M8003 2346EN
17 November 2023

Installation and commissioning manual
ECO Inverter+ 7-25 EasyAce

Read these instructions carefully before installation, use, or maintenance

Contents

5 Operation

6 Technical data

1 Introduction

1.1 Heat pumps covered in this manual

Heat pump models with EasyAce control	Item code	Refrigerant
ECO Inverter+ 7–25 EasyAce 07	ECOINVERTER7-2507	R-410A

1.2 Instructions and diagrams

Document	Designation (item code)
ECO Inverter+ Installation and commissioning	M8003 (34793615*) This manual
ECO Inverter+ 7-25 Electric diagram	110894 (34793613)
ECO Inverter+ 7-25 Piping diagram	(34793614)
EasyAce Quick guide	M8007 (34793602*)
EasyAce 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.

NOTICE	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.

	Installation, commissioning, or service of the appliance is to be carried out by authorized and trained personnel only, 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.

Tablet

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.

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

1.4 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.

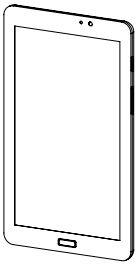
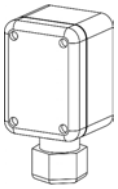
The compressor unit can be tilted up to 45 degrees from horizontal.

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.

1.5 Scope of delivery

Equipment and components

Item	PCS	Item code	Description
Installation and commissioning manual	1	34793615*	This manual
Operation manual	1	34793603*	M8004
Quick guide	1	34793602*	M8007
Electrical drawing	1	34793613	Diagram 110894
Tablet	1	378810400	 For using the heat pump's EasyAce control app
Outdoor temperature sensor TE0	1	36217543	 Connect to cable TE01–W1
Brine pump (evaporator pump) P101	1	34023075	Wilo Stratos Para 25/1-12 0–10 V
Heating pump (condenser pump) P201	1 1	34023129	Grundfos UPMXL 25-125 PWM
Power cable for heating pump P201	1	34024467	
Domestic hot water tank temperature TE265	1	36217266	Already connected to switchgear
Buffer tank temperature TE265	1	36217266	Already connected to switchgear • Replaces the condenser in sensor (TE201).
Heating circuit 1 flow temperature TE212	1	36217266	Already connected to switchgear
Torx T25 key	1	34798044	

*Finnish version only.

Sensors and actuators

Position	Description	ECO Inverter+
BRINE CIRCUIT		
TE101	Brine inlet temperature (evaporator in)	S
TE102	Brine outlet temperature (evaporator out)	S
P101	Brine pump (evaporator pump)	S
HEATING		
TE201	Heating return temperature (condenser in)	OC
1TE202, 2TE202…	Heating supply temperature (condenser out)	S
P201	Heating pump (condenser pump)	S
TE255	Space heating buffer tank temperature	S
TE265	Domestic hot water tank temperature	S
FV202	Change-over valve (space heating/DHW heating)	O
TE0	Outdoor temperature	S
HEATING CIRCUIT 1*		
TE212	Heating circuit 1 supply temperature	S
P211	Heating circuit 1 pump	O
FV212	Heating circuit 1 mixing valve	O
TE213**	Room temperature 1	O
HEATING CIRCUIT 2*		
TE222	Heating circuit 2 supply temperature	OC
P221	Heating circuit 2 pump	OC
FV222	Heating circuit 2 mixing valve	OC
TE233	Room temperature 2	OC
HEATING CIRCUIT 3		
TE232	Heating circuit 3 supply temperature	OC
P231	Heating circuit 3 pump	OC
FV232	Heating circuit 3 mixing valve	OC
TE223	Room temperature 3	OC
REFRIGERANT CIRCUIT		
PT1	Suction pressure, evaporator	S
TE1	Suction temperature, evaporator	S
PS1	Low pressure switch	S
EXV1	Expansion valve, evaporator	S
COMP1	Compressor	S
TE2	Discharge temperature	S
PS2	High pressure switch	S
PT2	Condenser pressure	S
Remote connection device		
EasyAce Hub	Remote connection device	S

*If an auxiliary controller is not installed, one heating circuit can be regulated by a control valve, while the second one does not have a control valve. The circuit controlled by the valve can be either heating circuit 1 or 2. Heating circuit 3 is always regulated by a control valve and requires an auxiliary controller.
**If the heating circuit does not have a control valve, the room temperature sensor can be installed without auxiliary equipment.

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).

1.6 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. 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 (B4) • DHW tank temperature (B3) • Heating circuit supply temperature (B1)

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	3-way control valve for heating circuit, DN32-16
Item code	1154330
Description	Esbe VRG131 11601200, DN32, Kvs 16, Rp 1 1/4"
Actuator	36962089, 36962220

Accessory	3-way control valve for heating circuit, DN40-25
Item code	1154332
Description	Esbe VRG131 11603400, DN40, Kvs 25, Rp 1 1/2"
Actuator	36962089, 36962220

Accessory	Change-over valve kit 1
Item code	GEOEXCV1
Description	Includes a change-over valve and valve actuator (item code: 34034063 and 34034064).

Accessory	Change-over valve kit 2
Item code	GEOEXCV2
Description	Includes a change-over valve and valve actuator (item code: 34034205 and 34034204).

Accessory	Change-over valve 1
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 2
Item code	34034205
Description	Esbe 3F 40 11100400, DN 40, Kvs 44, flange connection
Actuator	34034204

Accessory	Change-over valve actuator
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	Change-over valve actuator
Item code	34034204
Description	Esbe 90 series, 2-point 230 V AC, model 97, 12052500, running time 15 s
Valve	34034205

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 Inverter+ 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

1.7 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.

1.8 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.

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

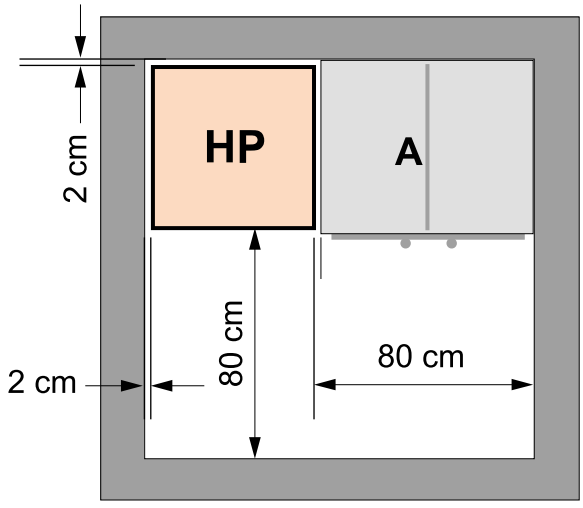
Place the unit on a stable, steady base that can carry its entire weight. Mount the unit securely in a vertical position onto its own leveling feet. Level the machine using the machine's leveling feet.

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. 1

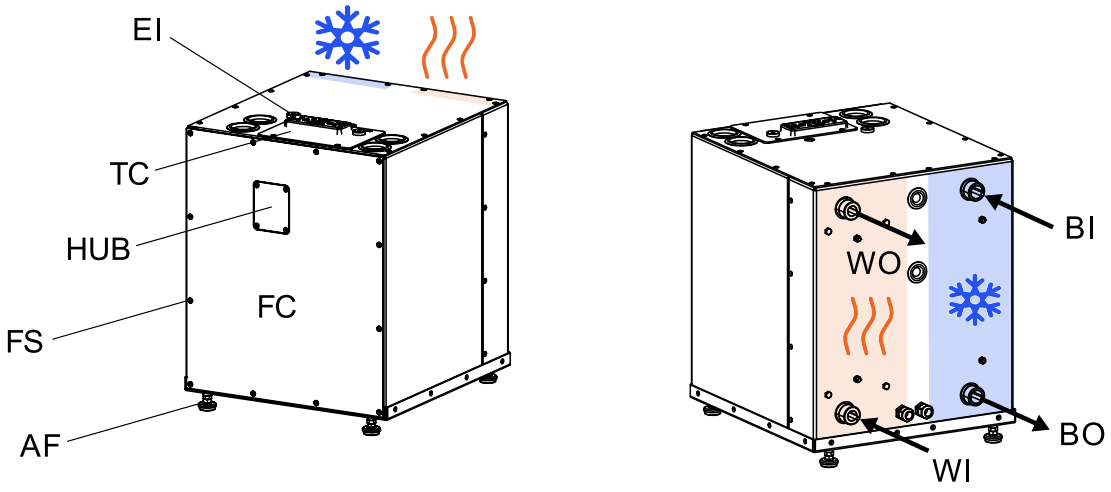
Pos.	Item
HP	Heat pump
A	Cupboard, appliance, storage tank, or other object

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

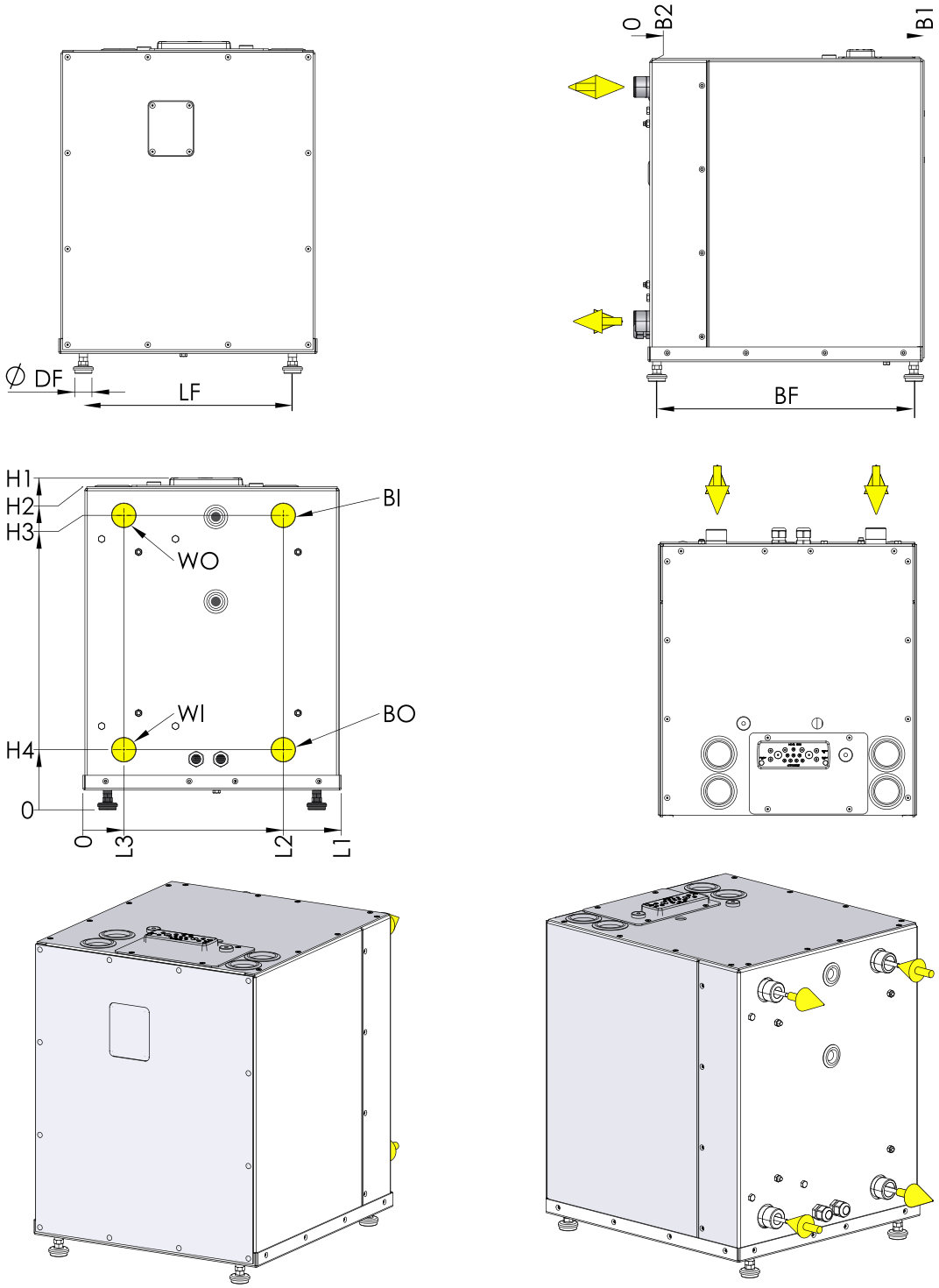
Components, ECO Inverter+



ECO Inverter+ main parts ver. 2

Pos.	Item	Description
❄	Brine circuit side (evaporator)	In from the top, out from the bottom.
≋	Heating side (condenser)	In from the bottom, out from the top.
WI	Heating water in (condenser in)	1 1/4" outer thread
WO	Heating water out (condenser out)	1 1/4" outer thread
BI	brine circuit in (evaporator in)	1 1/4" outer thread
BO	brine circuit out (evaporator out)	1 1/4" outer thread
AF	Leveling 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	EasyAce data hub	Behind a transparent panel (Torx T25)

Dimensions, ECO Inverter+



D077614 ECO Inverter+ ver. 2

Heat pump	L1	L2	L3	H1	H2	H3	H4	B1	B2
ECO Inverter+ 7–25	525	407	83	674	659	598	122	590	33

Heat pump	BI/BO	Ø WI/WO	LF	BF	Ø DF
ECO Inverter+ 7–25	ISO 228/1-G1 1/4 B	ISO228/1-G 1 1/4 B	425	522	35

Fuses, ECO Inverter+

Marking	Function	ECO Inverter+ 7–25	
		Default	Upon delivery
F1	Compressor fuse	ON	ON
F2	In-line heater fuse	N/A	OFF
F3	Control fuse (automation system fuse)	ON	ON
F4	Condenser circuit pump and heating circuit 1 pump	ON	ON
F5	Evaporator circuit pump	ON	ON

2.3 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.

2.4 In-line heater

An inline heater (label: EB203) can be installed in the heat pump's condenser line.

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 Inverter+ heat pumps.

Installation

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

The switchboards in ECO Inverter+ 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.

General instructions

When an in-line heater has not been installed and enabled in the automation system, the standard position for fuse F2 is OFF.

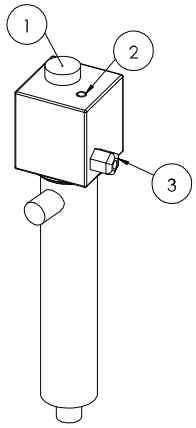
If an in-line heater has been installed and it needs to be disabled, disable the heater from the heat pump's settings. If an in-line heater has been installed and enabled in the settings, do not set the heater's fuse to the OFF position, unless there is a fault in the heater.

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. The thermostat will shut off power to the immersion heater only if there is a malfunction in the heat pump's automation system.

If you have accidentally turned the thermostat knob, turn the knob back to its highest setting.

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. To reset the switch, press the button on the black connection box on top of the heater. The button is under a transparent plastic lid. Remove the plastic lid with a slot-head screwdriver. Before resetting the overheat protection device, determine what caused the device to trip and address the issue. The device may have tripped due to vibration during transport or relocation.

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.



In-line heater ver. 2

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

In-line heater

2.5 Change-over valve (optional)

Accessory	Change-over valve kit 1
Item code	GEOEXCV1
Description	Includes a change-over valve and valve actuator (item code: 34034063 and 34034064).
Accessory	**Change-over valve kit 2**
Item code	GEOEXCV2
Description	Includes a change-over valve and valve actuator (item code: 34034205 and 34034204).

Install the change-over valve as indicated in the electric diagram and the piping diagram. When the valve is not energized, the valve is in position B (for ‘building’), which is used for space heating. When the valve is energized, the valve position is A (for ‘aqua’), which is used for heating domestic hot water.

- 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. As a general rule, plastic pipes should be tightened 1 1/2 turns.

2.6 DHW tank sensor

The heat pump comes 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.

2.7 Electrical connections, covers, and cable management

Electrical connections

To access the unit's switchboard, detach the cover on top of the compressor unit (TC) and the compressor unit front panel (FC). Note that you can make most of the connections by removing the top cover. Check the electrical connections from the unit's electric diagrams.

Switchboard cover and cable entries

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

Keep the cover closed and the screws fastened when filling or bleeding the system's circuits (brine circuit, heating circuit, or domestic water circuit). This will prevent leaking water from entering the compressor unit and spilling over the switchboard. Water can damage the switchboard.

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.

3 Heating circuits

3.1 Buffer tank

Enable the buffer tank from **Initial Setup** settings (see chapter *Commissioning*) or from **Heating** settings (Device settings → Service → Heating, see the table below).

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.

You can enable the buffer tank only if buffer tank temperature measurement is enabled. The temperature sensor used for this is the buffer tank sensor (TE255). See the instructions for installing the sensor in section *Buffer tank sensor*.

3.2 Buffer tank sensor

The heat pump comes with the buffer tank temperature sensor (TE255) already connected.

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 (B4) • DHW tank temperature (B3) • Heating circuit supply temperature (B1)

Connections

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

If required, you can use the same terminals for connecting the unit's built-in heating water return sensor (T201; condenser in). See the necessary connections in the unit's electric diagram.

You'll find the ends of the sensor cable's wires on the unit's switchboard near the terminal block for sensors.

If you wish to enable both the buffer tank sensor (TE255) and the heating water return sensor (TE201), install an auxiliary controller and connect the return sensor (TE201) to the auxiliary controller. Select the terminals for the sensor from the auxiliary controller's settings. The auxiliary controller will be delivered with additional instructions.

Installation

See the instructions for commissioning the buffer tank in section *Buffer tank.*

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.*

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.

3.3 Flow temperature sensor for heating circuit 1

The heat pump comes with the heating circuit 1 flow sensor (TE212) already connected.

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 (B4) ● DHW tank temperature (B3) ● Heating circuit supply temperature (B1)

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.

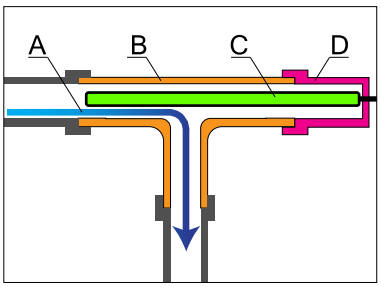
Surface installation

- 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.*



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

Tee fitting with sensor pocket ver. 1

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.

3.4 Heating water temperature, return to condenser

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).

3.5 Heating circuit’s control valve

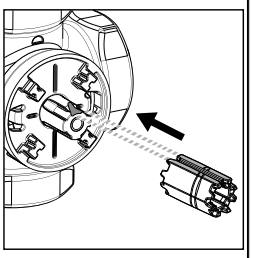
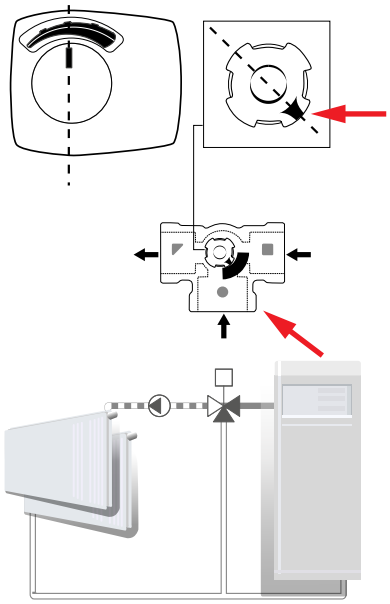
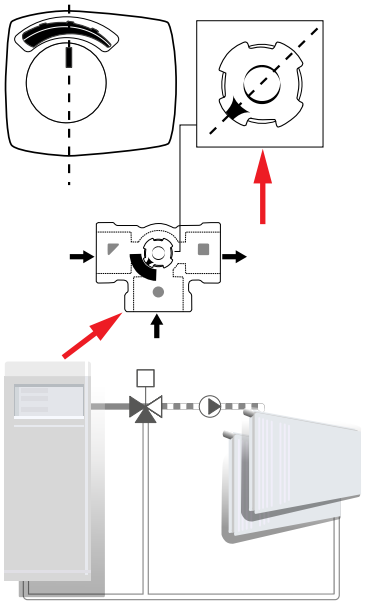
The heat pump can control both 230-V 3–point control valves and 0–10-V (24 V) control valves. See the instructions for connecting the control valve actuator to the heat pump in the unit’s electric diagram.

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.

<table>
<tr><td>Align the bevel on the valve stem with the slot on the actuator shaft.</td><td colspan="2">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.</td></tr>
<tr><td> 
ESBE valve stem ver. 2</td><td>A
  </td><td>B
  </td></tr>
</table>

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

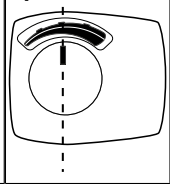
Accessory	Heating circuit control valve actuator, 3-point, 230 V
Item code	36962089
Description	Esbe ARA651 12101200, 3-point SPDT, 230 V, 3 wires, 60 s 90°
Valve	34034065, 34034067, 34034068, 34034467

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)

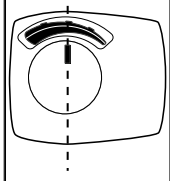
X2:3 (Q8): open



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)**

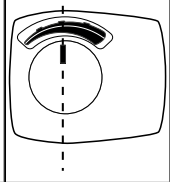
X2:3 (Q8): open



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)

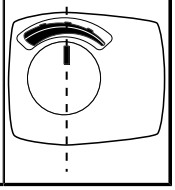
X2:4 (Q9): open



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

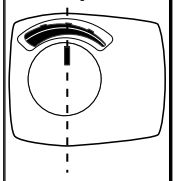
Accessory	Heating circuit control valve actuator, 0–10 V 24 V
Item code	36962220
Description	Esbe ARA639 12520100 (12520117 OEM), 0–10 V, 4–20 mA, 24 V AC/DC, 3 wires, 15/30/60/120 s 90°, pre-set to 60 s (DIP switch 2 ON), pre-set to OPEN (with increasing signal) counterclockwise CCW (DIP switch 6 ON)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

0 V closed, 10 V open

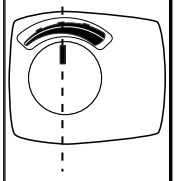
Signal	Control direction	Rotation direction
Increases	Open (more heat)	Counterclockwise (CCW)
Decreases	Closed (less heat)	Clockwise (CW)



Inverted setting enabled, DIP switch 6 ON

0 V open, 10 V closed

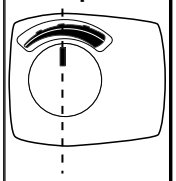
Signal	Control direction	Rotation direction
Increases	Closed (less heat)	Counterclockwise (CCW)
Decreases	Open (more heat)	Clockwise (CW)



Inverted control disabled, DIP switch 6 OFF

0 V closed, 10 V open

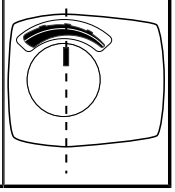
Signal	Control direction	Rotation direction
Increases	Open (more heat)	Clockwise (CW)
Decreases	Closed (less heat)	Counterclockwise (CCW)



Inverted control enabled, DIP switch 6 OFF

0 V open, 10 V closed

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



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.
	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

Pump operating mode

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. 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.

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.

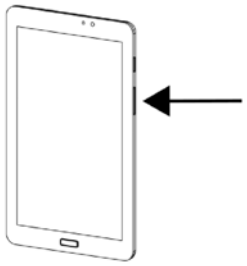
Note that when connecting actuators to the auxiliary controller, the actuator for the heating circuit 2 control valve can be a 3-point or 0–10 V actuator. For heating circuit 3, only a 0–10 V actuator can be used.

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.

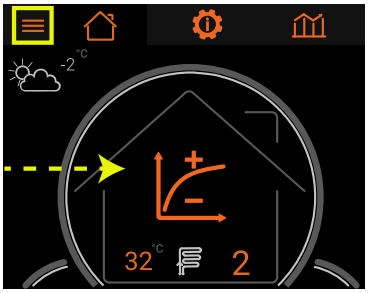
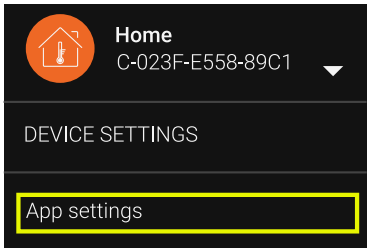
1. Switch on the wireless touch screen by pressing the power button.	2. Start the EasyAce app.
	

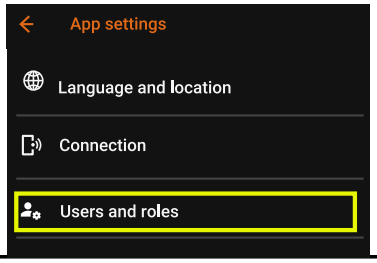
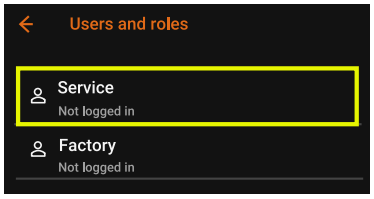
Start the commissioning process by signing in to the service level. This will give you access to the necessary settings.

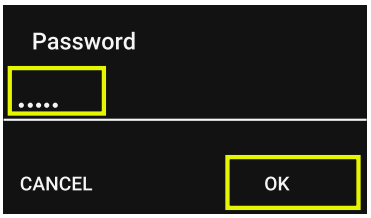
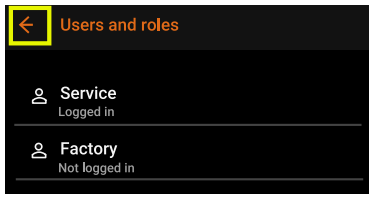
4.2 Signing in as a service level user

The Service level password is **8520**.

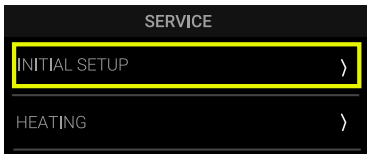
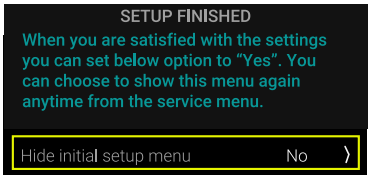
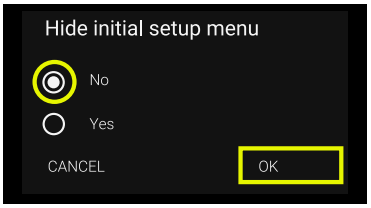
To gain access to all settings, sign in as a service-level user.

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

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.

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

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.

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

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 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

4.6.2 Typical heating curve adjustments

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. Adjust the curve if necessary.

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, space heating

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. ECO Inverter+: 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	**Freezing protection only** The electric heater will be switched on only when heating water temperature falls below +5 °C. The freezing protection function monitors the temperature in the condenser, buffer tank, and the heating circuits. Once the temperature exceeds +10 °C, the electric heater will be switched off. In freezing protection, space heating has priority over domestic hot water heating. • **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.**
	Backup use only 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. Select this option, if the fuse for the heat pump power supply is not rated for running the compressor and the electric heater in parallel.
	With compressor (parallel operation) 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. Select this option, if the fuse for the heat pump power supply is rated for running the compressor and the electric heater in parallel.

4.8 Additional heating, hot water

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.
	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. ● In freezing protection, space heating has priority over domestic hot water heating. ● **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 highest setpoint for domestic hot water is lower than the setpoints for the operating modes in which the system can use the heater.
	Backup use only 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.
	After compressor 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. Select this option, if the fuse for the heat pump power supply is not to run both the compressor and the heater at the same time.
	With compressor (parallel operation) 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. 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.

4.9 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.

4.10 Final settings

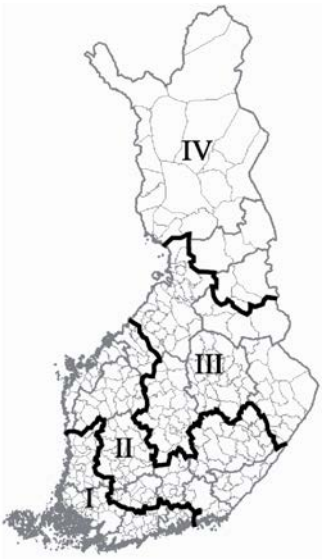
Manual control
The manual control function allows you to manually switch valve positions and, for example, turn on the brine pump or condenser pump to facilitate bleeding the corresponding circuit. The function can also be activated from the **Service** menu.

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.

4.11 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

References:
Lämmitys- ja ilmanvaihtolaitteiden suunnittelun normaaliohjeet. LVTY, 1966, Lämpö- ja vesijohtoteknillinen yhdistys r.y., Helsinki, Finland.
National Building Code of Finland, part D5 1985-2007; part D3 2012.
Ympäristöministeriön asetus uuden rakennuksen energiatehokkuudesta, Finlex: 1010/2017
Test reference year 2012 for building energy demand and impacts of climate change, Finnish meteorological institute, reports 2011:6, Sitra Reports 53
Weather data for building - physical studies and the building energy reference year 2020 in a changing climate, Finnish meteorological institute, reports 2020:6

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.The heat pump can be equipped with an optional in-line heater which acts as a backup for the heat pump's compressor and, if required, as a supplementary heat source.

After being pumped through the condenser, 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 Inverter+

MODEL/RATED CAPACITY (kW) 3~, 400 V, 50 Hz, PE		**7–25**
Empty weight	kg	136
In-line heater		
In-line heater as standard		no
Can be equipped with an in-line heater (6 kW)		yes
Pipe connections		
Condenser and evaporator connection (ISO 228 thread)		G 1 1/4
Maximum permissible operating pressure	bar	10
Noise level		
Overall A-weighted sound power level B0/W55	L_{WA}	51.3 +/-1.5 dB
Fuse		
Compressor and pumps		3 x 25 A

6.2 Compressor units

ECO Inverter+

MODEL / RATED CAPACITY (kW)3~ 400 V, 50 Hz, PE	**7–25**
Heat pump version	07
Refrigerant circuit (EU517/2014)	
Contains fluorinated greenhouse gases	Yes
Hermetically sealed device	Yes
To be checked periodically for leaks (maximum refrigerant charge: 10 CO_2-eq t)	No
Refrigerant	R-410A

MODEL / RATED CAPACITY (kW)3~ 400 V, 50 Hz, PE	7–25	
Refrigerant's PED group (EN 378:2016)	2	
Refrigerant's safety class (EN 378:2016)	A1	
Circuit's PED category (2014/68/EC)	1	
Refrigerant's GWP value (global warming potential)	2088	
Refrigerant charge	g	1800
Refrigerant charge	kg	1.8
Refrigerant charge	CO_2-eq kg	3758
Refrigerant charge	CO_2-eq t	3.758
Maximum permissible operating pressure PS	bar g	45
Maximum permissible temperature	°C	135
Minimum permissible temperature	°C	−15
Low pressure switch		
Low pressure cutoff setpoint	bar g	3.4 ± 0.5
Pressure reset setpoint	bar g	5.9 ± 0.5
High pressure switch		
High pressure cutoff setpoint	bar g	45 ± 1.2
Pressure reset setpoint	bar g	34 ± 2.0
Compressor		
Compressor type	Scroll	

6.3 Performance data

Rating conditions, low and medium temperature application

EN 14511

	B0/W35	B0/W55
Effective electric power input	2.111	4.337
cooling capacity	8.141	8.878
heating capacity	10.090	13.090
COP heating	4.779	3.018

Maximum capacity, low and medium temperature application

EN 14511

	B0/W35	B0/W55
Effective electric power input	6.334	8.234
cooling capacity	18.280	14.593
heating capacity	24.188	22.397
COP heating	3.819	2.720

Seasonal performance

Design			Brine / water			
Conditions specification according to EN 14825:2020	Temperature application				**Low** (reference water temperature 35 °C)	
	Reference heating season				**Average**	
	Outlet water temperature - indoor heat exchanger				Variable	
	Compressor speed control				Variable	
	Water flow rate – primary circuit				Variable	
	Water flow rate – secondary circuit				Variable	
Seasonal space heating energy efficiency	Heating	Average	η_s		**202.5**	%
		Warmer	η_s		–	%
		Colder	η_s		–	%
Seasonal efficiency according to EN 14825:2020	Heating	Average	**SCOP**		**5.26**	–
		Warmer	SCOP		–	–
		Colder	SCOP		–	–
Function	Cooling				No	
	Heating	Yes	Reference heating season	Average	Yes	
				Warmer	–	
				Colder	–	
Full heating load	Cooling		$P_{designc}$		–	kW
	Heating	Average	$P_{designh}$		24.19	kW
		Warmer	$P_{designh}$		–	kW
		Colder	$P_{designh}$		–	kW
Bivalent temperatures	Heating	Average	$T_{bivalent}$		-10	°C
		Warmer	$T_{bivalent}$		–	°C
		Colder	$T_{bivalent}$		–	°C
Operation limit temperatures	Heating	Average	TOL		-10	°C
		Warmer	TOL		–	°C
		Colder	TOL		–	°C
Seasonal power consumption according to EN 14825:2020	Cooling		Q_{CE}		–	kWh
	Heating	Average	Q_{HE}		9495	kWh
		Warmer	Q_{HE}		–	kWh
		Colder	Q_{HE}		–	kWh
Modes other than „active mode“	Off mode			P_{OFF}	21.6	W
	Thermostat off mode			P_{TO}	21.8	W
	Standby mode			P_{SB}	21.6	W
	Crankcase heater mode			P_{CK}	0.0	W

Design			Brine / water			
Conditions specification according to EN 14825:2020	Temperature application				**Medium** (reference water temperature 55 °C)	
	Reference heating season				**Average**	
	Outlet water temperature - indoor heat exchanger				Variable	
	Compressor speed control				Variable	
	Water flow rate – primary circuit				Variable	
	Water flow rate – secondary circuit				Variable	
Seasonal space heating energy efficiency	Heating	Average	η_s		**156.2**	%
		Warmer	η_s		–	%
		Colder	η_s		–	%
Seasonal efficiency according to EN 14825:2020	Heating	Average	**SCOP**		**4.10**	–
		Warmer	SCOP		–	–
		Colder	SCOP		–	–
Function	Cooling				No	
	Heating	Yes	Reference heating season	Average	Yes	
				Warmer	–	
				Colder	–	
Full heating load	Cooling		$P_{designc}$		–	kW
	Heating	Average	$P_{designh}$		22.40	kW
		Warmer	$P_{designh}$		–	kW
		Colder	$P_{designh}$		–	kW
Bivalent temperatures	Heating	Average	$T_{bivalent}$		-10	°C
		Warmer	$T_{bivalent}$		–	°C
		Colder	$T_{bivalent}$		–	°C
Operation limit temperatures	Heating	Average	TOL		-10	°C
		Warmer	TOL		–	°C
		Colder	TOL		–	°C
Seasonal power consumption according to EN 14825:2020	Cooling		Q_{CE}		–	kWh
	Heating	Average	Q_{HE}		11272	kWh
		Warmer	Q_{HE}		–	kWh
		Colder	Q_{HE}		–	kWh
Modes other than „active mode“	Off mode			P_{OFF}	21.6	W
	Thermostat off mode			P_{TO}	21.8	W
	Standby mode			P_{SB}	21.6	W
	Crankcase heater mode			P_{CK}	0.0	W

6.4 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.

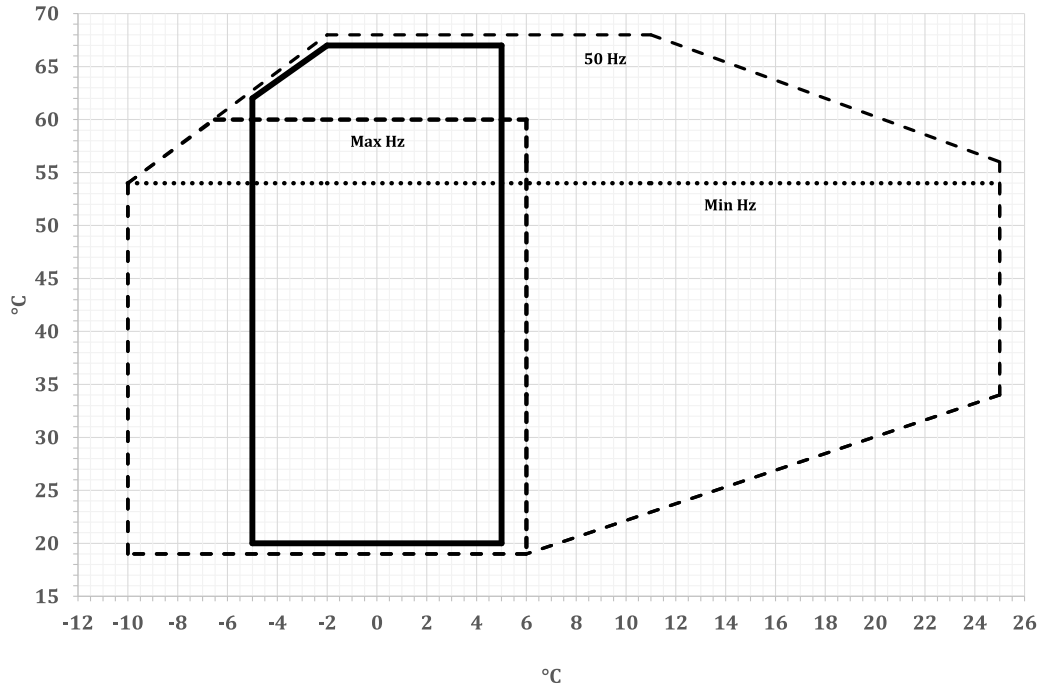
Brine temperature may exceed the maximum values momentarily during the start-up phase.

The heat pump’s automation system keeps the compressor’s rotation speed within the compressor’s operating envelope. The available operating range depends on the compressor’s rotation speed as well as the evaporator and condenser temperature. If

the unit's output temperature exceeds +60 °C, the system will limit the compressor's speed in steps. At the highest output temperature (+68 °C), compressor speed and heating capacity are kept at approximately 75% of the unit's maximum speed and power.

ECO Inverter+ 7–25		Minimum value		Maximum value	
		absolute	recommended	absolute	recommended
Brine into the evaporator	°C	–6	–5	25	5
Brine out of the evaporator	°C	–10	-9	–	–
Temperature difference across the evaporator circuit	°C	1	–	5	4
Water into the condenser	°C	15	20	63	61
Water from the condenser	°C	18	25	68	67
Temperature difference across the condenser circuit	°C	3	5	20	15

Operating envelope



Inverter+ operating envelope ver. 2

X-axis: Brine to condenser, ºC. Y-axis: Water from condenser, ºC. The bold continuous line indicates the unit's recommended operating envelope.

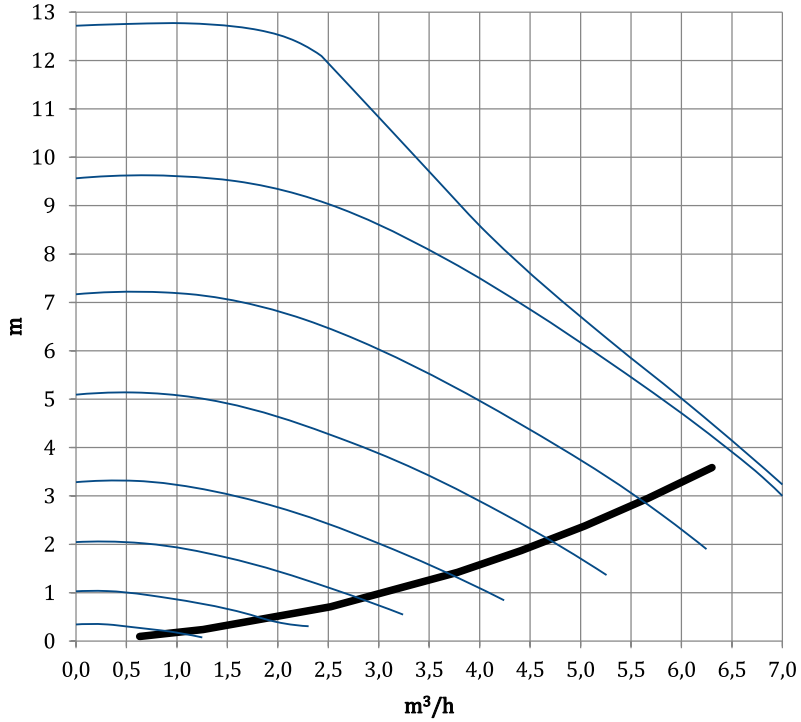
6.5 Pumps

Condenser circuit pump

Oilon designation	Pump	Description
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)

The bold ascending curve in the diagram indicates the unit's condenser circuit pressure drop as a function of flow rate. The remaining portion of the pump's total head can be used for circulating a heating circuit.

Condenser circuit pump curve, ECO Inverter+ 7–25



Condenser pump, ECO Inverter+ ver. 1

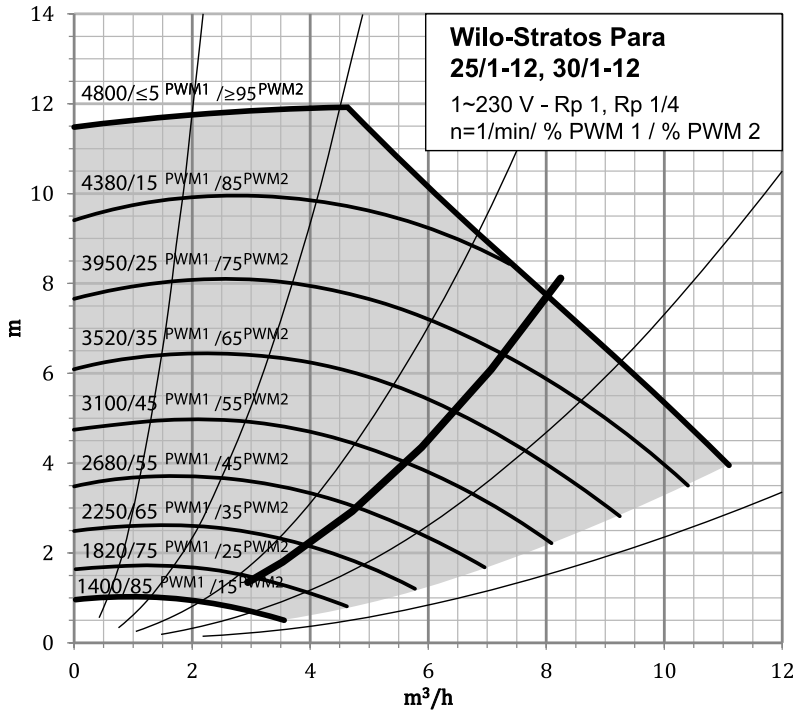
X-axis: Flow rate, m^3/h. Y-axis: pump head, m.
Condenser circuit fluid: water, +43 °C

Brine circuit pump

Oilon designation	Pump	Description
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

The bold ascending curve in the diagram indicates the device's evaporator circuit pressure drop as a function of flow rate. The remaining portion of the pump's total head can be used for circulating the brine circuit. The fluid in the graph is a mixture of water and ethanol (28 mass-%), temperature: −1.5 °C.

Brine circuit pump curve, ECO Inverter+



ECO Inverter+ brine pump curve ver. 1

X-axis: Flow rate, m^3/h. Y-axis: pump head, m.
0/−3 °C

Contact information of Oilon dealer:

Date of installation:

OILON GROUP
P.O. Box 5
FI-15801 LAHTI
FINLAND
Tel: +358 3 85 761
Fax: +358 3 857 6239
Email: info@oilon.com
www.oilon.com