M8008 2321EN
5 June 2023

Installation and commissioning manual
ECO Inverter+, Cube Inverter+ RVS

Read these instructions carefully before installation, use, or maintenance

Contents

4 Operation

5 Technical data

1 Introduction

1.1 Heat pumps covered in the manual

Model	Item code	Refrigerant
Cube Inverter+ 2-9 03	CUBEINVERTER2-903	R-410A
Cube Inverter+ 3-12 03	CUBEINVERTER2-1203	R-410A
ECO Inverter+ 2-9 03	ECOINVERTER2-903	R-410A
ECO Inverter+ 3-12 03	ECOINVERTER3-1203	R-410A
ECO Inverter+ 7–25 03	ECOINVERTER7-2503	R-410A

1.2 Product description

Eco Inverter+

ECO Inverter+ is an inverter heat pump that comprises a housed compressor unit, integrated switchboard and wall-mountable user interface. The device's switchboard allows for an installation of an electric heater for additional and reserve heat. The standard configuration of the device's automation is for a service buffer tank, a heating circuit storage tank and a single heating circuit controlled with a three-way valve.

ECO Inverter+ models 2-9 and 3-12 have condenser and brine circuit pumps ready-fitted inside the device. The 7-25 model requires installation of external pumps when the heat pump is installed.

Cube Inverter+

Cube Inverter+ is an inverter ground source heat pump that comprises a housed compressor unit and an internal domestic hot water storage tank. In addition to the compressor unit, the device includes an internal 6 kW electric heater for reserve heat production. The DHW storage tank is heated with a coil heat exchanger integrated into the tank. The standard configuration of the device's automation is for a service buffer tank and a single heating circuit. The condenser circuit's internal pump operates as the heating circuit's pump.

1.3 Instructions and diagrams

This manual includes the necessary basic instructions for operating the heat pump. For advanced instructions, see manual M8010 (available for download at www.oilon.com).

Document	Designation (Item code)
Installation and commissioning manual	M8008 (34793624*)
Operation manual	M8010 (34793625*)
Cube Inverter+, ECO Inverter+ 2–9, 3–12 Electric diagram	110743
ECO Inverter+ 7–25 Electric diagram	110783
Quick guide	34793587 (34793587*)

*Finnish version only.

1.4 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.

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.

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

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.

1.5 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

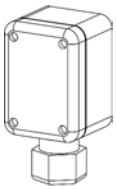
Do not lift or move the unit with the domestic hot water tank filled.

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.

1.6 Scope of delivery

Equipment and components

Item	PCS	Item code	Description
Installation and commissioning manual	1	34793624*	This manual
Electrical drawing	1		CUBE Inverter+: diagram 110743 ECO Inverter+ 3–12: dagram 110743 ECO Inverter+ 7–25: diagram 110783
Operating panel	ECO Inverter+: 1	36108182	Wall-mounted. Connect to cable WA1.5.
Outdoor temperature sensor B9	1	36217226	 Connect to cable WB9
Teflon gasket, 1"	ECO Inverter+ 3-12: 4 Cube Inverter+: 2	34797278	 Install between the heat pump's brine hoses and shut-off valves
Teflon gasket, 1 1/4"	ECO Inverter+ 7-25: 4	34797295	 Install in the heat pump's water and brine connections
Shut-off valve, 1"	ECO Inverter+ 3-12: 4 CUBE Inverter+: 4	34033361	 For the heat pump's brine and heating connections
Compressor fitting, 28 mm x 1"	Cube Inverter+: 2	34245086	 Cube Inverter+: Install the parts in heating connections.
Heating pump (condenser pump) Q9, ECO Inverter+ 7-25	ECO Inverter+ 7-25: 1	34023075	Wilo Stratos PARA 25/1-12
Domestic hot water tank temperature B3	ECO Inverter+: 1	36217266	Already connected to switchgear
Buffer tank temperature B4	ECO Inverter+: 1	36217266	Already connected to switchgear
Heating circuit 1 flow temperature B1	ECO Inverter+: 1	36217266	Already connected to switchgear

*Finnish version only.

Sensors and actuators

Position	Description	ECO Inverter + 2-9, 3-12	ECO Inverter + 7-25	CUBE Inverter + 2-9, 3-12
BRINE CIRCUIT				
B91	Brine inlet temperature (evaporator in)	S	S	S
B92	Brine outlet temperature (evaporator out)	S	S	S
Q8	Brine pump (evaporator pump)	S	O	S
HEATING				
B71	Heating return temperature (condenser in)	S	S	S
B21	Heating supply temperature (condenser out)	S	S	S
Q9	Heating pump (condenser pump)	S	S	S
K25/K26	Electric in-line heater	O	–	S
B4	Space heating buffer tank temperature	S	S	O
B41	Space heating buffer tank temperature, bottom	O	O	O
B3	Domestic hot water tank temperature	S	S	S
B31	Domestic hot water tank temperature, bottom	O	O	–
Q3	Change-over valve (space heating/ DHW heating)	O	O	S
B9	Outdoor temperature	S	S	S
INTEGRATED DHW TANK		–	–	S
HEATING CIRCUIT 1				
B1	Heating circuit 1 supply temperature	S	S	O
Q2	Heating circuit 1 pump	O	O	O
Y1/Y2	Heating circuit 1 mixing valve	O	O	O
B5/HMI1	Room temperature 1	O	O	O
HEATING CIRCUIT 2				
B12	Heating circuit 2 supply temperature	O	O	O
Q6	Heating circuit 2 pump	O	O	O
Y5/Y6	Heating circuit 2 mixing valve	O	O	O

Position	Description	ECO Inverter + 2-9, 3-12	ECO Inverter + 7-25	CUBE Inverter + 2-9, 3-12
B52/HMI2	Room temperature 2	O	O	O
HEATING CIRCUIT 3				
B14	Heating circuit 3 supply temperature	OC	OC	OC
Q20	Heating circuit 3 pump	OC	OC	OC
Y11/Y12	Heating circuit 3 mixing valve	OC	OC	OC
B53/HMI3	Room temperature 3	O	O	O
REFRIGERANT CIRCUIT				
H82	Suction pressure, evaporator	S	S	S
B85	Suction temperature, evaporator	S	S	S
E9	Low pressure switch	S	S	S
V81	Expansion valve, evaporator	S	S	S
K1	Compressor	S	S	S
B81	Discharge temperature	S	S	S
E10	High pressure switch	S	S	S
H83	Condenser pressure	O	S	O
Remote connection device				
OCI670	Remote connection device	O	O	O
Bus				
Modbus RTU		–	O	–

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).

1.7 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	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 (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	Sensor pocket 6x80 G1/2
Item code	3167816646
Description	For 6 mm sensor probes, with cable gland, depth: 80 mm, G1/2" outer thread, stainless steel
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	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 1
Item code	GEOEXCV1
Description	Includes a change-over valve and valve actuator (item code: 34034063 and 34034064).

Accessory	Change-over valve
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
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 Belimo DN32
Item code	34034600
Description	Belimo R3032-BL2
Purpose	To switch heating water flow between buffer tank and DHW tank
Actuator	36962268

Accessory	Change-over valve Belimo DN40
Item code	34034601
Description	Belimo R3040-BL4
Purpose	To switch heating water flow between buffer tank and DHW tank
Actuator	36962268

Accessory	Actuator for Belimo DN32–DN50 change-over valves
Item code	36962268
Description	Belimo SRD230A. AC 100–240 V, open/closed, 3-point, 20 s
Purpose	Actuator for Belimo change-over valves
Valve	34034600, 34034601, 34034602

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

Accessory	Remote connection device OCI670/109
Item code	36108276
Description	Siemens OCI670/109. For remote connection through the Climatix IC cloud service. Local connection through a USB cable. Connects to the heat pump controller through an LPB bus (DB+/MB–) and to the internet through a network cable. You can establish the connection with an internet browser, the Siemens ACS790 computer program or the Siemens Climatix IC mobile app.

Accessory	Modbus option (Eco Inverter+ 7-25 only)
Item code	32586214
Description	Provides Modbus RTU connectivity.

1.8 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.

1.9 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.

The heat pump may have more than one refrigerant circuit.

Depending on the model, the heat pump includes one of the refrigerants listed in table below.

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. Depending on the refrigerant type, refrigerants can be flammable, toxic, or both. 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...+35 °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

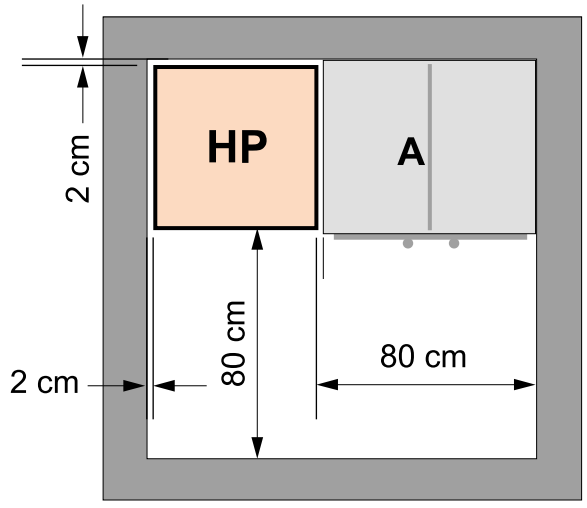
Place the unit on a stable, steady base that can carry its entire weight. Mount the unit securely in a vertical position onto its own leveling feet. Level the machine using the machine's leveling feet.

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.



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

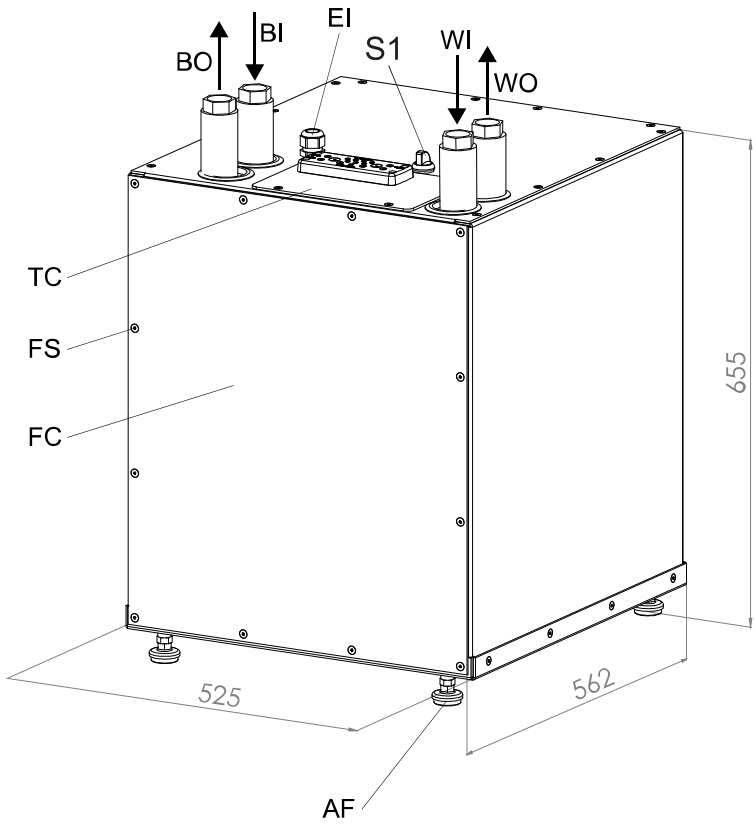
Access clearance ver. 1

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+

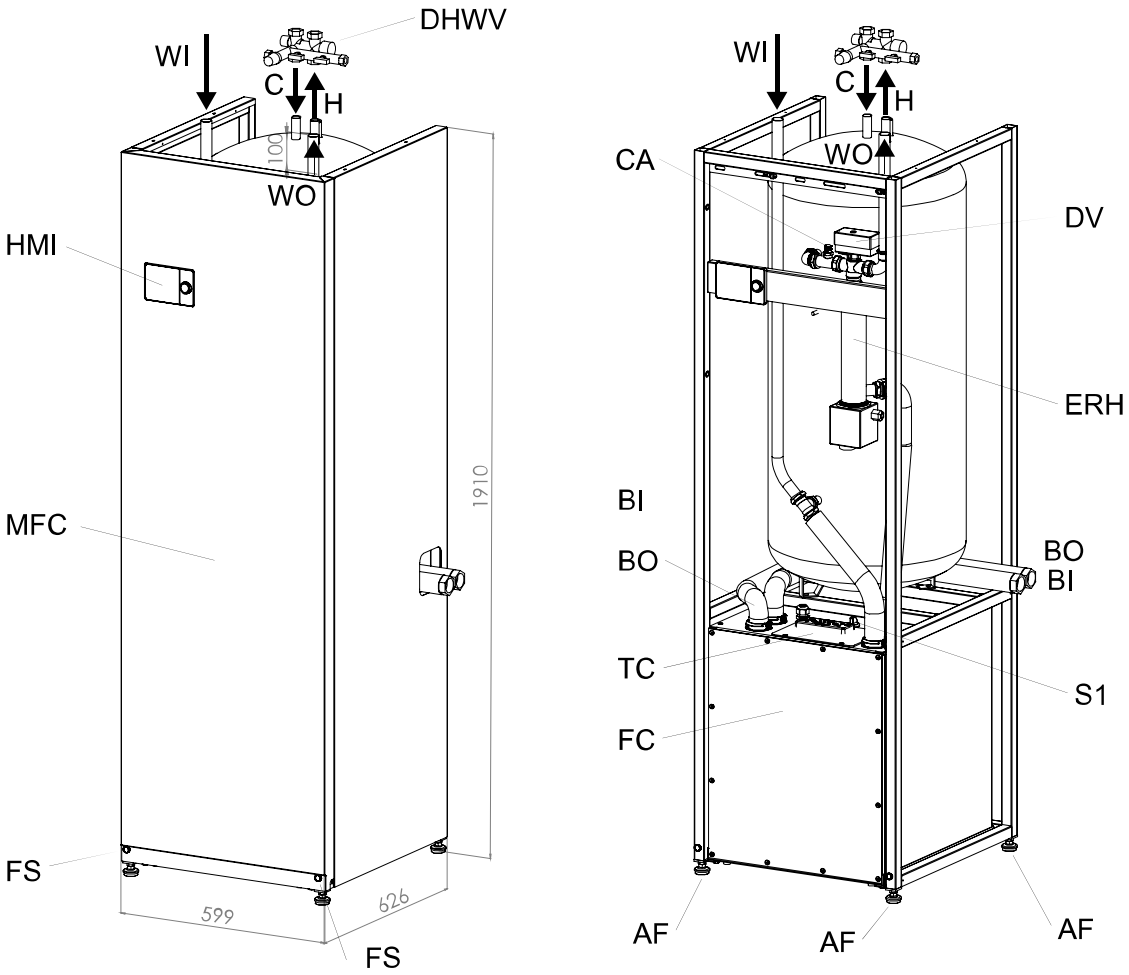


Junior ECO, ECO Inverter+ ver. 2

measurements in the image are in millimeters

WI	Heating water inlet (return)	Model: 7–25: 1 1/4" inner thread Other models: 1" inner thread Sealed with a gasket
WO	Heating water outlet (flow)	
BI	Brine circuit in	
BO	Brine circuit out	
S1	Operating switch	1/ ON: normal mode 0/OFF: compressor and immersion heaters off
AF	Adjustable feet	M10, DIN/ISO 17/16 mm
TC	Switchboard cover (Torx T25)	The unit's fuses are located under this cover.
FC	Compressor unit front panel (Torx T25)	Remove the front panel to make connections to the unit's automation system.
BP	Evaporator circuit pump (Brine circuit pump)	
EI	Mains connection	

Components, Cube Inverter+



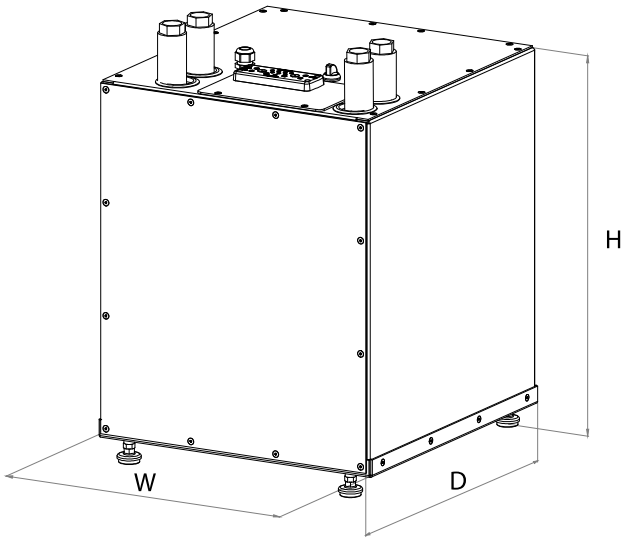
Cube Inverter+ ver. 2

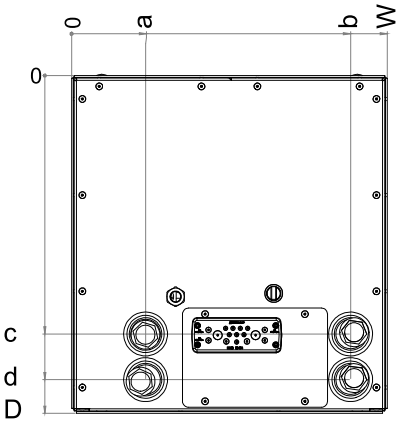
measurements in the image are in millimeters

H	Domestic hot water from DHW tank	22 mm steel pipe
C	Cold domestic water to DHW tank	
WI	Heating water inlet (return)	28 mm copper pipe
WO	Heating water outlet (flow)	
CA	Domestic hot water coil bleeding	Bleed screw, manual
BI	Brine circuit in	1" inner thread and flat gasket
BO	Brine circuit out	
HMI	Control panel	
B3	DHW sensor	
S1	Operating switch	1/ON: normal mode 0/OFF: compressor and in-line heaters off
DHWV	Mixing valve with safety valve (optional)	Oilon designation: 34034069
AF	Adjustable feet	M10, DIN/ISO 17/16 mm
MFC	Front panel	
FS	Front panel mounting screws	Torx T20
ERH	In-line heater	6 kW

DV	Change-over valve	A: domestic hot water B: building heating
TC	Switchboard cover (Torx T25)	The unit's fuses are located under this cover.
FC	Compressor unit front panel (Torx T25)	Remove the front panel to make connections to the unit's automation system.

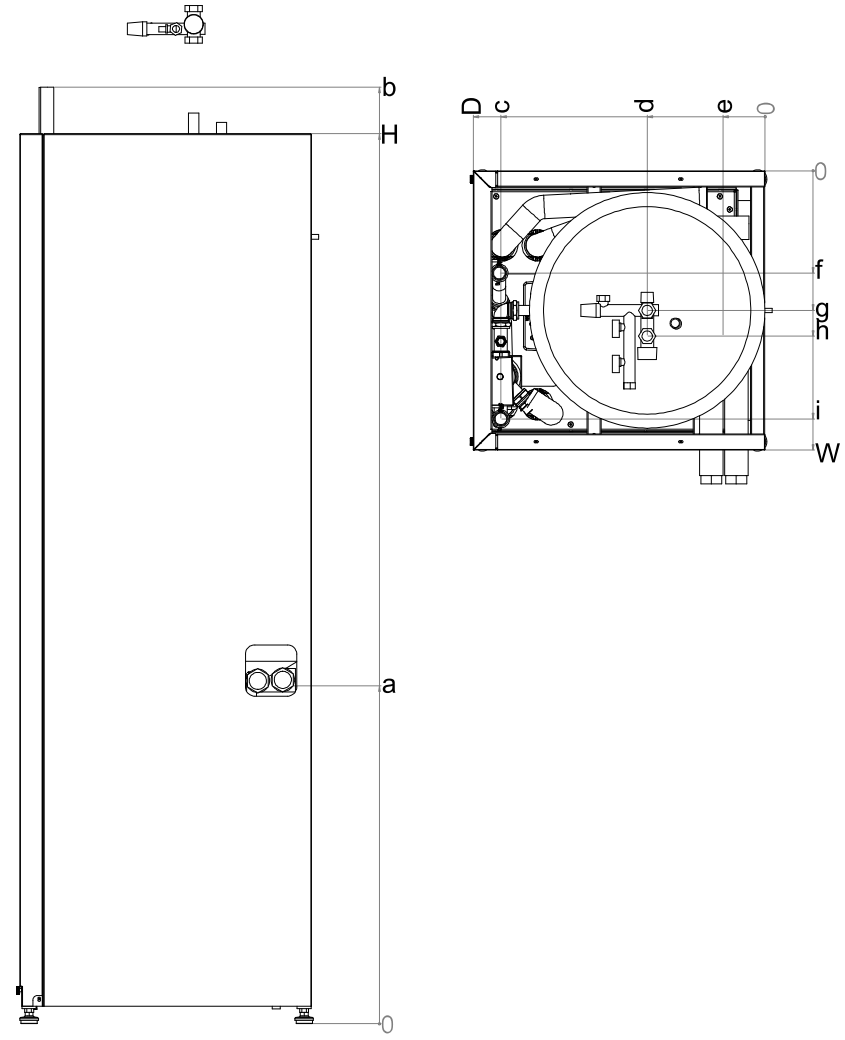
Dimensions, ECO Inverter+





Pos.	Dimension	Pos.	Dimension
W	525	a	123
D	562	b	655
H	655	c	430
		d	503

Dimensions, Cube Inverter+



Pos.	Dimension	Pos.	Dimension	Pos.	Dimension
W	599	b	2010	f	219
D	626	c	567	g	300
H	1910	d	253	h	355
a	726	e	90	I	532

Switches and fuses

The tables present the positions for components in electrical diagrams.

ECO Inverter+ 2-12, Cube Inverter+

Position	Function	Default position	Position at delivery
S1	Operating switch	1/ON	0/OFF
F1	Inverter fuse	ON	ON
F2	In-line heater fuse	ON	ON
F3	Control fuse (automation system fuse)	ON	ON
F4	Fuse shared by the unit's pumps	ON	ON

ECO Inverter+ 7-25

Position	Function	Default position	Position at delivery
S1	Operating switch	1/ON	0/OFF
F3	Control voltage, 230 V AC	ON	ON
F4	Heating pump (condenser pump)	ON	ON
F5	Brine pump (evaporator pump)	ON	ON

Operating switches

When the switch is in position 1/ON, the unit is in normal operating mode. When the switch is in position 0/OFF, the compressor is prevented from starting, while the heat pump's automation system stays operational. The frost protection function is an exception to this: it starts the in-line heater and the compressor's condenser circuit when the temperature falls below 5 °C, even if the switch is set to 0/OFF.

If the condenser circuit's temperature is below 5 °C and you do not want the compressor to start, set the compressor motor protection circuit breakers to the OFF position.

2.3 Covers and cable management

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

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

2.4 Electrical installation

Electrical connections

Check the connections from the unit's wiring diagrams.

- The electrical connections must be made as indicated in wiring diagrams.
- Mark any new or altered connections onto the unit's and building's wiring diagrams.
- Perform the necessary electrical safety measurements for the connections, make sure that all connections are safe, and prepare a measurement report.

If the heat pump features an integrated DHW tank and its pipe connections match the unit's factory defaults, there is no need to open the switchboard cover.

Safety switch for power supply

- The unit's power supply connection must be equipped with a safety switch.
- Place the safety switch in a visible, easy-to-access location.
- Make sure that safety switch bears the appropriate markings.

Switching the power on

- Do not turn on mains power before the necessary measurements have been taken and the connections confirmed safe.
- The unit can be switched on only after the unit's circuits and storage tanks have been filled and bled of air.
- Please follow any model-specific commissioning instructions.

Supply fuse

The power supply line must be equipped with an overcurrent protection device (fuse, fuse link) matching the specifications provided in the unit's wiring diagrams.

Sensor and communication cables

Leave sufficient clearance between sensor and communication cables and (230 V and 400 V) power cables. The clearance between power and data cables should be at least 10 cm.

Sensors

Connect the outdoor sensor and other necessary sensors to the automation according to the wiring diagrams and installation instructions of this manual (see the sections below).

Room unit

Connect the room units, if they are a part of the system (see section *QAA74.611 user interface*).

2.5 QAA74.611 user interface (room unit)

Use and placement

The wall-mounted user interface in the heat pump's automation is called the room unit. It can be used to measure the room temperature and to control the heat pump on the basis of measurement data. If the user interface is used for measuring the room temperature, place the interface unit in a location where the measurement result corresponds as fully as possible to the indoor air temperature of the measured space. A suitable location might, for example, be a position on a light-structured partition wall where the room unit is not exposed to heat from sunlight and radiators, or drafts from windows, doors, and ventilation systems. The system may contain multiple user interfaces.

Connecting the interface

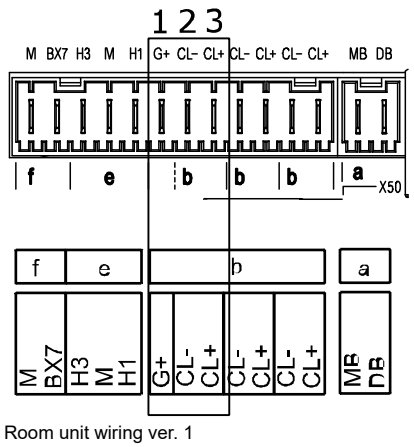
The wall-mounted user interface is connected to the terminals of the heat pump's three-terminal connector b, as shown in the table and image below. A regular two-wire insulated copper cable can be used with the display. The minimum cross-sectional area for the cable wires is 0,50 mm^2. The maximum permitted length of the cable is 200 m. When you run the sensor cable into the switchboard, use an insulated cable and, if possible, a cable trough that does not contain supply cables. Peel off the cable insulation and the wire insulation right next to the controller.

ECO Inverter+

The heat pump is delivered with a connection cable (WA1.5) already connected. Connect the user interface to the cable. The cable can be extended if required. A regular two-wire insulated copper cable can be used with the display. The minimum cross-sectional area for the extension cable's wires is 0.50 mm^2. The maximum permitted length of the cable is 200 m.

Room unit and heat pump controller connections

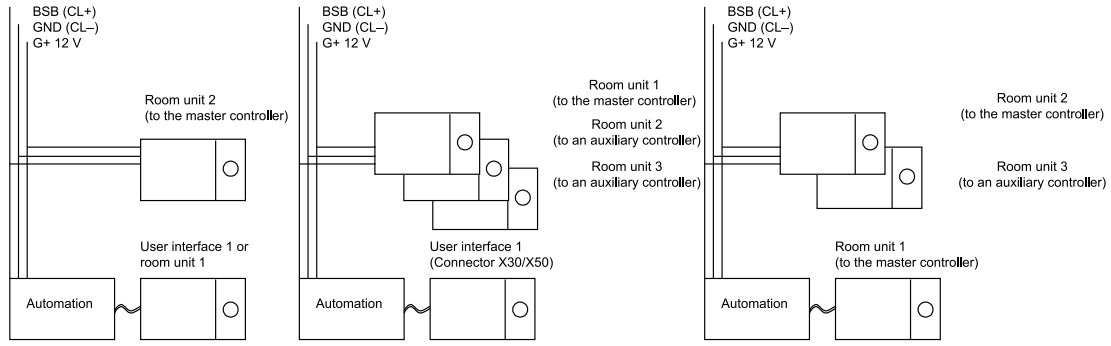
Room unit connector's terminal	Connector terminal of the heat pump's controller	
1	G+	room unit's backlight: DC +12 V, 36 mA heat pump's controller: DC +12 V, maximum 88 mA
2	CL−	bus and backlight ground (M)
3	CL+	BSB bus

Connect the user interface unit cable to pins G+, CL–, and CL+ of the three-terminal connector (b) on the low voltage side of the heat pump's main controller.	 Room unit wiring ver. 1	1: G+ 2: CL− 3: CL+

Connecting multiple room units

Multiple different interfaces can be connected to the heat pump automation. The system may contain one interface that is integrated into the heat pump, and three room units. The connection options are presented in the image below.

The interfaces utilize the automation's BSB bus. Integrated interfaces use the X30/X50 connection and room units use connectors CL+ and CL-. The room units can be connected in a line, star or tree formation, or a combination of these. Do not let the user interfaces form a closed circuit in the bus. Integrated interfaces draw their backlight power from the X30/X50 connection, and room units use connector G+. A single display's backlight uses approximately 36 mA. The X30/X50 and G+ connectors can supply a combined amount of approximately 88 mA. Thus a single heat pump controller can have at most two user interfaces. If the system requires more interfaces, the third and fourth interface are connected to the heat pump automation's auxiliary controller. A 12 V power source can be added for the backlights, or they can be left unconnected altogether.



Room unit connection options ver. 1

2.6 Pumps

Always check the pumps' flow dimensioning by comparing the pump performance (head, flow rate) to the circuit's pressure loss calculation. Pay special attention to the dimensioning of the brine circuit pump.

If the selected pumps deviate from the standard configuration and are connected to the heat pump switchboard, always check dimensioning of the pumps' power supply, and the power supply and cabling of the components. If necessary, change the coupling to comply with the pump's requirements.

Note that the pump operating sound may drift to the residential premises and other noise sensitive areas.

- Avoid installing the pumps in noise sensitive areas or in their vicinity.
- The pumps should be installed to the outer side of the wall. This way, noise drifting into residential premises can be eliminated.
- Insulate the external circulation pumps of the device with absorbers from the wall and floor surfaces. For example, rubber vibration absorbers can be used for insulation.

When selecting the pump, pay attention to a minimal electrical power consumption in the most probable point (MPP). This will keep the pumping costs as low as possible.

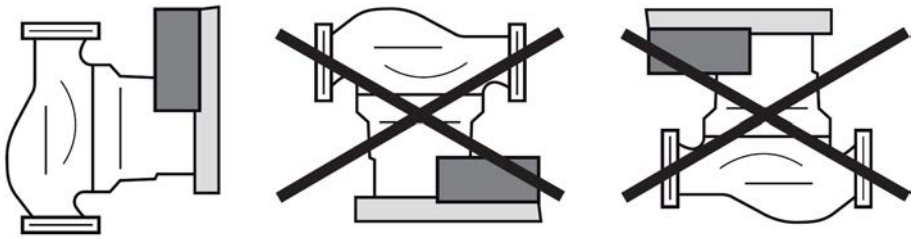
- The cost is significantly influenced by the pressure loss in the piping and its equipment. If the loss is kept to a minimum, the required electrical power is drastically reduced. This may allow for a smaller pump to be used. Usually the most important factor in attaining minimal pressure loss is having sufficiently wide piping.

Smaller pumps should be installed on vertical line, flow direction upwards. This way, air cannot accumulate in the pump housing. Larger pumps usually require horizontal installation. See the pump manual for the permitted installation methods.

Wet-motor pumps (water-lubricated pumps) must be installed so that the water can lubricate and cool the pump motor. This requires that the wet-motor pump's motor and its shaft are in a horizontal position. A wet-motor pump can be installed in a horizontal or vertical line, as long as the pump shaft is in a horizontal position (the motor shaft can be at an angle of max. 7 ° in relation to the horizontal and vertical plane).

Oilon is not responsible for the suitability of the pump in the customer's system, nor for any changes made in the installation phase.

Standard pumps are presented in the technical data section along with the flow data.



Wet-motor pump installation ver. 1

Installing a wet-motor pump

2.6.1 Pump installation

ECO Inverter+ 7–25 pump installation

The 7-25 model requires installation of external pumps when the heat pump is installed.

Their electrical connections are presented in the electrical diagrams. If their required current exceeds the values given in the diagrams, power is drawn directly from the building's switchboard. In this case the pumps' relay control can be done via the heat pump's switchboard, from the same relay that the smaller pump would have been in direct connection with.

The pump of the condenser circuit included in the standard delivery can be regulated via the pump's own red adjustment knob, or the control cable can be connected to the automation, which then regulates the pump's speed.

The brine circuit's connection depends on the selected pump. The automation also has a readiness for controlling the brine circuit's pump speed with a 0-10 V control signal.

2.7 Brine circuit

Design and implementation

All circuits must be implemented in accordance with existing legislation. The circuits' thermal and flow characteristics should meet the heat pump's capacity requirements.

- The pump for the brine circuit must be selected according to the circuit's pressure loss calculation (see section *Pumps.* in chapter *Technical data.*
- In a system with multiple brine circuits, the circuits should be connected in parallel, and the flow of each circuit should be separately adjustable.
- If the system includes multiple heat pumps, the brine circuit flow to each pump should be measurable and adjustable. The circuits should be designed to be as symmetrical as possible. If necessary, the piping can be fitted with balancing valves and non-return valves (for balancing flows and ensuring correct flow direction).
- If the selected pumps deviate from the standard configuration, always check dimensioning of the pumps' power supply and the heat pump's power supply.

Brine circuit pump

The pump for the brine circuit must always be selected according to the circuit's pressure loss calculation. The pressure loss is calculated from the brine capacity in design conditions, and the temperatures and attributes of the brine liquid in design conditions. The design conditions are the conditions where the capacity is at its peak during the device's normal operation. The brine circuit's pump must be able to produce the flow that the pressure loss calculation requires under the design conditions.
The temperature difference between the circuit's flow and return sides must be at maximum 4 °C. The recommended difference is 3 °C, because it diminishes the risk of underestimation and the evaporation temperature is kept as high as possible. Note that even a carefully drafted pressure loss calculation can have a margin of error as high as +/− 20 %, and that the pressure loss usually grows as the system ages.

Pipe size

Determine the appropriate pipe size by assessing technical suitability, pressure drop, cost, and ease of installation. When selecting the pipe size, consider the heating circuit's plans and specifications, the condenser circuit, and the heating circuit pump's performance as well as the pipe's material and the planned pipe equipment. The pipes, accessories and equipment used in the brine circuit is usually selected by the circuit's designer and the contractor.

- It is usually a good idea to choose the pipe size so that the flow rate in the pipes in approximately 0.5–1.5 m/s. For practical reasons, the flow rate may exceed these values in shorter pipe segments, but typically it will stay under 2.5 m/s. To ensure that gas bubbles are removed from the system, the flow rate should be kept higher than 0.3 m/s.
- The smaller the pipe, the larger the flow rate and pressure drop will be. Using an insufficient pipe size (or undersized fittings and equipment) will result in high pressure drop, inadequate flow, inefficient heat pump operation, high pump power draw, high pumping costs, noisy piping, inefficient deaerator operation, and piping cavitation
- Flow rates for different pipe options are provided at the end of this manual.

Brine solution

Brine circuits should be filled with a mixture of ethanol and water (or other equivalent solution) that meets the permit requirements specified by local authorities. Note that in some regions, solutions containing corrosion inhibitors are not allowed. In such regions, Naturet Geosafe by Altia (or other similar commercial product) can be used instead.

The solution used in brine circuits must be able to withstand all the different conditions within the circuit and the evaporator without freezing or becoming a slush. The solution's freezing point must be below −15 °C.

Ethanol and water solutions

The strength of an ethanol–water solution can be expressed either as percentage by mass or percentage by volume. There is a minor difference between the two. A suitable strength for the solution is 28–30 mass-%. This solution has a freezing point of −17… −20 °C. Stronger solutions should be diluted to the suitable strength with water. Always check the correct dilution ratio from the solution supplier.

Undiluted strength, percent by weight	Undiluted strength, percent by volume	Dilution
28	23	ready-made solution, undiluted
60	52	Add 1.020 liters of water to one liter of solution. Add 1,020 liters of water to one cubic meter of solution. Add 1.143 kg of water to 1 kg of solution. Add 1,143 kg of water to 1,000 kg of solution.
88	83	Add 1.814 liters of water to one liter of solution. Add 1,814 liters of water to one cubic meter of solution. Add 2.214 kg of water to 1 kg of solution. Add 2,214 kg of water to 1,000 kg of solution.

Safety valve

Install a safety valve in the highest point of the brine circuit return pipe (on the suction side of the circulation pump). Route the safety valve's discharge pipe to the floor drain for safe discharge, ensuring that the pipe has a continuous slope.

- The discharge pipe's diameter should be equal to or larger than the safety valve's nominal diameter.
- The discharge pipe must be self-draining (the pipe should not immersed in a reservoir or the floor gully or allowed to freeze).
- Placing a shut-off valve between the safety valve and the circuit is not allowed.
  - If an irremovable shut-off valve is placed between the safety valve and the circuit, detach the shut-off valve's handle after opening the valve and place a caution sign that forbids shutting the shut-off valve next to the valve.
- Correspondingly, placing a shut-off valve on the safety valve's discharge side is not allowed.
- Select the safety valve's opening pressure according to the brine circuit's maximum permitted operating pressure.
- Safety valve opening pressure must not exceed 3 bar. Single-family houses usually require a 1.5 bar safety valve.
- After filling the pipes, test the safety valve. Release the valve by pressing the button on the valve.

Shut-off valves

To facilitate heat pump maintenance, install shut-off valves on both sides of the brine circuit's heat pump. Place the shut-off valves so that they will cut off not only the heat pump but also any other circuit components that might require maintenance or replacement.

Place the circuit's filling and drain connections within the section of the circuit controlled by the shut-off valves.

Expansion tank

Connect the expansion tank to the brine circuit return pipe (on the suction side of the circulation pump). Use either a transparent plastic level vessel or a diaphragm expansion vessel as the expansion tank.

- If a level vessel is used, install the vessel in the highest point of the brine circuit.
- If a diaphragm expansion vessel is used instead, there is no need to install the vessel in the highest point in the system.
  - Check that the diaphragm expansion vessel's diaphragm is suitable for the solution used in the circuit and at the circuit's temperature level.

- To facilitate replacing the vessel and adjusting the circuit's pressure level, equip the diaphragm expansion vessel with a maintenance valve (shut-off valve and blow-off valve).
- Adjust the diaphragm expansion vessel's pressure to match the system's requirements.

Brine circuit filter (Y strainer)

Install the strainer in the brine circuit return pipe (on the suction side of the circulation pump). Ensure that it can be easily emptied and cleaned.

- To facilitate emptying and cleaning, install a shut-off valve on both sides of the filter.
- To prevent evaporator fouling, use an adequately small mesh size. In most cases, a mesh size of 1 mm or smaller should be used.

Pressure gauge

Install a pressure gauge with the expansion tank. Equip the gauge with a shut-off valve.

Bleed valve and deaerator

If the brine circuit cannot be bled of air through a level vessel, install a bleed valve or deaerator in the highest point of the brine circuit return pipe.

- Equip the bleed valve with a shut-off valve. If a deaerator is used, equip the deaerator with a shut-off valve and bypass kit.
- To prevent deaerator or bleed valve fouling, close the shut-off valve and use the bypass line when filling or flushing the system.

Pipe installation

When installing pipes, remember to account for the weight of the pipes and equipment as well as the changes in pipe length caused by thermal expansion. Install the pipes and equipment so that thermal expansion or the weight of the components causes no strain on the heat pump's pipes, joints, or connections.

Pipe and pipe equipment insulation

Tightly insulate the brine circuit's indoor pipes and pipe equipment against indoor air.

- Cold, uninsulated surfaces may attract condensation from indoor air.
- Do not leave gaps between the insulation and the insulated surface. The humidity in the air could condense on the cold surfaces under the insulation layer.

Filling and bleeding

- Before filling, make sure that all pipes have been correctly connected.
- Fill and bleed all pipes thoroughly before switching on the power.

Flushing the pipes

If the brine circuit contains impurities, flush the circuit before installing the heat pump.

- When flushing, check that the flow in the piping is unobstructed.
- To prevent clean components and the heat pump from fouling, do not circulate the flushing water through the pump side of the circuit. When laying out and installing the circuit, equip the circuit with flushing connectors and shut-off valves that will allow the heat pump to be bypassed and isolated from the rest of the system for flushing.

2.8 Condenser circuit and heating circuit

The thermostat valves of the heating circuit and the radiators should usually be opened completely if the system does not have a buffer. You may need to regulate the heating circuit and radiator currents and balance the network again if the temperature level deviates from the original level.

If the building's heating system already has a regulating system – for example, for floor heating – the integration of the regulating systems should be designed in connection with the building's HPAC system design. Take the piping and automation into account in the integration.

Designing and implementing the system

- The heating circuit must be implemented according to the effective legislation.
- The heating circuit must be heat and flow technically adequate for the heat pump's capacity.
  - Take the circuit's heat accumulation and transfer properties into account when designing, especially if the system does not include a buffer storage tank in the heating circuit.
- In a system with multiple heat pumps, the condenser circuit's flow to each heat pump must be measurable and adjustable. The circuits must be designed to be as symmetrical as possible, and if necessary, the piping must be fitted with balancing valves and non-return valves to ensure the correct flow direction and for balancing the flows.

Pipe size

- The appropriate pipe size is determined by the technical functionality, pressure loss, expenses and ease of installation. When selecting the pipe size, pay attention to the heating circuit's planning, the condenser and heating circuits' pump's performance, as well as the pipe material and equipment.
- It is usually a good idea to choose the pipe size so that the flow rate in the pipes is approximately 0.4...1.5 m/s. For practical reasons, the flow rate may exceed these values in shorter pipe segments, but typically stays at under 2.5 m/s. The flow rate must usually stay at over 0.3 m/s so the gas bubbles can be exhausted with the stream. Check the maximum permitted flow in the pipe's technical data.
- The smaller the pipe, the larger the flow rate and pressure loss will be. Using a pipe size that is too small will result in high pressure loss, inadequate flow, poor functioning of the heat pump, high electrical power consumption by the pump, high pumping expenses, noisy piping, poor functioning of the deaerators and piping cavitation.

Shut-off valves

Install shut-off valves on both sides of the condenser circuit's heat pump to facilitate the pump's maintenance. Make sure that in addition to the heat pump, all other components that may require maintenance or changing are also within the whole demarcated by the shut-off valves.

Heating circuit's minimum volumetric capacity in direct coupling

In a direct coupling, the heat pump's condenser is connected to the heating circuit directly, without a regulated storage tank and mixing valve (3-way valve). The circuit's volumetric capacity must be adequate for the pump's heating capacity. This means at

least 20 liters / kW. If the volumetric capacity is insufficient, an instantaneous water cylinder must installed so that the system has enough volume. In this connection, the automation does not regulate the cylinder, because the its only function is to bring more volumetric capacity to the heating circuit.

Buffer storage tank volume in storage tank coupling

In a storage tank coupling the heating circuit's condenser is connected to a buffer storage tank that automation regulates, and the heating circuit is connected to the buffer with a mxiing valve coupling (3-way valve). The buffer storage tank's volumetric capacity must be adequate for the heat pump's heating capacity. This means at least 15...20 liters / kW. In this coupling the heat pump's automation regulates the buffer storage tank's temperature and usually the heating circuit's mixing valve as well.

Safety valve

- The safety valve is installed in the highest point of the pipe extending from the heating circuit on the suction side of the circulation pump.
- In storage tank systems the safety valve is installed in the tank's uppermost connector sleeve.
- Install the safety valve's discharge pipe so that it is continuously descending and reaches the floor drain in a safe manner.
- The discharge pipe's diameter must be at least as large as the safety valve's nominal diameter.
- The pipe must be self-emptying (must not be placed under the liquid level of the tank or the well, must not freeze),
- A shut-off valve must not placed between the safety valve and the circuit.
    - If an irremovable shut-off valve is placed between the safety valve and the circuit, detach the shut-off valve's handle after opening the valve and place a caution sign that forbids shutting the shut-off valve next to the valve. Finally, make sure that the shut-off valve is open.
- The safety valve's discharge side must not have a shut-off valve.
- Select the safety valve's opening pressure according to the brine circuit's largest permitted operating pressure. The opening pressure may not be higher than 3 bar. Single-family houses usually require a 1.5 bar safety valve.
- Check the safety valve's functioning by releasing the valve from the button after the pipes have been filled.

Expansion tank

- Install the diaphragm expansion vessel to the pipe extending from the heating circuit on the suction side of the circulation pump.
- Ensure that the diaphragm expansion vessel is suitable for the heating circuit's temperature level.
- Equip the expansion vessel with a maintenance valve (shut-off valve and blow-off valve) to be able to adjust the pressure level and facilitate replacing the vessel.
- Adjust the diaphragm expansion vessel's pressure to a level that suits the system.

Heating circuit's filter (sanitary trap)

- Install the filter to the pipe extending from the heating circuit on the suction side of the circulation pump.
- Make sure it can be emptied and cleaned easily.
- Install a shut-off valve on both sides of the filter to facilitate the emptying and cleaning.
- Use an adequately small mesh size in the filter to prevent the condenser from getting dirty. A suitable size is 1 mm or less.

Pressure gauge

- Install a pressure gauge to the expansion tank.
- Equip the gauge with a shut-off valve.

Change-over valve's running time

If the system has a change valve that is used to control the heat pump's condenser circuit's switch from DHW heating to space heating, the valve's running time must be sufficiently long. The larger the temperature difference between DHW and space heating, the longer the running time needs to be. A suitable running time is several tens of seconds. This lets the temperature of the flow the condenser receives change slowly enough. If the running time is too short, the temperature may change too quickly, which may result in underpressure, overpressure or excessive hot gas temperature, depending on the running direction and temperatures. Rapid changes may wear out the compressor prematurely.

Bleed valve and air deaerator

- Install an automatic bleeding valve or air deaerator in the highest point of the pipe that runs into the heating circuit (i.e. the highest point of the hottest pipe).
- Equip the bleeding valve with a shut-off valve, and the air deaerator with a bypass kit.
  - To prevent the deaerator and bleeding valve from getting dirty, close the shut-off valve and use the bypass when the system is being filled and purged.

Insulating the pipes and pipe equipment

If needed, insulate the heating circuit's piping to prevent heat loss.

Flushing the pipes

- If the heating circuit and storage tanks contain impurities, flush them before installing the heat pump. When flushing, check that the flow in the piping is unobstructed.
- Do not circulate the flushing water through the heat pump or other clean components in the system, or they will get dirty. Design and fit the piping with flush connectors and shut-off valves that can be used to bypass and separate the heat pump from the rest of the system for the duration of the flushing.

Filling and bleeding

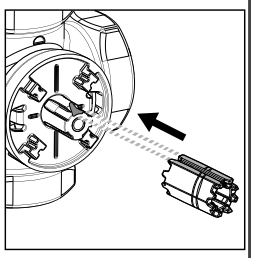
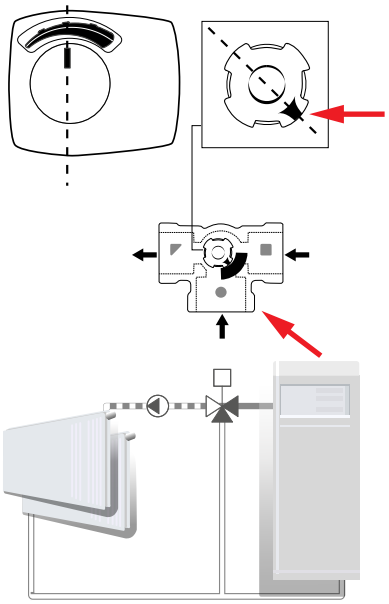
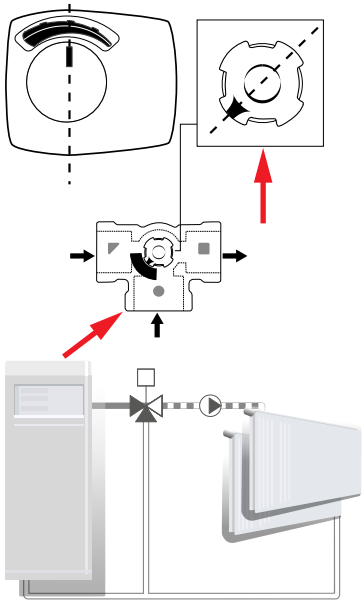
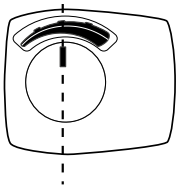
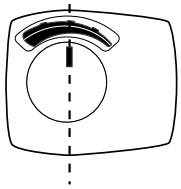
- Make sure that the pipe couplings are valid before filling.
- Fill and bleed all pipes thoroughly before switching on the electrical supply

Heating circuit pump's electrical current and fuse size

- Pay attention to the heating circuit pump's required electrical current and fuse size if it is connected to the heat pump's switchboard. The selected pump may not necessarily correspond to the supposed electrical current of the heating circuit's pump.
- Pay attention to the following components during connection: fuse size and cabling of the heating circuit's pump; backup fuse and cabling of the heat pump's power supply.

2.9 Heating circuit's control valve

The heating circuit's control valves are delivered with their own installation guide (provided by the component manufacturer). This is an outline of the installation of an Esbe VRG130 series valve and the connected Esbe ARA600 series actuator. The other valves in the system are installed in the same 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. The valve's installation guide presents other coupling options.</td></tr>
<tr><td rowspan="4"> 
ESBE valve stem ver. 2</td><td>A
  </td><td>B
  </td></tr>
<tr><td rowspan="3">Make the electrical connections according to the electrical diagrams. Pay attention to the valve's adjustment direction, which may differ from the default configuration presented in the electrical diagrams.</td><td>Valve open: clockwise (turning clockwise increases heat transfer from the storage tank to the heating circuit):</td><td>Valve open: counterclockwise (turning counterclockwise increases heat transfer from the storage tank to the heating circuit):</td></tr>
<tr><td>QX10: brown (clockwise, CW)
QX11: black (counterclockwise, CCW)</td><td>QX10: black (counterclockwise, CCW)
QX11: brown (clockwise, CW)</td></tr>
<tr><td>  </td><td>  </td></tr>
</table>

2.10 Pipe joints

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.

Leaks in the brine circuit

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.

2.11 Domestic hot water circuit

System design and implementation

The domestic water system should be implemented in accordance with applicable laws, rules, and regulations and the conditions and provisions specified by the water supplier.

If the system includes an external domestic hot water tank, the tank's volumetric capacity must be adequate for the heat pump's heating capacity.

Shut-off valves

Install shut-off valves on both sides of the tank.

- Place the cold water supply line's shut-off valves before any other piping equipment (such as the safety valve, pressure-reducing valve and expansion tank; first in the direction of flow). This allows the piping equipment to be isolated from the cold water supply line during maintenance.
- Place the hot water line's shut-off valves after all the other piping equipment (last in the direction of flow). This allows the piping equipment to be isolated from the DHW supply line during maintenance.

Safety valve

Install the safety valve in the storage tank cold water supply pipe. The safety valve is usually part of a mixing valve combination set, eliminating the need for a separate unit.

- Route the safety valve's discharge pipe to the floor drain for safe discharge, ensuring that the pipe has a continuous slope.
- The discharge pipe's diameter should be equal to or larger than the safety valve's nominal diameter.
- The discharge pipe must be self-draining (the pipe should not immersed in a reservoir or the floor gully or allowed to freeze).

- Placing a shut-off valve between the safety valve and the circuit is not allowed.
  - If an irremovable shut-off valve is placed between the safety valve and the circuit, detach the shut-off valve's handle after opening the valve and place a caution sign that forbids shutting the shut-off valve next to the valve. Finally, make sure that the shut-off valve is open.
- Correspondingly, placing a shut-off valve on the safety valve's discharge side is not allowed.
- The safety valve's opening pressure should be no more than 10 bar.
- After filling the pipes, test the safety valve. Release the valve by pressing the button on the valve.

Thermostat mixer

If the domestic hot water tank's temperature can rise above 65 °C, install a thermostat mixer in the storage tank hot water supply pipe. The mixer is usually part of a mixing valve combination set, eliminating the need for a separate unit.

- It is usually recommended to install at least one mixing valve in a domestic water system. A ready-to-use mixing valve kit usually includes all the necessary equipment needed in a domestic water pipework.
- Start by setting the mixer to the hottest position (the '+' direction). When the tank is at its hottest, measure tap water temperature.
- It is advisable to install the mechanical mixer at least 30 cm below the tank's hot water connection, so that the tank's heat does not cause strain to the mixing valve. This improves the valve's operational reliability and prolongs its service life.

Mixing valve

It is usually advisable to install at least one mixing valve in a domestic water system. A ready-to-use mixing valve kit usually includes all the necessary equipment needed in a domestic water system.

- Route the discharge pipe from the mixing valve's safety valve to the floor drain for safe discharge, ensuring that the pipe has a continuous slope. Follow any other instructions concerning the safety valve.
- Start by setting the mixing valve's safety mixer to the hottest position (the '+' direction). When the tank is at its hottest, measure tap water temperature.
- it is advisable to install the mixing valve at least 30 cm below the tank's hot water connection, so that the tank's heat does not cause strain to the mixing valve. This improves the valve's operational reliability and prolongs its service life.

Anti-siphon valve (non-return valve) and vacuum relief valve

Install a non-return valve (anti-siphon valve) or a vacuum relief valve in the domestic cold water line right after the shut-off valve. The anti-siphon valve or vacuum relief valve prevents water from the building's supply system from re-entering the distribution network in case of a malfunction.

- The non-return valve is usually part of a mixing valve combination set.

Pressure gauge

It is usually a good idea to install a pressure gauge in the cold water supply line of the domestic hot water tank. The gauge is very useful for filling the system and monitoring its operation during setup. For example, the gauge will help to identify whether a pressure reducer valve is needed.

- Equip the gauge with a shut-off valve.

Pressure reducer valve

If the pressure in the tank's cold water supply line is too high, install a pressure reducer valve in the supply line.

- The pressure reducer valve can prevent the safety valve from dripping constantly due to changes in the tank's temperature.

Expansion tank

In typical homes, the domestic water system rarely needs an expansion tank. However, if an expansion tank is required, use only tanks specifically approved for domestic water use. When running hot water from a tap, the water in the tank should move, and not remain still.

- An expansion tank can also be used to prevent the safety valve from dripping.
- If used in a domestic water system, install the expansion tank in the domestic hot water tank's cold water supply line, placing it after the pressure reducer (if present).
- To facilitate replacing the vessel and adjusting the circuit's pressure level, equip the expansion vessel with a maintenance valve (shut-off valve and blow-off valve).
- Adjust the diaphragm expansion vessel's pressure to a level that suits the system.

Filling and bleeding

- Before filling, make sure that all pipes have been correctly connected.
- Fill and bleed all pipes thoroughly before switching on the power.

2.12 DHW tank

Designing and implementing the system

- The domestic water system must be implemented according to the effective legislation and the regulations and conditions set by the water supplier.
- The service buffer tank must be sufficiently large in comparison with the water consumption and heat pump's capacity.

Shut-off valves

- Install shut-off valves on both sides of the tank.
- The cold water line's shut-off valves are placed first in the flow direction, before other piping equipment, such as the safety valve, pressure reducer valve and expansion tank. This lets the piping equipment be separated from the cold water supply line during maintenance.
- The hot water line's shut-off valves are placed last, after all the other equipment in the piping. This lets the piping equipment be separated from the DHW supply line during maintenance.

Safety valve

- Install the safety valve in the cold water pipe running to the storage tank.
  - The safety valve is usually integrated into complete mixing valves, so there is no need for a separate component.
- Install the safety valve's discharge pipe so that it is continuously descending and reaches the floor drain in a safe manner.
- The discharge pipe's diameter must be at least as large as the safety valve's nominal diameter.
- The pipe must be self-emptying (must not be placed under the liquid level of the tank or the well, must not freeze),
- A shut-off valve must not placed between the safety valve and the circuit.

- If an irremovable shut-off valve is placed between the safety valve and the circuit, detach the shut-off valve's handle after opening the valve and place a caution sign that forbids shutting the shut-off valve next to the valve. Finally, make sure that the shut-off valve is open.
- The safety valve's discharge side must not have a shut-off valve.
- Safety valve's opening pressure can be max. 10 bar.
- Check the safety valve's functioning by releasing the valve from the button after the pipes have been filled.

Thermostat mixer

- Install the thermostat mixer to the hot water pipe running from the storage tank, if the tank's temperature is able to rise above 65 °C. The mixer is usually included in mixing valve kits, so there is no need for a separate component.
- First, set the mixer to the hottest position (the + direction), then check the tap water temperature with the storage tank's maximum temperature.
- Install the mechanical mixer at least 30 cm below the storage tank's hot water connection, so that the tank's heat does not strain the mixing valve. This improves the valve's operational reliability and prolongs its service life

Mixing valve

- It is usually recommended to install at least one mixing valve in a domestic water system. A ready-to-use mixing valve kit usually includes all the necessary equipment needed in a domestic water pipework.
- Install the discharge pipe of the mixing valve's safety valve so that it is continuously descending and reaches the floor drain in a safe manner. Also follow all other instructions concerning the safety valve.
- First, set the mixing valve's thermostat mixer to the hottest position (the + direction), then check the tap water temperature with the storage tank's maximum temperature.
- Install the mixing valve at least 30 cm below the storage tank's hot water connection, so that the tank's heat does not strain the mixing valve. This improves the valve's operational reliability and prolongs its service life

Anti-siphonage valve (non-return valve) and vacuum relief valve

- Install a non-return valve (anti-siphonage valve) or a vacuum relief valve in the cold water line right after the shut-off valve. The anti-siphonage valve and vacuum relief valve prevent water from the supply network from re-entering the network when it is malfunctioning.
- The non-return valve is usually integrated into mixing valve kits.

Pressure gauge

- It is usually a good idea to install a pressure gauge in the cold water line running to the storage tank. The gauge facilitates filling the system and observing it (indicating the need for a pressure reducer valve, among other things).
- Equip the gauge with a shut-off valve.

Pressure reducer valve

- If the cold water pipework's pressure is high, install a pressure reducer valve in the cold water line running from the storage tank, if necessary.
- The pressure reducer valve can prevent the constant safety valve drip, which results from changes in the storage tank temperature.

Expansion tank

- The domestic water system does not usually require an expansion tank.
- If an expansion tank is installed in the system, it needs to be the kind that is approved for domestic water use, where the water flows through the tank. Water must not be still in the tank when hot water is being drawn.
- The expansion tank can also be used to prevent the safety valve from dripping.
- In a domestic water system, the expansion tank is installed in the cold water line running to the storage tank, after the pressure reducer (if installed).
- Equip the expansion vessel with a maintenance valve (shut-off valve and blow-off valve) to be able to adjust the pressure level and facilitate replacing the vessel.
- Adjust the diaphragm expansion vessel's pressure to a level that suits the system.

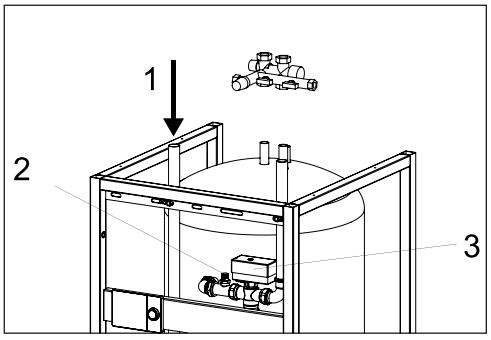
Filling and bleeding

- Make sure that the pipe couplings are valid before filling.
- Fill and bleed all pipes thoroughly before switching on the electrical supply.

2.13 Bleeding the domestic hot water coil (Cube Inverter+)

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

When the unit is shipped from the factory, the change-over valve is set to position B. The valve should be left in this position whenever domestic water is not being heated. If necessary, the valve position can be changed by activating the relay test (see section *Relay test*). Alternatively, detach the valve actuator and carefully turn the valve shaft with a small wrench or similar tool.



Bleeding DHW coil (RVS) ver. 2

Pos.	Item
1	Water to return line
2	Air out through the bleed screw
3	Change-over valve in position B

2.14 Removing the compressor unit from the housing (models with an integrated DHW tank)

To avoid personal injury or damage to the device or its surroundings, exercise caution when moving and carrying the compressor unit.

The compressor unit can be removed for easier moving, carrying, or servicing. If necessary, use lashing straps to make it easier to lift and move the unit.

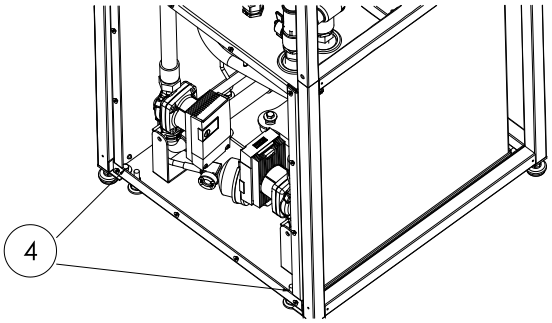
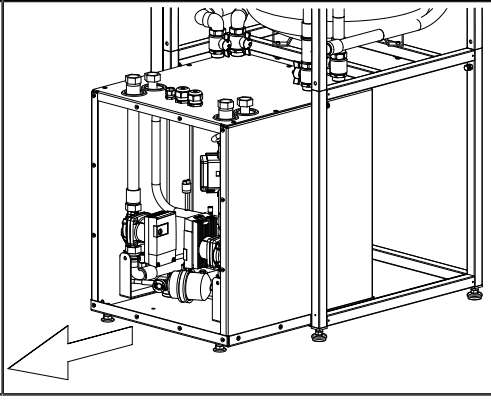
Preparation

1. If the heat pump has already been installed, start by checking that its electrical supply is not live.
2. Reduce the pressure of the water and brine circuits to near atmospheric pressure (gauge pressure: 0 bar).
3. Close all external shut-off valves before proceeding with removing the unit.
   - The component names are presented in section *Dimensions, connections, and parts.*

Detaching the unit

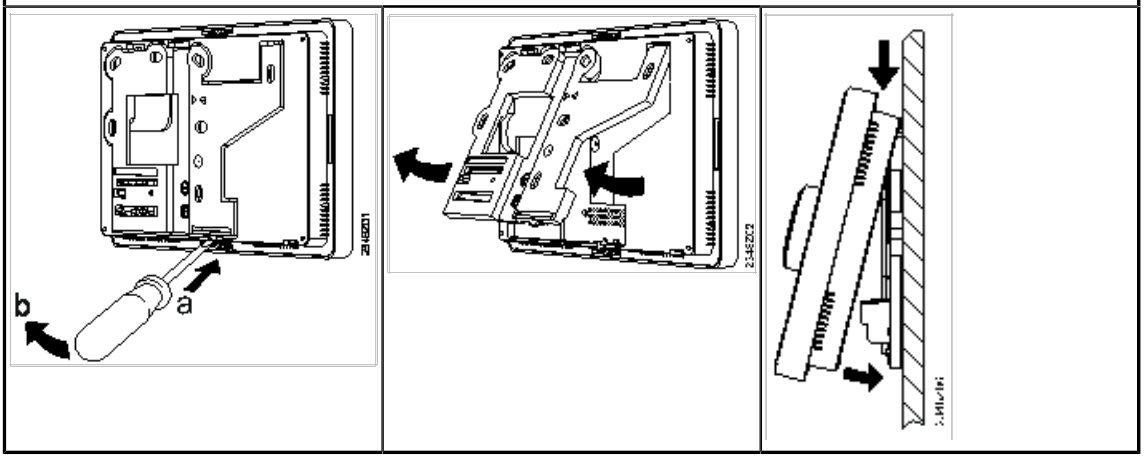
1. Remove the device's front plate (MFC, see section *Covers and cable management*).
2. Remove the display cable, **see the separate instructions at the end of this section.**.
3. Pull the halves of the electric immersion heater's (ERH) connector WE1 apart.
   - When detaching the connectors, grab the connector by the body, not the cable. Do not pull by the cables. The connector has a locking plate that needs to be opened with a slot-head screwdriver.
4. Detach the change-over valve's (DV) motor from the valve housing.
   - The motor is fastened with a pin that can be pulled out.
5. Remove the DHW sensor (B3) from the pocket in the lower section of the DHW storage tank.
   - Press the gasket above the pocket with one hand and use the other hand to pull the sensor out.
6. Open the thread connection in the flexible pipe leading from the unit to the change-over valve (DV).
   - Remove the connection by turning the freely rotating nut while applying gentle pressure from the other end of the connection. Make sure not to twist the hose when making or removing the connection. Do not open the beaded connection.
7. Open the thread connection in the flexible pipe leading from the unit to the electric immersion heater (ERH).
   - Remove the connection by turning the freely rotating nut while applying gentle pressure from the other end of the connection. Make sure not to twist the hose when making or removing the connection. Do not open the beaded connection.
8. Open the front plate of the compressor unit (FC, Torx 25).
9. Remove the unit's fastening screws and pull the unit out (see image).
   - Keep the brine circuit's pipes attached to the unit.

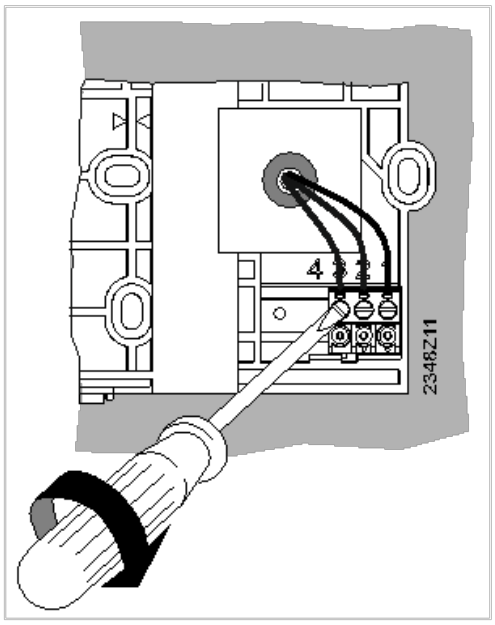
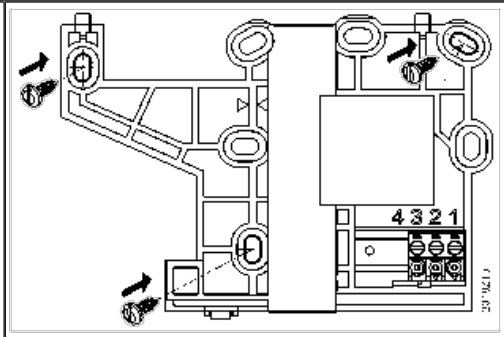
Reinstall in reverse order. During reassembly, test the flat seals on the water and brine connections, replace if necessary.

Remove the unit's mounting screws (4).	Finish by pulling the unit out.
	
Removing the compressor unit from the housing	

Detaching the display cable

Press the mounting bracket with a slot-head screwdriver and detach the display. The display is mounted back by first connecting the upper part with the back plate's brackets, and the pressing the lower part into the plate.



Detach the display cable.	Loosen the back plate's screws slightly to be able to reach the end of the cable.
	
Removing the display from its housing	

2.15 Modbus connection (Option for ECO Inverter+ 7-25 only)

Accessory	Modbus option (Eco Inverter+ 7-25 only)
Item code	32586214
Description	Provides Modbus RTU connectivity.

Connect the module to the controller's connector X60. Use two-sided tape to attach the module on top of the controller.

If the system includes several heat pumps, equip each controller with the Modbus module. Activate the terminating resistor in the last module in the chain by setting each of the module's DIP switches to the top position.

- The terminating resistor is disabled, when both of the DIP switches are in the lower position.

You can check that the controller has identified the module using the ACS program. In the configuration menu, the line **Modbus interface available** will show **yes**, and the **Modbus** menu will appear.

Modbus parameters

Configure the Modbus connection parameters presented below either using the user interface or the ACS program.

Menu	Line	Setting
Modbus	6641	Modbus slave address
Modbus	6652	Baud rate
Modbus	6653	Parity
Modbus	6654	Stop bit

The Modbus registers are available from our website and our customer services.

In heat pumps with inverter control, the Modbus connection in the heat pump's automation operates in master mode. Data for the automation can be retrieved from external slave devices. Connecting an external master device is not possible.

2.16 Electric immersion heater

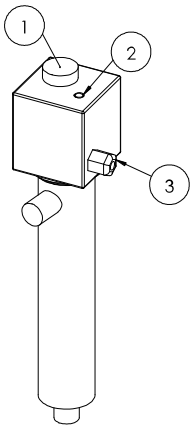
Models featuring an internal DHW tank are equipped with an internal electric immersion heater. Reset the overheat protection during installation. It may be triggered by blows or vibration during transport.

In models that do not have an integrated DHW tank, the condenser line immersion heater is optional. The unit's switchboard includes all the necessary contactors for connecting an immersion heater. Connect the heater as indicated in the wiring diagrams supplied with the heat pump. Reset the heater during installation.

The electric immersion heater is equipped with an internal overheat protection device. The device shuts the immersion heater's power off when the internal temperature of the immersion heater cartridge exceeds 105 °C. To reset the switch, press the button on the black plastic housing on top of the heater. The button is under a transparent plastic lid. Open the lid with a slot-head screwdriver. Before the overheat protection device is reset, determine what caused the device to trip and address the issue. The device may have tripped due to vibration during transport or relocation.

The thermostat inside the device's internal electric immersion heater should not be adjusted. The thermostat in the electric immersion heater is set to 80 °C at the factory. The immersion heater's own thermostat will cut off the immersion heater's power only if there is a malfunction in the unit's automation system or the backup operation thermostat. The setpoint for the electric immersion heater thermostat should be set high enough to account for both the building's heating circuit and its domestic hot water demand. This is necessary because the power supply for the immersion heater runs through the immersion heater thermostat in all operating modes.The internal thermostat is not used as the emergency operation thermostat for automation.

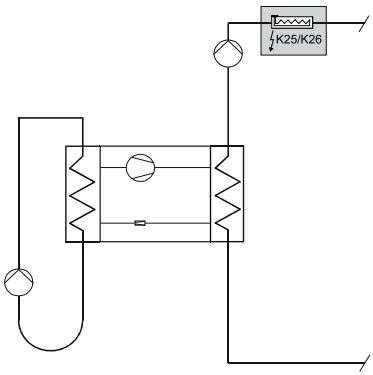
The condenser circuit's electric immersion heater has three 2 kW rod elements. The combined heating element capacity is 6 kW. The heating elements are controlled in three stages. Stage 1 (K25) is connected to contactor K2. Its capacity is 2 kW. Stage 2 (K26) is connected to contactor K3. Its capacity is 4 kW. When the third stage is active, stages 1 and 2 (K25+K26) are energized simultaneously.



In-line heater ver. 2

1	Electric immersion heater's thermostat
2	Electric immersion heater's overheat protection reset
3	Power connection

Electric immersion heater



Marking	Output	Contactor	Stage
K25	QX1	K2	Electric immersion heater stage 1
K26	QX2	K3	Electric immersion heater stage 2

Wiring diagram

2.17 Temperature sensors

Outdoor temperature sensor

The heat pump´s outdoor sensor (sensor code 89) is delivered as loose with the heat pump. The sensor is connected and installed during the heat pump installation. It is connected to cable WB9. The cable can be extended if required.

The sensor connection is presented in the pump's installation instructions and electrical diagrams. By default, the connection is to the k terminal (BX9) of the pump's Siemens RVS61.843 controller, but the sensor can be configured for other BX sensor inputs. One wire of sensor's cable is connected to the connector's pole BX9 and the other to the pole M (either way). The sensor connection and cable extension are done with a regular, insulated copper twin cable. Select the cross-sectional area of the wires by consulting the table below. When you run the sensor cable into the switchboard, use an insulated cable and, if possible, a cable trough that does not contain supply cables. Peel off the cable insulation and the wire insulation right next to the controller.

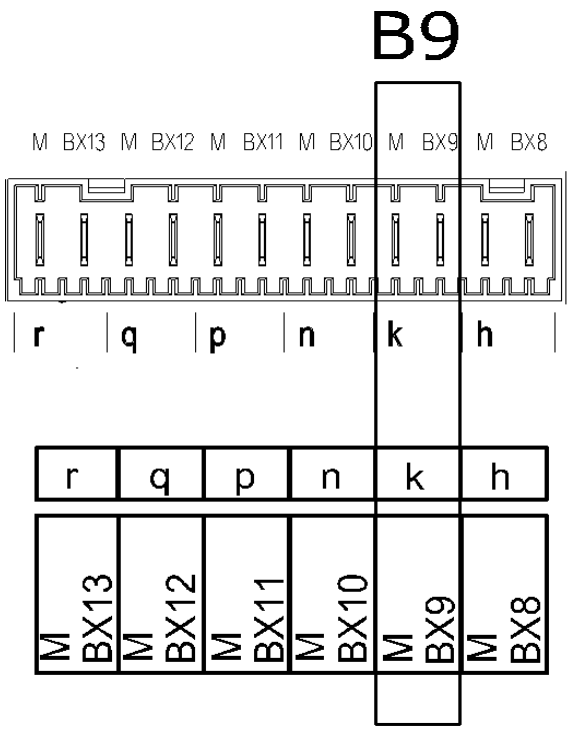
Select the cross-sectional area of the wires by consulting the table below.

Outdoor sensor cable

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

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 outside sensor is NTC 1 kOhm. Its value is 3464 K. In addition to the standard sensor, any corresponding NTC 1 kOhm sensor suited for outside conditions with a value of 3464 K +/- 100 K can be used.



Outside sensor connection (RVS/EasyAce) ver. 1

Temperature sensor inside a pipe or attached onto the surface of a pipe

Some of the external temperature sensors need to be installed during the heat pump's installation. When equipping the system's pipes with sensors, install the sensors in a way that allows them to measure the temperature of the fluid in the pipes as accurately as possible. The sensors should be attached to metallic pipe surfaces only or placed in a metallic sensor pocket in the pipe. Do not attach sensors on pipe surfaces made of heat-insulating materials, such as plastic or rubber. Attach the sensors 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.

Temperature sensors for external storage tanks

The temperature sensors for the heat pump's external storage tanks need to be installed during heat pump installation. Install the sensors in a way that allows them to measure the temperature of the fluid in the storage tank as accurately as possible. Install the storage tank sensors in metallic sensor pockets. Select a sufficiently-deep sensor pocket that has a snug opening for the applicable sensor probe. The air gap between the probe and the pocket wall should be as small as possible. If necessary, fill in the gap with thermal paste.

Sensor type

Sensor	Sensor type	β value	Tolerance
Outdoor temperature B9	NTC 1 kOhm	3,464 K (25 °C / 50 °C)	+/- 100 K
Outdoor temperature	NTC 10 kOhm	3,435 K (25 °C / 50 °C)	+/- 100 K
Other sensors (B3, B4, B21, B71, B91, B92, etc.)	NTC 10 kOhm	3,978 K (25 °C / 85 °C)	Other sensors: +/- 100 K

A Pt1000 sensor can also be used with a solar collector. The collector's sensor type is selected on line 6097.

Temperature sensor decommissioning

The temperature sensors are decommissioned by detaching the sensor from the connector, and then saving the changes by selecting "Yes" on lines 6200 and 6201.

For example, if sensors B4 and B1 are removed from the controller, and the changes are then saved on lines 6200 and 6201, the automation will automatically decommission the buffer storage tank (sensor B4) and the three-way valve of heating circuit 1 (sensor B1). Thus, a connection change from a buffer storage tank connection to a direct condenser connection of the heating circuits can be easily made.

2.18 Most common additional connections and connection changes

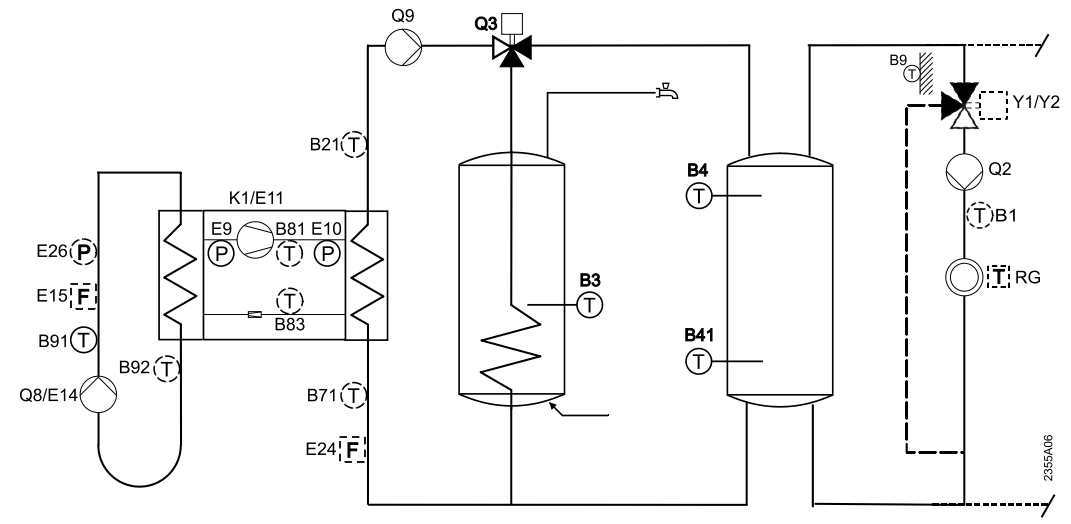
Automation settings must correspond to the pipe coupling. If necessary, change the input and output functions from the automation settings to correspond to the pipe coupling and the sensors in use. For making major changes, you should use the Siemens ACS790 computer program, because the program will automatically draw a principle pipe coupling, corresponding to the settings.

Automation recognizes the pipe coupling on the basis of the selected inputs and outputs and the connected temperature sensors. Any of the available functions can be chosen to free inputs and outputs. Remove from the controllers the additional temperature sensors, to which is not selected a function from the settings. Sensors can be removed either by disconnecting the quick coupling from the controller or the sensor wires from the quick coupling. If you disconnect the wires from the quick coupling, protect the bare wire ends so that they cannot cause a short circuit. Reset and save the temperature sensors in the automation memory after the changes by choosing "yes" on lines 6200 (save the sensors) and 6201 (reset the sensors).

In addition to the heat pump, storage tanks, and heating circuits, the automation can control a solar power system; cooling; and an additional heat source, such as electric heating or an oil boiler. Additional functions of the automation (block diagrams) are enabled by selecting the inputs and outputs required by the feature, such as inputs from temperature sensors and outputs of pumps' and valves' control, as well as by connecting the devices and temperature sensors to the selected inputs and outputs. The automation is equipped with control blocks for dozens of individual connections.

Cube Inverter+

Automation-controlled heating circuit storage buffer tank and control valve



DHW storage tank and space heating with the buffer storage tank.
DHW storage tank, valve Q3 and sensor B3 are internal to the device. Sensor B41 is not mandatory.

Changes to factory settings			
Menu	**Line**	**Line name**	**Setpoint**
Heating circuit 1	870	With buffer	Yes
Configuration	5930	Sensor input BX1	Buffer tank temperature B4
Configuration	6014	Function of mixing group 1	Heating circuit 1

Electrical connections

TEMPERATURE SENSORS (SMALL LETTERS IN CONNECTORS)					
Line	**Connector**	**Input**	**Action**	**Marking**	**Additional information**
5930	t	BX1	Buffer tank temperature B4	B4	Space heating circuit storage tank
5940 (6014)	p	BX11	Heating circuit 1 supply water B1	B1	Supply water pipe of heating circuit 1

The function for input BX11 is selected on line 6014. See chapter *Valve-controlled heating circuit selection*.

SUPPLY CURRENT OUTPUTS (CAPITAL LETTERS IN CONNECTORS)					
Line	**Connector**	**Output**	**Action**	**Marking**	**Additional information**
5899 (6014)	S	QX9	Heating circuit 1 pump Q2	Q2	
5900 (6014)	T	QX10	Heating circuit 1 valve open Y1	Y1	
5901 (6014)	T	QX11	Heating circuit 1 valve closed Y2	Y2	

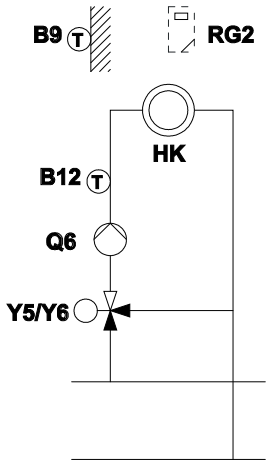
The functions for outputs Q9, Q10 and Q11 are selected on line 6014. See chapter *Valve-controlled heating circuit selection*.

Things to consider during installation

In this connection, the mixing shunt of the master controller is utilized in heating circuit 1. If another heating circuit (heating circuit 2) equipped with a mixing valve needs to be added, an auxiliary controller must to be installed.

Heating circuit 2 regulated by a three-way valve

The master controller has one functional block for the heating circuit's mixing valve. In models with an integrated DHW tank, heating circuit 1 is usually connected directly from the condenser to the heating circuit, leaving the mixing valve's functional block to be utilized with heating circuit 2. Heating circuit 2 is commissioned by performing the connections presented in this manual and electrical diagrams, and by switching the circuit on according to the instructions in chapter *Switching on heating circuit 2* in the heat pump's automation instructions.



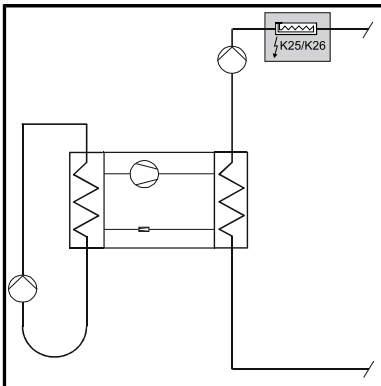
Settings
Configuration > Heating circuit 2 (line 5715): On
Configuration > Line 6014 Function mixing group 1: Heating circuit 2
Connections to the controller
QX10: Y5, heating circuit 2, three-way valve open
QX11: Y6, heating circuit 2, three-way valve closed
QX9: Q6 heating circuit 2 circulation pump (via fuse F7)
BX11: B12, heating circuit 2, flow temperature

Heating circuit 2 regulated by a three-way valve (with the controller)

Eco Inverter+

Electric immersion heater in the condenser line

The heat pump's switchboard is delivered with two contactors (K2 and K3) and a circuit breaker F2 for an electric heater installed in condenser line. The contactors' control signals have been connected to automation controller outputs QX1 and QX2. The heater is commissioned by selecting "electric heater 1 K25" for output QX1 on line 5890, and "electric heater 2 K26" for output QX2 on line 5891. The heater must equipped with overheat protection if it is not included in the default assembly.

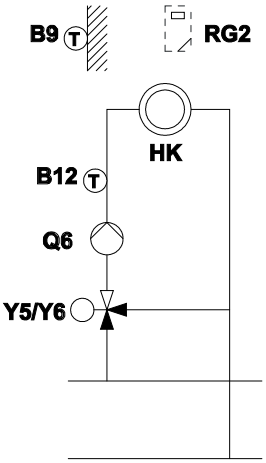


Settings
Configuration > line 5890, QX1: Electrical heater for flow 1 K25
Configuration > line 5891, QX2: Electrical heater for flow 2 K26
Automation connections
QX1: One electric heater resistor.
QX2: Two electric heater resistors

The electric immersion heater in the condenser circuit of the heat pump.

Heating circuit 2 with a three-way valve and auxiliary controller

The heat pump can be equipped with an optional auxiliary controller. It adds three-way valve control to heating circuit 2. Heating circuit 2 is commissioned by performing the connections presented in this manual and electrical diagrams, and by switching the circuit on according to the instructions in section *Switching on heating circuit 2* in the heat pump's automation instructions.



Settings
Configuration > Line 5715 Heating circuit 2: On
Configure the expansion module > Line 7300 Operation of additional module 1: Heating circuit 2
Configuration > Line 6200 Save sensors: Yes
Connections to auxiliary controller
QX21: Y5, heating circuit 2, three-way valve open
QX22: Y6, heating circuit 2, three-way valve closed
QX23: Q6 heating circuit 2 circulation pump (via fuse F7)
BX21: B12, heating circuit 2, flow temperature

Heating circuit 2 with a three-way valve connected to auxiliary controller

SUPPLY CURRENT OUTPUTS (CAPITAL LETTERS IN CONNECTORS)					
Line	**Connecto**	**Output**	**Action**	**Marking**	**Additional information**
7301 (7300)	T	QX21	Heating circuit 2 valve open Y5	Y5	
7302 (7300)	T	QX22	Heating circuit 2 valve closed Y6	Y6	
7303 (7300)	S	QX23	Heating circuit 2 pump Q6 (Through fuse F7)	Q6	

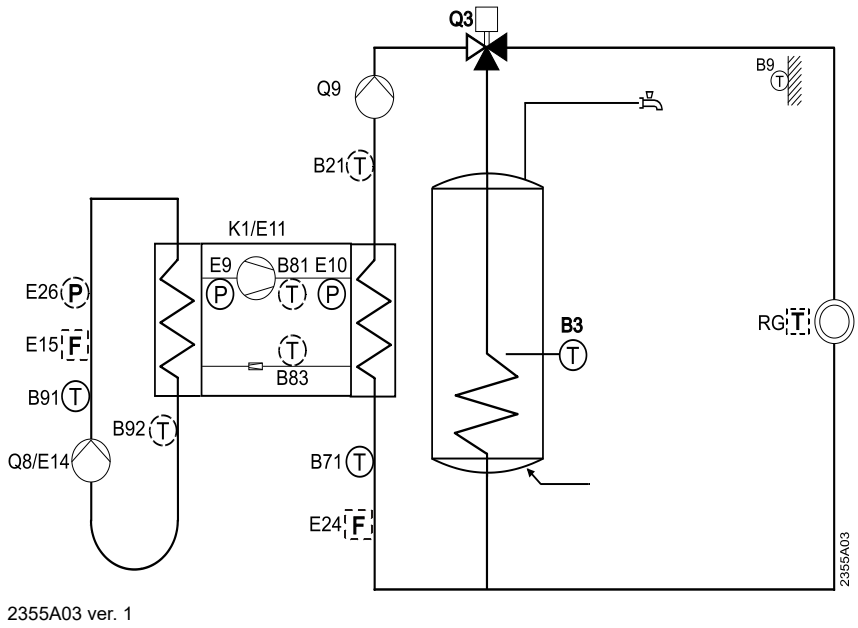
The function for outputs Q21, Q22 and Q23 is selected on line 7300.

TEMPERATURE SENSORS (SMALL LETTERS IN CONNECTORS)					
Line	**Connecto**	**Input**	**Action**	**Marking**	**Additional information**
7307 (7300)	e	BX21	Heating circuit 2 supply water B12	B12	

The function for input BX21 is selected on line 7300.

CONTROL SIGNALS (SMALL LETTERS IN CONNECTORS)					
Line	Connecto	Output	Action	Marking	Additional information
7348	e	UX21	(Heating circuit 2 pump Q6)	(Q6)	On demand, if the pump is equipped with speed control.
7349	e	UX21	Signal logic output UX21		On demand, if the pump is equipped with speed control. Standard or inverse, depending on the pump.
7350	e	UX21	Signal output		On demand, if the pump is equipped with speed control. 0...10 V or PWM depending on the pump

Space heating without a buffer storage tank



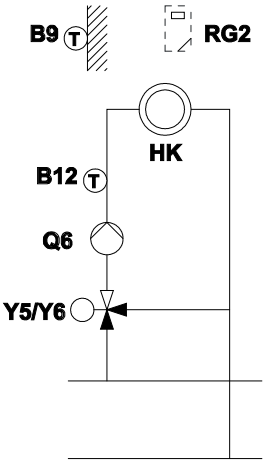
DHW storage tank and space heating without a buffer storage tank

AUTOMATION CONNECTION CHANGES

Detach temperature sensors B4 and B1 from the pump's master controller. Save the changes by selecting Yes on lines 6200 and 6201.

Heating circuit 2 with a three-way valve

The heat pump's switchboard and automation are delivered with the connections and a temperature sensor for heating circuit 1 controlled with a three-way valve. In this coupling, heating circuit 1 has been connected directly to the heat pump's condenser circuit. This lets the electrical connections, temperature sensor (B1) and automation functions be used by heating circuit 2, configured and connected parallel to heating circuit 1. Make the corresponding changes to the device identifiers in the electrical diagrams manually.



Settings
Configuration > Heating circuit 2 (line 5715): On
Configuration > Line 6014 Function mixing group 1: Heating circuit 2
Configuration > Line 6200 Save sensors: Yes
Connections to the controller
QX10: Y5, heating circuit 2, three-way valve open
QX11: Y6, heating circuit 2, three-way valve closed
QX9: Q6 heating circuit 2 circulation pump (via fuse F6)
BX11: B12, heating circuit 2, flow temperature (sensor B1's identifier changed to B12)

Heating circuit 2 regulated by a three-way valve (with the controller)

3 Commissioning

3.1 Before the first start-up

Before the first start-up check, that:

- the pipe connections are properly made and checked
- the electrical connections connections are properly made and checked
- all tanks and pipings are connected to a functioning safety valve
- the necessary air supply valves are placed properly within the system
- the expansion tanks are properly dimensioned and placed
- all pipes and storage tanks have been carefully filled and bled of air
- all necessary shut-off valves are open
- the general installation instructions have been followed (chapter *Installation*)
- the device-specific installation instructions have been followed
- the outdoor sensor has been installed
- the operating interface has been installed
- the other necessary sensors and devices have been installed.
- If the heat pump includes an internal or has been connected to an external electric heater, reset the heater's overheat protection before the initial start-up.

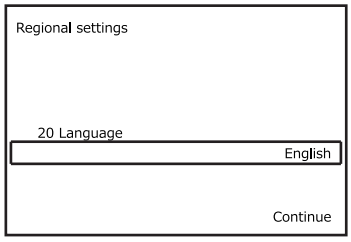
3.2 Commissioning menus

Language and time settings

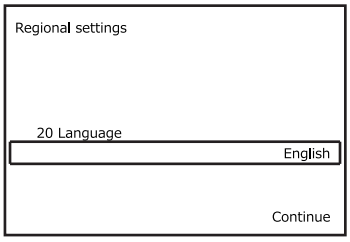
The menu settings are preset at the factory. However, if the commissioning menu appears, go through the settings as indicated below.

To bypass the settings pages in the commissioning menu, select **Skip** in the lower left-hand corner of the screen. If you select **Continue** by accident, select **Skip** in the following screens until the commissioning wizard menus have been bypassed.

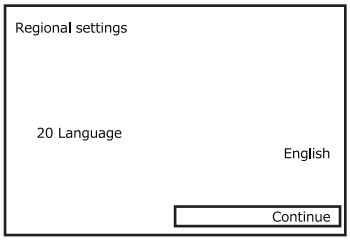
Commissioning menus can be accessed later from the service menu. Usually, it is advisable to change the settings later through the parameter menu.



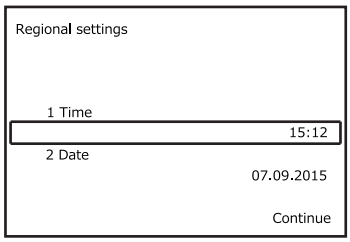
Initially, the display's language is English.



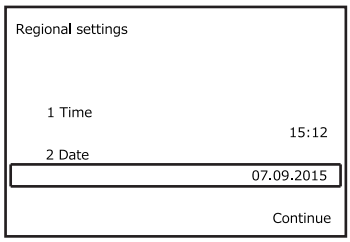
1. The interface language can be changed in the first screen.



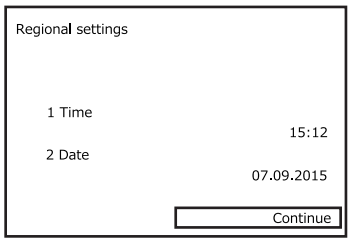
2. Move to the next page by pressing the button in the lower right-hand corner.



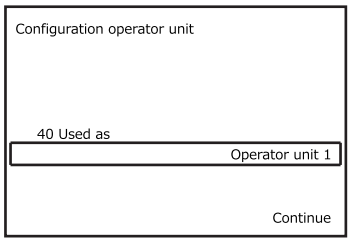
3. Set the time.



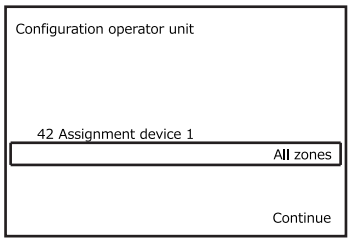
4. Set the date.



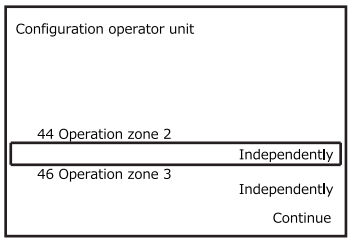
5. Continue to the next page.



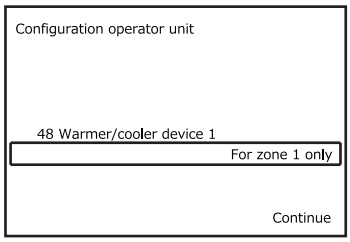
6. Select **Operator unit 1**.



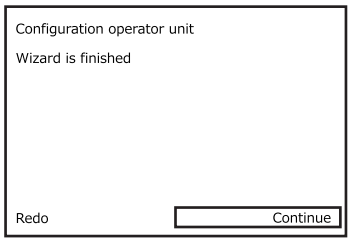
7. Select **All zones**.



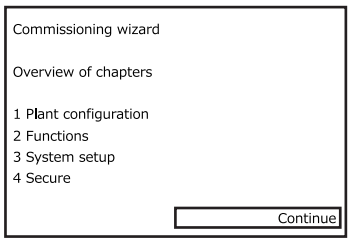
8. Select **Autonomously** for both.



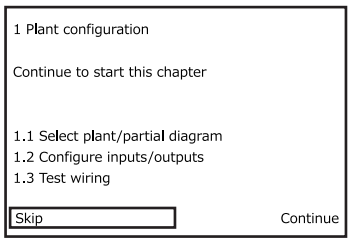
9. Select **For zone 1** only.



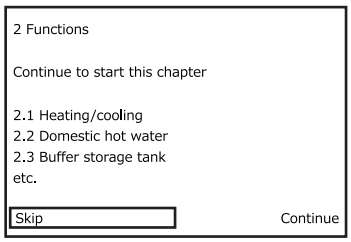
10. Exit the commissioning menus from the lower right-hand corner of the screen. Select **Continue**.



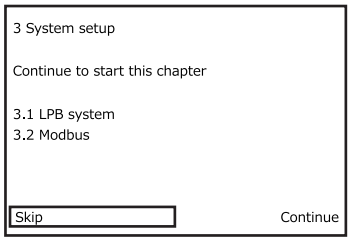
11. Continue to the next page.



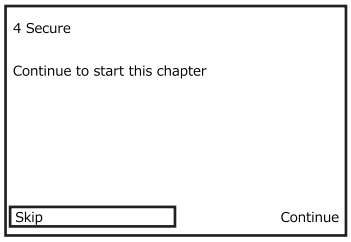
12. Select **Skip**.



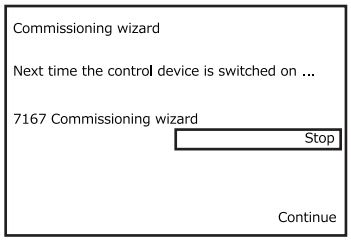
13. Select **Skip**.



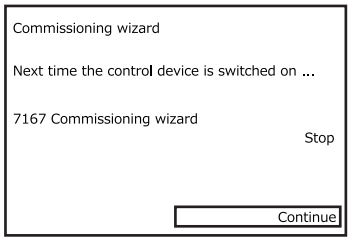
14. Select **Skip**.



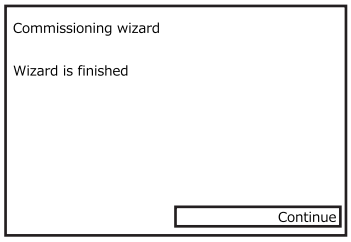
15. Select **Skip**.



16. Select **Stop**.



17. Select **Continue**.



18. Select **Continue**. Wait for the controller to load the data. This will take a few minutes.

3.3 Relay test

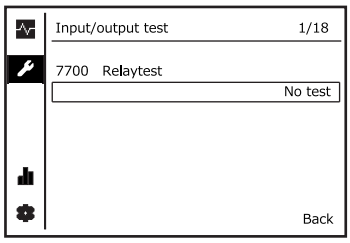
Use the relay test to test the operation of actuators.

1. Perform the relay test by selecting the desired QX output (and, if required, the UX signal output) and observing the operation of the actuator.
2. Finish the test by changing the relay test function setting (line 7700) to **no test**.
3. After the relay test, reset the heat pump (line 6711).

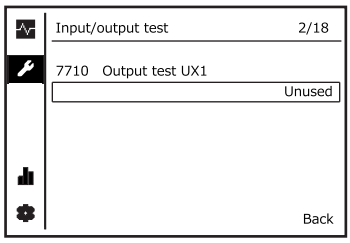
Connector	Output	Function	Marking	Additional information
R	QX8	Change-over valve Q3	Q3	Before the relay test, the change-over valve is in position B (B for building, heating circuit). ● Switching the power on turns the valve to position A (A for aqua, DHW tank). ● When you switch the relay test off, the valve returns to position B.
S	QX9	Heating circuit 1 pump Q2	Q2	When the test is activated, the pump should start to run. ● For speed controlled pumps, see further instructions in the following chapter.
T	QX10	Heating circuit 1 valve open Y1	Y1	The branch leading from the storage tank to the heating circuit opens (the circuit starts to take heat from the storage tank). ● After the test, the valve remains in the position it was in at the end of the test.
T	QX11	Heating circuit 1 valve closed Y2	Y2	The branch leading from the storage tank to the heating circuit closes (heating circuit's internal circulation). ● After the test, the valve remains in the position it was in at the end of the test.
U	QX12	Brine circuit (evaporator circuit) pump Q8	Q8	When the test is activated, the pump should start to run. ● See further instructions for speed controlled pumps at the end of this section.
V	QX13	Condenser circuit pump Q9	Q9	When the test is activated, the pump should start to run. ● See further instructions for speed controlled pumps at the end of this section.

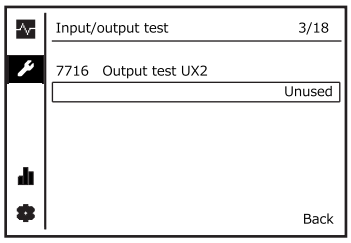
Relay test for speed controlled pumps

Perform the test for speed controlled pumps by activating the pump's QX output and signal output test. Finish the test by changing the relay test function setting (line 7700) to **no test** and setting the test value for UX output to **---**.



Select the QX output that is connected to the pump.





Activate an UX output test for the pump. Select the UX output that is connected to the pump (see section *Automation factory settings* and electrical diagrams). Select a test value, for example 100, 50, and 0 per cent.

Relay test for a speed controlled condenser circuit pump

Line	Connector	Output	Function	Marking	Additional information
7700	V	QX13	Condenser circuit pump Q9	Q9	When the test is switched on and the desired speed is selected on line 7710, the pump should start to run. ● Check that speed control works correctly by repeating the test with different speed settings on line 7710 (for example, to 100%, 50%, and 0%).
7710	y	UX1	Output test UX1	UX1	

Relay test for a speed controlled brine circuit pump

Line	Connector	Output	Function	Marking	Additional information
7700	U	QX12	Brine circuit pump Q8	Q8	When the test is switched on and the desired speed is selected on line 7716, the pump should start to run. ● Check that speed control works correctly by repeating the test with different speed settings on line 7716 (for example, to 100%, 50%, and 0%).
7716	y	UX2	Output test UX2	UX2	

3.4 Starting the heat pump

Set operating switch S1 to the ON position.

- Models with an integrated DHW tank must be re-set before setting the operating switch to the ON position.

Reset the heat pump if needed (section *Important settings and menus* in the heat pump's automation guide).

Wait for the compressor to start. Brine circuit's and condenser circuit's pumps start about 10–20 seconds before the compressor starts.

- If you have to restart the compressor, wait at least 5 minutes after the last start.

Make sure that the compressor rotates in the right direction.

- If the compressor’s rotation direction is correct, the operating sound is normal, the flow water line warms up, the hot gas pipe warms up (line 8415), the pressure in the high pressure zone increases, and that on the low pressure side falls (refrigeration gauge).

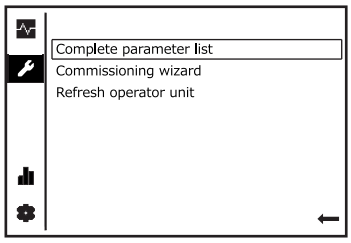
If the compressor's direction of rotation is incorrect, stop the compressor immediately by moving its operating switch S1 to the OFF position, or by moving the motor protection switch F1 to the OFF position, or by turning off the electrical supply to the device with the external switch Q1.

- If the compressor rotates in the wrong direction, it emits abnormal sound, the flow water or hot gas (line 8415) pipes do not warm up, and the pressure in the suction line does not fall, and the high pressure zone’s pressure does not increase (refrigerant gauge).
- If the compressor rotates in the wrong direction, make sure that the power supply is de-energized and replace the order of two phases with each other in the device’s supply cable. Then go back to the beginning of this chapter and go through the start-up steps again.
- The device is equipped with an internal phase guard that halts the compressor rotating incorrectly due to the phase order within 10 seconds of start-up.

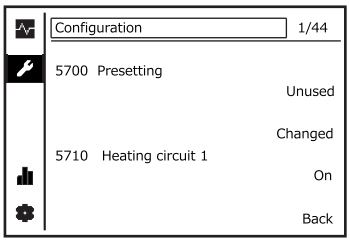
Check the temperature indicators to ensure that the condenser circuit warms up and the evaporator circuit cools down.

3.5 Switching on heating circuit 2

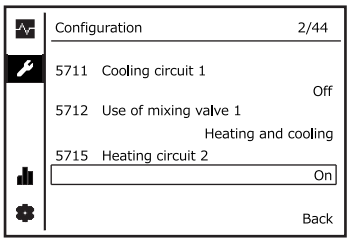
Heating circuit 2 is switched on from the parameter list’s (see *Parameter list*) configuration menu on line 5715.



Open the parameter list.



Select the configuration menu from the status bar.



Switch the heating circuit 2 **(On)** on line 5715.

3.6 Configuring automation settings

1. Move the operating switch S1 to OFF position and fuses to ON position.
2. Wait for the user interface to update the data from the controller.
   a. If necessary, go through the commissioning menus. The commissioning menu settings are preset at the factory.
3. Adjust the heating circuit’s basic settings to fit the heating system. The most common settings are listed in the table below.
4. Continue by bleeding the unit’s internal and external piping
5. If necessary, change the settings based on the piping diagram.
6. If you have installed external actuators (such as a heating circuit control valve), test the actuators’ operation and connections with a relay test.

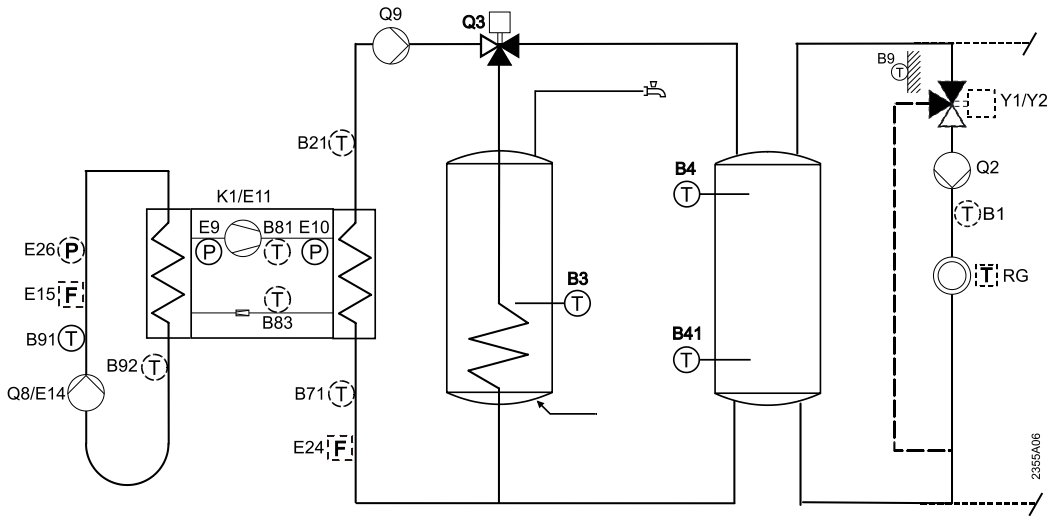
If necessary, activate the outdoor temperature simulation function from the **Diagnostics** menu. This will allow you to bypass the outdoor temperature sensor and set the outdoor temperature value manually.

Basic settings

Menu	Line	Setting
Heating circuit 1	720	Heating curve slope
Heating circuit 1	721	Heating curve displacement (parallel displacement)
Heating circuit 1	730	Summer/winter heating limit
Heating circuit 1	740	Flow temp. setpoint min. (lower limit)
Heating circuit 1	741	Flow temp. setpoint max. (upper limit)

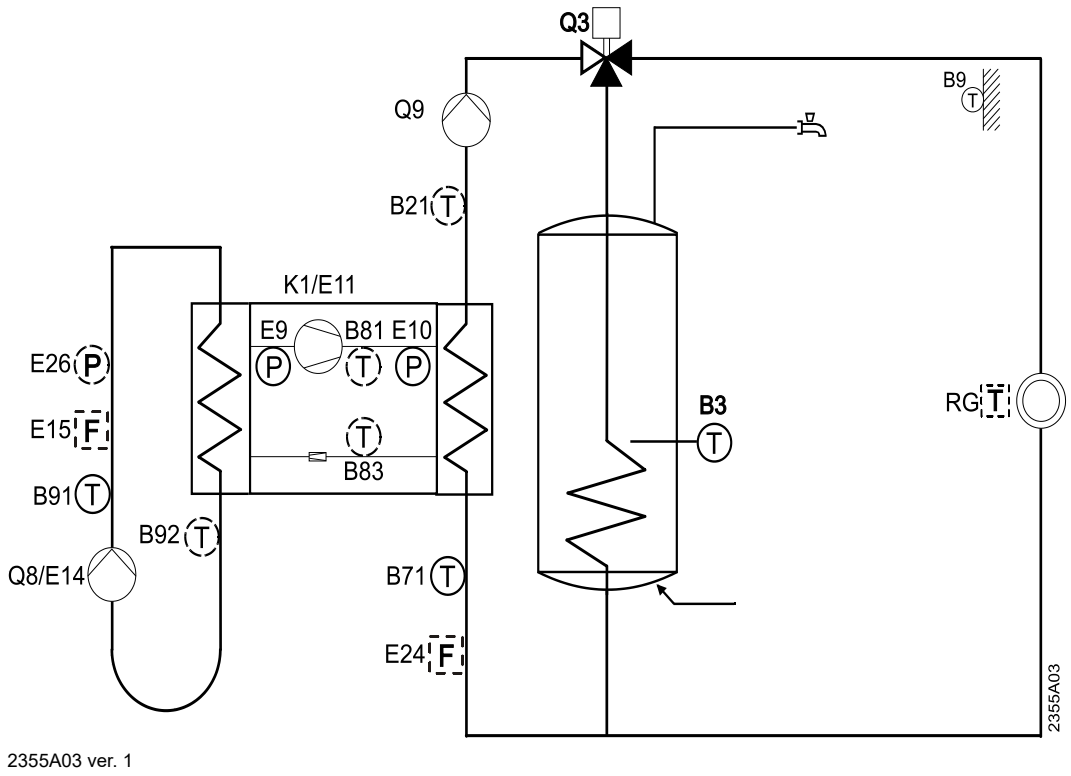
3.7 Automation factory settings (Cube Inverter+, Eco Inverter +)

Pipe connection corresponding to factory settings (Eco Inverter+)



DHW storage tank and space heating with a buffer storage tank.
Sensor B41 is not mandatory.

Pipe connection corresponding to factory settings (Cube Inverter+)



DHW storage tank and space heating without a buffer storage tank.
DHW storage tank, valve Q3 and sensor B3 are internal to the device.

Master controller inputs and outputs (Cube Inverter+, Eco Inverter+)

See connections from the wiring diagrams.

SUPPLY CURRENT OUTPUTS (CAPITAL LETTERS IN CONNECTORS)					
Line	**Connector**	**Output**	**Action**	**Marking**	**Additional information**
5892	X	QX3			
5894	Y	QX4 (ZX4)			
5895	Z	QX5			
5896	Z	QX6	Alarm output K10	K10	
5898	R	QX8	Change valve Q3	Q3	
5899 (6014)	S	QX9			
5900 (6014)	T	QX10			
5901 (6014)	T	QX11			
5902	U	QX12	Brine circuit (evaporator-circuit) pump Q8	Q8	
5903	V	QX13	Condenser-circuit pump Q9	Q9	
5909	Y	ZX4 (triac)			

MODEL-SPECIFIC SUPPLY CURRENT OUTPUTS					
Line	**Connector**	**Output**	**Action**	**Marking**	**Additional information**
Eco Inverter+					
5890	W	QX1	(Electric immersion heater stage 1 K25)	(K25)	Reserved for electric immersion heater stage K25. Contactor K2. Fuse F2.
5891	W	QX2	(Electric immersion heater stage 2 K26)	(K26)	Reserved for electric immersion heater stage K26. Contactor K3. Fuse F2.
5894	Y	QX4 (ZX4)			
Cube Inverter+					
5890	W	QX1	Electric heater stage 1 K25	K25	
5891	W	QX2	Electric heater stage 2 K26	K26	
ON/OFF-models					
5897	Q	QX7	Compressor 1 K1	K1	
Inverter models					
5897	Q	QX7	(Compressor 1 K1)	K1	Modbus connection, inverter

The function for outputs Q9, Q10 and Q11 is selected on line 6014. See section *Valve-controlled heating circuit selection*.

TEMPERATURE SENSORS (SMALL LETTERS IN CONNECTORS)					
Line	**Connector**	**Input**	**Action**	**Marking**	**Additional information**
5931	u	BX2			
5932	w	BX3			
5933	x	BX4			
5937	h	BX8			
5938	k	BX9			
5939	n	BX10	Heat pump supply water (condenser out) B21	B21	
5941	q	BX12	Return water of heat pump (condenser in) B71	B71	
5942	r	BX13	Brine circuit in (evaporator in) B91	B91	
5943	s	BX14	Brine circuit out (evaporator out) B92	B92	

The function for input BX11 is selected on line 6014. See section *Valve-controlled heating circuit selection*.

MODEL-SPECIFIC TEMPERATURE SENSOR INPUTS					
Line	**Connector**	**Output**	**Action**	**Marking**	**Additional information**
Eco Inverter+					
5930	t	BX1	Buffer tank temperature B4	B4	Heating circuit's storage tank
5940 (6014)	p	BX11	Heating circuit 1 supply water B1	B1	
Cube Inverter+					
5930	t	BX1			

MODEL-SPECIFIC TEMPERATURE SENSOR INPUTS					
Line	**Connector**	**Output**	**Action**	**Marking**	**Additional information**
5940 (6014)	p	BX11			
ON/OFF-models					
5936	f	BX7	Hot gas temperature B81	B81	
Inverter models					
5936	f	BX7	(Hot gas temperature B81)	B81	Modbus connection, inverter

SUPPLY CURRENT INPUTS (CAPITAL LETTERS IN CONNECTORS)					
Line	**Connector**	**Input**	**Action**	**Marking**	**Additional information**
5980	P	EX1	Electric utility prevention E6	E6	Operating switch S1
5981		EX1 direction			
5982	P	EX2			
5983		EX2 direction			
5984	P	EX3			
5985		EX3 direction			
5986	P	EX4			
5987		EX4 direction			
5988	P	EX5	3-ph current control		L1
5989		EX5 direction	normally closed (break contact)		
5990	P	EX6	3-ph current control		L2
5991		EX6 direction	normally closed (break contact)		
5992	P	EX7	3-ph current control		L3
5993		EX7 direction	normally closed (break contact)		
5996	K	EX9	Low pressure switch E9	E9	
5999		EX9 direction	normally closed (break contact)		
6000		EX10 direction	normally closed (break contact)		
6001		EX11 direction	normally closed (break contact)		

Normally closed contact receives voltage when the heat pump operates normally. Power supply of normally closed contact interrupts (break contact) under fault situations.

MODEL-SPECIFIC SUPPLY CURRENT INPUTS					
Line	**Connector**	**Output**	**Action**	**Marking**	**Additional information**
ON/OFF-models					
5997	K	EX10	High pressure switch E10	E10	
5998	Q	EX11	Compressor´s overload E11	E11	

MODEL-SPECIFIC SUPPLY CURRENT INPUTS					
Line	**Connector**	**Output**	**Action**	**Marking**	**Additional information**
Inverter models					
5997	K	EX10	(High pressure switch E10)	E10	Modbus connection, inverter
5998	Q	EX11	(Compressor's overload E11)	E11	Modbus connection, inverter

CONTROL SIGNALS (SMALL LETTERS IN CONNECTORS)					
Line	**Connector**	**Output**	**Action**	**Marking**	**Action**
6070	z	UX1	Condenser-circuit pump Q9	UX1	
6071	z	UX1	Signal logic output UX1	UX1	Inverted (ECO Inverter + 7-25: standard)
6072	z	UX1	Signal output UX1	UX1	PWM (ECO Inverter+ 7-25: 0–10 V)
6078	y	UX2	Brine circuit (evaporator circuit) pump Q8	UX2	
6079	y	UX2	Signal logic output UX2	UX2	Inverted (ECO Inverter + 7-25: standard)
6080	y	UX2	Signal output UX2	UX2	PWM (ECO Inverter+ 7-25: 0–10 V)

LOW VOLTAGE INPUTS (SMALL LETTERS IN CONNECTORS)					
Line	**Connector**	**Input**	**Action**	**Marking**	**Additional information**
5950	e	H1			
5960	e	H3			

Inputs and outputs of auxiliary controller

TEMPERATURE SENSORS (SMALL LETTERS IN CONNECTORS)					
Line	**Connector**	**Input**	**Action**	**Marking**	**Additional information**
7307 (7300)	e	BX21	Suction line temperature B85	B85	
7308	e	BX22	(Liquid line temperature B83)	(B83)	Eco Inverter+ Optional

The function for input BX21 is selected function on line 7300.

LOW VOLTAGE INPUTS (SMALL LETTERS IN CONNECTORS)					
Line	**Connector**	**Input**	**Action**	**Marking**	**Additional information**
7321	g	H21	Suction line pressure H82	H82	
7331	g	H22	(Liquid line pressure H83)	(H83)	Eco Inverter+ Optional

CONTROL SIGNALS (SMALL LETTERS IN CONNECTORS)					
Line	**Connector**	**Output**	**Action**	**Marking**	**Additional information**
7362	e	WX21	Evaporator expansion valve V81	V81	

3.8 Bleeding the system of air

You can use the **relay test** function (see section *Relay test*) to make it easier to bleed the system of air.

- Use the relay test to run the pump for a while, then stop, then run the pump again.
- Bleed and fill (pressurize) the circuits during each break.
- Repeat until bleeding is complete.
- If necessary, switch the positions of the change-over and control valves during bleeding.

3.9 Cascade connection

In a cascade connection, two or more heat pumps are connected to a system that is controlled by a single heat pump controller. One of the RVS61 heat pump controllers connected to the system operates as the master controller (which controls the entire system), and the other RVS61 controllers operate as slaves (which are controlled by the master controller). Heat pump controllers are connected to each other through an LBP bus. The system may contain up to 16 controllers (heat pumps).

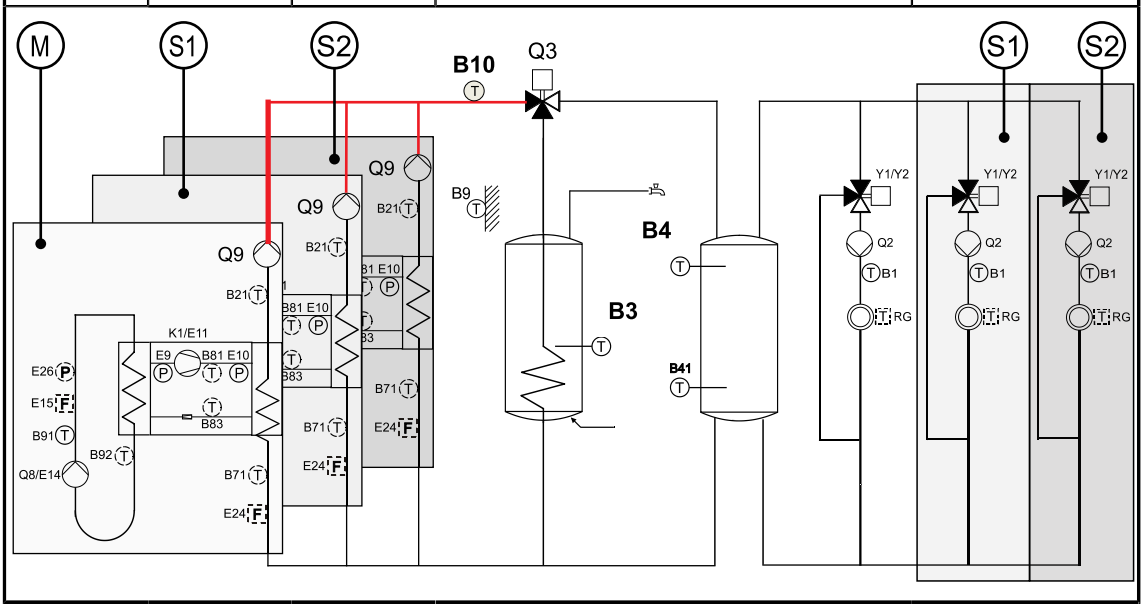
The controllers are connected via an LPB bus (DB+/MB–).

- Connect the outdoor temperature sensor (B9) to the master controller.

If the system includes several heat pumps (several A1.0 controllers), connect sensors B3, B4, B10 and B9 to the A1.0 controller that controls the entire system, and disconnect the sensors from the other A1.0 controllers.

- Disconnect the sensors by disconnecting the sensor’s connector from the relevant controller.
- If necessary, the disconnected sensors can be used for other functions.

Heat pumps in the cascade				
M	**S1**	**S2**		
Master S0/G1 Line 6600 = 1	**Slave** S0/G2 Line 6600 = 2	**Slave** S0/G3 Line 6600 = 3	Master controller's sensors, actuators, and functions	S1 = Slave S0/G2 S2 = Slave S0/G3

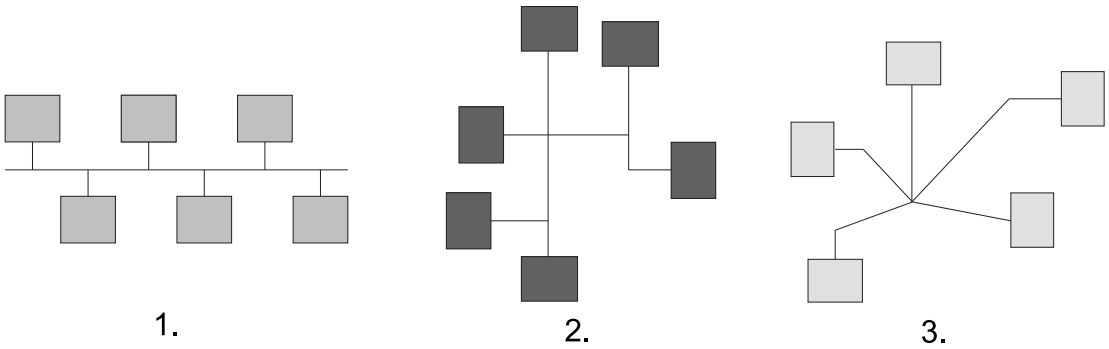


3.9.1 LPB bus configuration

The system's controllers are connected to an LPB bus (DB+/MB–). Any remote access devices will also be connected to the same bus.

- Use twisted pair cables with a minimum wire cross-sectional area of 0.75 mm^2. Over long distances, use 1.5 mm^2 wires.
- Do not arrange the bus as a closed loop.

The permitted topologies are presented below.



Cascade bus topology ver. 1

The minimum voltage between the bus's DB+ and MB– connectors is 9.5 V DC.

- If the voltage is smaller, the electrical resistance in the bus cables is too great.

- Check the cables and if necessary, use cables with a greater wire cross-sectional area.
- If there is no voltage present, the bus has short-circuited.
- If the voltage is negative, the polarity is incorrect.

Bus addresses

Each device in the bus has its own address. Set the device address from the user interface itself (line 6600).

- The device address of the master controller is always 1.
- Slave controllers can have any free address between 2 and 16.
- Do not use addresses 8 and 5, since these are reserved for the OCI700 connection cable and a remote connection device.

Enable the cascade by using the user interface to change each slave controller's device address to any free address (such as 3) and connecting the slave controller to the bus. Once the slave addresses have been changed and the bus cable connected, the cascade function will be enabled, and the cascade menu will be displayed in the master controller.

After the cascade has been enabled, make the necessary changes in the master and slave controllers' settings. The settings are presented in the table below. An example of a cascade consisting of four RE96 heat pumps is presented in the figure at the end of this section.

Menu	Line	Line name	Master (S0/G1)	Slave 1 (S0/G2)	Slave 2 (S0/G2)
LPB	6600	Device address (G)	1	2	3
LPB	6601	Segment address (S)	0	0	0
LPB	6640	Clock use	Master	Slave with remote setting	Slave with remote setting
Configuration	5710	Heating circuit 1	On	Off	Off
Configuration	5800	Heat source	Brine	Externally brine (If a common brine circuit pump is in use)	Externally brine (If a common brine circuit pump is in use)

Slave controllers' unused BX inputs and outputs can be disabled, but this is not necessary.

If there is a remote access device in the bus, it should be set as the master for clock use, and the master controller's line 6640 setting should be set to **Slave with remote setting**. This way, the entire system's time will be automatically kept up to date through the remote access device and, if necessary, the time can be changed from any controller.

Bus segments

If necessary, the bus can be divided into several segments. The device addresses within these segments are independent from the rest of the system.

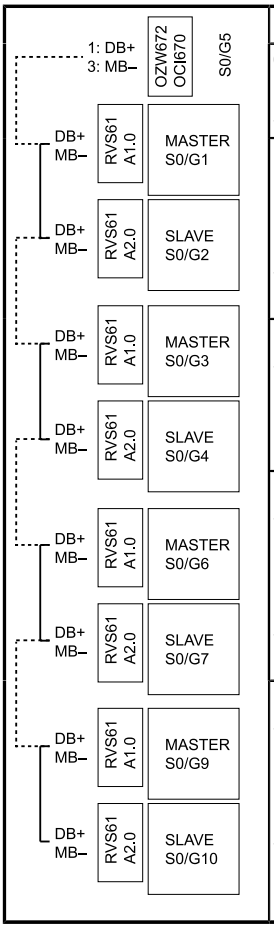
Select the segment ID from line 6601.

- The address for the segment's master is always 1.
- The address for the remote access device's segment is always 0.

The segment ID and the device address constitute the controller's entire address. The address can be, for example, S0/G1 or S0/G2, which means segment 0's (S0) master (G1) and its first slave (G2).

The ACS program can only be connected to device address 1 (the master controller). Any slave controllers connected to the bus will be displayed in the program through the master controller. As usual, the program can be used to copy the settings across all controllers connected to the bus through the master controller.

If you want to specifically connect to a slave controller using the ACS program, the controller needs to be disconnected from the bus and its device address changed to "1" via the controller's user interface. If the value on line 5800 is set to **externally brine**, the slave controller's PI diagram will show any and all components that can be present in the refrigerant circuit. Otherwise, the diagram will correspond to the actual controller settings. If you want to check the slave controller's wiring diagram for the refrigerant circuit, temporarily set the value on line 5800 to **Brine circuit**.



Devices in the cascade
OZW672 or OCI670 REMOTE CONNECTION DEVICE S0/G5
RE 96 MASTER S0/G1 Line 6600: 1, Line 6601: 0 B10, B4, B3, B9 SLAVE S0/G2 Line 6600: 2, Line 6601: 0
RE 96 SLAVE S0/G3 Line 6600: 3, Line 6601: 0 ● Disconnect sensors B10, B4, and B3 from the controller.
RE 96 SLAVE S0/G6 Line 6600: 6, Line 6601: 0 ● Disconnect sensors B10, B4, and B3 from the controller. SLAVE S0/G7 Line 6600: 7, Line 6601: 0
RE 96 SLAVE S0/G9 Line 6600: 9, Line 6601: 0 ● Disconnect sensors B10, B4, and B3 from the controller. SLAVE S0/G10 Line 6600: 10, Line 6601: 0

3.9.2 Shared brine circuit pump

A shared brine circuit pump can be defined for the cascade. The shared pump will always start when the first compressor in the running order starts, even if it is not in the compressor circuit that is controlled by the particular controller. By default, the cascade's shared brine circuit pump is connected to the master controller in accordance with the electrical drawings, and the slave controllers will request the master controller to activate the output via the bus.

Connect the pump using the regular brine pump output (Q8) in any of the controllers connected to the cascade.

- Select the controller to which the shared pump is connected on line 5803.
- By default, the setting for the line is **1**, which is the master controller's device address.

Enable the shared brine circuit pump by setting the option on line 5800 to **externally brine**.

- Enable this option in all controllers that use the shared brine circuit pump, except for the controller to which the shared pump is connected.
- As a rule, set the value on line 5800 to **externally brine** in all slave controllers, and leave the value unchanged in the master controller.

The controllers that use the shared pump may also have the their own brine circuit pump output Q8 configured. As usual, the output is activated when the compressor circuit controlled by the relevant controller starts, even if the controller sends out a request for the shared brine circuit pump to turn on via the bus. This means that if required, the shared brine circuit pump can be used as an additional pump alongside the compressor circuit's own brine circuit pump.

3.9.3 Separate heat pump for DHW heating

The cascade can be laid out and programmed so that one compressor unit (one condenser) is reserved for heating domestic hot water. In this configuration, the selected heat pump's automation system controls the change-over valve for the heat pump's flow, switching between domestic hot water heating and space heating as necessary.

1. To activate this function, open the configuration menu in the selected heat pump's settings.
2. On line 5736, activate the option **DHW dedicated**.
3. Install sensor B10 to the flow line branch that leads to space heating.

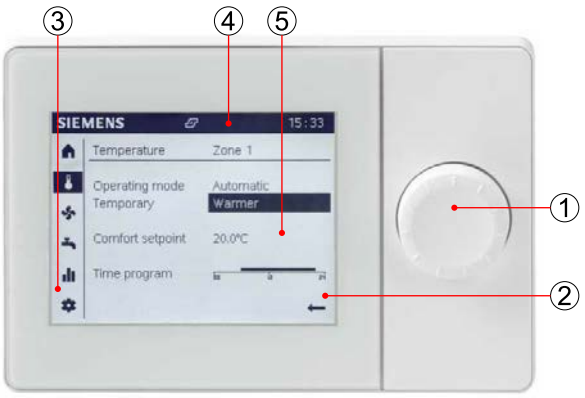
In space heating, the selected heat pump will operate just like the other heat pumps in the system (controlled by sensor B10).

Using all heat pumps for domestic hot water heating

If you wish to use all heat pumps for heating up domestic hot water, connect the change-over valve to the master controller, and position all of the heat pumps (condensers) upstream from the valve. This way, the system functions like an ordinary single-pump system.

4 Operation

4.1 Heat pump user interface



Navigate the menus and settings by turning the control knob.

Select a menu or setting by pushing in the control knob.

Move to the previous menu by using the arrow or text field at the bottom of the screen.

1) Control knob
2) Display
3) Navigation bar
4) Status bar
5) Work area

Status bar symbols

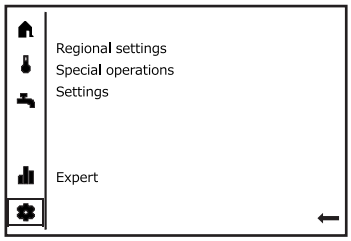
	Active alarm
	Special operations are active (e.g., outdoor temperature simulation or emergency operation), or the maximum number of error notifications permitted by the settings has been reached.
	The heating circuit operating mode has been changed and, as a result, scheduled automatic operation is disabled. This icon is shown if the operating mode is changed from Automatic to another mode, such as Comfort.
	User level No symbol: end-user (no password) 1: commissioning (no password) 2: expert (password: 00017) 3: OEM operation (password 24358)
	The heat pump's compressor is on.
	Event message

Navigation bar

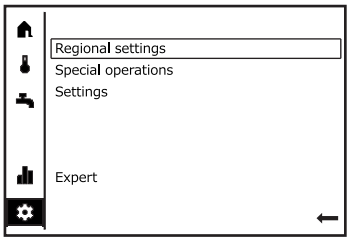
	Start page • key temperature values • switching heating circuits **ON** (to automatic mode) or **OFF** (to frost protection mode)
	Heating circuits • operating mode • room temperature setpoint for **Comfort** mode • time programs
	Domestic hot water • switching domestic hot water heating on and off • recharging DHW to its setpoint (before the switching limit is reached) • Domestic hot water time programs
	Status information • temperatures • operating modes • fault information and resetting the heat pump under fault conditions

	Settings • time and language • changing the user level • resetting the heat pump • emergency operation mode • basic settings for the heating circuit assigned to the current user interface
	Diagnostics menu • testing inputs and outputs • bus settings • outdoor temperature simulation • heat pump status • consumer-side heating details • error notification history
	Service menu • parameter list • commissioning menu (incl. assigning heating circuits to the user interface) • updating the user interface's operating views (visible if the interface needs to be updated)

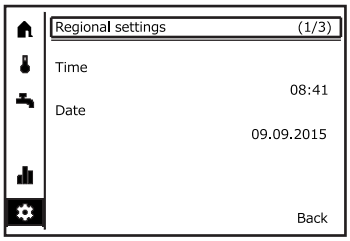
Using menus



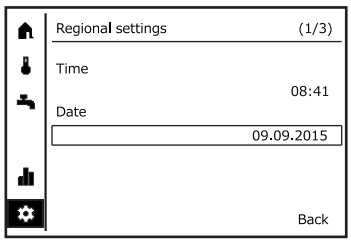
Move the cursor on the left-hand side of the screen to the desired menu icon. Select the menu by pushing in the control knob.



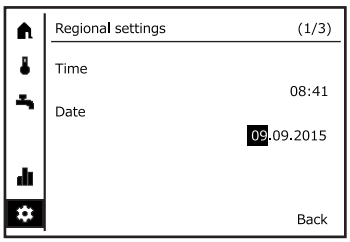
Move to the desired function by turning the control knob. Select the function by pushing in the control knob.



If the menu consists of several pages, the cursor is initially in the status bar.

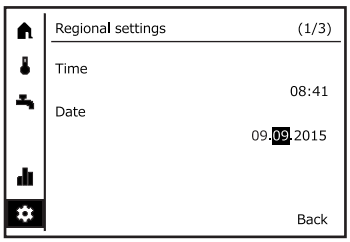


Move to one of the setpoints from the status bar by turning the control knob.



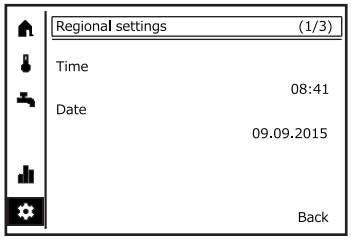
Select the setpoint to be changed by pushing in the knob.

- The setpoint can be changed, when its background turns dark.
- Adjust the setpoint by turning the control knob.

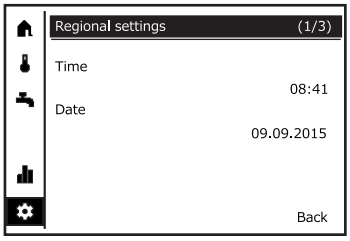


Move to the next number field by pushing in the control knob.

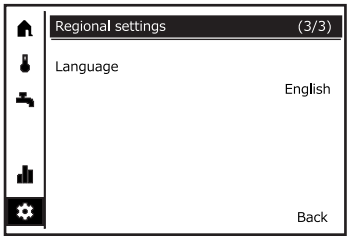
- Proceed like this until you have gone through all the fields.



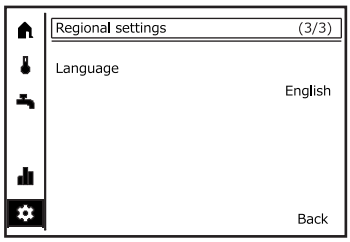
To move from one page to another, move to cursor the status bar



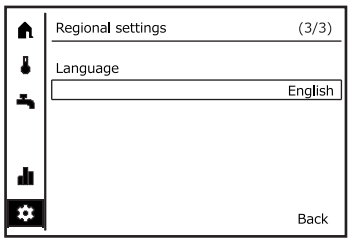
To scroll between the pages, push in the control knob.



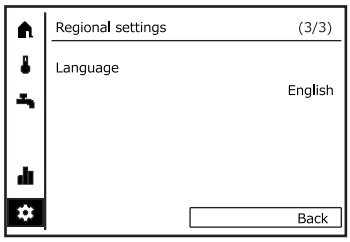
Move from one page to another by turning the knob.

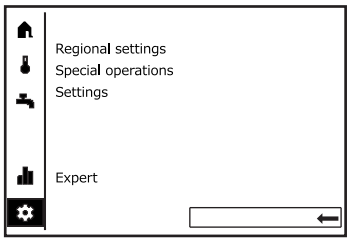


Once you are on the correct page, push in the control knob again.



Move from the status bar to one of the setpoints by turning the control knob.



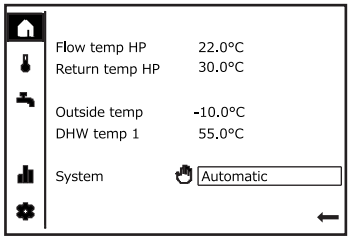


Go back by moving the cursor to the lower right-hand corner and pushing in the control knob.

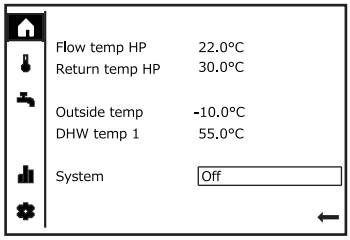
4.2 Start page

From the start page, you can switch all heating circuits assigned to the relevant user interface **ON** or **OFF** in one go. When switched ON, all heating circuits will operate in automatic mode. When switched OFF, all heating circuits will operate in frost protection mode. The start page shows the condenser's flow temperature (sensor B21), the condenser's return temperature (sensor B71), domestic hot water temperature (sensor B3), and the outdoor temperature (sensor B9).

An individual heating circuit's operating mode can be changed separately from the circuit's own settings.



Heating circuits switched **ON** (in automatic mode or in an operating mode selected separately from the settings afterwards).



Heating circuits in frost protection mode.

4.3 Heating circuit menu

Three different room temperature setpoints can be assigned to the heating circuits. These setpoints are **Comfort**, **Reduced**, and **Frost protection**. The **Comfort** setpoint can be altered directly from the heating circuit's main menu. The other setpoints can be changed in each heating circuit's advanced settings (through the parameter list).

If the heating circuit is controlled based on a heating curve, changing the room temperature setpoint will correspond to moving the heating curve sideways (parallel displacement). If the heating circuit is controlled based on room temperature measurement instead, changing the room temperature setpoint will directly change the target room temperature value.

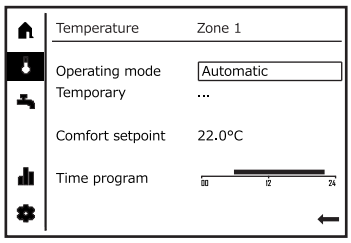
Heating circuits should be kept in **Automatic** mode, as this will allow them to be automatically disabled when the heating period ends (summer/winter heating limit). Additionally, time programs are enabled only when the heating circuit is in **Automatic** operating mode.

Time programs

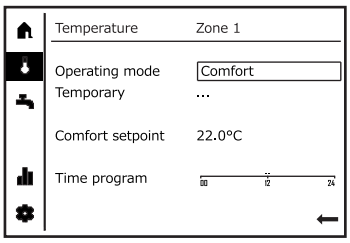
A time program toggles the heating circuit's operating mode automatically between **Comfort** mode and **Reduced** mode. **Comfort** mode is used during the period specified in the time program. At other times, **Reduced** mode is used. Time programs can be set up for each day of the week separately.

When using factory settings, the heating circuits have **Automatic** mode enabled, and the time program keeps **Comfort** mode on permanently. If a time program is used to switch from **Comfort** mode to **Reduced** mode, **Comfort** mode can be temporarily restored by selecting a temporary operating mode for the heater (from the **Temporary** setting). The heating circuit's operating mode will return to normal the next time the time program changes the mode or the user some other operating mode than **Automatic**.

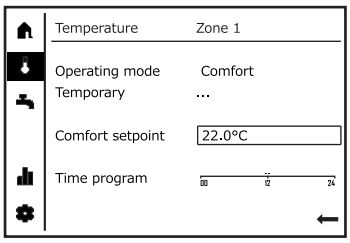
Settings



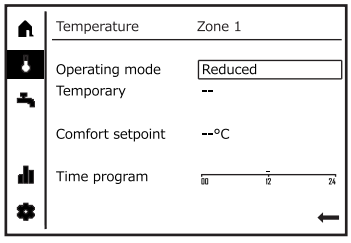
Automatic mode. Heating circuits should be kept in **Automatic** mode.



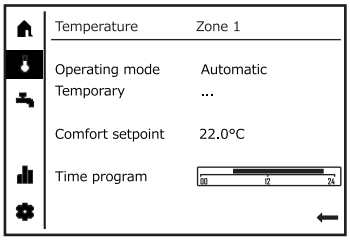
Comfort setpoint for room temperature always on.



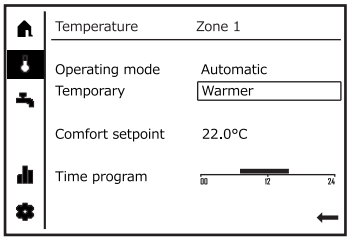
When the operating mode is set to **Comfort**, the setpoint for the room temperature in **Comfort** mode can be changed.



The **Reduced** setpoint for room temperature.



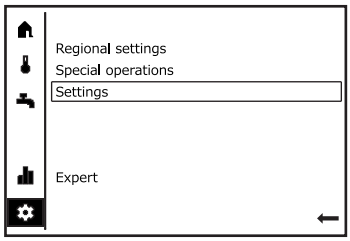
Time programs are enabled in **Automatic** mode only.



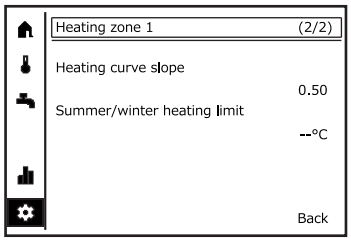
Temporary comfort mode selected for the heating circuit.

4.4 Heating curve

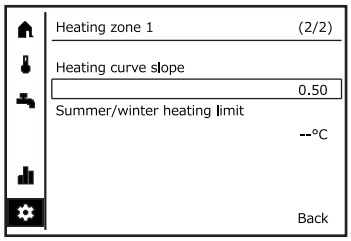
You can adjust the slope of the heating curve in the settings menu. The change applies only to the heating circuit assigned to the relevant user interface. Use the parameter list to change other settings for the particular heating circuit (and the settings of other heating circuits connected to the system).



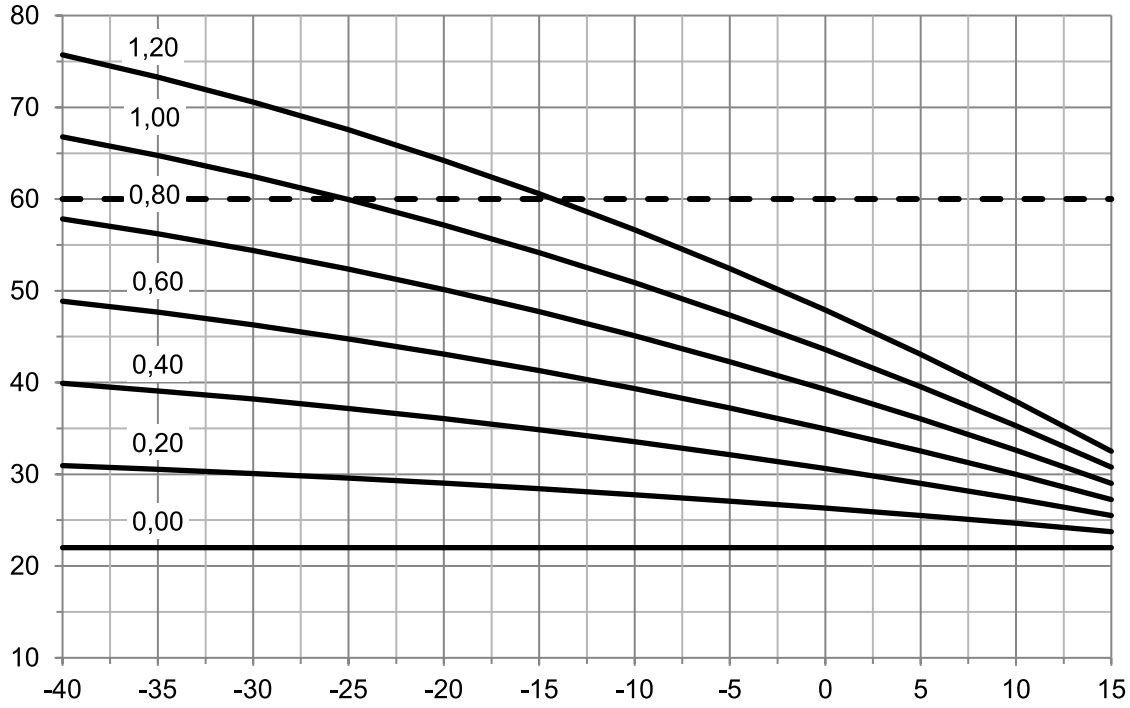
1. Select **Settings**.



2. Move to the correct menu page.



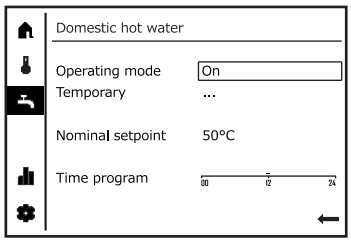
3. Enter the desired heating curve slope.



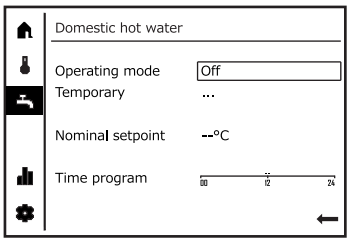
X-axis: outdoor temperature, °C. Y-axis: heating water temperature, °C.
Heating curves when the room temperature setpoint is 22 °C, the heating curve displacement is 0 °C, and the upper and lower limits do not restrict the heating water temperature.

4.5 Domestic hot water menu

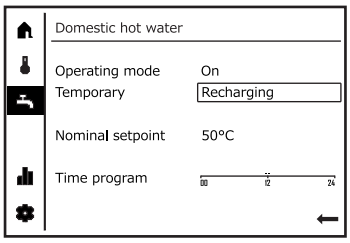
Key domestic hot water settings can be changed in the **Domestic hot water menu**. Other DHW settings can be changed in the domestic hot water and DHW storage tank settings in the parameter list.



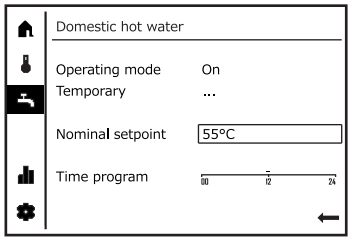
Domestic hot water heating on.



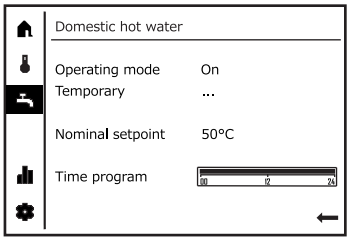
Domestic hot water heating off.



DHW is being heated to its setpoint before the temperature has fallen to the switch-on threshold. The function returns to normal mode once DHW temperature has reached its setpoint.



Changing the DHW temperature setpoint.



DHW time program (time program 4). Activate the time program from line 1620.

4.6 Changing the user level

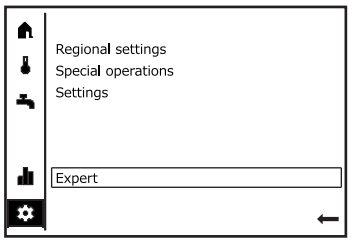
The heat pump automation has four distinct user levels. The user level influences the menu structure and the setpoints displayed in the menus. The user levels are **end user**, **commissioning**, **engineer**, and **OEM**.

The end user view is the default interface view. The **end user** and **commissioning** levels are sufficient for performing most actions.

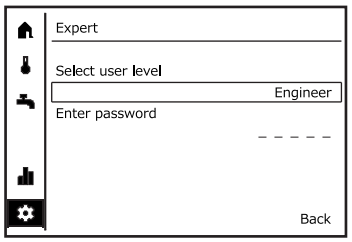
Change the user level from the settings menu (gear icon).

The **commissioning** level does not require a password, but the **engineer** and **OEM** levels are password-protected. The current user level is indicated by a number in the status bar.

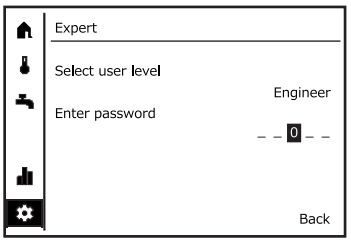
- No number: end user (no password)
- 1: commissioning (no password)
- 2: expert (password 00017)
- 3: OEM level (password 24358)



1. Enter the settings menu (gear symbol), and select **Expert**.

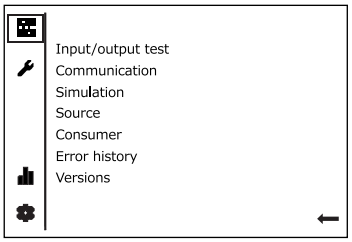


2. Select the user level.

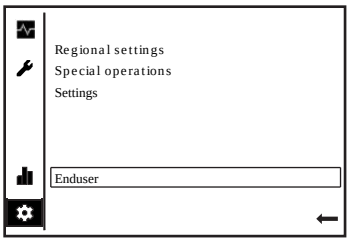


3. Enter the password (if necessary).

4. The interface will inform you that you have logged in.



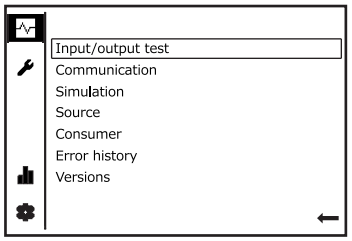
5. The menus applicable to the selected user level are now shown.



Returning to end-user level.

4.7 Diagnostics menu

The diagnostics menu can be accessed only at the commissioning user level or above. The sub-menus displayed depend on the user level.



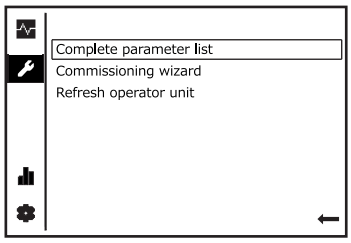
Diagnostics menu.

4.8 Service menu

The service menu can be accessed only at the **commissioning** user level or above. The service menu provides access to the **parameter list**. The parameter list allows for a much more in-depth configuration of the automation settings than the basic views.

In addition, the commissioning wizard can be launched again, and the user interface can be updated via the service menu. It is advisable to update the user interface after any changes in connections, such as after adding heating circuits.

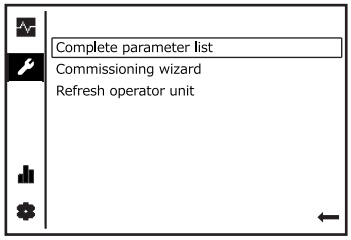
- If there is no need to update the user interface, the service menu does not include an option to start an update.



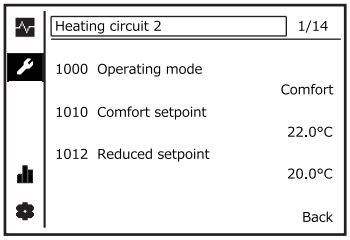
Service menu.

4.9 Parameter list

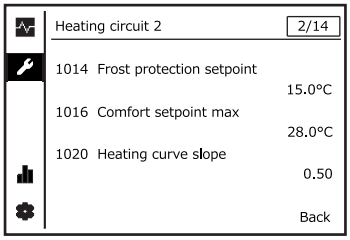
The parameter list can be accessed from the **service** menu. The parameter list can be accessed only at the **commissioning** user level or above. The lines displayed in the parameter list depend on the user level. During first start-up and after changing the user level, it will take some time for the user interface to load the parameter list.



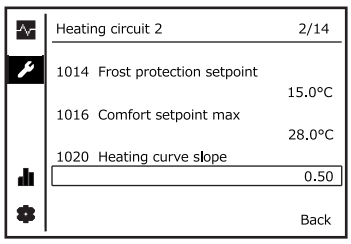
1. Open the parameter list.



2. Select the desired menu from the status bar.

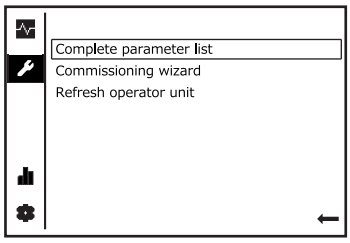


3. Scroll through the pages in the menu and select the relevant one.

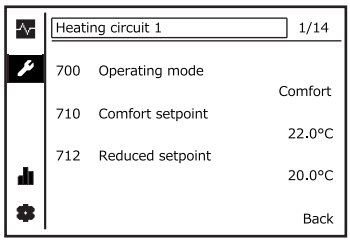


4. Move the cursor to the desired setpoint and edit it.

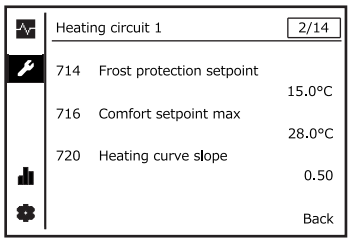
Advanced settings for heating circuits



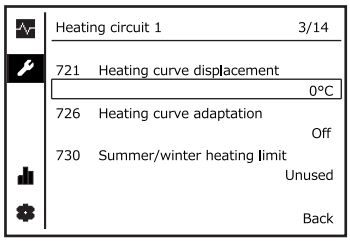
1. Open the parameter list.



2. Select the desired menu from the status bar.



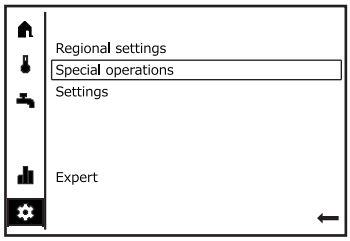
3. Scroll through the pages in the menu and select the relevant one.



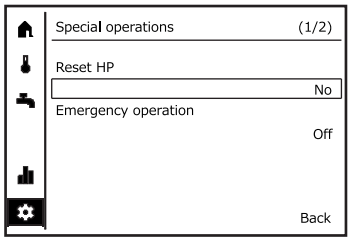
4. Move the cursor to the desired setpoint and edit it.

4.10 Resetting the heat pump

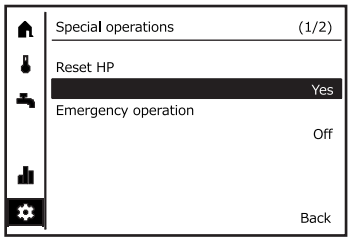
The heat pump can be reset (recovered) from a fault condition from the settings menu. Before the reset, you should investigate the causes of the fault and address the issue.



1. From the settings menu, select **Special operations**.

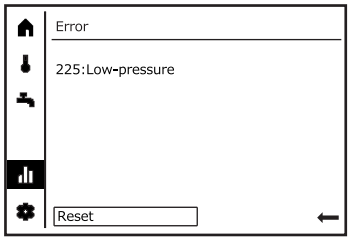


2. Select **Reset HP**.



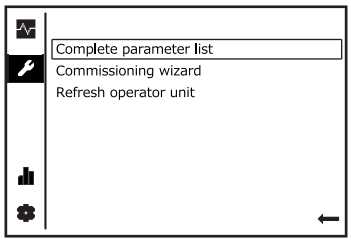
3. Change the setting to **Yes**.

In case of a fault

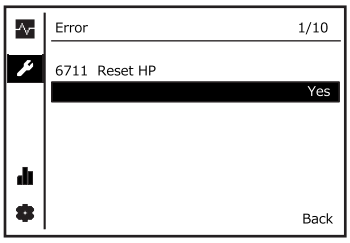


In the diagnostics menu, select **Reset.** Select **Confirm**.

Through the parameter list



Open the parameter list.



Enter the fault menu and select **Reset HP** on line 6711. Switch the line value to **Yes**.

5 Technical data

5.1 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		2–9	3–12	7–25
Empty weight	kg	148	148	160
In-line heater				
In-line heater as standard		no	no	no
Can be equipped with an in-line heater (6 kW)		yes	yes	yes
Heater power stages	pcs.	3	3	3
Pipe connections				
Condenser and brine circuit connection (ISO 228 thread)		G 1	G 1	G 1 1/4
Maximum permissible operating pressure	bar	6	6	6
Noise level				
A-weighted sound pressure level At 1 m distance	dB (A)	<40	< 40	< 40
Fuse				
Simultaneous use of compressor and in-line heater disabled		3 x 16 A	3 x 16 A	3 x 32 A

Cube Inverter+

MODEL/RATED CAPACITY (kW) 3~, 400 V, 50 Hz, PE		2–9	3–12
Empty weight	kg	256	256
In-line heater			
In-line heater as standard		yes	yes
Heater capacity	kW	6	6
Heater power stages	pcs.	3	3

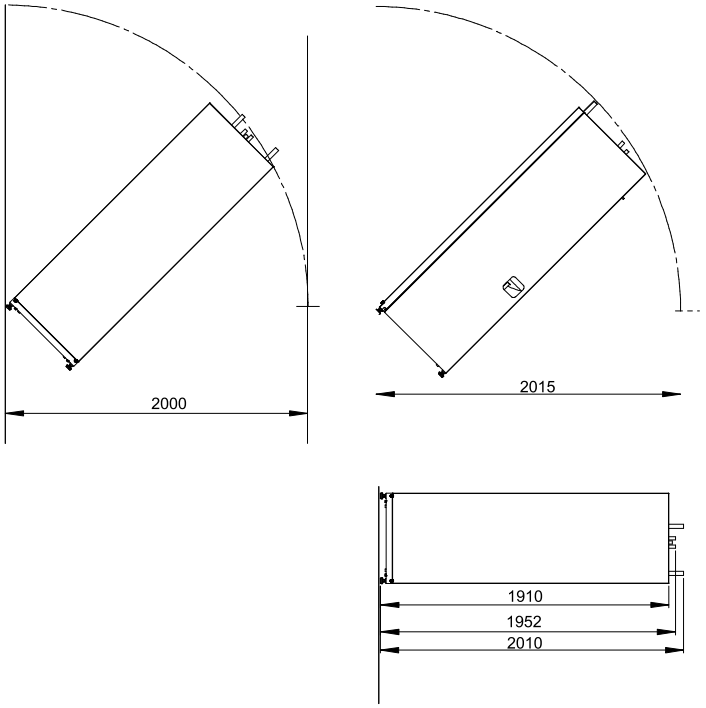
MODEL/RATED CAPACITY (kW) 3~, 400 V, 50 Hz, PE		2–9	3–12
Output for each heater stage	kW	2	2
Pipe connections			
Condenser circuit connection (copper pipe)	mm	28	28
Brine circuit connection (copper pipe)	mm	28	28
Maximum permissible operating pressure	bar	3	3
Sound level			
A-weighted sound pressure level At 1 m distance	dB (A)	< 40	< 40
Backup fuse			
Simultaneous use of compressor and in-line heater disabled		3 x 16 A	3 x 16 A

Domestic hot water tank

DHW storage tank Cube Inverter+		
Type		Coil storage 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)

Clearance required for lifting the unit upright

Cube Inverter+



Clearance for lifting upright ver. 2

5.2 Compressor units

Cube Inverter+, ECO inverter+

MODEL / RATED CAPACITY (kW)3~ 400 V, 50 Hz, PE		2–9	3–12	7–25
Heat pump version		03	03	03
Refrigerant circuit (EU517/2014)				
Contains fluoridized greenhouse gases		yes	yes	yes
Hermetically sealed device		yes	yes	yes
To be checked periodically for leaks (threshold 10 CO_2-eq t)		no	no	no
Refrigerant		R-410A	R-410A	R-410A
Refrigerant's PED group (EN 378:2016)		2	2	2
Refrigerant's safety classification (EN 378:2016)		A1	A1	A1
Circuit's PED category (2014/68/EU)		1	1	1
Refrigerant's GWP value (global warming potential)		2088	2088	2088
Refrigerant charge*	g	1200	1200	1500
Refrigerant charge*	kg	1.20	1.20	1.50
Refrigerant charge*	CO_2-eq kg	2506	2506	3132
Refrigerant charge*	CO2eq t	2.506	2.506	3.13
Maximum permissible operating pressure PS	bar g	45	45	45
The maximum permissible temperature:	°C	135	135	135
Minimum permitted temperature	°C	−15	−15	−15
Low pressure switch				

MODEL / RATED CAPACITY (kW)3~ 400 V, 50 Hz, PE		2–9	3–12	7–25
Low pressure switch-off	bar g	3.4 ± 0.5	3.4 ± 0.5	3.4 ± 0.5
Recovery pressure	bar g	5.9 ± 0.5	5.9 ± 0.5	5.9 ± 0.5
High pressure switch				
High pressure switch-off	bar g	43 ± 1.7	43 ± 1.7	45 ± 1.7
Recovery pressure	bar g	34 ± 1.7	34 ± 1.7	34 ± 1.7
Compressor				
Compressor type		scroll	scroll	scroll

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

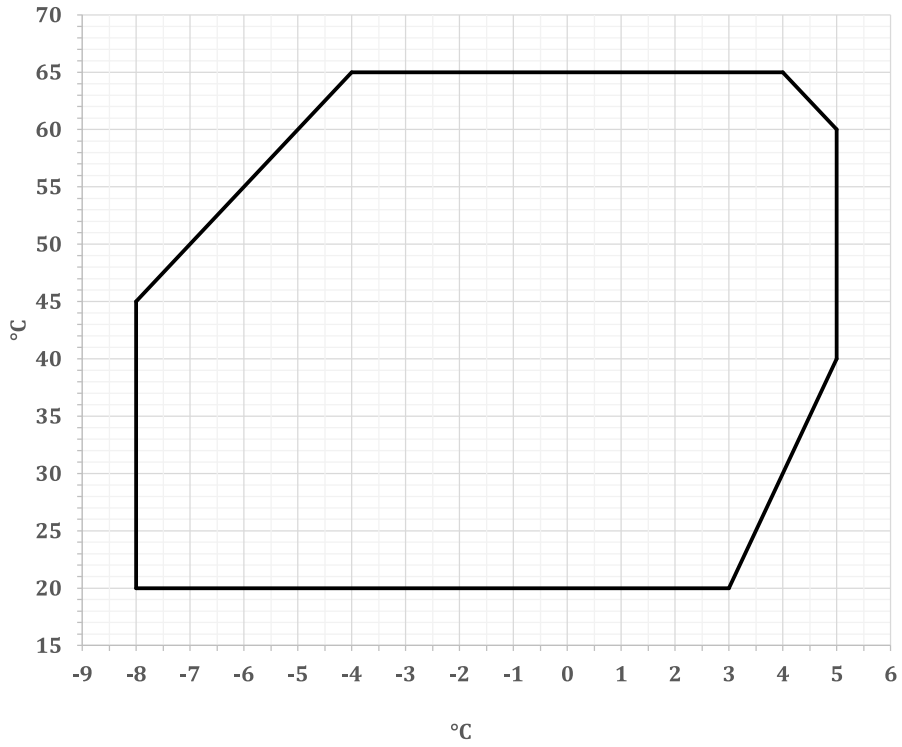
5.3 Operating conditions

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.

Inverter+ 2–9

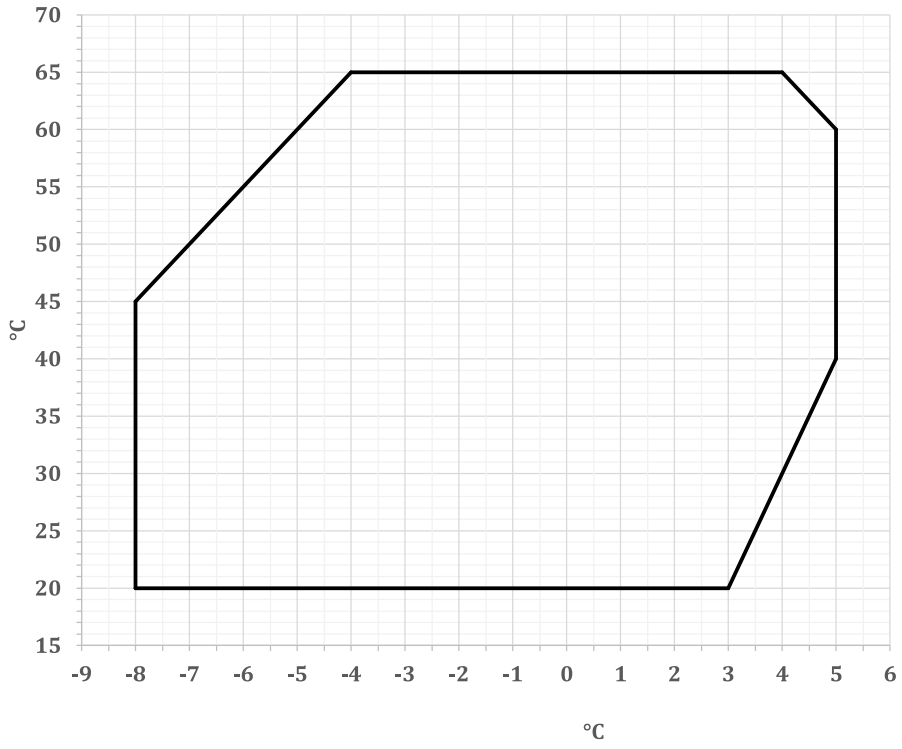
Inverter+ 2–9		Minimum value	Maximum value	Design value
Evaporator circuit's flow rate	kg/s	0.23	-	0.55
Temperature differential of the evaporator circuit	°C	1	4	3
Brine into the evaporator	°C	−5	9	0
Brine out of the evaporator	°C	−8	5	−3
Condenser circuit's flow rate	kg/s	0.08	-	0.43
Condenser circuit's temperature difference	°C	3	15	5
Water into the condenser	°C	15	60	30
Water from condenser	°C	20	67	35



Inverter+ 2–9 operating envelope. X-axis: temperature, brine from evaporator (°C), Y-axis: temperature, water from condenser (°C).

Inverter+ 3–12

Inverter+ 3–12		Minimum value	Maximum value	Design value
Evaporator circuit's flow rate	kg/s	0.23	-	0.66
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 flow rate	kg/s	0.08	-	0.53
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-%)

ECO Inverter 7–25+ (65 °C output temperature)

ECO Inverter 7–25+ (65 °C output temperature)		Minimum value	Maximum value	Design value
Evaporator circuit's flow	kg/s	0.47	-	1.22
Temperature differential of the evaporator circuit	°C	1	4	3
Brine into the evaporator	°C	−5	12	0
Brine out of the evaporator	°C	−8	9	−3
Condenser circuit's flow rate	kg/s	0.16	-	0.96
Condenser circuit's temperature difference	°C	3	25	5
Water into the condenser	°C	15	60	30
Water from condenser	°C	20	65	35

Inverter+ 7–25 operating envelope, output temperature: 65 °C. 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-%)

ECO Inverter+ 7–25 (60 °C output temperature)

ECO Inverter+ 7–25 (60 °C output temperature)		Minimum value	Maximum value	Design value
Evaporator circuit's flow rate	kg/s	0.47	-	1.48
Temperature differential of the evaporator circuit	°C	1	4	3
Brine into the evaporator	°C	−5	12	0
Brine out of the evaporator	°C	−8	9	−3
Condenser circuit's flow rate	kg/s	0.16	-	1.18
Condenser circuit's temperature difference	°C	3	25	5
Water into the condenser	°C	15	55	30
Water from condenser	°C	20	60	35

Operating envelope

Inverter+ 7–25 operating envelope, output temperature: 60 °C. X-axis: brine from evaporator (°C), Y-axis: water from condenser (°C).

Condenser circuit fluid: water

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

5.4 Performance data

ECO Inverter+, Cube Inverter+ 2–9

Heating, kW	Brine in, °C	Brine out, °C	Water in, °C	Water out, °C	Minimum output	Maximum output
B0/W25	0	−3	20	25	3.5	9.3
B0/W35	0	−3	30	35	3.4	9.0
B0/W45	0	−3	40	45	3.3	8.6
B0/W55	0	−3	47	55	3.2	8.2

Coefficient of performance, -	Brine in, °C	Brine out, °C	Water in, °C	Water out, °C	Minimum output	Maximum output
B0/W25	0	−3	20	25	6.1	5.6
B0/W35	0	−3	30	35	4.6	4.4
B0/W45	0	−3	40	45	3.5	3.5
B0/W55	0	−3	47	55	2.8	2.8

Cooling capacity, kW	Brine in, °C	Brine out, °C	Water in, °C	Water out, °C	Minimum output	Maximum output
B0/W25	0	−3	20	25	2.9	7.7
B0/W35	0	−3	30	35	2.7	6.9
B0/W45	0	−3	40	45	2.4	6.2
B0/W55	0	−3	47	55	2.1	5.3

Electrical power, kW	Brine in, °C	Brine out, °C	Water in, °C	Water out, °C	Minimum output	Maximum output
B0/W25	0	−3	20	25	0.6	1.7
B0/W35	0	−3	30	35	0.7	2.0
B0/W45	0	−3	40	45	0.9	2.4
B0/W55	0	−3	47	55	1.2	2.9

Electrical current, A	Brine in, °C	Brine out, °C	Water in, °C	Water out, °C	Minimum output	Maximum output
B0/W25	0	−3	20	25	1.2	2.6
B0/W35	0	−3	30	35	1.4	3.1
B0/W45	0	−3	40	45	1.7	3.6
B0/W55	0	−3	47	55	2.0	4.3

Standard	Climate	City	Brine in, °C	Brine out, °C	Max. flow temperature, °C	SCOP
EN 14825:2016	Average (A)	Strasbourg	0	−3	55	4.0
EN 14825:2016	Warm (W)	Athens	0	−3	55	4.0
EN 14825:2016	Cold (C)	Helsinki	0	−3	55	4.1
EN 14825:2016	Average (A)	Strasbourg	0	−3	35	5.3
EN 14825:2016	Warm (W)	Athens	0	−3	35	5.4
EN 14825:2016	Cold (C)	Helsinki	0	−3	35	5.5

Condenser circuit liquid: water

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

ECO Inverter+, Cube Inverter+ 3–12

Heating, kW	Brine in, °C	Brine out, °C	Water in, °C	Water out, °C	Minimum output	Maximum output
B0/W25	0	−3	20	25	3.4	11.5
B0/W35	0	−3	30	35	3.3	11.0
B0/W45	0	−3	40	45	3.3	10.5
B0/W55	0	−3	47	55	3.2	10.0

Coefficient of performance, -	Brine in, °C	Brine out, °C	Water in, °C	Water out, °C	Minimum output	Maximum output
B0/W25	0	−3	20	25	5.9	5.2
B0/W35	0	−3	30	35	4.5	4.2
B0/W45	0	−3	40	45	3.5	3.4
B0/W55	0	−3	47	55	2.7	2.7

Cooling capacity, kW	Brine in, °C	Brine out, °C	Water in, °C	Water out, °C	Minimum output	Maximum output
B0/W25	0	−3	20	25	2.8	9.3
B0/W35	0	−3	30	35	2.6	8.4
B0/W45	0	−3	40	45	2.3	7.4
B0/W55	0	−3	47	55	2.0	6.3

Electrical power, kW	Brine in, °C	Brine out, °C	Water in, °C	Water out, °C	Minimum output	Maximum output
B0/W25	0	−3	20	25	0.6	2.2
B0/W35	0	−3	30	35	0.7	2.6
B0/W45	0	−3	40	45	0.9	3.1
B0/W55	0	−3	47	55	1.2	3.7

Electrical current, A	Brine in, °C	Brine out, °C	Water in, °C	Water out, °C	Minimum output	Maximum output
B0/W25	0	−3	20	25	1.2	3.3
B0/W35	0	−3	30	35	1.4	3.9
B0/W45	0	−3	40	45	1.7	4.6
B0/W55	0	−3	47	55	2.0	5.4

Standard	Climate	City	Brine in, °C	Brine out, °C	Max. flow temperature, °C	SCOP
EN 14825:2016	Average (A)	Strasbourg	0	−3	55	4.0
EN 14825:2016	Warm (W)	Athens	0	−3	55	4.0
EN 14825:2016	Cold (C)	Helsinki	0	−3	55	4.1
EN 14825:2016	Average (A)	Strasbourg	0	−3	35	5.3
EN 14825:2016	Warm (W)	Athens	0	−3	35	5.3
EN 14825:2016	Cold (C)	Helsinki	0	−3	35	5.5

Condenser circuit liquid: water

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

ECO Inverter+ 7–25 (65 °C output temperature)

Maximum output temperature is selected at the factory. Oilon's maintenance personnel may change the settings on site.

Heating, kW	Brine in, °C	Brine out, °C	Water in, °C	Water out, °C	Minimum output	Maximum output
B0/W25	0	−3	20	25	7.4	20.9
B0/W35	0	−3	30	35	7.1	20.1
B0/W45	0	−3	40	45	6.9	19.6
B0/W55	0	−3	47	55	6.8	19.0
B0/W65	0	−3	55	65	6.7	18.3

Coefficient of performance, -	Brine in, °C	Brine out, °C	Water in, °C	Water out, °C	Minimum output	Maximum output
B0/W25	0	−3	20	25	6.2	5.4
B0/W35	0	−3	30	35	4.8	4.3
B0/W45	0	−3	40	45	3.7	3.5
B0/W55	0	−3	47	55	2.9	3.0
B0/W65	0	−3	55	65	2.4	2.5

Cooling capacity, kW	Brine in, °C	Brine out, °C	Water in, °C	Water out, °C	Minimum output	Maximum output
B0/W25	0	−3	20	25	6.2	17.0
B0/W35	0	−3	30	35	5.6	15.5
B0/W45	0	−3	40	45	5.1	14.0
B0/W55	0	−3	47	55	4.4	12.7
B0/W65	0	−3	55	65	4.0	11.1

Electrical power, kW	Brine in, °C	Brine out, °C	Water in, °C	Water out, °C	Minimum output	Maximum output
B0/W25	0	−3	20	25	1.2	3.9
B0/W35	0	−3	30	35	1.5	4.7
B0/W45	0	−3	40	45	1.9	5.6
B0/W55	0	−3	47	55	2.3	6.3
B0/W65	0	−3	55	65	2.8	7.2

Electrical current, A	Brine in, °C	Brine out, °C	Water in, °C	Water out, °C	Minimum output	Maximum output
B0/W25	0	−3	20	25	2.3	6.3
B0/W35	0	−3	30	35	2.8	7.2
B0/W45	0	−3	40	45	3.4	8.2
B0/W55	0	−3	47	55	4.1	9.2
B0/W65	0	−3	55	65	4.6	10.5

Standard	Climate	City	Brine in, °C	Brine out, °C	Max. flow temperature, °C	SCOP
EN 14825:2016	Average (A)	Strasbourg	0	−3	55	4.1
EN 14825:2016	Warm (W)	Athens	0	−3	55	4.2
EN 14825:2016	Cold (C)	Helsinki	0	−3	55	4.2
EN 14825:2016	Average (A)	Strasbourg	0	−3	35	5.4
EN 14825:2016	Warm (W)	Athens	0	−3	35	5.5
EN 14825:2016	Cold (C)	Helsinki	0	−3	35	5.3

Condenser circuit liquid: water

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

* For heat pumps, space heaters and heat pump combination heaters, the rated heat output Prated is equal to the design load for heating Pdesignh, and the rated heat output of a supplementary heater Psup is equal to the supplementary capacity for heating sup (Tj).
** If Cdh is not determined by measurement, then the default degradation coefficient is Cdh = 0.9.

ECO Inverter+ 7–25 (60 °C output temperature)

Maximum output temperature is selected at the factory. Oilon's maintenance personnel may change the settings on site.

Heating, kW	Brine in, °C	Brine out, °C	Water in, °C	Water out, °C	Minimum output	Maximum output
B0/W25	0	−3	20	25	7.4	25.6
B0/W35	0	−3	30	35	7.1	24.7
B0/W45	0	−3	40	45	6.9	24.1
B0/W55	0	−3	47	55	6.8	23.5
B0/W65	0	−3	55	65	6.7	22.6

Coefficient of performance, -	Brine in, °C	Brine out, °C	Water in, °C	Water out, °C	Minimum output	Maximum output
B0/W25	0	−3	20	25	6.2	5.1
B0/W35	0	−3	30	35	4.8	4.1
B0/W45	0	−3	40	45	3.7	3.4
B0/W55	0	−3	47	55	2.9	2.9
B0/W65	0	−3	55	65	2.4	2.5

Cooling capacity, kW	Brine in, °C	Brine out, °C	Water in, °C	Water out, °C	Minimum output	Maximum output
B0/W25	0	−3	20	25	6.2	20.6
B0/W35	0	−3	30	35	5.7	18.7
B0/W45	0	−3	40	45	5.1	17.1
B0/W55	0	−3	47	55	4.5	15.5
B0/W65	0	−3	55	65	4.0	13.6

Electrical power, kW	Brine in, °C	Brine out, °C	Water in, °C	Water out, °C	Minimum output	Maximum output
B0/W25	0	−3	20	25	1.2	5.0
B0/W35	0	−3	30	35	1.5	6.0
B0/W45	0	−3	40	45	1.9	7.1
B0/W55	0	−3	47	55	2.3	8.0
B0/W65	0	−3	55	65	2.8	9.0

Electrical current, A	Brine in, °C	Brine out, °C	Water in, °C	Water out, °C	Minimum output	Maximum output
B0/W25	0	−3	20	25	2.3	8.1
B0/W35	0	−3	30	35	2.8	8.9
B0/W45	0	−3	40	45	3.4	10.0
B0/W55	0	−3	47	55	4.1	11.1
B0/W65	0	−3	55	65	4.6	12.4

Standard	Climate	City	Brine in, °C	Brine out, °C	Max. flow temperature, °C	SCOP
EN 14825:2016	Average (A)	Strasbourg	0	−3	55	4.1
EN 14825:2016	Warm (W)	Athens	0	−3	55	4.2
EN 14825:2016	Cold (C)	Helsinki	0	−3	55	4.2

Standard	Climate	City	Brine in, °C	Brine out, °C	Max. flow temperature, °C	SCOP
EN 14825:2016	Average (A)	Strasbourg	0	−3	35	5.4
EN 14825:2016	Warm (W)	Athens	0	−3	35	5.5
EN 14825:2016	Cold (C)	Helsinki	0	−3	35	5.3

Condenser circuit liquid: water

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

5.5 Pumps

Pump options

An overview of available pump options is presented below. Further details are provided for the first three pumps later in this section. Pump graphs are provided at the end of this section. Technical data for other pumps can be found on Wilo's website (link).

	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	34023073	Wilo-Stratos PARA 15/1-9 T10 130 mm 6h	1–phase, wet-motor, G 1 outer thread, installation dimension 130 mm, inverse PWM, 3.5-90 W (0.05–0.70 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
D	34023081	Wilo-Yonos PARA HF 40/0.5-12 (Wilo-Yonos MAXO 40/0.5-12)	1-phase, wet-motor, DN 40 flange, distance between flanges 250 mm, manual control, 15–550 W (0.17–2.4 A), motor protection 1.6-2.5
E	34023070	Wilo-Stratos 40/1-12	1-phase, wet-motor, DN 40 flange, distance between flanges 250 mm, manual control, with accessory card* 0…10 V and bus control etc., 25–550 W (0.20–2.40 A), motor protection 1.6-2.5
F	34023082	Wilo-Yonos MAXO 40/0.5-16	1-phase, wet-motor, DN 40 flange, distance between flanges 250 mm, manual control, 30–800 W (0.27–3.5 A), motor protection 2.5-4
G	34023083	Wilo-Yonos MAXO 50/0.5-16	1-phase, wet-motor, DN 50 flange, distance between flanges 340 mm, manual control, 40–1250 W (0.3–5.5 A), motor protection 4-6.3
H	34023066	Wilo-VeroLine-IPL 40/115-0.55/2	3-phase, dry-motor, DN 40 flange, distance between flanges 250 mm, 1-speed, 1.34 A, motor protection 1.6-2.5
I	34023067	Wilo-VeroLine-IPL 50/105-0.75/2	3-phase, dry-motor, DN 50 flange, distance between flanges 280 mm, 1-speed, 1.7 A, motor protection 1.6-2.5
J	34023068	Wilo-VeroLine-IPL 50/120-1.5/2	3-phase, dry-motor, DN 50 flange, distance between flanges 340 mm, 1-speed, 3.2 A, motor protection 2.5-4
K	34023063	Wilo-VeroLine-IPL 50/130-2.2/2	3-phase, dry-motor, DN 50 flange, distance between flanges 340 mm, 1-speed, 4.5 A, motor protection 4-6.3
KV1	34023076	Wilo-Yonos PARA Z 25/7.0 PWM2 180 mm 6h	1-phase, bronze housing (DHW pump), wet-motor, G 1 1/2 outer thread, setting dimension 180 mm, PWM, 3–45 W (0.03–0.44 A)

* For example, an accessory card with status information and 0–10 V control (Wilo product number 2030495)

Wilo-Yonos PARA GT 15/7.5 PWM1 130 mm

Motor and control type		EC motor, AC drive, wet motor
Pipe connection		ISO 228 G 1 (1" outer thread)
length (fitting dimension)	mm	130
weight	kg	2.5
Electrical connection		1~ 230 V, 50 Hz, N, PE
maximum allowable fluctuation margin for operating voltage		+10/−15%
motor protection		internal, but has a fuse in the switchboard depending on the model
electrical current	A	0.04–0.66
pump power consumption (P1)	W	4–75

Energy Efficiency Index (EEI)		≤21
maximum allowable static pressure	bar	6
allowable flow temperature range	°C	−10…95
minimum allowable inlet pressure at a flow temperature of 50 °C	kPa	5
minimum inlet pressure at a flow temperature of 95 °C	kPa	45
control signal		PWM (the inverse speed in relation to the control signal level)
control signal matching the maximum pump speed		PWM 0% (full speed as the control signal is cut)
control signal matching the minimum pump speed		PWM 100%
speed when the control signal is cut off		full speed

Wilo-Stratos PARA 15/1-9 T10 130 mm

Motor and control type		EC motor, AC drive, wet motor
Pipe connection		ISO 228 G 1 (1" outer thread)
length (fitting dimension)	mm	130
weight	kg	1.8
Electrical connection		1~ 230 V, 50 Hz, N, PE
maximum allowable fluctuation margin for operating voltage		+10/−15%
motor protection		internal, but has a fuse in the switchboard depending on the model
electrical current	A	0.05–0.70
pump power consumption (P1)	W	3.5–90
Energy Efficiency Index (EEI)		≤23
maximum allowable static pressure	bar	10
allowable flow temperature range	°C	−10…95
minimum allowable inlet pressure at a flow temperature of 50 °C	kPa	5
minimum inlet pressure at a flow temperature of 95 °C	kPa	45
control signal		PWM (the inverse speed in relation to the control signal level)
control signal matching the maximum pump speed		PWM 0% (full speed as the control signal is cut)
control signal matching the minimum pump speed		PWM 100%
speed when the control signal is cut off		full speed

Wilo-Stratos PARA 25/1-12 T16 180 mm

Motor and control type		EC motor, AC drive, wet motor
Pipe connection		ISO 228 G 1 ½ (1 ½" outer thread)
length (fitting dimension)	mm	180
weight	kg	6.2
Electrical connection		1~ 230 V, 50 Hz, N, PE
maximum allowable fluctuation margin for operating voltage		+10/−15%
motor protection		internal + a fuse in the switchboard
electrical current	A	0.16–1.37
pump power consumption (P1)	W	16–310

Energy Efficiency Index (EEI)		≤ 23
maximum allowable static pressure	bar	10
allowable flow temperature range	°C	−10…95
minimum allowable inlet pressure at a flow temperature of 50 °C	kPa	30
minimum inlet pressure at a flow temperature of 95 °C	kPa	100
control signal		0...10 V or manual control
control signal matching the maximum pump speed		10 V
a control signal matching the minimum pump speed		3 V and 0 V
control signal corresponding to the pump's OFF state		0.5…2 V
speed when the control signal is cut off		minimum rotational speed (with a 0 V control signal or without a control signal minimum speed is used)

Pump graphs

The manufacturer has drafted pump graphs for pure water. The water temperature in the graphs is approximately 20 °C, making the water density approximately 1000 kg/m3 and viscosity approximately 1,0 mPa·s (1.0 cP). The pressure difference presented the graphs is only applicable to pure water in these circumstances. The pump head (H) is valid for other circumstances and liquids as well, regardless of the liquid density, as long as its viscosity does not deviate greatly from water's viscosity in the circumstances laid out previously. Pump graphs are usually valid as they are for a typical mixture of 30-m % ethanol and water, because the solution's viscosity is sufficiently close to water's viscosity. Depending on the solution and operating conditions, the graphs can be adjusted according to for example ISO/TR 17766:2005, but this is not usually necessary. The adjusted pump head for a typical 30-m % ethanol and water solution is approximately 95...98 % of the pump head used for pure water. The pump head is presented on the left side of the graphs. The unit is meter (m). The pressure difference is converted into pump head with the following formula:

$$H = \frac{\Delta p}{\rho g}$$

H Is the pump's total head (m), **Δp** its pressure difference (Pa), **ρ**the density of pumped liquid (kg/m^3) and **g** the acceleration of Earth's gravitational pull (m/s^2). The value used for acceleration is 9.81 m/s^2. The pressure difference in the formula comes from the pressure loss calculation. The calculation can be presented directly as pump head, so it can be used directly when reading pump graphs. For water, 1 m in pump head is approximately 10 kPa (10 m is approx. 100 kPa = 1 bar). This is also roughly valid for water and ethanol solutions.

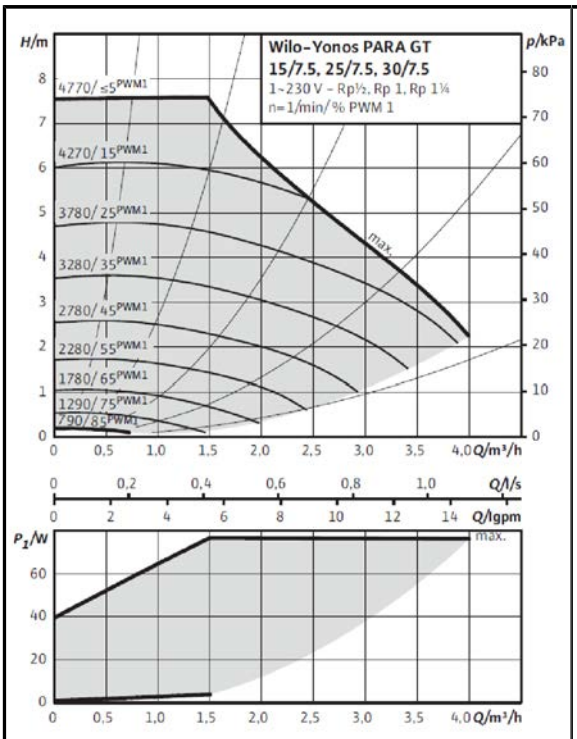
Markings I, II and III in the graphs indicate the default rotational speed's setpoint, the 0-10 V control voltage, and the level of the PWM pulse signal. Δp-c indicates a control type that keeps the pressure difference in the pump at a nearly standard level, and Δp-v indicates a control type based on a fluctuating pressure difference. The pump manufacturer recommends the latter type for single-unit systems. For detail-level explanations on the control types, see the pump manufacturer's instructions and

guides. In graphs denoting capacity, P1 is the electrical power supplied to the pump's motor, and P2 is the motor's shaft output. The electrical is calculated from the shaft output using the coefficient of performance.

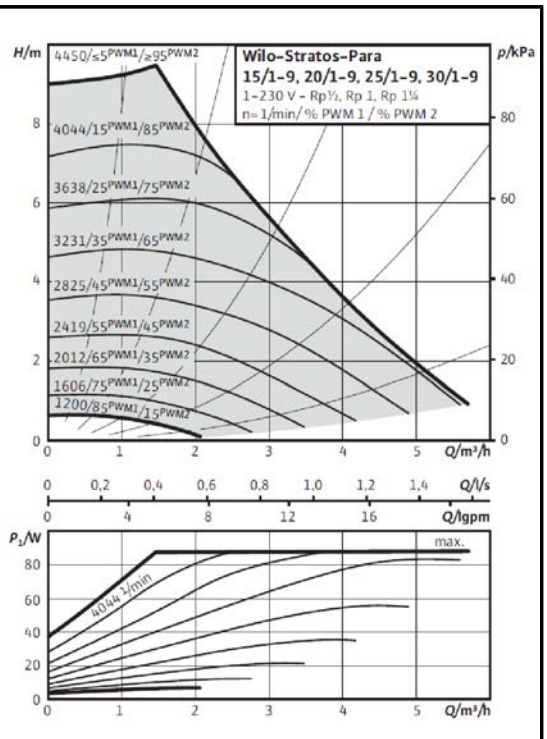
Outline for checking the pump's flow characteristics against capacity requirements:

- Determine the brine circuit's pressure loss in terms of pressure difference**Δp** (kpa) or pump head **Δp** (m) using a certain design flow rate. Ethanol solution's viscosity differs from pure water. Be sure to take this into account in the calculation.
- Add the heat pump's internal loss to the brine circuit's pressure loss. The internal pressure loss is presented in the heat pump's technical data as pressure loss (kPa). Convert the pressure difference into pump head if the brine circuit's pressure loss is not already presented as pump head.
- Convert the total pressure loss **Δp** (kPa) calculated previously into pump head **H** (m), if the pressure loss is not already presented in pump head. Also convert the flow rate's unit into m^3/h or L/s. These units are found in the pump graphs.
- Check the flow rate **Q** (m^3/h) corresponding to the pressure loss calculation from the horizontal axis, and the pump head **H** (m) corresponding to the total pressure loss from the vertical axis. Make sure that this design point is withn the pump's operating range. If not, change the pump or the design.
- For reduced electricity consumption, also check the consumption in the design point. If the consumption is high, change the pump or the design.
- Note that even a carefully drafted pressure loss calculation can have a margin of error as high as +/− 20 %, and that the pressure loss usually grows as the system ages.

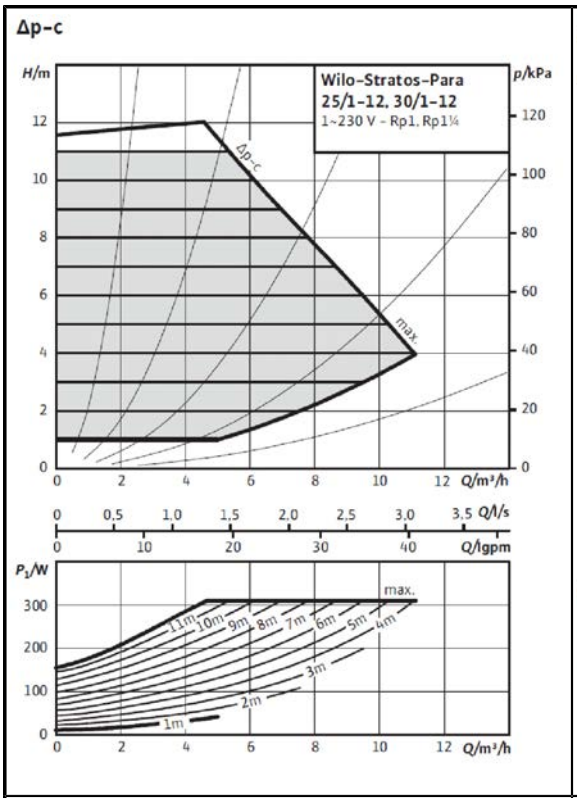
Pump graphs



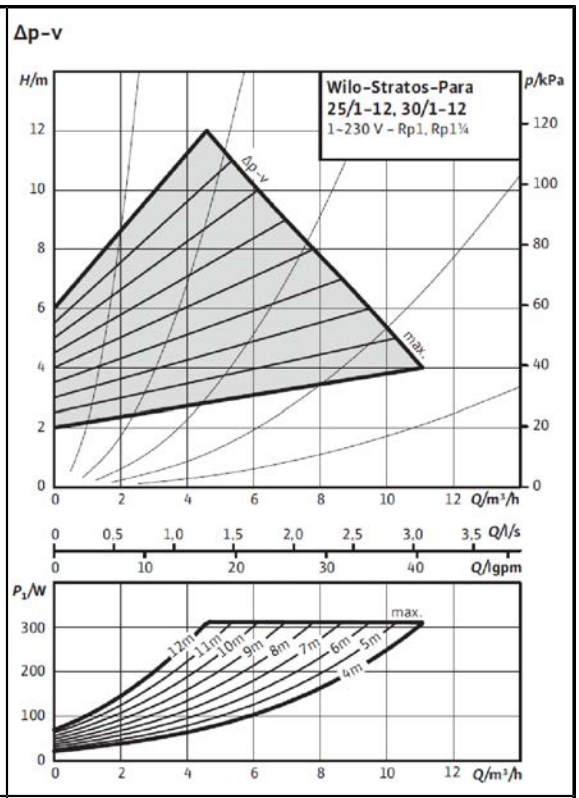
Wilo-Yonos PARA GT 7.5



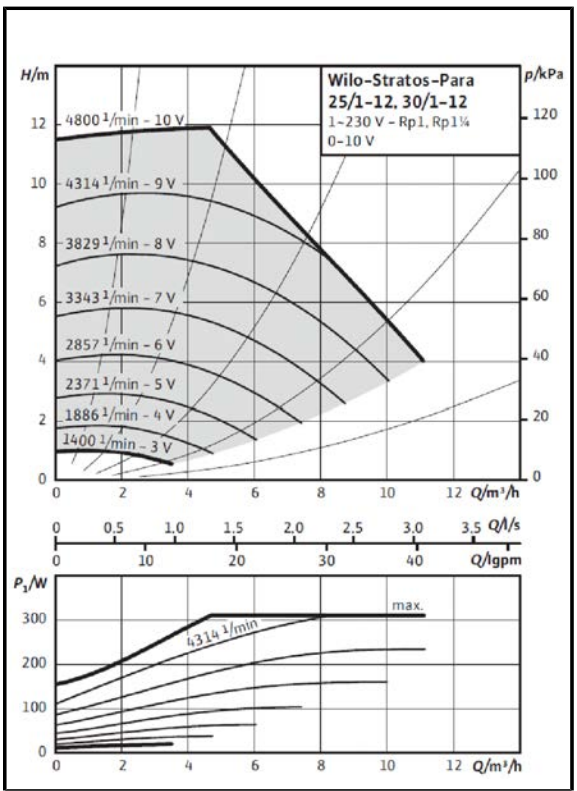
Wilo-Stratos PARA 1-9



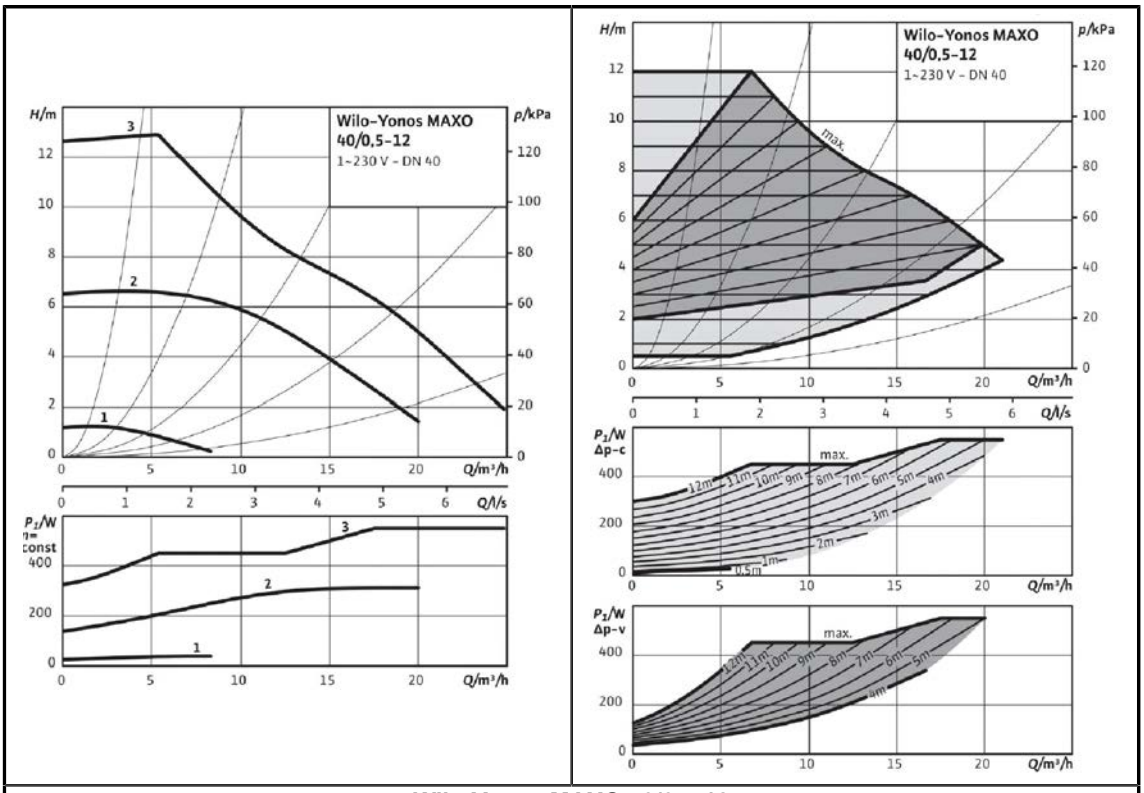
WILO-STRATOS PARA 1-12, ΔP-C (CONSTANT)



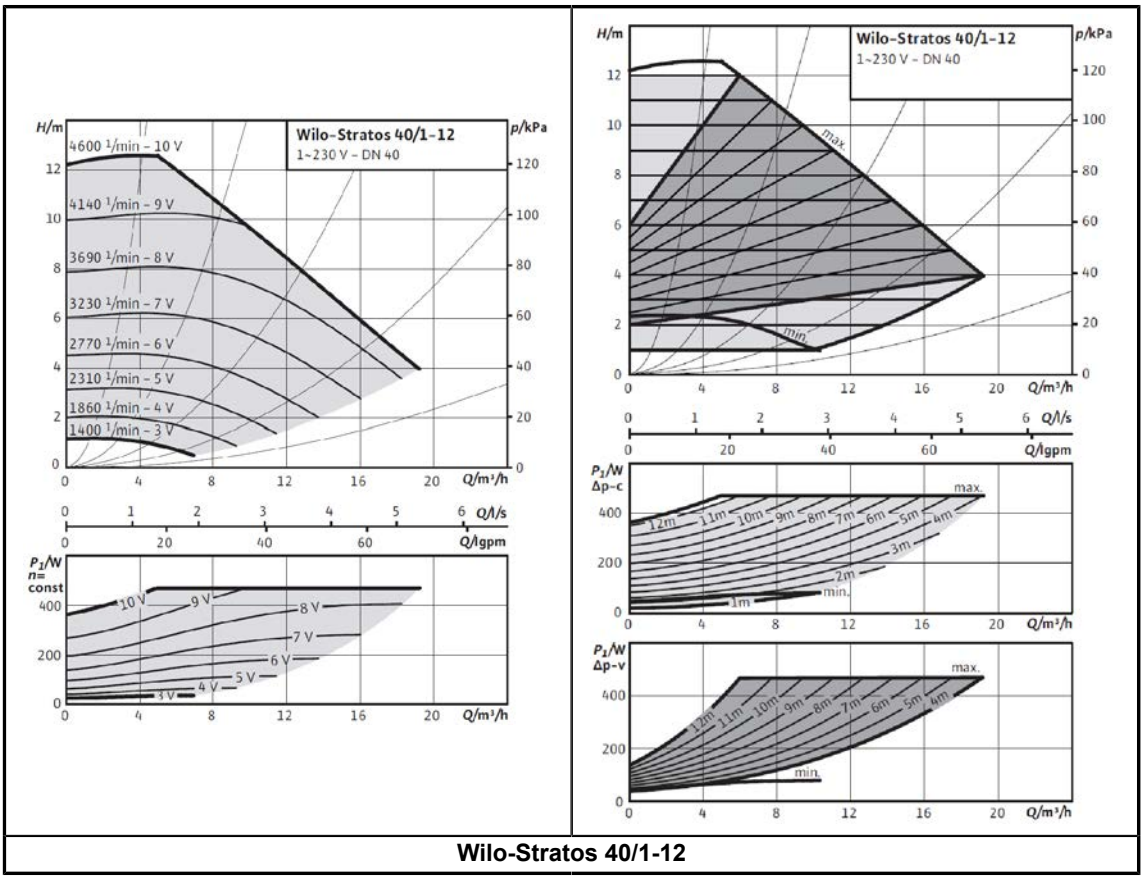
WILO-STRATOS PARA 1-12, ΔP-V (VARIABLE)



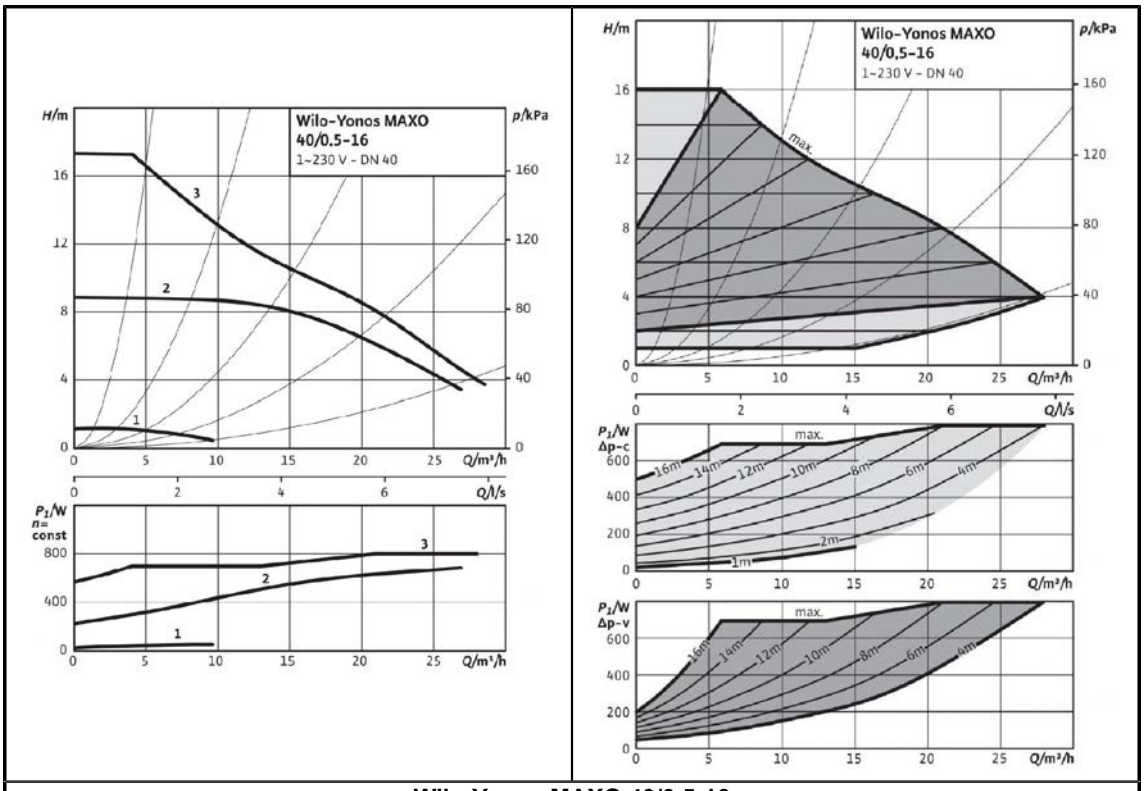
Wilo-Stratos Para 1–12, external control mode via analog input (0–10 V)



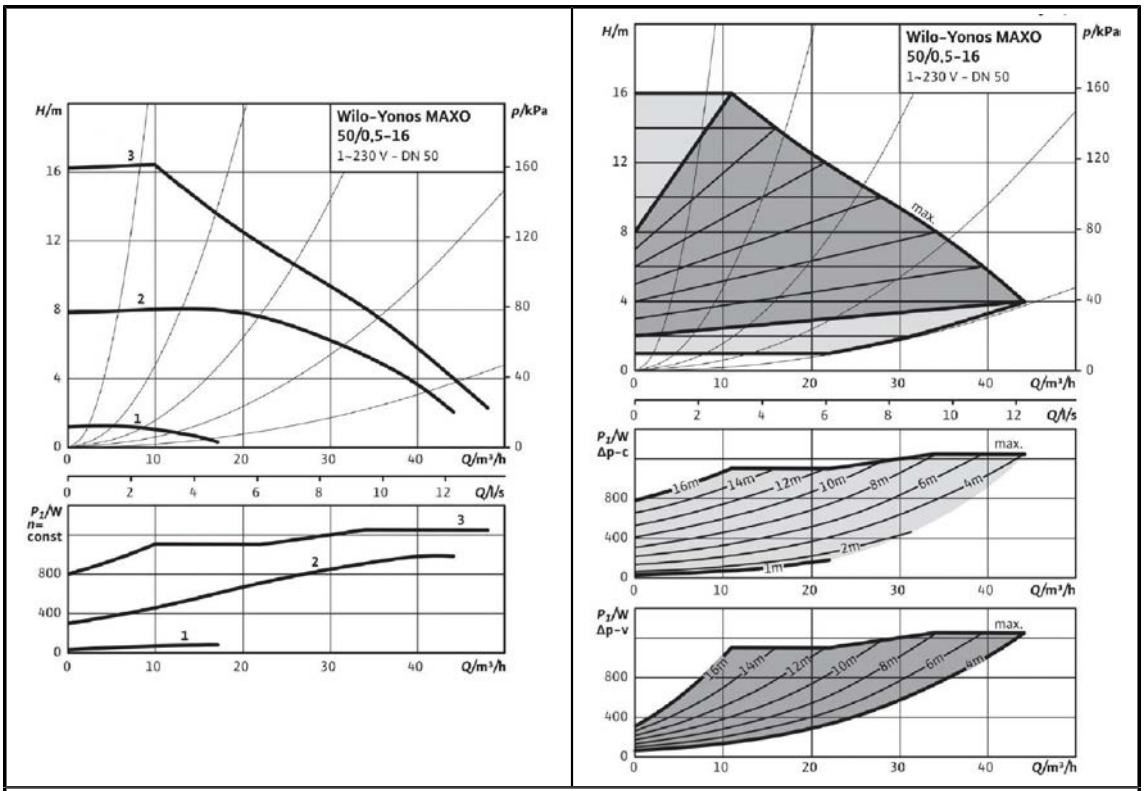
Wilo-Yonos MAXO 40/0.5-12



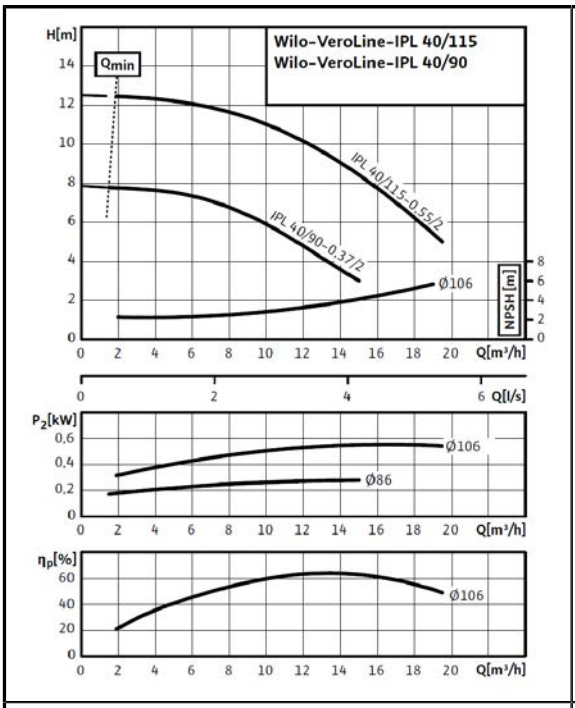
Wilo-Stratos 40/1-12



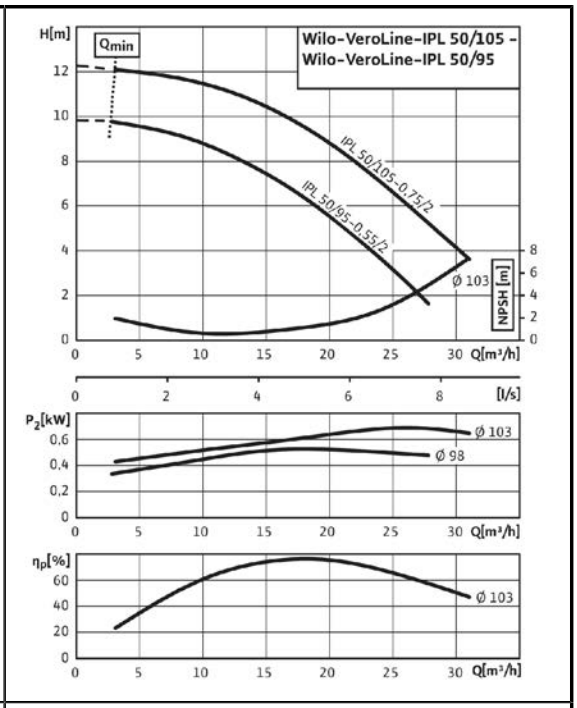
Wilo-Yonos MAXO 40/0.5-16



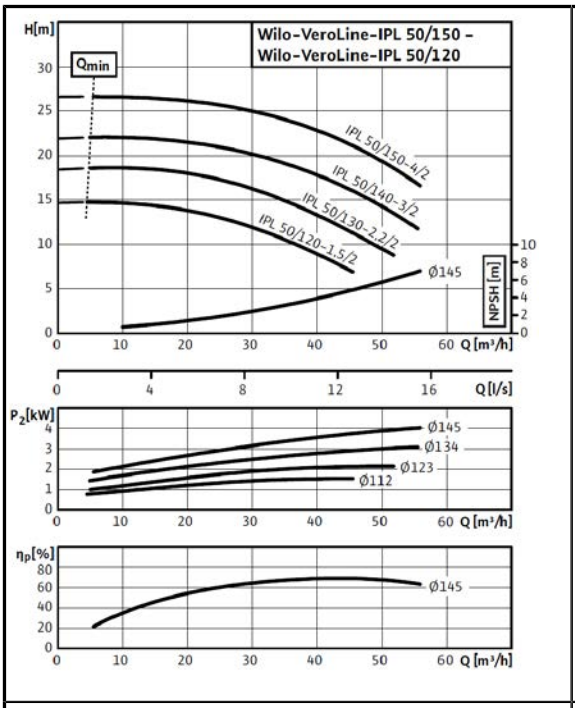
Wilo-Yonos MAXO 50/0.5-16



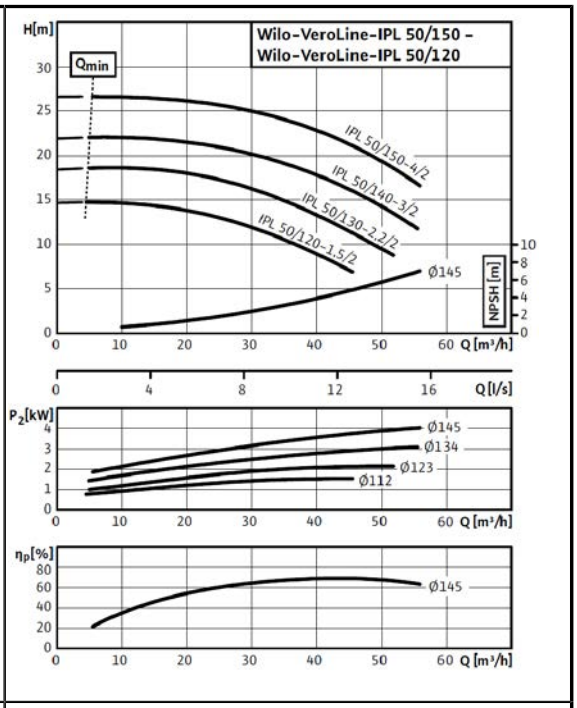
Wilo-VeroLine-IPL 40/115-0.55/2



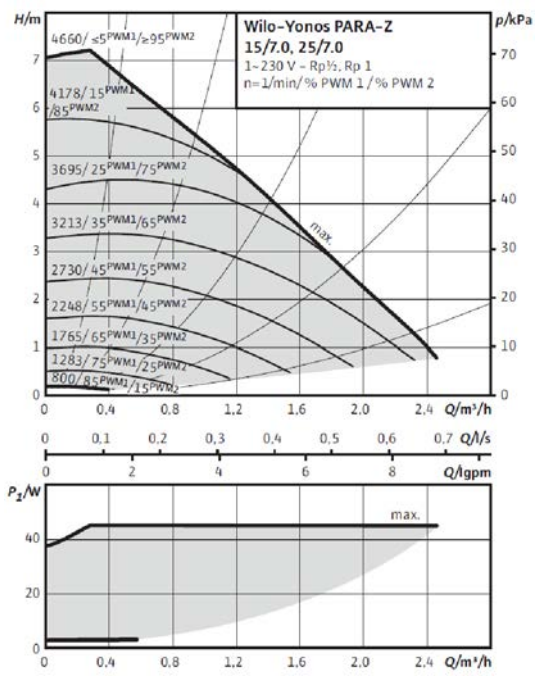
Wilo-VeroLine-IPL 50/105-0.75/2



Wilo-VeroLine-IPL 50/120-1.5/2



Wilo-VeroLine-IPL 50/130-2.2/2

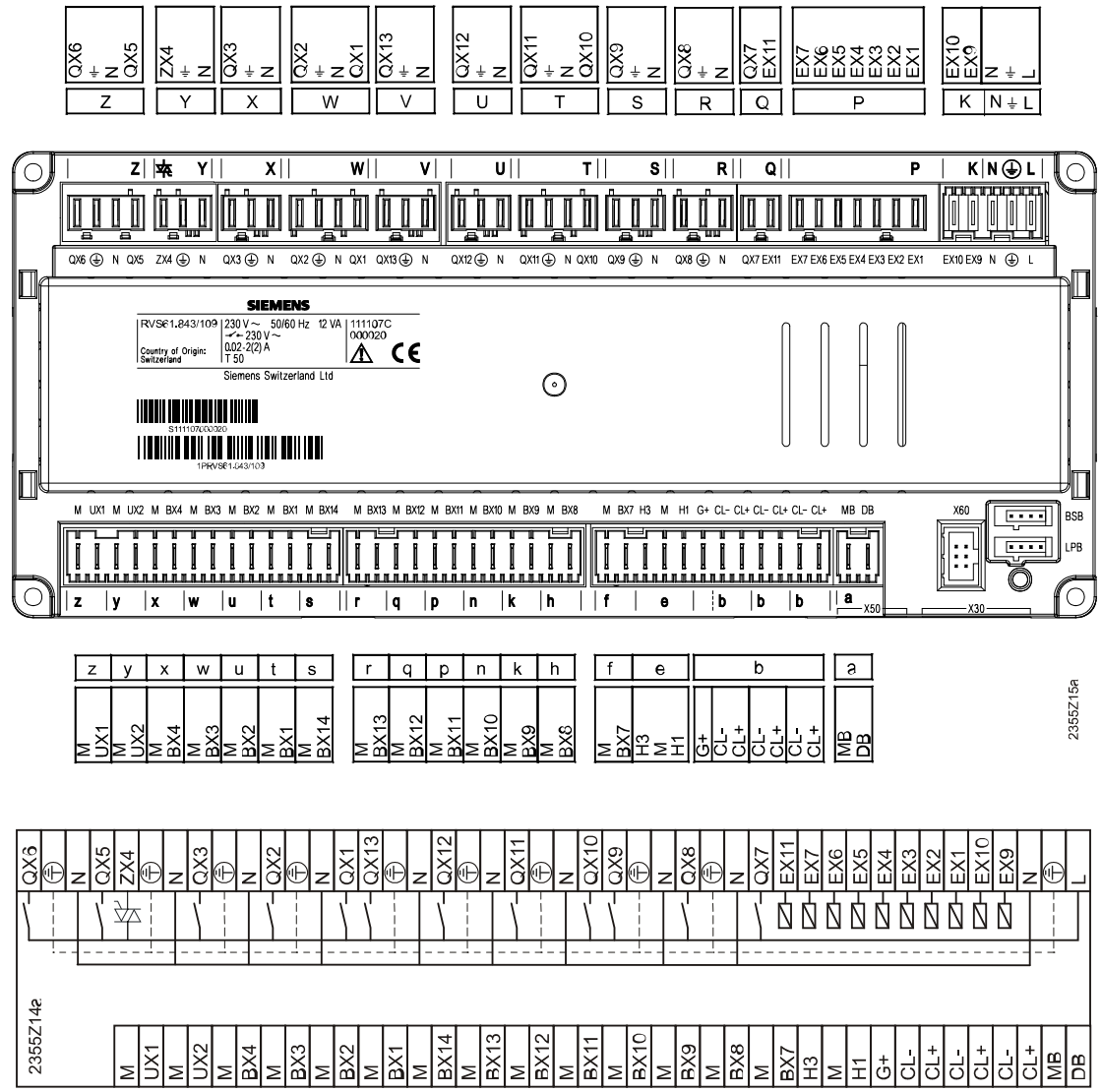


Wilo-Yonos PARA Z 25/7.0 PWM2 ver. 1

Wilo-Yonos PARA-Z 25/7.0 PWM2

5.6 Master controller

Additional information on model-specific functions is presented in electrical diagrams. Outputs that have been marked blank have no function. A function to those can be freely chosen. The function can be changed, if needed.

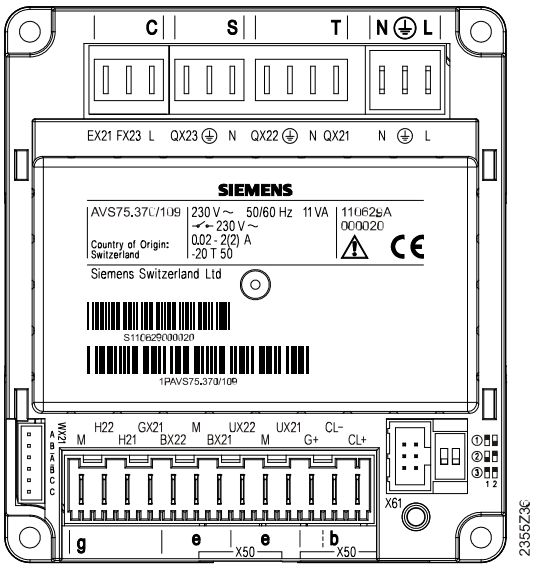


Master controller ver. 1

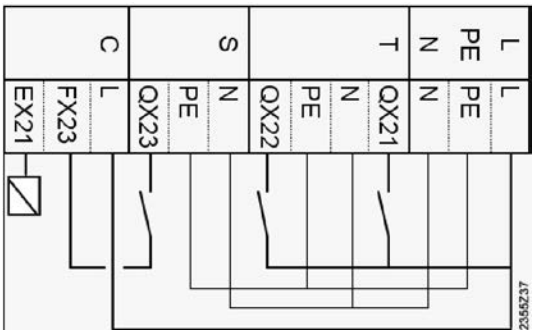
5.7 Auxiliary controllers

There can be three auxiliary controllers in total. Model-specific functions have been presented in the electrical diagrams of each model and their respective installation chapters. Outputs, marked blank, have no function. A function to those can be freely chosen. The function can be changed, if needed.

The function for auxiliary controller 1 is usually selected on line 7300. This selection locks some of the controller's inputs and outputs while other connections remain freely available. Typically the auxiliary controller regulates heating circuit 2's three-way valve. The tables presented on the following page correspond to this connection.



Auxiliary controller ver. 1



Auxiliary controller wiring diagram ver. 1

DIP switch positions

DIP switch	Address
① 1 2	Address 1: Auxiliary controller 1
② 1 2	Address 1: Auxiliary controller 2
③ 1 2	Address 1: Auxiliary controller 3

Supply current outputs (capital letters in connectors)

Line	Connector	Output	Action	Marking	Additional information
7301 (7300)	T	QX21	Heating circuit 2 valve open Y5	Y5	If the heating circuit has a control valve, otherwise vacant. Selected via line 7300.*
7302 (7300)	T	QX22	Heating circuit 2 valve closed Y6	Y6	If the heating circuit has a control valve, otherwise vacant. Selected via line 7300.*
7303 (7300)	S	QX23	Heating circuit 2 pump Q6	Q6	If the heating circuit contains a pump, otherwise vacant. Selected via line 7300.*

*See chapter *Valve-controlled heating circuit selection*.

Function for outputs Q21, Q22 and Q23 is also selected on line 7300.

Temperature sensors (small letters in connectors)

Line	Connector	Input	Action	Marking	Additional information
7307 (7300)	e	BX21	Heating circuit 2 supply water B12	B12	If the heating circuit has a control valve, otherwise vacant. Selected via line 7300.*
7308	e	BX22			

*See chapter *Valve-controlled heating circuit selection*.
The function for input BX21 is also selected on line 7300.

Low voltage inputs (small letters in connectors)

Line	Connector	Input	Action	Marking	Additional information
7321	g	H21			
7331	g	H22			

Sensor voltage (small letters in connectors)

Line	Connector	Input	Action	Marking	Additional information
7341	g	GX21			

Supply current inputs (capital letters in connectors)

Line	Connector	Input	Action	Marking	Additional information
7342	C	EX21			

Control signals (small letters in connectors)

Line	Connector	Output	Action	Marking	Additional information
7348	e	UX21			
7355	e	UX22			

5.8 Intended use of inputs and outputs

BX	Temperature input	temperature sensors	NTC 10 kOhm (outdoor sensor NTC 1 kOhm, solar collector NTC 10 kOhm or Pt1000)
EX	230 V input	control signals, voltage control, grid-power monitoring, pressure switches	120 V…230 V control signals
HX	Low voltage input	control signals, electricity meter, energy meters, pressure sensors etc.	digital, analog 0…10 V, pulse, frequency
QX	230 V output	actuators controlled by automation, additional heat source control, etc.	
UX	Low voltage output	speed of rotation for pumps, additional heat source control, etc.	0…10 V, PWM
ZX	TRIAC output	control signals	
GX	Sensor´s voltage	operating voltage for active sensors 5 V or 12 V	5 V (4.75...5.25 V) or 12 V (11.4...12.6 V), SELV, 20 mA

BX	Temperature input	temperature sensors	NTC 10 kOhm (outdoor sensor NTC 1 kOhm, solar collector NTC 10 kOhm or Pt1000)
DB MB (M)	LPB bus	additional controllers, remote access devices, cascade connection reserved addresses: 0.5 OZW672 remote connection, 0.8 OCI700 connection cable	Copper cable, length at most 250 m. The minimum cross-sectional area for the wires is 0.5 mm^2. If the cable is pulled for several meters, use an area of at least 1.5 mm^2 The most recommended option is a twisted pair cable (instrumentation cable). Unshielded cables must be at least 150 meters away from charged conductors. DB: bus + (terminals 1 and 2 of remote access devices) MB (M): bus – (terminals 3 and 4 of remote access devices) Bus voltage is approximately +9.5 V.
CL+ (BSB) CL− (M)	BSB bus	user interfaces, remote connection	cross-sectional area at least 0.50 mm2, length at most 200 m CL+ (BSB): bus + CL− (M): bus and user interfaces backlight –
G+	User interfaces backlight	user interfaces backlight	DC +12 V 88 mA SELV user interfaces' backlight +
BSB	BSB bus	user interfaces with a flat cable	
LBP	LPB bus	OCI 700 service cable and Siemens ACS790 program	
M	Low voltage ground	bus and temperature sensor ground	
X60	LPB bus (Equipment)	antenna for wireless devices or Modbus converter.	
X30 and X50	BSB bus (Equipment)	additional controllers and user interfaces integrated to the device	
WX21	Expansion valve	unipolar expansion valve	
GX	supply voltage 5 V or 12 V	supply voltage of pressure sensors and other sensors	
FX23	voltage input for QX23 relay		

Inputs EX5, EX6 and EX7 are always reserved for the voltage and phase control, and inputs EX9 and EX10 for pressure switches. See the detailed electrical specifications of inputs and outputs from automation and bus system manuals. Connections M, MB and CL- have been interconnected inside the controller.

5.9 Temperature sensors

Sensor	Sensor type	value	Tolerance:
Outdoor temperature B9	NTC 1 kOhm	3464 K (25 °C / 50 °C)	+/–100 K
Other sensors (B3, B4, B21, B71, B91, B92 etc.)	NTC 10 kOhm	3978 K (25 °C / 85 °C)	B85: +/–10 K Other sensors: +/–100 K

5.10 EN 14825 Technical data sheets

Cube Inverter+, Eco Inverter+ 3-12 03

Technical data sheet	EN 14825:2016				
Model (indoor + outdoor)	ECO Inverter+ 3-12 03 / Cube Inverter+ 3-12 03				
Air-to-water heat pump	N				
Water-to-water heat pump	N				
Brine-to-water heat pump	Y				
Low-temperature heat pump	N				
Equipped with supplementary heater	N/Y				
Heat pump combination heater	N/Y				
Parameters shall be declared for medium-temperature application, except for low-temperature heat pumps. For low temperature heat pumps, parameters shall be declared for low-temperature heat pumps					
Parameters shall be declared for average climate conditions and for warmer and/or colder climate conditions, where applicable					
Rated heat output*	Prated			10,2	kW
Seasonal space heating energy efficiency	η_s			150	%
Declared capacity for heating at indoor conditions 20°C and outdoor temperature Tj	climate (average, warmer or colder)	Tj = −7°C		9,4	kW
		Tj = 2°C		6,7	kW
		Tj = 7°C		5,1	kW
		Tj = 12°C		3,4	kW
		Tj = bivalent temperature		10,1	kW
		Tj = operation limit	Pdh	-	kW
		Tj = −15°C (if TOL < −20°C) (for air to water heat pumps)	Pdh	-	kW
Bivalent temperature		T_{biv}		-10	°C
Degradation coefficient**		Cdh		0,997	-
Declared coefficient of performance for heating at indoor conditions 20°C and outdoor temperature Tj	Tj = −7°C	COPd		3,02	-
	Tj = 2°C	COPd		3,88	-
	Tj = 7°C	COPd		4,57	-
	Tj = 12°C	COPd		5,24	-
	Tj = bivalent temperature	COPd		2,82	-
	Tj = operation limit	COPd		-	-
	Tj = −15°C (if TOL < −20°C) (for Air to water heat pumps)	COPd		-	-
Operation limit temperature	TOL			-	°C
Heating water operation limit temperature	WTOL			65	°C
Power consumption in modes other than active mode	Off mode	P_{OFF}		2	W
	Thermostat-off mode	P_{TO}		20	W
	Standby mode	P_{SB}		2	W
	Crankcase heater mode	P_{CK}		0	W
Supplementary heater	Rated heat output*	P_{sup}		6,0	kW
	Type of energy input			Electricity	
Other items	Capacity control			Fixed	
	Annual energy consumption	Q_{HE}		5334	kWh
For water/brine-to-water heat pumps	Rated brine or water flow rate, outdoor heat exchanger			2,5	m^3/h
For air-to-water heat pumps	Rated air flow rate, outdoors			-	m^3/h
Contact details	Oilon Oy, Metsä-Pietilänkatu 1, 15800 Lahti, Finland				
* For heat pumps space heaters and heat pump combination heaters, the rated heat output Prated is equal to the design load for heating Pdesignh, and the rated heat output of a supplementary heater Psup is equal to the supplementary capacity for heating sup(Tj)					
** If Cdh is not determined by measurement then the default degradation coefficient is Cdh = 0,9					

Eco Inverter+ 7-25 03

Technical data sheet	EN 14825:2016				
Model (indoor + outdoor)	ECO Inverter+ 7-25 03				
Air-to-water heat pump	N				
Water-to-water heat pump	N				
Brine-to-water heat pump	Y				
Low-temperature heat pump	N				
Equipped with supplementary heater	N				
Heat pump combination heater	N				
Parameters shall be declared for medium-temperature application, except for low-temperature heat pumps. For low temperature heat pumps, parameters shall be declared for low-temperature heat pumps					
Parameters shall be declared for average climate conditions and for warmer and/or colder climate conditions, where applicable					
Rated heat output*	Prated			18,8	kW
Seasonal space heating energy efficiency	η_s			156	%
Declared capacity for heating at indoor conditions 20°C and outdoor temperature Tj	climate (average, warmer or colder)	Tj = −7°C		17,1	kW
		Tj = 2°C		12,5	kW
		Tj = 7°C		10,0	kW
		Tj = 12°C		7,2	kW
		Tj = bivalent temperature		18,7	kW
		Tj = operation limit	Pdh	-	kW
		Tj = −15°C (if TOL < −20°C) (for air to water heat pumps)	Pdh	-	kW
Bivalent temperature		T_{biv}		-10	°C
Degradation coefficient**		Cdh		0,997	-
Declared coefficient of performance for heating at indoor conditions 20°C and outdoor temperature Tj	Tj = −7°C	COPd		3,19	-
	Tj = 2°C	COPd		4,04	-
	Tj = 7°C	COPd		4,65	-
	Tj = 12°C	COPd		5,45	-
	Tj = bivalent temperature	COPd		2,96	-
	Tj = operation limit	COPd		-	-
	Tj = −15°C (if TOL < −20°C) (for Air to water heat pumps)	COPd		-	-
Operation limit temperature	TOL			-	°C
Heating water operation limit temperature	WTOL			65	°C
Power consumption in modes other than active mode	Off mode	P_{OFF}		0	W
	Thermostat-off mode	P_{TO}		20	W
	Standby mode	P_{SB}		2	W
	Crankcase heater mode	P_{CK}		0	W
Supplementary heater	Rated heat output*	P_{sup}		6,0	kW
	Type of energy input			Electricity	
Other items	Capacity control			Fixed	
	Annual energy consumption	Q_{HE}		9461	kWh
For water/brine-to-water heat pumps	Rated brine or water flow rate, outdoor heat exchanger			4,5	m^3/h
For air-to-water heat pumps	Rated air flow rate, outdoors			-	m^3/h
Contact details	Oilon Oy, Metsä-Pietilänkatu 1, 15800 Lahti, Finland				
* For heat pumps space heaters and heat pump combination heaters, the rated heat output Prated is equal to the design load for heating Pdesignh, and the rated heat output of a supplementary heater Psup is equal to the supplementary capacity for heating sup(Tj)					
**If Cdh is not determined by measurement then the default degradation coefficient is Cdh = 0,9					

5.11 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					
			Eco Inverter + 2–9 Cube Inverter + 2–9	**Eco Inverter + 3–12 Cube Inverter + 3–12**	**Eco Inverter + 7–25**
Product fiche, space heaters					
Supplier's name or trademark			Oilon	Oilon	Oilon
Supplier's model identifier			Eco Inverter+ 2–9 03 Cube Inverter + 2–9 03	Eco Inverter+ 3–12 03 Cube Inverter + 3–12 03	Eco Inverter+ 7–25 03
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+++
Total rated heat output of heat pump and supplementary heater	P_{rated} + P_{sup}	kW	Eco Inverter: 8 Cube Inverter: 8 + 6	Eco Inverter+: 10 Cube Inverter +:10+6	19
Seasonal space heating energy efficiency	η_s	%	151	150	156
Annual electricity consumption, space heating	Q_{HE}	kWh	4313	5334	9458
Sound power level	L_{WA}	dB(A)	Eco Inverter: 42 Cube Inverter: 40	Eco Inverter+: 42 Cube Inverter +: 40	45
Specific precautions that shall be taken when the space heater is assembled, installed or maintained			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	Eco Inverter: 8 Cube Inverter: 8 + 6	Eco Inverter+: 10 Cube Inverter +:10+6	19
Total rated heat output of heat pump and supplementary heater under warmer climate conditions	P_{rated} + P_{sup}	kW	Eco Inverter: 8 Cube Inverter: 8 + 6	Eco Inverter+: 10 Cube Inverter +:10+6	19
Seasonal energy efficiency under colder climate conditions, space heating	η_s	%	156	155	159
Seasonal energy efficiency under warmer climate conditions, space heating	η_s	%	151	151	159
Annual electricity consumption under colder climate conditions, space heating	Q_{HE}	kWh	4972	6156	11111
Annual electricity consumption under warmer climate conditions, space heating	Q_{HE}	kWh	2785	3437	6014

Commission delegated regulation (EU) No 811/2013 Annex IV					
				Cube Inverter + 2–9	Cube Inverter + 3–12
Product fiche, combination heaters (Cube inverter+ only)					
Supplier's name or trademark				Oilon	Oilon
Supplier's model identifier				Cube Inverter+ 2–9 03	Cube Inverter+ 3–12 03
Standard rating conditions (Brine 0/−3 °C, water 47/55 °C), average climate conditions					
Space heating application: medium temperature				B 0 °C / W 55 °C	B 0 °C / W 55 °C
Water heating load profile				XL	XL
Water heating energy efficiency class (starting from September 26, 2019), water 47/55				A+++	A+++
Annual electricity consumption, DHW heating	AEC	kWh		1472	1488
Energy efficiency, DHW heating	η_{wh}	%		114	113
The combination heater can be timed to operate outside off-peak periods				Yes	Yes
Specific precautions that shall be taken when the space heater is assembled, installed or maintained				1)	1)
Annual electricity consumption under colder climate conditions, DHW heating	AEC	kWh		1472	1488
Annual electricity consumption under warmer climate conditions, DHW heating	AEC	kWh		1472	1488
Energy efficiency under colder climate conditions, DHW heating	η_{wh}	%		114	113
Energy efficiency under warmer climate conditions, DHW heating	η_{wh}	%		114	113

Commission regulation (EU) No 813/2013 Annex II Table 2					
			Eco Inverter + 2–9 Cube Inverter + 2–9	Eco Inverter + 3–12 Cube Inverter + 3–12	Eco Inverter + 7–25
Product information, heat pump space heaters and heat pump combination heaters					
Supplier's name or trademark			Oilon	Oilon	Oilon
Supplier's model identifier			Eco Inverter+ 2–9 03 Cube Inverter + 2–9 03	Eco Inverter+ 3–12 03 Cube Inverter + 3–12 03	Eco Inverter+ 7–25 03
Air-to-water heat pump			No	No	No
Water-to-water heat pump			Yes	Yes	Yes
Brine-to-water heat pump			Yes	Yes	Yes
Equipped with a supplementary heater			Eco Inverter+: no Cube Inverter +: yes	Eco Inverter+: no Cube Inverter +: yes	No
Combination heater			Eco Inverter+: no Cube Inverter +: yes	Eco Inverter+: no Cube Inverter +: yes	No
Average temperature application (brine 0/−3 °C, water 47/55 °C), average climate conditions					
Rated heat output	P_{rated}	kW			
Seasonal space heating energy efficiency	η_s	%			
Bivalent temperature	T_{biv}	°C			
Cycling interval capacity for heating	P_{cych}	kW			
Degradation coefficient	Cdh	–			

Commission regulation (EU) No 813/2013 Annex II Table 2					
			Eco Inverter + 2–9 Cube Inverter + 2–9	Eco Inverter + 3–12 Cube Inverter + 3–12	Eco Inverter + 7–25
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
Outdoor temperature +2 °C, flow +42 °C	Pdh	kW	5.4	7.2	9.7
Outdoor temperature +7 °C, flow +36 °C	Pdh	kW	5.6	7.3	10.0
Outdoor temperature +12 °C, flow +30 °C	Pdh	kW	5.7	7.5	10.2
Outdoor temperature −7 °C, flow +55 °C	Pdh	kW	5.1	6.8	9.1
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
Outdoor temperature +2 °C, flow +42 °C	COPd	-	3.70	3.80	3.97
Outdoor temperature +7 °C, flow +36 °C	COPd	-	4.29	4.46	4.63
Outdoor temperature +12 °C, flow +30 °C	COPd	-	4.97	5.34	5.41
Outdoor temperature −7 °C, flow +55 °C	COPd	-	2.67	2.75	2.87
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
When the thermostat is not requesting heat	P_{TO}	kW	0.01	0.01	0.01
On standby	P_{SB}	kW	0.01	0.01	0.01
In crankcase heating mode	P_{CK}	kW	0.00	0.00	0.00
Supplementary heater					
Rated heat output		kW	-	-	-
Type of energy input		-	-	-	-
Other items					
Capacity control		-	Yes	Yes	Yes
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
Water heater (CUBE only)					
Declared load profile			L	L	L
Daily electricity consumption	Q_{elec}	kWh/d	7.142	6.935	6.645
Energy efficiency, DHW heating	η_{wh}	-	107	110	115
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:

Date of installation:

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