.66 mm^2/s, density: 970 kg/m^3.

Wilo-Stratos Para 1–12, external control mode via analog input (0–10 V)

6.8 EU Product Data

The values presented in this document are rounded to the nearest integer in accordance with the regulation.

The values in the table apply only when calculation rules and assumptions specified in the ecodesign and energy labelling regulation are applied. The values for the actual building may differ considerably from those presented here.

CUBE, ECO

Commission delegated regulation (EU) No 811/2013 Annex IV								
			6	**8**	**10**	**13**	**17**	**21**
Product fiche, space heaters								
Supplier's name or trademark			Oilon	Oilon	Oilon	Oilon	Oilon	Oilon
Supplier's model identifier			ECO 6 07 Cube 6 07	ECO 8 07 Cube 8 07	ECO 10 07 Cube 10 07	ECO 13 07 Cube 13 07	ECO 17 07	ECO 21 07
Standard rating conditions (Brine 0/−3 °C, water 47/55 °C), average climate conditions								
Seasonal space heating energy efficiency class (starting from September 26, 2019), water 47/55 °C			A++	A++	A+++	A+++	A+++	A+++
Total rated heat output of heat pump and supplementary heater	P_{rated} + P_{sup}	kW	5 + 6	7 + 6	9 + 6	12 + 6	15 + 6	19 + 6
Seasonal space heating energy efficiency	η_s	%	145	150	157	157	156	159
Annual electricity consumption, space heating	Q_{HE}	kWh	2821	3629	4689	5969	7940	9631
Sound power level	L_{WA}	dB(A)	40	44	45	47	ECO: 48 CUBE: –	ECO: 46 CUBE: –
Specific precautions that shall be taken when the space heater is assembled, installed or maintained			1)	1)	1)	1)	1)	1)
Standard rating conditions (brine 0/−3 °C, water 47/55 °C), colder and warmer climate conditions								
Total rated heat output of heat pump and supplementary heater under colder climate conditions	P_{rated} + P_{sup}	kW	5 + 6	7 + 6	9 + 6	12 + 6	15 + 6	19 + 6
Total rated heat output of heat pump and supplementary heater under warmer climate conditions	P_{rated} + P_{sup}	kW	5 + 6	7 + 6	9 + 6	12 + 6	15 + 6	19 + 6
Seasonal energy efficiency under colder climate conditions, space heating	η_s	%	150	156	162	162	161	164
Seasonal energy efficiency under warmer climate conditions, space heating	η_s	%	146	152	158	159	158	161
Annual electricity consumption under colder climate conditions, space heating	Q_{HE}	kWh	3259	4181	5413	6892	9177	11146

Commission delegated regulation (EU) No 811/2013 Annex IV								
			6	8	10	13	17	21
Annual electricity consumption under warmer climate conditions, space heating	Q_{HE}	kWh	1808	2317	2997	3818	5075	6157

Commission delegated regulation (EU) No 811/2013 Annex IV						
			6	8	10	13
Product fiche, combination heaters (CUBE only)						
Supplier's name or trademark			Oilon	Oilon	Oilon	Oilon
Supplier's model identifier			Cube 6 07	Cube 8 07	Cube 10 07	Cube 13 07
Standard rating conditions (Brine 0/−3 °C, water 47/55 °C), average climate conditions						
Water heating load profile			L	L	L	L
Water heating energy efficiency class (starting from September 26, 2016)			A	A	A	A
Annual electricity consumption, DHW heating	AEC	kWh	1571	1526	1462	1472
Energy efficiency, DHW heating	η_{wh}	%	107	110	115	114
The combination heater can be timed to operate outside off-peak periods			Yes	Yes	Yes	Yes
Specific precautions that shall be taken when the space heater is assembled, installed or maintained			1)	1)	1)	1)
Annual electricity consumption under colder climate conditions, DHW heating	AEC	kWh	1571	1526	1462	1472
Annual electricity consumption under warmer climate conditions, DHW heating	AEC	kWh	1571	1526	1462	1472
Seasonal energy efficiency under colder climate conditions, space heating	η_s	%	150	156	162	162
Seasonal energy efficiency under warmer climate conditions, space heating	η_s	%	146	152	158	159
Energy efficiency under colder climate conditions, DHW heating	η_{wh}	%	107	110	115	114
Energy efficiency under warmer climate conditions, DHW heating	η_{wh}	%	107	110	115	114

Commission regulation (EU) No 813/2013 Annex II Table 2								
			6	8	10	13	17	21
Product information, heat pump space heaters and heat pump combination heaters								
Supplier's name or trademark			Oilon	Oilon	Oilon	Oilon	Oilon	Oilon
Supplier's model identifier			ECO 6 07 Cube 6 07	ECO 8 07 Cube 8 07	ECO 10 03 Cube 10 07	ECO 13 07 Cube 13 07	ECO 17 07	ECO 21 07
Air-to-water heat pump			-	-	-	-	-	-
Water-to-water heat pump			Yes	Yes	Yes	Yes	Yes	Yes
Brine-to-water heat pump			Yes	Yes	Yes	Yes	Yes	Yes
Equipped with a supplementary heater			Yes	Yes	Yes	Yes	Yes	Yes

Commission regulation (EU) No 813/2013 Annex II Table 2								
			6	8	10	13	17	21
Combination heater			CUBE: Yes ECO: -	CUBE: Yes ECO: -	CUBE: Yes ECO: -	CUBE: Yes ECO: -	ECO: -	ECO: -
Average temperature application (brine 0/−3 °C, water 47/55 °C), average climate conditions								
Rated heat output	P_{rated}	kW	5	7	9	12	15	19
Seasonal space heating energy efficiency	η_s	%	145	150	157	157	156	159
Bivalent temperature	T_{biv}	°C	-	-	-	-	-	-
Cycling interval capacity for heating	P_{cych}	kW	-	-	-	-	-	-
Degradation coefficient	Cdh	–	0.9	0.9	0.9	0.9	0.9	0.9
Declared heating capacity for partial load at an indoor temperature of 20 °C and the outdoor temperatures and flow temperatures given below (brine 0/−3 °C)								
Outdoor temperature −7 °C, flow +52 °C	Pdh	kW	5.2	6.9	9.3	11.8	15.6	19.4
Outdoor temperature +2 °C, flow +42 °C	Pdh	kW	5.4	7.2	9.7	12.4	16.4	20.4
Outdoor temperature +7 °C, flow +36 °C	Pdh	kW	5.6	7.3	10.0	12.7	16.9	21.0
Outdoor temperature +12 °C, flow +30 °C	Pdh	kW	5.7	7.5	10.2	13.0	17.4	21.6
Outdoor temperature −7 °C, flow +55 °C	Pdh	kW	5.1	6.8	9.1	11.7	15.4	19.1
Bivalent temperature	T_{biv}	°C	-	-	-	-	-	-
Operating limit temperature (outdoor temperature)	TOL	°C	-	-	-	-	-	-
Declared coefficient of performance for partial load at an indoor temperature of 20 °C and the outdoor temperatures and flow temperatures given below (brine 0/–3 °C)								
Outdoor temperature −7 °C, flow +52 °C	COPd	-	2.88	2.96	3.10	3.08	3.10	3.20
Outdoor temperature +2 °C, flow +42 °C	COPd	-	3.70	3.80	3.97	3.99	3.96	4.05
Outdoor temperature +7 °C, flow +36 °C	COPd	-	4.29	4.46	4.63	4.65	4.59	4.67
Outdoor temperature +12 °C, flow +30 °C	COPd	-	4.97	5.34	5.41	5.41	5.34	5.38
Outdoor temperature −7 °C, flow +55 °C	COPd	-	2.67	2.75	2.87	2.85	2.88	2.98
Bivalent temperature	T_{biv}	°C	-	-	-	-	-	-
Operating limit temperature (outdoor temperature)	TOL	°C	-	-	-	-	-	-
Power consumption								
When the unit is in OFF mode	P_{OFF}	kW	0.00	0.00	0.00	0.00	0.00	0.00
When the thermostat is not requesting heat	P_{TO}	kW	0.01	0.01	0.01	0.01	0.01	0.01
On standby	P_{SB}	kW	0.01	0.01	0.01	0.01	0.01	0.01
In crankcase heating mode	P_{CK}	kW	0.00	0.00	0.00	0.00	0.00	0.00
Supplementary heater								
Rated heat output		kW	-	-	-	-	-	-
Type of energy input		-	-	-	-	-	-	-
Other items								
Capacity control		-	Yes	Yes	Yes	Yes	Yes	Yes

Commission regulation (EU) No 813/2013 Annex II Table 2								
			6	**8**	**10**	**13**	**17**	**21**
Brine volume flow rate (brine 0/−3 °C, brine solution: water–ethanol 30 m-%, water +47/ +55 °C)		m3/h	1.0	1.3	1.8	2.3	3.1	3.9
Water heater (CUBE only)								
Declared load profile			L	L	L	L	–	–
Daily electricity consumption	Q_{elec}	kWh/d	7.142	6.935	6.645	6.691	–	–
Energy efficiency, DHW heating	η_{wh}	-	107	110	115	114	–	–
Name and address of the manufacturer								
Suomen Lämpöpumpputekniikka Oy, Unikontie 2, FI-62100 Lapua, Finland								

1) Specific precautions that shall be taken when the space heater is assembled, installed or maintained

See section *Safety notice and warnings*.

Disassembly, recycling and/or disposal at end-of-life

See sections *Decommissioning* and *Disposal of refrigerant*.

Contact information of Oilon dealer:

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