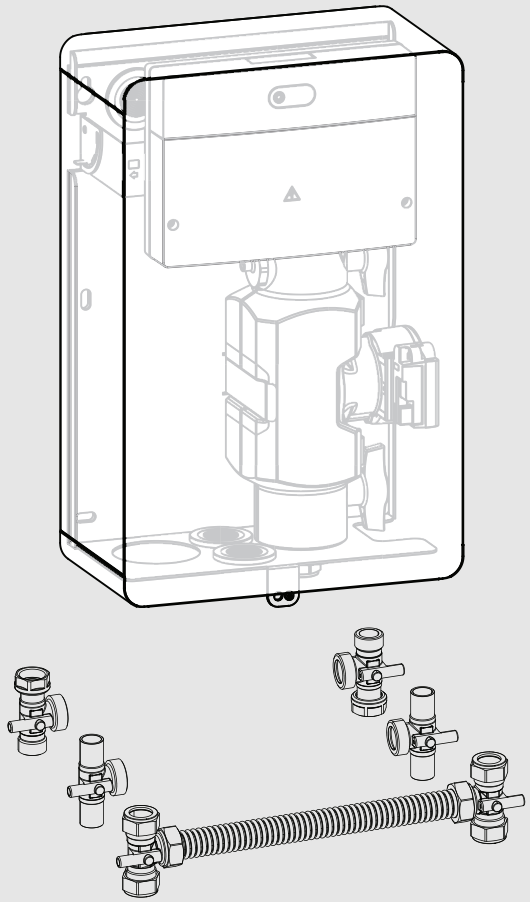
BOSCH

Installation/operating instructions for specialists

Hybrid-Set
CSH5800iAW 0



6721875003 (2024/08) UK/IE

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1 Explanation of symbols and safety instructions

1.1 Explanation of symbols

Warnings

In warnings, signal words at the beginning of a warning are used to indicate the type and seriousness of the ensuing risk if measures for minimising danger are not taken.

The following signal words are defined and can be used in this document:

DANGER

DANGER indicates that severe or life-threatening personal injury will occur.

WARNING

WARNING indicates that severe to life-threatening personal injury may occur.

CAUTION

CAUTION indicates that minor to medium personal injury may occur.

NOTICE

NOTICE indicates that material damage may occur.

Important information

The info symbol indicates important information where there is no risk to people or property.

1.2 General safety instructions

⚠ Notices for the target group

These installation instructions are intended for gas, plumbing, heating and electrical contractors. All instructions must be observed. Failure to comply with instructions may result in material damage and personal injury, including danger to life.

- ▶ Read the installation, service and commissioning instructions (heat source, heating controller, pumps, etc.) before installation.
- ▶ Observe the safety instructions and warnings.
- ▶ Follow national and regional regulations, technical regulations and guidelines.
- ▶ Record all work carried out.

⚠ Safety of electrical devices for domestic use and similar purposes

The following requirements apply in accordance with EN 60335-1 in order to prevent hazards from occurring when using electrical appliances:

“This appliance can be used by children of 8 years and older, as well as by people with reduced physical, sensory or mental capabilities or lacking in experience and knowledge, if they are supervised and have been given instruction in the safe use of the appliance and understand the resulting dangers. Children shall not play with the appliance. Cleaning and user maintenance must not be performed by children without supervision.”

“If the power cable is damaged, it must be replaced by the manufacturer, its customer service department or a similarly qualified person, so that risks are avoided.”

Installation, commissioning and servicing
Installation, commissioning and servicing must only be carried out by an authorised contractor.

- ▶ Only use original spares.

⚠ Electrical work
Electrical work must only be carried out by a qualified electrician.

- ▶ Before starting electrical work:
  - Isolate all poles of the mains voltage and secure against reconnection.
  - Make sure the mains voltage is disconnected.
- ▶ The product requires different voltages.
  Do not connect the extra-low voltage side to the mains voltage or vice versa.
- ▶ Observe the wiring diagrams of other system components as well.

⚠ Handover to the user
When handing over, instruct the user how to operate the heating system and inform the user about its operating conditions.

- ▶ Explain how to operate the heating system and draw the user's attention to any safety relevant action.
- ▶ In particular, point out the following:
  - Alterations and repairs must only be carried out by an approved contractor.
  - Safe and environmentally compatible operation requires inspection at least once a year and responsive cleaning and maintenance.
  - The heat generator may only be operated with the casing fitted and closed.
- ▶ Point out the possible consequences (personal injury, including danger to life or material damage) of non-existent or improper inspection, cleaning and maintenance.
- ▶ Leave the installation instructions and the operating instructions with the user for safekeeping.

⚠ Hot assemblies/surfaces!
After the appliance has not been used for a long time, parts of the appliance may also still be hot and cause burns if touched!

- ▶ Insulate components sufficiently.
- ▶ Allow the appliance to cool down completely, wear protective gloves if necessary.

⚠ Operation only with closed hood/casing

- ▶ Operate electrical components only with closed hood/casing.

⚠ Damage caused by frost
The system can freeze if it is switched off:

- ▶ Observe the notices regarding frost protection.
- ▶ Due to the additional functions, e.g. DHW heating or anti-seizing function, the system should always be left on.
- ▶ Correct any faults immediately.

2 Product Information

2.1 Declaration of Conformity

The design and operating characteristics of this product comply with the British, European and supplementary national requirements.

UK CA CE The UKCA and CE markings declare that the product complies with all the applicable British and European legislation, which is stipulated by attaching these markings.

You can request the complete text of the Declaration of Conformity from the UK address indicated in this document.

2.2 Simplified UK/EU Declaration of conformity regarding radio equipment

Bosch Thermotechnik GmbH hereby declares, that the product CSH5800iAW O described in these instructions complies with the Directive UK S.I. 2017/1206 (UK) 2014/53/EU.

You can request the complete text of the UK/EU Declaration of Conformity from the UK address indicated in this document.

2.3 GB Importer

Bosch Thermotechnology Ltd.
Cotswold Way, Warndon
Worcester WR4 9SW / UK

2.4 Product description

The hybrid set as the central hydraulic component enables the connection of a CS5800i AW heat pump outdoor unit to a conventional heat generator.

NOTICE

Always observe the installation/operating instructions of the system components installed!
The QR code on the pump can be used to call up the WILO homepage.

The hybrid manager MH210 serves the following purposes:

- The hybrid manager connects a heat pump outdoor unit to a conventional heat generator and determines the power requirement on the heat pump.
- The hybrid manager determines when which device is to be used. This control strategy of the hybrid system depends on the selected control strategy of the user, the application limits of the heat pump, the outdoor temperature and the wiring of the Smart grid interface.
- The hybrid manager blocks the conventional heat generator and releases it according to selected control strategies.
- The hybrid manager serves as an interface to additional temperature sensors and hydraulic actuators in the system.

The menu designations shown in this document refer to system controller CH120 or EasyControl CT200. The names of other operating units may differ.

2.5 Compatibility with conventional heat generators

The Hybrid-Set is designed for installation on the following conventional heat generators (wall mounted gas condensing combi boiler) in combination with heat pump units:

- 2300i HRC[1)]
- Condens 1000[1)]
- GC2300iW[1)]
- GC4300iW
- GC5700iW
- GC7000iW
- Greenstar GR1000W[1)]
- Greenstar 2000 Life[1)]
- Greenstar GR2301iW[1)]
- Greenstar 4000 Combi
- Greenstar Life GR8300iW
- Greenstar Style GR8700iW
- Greenstar CDI Compact
- Greenstar SI Compact
- Greenstar ErP NG Combi
- Nefit 1200 HRC[1)]
- Nefit TrendLine II
- Megalis iCondens
- TrendLine AquaPower Plus HRC

With EasyControl adapter:

- Nefit TrendLine I

With EasyControl adapter and EasyControl CT200:

- Nefit ProLine NxT

2.6 Scope of delivery

The hybrid set is supplied complete, including accessories.

▶ Check that the scope of delivery is undamaged.
▶ Install only parts which are in a faultless condition.

1) Function tests are supported with CH120, software PF22.04 and RRC2, software 5.2.

2.6.1 Scope of delivery

- Connection set CSH5800iAW O including hybrid manager for installation inside and outside a building (→Chapter 5).

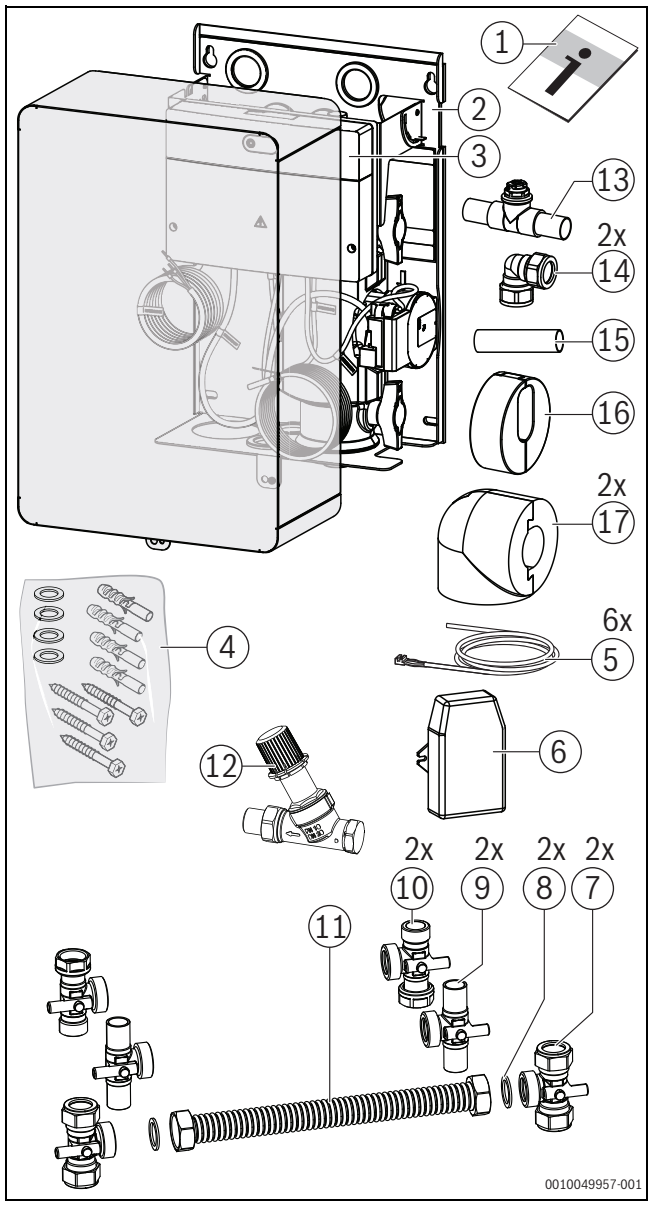

Fig. 1 Scope of delivery CSH5800iAW O

[1] Installation Instructions
[2] Pump assembly with wall mounting bracket (hybrid box)
[3] Hybrid manager MH210
[4] Installation material (pack)
[5] Connecting line and temperature sensors (2x sensor cables: T0 switch temperature sensor, TH2 heat pump return temperature sensor; 1x pump connection line; 1x hybrid manager connection line MH210; 1x LIN data cable)
[6] Outside temperature sensor T1
[7] Tee section compression fitting Ø 22 mm G1
[8] 2x gasket Ø 22.2x30x1.5
[9] Tee section Ø 22 mm G1
[10] Tee section G¾xG1xG¾
[11] Metal corrugated hose Dn25x280 mm
[12] Pressurised bypass valve
[13] Pipe Ø 22 bypass hybrid cpl.
[14] Elbow clamping ring fitting Ø 22 mm
[15] PipeDIN EN 1057 Ø 22x1.5x85 mm
[16] Thermal insulation EPP Ø 96x36 cpl.
[17] Thermal insulation EPP elbow Ø 96x96 cpl.

2.7 Accessories

For detailed information about suitable accessories, refer to the catalogue or Internet page of the manufacturer.

- CAN-BUS cable (15 m) (Part no. 8738206183)
- CAN-BUS cable (30 m) (Part no. 8738206184)

Installation of accessories

▶ Install the additional accessories in accordance with legal regulations and the instructions supplied.

2.7.1 Additional accessories

For further information about suitable accessories, refer to the catalogue or Internet page of the manufacturer.

- 8732963437 CSH5800iAW O
- 8732963442 CSH5800iAW

Installation of accessories

▶ Install the additional accessories in accordance with legal regulations and the instructions supplied.

2.8 Cleaning

▶ Wipe the casing with a damp cloth if necessary. Never use aggressive or caustic cleaning agents for this.

3 Important notes on the use with wall mounted boiler heat generators

- Frost protection mode can only be ensured if the heat pump and its accessories (e.g. valves) are correctly installed. In cold weather conditions, it may take up to an hour for the compressor to start. During this time, the compressor is preheated to operating temperature.
- The hybrid manager automatically detects whether there is a volumetric flow rate in the heating circuit. If there is no volume flow, the heat pump is not switched on.

4 Installation

4.1 Prerequisites

▶ Observe all the current applicable national and regional regulations as well as all technical rules and guidelines.
▶ Obtain all necessary approvals (gas supplier, etc.).
▶ Consider the requirements of the building authorities, e.g. when using a condensate neutraliser (accessory).
▶ Convert open heating systems into closed systems.
▶ Do not use galvanized radiators or pipework.
▶ Observe clearances and protection zones with regard to the installation position of the hybrid box (→installation instructions of the heat pump outdoor unit).

Surface temperature

The maximum surface temperature of the appliance is below 85 °C. Therefore no special safety measures are required to protect flammable materials and fitted furniture. Country-specific regulations must be observed.

5 Installation, Hybrid-Set with box, inside and outside a building

5.1 Installation diagram for the connection set CSH5800iAW O (inside and outside the building)

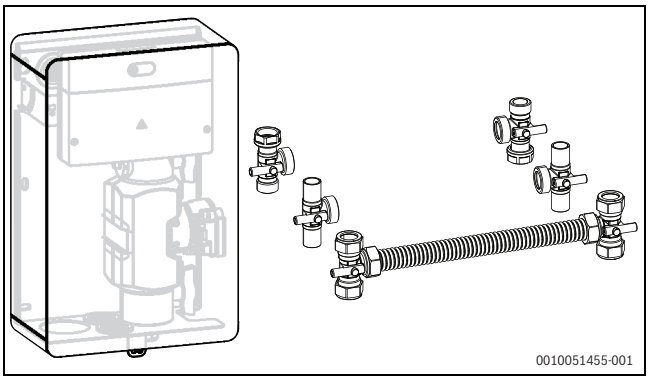

Fig. 2 CSH5800iAW O

Hydraulic lines routing at the rear through the wall (option 1) and electrical connection

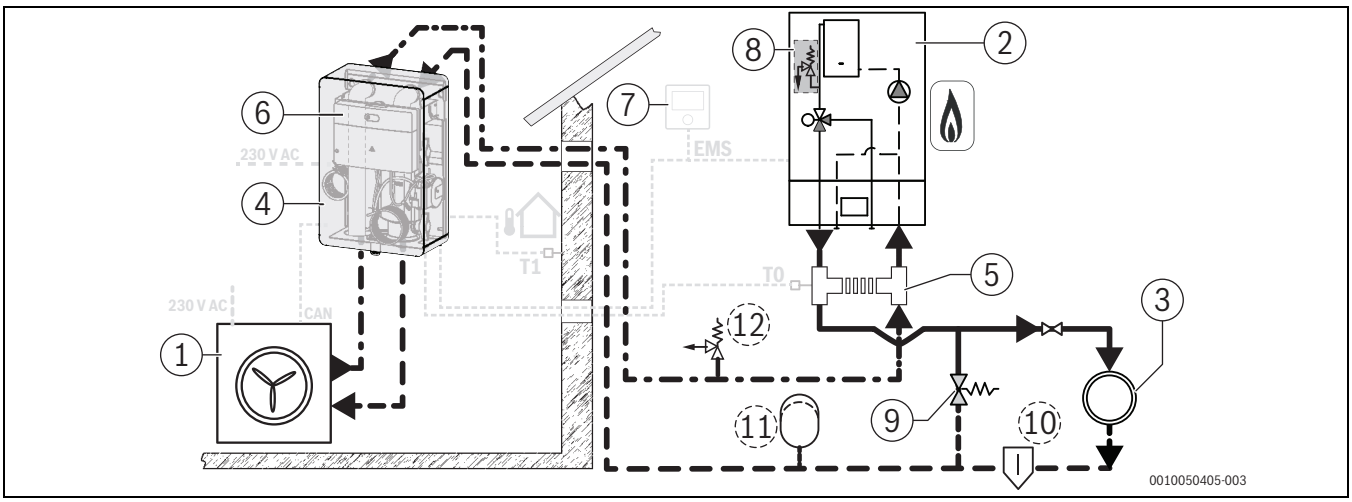

Fig. 3 Installation diagram CSH5800iAW O, hydraulics

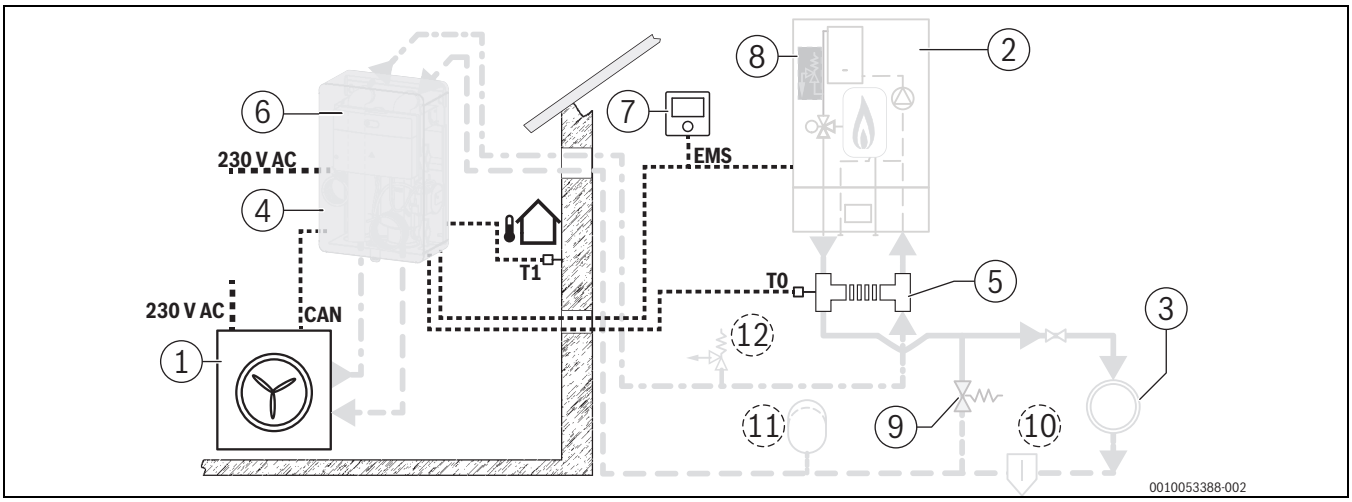

Fig. 4 Installation diagram CSH5800iAW O, electrical

Legend to fig. 3 and 4:

[1] Heat pump (outdoor unit)
[2] Heat generator (boiler)
[3] Heating circuit
[4] Hybrid pump assembly cpl.
[5] Bypass/low loss header (LLH; corrugated metal hose with tee sections)
[6] Hybrid manager
[7] Room controller
[8] Water pressure relief valve
[9] Pressure relief valve (default setting at 200 mbar)
[10] Filter (on-site installation by installer)
[11] Expansion vessel (on-site installation by installer)
[12] Pressure-relief valve (EN12828+A1; on-site installation by installer)
[T0] Differential sensor
[T1] Outside temperature sensor
[CAN] 4-pin, CAN Power, CAN Data

Hydraulic lines routing underneath the box through the wall (U-shaped, option 2) and electrical connection

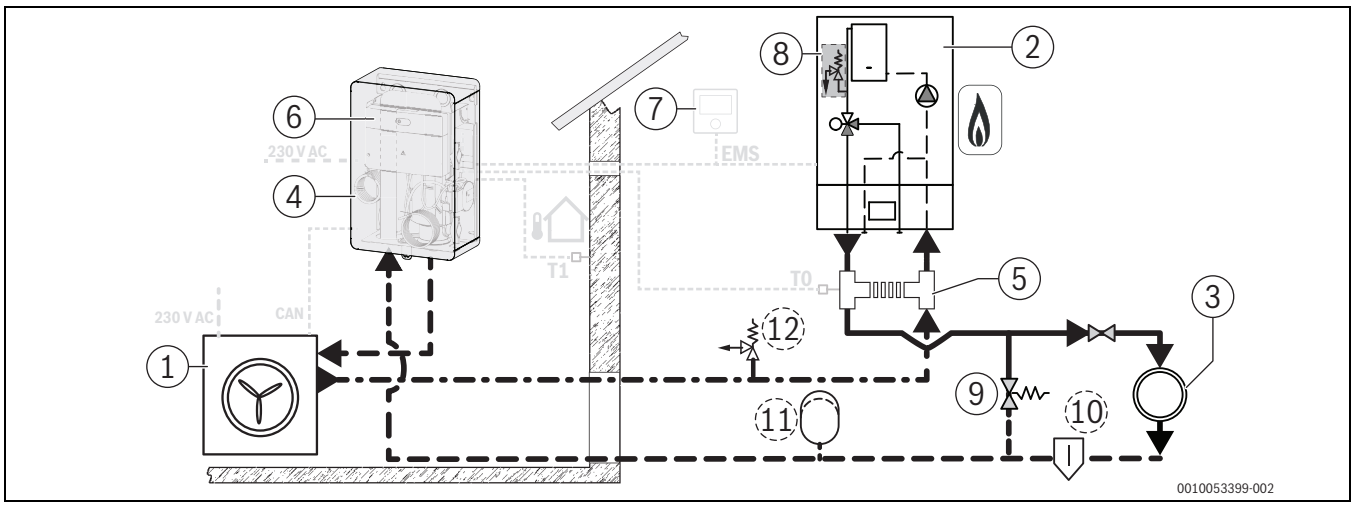

Fig. 5 Installation diagram CSH5800iAW O, hydraulics

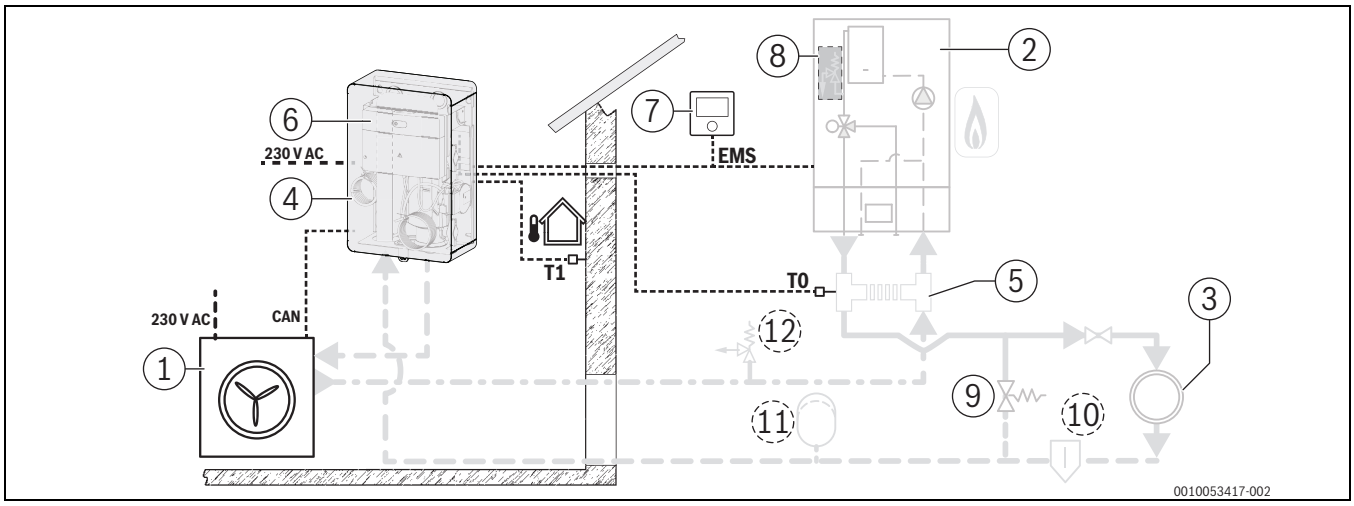

Fig. 6 Installation diagram CSH5800iAW O, electrical

Legend to fig. 5 and 6:

[1] Heat pump (outdoor unit)
[2] Heat generator (boiler)
[3] Heating circuit
[4] Hybrid pump assembly cpl.
[5] Bypass/low loss header (LLH; corrugated metal hose with tee sections)
[6] Hybrid manager
[7] Room controller
[8] Water pressure relief valve
[9] Pressure relief valve (default setting at 200 mbar)
[10] Filter (on-site installation by installer)
[11] Expansion vessel (on-site installation by installer)
[12] Pressure-relief valve (EN12828+A1; on-site installation by installer)
[T0] Differential sensor
[T1] Outside temperature sensor
[CAN] 4-pin, CAN Power, CAN Data

5.1.1 Temperature sensor on the heat pump

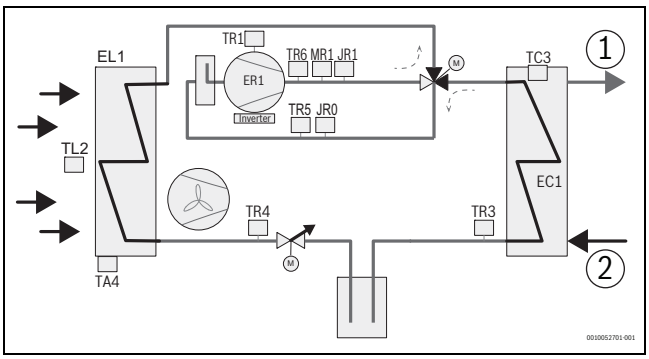

Fig. 7 Temperature sensor on the heat pump

[1] To the bypass/low loss header (LLH)
[2] From the heating circuit
[EC1] Heat exchanger (condenser)
[EL1] Evaporator
[ER1] Compressor
[JR0] Low pressure sensor
[JR1] High pressure sensor
[MR1] High pressure switch
[TA4] Drip tray temperature sensor
[TC3] Temperature sensor, heat transfer medium outlet
[TL2] Temperature sensor, air intake
[TR1] Temperature sensor, compressor
[TR3] Temperature sensor, condenser return (liquid), heating mode
[TR4] Evaporator return (liquid) temperature sensor, cooling mode
[TR5] Suction gas temperature sensor
[TR6] Temperature sensor hot gas

5.2 Notes on hydraulic connection

WARNING

Risk of burning from hot surfaces!

After the appliance has not been used for a long time, parts of the appliance and components may also still be hot and cause burns if touched!

- Insulate components sufficiently.
- Allow the appliance to cool down completely, wear protective gloves if necessary.

NOTICE

Material damage due to frost and UV radiation!

In case of a power outage the water in the pipes may freeze.

The insulation may become brittle due to UV radiation and crack after some time.

- Use insulation with a thickness of at least 19 mm for pipework and connections outdoors.
- Install drain valves so that the water can be drained out of the lines to and from the heat pump if it is not going to be used for some time or if there is a risk of frost.
- Use UV and moisture-resistant insulation.

NOTICE

Residue in the pipework can damage the system.

Solids, metal/plastic filings, hemp as well as thread tape residue and similar material can get stuck in pumps, valves and heat exchangers.

- Keep foreign bodies from entering the pipework.
- Do not leave pipe parts and connections directly on the ground.
- When deburring, make sure that no residue remains in the pipe.
- **Before connecting the heat pump and indoor unit, rinse the pipe system to remove any foreign bodies.**

NOTICE

Material damage due to frost!

If the shut-off valves are closed, frost protection for the outdoor unit and connecting pipes is not guaranteed due to the lack of flow.

- Shut-off valves must always be open during operation.
- Use approved antifreeze (→technical documentation no. 6720841872).

NOTICE

Operating faults due to closed shut-off valves/radiator valves!

All shut-off valves must always be open, as otherwise it will not be possible to operate the heating system and it must be switched off. The mass flow rate through the outdoor unit of the heat pump must never be blocked or shut off during operation.

- All shut-off valves must always be open during operation.
- If additional shut-off valves are installed by the installer, they must always be open during operation.
- Switch off the heating system if shut-off fittings/valves have to be closed.
- Do not install any shut-off valves / valves between the heat pump (outdoor unit) and heat generator.
- Never close all thermostatic valves (e.g. of the radiator) / always ensure that at least one radiator valve is fully open.
- When operating the system the connection between the heat pump (outdoor unit) and heat generator must never be blocked.

NOTICE

Faults due to air in the system!

Air trapped in the system can lead to operating faults.

- To facilitate venting of the heat pump circuit, it is recommended to install a venting device (automatic air vent) in the highest point of the pipework between the indoor and outdoor unit

NOTICE

Fault due to non-observance of the maximum lengths of pipework!

To ensure that the heat pump functions correctly, certain maximum lengths of pipework between the connection to the heat generator (single pipe length) and the outdoor unit as well as the CAN BUS line between the pipe assembly and the outdoor unit must not be exceeded (→Fig. 8).

NOTICE

Leaking hydraulic lines!

External mechanical influences to pipe connections may lead to leaks in the pipe system.

- Secure pipework always using suitable fixing components.

5.3 Insulation

NOTICE

Material damage from frost!

In case of a power outage the water in the pipes may freeze.

- ▶ Use insulation with a thickness of at least 19 mm for pipework outdoors.
- ▶ In buildings, use insulation with a thickness of at least 12 mm for pipework. This is also important for safe and efficient heating mode.

- ▶ All heat conducting lines with a suitable heat insulation corresponding to applicable regulations.

5.4 Notes when using the compression fittings

- ▶ Cut the connector pipe to length at right angles using a pipe cutter.
- ▶ Carefully deburr the inside and outside of the pipe abrasive and remove any chips.
- ▶ Push the nut and the olive onto the pipe.
- ▶ Push the pipe into the pre-assembled clamp connection to the stop.
- ▶ Once the pipe has been pushed to the stop, tighten the union nut by hand.
- ▶ Using a suitable tool, tighten the union nut by about a ½ a turn (corresponds to a tightening torque of 70 Nm); in doing so, hold the screw fitting and prevent the pipe from turning.

5.5 Notices regarding installation of the filter

- ▶ Install the additional accessories in accordance with legal regulations and the instructions supplied.

NOTICE

Material damage due to contamination residues!

Contamination residues in the piping between the indoor and outdoor unit causes damage to the heat pump. To avoid this, observe the following measures:

- ▶ Flush the pipework prior to connection to the outdoor unit.
- ▶ Clean the particle filter and dirt separator at regular intervals after commissioning.

An additional magnetite and dirt separator is a necessary accessory for existing systems.

- ▶ Install the magnetite and dirt separator in the system return on the direction of flow behind the tubular radiators (heating circuit) (→Fig. 3).

If the aforementioned installation of the magnetite and dirt separator is not possible under certain conditions, the maintenance intervals of the integrated particulate filter in the hydraulic group are increased.

5.6 Line lengths (electric/hydraulic)

NOTICE

Fault due to non-observance of the maximum lengths of pipework!

To ensure that the heat pump functions correctly, certain maximum lengths of pipework between the connection to the heat generator (single pipe length) and the outdoor unit as well as the CAN BUS line between the pipe assembly and the outdoor unit must not be exceeded (→Fig. 8).

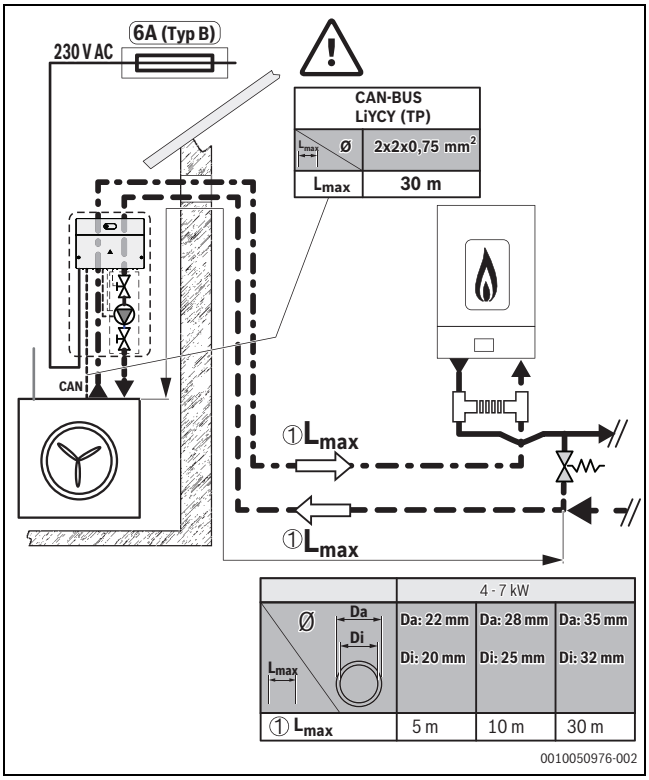

Fig. 8 Requirements on the cable lengths (example representation: through the back of the wall)

[1] L_{max} designates the single length of the pipework between the outdoor unit and the pressurised bypass valve (applies for all installation variants).

- ▶ Do not forget the gaskets and observe the maximum tightening torques.
- ▶ Sufficiently fix all lines (electric/hydraulic).
- ▶ If necessary, open the shut-off valves.

5.7 Special features during assembly of the pump assembly (hybrid box), outdoor area

WARNING

Danger to life due to highly flammable gas!

The heat pump contains flammable refrigerant. In the event of a refrigerant leak, a highly flammable gas may be generated by contact with air. There is a risk of fire and deflagration.

- Install the heat pump in a place with good ventilation where there are no permanent sources of ignition (e.g. open fire, wall mounted conventional gas boiler or electric heater).
- Do not install the pump group (hybrid box) in the protection zone of the outdoor unit (heat pump) (→technical documentation of the heat pump).

The pump assembly for installation outside the building can be installed in two options (→Chapter 5.8).

- Observe protective zones (→Chapter 5.7.1 to 5.7.3).
- Observe the installation instructions for the heat pump CS5800i AW.

5.7.1 Protection zone with floor-standing heat pump CS5800i AW against a wall

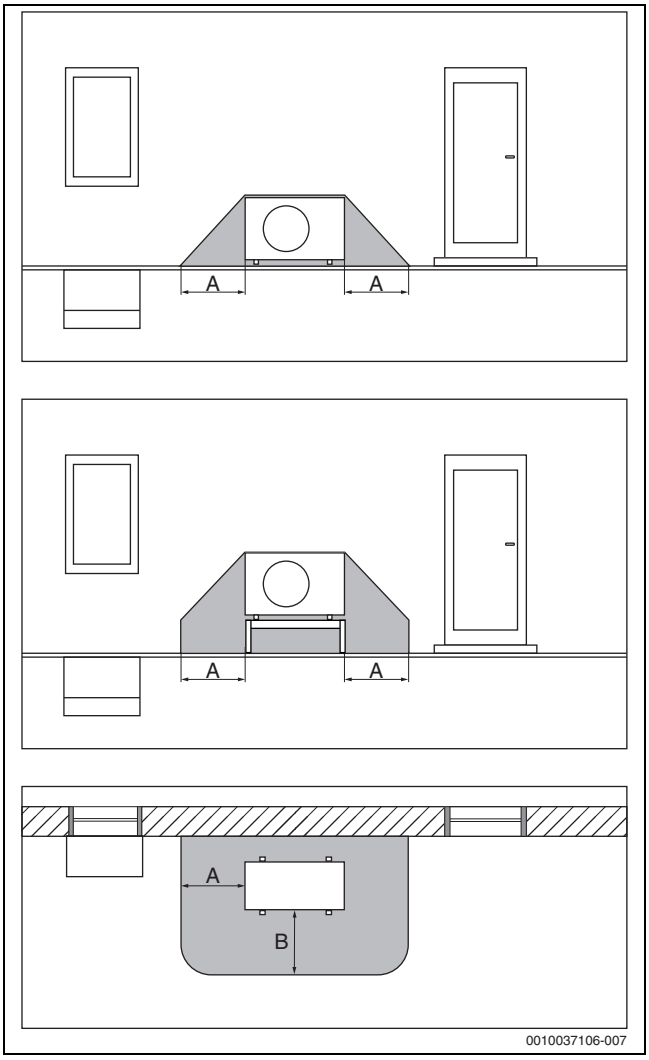

Fig. 9 Protection zone, floor-standing heat pump

[A] 1000 mm
[B] 1000 mm

5.7.2 Protection zone, ground-mounted heat pump CS5800i AW free-standing or on a flat roof

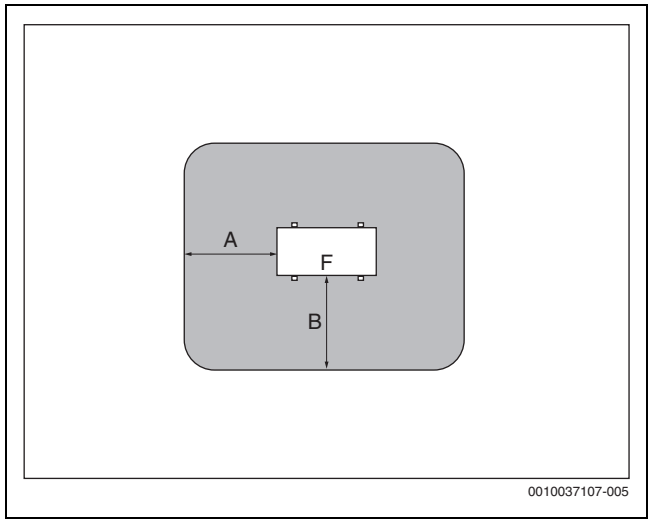

Fig. 10 Protection zone for installation on the floor, on the premises or roof

[A] 1000 mm
[B] 1000 mm
[F] Front

5.7.3 Protection zone with floor-standing heat pump CS5800i AW in one corner

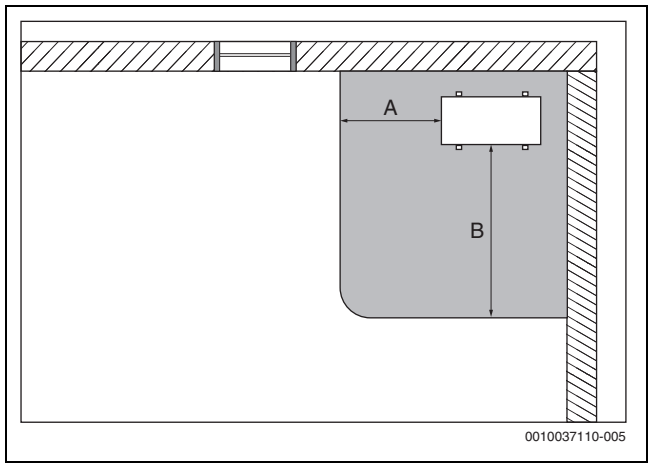

Fig. 11 Protection zone, floor standing in a corner

[A] 1000 mm
[B] 2000 mm

5.8 Assembly of the pump assembly (hybrid box), outdoor and indoor area

5.8.1 Removing the front panel

- If necessary, remove padlock (on-site).
- Remove the fixing screw at the bottom of the front panel.
- Lift front panel and pull forwards to remove.

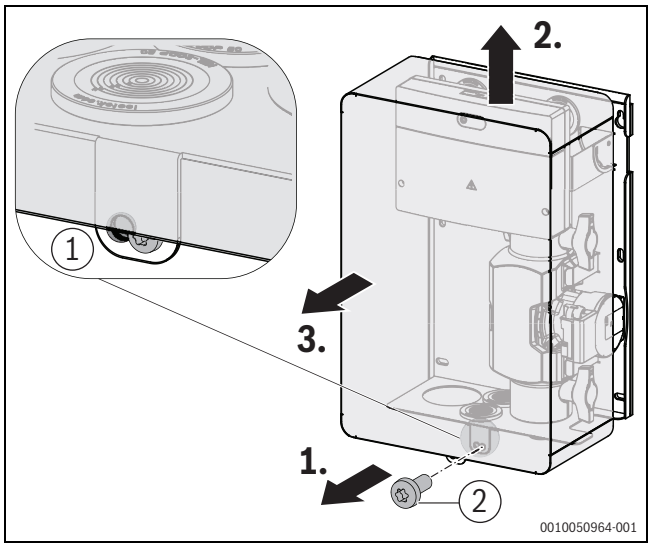

Fig. 12 Removing the front panel

[1] If necessary, padlock (on-site)
[2] Fixing screw, front panel

5.8.2 Wall clearances

To ensure service and access, a clearance of 100 mm on the right side and 50 mm on all other sides is recommended.

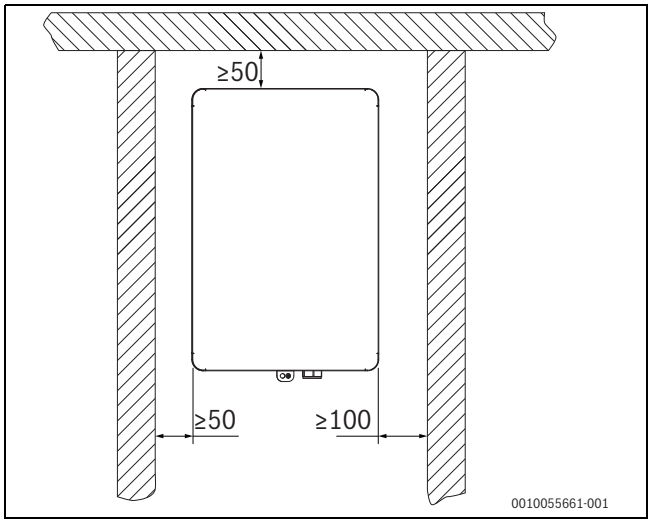

Fig. 13 Wall clearances

5.8.3 Assembly on the wall

Before installing the wall mounting bracket (→Fig. 14), the corresponding mounting holes and openings for the hydraulic and electrical lines must be made on the wall as described below, in accordance with the selected option 1 or 2 (→Fig. 15 and 16).

Option 1: hydraulic line routing through the back of the wall

Electrical cables can be routed either at the rear through the wall or downwards through the bottom panel (→Fig. 14 and 15).

- Cut in grommets according to the selected connection method.

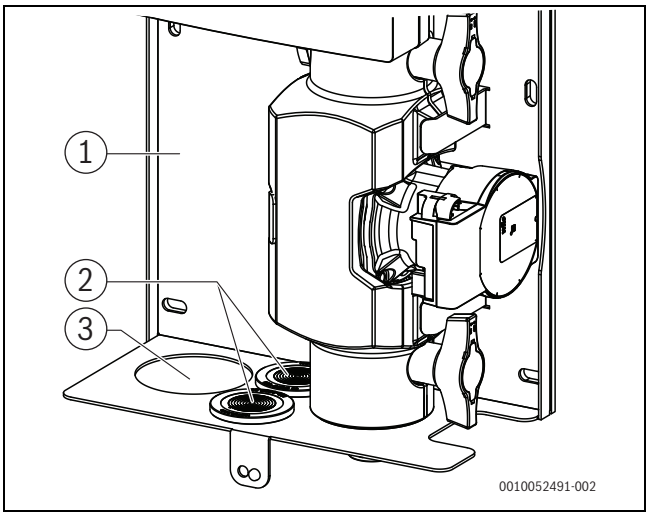

Fig. 14 Opening for the cables through the bottom panel

[1] Wall mounting bracket (back panel)
[2] Opening for electrical cables (optional)
[3] Opening for hydraulic piping

The hole diameter of the piping depends on the selected thickness of the thermal insulation.

- ▶ Drill holes in the wall according to the drilling plan (→Fig. 15).
- ▶ Centre/bottom fixing holes are optional and must be selected depending on the wall quality.
- ▶ Use wall plugs that are suitable for the wall properties.
- ▶ Pre-mount two suitable upper plugs with screws.
- ▶ Hang the hybrid box with the upper fixing openings in the back panel on the pre-assembled screws.
- ▶ Check that the wall holes and the openings in the hybrid box match.
- ▶ If necessary, fix the hybrid box with additional screws.
- ▶ Check that the hybrid box is firmly in place.

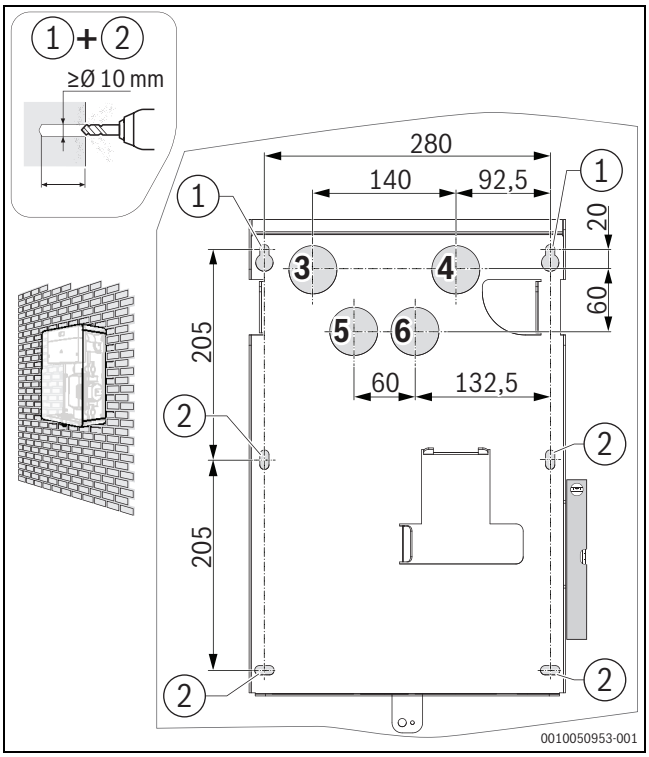

Fig. 15 Drilling plan for option 1

[1] Fixing holes, top
[2] Fixing holes top middle/bottom (optional)
[3] Opening, pipework to bypass/low loss header
[4] Opening, pipework from heating system
[5] Opening for mains voltage 230 V (optional)
[6] Opening for mains extra-low voltage ≤ 24 V (optional)

Option 2: hydraulic lines routing underneath the box through the wall

Electrical cables can be routed either through the wall or downwards through the bottom panel (→Fig. 14 and 16).

- ▶ Cut in grommets according to the selected connection method.

The hole diameter of the piping depends on the selected thickness of the thermal insulation.

- ▶ Drill holes in the wall according to the drilling plan (→Fig. 16).
- ▶ Centre/bottom fixing holes are optional and must be selected depending on the wall quality.
- ▶ Use wall plugs that are suitable for the wall properties.
- ▶ Pre-mount two suitable upper plugs with screws.
- ▶ Hang the hybrid box with the upper fixing openings in the back panel on the pre-assembled screws.
- ▶ Check that the wall holes and the openings in the hybrid box match.
- ▶ If necessary, fix the hybrid box with additional screws.
- ▶ Check that the hybrid box is firmly in place.

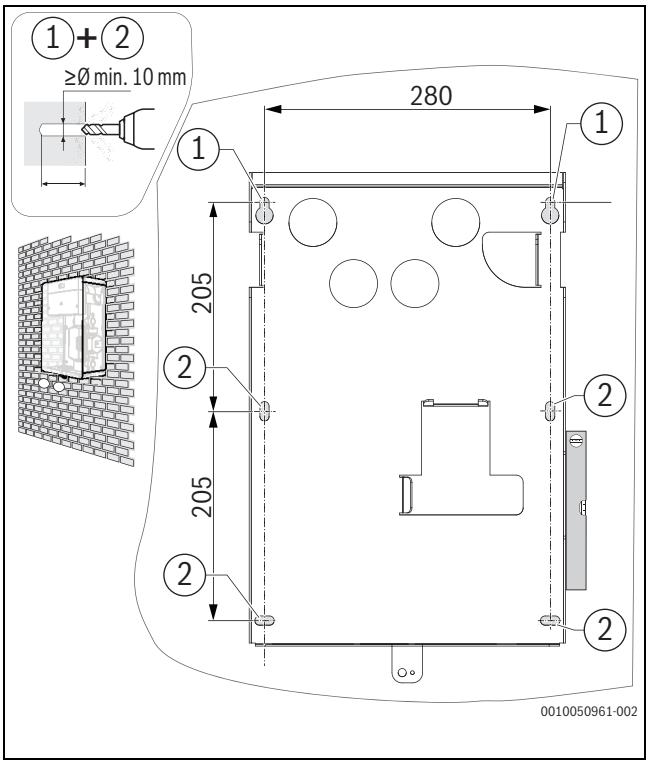

Fig. 16 Drilling plan for option 2

[1] Fixing holes, top
[2] Fixing holes top middle/bottom (optional)

5.9 Hydraulic connection

The hydraulic connection of the hybrid set can be carried out in two variants according to the wall-mounted installation (→Chapter 5.8).

NOTICE

Leaking hydraulic lines!

External mechanical influences to pipe connections may lead to leaks in the pipe system.

- ▶ Secure pipework always using suitable fixing components.

Preparation for both connection variants

- ▶ Disengage the lateral tabs on the mounting bracket of the hybrid manager (**1.**) and swivel the hybrid manager upwards (**2.**).

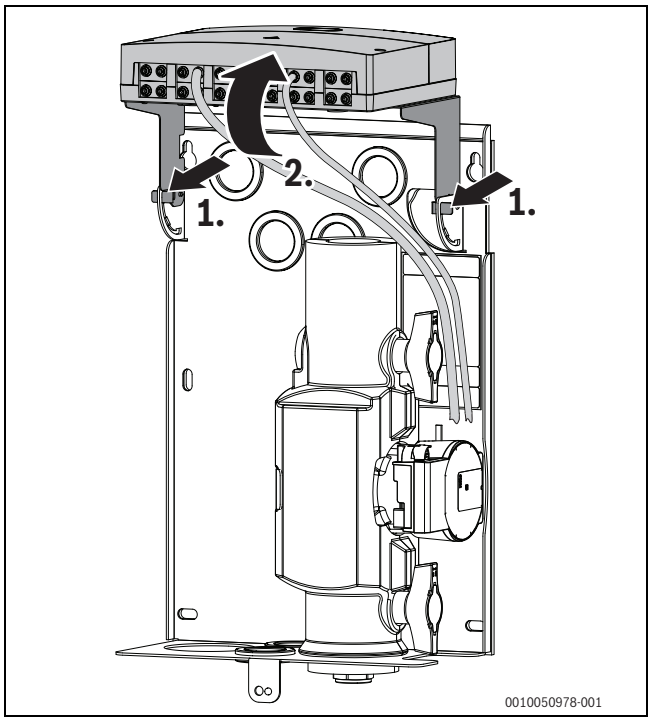

Fig. 17 Swivel the hybrid manager upwards

Connection for wall-mounted installation, hydraulic pipe routing at the rear through the wall (option 1)

(Chapter→ 5.8)

The connection lines (hydraulic/electrical) are routed behind the hybrid set through the external wall into the building interior.

- ▶ Remove the front thermal insulation half-shell of the pipe assembly (**1.**).
- ▶ Cut the upper grommets in the back panel according to the pipe diameter (**2.**).
- ▶ Cut the lower grommets in the back panel to route through the electrical cables (**3.**).

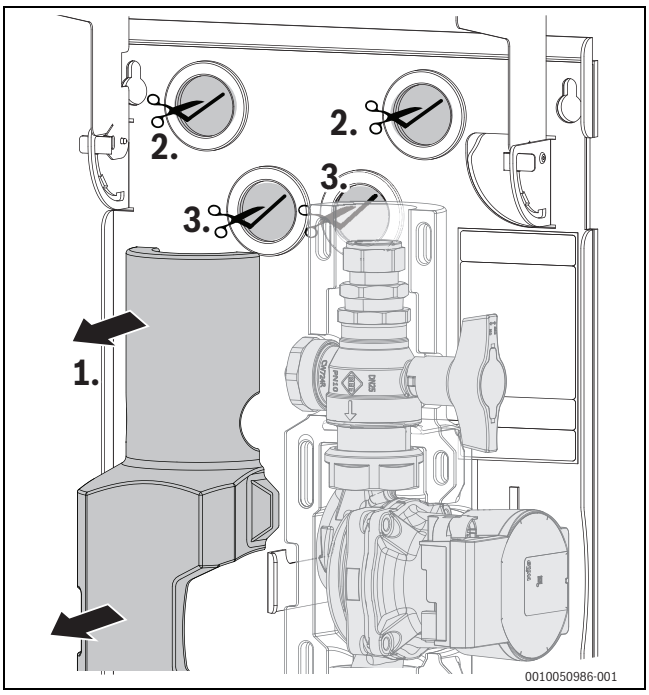

Fig. 18 Remove the thermal insulation half-shell and cut the grommets (hybrid manager not shown)

- ▶ For the use of the clamping ring fittings, observe the instructions on page 10.
- ▶ Mount the Ø 22 mm elbow clamping ring fitting and the pipe connector from the scope of delivery on the pump line (→Fig. 19).
- ▶ Install the second Ø 22 mm elbow clamping ring fitting from the scope of delivery and the connector pipe on site.

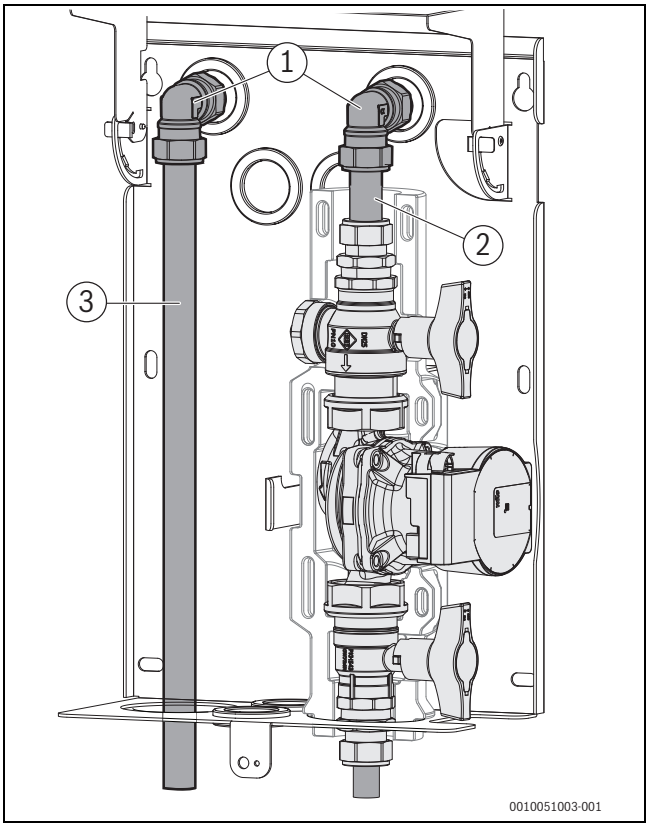

Fig. 19 Establishing the hydraulic connection (option 1, hybrid manager not shown)

[1] Elbow clamping ring fitting Ø 22 mm
[2] Pipe connector Ø 22 mm
[3] Connector pipe Ø 22 mm (on site)

Connection for wall-mounted installation, U-shaped hydraulic line routing through the base plate (option 2)

(Chapter→ 5.8)

The connection lines (hydraulic) are routed underneath the hybrid set through the external wall into the building interior or with indoor assembly routed to the outside.

- ▶ Remove the front thermal insulation half-shell of the pipe assembly (**1.**).
- ▶ Cut the lower grommets in the back panel to route through the electrical cables (**2.**; optionally).

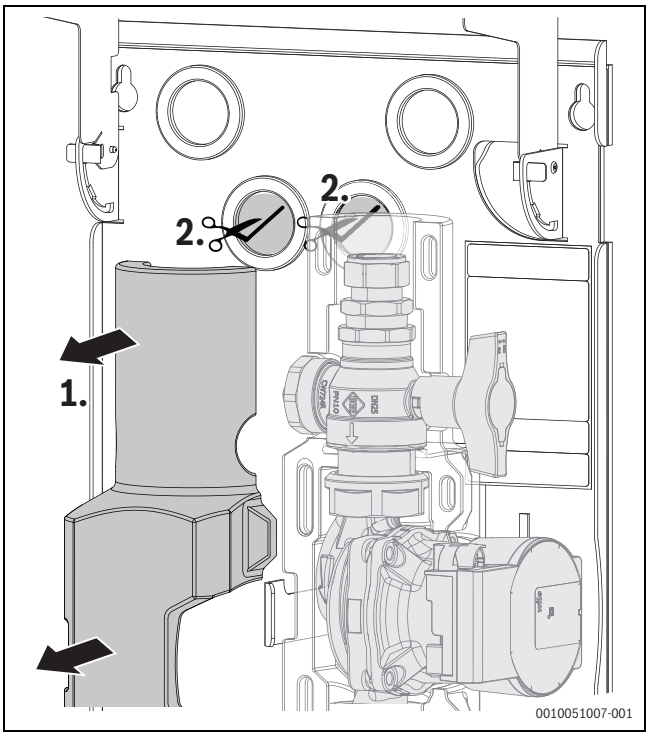

Fig. 20 Remove the thermal insulation half-shell and cut the grommets (hybrid manager not shown)

- ▶ For the use of the clamping ring fittings, observe the instructions on page 10.
- ▶ Mount the Ø 22 mm elbow clamping ring fitting and the pipe connector from the scope of delivery on the pump line (→Fig. 21).
- ▶ Install bypass hybrid cpl. [2] and second angle clamping ring fitting Ø 22 mm from scope of delivery as well as connector pipe on site.
- ▶ Provide connector pipe (→Fig. 21, [4]) with thermal insulation in accordance with local regulations.

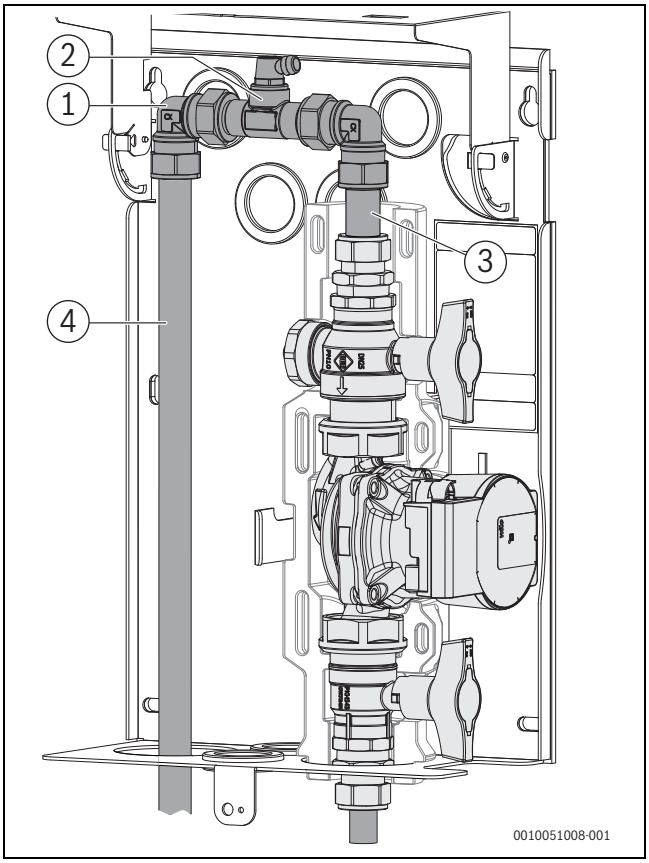

Fig. 21 Establishing the hydraulic connection (U-shaped) (option 2, hybrid manager and mounting bracket not shown)

[1] Elbow clamping ring fitting Ø 22 mm
[2] Pipe Ø22 bypass hybrid cpl.
[3] Pipe connector Ø 22 mm
[4] Connector pipe Ø 22 mm (on site)

5.10 Mount the pressurised bypass valve

- ▶ Mount the pressurised bypass valve in the system according to the hydraulic schematics (→Fig. 3), observing the direction of flow in the process.
- ▶ Install the pressurised bypass valve in the vicinity of the heat generator.
- ▶ Set the minimum volumetric flow rate (→Chapter 9.1).

5.11 Mount the bypass/low loss header (LLH)

NOTICE

Material damage due to too small bending radius!

The bending radius on the corrugated metal hose must not be less than 32 mm.

- ▶ Make a corresponding bending radius of ≥ 32 mm for the bypass/low loss header (LLH).

5.11.1 Option 1 (Install bypass/low loss header (LLH) in the system)

- ▶ Install the bypass/low loss header (LLH) in the system according to the hydraulic schematics (→Fig. 3).
- ▶ Install the bypass/low loss header (LLH) in the vicinity of the heat generator.
- ▶ When using the tee sections with clamping ring fitting, observe notes on page 10.

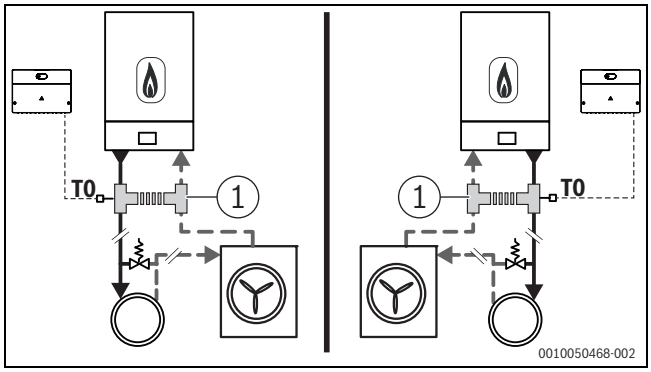

Fig. 22 Bypass/low loss header (LLH) in the system, option 1

[1] Bypass/low loss header (LLH)

5.11.2 Option 2 (Install bypass/low loss header (LLH) directly at the heat source)

- ▶ Install the bypass/low loss header (LLH) directly on the connections of the heat generator according to the hydraulic schematics (→Fig. 3).
- ▶ When using the tee sections with clamping ring fitting, observe notes on page 10.

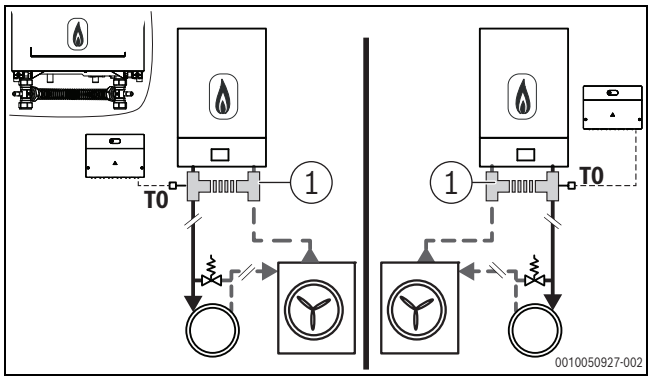

Fig. 23 Bypass/low loss header (LLH) directly at the heat generator, option 2

[1] Bypass/low loss header (LLH)

5.11.3 Option 3 (Install bypass/low loss header (LLH) in a mounting frame)

- ▶ Install the bypass/low loss header (LLH) directly to the connections in the mounting frame of the heat generator according to the hydraulic schematics (→Fig. 3).
- ▶ Use tee sections Ø22 mm G1.

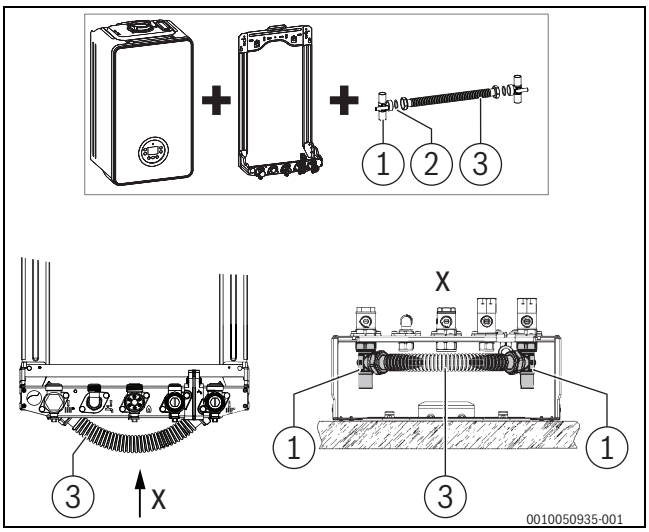

Fig. 24 Bypass/low loss header (LLH) in the mounting frame, option 3

[1] Tee section Ø 22 mm G1
[2] 2x gasket Ø 22.2x30x1.5
[3] Metal corrugated hose Dn25x280 mm

5.12 Install temperature sensor T0

Temperature sensor T0 is installed in the tee section in the flow line of the system.

NOTICE

Malfunction caused by measuring error!

Incorrect measurement values may be recorded if the sensor is not installed correctly.

- ▶ In doing so, ensure that the retaining spring is installed correctly.

- ▶ Ensure that the correct sensor is used.
- ▶ Insert the T0 temperature sensor into the sensor pocket at the tee section. Ensure that the retaining spring is in contact with the sensor body.
- ▶ Check that the sensor is securely seated.

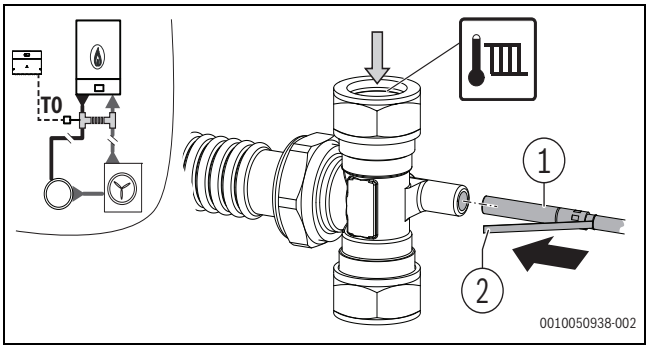

Fig. 25 Install temperature sensor T0 (example)

[1] Temperature sensor T0
[2] Retaining spring

5.13 Electrical connection, hybrid set CSH5800iAW O

5.13.1 General notices regarding electrical connections CSH5800iAW O

WARNING

Risk to life from electric shock!

Touching live electrical parts can cause an electric shock.

- Before working on electrical parts, disconnect all phases of the power supply (fuse/circuit breaker) and lock the isolator switch to prevent unintentional reconnection.

- Observe installation and safety measures in accordance with VDE regulations 0100 (IEC 60364 series, CENELEC HD 384 series) and special regulations (TAB) of the local power supply company.
- In rooms with bath or shower: connect appliance to an RCD (circuit-breaker).
- Do not connect any additional consumers to the mains power supply of the device.

NOTICE

Material damage due to electrical voltage!

The voltage supply of the outdoor unit must be via an external 230 V cable (→installation instructions, outdoor unit heat pumps).

- Fuse protection using a 16 A fuse (230 V cable).
- Never connect the electrical connection cable of the outdoor unit to the control unit of the heat generator or to the hybrid manager.

NOTICE

The voltage supply of the hybrid manager can be carried out via the conventional heat generator or alternatively via a direct connection to the fixed electrical installation.

The conventional heat generator must have a separate isolating device for disconnecting all poles from the mains under the conditions of overvoltage category III.
Even when connected directly to the mains, a separate isolating device must be installed in accordance with the installation regulations in order to be able to disconnect all poles of the hybrid manager from the mains (OVC III).

- Establish the voltage supply of the hybrid manager via the conventional heat generator.
- **Alternatively:** establish the voltage supply to the hybrid manager on site via the fixed electrical installation.

A prefabricated 3-wire power cable of 2 m length, type H05BN4-F with a nominal cross-section of 0.75 mm^2 is supplied with the hybrid set. The cable is suitable for indoor use and also offers permanent UV protection and when used outdoors, temporary protection against water (AD2).
A 6 A circuit breaker (type B) must be selected in the fixed electrical installation due to the nominal cross-section of the power cable of 0.75 mm^2.

The hybrid manager is already completely wired with the components installed in the pipe group. Additional electrical connections must be made on site between the outdoor unit, hybrid box and the conventional heat generator.

- When observing the applicable regulations for the connection, at least electrical cables of type H05 VV-F (inside) or the H05RN-F (outside) must be used.

Dimension the length of all electrical connecting cables (mains, communication and sensor cables) for the maintenance position of the hybrid manager. Only being in this position guarantees that a sufficient length of the cables is achieved.

- Loosen two screws of the cover of the hybrid module and remove the cover.
- Route the connection cables through the conduit in of the hybrid manager.
- Connect the connection lines according to the following specifications.
- Fit the cover with the two screws.

Electrical connection in the hybrid set

- Route the electrical power cables through the sealing grommets in the back panel of the enclosure and the wall holes (→Fig. 26).
- Route the mains voltage lines for the hybrid manager and extra-low voltage cables in separate openings and cable conduits.

-or-

- Route the electrical power cables through the sealing grommets in the bottom panel of the enclosure (→Fig. 27).
- Route the mains voltage lines for the hybrid manager and extra-low voltage cables in separate openings and cable conduits.

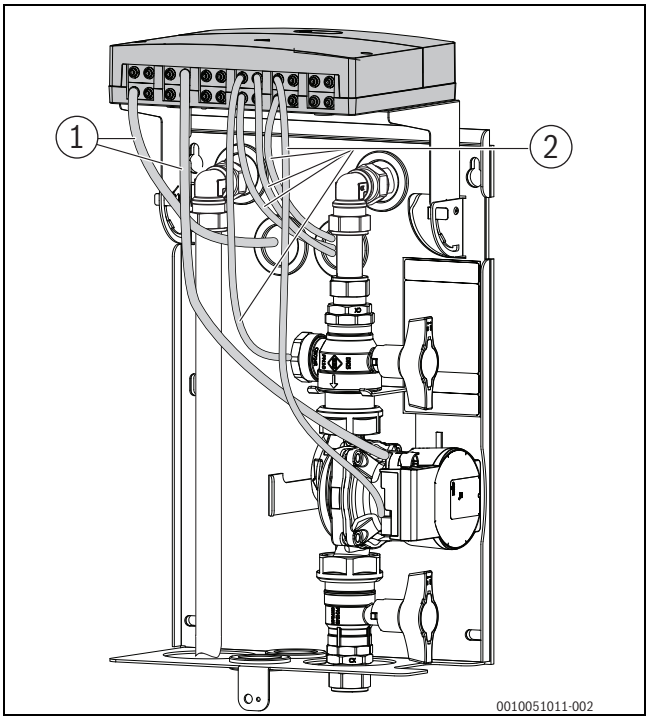

Fig. 26 Route cables through the wall at the rear (thermal insulation not shown, hydraulic pipework according to option 1)

[1] Mains voltage line
[2] Extra-low voltage cables

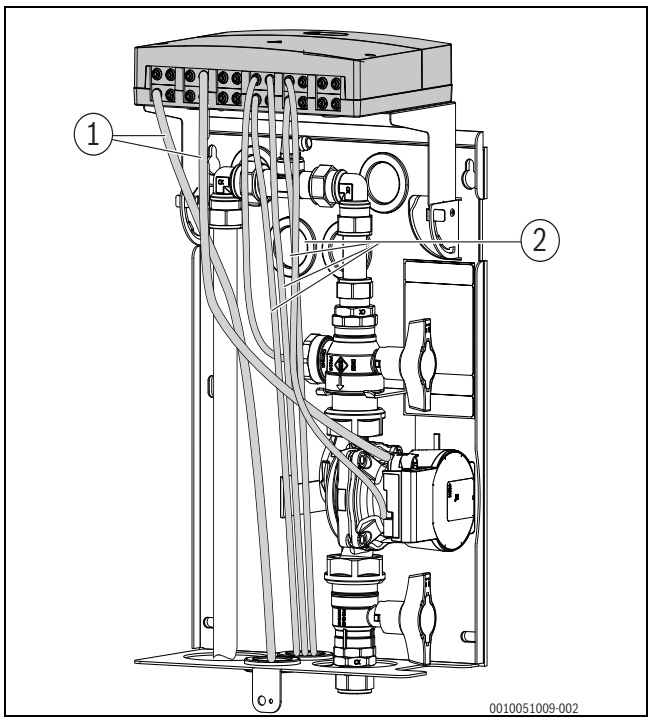

Fig. 27 Route cables through the bottom panel (thermal insulation not shown, hydraulic pipework according to option 2)

[1] Mains voltage line
[2] Extra-low voltage cables

5.13.2 Connect voltage supply (mains voltage side: 230 V)

Designations of the connecting terminals	
VW1	Without function
PH0	Connect circulating pump (indoor unit)
VC1/OA1	Without function
230 V AC	Mains voltage output (after the isolator)
230 V AC	Mains voltage input (for further modules)
LR 43/44	Connection of an external 230 V controller

Table 1 Connecting terminal on the mains voltage side (230 V)

The assignment of the electrical connection depends on which system is installed.

- Only use electric cables of the same quality.
- Make sure the power supply is connected to the correct phases. A power supply of the MH210 via an earthed safety plug is not permissible.
- Connect only components and assemblies to the outputs as described in these instructions.

The maximum power consumption of the connected components and assemblies must not exceed the power output stated in the specifications for the hybrid manager.

- If the mains voltage is not supplied via the electronic system of the heat source: install an all-pole standard-compliant isolator (according to EN 60335-1) on site to interrupt the mains voltage supply.

- Remove two screws in the cover of the hybrid module and take off the cover (→Fig. 28).

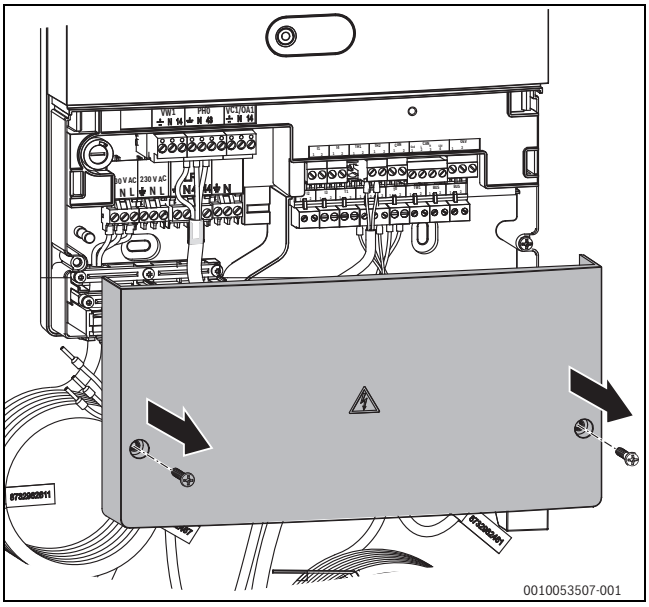

Fig. 28 Remove the cover of the hybrid manager

- If necessary, remove the cable ties from the 230 V power cable (→Fig. 29) and route the cable through the back panel or the bottom panel of the hybrid set.
- Connect the three wires of the cable properly to the mains power supply of the building.
- Refit the cover of the hybrid manager.

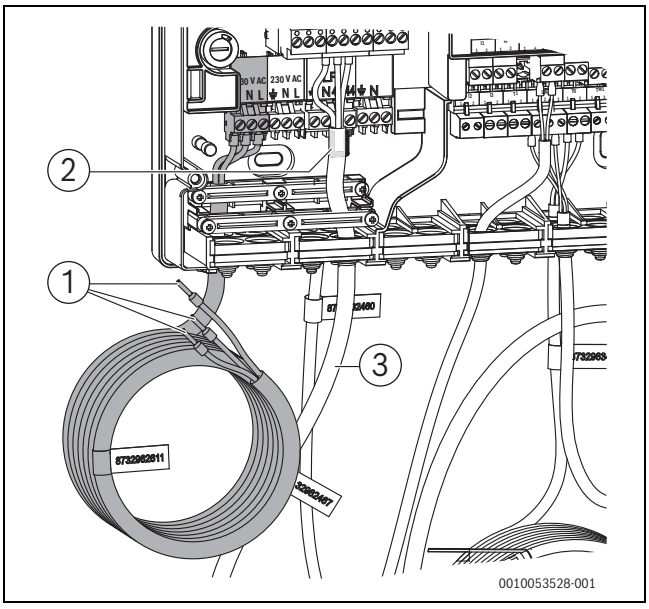

Fig. 29 Connect 230 V voltage supply

[1] 230 V power cable with wires
[2] Jumper between **43** and **44** (shown concealed)
[3] Connection cable PH0

5.13.3 Connection of voltage supply for external controller (230 V)

The settings are not communicated between CH120 and the external controller.

An external controller is connected to terminals **43** and **44**

- Before connecting an external controller with 230 V connection, remove the jumper between **43** and **44** (→Fig. 29).
- Remove the three screws and strain relief, (→Fig. 30, step **1.**).
- Remove the two cable grommets (**2.**).
- Cut into the grommet and feed through the connecting cable of the controller (**3.**).
- Remove the two terminals (→Fig. 30, step **4.**).

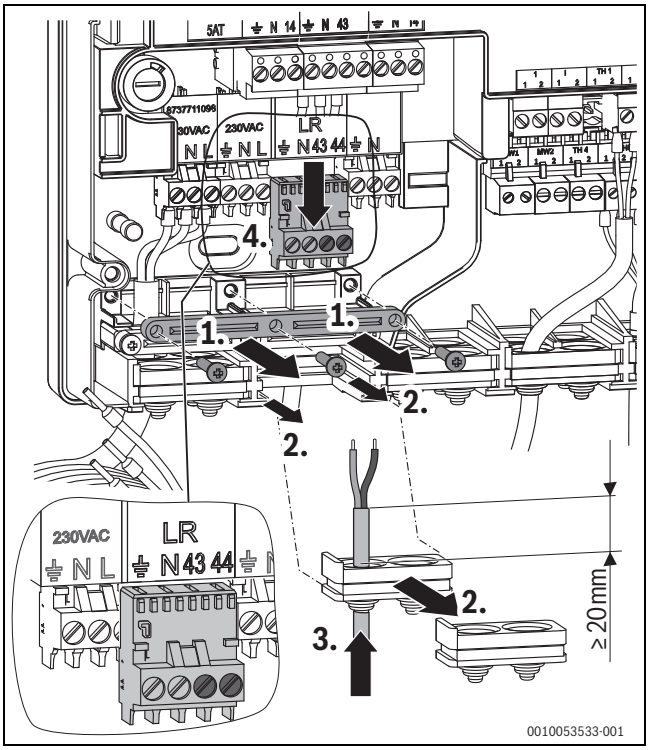

Fig. 30 Connect the 230 V voltage supply of the external controller (PH0 cable not shown)

- Connect the connecting cable of the controller to terminal connections **43** and **44** properly (→Fig. 31)
- Reattach the terminals to the terminal strip.

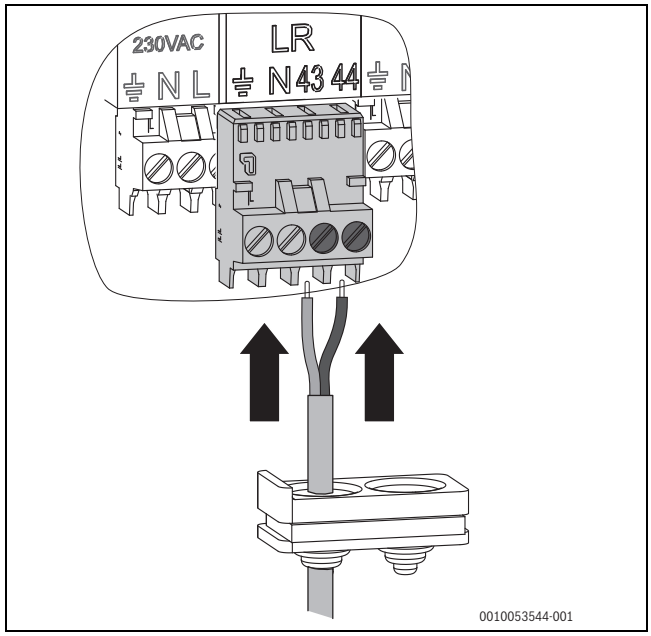

Fig. 31 Connect the connection line of the external controller to the terminal

- Insert the cable grommet with cable, insert the cable into the line routing and mount the strain relief.
- Refit the cover of the hybrid manager.

Connection on the conventional heat generator

If an external 230 V controller is connected to the conventional heat generator when converting to a hybrid system, this must be connected to the hybrid manager.
The standard jumper intended must then be inserted in the conventional heat generator.

If no jumper is inserted, the conventional heat generator remains blocked.

- Connect the jumper between connection **L** and **LR** in the connection strip in the conventional heat generator (→Fig. 32).

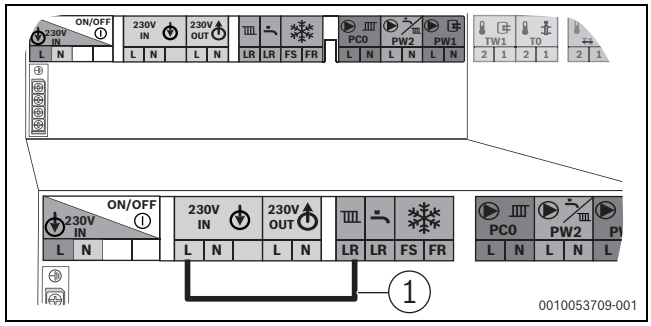

Fig. 32 Connecting the jumper to the terminals in the conventional heat generator (example representation)

[1] Jumper L-LR

5.13.4 Outside temperature sensor T1

A temperature sensor cable that runs outdoors must satisfy the following requirements:

- Conductor cross-section: 0.5 mm^2
- Resistance: max. 50 Ω/km
- Number of conductors: 2

We recommend a double insulated cable of type "RE-2X(St)Y".

- ▶ Mount the sensor on the coldest side of the house (normally facing north). Protect the sensor from direct solar radiation, draughts, etc. In addition, the sensor must not be installed directly under the ceiling.
- ▶ Connect the outdoor temperature sensor T1 to terminal T1 of the hybrid manager.

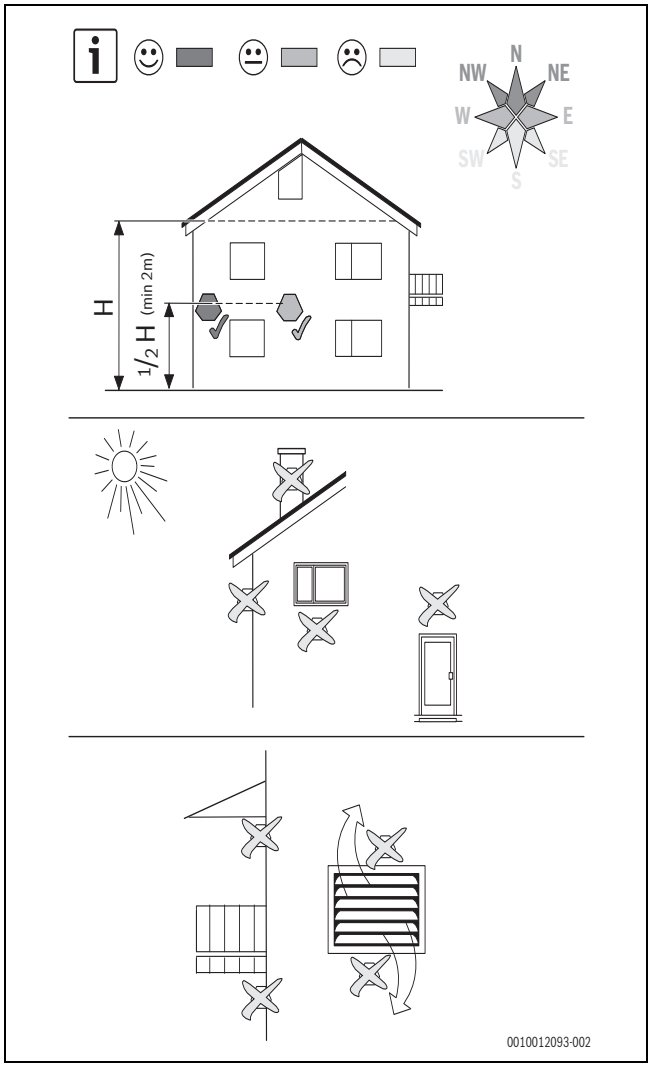

Fig. 33 Positioning the outside temperature sensor

5.13.5 BUS connection and temperature sensor (extra-low voltage side: ≤ 24 V)

The extra-low voltage side is a SELV circuit that is not connected to protective earth. The BUS and sensor cables must therefore have a dielectric strength of at least 500 VAC (1 minute) to protective earth. A typical BUS cable [e.g. LIYCY (twisted pair) 2x2x0.75 mm^2] meets this requirement.

Designations of the connecting terminals	
BUS	EMS 1/EMS 2 BUS input/output (reverse polarity protected)
CAN (4-pin)	CAN Power, CAN Data (connection/communication with the heat pump outdoor unit)
I1	SG Ready 1
I2	Without function
I3	Without function
I4	SG Ready 2
MW1	Without function
MW2	Without function
OEV	Without function
LIN	Pump with LIN-BUS communication
TH1	Without function
TH2	Return temperature sensor to heat pump
CAN (2-pin)	For SW updates
T1	Outside temperature sensor
T0	Low loss header temperature sensor
TW1	Without function

Table 2 Connecting terminal on the low voltage side (≤ 24 V)

NOTICE

CAN-BUS

System fault if the CAN Power (12 V) and CAN Data BUS connections are confused! The communication circuits are not designed for 12 V constant voltage.

- ▶ Ensure that the cables are connected to the connections of the hybrid manager marked accordingly (→ Fig. 35).

- ▶ To avoid capacitance inductive interference: Make sure all low-voltage cables are routed separately from supply voltage carrying cables (min. clearance 100 mm).
- ▶ Route cables through the grommets provided and connect them as shown in the wiring diagrams.

We recommend using a shielded cable. The shielding must only be connected on one side, and not both sides. This way you avoid external interference.

- ▶ Insulate the shielding.

General BUS connection (EMS 1/EMS 2)

Maximum total length of BUS connections:

- 100 m with 0.50 mm^2 conductor cross-section
- 300 m with 1.50 mm^2 conductor cross-section

If the maximum cable length of the BUS connection between all BUS nodes is exceeded, or if the a ring structure exists in the BUS system, the system cannot be commissioned.

BUS connection between MH210 – control unit – other modules

- ▶ The conventional heat generator is connected to the hybrid manager via the EMS 1-BUS or via the EMS 2-BUS.
- ▶ The heat pump outdoor unit is connected to hybrid manager via CAN-BUS. The cable is available as an accessory in 15 and 30 m lengths.
- ▶ In a normal environment with little external interference, a shielded cable is not necessary but we recommend using it.
- ▶ If the conductor cross-sections vary, use a junction box to connect the BUS nodes.
- ▶ Insert the BUS participant [B] via the electrical distribution box [A] into the star (→ Fig. 34), follow the instructions for the operating unit and the other modules).

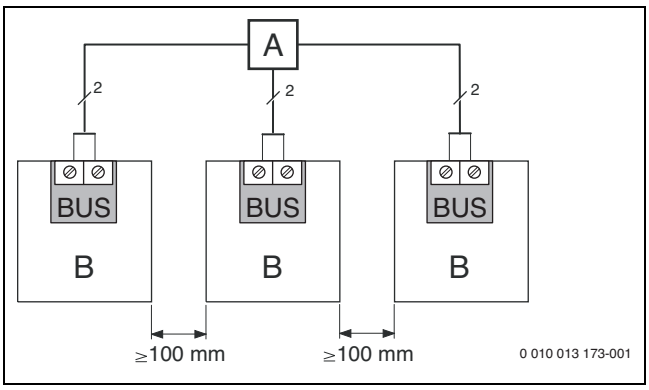

Fig. 34 Connecting the electrical distribution box

Connecting the LIN line pump

The pump is connected completely at the factory.

Observe the following when replacing the pump:

Plug assignment:

- **1** blue/grey
- **2** black
- **3** brown

- ▶ Connect the connection line to the corresponding connection (LIN) according to the terminal assignment.
- ▶ Ensure that the plug has a correct fit and is locked in place.

5.13.6 Overview of the terminal assignment

This overview indicates which system parts can be connected for all terminals in the hybrid manager.

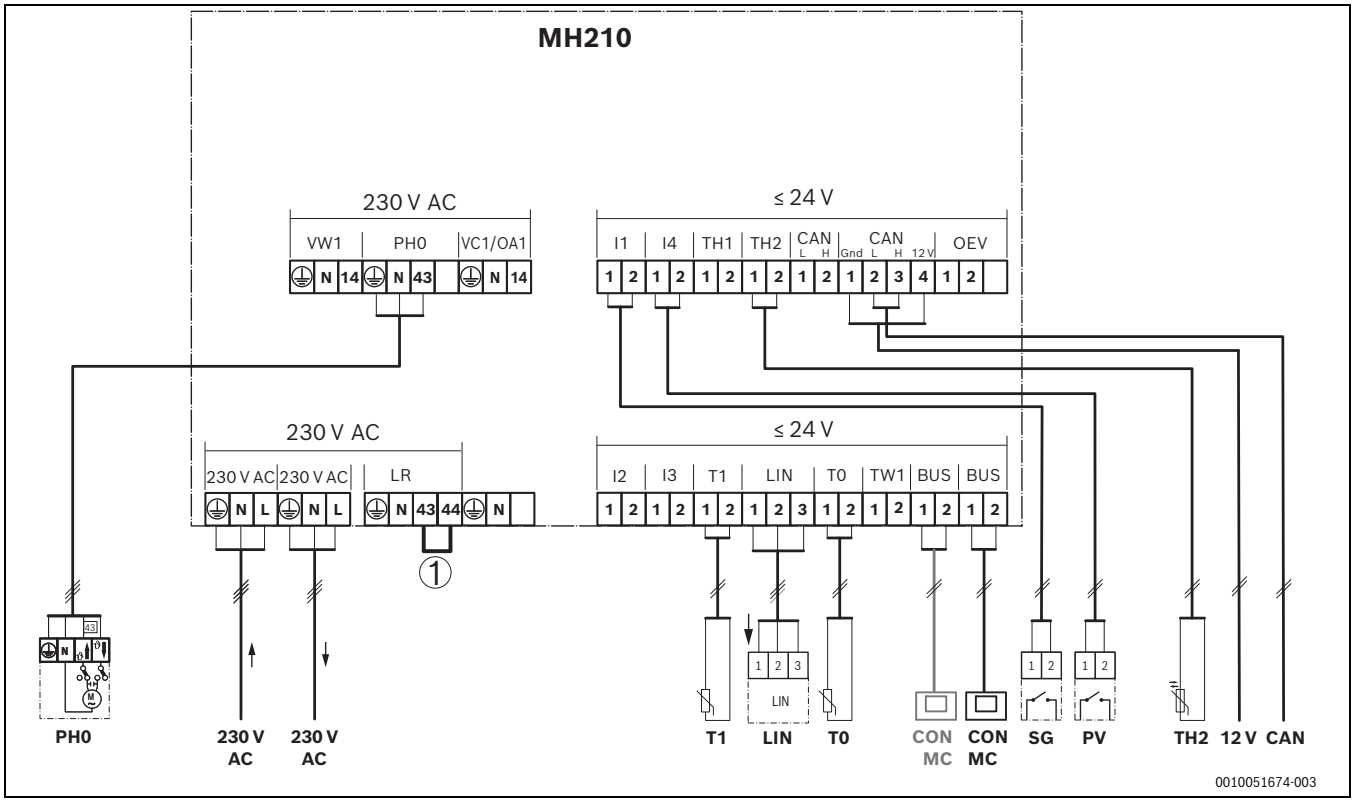

Fig. 35 Overview of the terminal assignment

Legend for figure 35 and tables 1 and 2:

[1] This jumper must be removed when connecting an external 230 V controller.
12 V Supply of the outdoor unit control unit (ODU)
230 V AC Mains voltage connection, incoming
230 V AC Mains voltage connection, outgoing, for supplying further modules
PH0 DHW circulation pump (heat pumps indoor unit)
LR 43/44 Connection 230 V external room thermostat (230 V)
BUS EMS 1/EMS 2-BUS
CAN CAN Power, CAN Data (connection/communication with the heat pump outdoor unit); the additional two-pole CAN connection on the left is intended for software updates
CON Control unit with EMS 1 BUS system and EMS 2 signal input/output for hybrid systems (**cont**roller, 2 alternative connections)
I1 SG Ready 1
I2 Without function
I3 Without function
I4 SG Ready 2
LIN Pump with LIN-BUS communication
Terminal assignment:
1-blue, grey
2-black
3-brown
MC **M**aster **c**ontroller (2 alternative connections)
PV **P**hoto**v**oltaic system
SG Smart grid
T0 Low loss header temperature sensor
T1 Outside temperature sensor
TH2 Temperature sensor return to heat pump

5.14 Leak test and thermal insulation

After the system has been completely installed, a leak test must be carried out.

- ▶ Open all ball valves.
- ▶ Fill the system with water, following the instructions in Chapter 6.
- ▶ Check all screw fittings and sealing joints for leaks and eliminate them if necessary.
- ▶ After a successful leak test, insulate the pipes and elbow fittings in the hybrid set with the supplied thermal insulation parts (→Fig. 36).
- ▶ Insulate the connector pipe in the hybrid set.
- ▶ Swivel the hybrid manager forward into the operating position.
- ▶ Insulate the piping in accordance with the legal regulations.

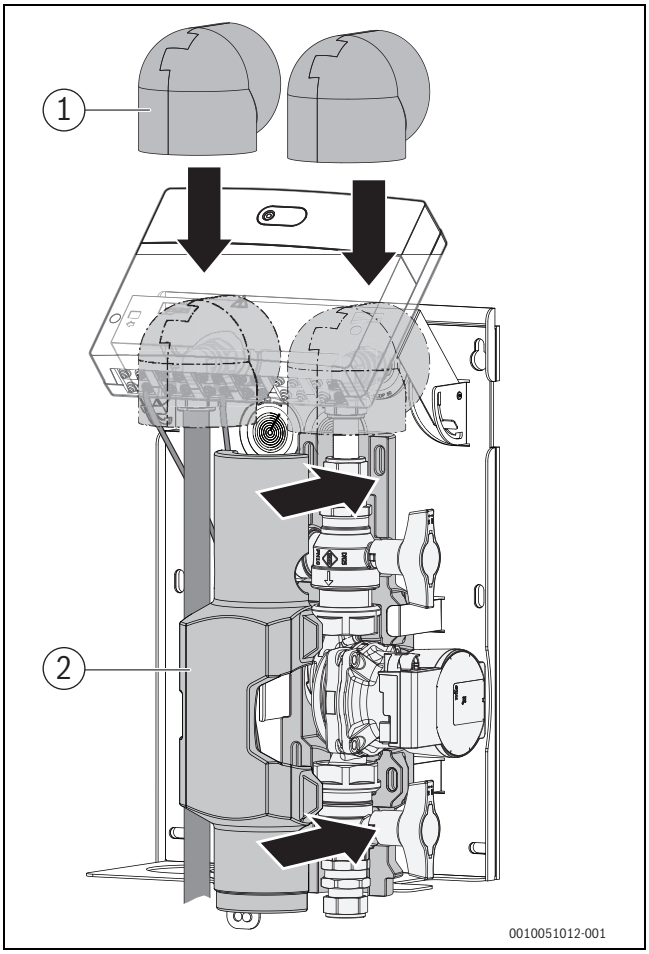

Fig. 36 Install thermal insulation (example: hydraulic connection, option 1)

[1] Thermal insulation for elbow fitting (2-part)
[2] Thermal insulation at the front for the pump line

▶

NOTICE

Damage due to access to system data!

To prevent unauthorised access to data when the unit is installed outdoors, a padlock can be attached to the front panel.

- ▶ Attach the padlock at the bottom through the front panel and wall mounting bracket.

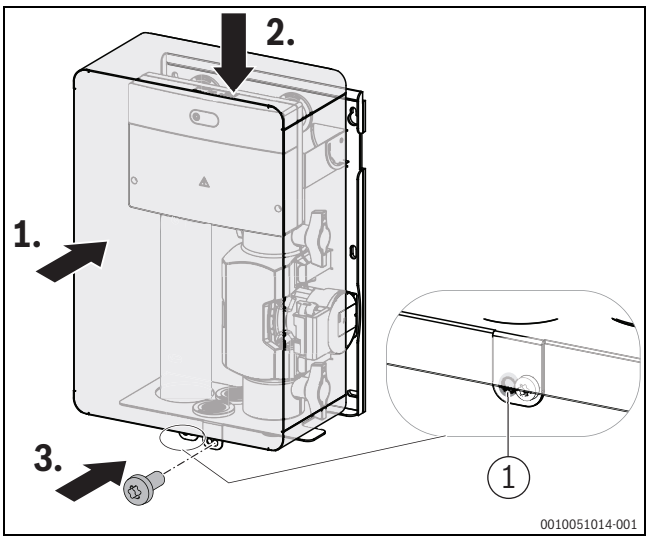

Fig. 37 Fitting the front panel

[1] Securing eyelet for padlock

6 Fill and top-up water

Heating water quality requirements

The quality of the fill and top-up water is an essential factor for increased efficiency, functional reliability, long service life and for maintaining the operational readiness of a heating system.

Unsuitable water can damage the heat exchanger or cause a fault in the heat generator or DHW supply!

Unsuitable or contaminated water can lead to sludge formation, corrosion or calcification. Unsuitable antifreeze or hot water additives (inhibitors or corrosion inhibitors) can damage the heat generator and heating system.

- ▶ Only fill the heating system with potable water. Do not use ground water or well water.
- ▶ Determine the hardness of the fill water before filling the system.
- ▶ Flush the heating system before filling.
- ▶ Clean the filter after commissioning the system (→Chapter 8.5.3 "After commissioning the system, clean the filter", page 32).
- ▶ If magnetite (iron oxide) is present, corrosion inhibiting measures are required and installation of a magnetite or sludge separator and an air vent valve in the heating system is recommended.

For markets outside Germany:

- ▶ The limit values in table 3 must not be exceeded, even if the national guidelines prescribe higher limit values.

Water quality	Unit	Value
Conductivity	µS/cm	≤ 2500
pH value		≥ 6.5... ≤ 9.5
Chloride	ppm	≤ 250
Sulphate	ppm	≤ 250
Sodium	ppm	≤ 200

Table 3 Boundary conditions for potable water

- ▶ Check pH value after > 3 months operation. Ideally during initial maintenance.

Material of the heat generator	Heating water	pH value range
Iron material, copper material, copper-brazed heat exchanger	•Untreated potable water •Fully softened water	7.5[1)] – 10.0
	• Low-salt mode < 100 µS/cm	7.0[1)] – 10.0
Aluminium material	•Untreated potable water	7.5[1)] – 9.0
	• Low-salt mode < 100 µS/cm	7.0[1)] – 9.0

1) At pH values < 8.2 an on-site test for ferrous corrosion must be carried out - the water must be clear and sediment free

Table 4 Check pH value after > 3 months operation

- ▶ Treat the fill and top-up water according to the instructions in the following section.

Depending on the hardness of the fill water, the water quantity in the system and the maximum heating capacity of the heat generator, water conditioning may be necessary to avoid damage due to limescale in water heating systems.

Requirements for fill and top-up water for heat generators made of aluminium and heat pumps.

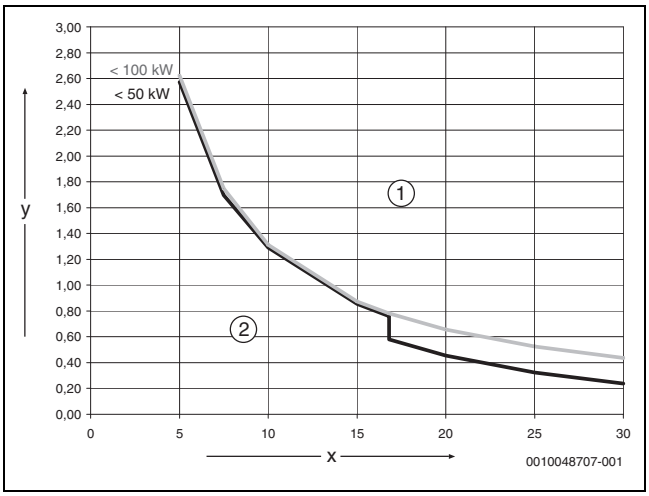

Fig. 38 Heat generator < 50 kW < 100 kW

[x] Total hardness in °dH

[y] Maximum possible water volume over the service life of the heat source in m^3

[1] Above the curves, use fully demineralised fill and top-up water with a conductivity of ≤ 10 µS/cm

[2] Unconditioned fill and top-up water can be used below the curve in accordance with the Drinking Water Ordinance [Germany]

For systems with a specific water content > 40 l/kW a water conditioning must be carried out. If several heat generators are available, then the water volume of the heating system must be based on the heat generator with the lowest output.

A recommended and approved method for water conditioning is complete demineralisation of the fill and top-up water up to a conductivity of ≤ 10 µS/cm. Instead of water treatment, system separation can be provided directly after the heat source by means of a heat exchanger.

Avoidance of corrosion

In most cases, corrosion plays only a minor role in heating systems. However, this will only be the case if a corrosion-tight DHW conditioning system is used. In other words, no oxygen enters the system during operation. Continuous introduction of oxygen leads to corrosion and can thus cause rusting and rust sludge formation. Sludge formation can not only cause blockages and therefore a diminished heat supply but also deposits (similar to limescale deposits) on the hot surfaces of the heat exchanger.

The amounts of oxygen introduced by the fill and top-up water are generally very small and can therefore be ignored.

To avoid oxygen enrichment, the connecting pipework must be oxygen-tight!
Avoid using rubber hoses. The connection accessories provided should be used for the installation.

The most important factor with regard to oxygen permeation during operation is generally pressure maintenance and in particular the function, correct sizing and correct setting (pre-charge pressure) of the expansion vessel. The pre-charge pressure and function must be checked annually.
Depending on the water volume in the system, an additional expansion vessel may be required. The installer must select the required size and select the correct pressure.

Also check the function of the automatic ventilation when carrying out maintenance.

It is also important to monitor and document the quantities of fill and top-up water via a water meter. If larger quantities of top-up water are regularly required, this indicates insufficient pressure maintenance, leaks or continuous oxygen permeation. Warranty claims in respect of our heat source are only valid in conjunction with the requirements described here and a fully completed operator's log.

Antifreeze

Unsuitable antifreeze can damage the heat exchanger or cause a fault in the heat generator or DHW supply.

Unsuitable antifreeze can damage the heat source and heating system. Only in the release list in the document 6720841872 use listed antifreeze.

- ▶ Only use antifreeze according to the specifications of the manufacturer, e.g. regarding minimum concentration.
- ▶ Follow the instructions of the antifreeze manufacturer about regularly checking the concentration and corrective measures.

Heating water additives

Unsuitable heating water additives can damage the heat generator and heating system, or cause a fault in the heat generator or DHW supply.

A heating water additive, e.g. corrosion inhibitor, may only be used if the manufacturer of the heating water additive can prove its suitability for all materials in the heating system.

- ▶ Only use heating water additives in the concentration specified in the manufacturer's instructions. Regularly check concentration and corrective measures.

Heating water additives, e.g. corrosion inhibitors, are only required in the case of constant oxygen permeation, which cannot be prevented through other means.

Sealant in the heating water can lead to deposits in the heat generator, which is why using sealant is not recommended.

6.1 Quality requirements for the heating water

The quality of the fill and top-up water is an essential factor for increased efficiency, functional reliability, long service life and for maintaining the operational readiness of a heating system.

Unsuitable water can damage the heat exchanger or cause a fault in the heat generator or DHW supply!

Unsuitable or contaminated water can lead to sludge formation, corrosion or scaling. Unsuitable antifreeze or hot water additives (inhibitors or anti-corrosion agents) can damage the heat generator and heating system.

- ▶ Only fill the heating system with potable water. Do not use well or groundwater.
- ▶ Determine the water hardness of the filling water, before filling the system.
- ▶ Flush the heating system prior to filling.
- ▶ If magnetite (iron oxide) is present, anti-corrosion measures are required and the installation of a magnetite separator and a de-airing valve in the heating system is recommended.
- ▶ The limit values in table 5 must not be exceeded, even if national directives contain higher limits.

Water quality	Unit	Value
Conductivity	µS/cm	≤ 2500
pH		≥ 6,5... ≤ 9,5
Chloride	ppm	≤ 250
Sulphate	ppm	≤ 250
Sodium	ppm	≤ 200

Table 5 Boundary conditions for potable water (filling water)

- ▶ Check the pH value after > 3 months of operation. Ideally at the first service.

Material of heat generator	Heating water	pH value range
Copper brazed heat exchangers	•Untreated potable water •Fully softened water	7.5[1] – 10.0
	• Low-salt operation < 100 µS/cm	7.0[1] – 10.0

1) If pH value is < 8.2 an on-site test for ferrous corrosion is necessary

Table 6 pH value ranges after > 3 months of operation

- ▶ Treat the fill and top up water according to the instructions in the following section.

Depending on the hardness of the filling water, the system water volume and the maximum heat output of the heat generator, water treatment may be required to avoid a damage in water heating installations, due to the formation of lime scale.

6.1.1 Requirements on the fill and top-up water

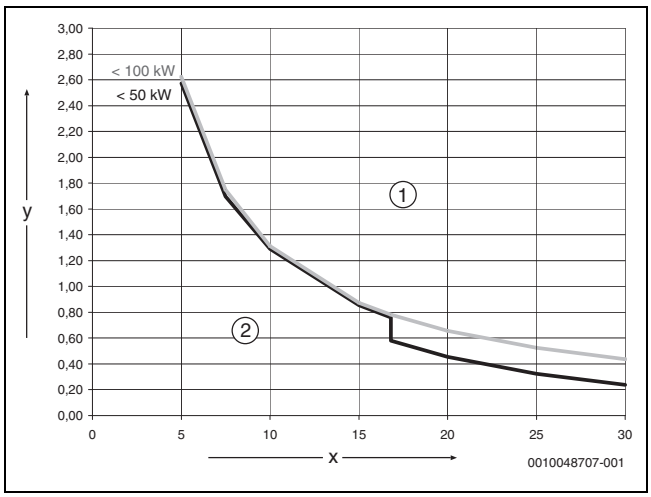

Fig. 39 Heat generators < 50 kW-100 kW

[x] Total hardness in °dH
[y] Maximum possible water volume over the service life of the heat source in m^3
[1] Above the curve, only use desalinated fill and top-up water, with a conductivity of ≤ 10 µS/cm
[2] Below the curve, untreated fill and top-up water according to drinking water regulation can be used

For systems with a specific system water content >40 l/kW, water treatment is mandatory. If there are several heat generators in the heating system, then the system water volume must be related to the heat generator with the lowest output.

	Water hardness unit conversion				
	°dH	°e	°fH	ppm	mmol/l
1°dH=	1	1,25	1,8	17,8	0,1783
1°e=	0,798	1	1,4	14,3	0,142
1°fH=	0,56	0,7	1	10	0,1
1 ppm CaCO3 (USA)	0,056	0,07	0,1	1	0,01
1mmol/l=	5,6	7,02	10	100	1

Table 7 Water hardness unit conversion

A recommended and approved method for water treatment is desalination of the fill and top-up water to a conductivity of ≤ 10 µS/cm.

6.1.2 Prevention of corrosion

In most cases, corrosion plays only a minor role in heating systems. However, a precondition for this is that the system is a corrosion-sealed water heating installation. This means that there is practically no access of oxygen to the system during operation.

Continuous introduction of oxygen leads to corrosion and can thus cause rusting and rust sludge formation. Sludge formation can not only cause blockages and therefore a diminished heat supply but also deposits (similar to lime scale deposits) on the hot surfaces of the heat exchanger.

The amount of oxygen introduced by the fill- and top-up water are generally very small and can therefore be ignored.

To avoid oxygenation, connection pipes must be diffusion-tight!
The use of rubber hoses should be avoided.

The intended connection accessories should be used in the installation.

During operation, pressure maintenance with regard to oxygen ingress and in particular the function, correct sizing and correct setting (pre-charge pressure) of the expansion vessel is of highest importance. Check the pre-charge pressure and function annually.

Furthermore, the function of automatic air vents should also be checked during maintenance.

It is also important to check and document the top-up water quantities via a water meter. Larger and regularly required water top-up quantities indicate insufficient pressure maintenance, leaks or continuous oxygen input.

6.1.3 Antifreeze

Unsuitable antifreeze can damage the heat exchanger or cause a fault in the heat source or DHW supply.

Unsuitable antifreeze can damage the heat source and heating system. Only use antifreeze as listed in the document 6720841872, which contains antifreeze products approved by us.

- Only use antifreeze according to the specifications of the manufacturer, e.g with regard to the minimum concentration.
- Follow the instructions of the manufacturer of the antifreeze about regular checking of the concentration and corrective measures.
- The use of antifreeze reduces the efficiency.

6.1.4 Heating water additives

Unsuitable heating water additives can cause damage to the heat source and heating system or cause a fault in the heat source or DHW supply.

The use of a heating water additive, e.g. corrosion inhibitor, is only allowed, if the manufacturer of the heating water additive certifies its suitability for all materials in the heating system.

- Only use heating water additives in accordance with the instructions of its manufacturer about concentration, regular checking of the concentration and corrective measures.

Sealants in the heating water can cause deposits in the heat generator, therefore it is not advisable to use it.

Suitable water treatment products (inhibitors/cleaners) can be obtained from the following manufacturers:

Follow the guidance of BS7593:2019[1)] for treatment of water in domestic hot water heating systems.

ADEY	www.adey.com
FERNOX	www.fernox.com
SENTINEL	www.sentinelprotects.com/uk

Table 8

1) Only applicable in the United Kingdom

7 Minimum volume and installation of the heating system

To safeguard the heat pump function and avoid an excessive number of start/stop cycles, incomplete defrosting and unnecessary alarms, it must be possible to store a sufficient amount of energy in the system. This energy is stored in the water volume of the heating system, and also in the components of the system **(at least one radiator valve must be open)** as well as in concrete floors (underfloor heating system).

8 Commissioning

8.1 System requirements

- For the hybrid manager to communicate via the BUS interface EMS (Energy Management System), it requires the CH120 or EasyControl CT200 system controller:
- The hybrid manager can only be used with the heat pump outdoor unit CS5800i AW.

8.2 Important notices on use

The hybrid manager MH210 communicates via an EMS interface with other EMS-enabled BUS participants.

- The installation room must be suitable for the IP rating stated in the technical data of the hybrid manager and the pump.

8.3 Functions

Together with a system controller, the hybrid manager MH210 controls a heating system consisting of an electrically operated heat pump and another conventional heat generator (e.g. oil or floor standing gas condensing boiler). The time when which heat generator is operated depends on the selected control strategy, the current ambient conditions and the temperature levels.
Since DHW is always prepared by the conventional heat generator, the control strategy has no influence on the DHW convenience function.

The maximum operating range of the heat pump is at outside temperatures between -20°C and +45°C.

The hybrid manager offers a Smart Grid Ready (SG Ready) interface. This interface can be used, for example, to optimise or block operation of the heat pump by means of a photovoltaic inverter or a signal from the electricity supplier.

8.3.1 Control strategy with bivalence temperature

The dual-fuel temperature determines the outdoor temperature up to which the heat pump alone supplies the heat demand. The dual-fuel temperature is pre-set to 2 °C on the control unit. This setting can be changed.

The dual-fuel temperature should be set so that the heat pump can cover the heat demand alone above the dual-fuel temperature. Further details on the selection of the dual-fuel temperature can be found in the planning document of the hybrid system or the heat pump.

Heat pump-optimised (outdoor temperature parallel)

- Heating mode: above the dual-fuel temperature, the heat pump supplies the heat demand alone. Below the dual-fuel temperature, the conventional heat generator is switched on if the heat pump cannot cover the heat demand for more than half an hour. The conventional heat generator is switched on immediately if the heat pump cannot reach the required flow temperature due to its operating limits.

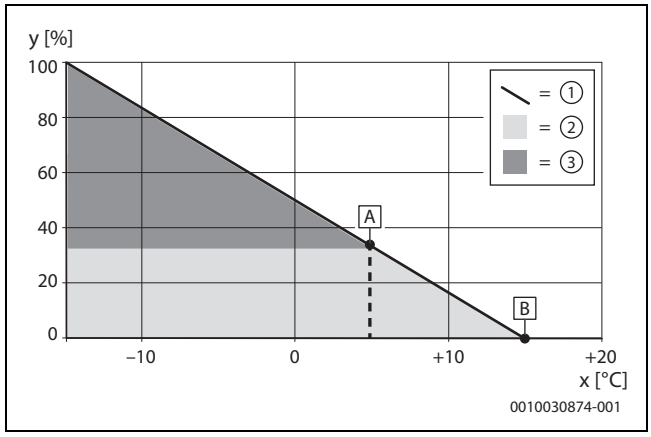

Fig. 40 Control strategy, maximise renewable energy share

x Outdoor temperature
y Relative heating load

A Dual-fuel temperature
B Heating limit temperature

[1] Heating load
[2] Heat pump
[3] Conventional heat generator

8.3.2 Other control strategies

Independent of the dual-fuel temperature, further control strategies can be selected on the control unit. These are described below.

Observe country-specific guidelines and requirements regarding subsidies when selecting the control strategy.

Cost-optimised (optimised for costs according to energy prices)

This control strategy should only be selected by users who are prepared to regularly adjust the energy prices in the control unit. The cost-optimised strategy calculates which heat generator currently works more cost-efficiently, the heat pump or the conventional heat generator. The following influencing variables apply:

- The efficiency of the heat pump is influenced by the outdoor temperature, the flow setpoint temperature and the modulation of the heat pump.
- The gas/oil prices and the electricity prices of the user.
- When using a PV system (→Chapter 8.3.3, page 28), the set level of the feed-in tariff also has an influence on the cost calculation of the heat pump. This is especially the case in mode 3.

The share of the heat pump can be increased by using PV.
In heating mode, the boiler is switched on regardless of the costs if the heat pump cannot cover the heat demand or cannot supply the required flow temperature.

8.3.3 Smart Grid Ready (SG Ready)

The hybrid manager is equipped with an SG Ready interface for heating pumps. Here, four operating states can be selected dynamically via the two switching inputs I1 and I4.

Display	Switching status	Meaning	Behaviour of the hybrid system
Mode 1	I1 closed, I4 open	Heat pump blocked by power supply company block	The heat pump does not run. When the heat pump is running, it may take up to 2 minutes to switch it off. Instead of the heat pump, the conventional heat generator provides the heat. The heat pump only runs if there is an acute risk of frost in order to protect the system from damage.
Mode 2	I1 open, I4 open	Normal Operation	The heat pump runs according to the set control strategy.
Mode 3	I1 open, I4 closed	Heat pump preferred	Regardless of the selected control strategy, the heat pump is always preferred in heating mode. This mode has no influence on normal hot water operation or low-noise operation.
Mode 4	I1 closed, I4 closed	Forced operation of heat pump	The same behaviour applies as with Mode 3. In addition, the heat pump runs in heating mode at minimum output until the maximum flow temperature is exceeded. This can also result in a higher flow temperature than required by the controller. In low-noise operation with setting **Switch off HP**, the heat pump is operated with reduced output.

Table 9 Operating states at the control unit with full SG Ready function

Typical applications for the SG Ready interface are:

- Heat pump combined with a photovoltaic system
- Heat pump combined with an intelligent electricity meter

Heat pump combined with a photovoltaic system (PV system)

To combine the heat pump with a PV system, a switching output of the inverter is usually connected to the SG Ready interface of the heat pump. Thus, the PV system supplies the heat pump with electrical power.

The switching output of the inverter (usually with switching threshold and hysteresis) should be configured to avoid too frequent switching. At the same time, the PV system must supply sufficient electrical power to operate the heat pump at least at the lowest compressor speed. Further information can be found in the inverter manufacturer's installation instructions.

Often inverters do not use the full scope of the SG Ready interface, but only switch the heat pump between the states Mode 2 and Mode 3. For this purpose, contact I4 must be connected (closed: PV system supplies electricity). I1 does not have to be assigned.

The assignment at the inputs I1 and I4 then looks as follows:

Display	Switching status	Meaning
Mode 1	not available	Heat pump blocked by power supply company block
Mode 2	I1 open, I4 open	Normal Operation
Mode 3	I1 open, I4 closed	Heat pump preferred
Mode 4	not available	Forced operation of heat pump

Table 10 Power supply from the PV system

Heat pump combined with an intelligent electricity meter

In order to control the electricity grid load, the power supply company reserves the following procedure:

- The electricity purchase for heat pump systems is completely blocked (power supply company block).
- The electricity purchase for heat pump systems is enforced by means of forced operation.

The usual case of application is the power supply company block. For this, it is sufficient to assign contact I1, which switches between the states Mode 1 and Mode 2. The exact connection with the intelligent electricity meter is described in the operating instructions of the electricity meter. If the compressor of the heat pump is disconnected from the mains when the power supply company lock is active, all errors that would occur due to this interruption of the power connection are suppressed in the controller.

The assignment at the inputs I1 and I4 then looks as follows:

Display	Switching status	Meaning
Mode 1	I1 closed, I4 open	Heat pump blocked by power supply company block
Mode 2	I1 open, I4 open	Normal Operation
Mode 3	not available	Heat pump preferred
Mode 4	not available	Forced operation of heat pump

Table 11 Power supply from an external provider (power supply company blocking function)

8.3.4 Pump in the heat pump circuit

The pump in the heat pump circuit runs under the following circumstances:

- During a heat demand
- After operation of the heat pump for a short time (overrun)
- If there is a risk of frost or the temperature sensors are defective

8.3.5 LED

The LED displays the operating status of the hybrid manager and possible faults (→ chapter 12, page 39).

This operating display is only reliable when the configuration wizard has been completed and all relevant parameters have been set.

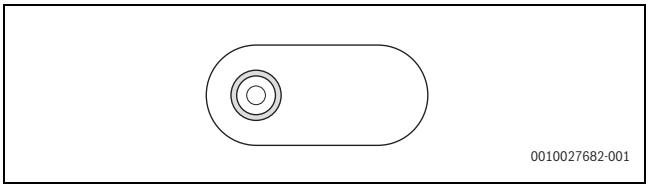

Fig. 41 LED

8.4 Commissioning

First make all electrical connections and then carry out the commissioning!

- ▶ Observe the installation instructions for all components and assemblies in the system.
- ▶ Only switch on the power supply after all modules are set up.

8.4.1 Commissioning of the system and hybrid manager

1. Isolate all poles of the mains voltage and secure against reconnection.
2. Make sure the mains voltage is disconnected.
3. Connect all required sensors and actuators.
4. Mechanically establish the power supply (230 V AC) at all installed modules and heat sources.
5. If necessary, set the coding switch on other modules.
6. Switch on the power supply (mains voltage) to the entire system.

Once the status indicator on the the hybrid manager lights up green constantly:

7. Start commissioning the control unit → installation instructions of control unit.
8. In the service menu **Commissioning** > **Start configuration wizard?** > **Yes** set **Hybrid system installed** and follow up to menu. The configuration wizard suggests a configuration for the hybrid manager based on the connected sensor.
9. Check the settings in the menu of the **Hybrid systems** (→ Table 12) and if required, adjust to the installed system.
10. Make remaining adjustments as described in the installation instructions for the control unit.

8.4.2 Hybrid menu settings

If the hybrid manager is installed, on the control unit the **Service menu** is supplemented by the submenu **Hybrid settings**.

the **Hybrid settings** menu contains the following menu items:

- **Control strategy** – Setting of the operating mode
- **Dual-fuel sw.-over point** – Setting the dual-fuel temperature
- **Low-noise operation** – Settings and functions for low-noise operation of the heat pump
- **Energy prices**– Setting of the energy prices
- **Manual defrosting** – Setting of the manual defrosting

The factory settings are shown in bold in the setting areas. The corresponding functions are described in chapter 8.3 (→ page 27).

Menu item	Setting area: function description
Control strategy	Costs (optimised for costs according to energy prices)
	Maximise the share of renewable energy (outside temperature parallel)
Dual-fuel sw.-over point	–20 … **2** … 20 °C: select dual-fuel switch-over point
Energy prices	Energy costs and payment, can be set in cent amounts. • Gas costs • Oil costs • Electricity costs • Feed-in tariff PV (Feed-in tariff for photovoltaic)
Low-noise operation	Operating mode: • **off** • Reduced output • **Switch off HP** (Turn off the heat pump) • perm. reduced (Permanently reduced)
	Start time: • 0:00 … **22:00** … 23:00: Start time for low-noise operation (daily)
	End time: • 0:00 … **06:00** … 23:00: End time for low-noise operation (daily)
Manual defrosting	This menu item is only visible when the compressor is running and when defrosting is inactive. **Yes**: start defrosting
	No: do not start defrosting

Table 12 Menu items in the service menu

8.4.3 Main menu

To set low-noise operation, the end customer can see the following additional menu items in the main menu:

Menu item	Setting area: function description
Low-noise operation (Depending on the control unit, several power levels can be selected for the heat pump Compress 5800 AWWLW... A H.)	Operating mode: • **off** • Reduced output • **Switch off HP** (Turn off the heat pump) • perm. reduced (Permanently reduced)
	Start time: • 0:00 … **22:00** … 23:00: Start time for low-noise operation (daily)
	End time: • 0:00 … **06:00** … 23:00: End time for low-noise operation (daily)
	Start low-noise operation: • **No** • Reduced output • **Switch off HP** (Turn off the heat pump)
	0 … **4** … 24 h: Duration of low-noise operation (once from activation)

Table 13 Menu items in the main menu of the end customer

8.4.4 DiagnosisMenu

The menus, information or values displayed on the control unit depend on the components of the system installed.

- ▶ Observe the technical documentation for the heat source, control unit, additional modules and other system components.

If the hybrid manager is installed, the **Diagnosis** menu will be supplemented by the following menu items:

- **Function test** > **Hybrid**
- **Monitored values** > **Hybrid**

Function test

The function of the devices connected to the hybrid manager can be tested in this menu. For example, the pump in the return of the heat pump can be specifically switched on or off.

Function test of the heat pump: the heat pump is intrinsically safe. Waiting times of several minutes are possible. During this time, the menu for starting is hidden in the control unit. To ensure lubrication of the compressor, the heat pump should run for at least 5–10 minutes. When selecting the compressor output, make sure that the flow temperature of the outdoor unit remains below the permissible max. value.

The compressor is preheated before starting. This can take up to 30 Minutes, depending on the outdoor air temperature. The prerequisite for start-up is that the compressor temperature (TR1) is 20 K above the supply air temperature (TL2) and 20 K below the flow temperature from the heat pump (TC3). The set value is limited to the range between 20 °C and 45 °C. The temperatures are displayed in the diagnosis menu of the control unit.

A quick start of the heat pump is only possible if an active heat requirement exists.

The heat pump can only be defrosted manually if the compressor is running with the 4-way valve in heating mode and the outside temperature is below 15 °C.

Monitored values

This menu allows you to call up information on the current status of the appliances connected to the hybrid manager. For example, you can display how high the flow and return temperatures are in the hybrid system.

8.5 Commissioning the system

When planning the system, the coefficient of performance and the associated annual performance factor can be positively influenced by skilful selection of the heat source and the heat distribution system. The smaller the difference between the supply and heat source temperature (outside air), the better the coefficient of performance.
The best coefficient of performance (COP) results from high heat source temperatures and low supply temperatures in the heat distribution system. Low flow temperatures can be achieved primarily with surface heating systems.

NOTICE

Malfunctions/fault displays during commissioning!

If all components are not installed and connected when the system is commissioned, this can lead to malfunctions and error messages.

- ▶ Ensure that all system components are installed and connected.

8.5.1 Prior to commissioning, purge the pipework of the heating system

Before commissioning the heating system, the pipework must be purged in order to remove any dirt or metal particles which could damage the system components.

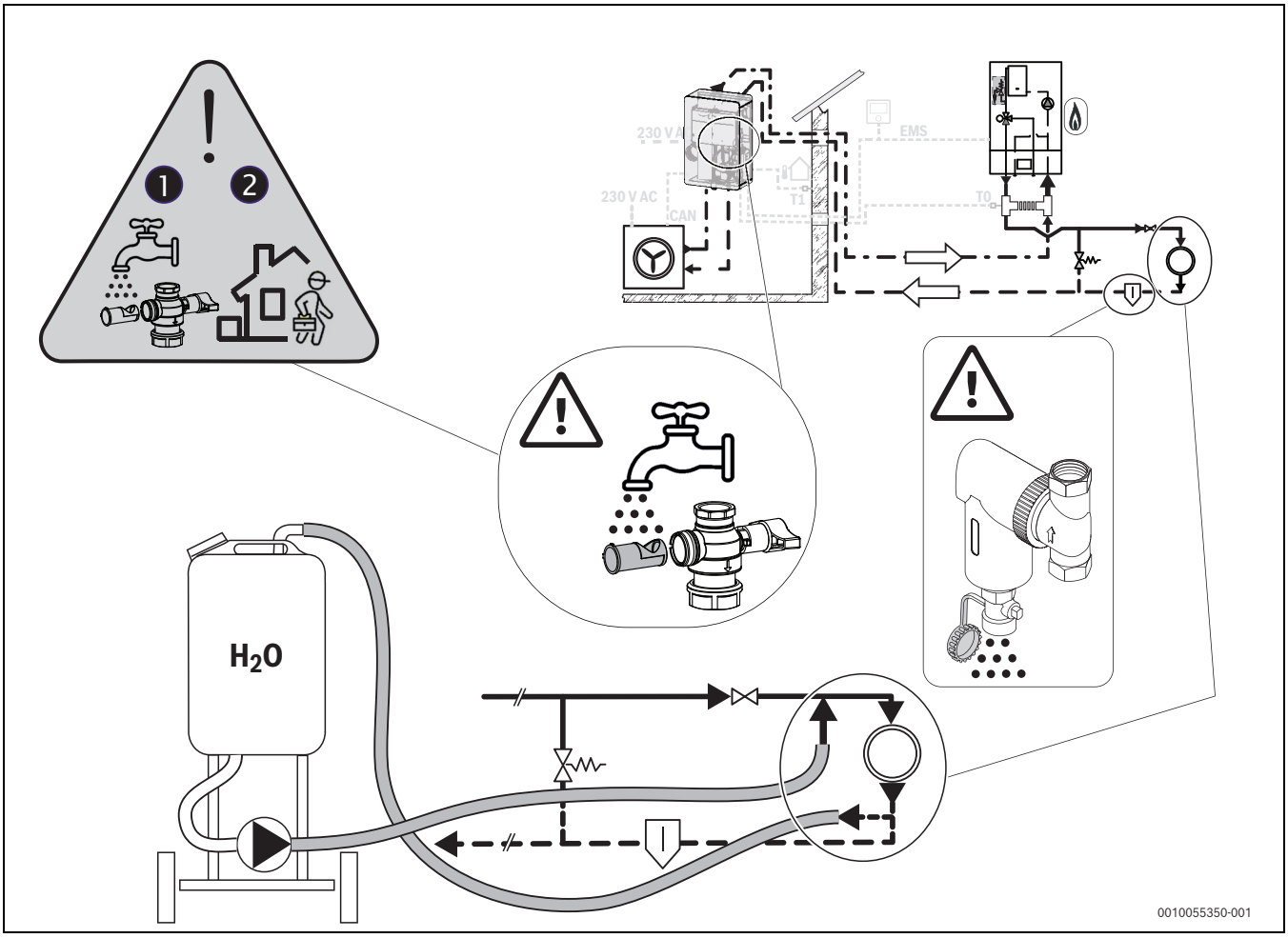

Fig. 42 Purge the heating system with the purging device (example)

8.5.2 Filling and venting the heating system

NOTICE

The system will be damaged if it is powered up without water.

Components in the heating system will be over heated if it is powered up without water.

- ▶ Fill the DHW cylinder and heating system **before** powering on the heating system, and establish the correct pressure.

Filling the heating system

Depending on the water volume in the system, an additional expansion vessel may be required. The installer must select the required size and select the correct pressure.

To facilitate venting of the heat pump circuit, it is recommended to install a venting device in the highest point of the pipework between the indoor and outdoor unit.

- ▶ Disconnect the electrical power supply to the outdoor unit and the conventional heat generator.
- ▶ Open all valves in the heating system.
- ▶ If installed, activate the other automatic air vent valves in the heating system.
- ▶ Ensure flow rate at the integrated particulate filter, open ball valve if required.
- ▶ Slowly fill the heating system via the conventional heat generator.

Operating pressure	
1.2-1.5 bar	Minimum charge pressure. Fill the system to a pressure of 0.2–0.5 bar above the pre-charge pressure of the expansion vessel when the heating system is cold.
3 bar	Maximum charge pressure at maximum heating water temperature: must not be exceeded (pressure relief valve opens).

Table 14 Operating pressure

- ▶ If the pressure does not remain constant, check whether the heating system and the expansion vessel are tight.
- ▶ Reconnect the power supply to the outdoor unit and conventional heat generator.

Venting the heating system

- ▶ Open **Service menu**.
- ▶ Select and confirm the **Diagnosis** menu.
- ▶ Select and confirm the **Function test** menu item.
- ▶ Select menu item **Heat pump** and activate **Air purge mode**.
- ▶ If installed, switch other DHW circulation pumps in the heating system cyclically on and off.
- ▶ Check the operating pressure and top up water if necessary until the required pressure in the heating system has been reached.
- ▶ Vent the system via other air vent valves of the heating system (e.g. radiators).
- ▶ Repeat steps 1 to 4 until the heating system has been vented. The complete venting of the heat pump circuit may take up to 20 minutes.
- ▶ If necessary, reactivate the **Air purge mode** after 15 minutes.
- ▶ Clean all filters installed, in particular the **particulate filter**.

8.5.3 After commissioning the system, clean the filter

(→Also chapter 14)

During the commissioning phase and during operation, particles in the heating system can contaminate the filter and have a negative impact on the function of the pump. To ensure proper operation, the particulate filter must be cleaned after commissioning and before changing over to continuous operation.

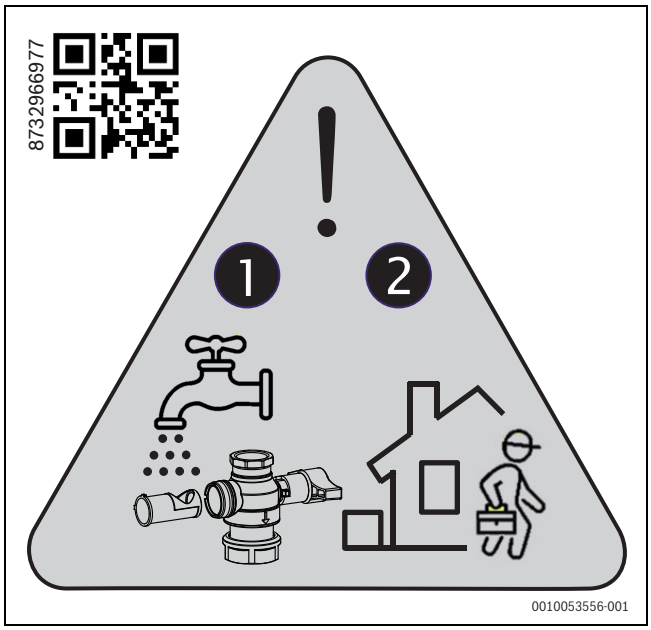

Fig. 43 Clean the particulate filter after commissioning and maintenance

- ▶ Close the service valves above and below the pump.
- ▶ Place a drip pan underneath to collect any water that may escape.
- ▶ Remove the particle filter at the shut-off valve and rinse it under running water.
- ▶ Reinstall the particle filter (hand-tight) and open the shut-off valves. Ensure the correct installation position of the filter (guide lugs/ recesses).

NOTICE

Open the shut-off valves after filter maintenance and pump replacement again!
Re-install the TH2 temperature sensor after maintenance!

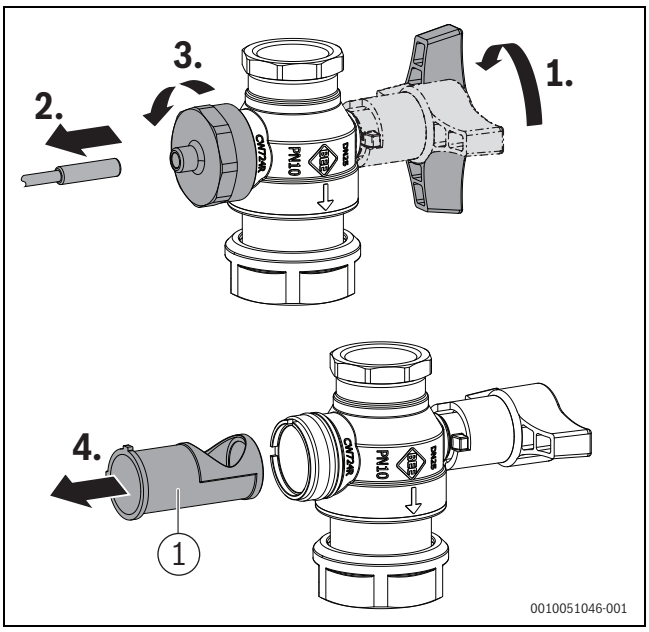

Fig. 44 Removal and installation of the particle filter (example)

[1] Particle filter

8.6 Operation with liquid gas (LPG)

In order to operate correctly with liquid gas (LPG) the costs of the fuel must be set under the menu item **Hybrid settings** – **Control strategy** – Cost-optimised.

Depending on the country, these are specified in:

- GBP/kWh
- €/kWh
- €/ m³ (€/cbm)

Liquid gas (LPG)	Conversion factor
1 kg	13.98 kWh
1 m³	28.14 kWh
1 l	7.17 kWh

Table 15 Conversion factors for energy prices with liquid gas operation

Example: 1 kg liquid gas costs 0.5 GBP. To obtain the costs in GBP/kWh, the costs per 1 kg must be divided by the conversion factor.

$$\frac{0,5\,\frac{\text{GBP}}{\text{kg}}}{13,98\,\frac{\text{kWh}}{\text{kg}}} = 0,036\,\frac{\text{GBP}}{\text{kWh}}$$

F. 1 Example

9 Adjusting the system components, minimum volumetric flow rate

9.1 Set the pressure relief valve, minimum volumetric flow rate

To ensure safe and trouble-free operation of the heat pump, a minimum volumetric flow rate must be set.
For this purpose, a pressure relief valve (scope of delivery) must be installed in the system according to the respective installation diagram (→ Fig. 3).
The overflow valve is factory-set to an opening pressure of 0.2 bar (20 kPa).
The opening pressure [Δp] corresponds to the maximum system delivery head (→Fig. 45).

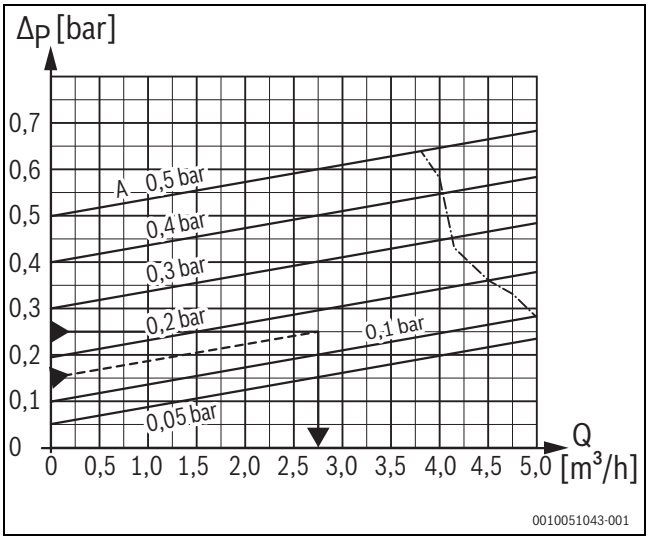

Fig. 45 Pressure relief valve adjustment range

The default setting ensures the minimum volumetric flow rate if the maximum pipe dimensions specified in the table 16 are observed.

Pipe inside diameter	Ø 20 mm	Ø 25 mm	Ø 32 mm
Maximum pipe length	5 m	10 m	30 m

Table 16 Permissible pipe dimensions

If required, the pressure relief valve can be set manually to a minimum volumetric flow rate of 1 m³/h (1000 l/h).

The following actions and settings are necessary to do this:

- ▶ Close all heating circuits or heating circuit valves.
- ▶ Clean all existing filters and sludge separators.
- ▶ In the submenu of the **Service menu** select **Function test** the menu item **Activate function tests** and confirm with **Yes**.
- ▶ In the submenu **Hybrid system** set the set value of the **Hybrid pump** (PH0) to 100%.
- ▶ Close the pressure relief valve until a minimum volumetric flow rate of 1 m³/h is reached.
  The current volumetric flow rate is displayed when the function check of the pump PH0 is in progress.

Pressure relief valve adjustment

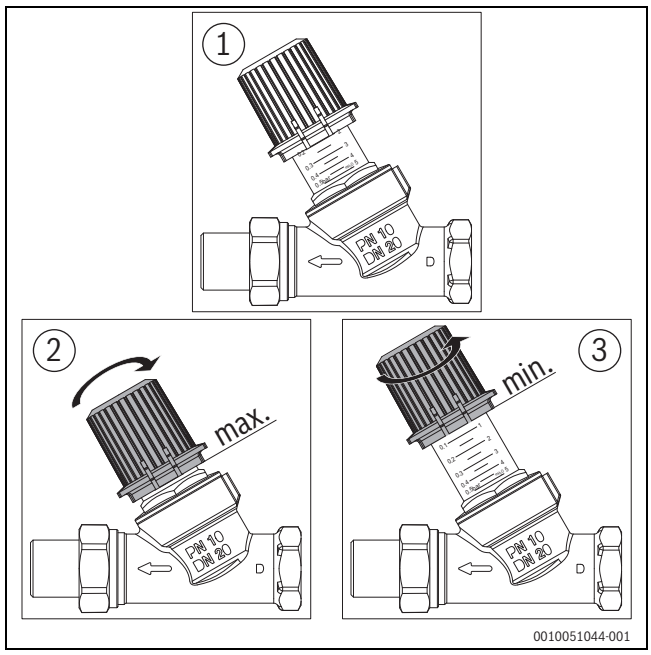

Fig. 46 Pressure relief valve adjustment

[1] Factory Setting
[2] Maximum opening pressure adjustment
[3] Minimum opening pressure adjustment

Changing the default setting

A reduction in the opening pressure, e.g. due to flow noise in the system, leads to an increase in the volumetric flow rate of the heat pump and is therefore not critical.

In systems with a greater delivery head, in which higher opening pressures are required, these must not exceed 0.25 bar (25 kPa) in order to ensure the minimum volumetric flow rate.
Higher setting values can lead to a loss of comfort and possibly to error messages (insufficient volumetric flow rate).

During operation, the pressure relief valve may make a little noise during the start-up and defrosting phases.

Checking the minimum volumetric flow rate

- ▶ Determine the minimum volumetric flow rate 1 m³/h (1000 l/h) (→Technical documentation of the outdoor unit).
- ▶ Put the system into operation (with adjustment of the opening pressure, if necessary).
- ▶ Shut off all heating circuits.
- ▶ In test mode, set circulation pump to 100% output.
  The volumetric flow rate displayed in the main controller of the heat pump must not fall below the required minimum volumetric flow rate of 1000 l/h.
- ▶ If necessary, clean the filter to ensure the minimum volumetric flow rate.

9.2 Adjust the pump, residual head

0.2 bar residual head (standard)

In the as-delivered condition, the residual head of the pump is 0.2 bar, and is limited by the opening pressure of the pressure relief valve (factory setting 0.2 bar). The residual head of 0.2 bar can be ensured in all system configurations (irrespective of which version of the connecting line between the heat pump and outdoor unit is selected (→Tab. 16).

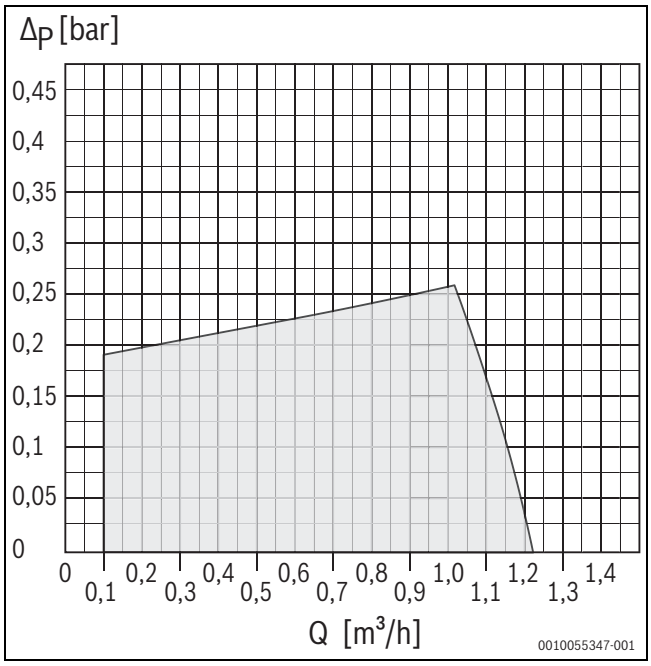

Fig. 47 Residual head of pump, 0.2 bar (200 mbar)

0.3 bar residual head (DN25/DN32)

The residual head of the pump can be increased to 0.3 bar by setting the value of 0.3 bar at the pressure relief valve. This setting can only be made if the diameter of the pipe that connects the outdoor unit to the heat pump is DN25 or DN32. Otherwise the minimum volumetric flow rate required for the heat pump cannot be ensured. Adjusting the residual head to 0.3 bar also reduces the contamination reserve of the filter, as a lower pressure loss is available for the filter contamination, the filter may need to be frequently cleaned if the heating water is contaminated (→Chapter 47 and 48).

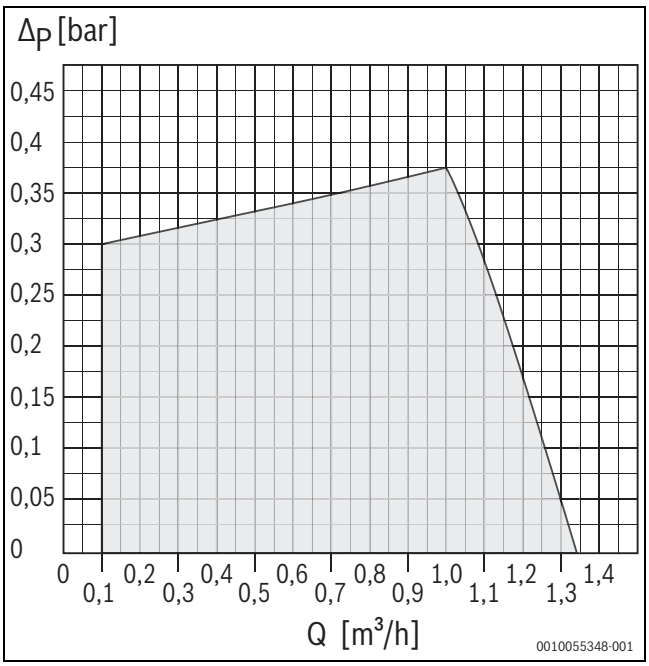

Fig. 48 Residual head of pump, 0.3 bar (300 mbar)

9.3 Setting the pump speed in the conventional heat generator

To ensure the required heating circuit flow temperature, it may be necessary to set the speed of the pump in the conventional heat generator to higher values (e.g. > 50%):

- In the **Service Menu**, select the **Hybrid system** sub-menu and **Confirm: OK**.
- Select menu item **Min. modulation boiler pump**, confirm and set the desired values with the ∨ and ∧ buttons and **Confirm: OK**.
- Exit the menu with ↩.

The setting can be made in the system controller or in the appliance control unit.
We recommend setting the speed of the pump in the conventional heat generator to values above 50%.

10 Heat pump design aid

Setting the dual-fuel temperature

The set dual-fuel temperature decides from which outdoor temperature the conventional heat generator switches on or switches to stand-alone mode. The dual-fuel temperature must be selected so that the heat pump can cover the sole heat demand above the dual-fuel temperature. The dual-fuel temperature can be set on the control unit.

Flow temperature 35 °C

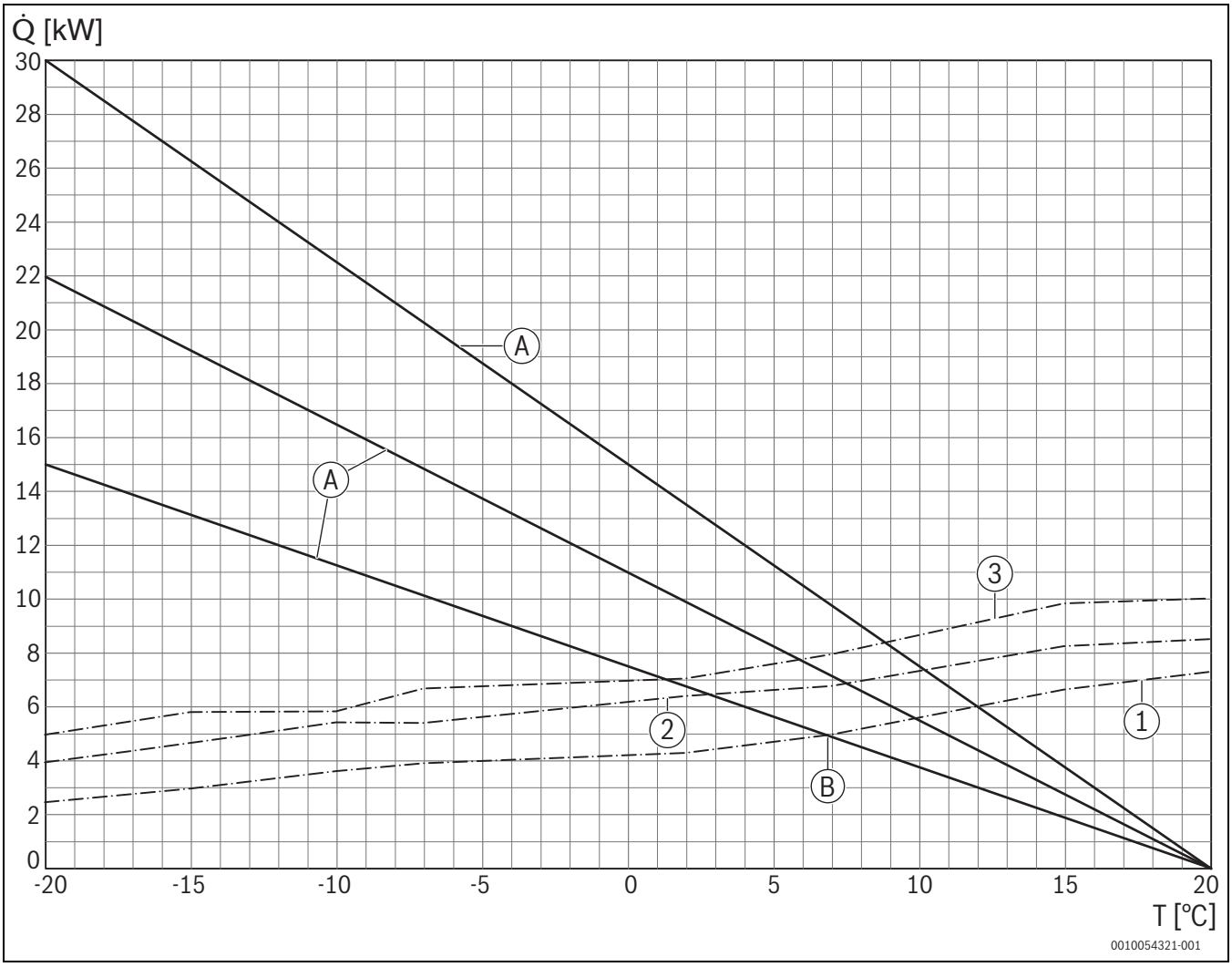

*Fig. 49 Diagram to determine the dual-fuel points at **35 °C** flow temperature*

Flow temperature 45 °C

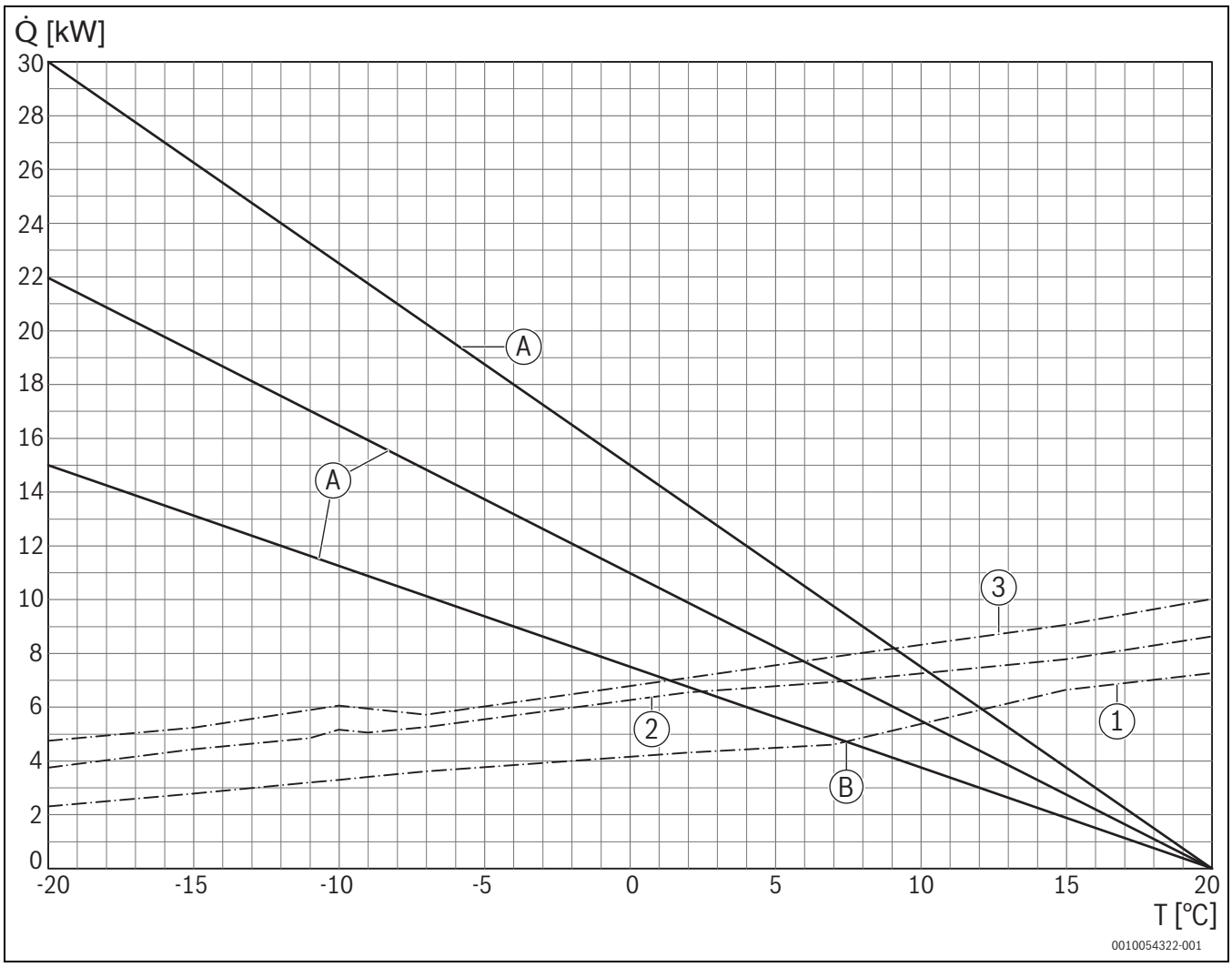

*Fig. 50 Diagram to determine the dual-fuel points at **45 °C** flow temperature*

Flow temperature 55 °C

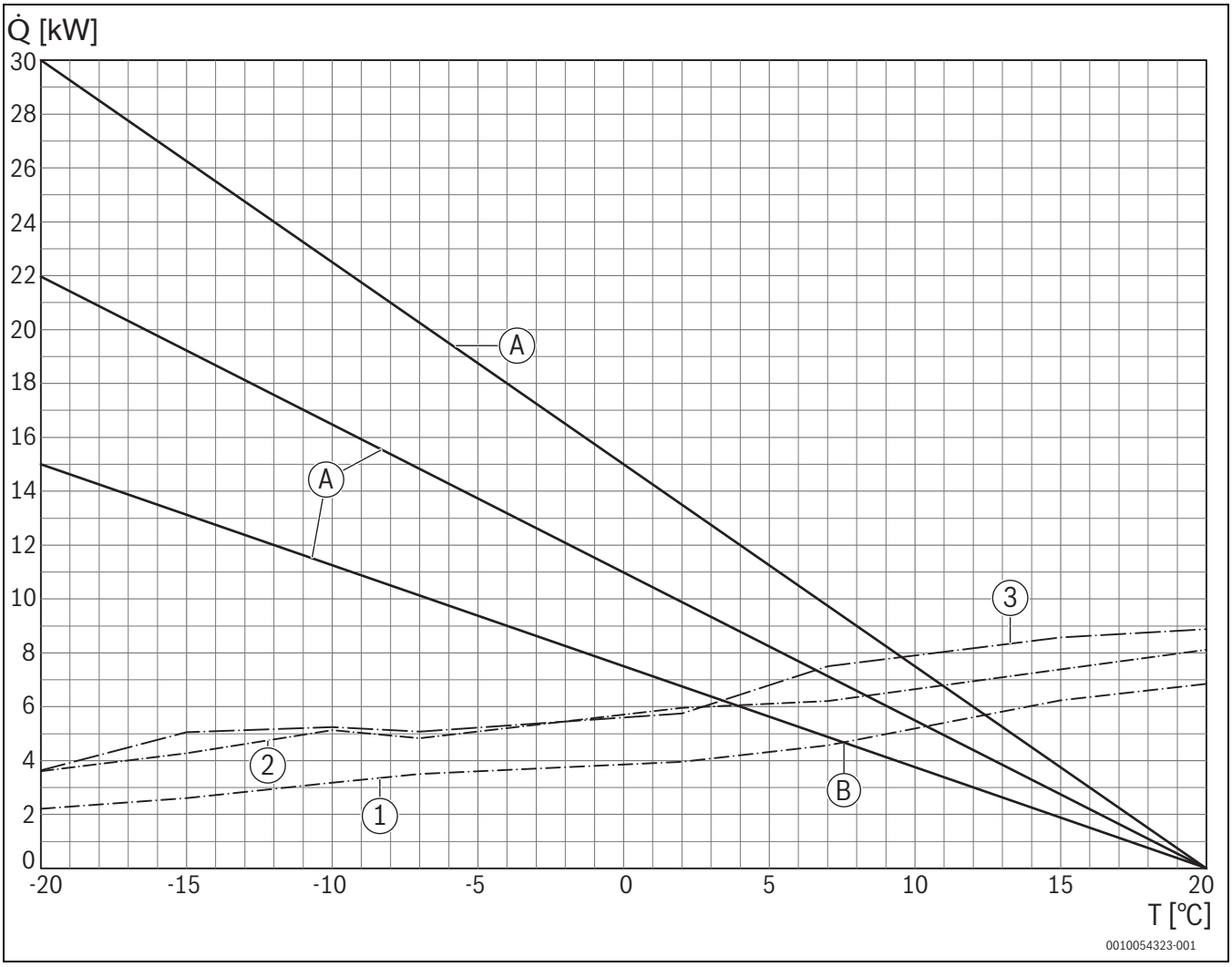

*Fig. 51 Diagram to determine the dual-fuel points at **55 °C** flow temperature*

Flow temperature 65 °C

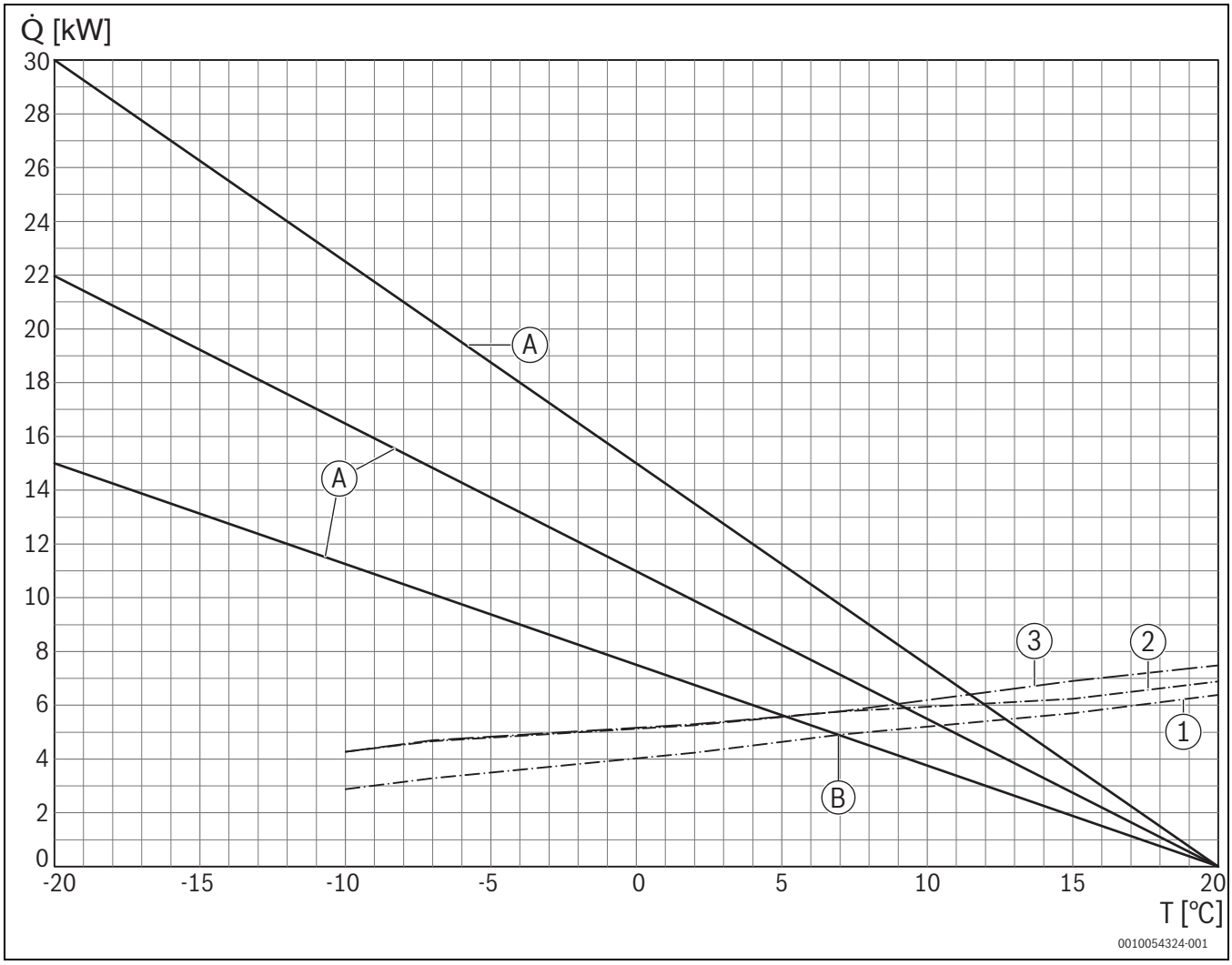

*Fig. 52 Diagram to determine the dual-fuel points at **65 °C** flow temperature*

Key to Fig. 49 to 52:

[T] Outdoor temperature
[Q] Heat output demand
[A] Building curves
[B] Dual-fuel points of the selected heat pump
[1] Heat output curve of the heat pump CS5800i AW 4
[2] Heat output curve of the heat pump CS5800i AW 5
[3] Heat output curve of the heat pump CS5800i AW 7

11 Overview of the service menu

The menu items in the service menu depend on the control unit and system installed. The following menu items are added to the service menu for the hybrid system.

Service menu

Commissioning

- ...
- Hybrid system installed
  - ...
- ...

Hybrid settings (Hybrid system settings)

- Control strategy
  - Cost-optimised
  - Heat pump-optimised (outdoor temperature parallel)
- Dual-fuel sw.-over point
- Energy prices
  - Gas costs
  - Oil costs
  - Electricity costs
  - Feed-in tariff PV
- Low-noise operation
  - Operating mode
  - Start time
  - End time
- Manual defrosting

Diagnosis

- Function test
  - *Hybrid* (Hybrid system)
    - ...
- ...
- Monitored values
  - *Hybrid* (Hybrid system)
    - ...
- ...

The energy values shown in the operating unit are estimated based on the internal data of the hybrid system. Many factors affect the energy consumption in real life conditions which means the energy values displayed are different to the energy values of an energy meter. The energy values are for information and should not be used for invoicing purposes. The energy values can be used to compare the energy consumption of various days/weeks/months

12 Faults

The LED displays the operating status of the hybrid manager and possible faults.

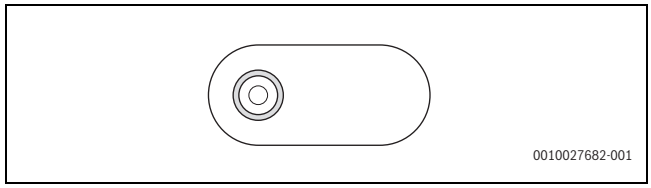

Fig. 53 LED

Status indicator	Possible cause	Remedy
Constantly OFF	Power supply interrupted	▶ Turn on the mains power supply.
	Faulty fuse	▶ When the power supply is switched off, replace the fuse (→ Fig. 54).
Constantly red	Internal failure	▶ Replace hybrid manager.
Red - blinking	• Defective sensor of the MH210 • Pump defective • Error message of the heat pump via CAN BUS.	▶ Check components.
Constantly yellow	Communication fault on the LIN-BUS	▶ Check the connecting cable and possibly, also the pumps.
Yellow flashing	Communication fault on the CAN-BUS	▶ Check the connecting cable and possibly, also the outdoor unit.
Constantly green	No fault	Normal Operation
Green flashing	Communication fault on the EMS 1/EMS 2-BUS	▶ Check the connecting cable.

Table 17 Status indicator and remedy of possible faults

Use only original spare parts. Damage caused by the use of spare parts not supplied by the manufacturer is excluded from the warranty.

▶ If a fault cannot be rectified, contact your local service engineer.

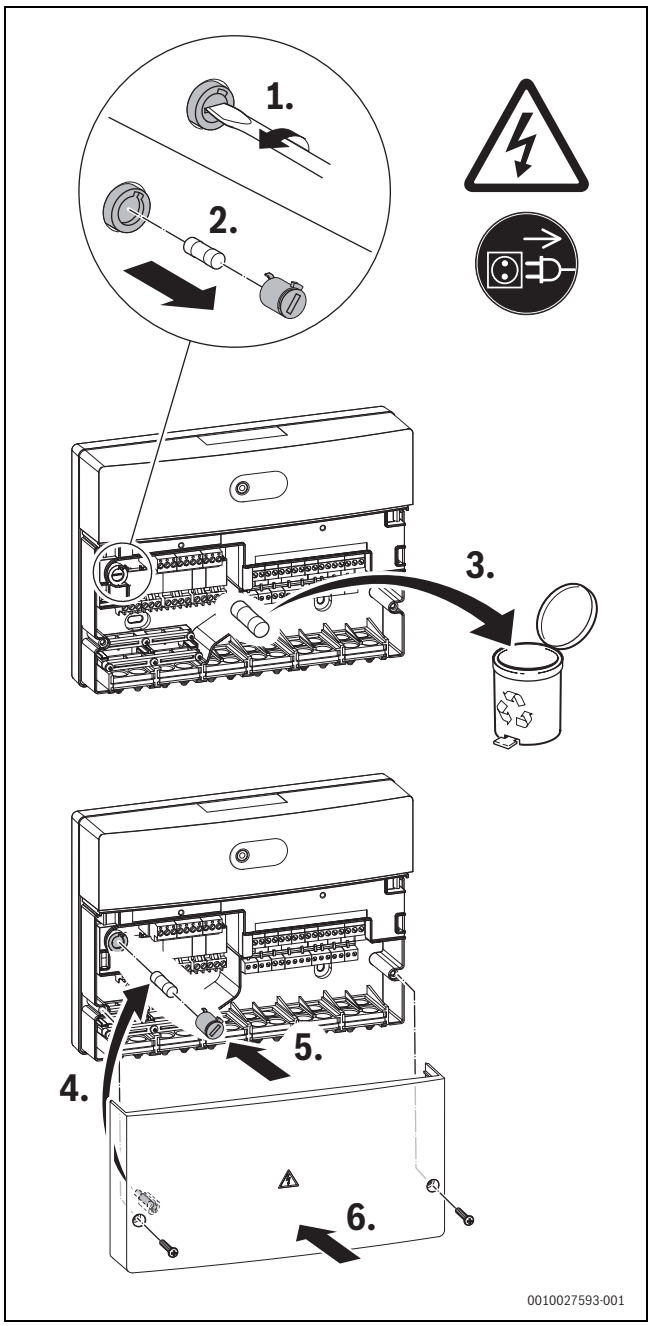

Fig. 54 Replacing the fuse

12.1 Faults of the hybrid system

Fault displays

Fault indications can be reset on the control unit in the diagnostic menu with **Reset**.

The following fault displays for the hybrid set can be shown in the display of the operating unit:

Display code	Fault code	Description	Test procedure/Cause	Action
–	5197	Hybrid circulation pump fault (PH0).	Voltage too high / too low. Temperature of electronics too high. Blocked impeller. Pump is flowing backwards (generator mode).	Check electrical connection / output voltage. Check the ambient temperature of the pump. Dismantle pump and check impeller for blockage. Check the hydraulic connection. Replace the pump if necessary.
–	5198	Hybrid circulation pump (PH0) blocked or defective.	Pump impeller blocked. Pump defective.	Disassemble the pump and impeller, unblock if necessary. Replace the pump if necessary.
–	5199	Dry running of the hybrid circulation pump (PH0).	No water in the system. Air in the system.	Fill the system with water. Start the bleeding function.

Display code	Fault code	Description	Test procedure/Cause	Action
–	5480	No circulation to heat pump.	Check the flow and return to the outdoor unit. Maximum pipe length exceeded. Check correct seating of the TH1 and TH2 sensors.	Ensure circulation. Correct sensor position.
–	5481	No CAN communication between hybrid manager and outdoor unit.	Check CAN BUS cable for continuity. Check connection of wires.	Replace the cable if necessary.
–	5482	Signal from ret. temp. sensor TH2 on hybr. man. outside curve.	Check sensor cable and sensor. Cable break Sensor defective.	Renew sensor.
–	5483	Signal from ret. temp. sensor TH1 on hybr. man. outside curve.	Check sensor cable and sensor. Cable break Sensor defective.	Renew sensor.
–	5484	Chosen hyd. conf. n. supp. f. det. sys.	Ensure that approved hydraulics have been installed. Check components (HYC, hybrid manager, heat generator).	Adjust configuration.
–	5485 5141	Circulation to heat pump too low.	Circulation to heat pump too low. Additional installations in the pipework, resistance too high (maximum pipe length exceeded / incorrect dimensioning). Air in the pipework to the heat pump. The pump in the heat pump circuit is defective.	Check the wire mesh filter in the pump assembly and clean if necessary. Check piping system, adjust to specifications if necessary. Vent the pipework. Replace the pump.
–	5486	No LIN bus communication.	Broken connecting cable, poor plug contact.	Check LIN bus cable and connector for correct fit and assignment (connector snaps into the pump).
–	5487	Defective low loss header temperature sensor on the hybrid manager	Check sensor.	Renew the low loss header temperature sensor.
–	5488	Defective outside temperature sensor on the hybrid manager	Check sensor.	Renew the outside temperature sensor.
–	5489	No values entered for energy prices.	No values entered for energy prices.	Enter prices (note: update at regular intervals).
–	5490	Signal from return temperature sensor TH2 on hybrid manager is outside the curve, cable break, sensor defective.	Check sensor cable and sensor. Cable break Sensor defective.	Renew sensor.
–	5691	Non-compatible SW version in the outdoor unit.	Check the outdoor unit.	If necessary, have a software update carried out, if possible.
–	5692	Incompatible SW version in the heat generator, or unsupported heat generator connected.	Check the conventional heat source.	If necessary, have a software update carried out, if possible.
–	5693	Internal fault in the outdoor unit.	Supply voltage is outside the permissible range of 140 - 300 V or defect in the outdoor unit.	Ensure voltage supply according to specification or repair the outdoor unit.

Table 18 Fault displays at the control unit

13 Frost protection

NOTICE

Material damage due to frost!

If the shut-off valves are closed, frost protection for the outdoor unit and connecting pipes is not guaranteed due to the lack of flow.

- ▶ Shut-off valves must always be open during operation.

NOTICE

During the heating period, one radiator/heating circuit must always be open to ensure frost protection; at best, this can be ensured by removing the corresponding thermostatic radiator valves.

14 Inspection and maintenance

14.1 Safety instructions for inspection and maintenance

WARNING

Danger to life from electric shock!

Touching live electrical parts can cause an electric shock.

- ▶ Before working on electrical parts, disconnect all phases of the power supply of the entire heating system (fuse/miniature circuit breaker) and secure to prevent unintentional reconnection.

⚠ Safety instructions for the pump

WARNING

Danger to life due to magnetic field!

Danger to life for persons with medical implants caused by permanent magnets installed in the pump.

- ▶ Never disassemble the motor.

CAUTION

Risk of burning from hot surfaces!

Pump housing and wet rotor motor can become hot and cause burns if touched.

- ▶ Allow the pump to cool down before carrying out any work.

CAUTION

Risk of scalding through hot media!

Hot pumped media can lead to scalding. Before loosening the housing screws, observe the following:

- ▶ Allow the heating system to cool down completely.
- ▶ Close the shut-off valves or drain the heating system.

⚠ Risk of scalding from hot water!

Hot water can lead to severe scalding.

- ▶ Make residents aware of the risk of scalding prior to activating the chimney sweep mode or a thermal disinfection.
- ▶ Carry out thermal disinfection outside the normal hours of use.
- ▶ Do not change the maximum domestic hot water temperature set.

⚠ Damage to device due to escaping water.

The control device could be damaged by escaping water.

- ▶ Cover the control device before working on water routing parts.

⚠ Following inspection/maintenance

- ▶ Re-tighten all threaded connections that have been loosened.
- ▶ Bring the appliance into operation (→ Chapter 8.5, page 30).
- ▶ Check all joints for tightness.

Notice on chimney sweep mode

For EMS appliances:

Chimney sweep mode can be activated on the conventional heat generator. The heat pump stops automatically and the circulation pump PH0 is operated.

For non-EMS appliances:

To carry out chimney sweep mode trouble-free, the pump test must be activated in the service menu and the pump speed set to 100 %. The heat pump stops automatically. After ending the chimney sweep mode, deactivate the pump test and exit the service menu.

14.2 Maintenance particulate filter in front of the pump

(→Fig. 56, schematic diagram)

During the commissioning phase and during operation, particles in the heating system can contaminate the filter and have a negative impact on the function of the pump. To ensure proper operation, regular maintenance and cleaning of the particle filter is required according to the Table 19.

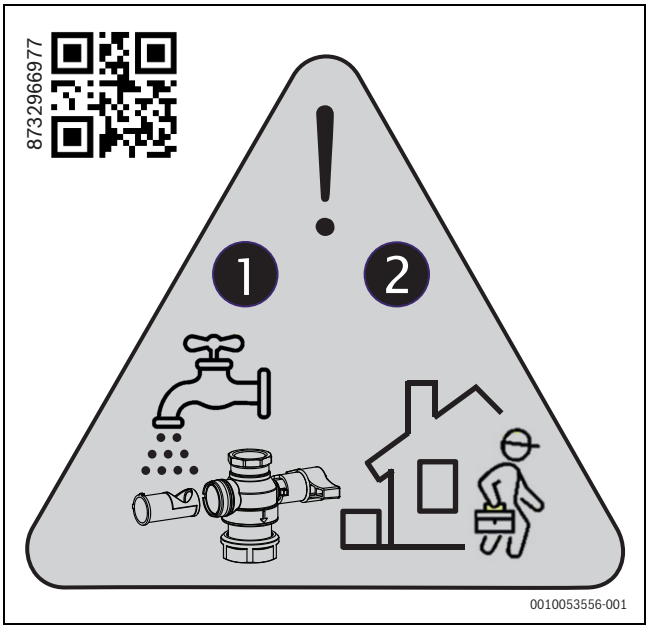

Fig. 55 Clean the particulate filter after maintenance

NOTICE

Fault display "Circulation too low"

If the service valves are closed during operation, a fault display appears.

- ▶ Switch off the heat pump and conventional heat generator before maintenance.

- ▶ Close the service valves above and below the pump.
- ▶ Place a drip pan underneath to collect any water that may escape.
- ▶ Carefully pull out the temperature sensor (retaining spring).
- ▶ Remove the particle filter at the shut-off valve and rinse it under running water.
- ▶ Reinstall the particle filter (hand-tight) and open the shut-off valves. Ensure the correct installation position of the filter (guide lugs/ recesses).

NOTICE

Open the shut-off valves after filter maintenance and pump replacement again!
Re-install the TH2 temperature sensor after maintenance!

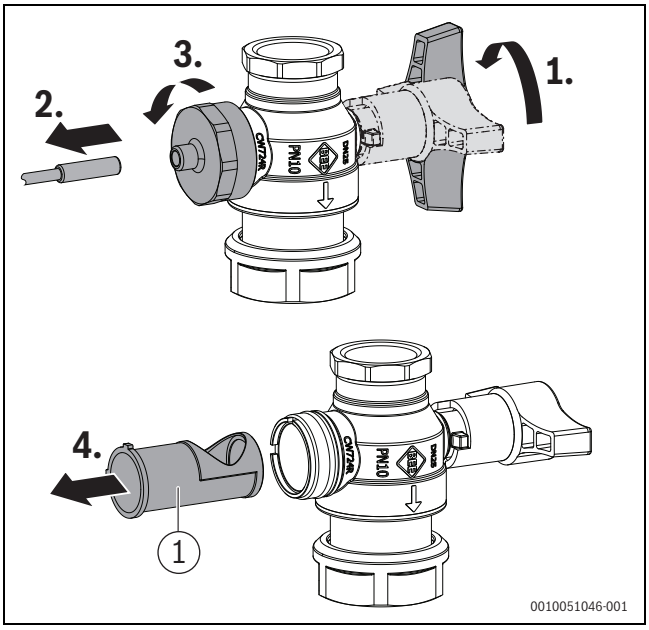

Fig. 56 Removal and installation of the particle filter (example)

[1] Particle filter

14.3 Maintenance intervals of the particle filter

NOTICE

Frequent contamination of the filter!

If the contamination of the filter occurs frequently, the system may have to be cleaned.

▶ Contact your service partner.

We recommend maintenance of the particle filter according to the following table:

Phase	Cleaning interval
During the commissioning phase	Until no more contamination is present (purge thoroughly prior to commissioning).
Regular cleaning	At least 1x annually

Table 19 Maintenance intervals of the particle filter

15 Environmental protection and disposal

Environmental protection is a fundamental corporate strategy of the Bosch Group.
The quality of our products, their economy and environmental safety are all of equal importance to us and all environmental protection legislation and regulations are strictly observed.
We use the best possible technology and materials for protecting the environment taking account of economic considerations.

Packaging

Where packaging is concerned, we participate in country-specific recycling processes that ensure optimum recycling.
All of our packaging materials are environmentally compatible and can be recycled.

Used appliances

Used appliances contain valuable materials that can be recycled.
The various assemblies can be easily dismantled. Synthetic materials are marked accordingly. Assemblies can therefore be sorted by composition and passed on for recycling or disposal.

Old electrical and electronic appliances

This symbol means that the product must not be disposed of with other waste, and instead must be taken to the waste collection points for treatment, collection, recycling and disposal.

The symbol is valid in countries where waste electrical and electronic equipment regulations apply, e.g. "(UK) Waste Electrical and Electronic Equipment Regulations 2013 (as amended)". These regulations define the framework for the return and recycling of old electronic appliances that apply in each country.

As electronic devices may contain hazardous substances, it needs to be recycled responsibly in order to minimize any potential harm to the environment and human health. Furthermore, recycling of electronic scrap helps preserve natural resources.

For additional information on the environmentally compatible disposal of old electrical and electronic appliances, please contact the relevant local authorities, your household waste disposal service or the retailer where you purchased the product.

You can find more information here:
www.bosch-homecomfortgroup.com/en/company/legal-topics/weee/

Batteries

Batteries must not be disposed together with your household waste.
Used batteries must be disposed of in local collection systems.

Declaration according to Regulation (EC) No 1907/2006 (REACH Regulation, EU Chemicals Regulation)

Regulation, SVHC list (as of 17.12.2015), Article 33 (1):
The control unit may contain SVHC Lead Titanium Zirconium Oxide [$(Pb_x Tl_y Zr_z) O_3$].

16 Data Protection Notice

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17 Appendix

17.1 Commissioning and maintenance protocols

▶ Sign and date the commissioning and maintenance work carried out.

Customer/system operator		**Installation company / customer number**	
Name:		Name	
First name:		First name	
Street/House number		Street/House number	
Postcode / Place:		Postcode / Place	
		Customer number:	

Table 20 System data

Heat generator control			
Control unit:		Software Version:	
Remote control type:			
Other modules:			

Table 21 Heat generator control

Hybrid system			
Hybrid manager:		Software Version:	
Outdoor unit:		Software Version:	
CH120, etc.:		Software Version:	
Other modules / remote controls / Smart Home:			

Hybrid system	
Heating controls set, notes:	
Have changed settings of the heating control been documented?	Yes ☐ No ☐

Table 22 Hybrid system data

0	Operating hours / Cycles / Counter readings	
0.1	System operating hours	
0.2	Boiler / burner operating hours	
0.3	Boiler / burner operating hours	
0.4	Compressor heating operating hours	
0.5	Compressor / heat pump number of starts	
0.6	Gas meter counter reading	
0.7	Boiler power meter counter reading	
0.8	Heat pump power meter counter reading	

Table 23 Operating hours / Cycles / Counter readings

1.	Installation conditions	Yes	No
1.1	Cellar ☐ | Attic ☐ | Residential unit ☐ |	–	–
1.2	Assembly / freedom from maintenance given?		
1.3	Have the maximum clearances of the pump line been observed?		
1.4	Has the pump line been installed in the direction of flow?		
1.5	Is the installation location frost-free?		
1.6	**Box variant outdoor area**	Yes	No
1.6.1	Has the Box been installed outside the protection zone of the outdoor unit?		
1.6.2	Has the pipework been thermally insulated according to the specification?		
1.6.3	Does the electrical power connection comply with the specifications in the installation instructions?		
1.7	**Box variant indoor area**	Yes	No
1.7.1	Is the installation location frost-free?		

Table 24 Commissioning and maintenance protocol, installation conditions

2.	Hydraulics / system		Yes	No
New installation ☐ | Renovation measure ☐ | Appliance replacement ☐ | Others ☐ |			–	–
2.1	Does the design correspond to an approved hydraulic schematics? Hydraulic number:			
2.2	Are there any deviations from the approved hydraulic schematics?			
2.3	Has the low loss header underneath the heater been installed in accordance with IM specifications?			
2.4	Is the flow temperature sensor located on the flow side of the low loss headers according to specifications in the installation instructions?			
2.5	Is the pressure relief valve correctly positioned according to the installation instructions? (position, direction of flow)			
2.6	The pressure relief valve is pre-set to: ☐ mbar		–	–
2.7	Minimum circulation volume checked: ☐ Litre		–	–
2.8	Heat distribution:	Radiators ☐ | Underfloor heating system ☐ | Others ☐ |	–	–
2.9	Heating system charge pressure: ☐ bar		–	–
02:10	Are safety valve and expansion vessel (can only be shut off with tools) available for the entire system?			
02:11	Does the safety valve open freely into a waste water connection?			
02:12	Have the connections on the heating appliance been visually checked for leaks?			
02:13	Has the dirt separator been positioned correctly according to the installation instructions?			
02:14	Has the dirt separator and filter in the pump assembly been checked for cleanliness after commissioning?			
02:15	Have the dirt separator and filter been checked for cleanliness?			
02:16	Has water conditioning been carried out?			
02:17	What water conditioning process was used? (Antifreeze, corrosion inhibitors, softening, desalination...)			
02:18	**DHW heating**			
2.18.1	DHW heating on the combi boiler checked for function?			

Table 25 Commissioning and maintenance protocols, hydraulics / system

3.	Setting up the heat pump		Yes	No
3.1	Is the heat pump standing on a solid flat surface?			
3.2	Is the heat pump aligned horizontally?			
3.3	Has the main wind direction been considered when installing the heat pump?			
3.4	Is the heat pump stably anchored and fixed at the feet?			
3.5	Are the minimum distance dimensions specified in the installation instructions observed?			
3.6	Only to be completed if "No" was specified under 3.5! Clearances [cm] to walls, fences, hedges, etc., if different from the installation instructions:			
	To walls: ☐ | Behind: ☐ | Top: ☐ | Left side: ☐ | Right side: ☐		–	–
	In front of the heat pump.	☐ cm	–	–
3.7	Is the heat pump positioned so that no snow or rain slide down / drip from the roof onto the house?			
3.8	Have the specified protection zones been observed?			

3.	Setting up the heat pump	Yes	No
3.9	Have recesses (e.g. open downpipe connected to the public sewage system, etc.) in which refrigerant can collect been avoided or closed?		
03:10	Is the condensate drain installed in such a way that condensation water is safely drained off, even in winter?		
03:11	Does the condensate drain have an auxiliary heating cable?		
03:12	Is the condensate hose additionally insulated?		
03:13	Is the condensate drained into a gravel bed in the ground?		
03:14	Is the condensate hose additionally insulated and is it routed into the rainwater drain channel without an auxiliary heating cable?		
03:15	Are anti-vibration connecting pipeworks used on the heat pump?		
03:16	Are drain plugs intended for draining the heat pump?		
03:17	Circuit between IDU/ODU cannot be completely shut off (see installation instructions).		
03:18	Have the connections on the heat source side been established correctly? (Dimensioning according to the installation instructions)		
	Internal diameter: mm	–	–
	Installed single pipe length between heat pump and heat generator: m	–	–
	Does the minimum length of the connection line correspond with the specifications?		
	Does the maximum length of the connection line correspond with the specifications?		
03:19	Is sufficient ventilation of the hydraulics possible?		
03:20	Have the connections on the heating side been properly insulated?		

Table 26 Commissioning and maintenance protocols, setting up the heat pump

4.	Electric connection	Yes	No
4.1	Has the electrical connection been made by a electrical contractor?		
4.2	Were the CAN-BUS connection lines correctly connected to the components (no twisted cables, maximum permissible cable length of 30 m has not been exceeded)?		
	Was the specified minimum cable cross-section of ≥ 0.75 mm^2 used for the CAN-BUS connection lines?		
4.3	Are the low-voltage cables routed free of interferences? (min. 100 mm to cables carrying 230 V /400 V)		
4.4	Does the power supply correspond to the installation instructions and have jumpers set at the factory for special circuits (EVU) been removed?		
4.5	Is the fuse protection of the components comprehensible through labelling in the control cabinet?		
4.6	Has the phase sequence L1, L2, L3 been checked for clockwise field of rotation?		
4.7	Can 230 VAC be measured at phase L1 against neutral (N)?		
4.8	Is the power supply company contact/PV or Smart Grid connected in the control?		
4.9	Is the outdoor temperature sensor T1 located on the coldest side of the house and connected to the hybrid manager?		

Table 27 Commissioning and maintenance protocols, electrical connection

EMS Fault log (delete fault history after checking)				
Fault code	Fault type	Description	Duration - from	Duration

Table 28 EMS Fault log

Remarks / Deficiencies / Monitor values / Recommendations)	

Table 29 Remarks / Deficiencies / Monitor values / Recommendations

Commissioning and handing over the heat generator	Yes	No
Was commissioning completed successfully?		
Commissioning was terminated; follow-up date is required		
Have all filters in the system been cleaned after commissioning?		
Operator has been instructed. Any deficiencies entered in table 29 must be rectified.		
The operator has been instructed and technical documents have been handed over.		

Table 30 Commissioning and handing over the heat generator

	Date	Commissioning / Maintenance	Company stamp / Signature
1		**Commissioning:.....** **Maintenance.....**	
2		**Commissioning:.....** **Maintenance.....**	
3		**Commissioning:.....** **Maintenance.....**	
4		**Commissioning:.....** **Maintenance.....**	
5		**Commissioning:.....** **Maintenance.....**	
6		**Commissioning:.....** **Maintenance.....**	
7		**Commissioning:.....** **Maintenance.....**	
8		**Commissioning:.....** **Maintenance.....**	

Table 31 Verification log, commissioning / maintenance

17.2 Technical data

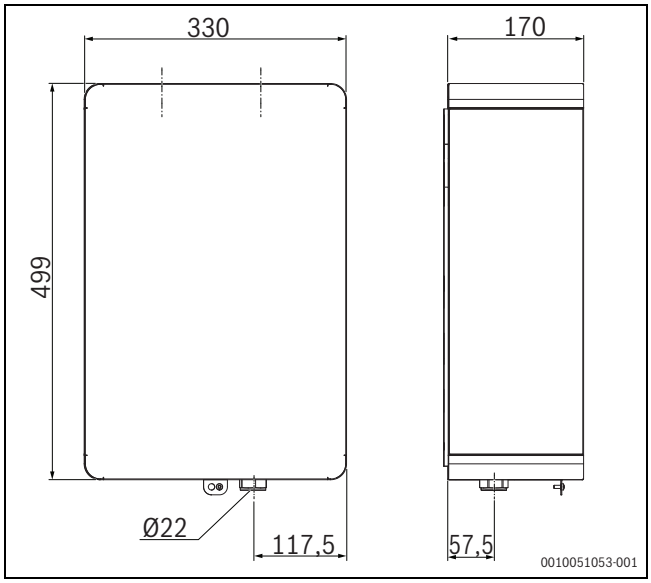

Fig. 57 Dimensions CSH5800iAW O

Technical data	CSH5800iAW O
Max. permissible operating pressure	0.3 MPa (3 bar)
Water temperature	0…80 °C
Sound emission	37 dB
Weight	13 kg
Maximum installation altitude	2000 m above sea level
Maximum conductor cross-section	
• Terminal mains voltage(230 V)	•2.5 mm^2
• Extra-low voltage terminal (≤ 24 V)	•1.5 mm^2
Rated voltages	
• EMS 1/EMS 2-BUS	•15 V DC (reverse polarity protected)
• CAN-BUS	•12 V DC
• Hybrid manager mains voltage	•230 V AC, 50 Hz
• Control unit	•15 V DC (reverse polarity protected)
• Pumps	•230 V AC, 50 Hz
Fuse (internal)	230 V, 5 AT
Miniature circuit breaker (external)	maximum 6 A (type B)
BUS interface	EMS 1/EMS 2, CAN-BUS and LIN-BUS
Power consumption on – standby	< 3 W
Maximum output, total	600 W
Maximum output per connection	
• PH0	•400 W (high-efficiency pumps permissible; <30 A for 10 ms)
Measuring range for return and system return sensors	
• Lower fault limit	•< – 10 °C
• Display area	•0 … 100 °C
• Upper fault limit	•> 125 °C
Output for the outdoor unit (safety extra-low voltage SELV)	12 V/600 mA maximum
Cable length to the outdoor unit (CAN-BUS)	Maximum 30 m
Permissible ambient temperatures	–20…+45 °C
IP rating	IPX4D
IP rating	I
For France: V Hp	14l (→NF DTU 65.16 : 2017 - 06 (t=180s, dT=5K)

Table 32 Technical data

17.3 Measurements from temperature sensors

CAUTION

Physical injury or material damage due to incorrect temperature

If sensors with incorrect characteristics are used, the temperatures may be too high or too low.

- Make sure that the temperature sensors used comply with the specified values (see tables below).

°C	Ω	°C	Ω	°C	Ω	°C	Ω
20	12488	40	5331	60	2490	80	1256
25	10001	45	4327	65	2084	85	1070
30	8060	50	3605	70	1753	90	915
35	6536	55	2989	75	1480	-	-

Table 33 Sensor T0, TH2, TC3

°C	Ω	°C	Ω	°C	Ω
– 40	154300	5	11900	50	1696
– 35	111700	10	9330	55	1405
– 30	81700	15	7370	60	1170
– 25	60400	20	5870	65	980
– 20	45100	25	4700	70	824
– 15	33950	30	3790	75	696
– 10	25800	35	3070	80	590
– 5	19770	40	2510	85	503
0	15280	45	2055	90	430

Table 34 Sensor T1

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